



BG-QuadFusion-4K

Crestron Driver User Manual

4-Channel 4K HDMI and DisplayPort Production Switcher with PIP/POP, Keying, Video Wall Transitions and USB UVC Output

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Statement

Please read these instructions carefully before connecting, operating, or configuring this product. Please save this manual for future reference.

Safety Precaution

- To prevent damaging this product, avoid heavy pressure, strong vibration, or immersion during transportation, storage, and installation.
- The housing of this product is made of organic materials. Do not expose to any liquid, gas, or solids which may corrode the shell.
- Do not expose the product to rain or moisture.
- To prevent the risk of electric shock, do not open the case. Installation and maintenance should only be carried out by qualified technicians.
- Do not use the product beyond the specified temperature, humidity, or power supply specifications.
- This product does not contain parts that can be maintained or repaired by users. Damage caused by dismantling the product without authorization from BZBGear is not covered under the warranty policy.
- Installation and use of this product must strictly comply with local electrical safety standards.

Introduction

This driver has been designed to provide control of the BZBGear BG-QuadFusion-4K production switcher from a Crestron control system over the network.

The BG-QuadFusion-4K takes four 4K inputs (input 1 accepts either HDMI or DisplayPort) and provides three HDMI program outputs, a multiview output and a USB UVC output for streaming. The module controls the program and preview buses, cuts and auto transitions, Mix / Fade / Wipe effects, fade to black, freeze, PIP and POP, luma and chroma keying, the two-channel audio mixer, and HDR.

Unlike the BZBGear matrix switchers, this product does NOT use the ASCII command set. It speaks the manufacturer's "Communication Protocol for Video Switcher V2.1": binary frames carried over UDP. There is no TCP control port, so the module must be wired to a UDP client rather than a TCP/IP client.

The module is two-way: it decodes the switcher's 98-byte status block and drives digital, analog and serial feedback so a touch panel can show the live program and preview sources, the selected transition, and the state of every function the module controls.

Installation

- Copy all of the files in the module folder into your SIMPL Windows project directory so that SIMPL Windows recognizes the driver module.
- Open "BG QuadFusion 4K.usp" in SIMPL+ Windows and compile it (F12) to generate the .ush header and the user module.

- In SIMPL Windows, add an Ethernet UDP/TCP Client and set it to UDP, with the switcher's IP address and port 7000.
- Drop the "BG QuadFusion 4K" user module into your program.
- Wire the module's Tx_Switcher output to the tx\$ of the UDP client, and wire the rx\$ of the UDP client back to the module's Rx_Switcher input.
- Connect your touch panel joins to the module signals listed under Inputs and Outputs. A suggested join map is included with the module.

To control the matrix over the network, use a TCP/IP Client with the following settings:

Setting	Value
Connection	UDP - use an Ethernet UDP/TCP client symbol set to UDP mode
IP Address	The address configured on the switcher (shown in its menu)
UDP Port	7000
RS-232	Not used - this product is controlled over the network only

This model has no serial control port. All control is over UDP port 7000.

Because UDP is connectionless there is no socket to monitor: the module drives Online_Fb from the replies themselves and drops it if the switcher stops answering for 15 seconds.

Inputs

The module has the following signals available as inputs:

Status

Signal	Type	Description
Poll_Status	Digital	Read the switcher's full status block. The module sends this automatically at start-up and again shortly after every command, so feedback settles without waiting for the next poll. Drive it from an oscillator to keep the state fresh.
Identify	Digital	Ask the switcher to identify itself. The reply populates Model_Fb.

Program and Preview

Signal	Type	Description
PGM_Source	Analog	Program bus source: 1-4 for the inputs, 9 for colour bars. This changes what goes to air.
PVW_Source	Analog	Preview bus source: 1-4 for the inputs, 9 for colour bars.
Take_Cut	Digital	CUT: swap the program and preview buses immediately.
Take_Auto	Digital	AUTO: transition from preview to program using the selected effect and rate.

Transition Settings

Signal	Type	Description
Transition_Mix	Digital	Select the Mix transition.
Transition_Fade	Digital	Select the Fade transition.

Wipe_Effect	Analog	Select wipe effect 1-10. The module converts this to the value the switcher expects on the wire.
Transition_Rate	Analog	AUTO transition speed: 0 slow, 1 medium, 2 fast.

Fade to Black, Freeze and Mute

Signal	Type	Description
FTB_ON / FTB_OFF	Digital	Fade the program output to black, or restore it.
Still_ON / Still_OFF	Digital	Freeze the program output, or release it.
Mute_ON / Mute_OFF	Digital	Mute the program audio, or unmute it.

PIP and POP

Signal	Type	Description
PIP_Enable	Analog	Picture-in-picture: 0 off, 1 on.
PIP_Size	Analog	PIP window size: 0 small, 1 medium, 2 large. Changing the size also repositions the PIP window.
POP_Enable	Analog	Picture-outside-picture: 0 off, 1 on.
POP_Window	Analog	Which source fills the POP window: 1 preview, 2 program. The switcher does not accept 0.

Keying

Signal	Type	Description
Luma_Key	Analog	Luma key: 0 off, 1 on.
Chroma_Key	Analog	Chroma key: 0 off, 1 on.
Chroma_Color	Analog	Chroma key background: 0 green, 1 blue.

Audio

Signal	Type	Description
Audio_Mode	Analog	0 AFV (audio follows video), 1 Mix. The two mixer sources below only take effect in Mix mode.
Volume_CH1 / Volume_CH2	Analog	Mixer channel volume, 0-100.
Volume_Master	Analog	Master output volume, 0-100.
Audio_Source_CH1 / Audio_Source_CH2	Analog	Mixer channel source. See the audio source table below.

HDR and System

Signal	Type	Description
HDR_Enable	Analog	HDR: 0 off, 1 on.
HDR_Mode	Analog	HDR mode: 0 Off, 1 Follow, 2 HDR10, 3 HLG.
Restart_Device	Digital	Restart the switcher. It goes off air while it reboots and comes back with its last SAVED settings, so any unsaved live changes - sources, audio mode, volumes, output resolution - are lost. Put it behind a confirmation on any panel.

Device Receive

Signal	Type	Description
Rx_Switcher	Buffer	Binary frames received from the switcher. Wire the rx\$ of the UDP client to this signal.

Outputs

The module has the following signals available as feedback outputs:

Status Feedback

Signal	Type	Description
Online_Fb	Digital	High while the switcher is answering. UDP is connectionless, so this is driven by the replies themselves and drops after 15 seconds of silence.
FTB_Fb	Digital	High while the program output is faded to black.
Still_Fb	Digital	High while the program output is frozen.
Mute_Fb	Digital	High while the program audio is muted.
PIP_Fb / POP_Fb	Digital	High while PIP or POP is active.
Luma_Fb / Chroma_Fb	Digital	High while the luma or chroma key is active.
HDR_Fb	Digital	High while HDR is enabled.
Model_Fb	Serial	The model name the switcher reports ("BG-QuadFusion-4K-").
Rx_Last_Frame	Serial	A summary of the last frame received - command, status and length. Useful when commissioning or debugging.
PGM_Source_Fb / PVW_Source_Fb	Analog	The source on each bus: 1-4 for the inputs, 9 for colour bars.
Transition_Fb	Analog	1 Mix, 2 Fade, 3 Wipe.
Wipe_Effect_Fb	Analog	The selected wipe, 1-10, or 0 when no wipe is selected.
Rate_Fb	Analog	AUTO transition speed: 0 slow, 1 medium, 2 fast.
PIP_Size_Fb	Analog	0 small, 1 medium, 2 large.
POP_Window_Fb	Analog	1 preview, 2 program.
Chroma_Color_Fb	Analog	0 green, 1 blue.
Audio_Mode_Fb	Analog	0 AFV, 1 Mix.
Volume_CH1_Fb / Volume_CH2_Fb / Volume_Master_Fb	Analog	Current volumes, 0-100.
Audio_Source_CH1_Fb / Audio_Source_CH2_Fb	Analog	Current mixer sources. See the audio source table.
Resolution_Fb	Analog	Output resolution code reported by the switcher: 7 = 2160p60, 11 = 2160p50.
Input1_Connector_Fb	Analog	Which connector input 1 is using: 0 HDMI, 1 DisplayPort.
HDR_Mode_Fb	Analog	0 Off, 1 Follow, 2 HDR10, 3 HLG.

Device Transmit

Signal	Type	Description
Tx_Switcher	Serial	Binary frames for the switcher. Wire this signal to the tx\$ of the UDP client.

Note: This module has no I/O arrays. If any are ever added they must be declared last within their direction group: SIMPL+ shares one index space for analog and serial outputs, and a discrete output declared after an output array causes the feedback pins to be mis-formed.

Device Feedback

The switcher does not send text. It returns binary frames, and almost all feedback comes from a single 98-byte status block returned by the read-all command. The module decodes the following byte offsets within that block. These offsets were confirmed against a live BG-QuadFusion-4K; the protocol document covers a whole family of switchers and does not match this model everywhere.

Line received from the device	Signal updated
Offset 0 / 1	PGM_Source_Fb / PVW_Source_Fb (1-4, 9 = colour bars)
Offset 2	Audio_Mode_Fb (0 AFV, 1 Mix)
Offset 4 / 5	Audio_Source_CH1_Fb / Volume_CH1_Fb
Offset 7 / 8	Audio_Source_CH2_Fb / Volume_CH2_Fb
Offset 10	Volume_Master_Fb
Offset 11	Transition_Fb - 1 Mix, 2 Fade, any other value means a wipe
Offset 12	Wipe_Effect_Fb - the status block reports the effect CODE, which the module looks up in the ten-entry wipe table at offsets 13-22. It does NOT echo the 116-125 value the select command takes.
Offset 23	FTB_Fb
Offset 24 / 28	PIP_Fb / PIP_Size_Fb
Offset 33	Still_Fb
Offset 34 / 35	Rate_Fb / Resolution_Fb
Offset 36	Input1_Connector_Fb (0 HDMI, 1 DisplayPort)
Offset 38	Mute_Fb - reported as 0x00 or 0xFF, not 0 or 1
Offset 40 / 41	POP_Fb / POP_Window_Fb
Offset 50 / 51 / 53	Luma_Fb / Chroma_Fb / Chroma_Color_Fb
Offset 92	HDR - bit 0 is HDR_Fb, the remaining bits are HDR_Mode_Fb

Note: Fade to black, freeze and mute are TOGGLES on this switcher - there is no command to set them to a particular state. The module reads the current state from the status block and only sends the toggle when the state needs to change, so the On and Off inputs behave like ordinary level controls. The switcher also emits unsolicited fader frames while the T-bar moves or an AUTO transition runs; the module consumes and ignores them.

UDP Command Reference

The switcher is controlled with binary frames over UDP port 7000. Every frame has the layout below; multi-byte values are sent LOW BYTE FIRST. The module builds and checks these frames for you - this reference is here so the frames can be recognised in a packet capture, and so additional commands can be sent with a raw string if needed.

A5 6C | length (2) | device type A5 | device id FF | interface 01 | 00 x9 | command | data | checksum (2) | AE

The length counts the whole frame, including the leading A5 6C and the trailing AE. The checksum is the sum of every byte before it. Replies use the same layout with the platform id 0x69 in reserved byte 14, followed by the command, a status byte (00 = ok) and the data.

Status Commands

Command	Description
0xFF	Identify. Replies with the model name followed by binary id bytes
0x0A	Read all data. Replies with the 98-byte status block
0x06	Heartbeat. Replies with an acknowledgement only
0x49	Version. Replies with hardware and serial information plus a copy of the status block
0x0B	Restart the switcher. It drops off the network for a few seconds and comes back with its SAVED settings - any live changes that were not saved are lost

Program, Preview and Takes

Command	Description
0x80 n	Program source: n = 1-4 for the inputs, 9 for colour bars
0x81 n	Preview source, same values
0x83	CUT - swap the buses immediately. Inhibited while the T-bar is parked away from an end stop (see the note below)
0x84	AUTO - transition at the selected rate. Emits a burst of unsolicited fader frames. Subject to the same T-bar inhibit

Transitions

Command	Description
0x8D	Select the Mix transition
0x8E	Select the Fade transition
0x92 n	Select a wipe: n = 116-125 for wipes 1-10. The status block reports the effect code, not this value
0xB1 n	AUTO rate: 0 slow, 1 medium, 2 fast

Toggles

Command	Description
0x85	Fade to black - TOGGLE, there is no set-to-state form
0xCF	Freeze frame - TOGGLE
0xD6	One-touch mute - TOGGLE

PIP, POP and Keying

Command	Description
0x86 n	PIP: 0 off, 1 on
0xA2 n	PIP size: 0 small, 1 medium, 2 large
0xA0 / 0xA1	PIP horizontal / vertical position, two bytes, low byte first
0xA7 n	POP: 0 off, 1 on
0xA8 n	POP window: 1 preview, 2 program. 0 is acknowledged but ignored
0x8B n / 0x8C n	Luma key / chroma key: 0 off, 1 on
0x98 n	Chroma key background: 0 green, 1 blue

Audio

Command	Description
0xB6 n	Audio mode: 0 AFV, 1 Mix
0xB8 c v	Volume: c = 0 channel 1, 1 channel 2, 3 master; v = 0-100
0xB9 n / 0xBA n	Mixer source for channel 1 / channel 2. Mix mode only

HDR

Command	Description
0xDF n	HDR: 0 off, 1 on
0xE0 n	HDR mode: 0 Off, 1 Follow, 2 HDR10, 3 HLG

Note: Every command is acknowledged with a status byte of 00, even when the value is out of range and the switcher ignores it - the only reliable way to confirm a setting is to read the status block back, which this module does automatically.

IMPORTANT: CUT and AUTO are inhibited while the switcher's T-bar is parked away from an end stop. In that state both commands are still acknowledged but nothing happens, and the buses only change via the T-bar itself. If Take_Cut and Take_Auto appear to do nothing, move the T-bar fully to one end and they will work again. This was confirmed on the reference unit: both commands were ACKed and ignored until the fader was swept to an end stop, after which both worked normally.

Restarting reverts the switcher to its last SAVED configuration: on the reference unit a restart changed the program and preview sources, the audio mode, a mixer source, a volume, the chroma key colour and the output resolution. Save the desired configuration on the switcher before relying on Restart_Device.

The protocol also covers recording, streaming, camera control, GPI, patterns and fan control; those belong to other switchers in the same family and are not supported by this model. The output resolution command (0xA3) is deliberately not exposed because the document's resolution table does not match this model; the module reports the resolution read-only.

Source Values (0x80 and 0x81)

The same values are used for the program bus, the preview bus and the PGM_Source / PVW_Source feedback signals.

Value	Source
1	Input 1 (HDMI or DisplayPort)
2	Input 2
3	Input 3
4	Input 4
9	Colour bars

Audio Mixer Source Values (0xB9 and 0xBA)

These apply to Audio_Source_CH1 and Audio_Source_CH2, and only take effect while the switcher is in Mix mode. In AFV mode the audio follows the program source.

Value	Source
0	Phone In
1	Mic 1
2	Mic 2
3	Input 1
4	Input 2
5	Input 3
6	Input 4

Wipe Effect Codes

Wipes are SELECTED with 116-125 (wipe 1-10), but the status block reports the effect code below instead. The module resolves the code using the wipe table the switcher returns at offsets 13-22 of the status block, so it stays correct even if a different unit uses a different set of codes. The values below are what the reference unit reported.

Wipe	Select value	Code reported
1	116	0x02
2	117	0x0E
3	118	0x1F
4	119	0x29
5	120	0x38
6	121	0x42
7	122	0x48
8	123	0x51
9	124	0x53
10	125	0x5B

Tech Support

For technical support, please contact BZBGear:

- Email: support@bzbgear.com
- Phone: +1(888)499-9906
- Address: 830 National Drive #140, Sacramento, CA 95834, USA

Warranty

BZBGear products are backed by a limited product warranty. For full warranty details, please visit www.bzbgear.com or contact BZBGear support.

Mission Statement

BZBGear is dedicated to providing high-quality, professional-grade AV equipment that delivers exceptional performance and reliability for both commercial and residential applications.

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