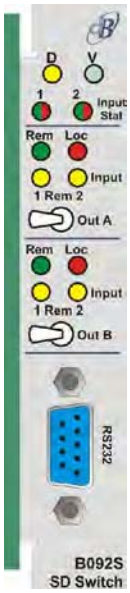
B092

DUAL SD-SDI
MONITOR / SWITCH SERIES



Handbook

Version 1.6

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Contents

Introduction

The B092 Hawkeye module is a general purpose SDI signal probe that may be used to adapt any third-party control system to monitor SDI signals. Alternatively, an integrated-controller version is available with a seamless on-chip 2x2 switch that avoids the need for external switching equipment.

The B092 series

Two versions are available:

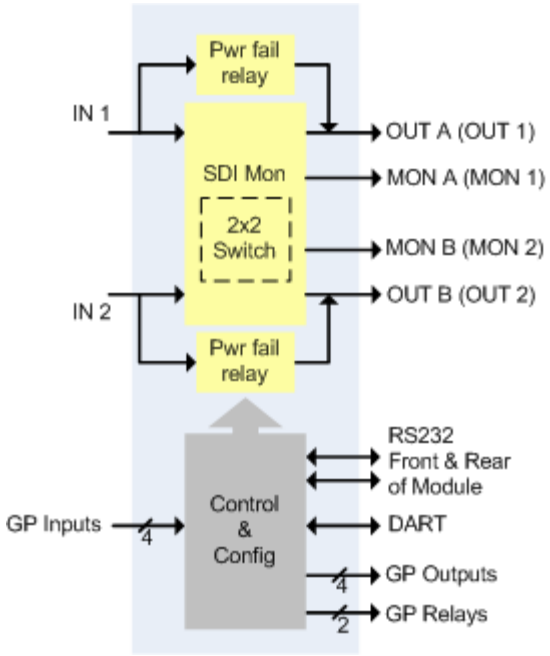
- B092M - Dual SD-SDI Monitor with Loop-throughs
- B092S - Dual SD-SDI Monitor with Integrated 2x2 Switch and Auto-Control

The B092S integrated switch may also be driven externally if required.

The B092 requires a 1U or 3U rack-frame which is available separately from dB, along with the necessary card back for each module. Alternatively, a 3U Pro-Bel Vistek frame may be used, and the back ordered separately.

Common block diagram

Both module versions share a common platform.



The B092S(M)

Outputs labelled "OUT" are bypass-relay protected, providing a loop-through path for the inputs under power-fail conditions. Outputs labelled "MON" are copies of the OUT signals available only when the module is powered.

The rear connector carries the video inputs and outputs, general purpose IO and a 3-wire serial port. There is an additional serial port on the front panel to facilitate local access.

The B092S provides flexible control modes with routing capability and routing indication.

The B092M has no control mode or routing indication as the routing is fixed because it has no switch. The rear panel control IO is disabled but the rear panel monitoring IO remains enabled. The LEDs in the outputs section of the front panel are not illuminated and the switches have no effect. The monitoring output is set for (powered) input loop-through and the relay bypass outputs Out A/B are not connected.

Signal I/O conforms to SMPTE 259M-C. This is the standard most commonly inferred by the term SD-SDI (Standard Definition Serial Digital Interface). It specifies a 270 MHz data-link, carrying component video with 13.5 MHz, 4:2:2 sampling. The frame format is either 525-line (interlaced) at 59.94 Hz, or 625-line (interlaced) at 50 Hz. Parts A, B and D of the standard refer to serial interfaces not running at 270 MHz and are not supported.

For seamless B092S switching, the SDI inputs must be genlocked externally. A constant offset of anything up to one line of video is permitted between the two inputs. Video synchronizers are available in Hawkeye module format for genlocking unrelated inputs upstream of a B092S if required.

All types of embedded audio legal for SMPTE 259M-C are supported, but level measurements are implemented for AES-3 linear PCM audio only. This is the most common format for embedded audio. Audio level alarms should be disabled for inputs carrying non-PCM audio.

Main features

Alarms (B092M and B092S):

Various properties of the incoming SDI are monitored and the user defines which of these affect alarms. The most important of these is the input status, or channel alarm, which is displayed on the front panel for each input. As well as providing a status summary, it also defines input failure as far as the B092S switch is concerned.

Monitored properties include:

- SDI data-link failure
- TRS, EDH and ANC errors
- Video standard change
- Video black, video freeze
- Audio fail, audio silence, audio level
- Input video offset

Routing / switching (B092S only):

Multiple switching methods are offered:

- Local - front panel switching
- Remote ext - GPIO / DART switching
- Remote serial - front / rear serial port switching
- Auto - on-chip controller switching

Interfaces

Configuration, monitoring and control are possible as shown in the table below:

Interface	Supported tasks
Front / rear panel serial port	Configuration, monitoring, control
General purpose IO	Limited monitoring, control
Front panel LEDs and switches	Limited monitoring, control
DART interface	Limited monitoring, control

Remote control and monitoring

Remote control and monitoring is possible by sending commands to individual modules in a 1RU or 3RU frame using the supplied S090 software or from a command-line using a standard RS232 terminal or terminal emulator. In addition, system level remote control of multiple modules in a 3RU frame is possible using DART and the B070 bus controller. System level control is also possible using the B070 and the B065 Rack Controller Module to provide both RS232 and Ethernet interfaces.

The advantage of the B065 is that it allows Simple Network Management Protocol (SNMP) based network management systems to be used such as the optional B067 SNMP Remote Control Software.

Module level

Two software solutions exist to facilitate configuration, monitoring and control of a module over its serial ports.

- S090 Graphical User Interface
- Command-line Interface

The S090 is client software that may be installed on a PC running Windows. It provides a fully-featured GUI for each B09X module connected. Multiple instances of the software may be run simultaneously. Each module requires its own serial connection and must be assigned a unique COM port on the PC.

The command-line interface is provided as an alternative for Windows users, and to support other operating systems such as Linux, Solaris and Mac OS X. It uses a straightforward text-based protocol with full online help, providing full access to all the module features. The user simply invokes a terminal emulator program on the client machine to gain access. Multiple modules are handled as above with separate connections and unique COM ports.

The command-line also facilitates scripting, allowing the user to automate configuration. By the same token, it offers an entry point for integrating individual Hawkeye modules into third-party control systems. The full protocol is available on request to enable speedy development of third-party drivers.

Both the S090 and the command-line interface can be operated remotely over a LAN using the B064 LAN-to-Serial converter dongle and virtual serial port software.

In summary, the module-level tools are used for configuration and wherever more detailed monitoring or more responsive control is required.

Note: Module level tools are required for the initial configuration and/or monitoring of modules used in 1U frame systems. System level tools are not available.

System-level

Two software solutions exist to facilitate monitoring and control of multiple modules in a frame using a single connection to the frame rather than an individual connection to each module.

- Pro-Bel Vistek DART (XML)
- dB DART (SNMP)

Both solutions require a 3U frame with a B070 bus controller card fitted in the dedicated slot above the power supplies. This bus controller handles the interface between the internal rack network (DARTbus) and the proprietary external network (DARTnet). Each solution also requires a network controller. The two solutions are mutually exclusive, as each uses a different topology for the DARTnet, and a different network controller. Note that it's not the frame which determines the solution, but the network controllers and how they are wired.

The Pro-Bel system envisages a number of frames daisy-chained together to form the DART network, which would be controlled using one or more network controller or gateway machines, such as a ViewNet Gateway. These machines act as a bridge between the DART network and conventional IP over Ethernet networks. Support and documentation for this system is provided by Pro-Bel.

The dB system uses a simpler approach mandating the use of one network controller per frame, such as the B065. Each DART network then consists of precisely one frame and one network controller. This reduces the proprietary network down to a single wire link, and shifts the handling of multiple racks out to the conventional network. As a result, each DART network is isolated from every other DART network in a multi-rack system.

The dB network controller may now be thought of as the second half of a rack interface that connects the frame directly to a conventional Ethernet network. To re-enforce this concept and to save space, the B065 is itself a Hawkeye module, allowing it to fit into a general purpose slot in the frame. The DART network is transparent to the user, and the B065 provides an SNMP interface to the entire frame.

Support and documentation for this system is provided by dB.

The B092 makes essential monitoring results available for both systems over DART by default. To control the B092S switch rather than just monitoring it however, remote_ext control mode must be assigned to DART rather than GPIO in the module configuration.

Installation

Selecting rear connectors

All B092 variants use the VB100 rear connector. Overlays are used to label the connections for the two different versions.

Type	Chassis	Available overlays
VB100	1U(F010) / 3U dB Broadcast/Pro-Bel Vistek	B092S, B092M

1U/3U chassis VB100

VB100 overlay for B092M

VB100 overlay for B092S

External connections

The SDI I/O uses the BNC connectors. The general purpose I/O uses the 26 way 'D' type connector.

SDI I/O

BNC	Signal - B092M	Signal - B092S
A	IN 1	IN 1
A1	OUT 1	OUT A
A2	MON 1	MON A
B2	MON 2	MON B
B1	OUT 2	OUT B
B	IN 1	IN 2

Main outputs are labelled OUT, whilst monitoring outputs are labelled MON.

B092M: The input signals (IN 1, IN 2) have a fixed routing to the main outputs (OUT 1, OUT 2 respectively).

B092S: The input signals (IN 1, IN 2) are routed to the main outputs (OUT A, OUT B) by the integrated switch. Each output may be routed independently.

Main outputs are designed to feed a broadcast chain. They are protected against power failure using bypass relays. The relays route IN 1 to OUT A and IN 2 to OUT B if the module power fails. Note that even if this does not result in a routing change (e.g. B092M), the video delay across the module is likely to be affected. To minimise this effect, the mvo setting can be reduced (see later). This emergency switching is a conventional non-seamless operation.

Monitoring outputs provide a copy of their respective OUT signal. The behaviour of MON outputs is not jumper-selectable as it was in the B08X series. MON outputs are not protected by a power-fail relay.

General purpose I/O

Ext In and Ext Out signals use a LOW voltage for signal TRUE.

Pin	Signal - B092S	Function
1	Tx Data	Rear serial port
2	Rx Data	Rear serial port
3	Ext In 1	Control - Switch A to 1
4	Ext In 2	Control - Switch A to 2 *
5	Ext Out 1	Configurable
6	Ext Out 2	Configurable
7	Ext Out 3	Control - A is in local mode
8	Ext Out 4	Control - OUT A is passing IN 2
9	Relay 1 NO/NC	Configurable
10	Relay 1 Common	
11	Not used	
12	Not used	
13	0V	
14	0V	
15	Not used	
16	Not used	
17	Relay 2 Common	
18	Relay 2 NO/NC - configurable	Configurable
19	Ext Out 8	Control - OUT B is passing IN 2
20	Ext Out 7	Control - B is in local mode
21	Ext Out 6	Configurable
22	Ext Out 5	Configurable
23	Ext In 4	Control - Switch B to 2 *
24	Ext In 3	Control - Switch B to 1
25	Connected to pin 2	Rear serial port
26	Connected to pin 1	Rear serial port

Ext Outs are open-collector Darlingtons with emitters commoned to 0V.

Ext Ins are opto-coupled inputs which may be shorted to 0V.

0V is also the serial port GND.

Note: * If both ‘Switch to 1’ and ‘Switch to 2’ control inputs are asserted for an output, the controller will implement 'Switch to 2'.

Pin	Signal - B092M	Function
1	Tx Data	Rear serial port
2	Rx Data	Rear serial port
3	Ext In 1	*Not available*
4	Ext In 2	*Not available*
5	Ext Out 1	Configurable
6	Ext Out 2	Configurable
7	Ext Out 3	*Not available*
8	Ext Out 4	*Not available*
9	Relay 1 NO/NC	Configurable
10	Relay 1 Common	
11	Not used	
12	Not used	
13	0V	
14	0V	
15	Not used	
16	Not used	
17	Relay 2 Common	
18	Relay 2 NO/NC - configurable	Configurable
19	Ext Out 8	*Not available*
20	Ext Out 7	*Not available*
21	Ext Out 6	Configurable
22	Ext Out 5	Configurable
23	Ext In 4	*Not available*
24	Ext In 3	*Not available*
25	Connected to Pin 2	Rear serial port
26	Connected to Pin 1	Rear serial port

Ext Outs are open-collector Darlingtons with emitters commoned to 0V.

Ext Ins are opto-coupled inputs which may be shorted to 0V.

0V is also the serial port GND.

External inputs have pull-up resistors attached. There is a minimum hold time, which is of the order of 10ms. Inputs must be asserted low for at least this time to guarantee acceptance. Spikes that are shorter than this will be ignored.

External outputs are open-collector Darlington outputs. When an external pull-up is connected, this results in a low voltage for signal true.

Each relay is jumper-selectable to select the Normally Open or Normally Closed contact. See next section for details.

External outputs are updated synchronously every second. At any given time they declare the results of the previous analysis second. For monitoring outputs this represents a summary of errors, which occurred during that time. For switch status outputs however, it represents the current status at the update time. It follows that the status outputs may declare a new route up to a second after the event has occurred. Furthermore, since the switch responds quickly to control commands, if successive commands are issued to cause

a switch and then a switch back, this can occur without being reported on the status lines. The front panel LEDs follow exactly the same policy.

In other words, open-loop external control systems are free to drive the switch quickly, whilst closed-loop ones will need to wait for 1s after each command to verify the effect.

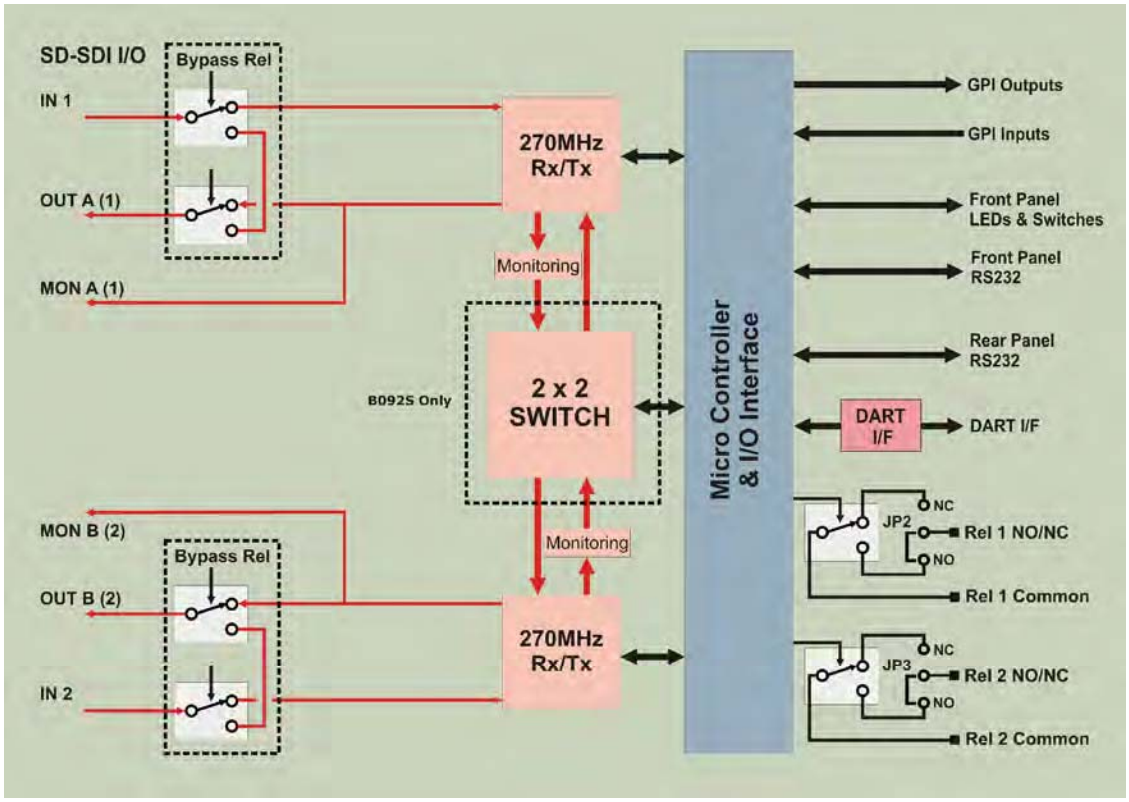
Front panel RS232

RS232 – 9 way 'D' type	
Pin	**Signal**
1	N/C
2	Transmit data (To PC)
3	Receive data (From PC)
4	N/C
5	Ground
6	N/C
7	N/C
8	N/C
9	N/C

A one-to-one serial cable is suitable for use on the front panel serial port. USB-to-serial converter cables may also be used.

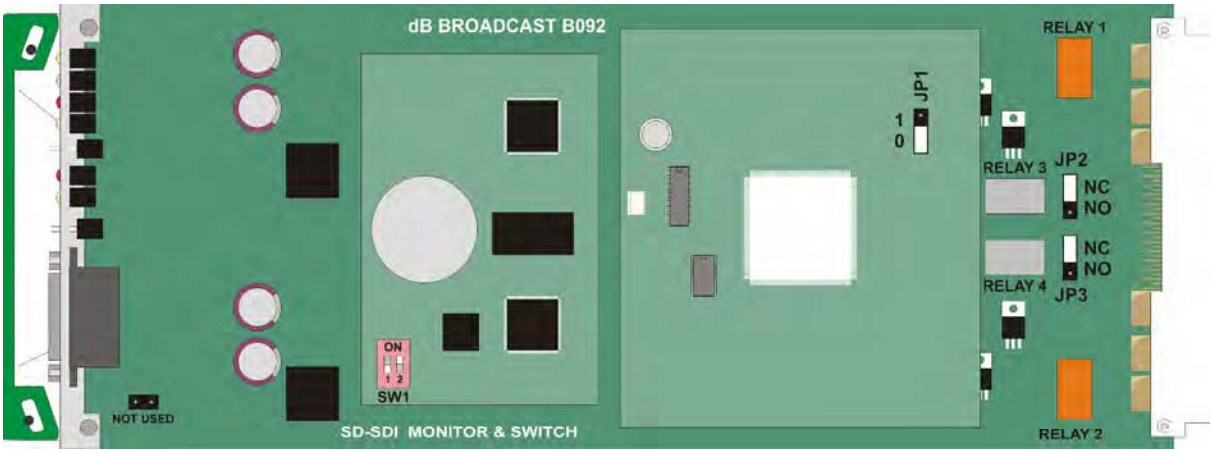
The rate is set by slider 2 on DIL switch S1 on the microcontroller sub-board. This can be either 9600 or 38400 Baud, with 8 data bits, 1 stop bit, no parity and software handshaking using Xon/Xoff. This setting affects both front and rear serial ports. Use of the 9600 setting is not recommended.

Hardware setup



The B092S & B092M Monitor with optional 2x2 Switch

Note: The bypass relays and the 2x2 soft switch are only enabled on the B092S.



The B092 module showing jumper links

Link functions

JP2	NO: Relay 1 NO contact is wired out
	NC: Relay 1 NC contact is wired out
JP3	NO: Relay 2 NO contact is wired out
	NC: Relay 2 NC contact is wired out

The relays are energised in the non-alarm state, so that a power failure has the same effect as an alarm, regardless of whether the NC or NO side is wired out. For the correct sense, read “N” in the table above as “Alarm”.

Switch functions

SW1 is located on the VM1 microcontroller piggyback module nearest the front panel.

SW1-1	Programme/Run mode. This should be set to run.
SW1-2	Serial Baud Rate. Selecting 38k4 is recommended.

Factory settings

Note: RV1 and RV2 under the rear piggyback module are set at the factory and should not require adjustment. JPI on the motherboard is unused, and should be left without jumper. JPI on the daughterboard should be jumpered in position 0. (Position 1 enables a test port).

Operation

Configuration

Configuration of a B092 is carried out over its front or rear serial port from a client machine running the S090 software, or using the command-line. Module settings are stored on the card itself in non-volatile memory. Details of the configuration options are laid out in the chapters that follow on the S090 and command-line interfaces.

Note: Since settings are not stored by the bus or network controller, they will move with the module rather than staying with the slot during a hot-swap operation. DART routing commands ARE associated with the slot however.

Summary alarms

The B092 is designed to enable a manageable status summary to be obtained from various error conditions according to the priorities of the target system. This is achieved using four configurable summary alarms per channel (the main input status alarm, plus three auxiliaries) configured by selecting drivers from a pre-defined list of possible sub-alarms.

Input status alarms

The B092 has one master status alarm per input. These alarms are displayed on the front panel as input status LEDs. As well as providing a useful summary of each input, these alarms determine the status of the inputs as far as the auto-switching algorithm is concerned.

Good status (SDI_status = '1') is indicated green.

Fail status (SDI_status = '0') is indicated red.

The status alarms are configurable, being driven by some combination of sub-alarms. The three SDI-fail sub-alarms are mandatory and cannot be removed from the alarm equation.

Equation 1: Fail status = logical OR of the included sub-alarms.

Sub-alarms

*SDI Fail - Link **
*SDI Fail - Stuck Bit **
*SDI Fail - Std Lock **
Video Standard
TRS Errors
EDH Errors
ANC Errors
Video Black
Video Freeze
Audio Fail
Audio Silence
Audio Level

Sub-alarms are included or excluded from the equation for each status alarm in the configuration using the S090 or the command-line interface. Mandatory terms (*) cannot be removed from the equation.

The status alarms for inputs 1 and 2 are SDI_status_1 and SDI_status_2 respectively. Each may be configured differently.

External output alarms

These are configured in the same way as the input status alarms with the additional feature that they may be set to follow the input status alarm even if its definition is changed. The external output alarms form part of the GPIO interface.

Other settings

In addition to configuring the summary alarms, the behaviour of individual sub-alarms may be configured. This involves specifying the expected video standard, various algorithm thresholds, expected audio channels, level thresholds and so on. There are also global settings such as the video delay across the module, and various control options. Full details of these can be found in the chapter on the S090 client.

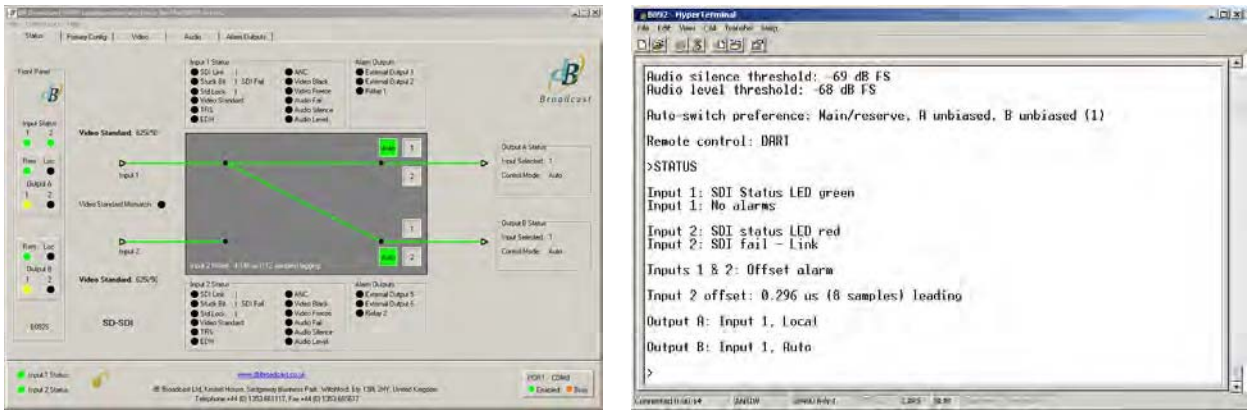
Monitoring

The B092 monitors its input SDI looking for the presence of certain required elements, and flagging various errors. It provides a number of sub-alarms which represent the outcome of various standard and customized tests, as well as a certain amount of information derived directly from the streams. The sub-alarms may be combined by the user to form summary alarms, the most important of which is the input status alarm for each channel.

Interfaces

Monitoring information is available over a number of different interfaces. Interfaces should be selected according to the requirements of your system. Such considerations include the amount and type of information that is required, and whether the information is fed to an automatic system, or presented to an operator.

All monitoring results are available over the module's serial ports, and may be accessed using the S090 client software, or in text form by polling the command-line interface.



Full monitoring is available over B092 serial ports.

Both serial solutions offer access to all results and front and rear serial ports may be operated simultaneously.

Connection is made directly using a serial cable, or over an IP network using a virtual serial port and dongle solution, also available from dB.

The GPIO and DART interfaces provide essential information only, as appropriate for their application. When using the B092 as a remote analysis or diagnostic tool, a serial port connection is therefore the best option. The other interfaces provide a useful alternative for systems where simplification of alarms and / or wiring is an important consideration, such as when a single machine acts as a collator or controller for a large number of modules.

The GPIO interface is the simplest method of returning status information about the SDI to an external system. Its monitoring component comprises six outputs, three per channel. Specifically, two open-collector transistor outputs, and one relay are provided. The relay offers a choice of normally closed and normally open contacts. These external alarm outputs may be set up to follow the input status alarm or configured with a completely different set of sub-alarms, allowing both failure and warning signals to be defined.

The DART interface may be used for monitoring if a B070 controller card is present in the frame. A DARTnet controller is also required to translate the DART information into a standard format. The B065 is such a controller, providing an SNMP interface to the frame.

The B092 front panel LEDs display the input status alarms, as well as the routing and control mode (local / other) for each output, but no sub-alarms are indicated.

Sub-alarm details

A total of 12 sub-alarms are evaluated for each input channel. They are listed in order of priority (decreasing severity). This arrangement is intended to facilitate speedy problem diagnosis. Under alarm conditions, it is generally possible to look down this list in order and conclude that the first indicating alarm points to the source of the problem.

The first three sub-alarms (Link, Stuck Bit and Std Lock) are fundamental, and are used to mute the other sub-alarms. They are therefore mandatory and cannot be removed from the SDI status configuration equations.

SDI Fail - SDI Link

This sub-alarm indicates that the input deserialiser chip has failed to lock to the datalink layer of the incoming signal. It indicates that input cable has been disconnected or that a signal with the wrong datalink format has been applied (e.g. ASI, 360 MHz SDI or HD SDI). In the presence of this alarm, all other sub-alarms are muted.

SDI Fail - Stuck Bit

SMPTE 259M-C SDI is defined as a serial version of the SMPTE 125M parallel interface. It is in the context of this parallel interface that the stuck bit sub-alarm operates. Even if a physical SMPTE 125M interface does not appear to exist upstream in your system, SDI is often created even today by passing such a parallel interface to a serialiser chip within a device on the actual circuit board. This sub-alarm is therefore still useful for diagnosing problems due to hardware failure on this bus in the preceding equipment. It is triggered when one of the bits has been permanently set to low or high. In the presence of this alarm, all lower priority alarms are muted. Note that the B092 requires the bit to be stuck through the

blanking as well as the active picture region, to avoid a still solid colour frame from tripping this sub-alarm.

SDI Fail - Std Lock

This sub-alarm indicates that deserialiser chip on the B092 has been unable to lock to the incoming video standard. It is intended to indicate inconsistencies in the incoming video standard in terms of number of samples per line and so on, that may be due to excessive jitter or SMPTE 125M clock bounce for example. Note, that if the standard is legal for transport over SMPTE 259M-C this alarm will not be set regardless of the expected standard specified in the configuration unless there are inconsistencies in the signal. Indeed, if the format is consistent with itself it may be passed whether it is legal or not. In the presence of this alarm, all lower priority alarms are muted.

Video Standard

The B092 supports a number of SD video standards primarily 625i and 525i. The expected video format(s) for your system must be selected in the configuration. Having done this, the video standard alarm will be set whenever an unexpected format is detected. Note that this alarm is purely related to the configuration setting. It does not indicate illegality. The video standard is automatically detected from the position of the TRS signals in the incoming data. The detection algorithm includes a degree of noise immunity allowing it to cope with random errors as well as TRS irregularities on the SMPTE RP 168 switching lines.

TRS Errors

Individual TRS errors in the SAV or EAV sequences are counted up to a specified user threshold, at which point the alarm is triggered. The threshold is specified in the configuration in errors per second. If the threshold is set to its minimum value of 1, the alarm operates as an error detector. In this case, one would probably not wish to include it in the configuration equation especially if auto mode switching is being used. At higher values it can be used to set a TRS quality threshold where it may be appropriate to include it in the status equation if, for example, there is a real prospect of an asymmetry in the quality of the two inputs.

EDH Errors

Individual Active Picture CRC errors and Full Field CRC errors declared in the EDH packets are counted up to a specified user threshold, at which point the alarm is triggered. There is a separate counter and threshold for each type of error. Each counter may be enabled or disabled in its contribution to the sub-alarm. The thresholds are specified in the configuration in errors per second. If the thresholds are set to their minimum value of 1, the alarm operates as an error detector. In this case, one would probably not wish to include it in the configuration equation especially if auto mode switching is being used. At higher values it can be used to set a data integrity quality threshold where it may be appropriate to include it in the status equation if, for example, there is a real prospect of an asymmetry in the quality of the two inputs.

Note: Firmware 1.0/11625 has the TRS and EDH Errors counters permanently set to the minimum value of 1.

ANC Errors

Individual events in the ancillary data have their own component alarms in the B09X series. The ANC Errors alarm is itself the summary of these alarms. It too has a configuration equation that allows individual components of the ANC analysis to be enabled or disabled for the purposes of contributing to the ANC Errors alarm, and thereby to switching if ANC Errors is included in the input status equation.

The B092 however, has but one ANC Errors component, the Video Payload ID alarm. This alarm is set if the signal contains SMPTE 352M Video Payload ID ancillary packets, and the payload description does not match the auto detected video standard. This component alarm is permanently wired in to the ANC Errors alarm on the B092.

Video Black

The video black algorithm detects a digitally black picture. For this alarm to be set, a number of consecutive fields must be declared black. The number of fields acts as a good to fail for the alarm. This number can be set in the configuration.

A number of thresholds will be available that can be set in the configuration to redefine black for a perceptually black signal if required.

Video Freeze

Video freeze is detected using a proprietary algorithm. Parameters are available for configuring this alarm.

Audio Fail

Up to 16 channels of AES audio are permitted along with the video in a SMPTE 259M-C SDI stream. These audio channels are arranged in 4 groups of 4 channels. The audio fail sub-alarm detects the presence of audio packets in the stream which are identified according to their channel number and group. It may be configured to expect any combination of channels as its minimum content threshold. If packets from the expected channels do not exist in the stream, the audio fail sub-alarm will be triggered.

Audio Silence

Given that a particular audio group is present, this alarm examines the level of the audio data therein and will alarm if it falls below a configurable threshold. This alarm can be selectively enabled on the audio that is present.

Audio Level

Given that a particular audio group is present, this alarm examines the level of the audio data therein and will alarm if it falls below a configurable threshold. This alarm can be selectively enabled on the audio that is present. It is intended that this alarm will have a higher threshold than the audio silence alarm.

General results

The B092 provides the following general results in addition to the sub-alarms.

- Input 1 Detected Video Standard
- Input 2 Detected Video Standard
- Video Standard Mismatch
- Audio Sub-subs
- External Alarm Output Status

Note: These results are easily accessible using the S090 client, and very intuitive. When using the command-line protocol however, there is no high-level language construct provided in uC firmware version 1.0 for easily displaying results 1) to 4). They are available in register format only.

Supported video standards

All legal SMPTE 259M-C video standards are supported. The most common of these are:

- 525i / 59.94
- 525ei / 59.94
- 625i / 60

Frames are either 625- or 525-line. The 'i' stands for interlaced, and the field rate follows the '/' in Hz. Standard 525-line video has 20 lines of vertical blanking before the first field, but it is also legal to extend the active picture to leave only 10 lines of vertical blanking before the first field. If this condition is detected, the module reports an 'e' after the 525 in the standard name.

A number of names are reserved for unusual formats that may also be seen on a SMPTE 259M-C datalink:

- 525 generic
- 525e generic
- 625 generic

Non SMPTE 259M-C formats such as composite SDI result in an SDI Link Failure alarm rather than an unusual video standard since they occur on link rates other than 270 MHz.

Video standard mismatch

A video standard mismatch is declared if the detected video standards for the two inputs differ. Switching operations may or may not be seamless in the presence of this indicator depending on the nature of the mismatch, and of course whether the inputs are genlocked. Note that this is not the same as the video standard sub-alarm, which indicates for each channel that the detected standard did not match the expected standard.

Audio sub-subs

Failure, low-level and silence alarms are provided individually for all 4 channels in all 4 audio groups for each SDI input. In particular, previews are provided so that it is possible to see the status of each audio channel regardless of whether it is selected to contribute to the global audio fail, low-level or silence sub-alarms.

Control (B092S only)

A major advantage of the B092S is its suitability for stand-alone operation, saving cost and space with its ability to function without an external control system. However, there are several other methods of controlling the B092S apart from the on-chip controller. These include the front panel switches, the general purpose IO, the DART interface and the front and / or rear serial ports.

Note: The B092M has no control mode or routing indication as the routing is fixed because it has no switch. Accordingly, the LEDs in the outputs section of the front panel are not illuminated and the switches have no effect.

This control flexibility allows the B092S to be deployed in many different ways. The control methods are arbitrated using control modes. These modes have a fixed order of precedence with 1 being the highest priority:

Priority	Mode	Description
1	Local	- front panel switching
2	Remote ext	- GPIO / DART switching
3	Remote serial	- front/rear serial port switching
4	Auto	- on-chip controller switching

Generally speaking, the device will be connected to operate in one control mode under normal circumstances, leaving the other modes available for occasional use. At any time, the mode is determined by the highest priority active interface. The choice of control system depends upon the system designer.

Control modes are assigned per output. This means output A can be under local control whilst output B remains in auto, for example.

Example systems

Below are some examples of common control strategies.

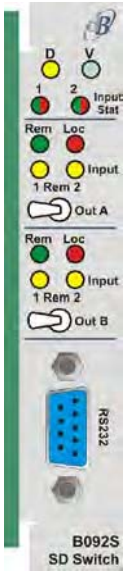
Example	Normal Mode	Maintenance Mode
i	Auto	Local
ii	Remote ext	Local
iii	Remote serial	Local
iv	Auto	Remote serial

Local mode

Local mode is for forcing an output manually to one SDI input or the other. It is particularly useful for isolating part of a system to perform on-site maintenance. Local mode is achieved per output by activating its front panel switch. It has the highest precedence and overrides all other switching commands.

Local mode is indicated by the red front panel LEDs. The control mode LEDs operate in real time without any delay.

Front panel controls and LEDs



LED Indicators:

D	Yellow	– Flashing indicates DART monitoring is active
V	Green	– Indicates DC power present & OK
1/2	Green/Red	– Indicates configurable input status good / fail
Rem	Green	– Remote / Auto control active
Loc	Red	– Local control active
Input 1/2	Yellow	– Shows the currently selected input, either 1 or 2

Note: The 8 output indicators and 2 front panel switches are disabled on a B092M.

B092S front panel control

Local control is in force on an output when its front panel switch is not in the central position. Remote control is defined as any control mode other than local, including auto.

Each front panel switch can be used to locally force an SDI output to either of the module inputs.

Output	Front panel switch position		
	Left	**Central**	**Right**
A	Output A to Input 1	Remote / Auto	Output A to Input 2
B	Output B to Input 1	Remote / Auto	Output B to Input 2

The front panel switches allow an on-site engineer to temporarily disable all remote / auto control for each output, forcing that output either to input 1 or input 2. This is a useful feature when performing maintenance on a live broadcast system.

Below the input status alarms, the front panel is divided into two sections, one for each output. Output A indication appears above output B indication. Each output section features control mode indication and a routing indication.

Control mode indication is provided by the Rem / Loc LEDs, which show the currently active control mode for each output. Loc indicates local control (a front panel switch is in play), whereas Rem indicates all other modes. See the control modes section for further information. Routing indication is provided by the yellow routing LEDs that show which input is connected to each output.

Full configuration, monitoring and control is possible using either of the serial ports. This allows the rear port to be used as part of the fixed installation whilst the front port can be used for maintenance at the same time.

Remote ext mode (GPIO)

Remote ext mode is for driving the B092S switch using either the GPIO interface or the DART interface. The GPIO interface is the set of discrete IO lines available on the module rear connector. The B092 provides 3 GPIO alarm output signals per channel - 2 transistors and 1 relay.

In addition to the alarm outputs, this interface also provides control mode and routing indication for each output, just like the front panel - a total of 4 further transistor outputs.

Finally there are also two control inputs for driving each output switch.

Only one of these interfaces can be used for control at any one time. Assign the one you wish to use to remote ext in the configuration, using the command-line or the latest version of S090 software. Remote ext has the second highest level of priority.

For DART control, refer to the manual accompanying your DART control system (e.g. Vistek ViewNet, or dB B065).

When GPIO control is enabled, it is entered when local mode is off and a valid forcing signal is received on the general purpose inputs. These forcing signals must be held for as long as they are required.

Removing them results in a return to auto mode. If both the force-to-1 and force-to-2 control inputs are activated at the same time on a channel, force to IP 2 always wins. For serial or auto control to be possible, the remote ext control lines must be inactive (voltage high). This is the default condition when there is no connection to these inputs.

See also notes under General Purpose IO in the INSTALLATION section.

Remote ext mode (DART)

DART support allows the B092 to easily integrate into a Pro-Bel Vistek DARTnet system. Db Broadcast and Pro-Bel Vistek racks are capable of operating with or without DART functionality. To operate with DART functionality, a rack controller module must be fitted in the dedicated rack controller slot above the rack PSUs. This controller communicates with rack modules such as the B092 using the rack's internal DARTbus.

A number of racks may then be daisy-chained together using the rack's external DARTnet connector. The DARTnet as a whole may be connected to a standard Ethernet LAN through a ViewNet gateway unit. This unit may be accessed by any PC on the LAN using the ViewNet gateway client software.

The B092 allows its switch to be controlled externally over DART as an alternative to GPIO. This feature must be enabled in the B092 configuration as its default setting is OFF.

The B092 also makes a sub-set of its monitoring alarms available over DART, to enable an external controller to make the appropriate switching decisions, or for information purposes only. Monitoring over DART is always enabled regardless of the status of the control setting above. Below is a list of the alarms available:

Channel status

- SDI Fail
- Video Standard
- TRS Errors
- EDH Errors
- ANC Errors
- Video Black
- Video Freeze
- Audio Fail
- Audio Silence
- Audio Level

SDI Fail over DART is the logical OR of the following three sub-alarms:

- SDI Fail - Link
- SDI Fail - Stuck Bit
- SDI Fail - Std Lock

Channel status is a summary alarm defined in the B092 configuration.

Remote serial mode

Remote serial mode is for driving the switch using a serial port. This could be the front panel serial port or the rear one. This mode is used by both the S090 software and the command-line interface. It has the third highest level of precedence and both serial ports have the same priority. The front panel port is designed for on-site access with a laptop or PDA. The rear port is designed for fixed installations. Both ports may used simultaneously, though if one port is being used by a control system it is wise to use local mode when trying to create temporary overrides.

Remote serial commands are persistent. They must be overridden by another command of equal or higher precedence, or switched off by the return to auto command. This is issued by the auto button in the S090 software or by entering opx:0 on the command-line (x = a or b).

It is possible to drive this port remotely over a LAN using a LAN to serial converter unit (not supplied).

Auto mode

Auto mode is the default used when no other control modes are in force. It can be enabled or disabled. When disabled it does nothing other than act as the off state for the other control modes. When active it gives control to the internal on-chip controller whenever auto mode is invoked. Auto mode is enabled using the switch config box in the S090 software, or the asp command on the command-line interface.

Changing control mode

To change to a higher precedence control mode, simply issue a command on the higher level interface and any lower precedence commands will be overridden.

To switch to a lower precedence mode, the higher precedence command must first be cancelled. This drops the control down to auto. Provided auto mode is disabled or in agreement with the current routing no change will occur. Auto mode will be always be in agreement if both streams have the same input status and the auto-switch preference is set to unbiased. Having returned to auto, any other control command may be issued, changing the mode back up to the required level.

Cancelling local mode is achieved by returning the front panel switch to the central position.

Cancelling remote ext mode is achieved by allowing both switching inputs to float high or by pulling them up externally.

Cancelling remote serial mode is achieved by selecting the auto button from within the S090 software, or by sending the opx:0 command on the command-line interface (x=a for output A, b for output B).

Auto switch settings

Switch modes determine the behaviour of the switch when in auto control mode.

A dependency setting and a bias setting must be selected.

Not all combinations will be offered.

Dependency	Description
Main/Reserve	Outputs are independent
Preview	Output B always takes the opposite input to A In the event of an input failure, the inputs are routed, so that if (say) the A output is used for transmission it will continue to receive a good signal, whilst the bad input is routed to output B, which can then be used to preview or monitor the failed input.
Off	No auto-switching is performed on either output.

For each output a switch mode can be set (B092S):

Mode	Description
Biased	This mode switches the output away from a failed input if the other input is healthy, and back again when the preferred input comes good again. The output can be configured as biased to 1 or biased to 2.
Unbiased	This mode is used to minimise the number of switches that are made, by not preferring one input over the other. This means after a switch is made, the output stays on the new input indefinitely whilst it remains healthy.

Switch types

Switching will be according to SMPTE RP 168 whenever possible.

The device will endeavour to provide smooth switching between its two inputs. The degree of smoothness will depend on the relative timing of the input signals and the number and type of error conditions present on each.

For smooth switching, the inputs should be nominally co-timed. In other words, there should be sufficient overlap in the SMPTE RP 168 switching zone on each input for a smooth switch to occur. In practice this means that the input signals should be synchronised to within a line.

Switching will not be smooth if any of the following errors are present:

SDI Fail	- SDI Link
SDI Fail	- Stuck Bit
SDI Fail	- Std Lock
Video Standard	- if both inputs are unknown rather than just unexpected.

The following alarms represent errors that affect the timing of the video signal. Therefore, under these conditions, a switching operation cannot be guaranteed to be smooth:

TRS Errors

EDH Errors

The following errors may occur without any of the above being present. If this is the case switching under these errors or none will result in a smooth switch.

ANC Errors

Video Black

Video Freeze

Audio Fail

Audio Silence

Audio Level

A smooth switch means that only RP168 compatible disturbance to the horizontal or vertical video synchronisation should be present in the output signal. For compatible decoders, no visible video sync disturbance should be observed.

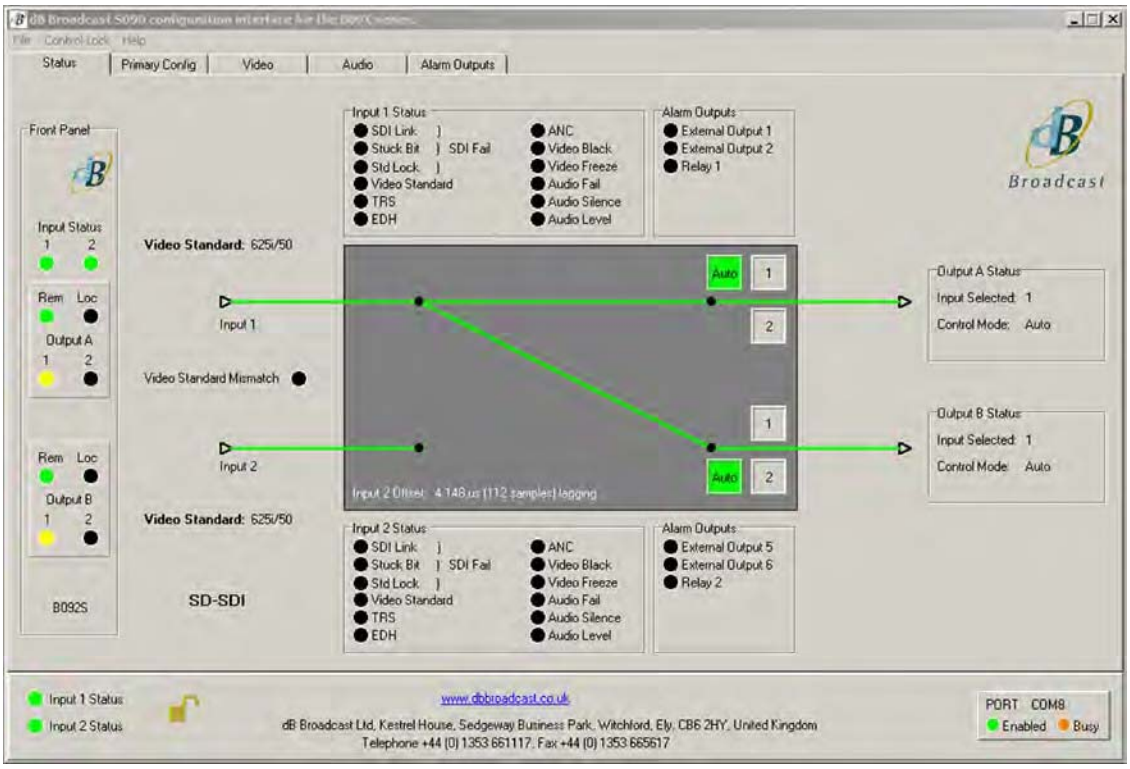
The S090 Graphical Interface

Introduction

The S090 graphical interface is a Windows-based application for configuration, monitoring and control of B09X series Hawkeye modules.

The configuration screens and their enabled functions depend on the type of module attached. With a B092 the five tabbed screens are as below: Status, Primary Config, Video, Audio and Alarm Outputs.

Individual functions not supported by an attached module will be greyed out.



The S090 software connected to a B092S

The status screen may be thought of as an operator interface, whilst the other screens are primarily for the use of installation engineers. The status bar is visible on all screens and shows Input status, Port in use (useful for multiple modules) and port busy status.

Note: The B092 'M' variant has no routing switcher.

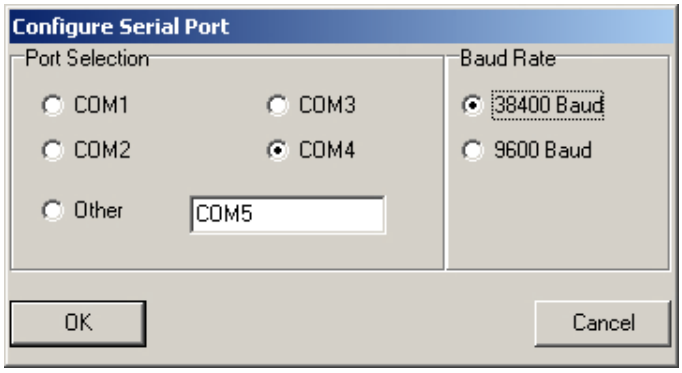
Installation

The latest version of the S090 software may be downloaded from the dB Broadcast website http://www.dbbroadcast.co.uk

To install the software extract the files to a temporary folder on your PC and run setup.exe.

Serial configuration

To configure the serial ports select Serial Configuration from the File menu. This will display a dialogue box:



Select com port and Baud rate

Only the port and speed can be configured as all other settings are fixed for the B092.

Tip: The speed selection must match that of the dip switch on the B092 microcontroller daughter-board. 38,400 Baud is recommended.

System requirements

The following minimum computer system specification is required to run this software.

- Pentium class PC
- Windows XP (32-bit) or Vista (32-bit)
- At least one Windows supported serial port
- A standard pin-to-pin or ‘straight-through’ serial cable

Software operation

The status bar

The status bar at the bottom of each tabbed menu provides an instant view of the status of the two inputs, serial link including port in use and if the panel is locked.

Status bar

Input status

There are two indicators, one for each input. If the indicator is green, the input is good while if the indicator is red then that input has failed.

Busy LED

The Busy indicator shows the status of the serial link. It is lit when a command has been sent and the PC is waiting for a response. If no other activity takes place it will flash about once per second as it polls the device.

Note: The Busy LED may stay on for several seconds. This is because the software queues the commands to be sent. When a response is received the next request is sent immediately.

Port

This shows the serial port in use.

Locking mode

The padlock is used to determine whether the application is in read only or read/write mode. It was introduced to prevent accidental modification of parameters in the system.

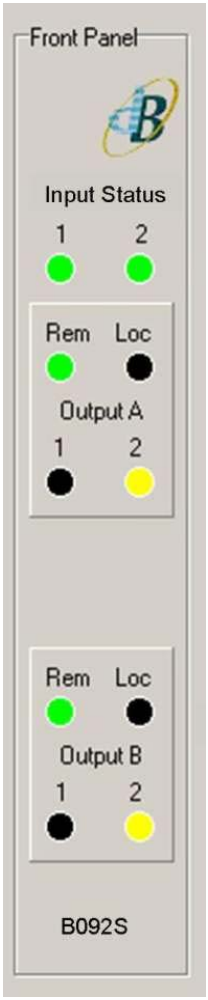
No configuration can be performed when the padlock is closed.

The state of the locking mode may be changed using the pull-down *Enable Menu* from the top menu bar.

The status tab

Front panel mimic

This panel provides a mimic of the LEDs on the front of the module.



B092S panel mimic

The top two LEDs indicate the status for the two inputs, green for good and red for failure.

The Rem and Loc LEDs indicate the control mode for each output. When a red Loc LED is on, that output is in local mode (a route has been forced using the corresponding front panel switch).

The green Rem LED covers all other modes (remote serial, remote ext and auto). The indication is designed to prevent a maintenance operative inadvertently abandoning a module in local mode. Since local has the highest priority, it effectively disables all other modes of control.

Note: The mimic panel for the B092M does not include the sub-panels for Output A or Output B as they are never illuminated.

Input and alarm status

The status for input 1 is shown above the switch and the status for input 2 is shown below the switch.

Input 1 status (and output alarms related to input 1)

The first two columns indicate the status of the input sub-alarms and the last column indicates the status of the sub-alarm driven summary alarms available on the GPIO connector. Some of the sub-alarms are dependent on configurations found on other screens.

Output alarms are configured using the Alarm Outputs tab and are related to inputs as follows:

Outputs relating to Input 1	Outputs relating to Input 2
External Output 1	External Output 5
External Output 2	External Output 6
Relay Output 1	Relay 2

Output status

The two output panels on the main Status tab to the right of the input router switch indicate the status of the current output: which input it is switched to, and its control mode. The control mode shows whether it has been switched automatically or has been forced.

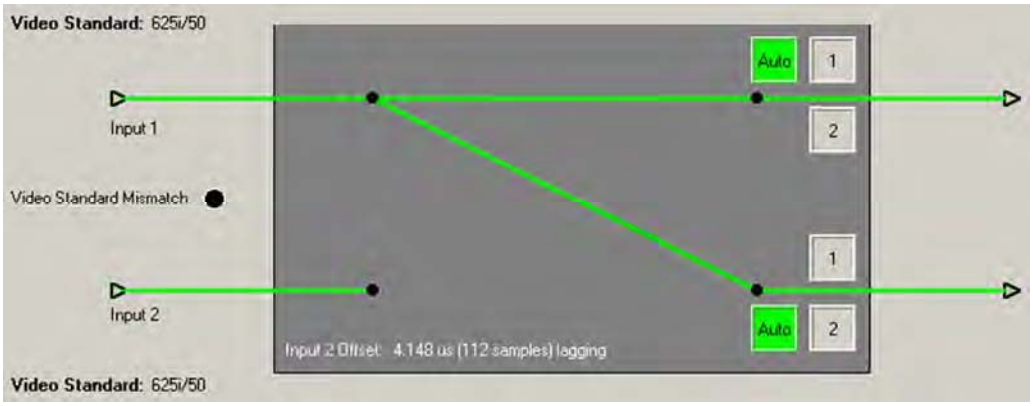
Output status

The methods of forcing are:

- Locally (using the front panel switch)
- Serially (using this software or the command-line interface)
- Externally (using the parallel inputs or the DART interface)

Control modes are discussed in more detail in the Operation chapter.

The route of the SDI inputs through the module to the two main outputs is indicated by the routing graphic in the centre of the status tab. Since the B092M does not feature an integrated switch, its graphic shows no through connection to the main outputs.



Status tab input router switch

A green line indicates the input is good and a red line indicates a faulty input.

This display echoes the Input Status LEDs found on the Front Panel Mimic and the Status Panel.

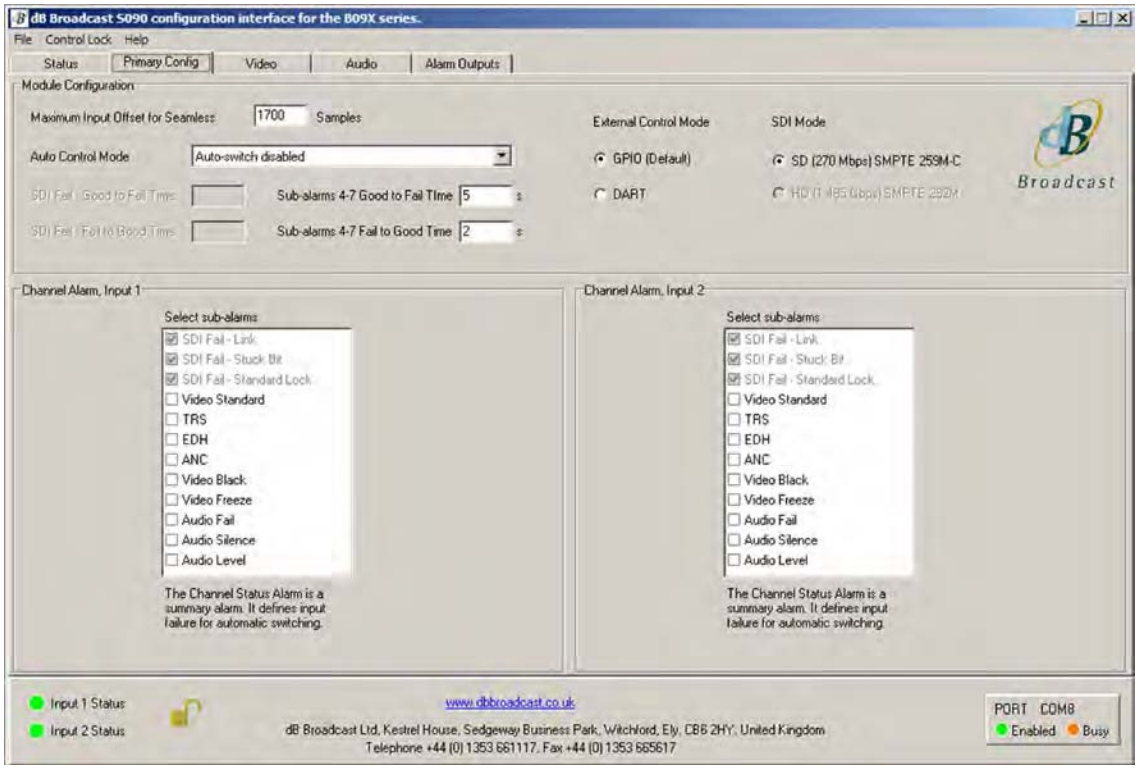
The auto button is illuminated green when that output is in auto control mode. This indicates that the routing of that output is available for serial forcing using this software. Of course if the control mode is already serial, the routing is also available for forcing. If the mode is remote external or local, the routing is not available to be forced serially. Forcing is achieved by clicking on the button showing the number of the required input for that output.

Cancelling any control mode returns control to auto, rather than the previous setting. A warning will be given if an attempt to close the S090 software is made before auto control is restored. Note that auto control may be disabled on the Primary Config tab if required, so that it acts as a dummy state which is guaranteed to do nothing when it has control.

The primary config tab

The primary configuration tab provides access to the following:

- Module configuration panel – (switching modules only)
- Channel alarm configuration



Channel alarms and switching configuration (B092S only)

Switching configuration

The switching configuration panel is used to configure the integrated 2x2 switch. It does not appear when connected to a B092M.

The switch type buttons indicate the default switching method employed. The B092S allows selection of disabled, near-seamless or non-seamless.

External control mode

Control of the switch is automatically arbitrated. See section on **Error! Reference source not found.** on page **Error! Bookmark not defined.** However, the remote external control mode must be configured for use with either the General Purpose IO interface on the rear of the module, OR the rack based DART interface. GPIO is the default setting.

SDI mode

The SDI mode may be either SD at 270Mbps or HD at 1.485 Gbps.

Channel alarm configuration

There are two channel alarm configuration panels, one for input 1 and one for input 2. They allow the input alarm criteria to be configured for the following conditions:

SDI Fail – Link

SDI Fail – Stuck Bit

SDI Fail – Standard Lock

Video Standard – (changes in expected video standard trigger alarm)

TRS – (missing or incorrect timing reference signal)

EDH – (Error Detection and Handling CRC error detected)

ANC – (Ancillary Data error detected)

Video Black – (video detected at black – see Video tab)

Video Freeze – (absence of video movement detected – see Video tab)

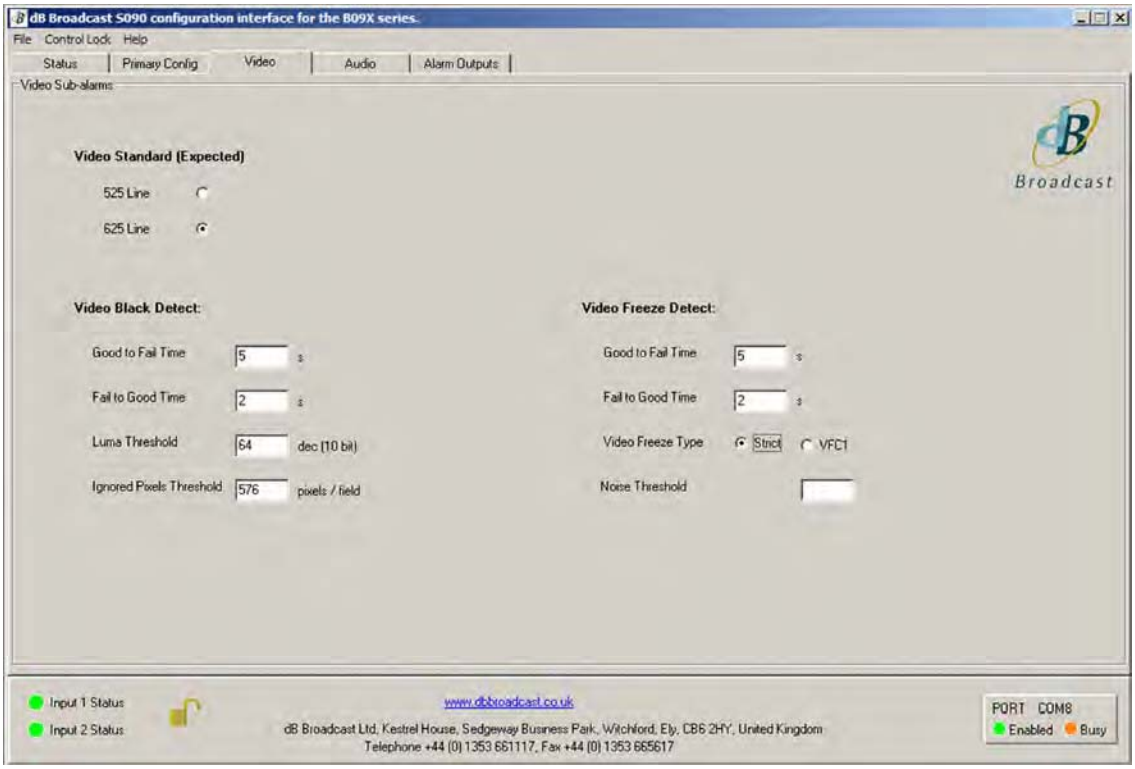
Audio Fail – (see Audio tab)

Audio Silence – (see Audio tab)

Audio Level – (see Audio tab)

Note: The Channel Status Alarm is a summary alarm. It defines input failure for automatic switching.

The video tab



Video alarm settings

Expected Video Standard

525/625 – Select 525 or 625 line format as the expected standard.

Video Black Detect

Good to Fail time – time in seconds video is below the Luma/pixel values before video is considered to be at black.

Fail to Good time – time in seconds video rises above the Luma/pixel values before video is considered not to be at black.

Luma Threshold – luminance value below which video may be considered to be at black.

Ignored Pixels Threshold – the number of pixels which can be at black before a video is considered to be at black.

Video Freeze Detect

Good to Fail time – time in seconds that frame to frame video movement is absent before a freeze is detected.

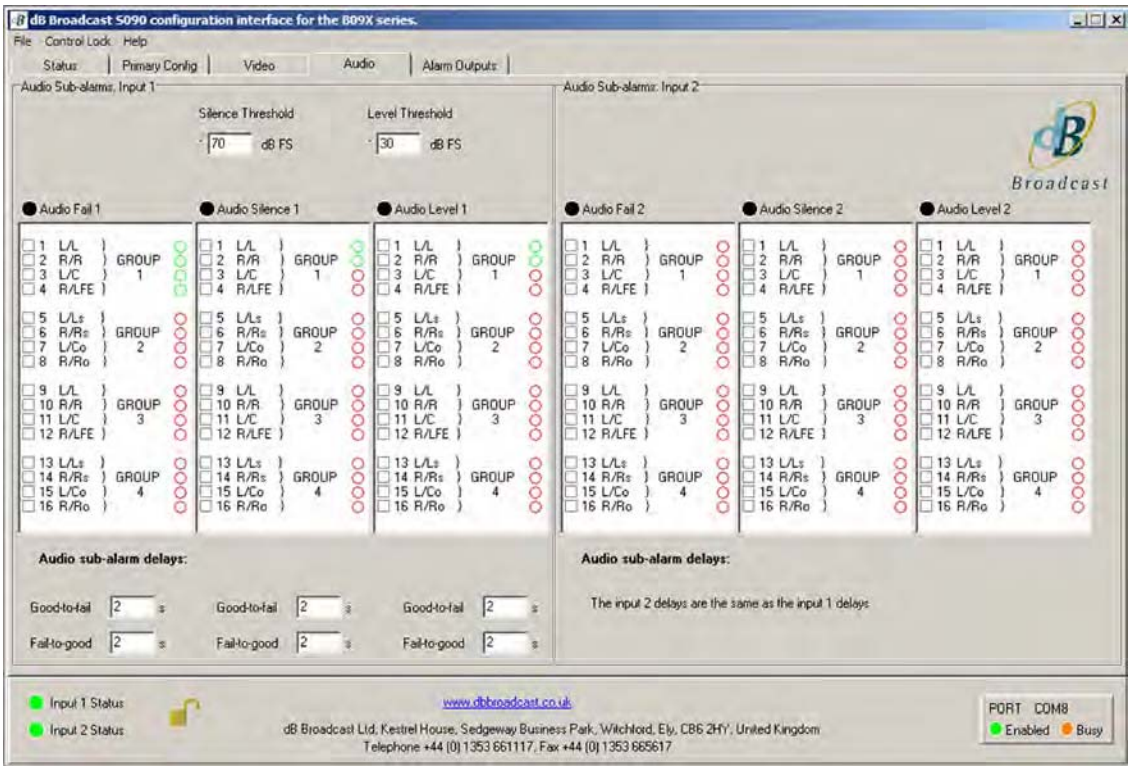
Fail to Good time – time in seconds frame to frame video movement exists after a freeze before video is considered not to be frozen.

Video Freeze Type – Select Strict or VFC1.

Noise Threshold – enter the S/N in dBs to ignore in detecting a freeze.

The audio tab

There are two Audio Sub-alarm configuration panels, one for input 1 and one for input 2.



Audio Alarms

For each Fail, Silence or Over Level alarm for each input, select the audio channels in each group to be monitored. Then set the threshold and delay settings for both inputs.

Silence Threshold

Enter the level in dBs below which an input may be considered silent.

Level Threshold

Enter the level in dBs below which an input may be considered over (normal) level.

Fail Threshold

Failure occurs when the embedded data stream is absent.

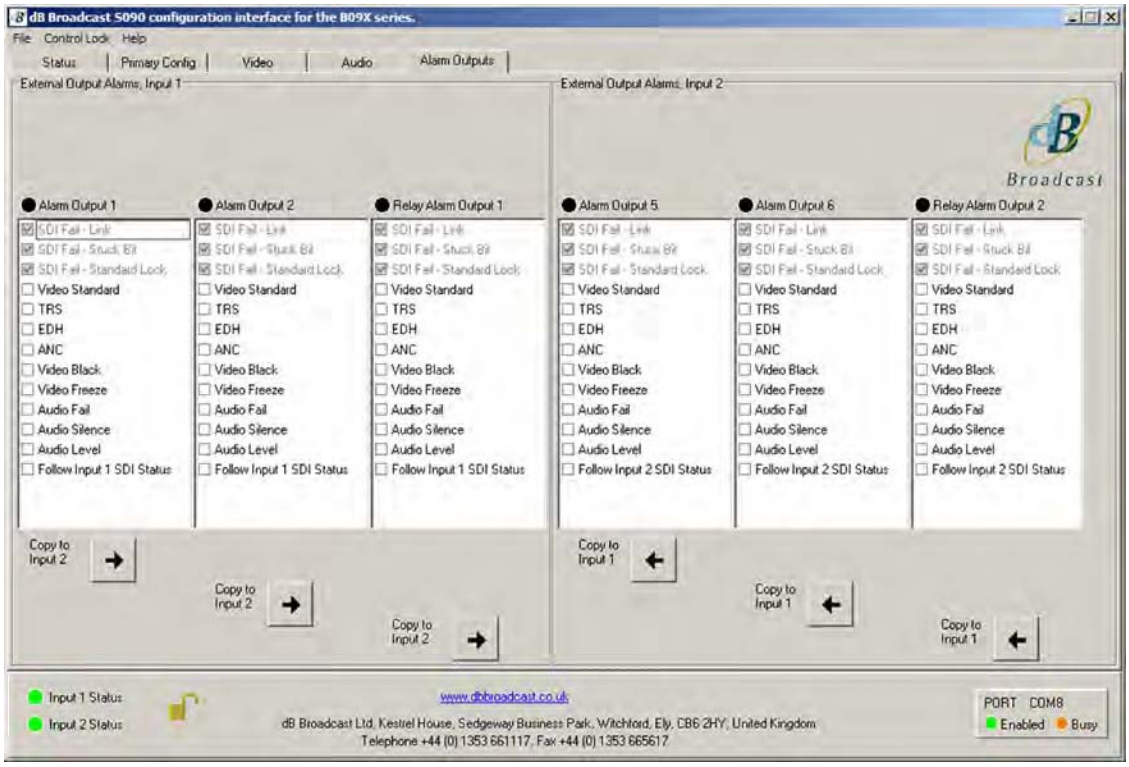
Sub-alarm delays

Good to Fail time – time in seconds an audio stream has to have failed or its decoded level be below the silence or above the level thresholds before it is considered to have failed, be actually silent or over level.

Fail to Good time – time in seconds an audio stream re-appears or its decoded level rises above the silence or below the level threshold before it is no longer considered to have failed be actually silent or over level.

The alarm outputs tab

This screen is used to configure the output alarms. The LED next to each label gives the current state of the alarm.



Configuring output alarms

To copy the configuration of an output or relay alarm to it's counterpart on the opposite channel use the arrow buttons (i.e. relay 1 to relay 2, alarm output 1 to alarm output 5, alarm output 2 to alarm output 6 and vice versa).

The Command-line interface

The Command-line interface (CLI) may be used for configuration, monitoring and control. It is provided to facilitate scripting and as an entry point for integration into existing software systems. It provides full access to all B092 features using standard terminal emulation programs such as HyperTerminal PE, Poderosa or PuTTY.

The command-line protocol is available via the front or rear serial connection.

Terminal settings

The Baud rate is set by slider 2 on DIL switch S1 on the microcontroller sub-board. This can be either 9600 or 38400 (recommended) Baud, with 8 data bits, 1 stop bit, no parity and software handshaking using Xon/Xoff. This setting affects both front and rear serial ports.

Note: Poderosa 4.1.0 (http://en.poderosa.org/) is a free terminal emulator that enables a number of modules on different COM ports to be driven simultaneously. It works on Windows NT4.0, ME, 2000, XP and Vista, provided .NET Framework 2.0 is installed. The serial port connection plug-in from the Poderosa website must also be downloaded for use with the B092. It is not recommended to mix connections with software handshaking (e.g. to B092) with connections that require hardware handshaking in the same session.

PuTTY is a reasonably stable alternative which may be compiled for use on a number of operating systems. However, at time of writing it is still officially a beta release.

For Windows 2000 SP4, the free version of HyperTerminal included with the OS is useful. For other versions of Windows, including XP, use of HyperTerminal is no longer recommended, due to the presence of a back scroll buffer bug that makes it difficult to read B092 responses which appear corrupted. This bug appears to be fixed in the PE version available from http://www.hilgraeve.com/hyperterminal.html. This version supports Windows Vista but is not free for business use.

Command directory

Note: CLI commands are not case sensitive.

Dedicated query commands	
status	Show current alarm, sub-alarm and routing status
inout	Show current GPIO status
alarm	List all alarm codes and current assignments
config	List current configuration
version	Query software and firmware versions
help	List all commands

Note: The '?' argument, where supported, turns the command into a query.

Offline configuration		
mvo:X	Set maximum video offset (module delay)	X = {100..2000} (samples)
rct:X	Set remote control type (GPIO/DART)	X = {1, 2, ?} (1 => GPIO)

The offline configuration commands mvo and rct are designed for use during the test phase of a broadcast installation, rather than on a live system. A brief disturbance to the output signal is possible when using mvo, and since rct involves a handover between two external control systems there is always the possibility of unintentional switching at the moment of handover, though this would be down to the operation of the controllers rather than the B092.

Mvo actually determines the video delay across the module. If you are confident of your input offset range, the mvo value may be reduced if required.

Switching operations are seamless for actual input offset < mvo provided actual offset does not exceed one line of video. Mvo values above one line (i.e. 1716 for 525 formats and 1728 for 625 formats) are provided to allow additional video delay across the module, but they will not extend the range of input offset for seamless operation beyond its one line ceiling.

Alarm assignments: N = {1, 2} M = {1, 2, 5, 6}		
asN:X	Add sub-alarm X to ch status N	X = {4..12, ?}
aoM:X	Add sub-alarm X to ext output M	X = {4..13, ?}
arN:X	Add sub-alarm X to relay output N	X = {4..13, ?}
rsN:X	Remove sub-alarm X from ch status N	X = {4..12, ?}
roM:X	Remove sub-alarm X from ext output M	X = {4..13, ?}
rrN:X	Remove sub-alarm X from relay output N	X = {4..13, ?}

Alarm code numbers (X):	
1	SDI Fail - Link
2	SDI Fail - Stuck Bit
3	SDI Fail - Standard Lock
4	Video Standard
5	TRS
6	EDH
7	ANC
8	Video Black
9	Video Freeze
10	Audio Fail
11	Audio Silence
12	Audio Level
13	Follow channel status alarm of relevant input

Sub-alarm assignments: N = {1, 2}		
aafN:X	Add audio ch X to audio fail N	X = {1..16, A, ?}
aasN:X	Add audio ch X to audio silence N	X = {1..16, A, ?}
aalN:X	Add audio ch X to audio level N	X = {1..16, A, ?}
rafN:X	Remove audio ch X from audio fail N	X = {1..16, A, ?}
rasN:X	Remove audio ch X from audio silence N	X = {1..16, A, ?}
ralN:X	Remove audio ch X from audio level N	X = {1..16, A, ?}

Sub-alarm delay settings			
ogf:X	Set alarms 4-7	good-to-fail time	X = {0..240, ?} (seconds)
bgf:X	Set video black	good-to-fail time	X = {2..240, ?} (seconds)
fgf:X	Set video freeze	good-to-fail time	X = {2..240, ?} (seconds)
ofg:X	Set alarms 4-7	fail-to-good time	X = {2..240, ?} (seconds)
bfg:X	Set video black	fail-to-good time	X = {0..240, ?} (seconds)
ffg:X	Set video freeze	fail-to-good time	X = {0..240, ?} (seconds)
afgf:X	Set audio fail	good-to-fail time	X = {2..240, ?} (seconds)
asgf:X	Set audio silence	good-to-fail time	X = {2..240, ?} (seconds)
algf:X	Set audio level	good-to-fail time	X = {2..240, ?} (seconds)
affg:X	Set audio fail	fail-to-good time	X = {0..240, ?} (seconds)
asfg:X	Set audio silence	fail-to-good time	X = {0..240, ?} (seconds)
alfg:X	Set audio level	fail-to-good time	X = {0..240, ?} (seconds)

Video settings		
svs:X	Set video standard	X = {1, 2, ?}
sbl:X	Set video black luma threshold	X = {64..255, ?}
sip:X	Set video black ignored pixels	X = {0..65535, ?}
fda:X	Set video freeze detect algorithm	X = {1, 2, ?}
fdt:X	Set video freeze detect threshold	X = {0..32767, ?}

Audio settings		
ast:X	Set audio silence threshold	X = {-80..0, ?} (dB FS)
alt:X	Set audio level threshold	X = {-80..0, ?} (dB FS)

Switch (B092S only)		
asp:X	Auto-switch preference	X = {1..9, ?}
opa:X	Force output A source (0 => auto)	X = {0, 1, 2}
opb:X	Force output B source (0 => auto)	X = {0, 1, 2}

References

International standards:

[1] ITU-R BT.601-5 Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-screen 16:9 Aspect Ratios

[2] ITU-R BT.656-4 Interfaces for Digital Component Video Signals in 525-line and 625-line Television Systems Operating at the 4:2:2 Level of Recommendation ITU-R BT.601 (Part A)

[3] ITU-R BT.1364 Format of Ancillary Data Signals Carried in Digital Component Studio Interfaces

[4] ITU-R BT.1363 Jitter specifications and methods for jitter measurements of bit-serial signals conforming to Recommendations ITU-R BT.656, ITU-R BT.799 and ITU-R BT.1120

SMPTE standards:

[5] SMPTE 259M-2008 SDTV Digital Signal/Data - Serial Digital Interface

[6] SMPTE 125M-1995 Component Video Signal 4:2:2 - Bit-Parallel Digital Interface

[7] SMPTE 291M-2006 Ancillary Data Packet and Space Formatting

[8] SMPTE 272M-2004 Formatting AES/EBU Audio and Auxiliary Data into Digital Video Ancillary Data Space

SMPTE recommended practices

[9] SMPTE RP 165-1994 Error Detection Checkwords and Status Flags for Use in Bit-Serial Digital Interfaces for Television

[10] SMPTE RP 168-2002 Definition of Vertical Interval Switching Point for Synchronous Video Switching

[11] SMPTE RP 184-2004 Specification of Jitter in Bit-Serial Digital Systems

[12] SMPTE RP 192-2003 Jitter Measurement Procedures in Bit-Serial Digital Interfaces

Ordering Information

B092 module types

B092M	Dual SD-SDI Monitor for Pro-Bel Vistek frame
B092S	Dual SD-SDI Monitor with 2x2 Switch for Pro-Bel Vistek frame

3U Pro-Bel Vistek configuration

V1606-dB-2PSU	3U Chassis, 14 Module slots, 2 PSU slots (2 PSUs included)
V1606-dB-48V	3U Chassis, 14 Module slots, 2 48V PSU slots (2 48V PSUs included)
VB100	BNC Rear connector module

1U Pro-Bel Vistek configuration (dual PSU)

F010	1U Chassis, 2 Module slots, 2 PSUs (PSUs included)
VB100	BNC Rear connector module

S090 software

S090	Graphical tool for module configuration, monitoring and manual control over serial interface, for PCs running windows 2000, Windows XP (32-bit) or Windows Vista (32-bit).

B064 software

B064	LAN to serial converter with dongle to provide virtual serial port for use with S080 and S090 software.