

Application Note DT-AN-2174B-1

DTA-2174B – Firmware Variants

1. Introduction

The DTA-2174B is a four port SDI/ASI card with support for reception and transmission of SD, HD, 3G and 4K SDI signals as well as MPEG-2 transport-streams over ASI. The functions of the board are defined by the firmware loaded on the board, the driver and software API (Matrix API® 2.0) provided by DekTec.

To enable a cost-effective hardware design, the DTA-2174B's firmware has been split into different firmware variants, each targeting specific uses cases. These variants are combined in a single firmware image referred to as a package.

The table below provides an overview of the variants in the DTA-2174B firmware package:

Variant	Description
1	4x3G-SDI/ASI with Genlock Four independent 3G-SDI/ASI ports, each of which can be configured as input or output, and as ASI or SDI (3G, HD or SD). Outputs can be locked to the genlock input. Output ports can also be configured as a 'copy' of another output channel (multi-buffering). This variant does not support 12G-SDI, nor quad-link 4K. Typical use cases <ul style="list-style-type: none">- SDI to SMPTE-2022 IP or vice versa;- Multi-port SD/HD/3G encoder/decoder;- General purpose SDI or ASI streamer/recorder/analyzer;- SDI multi viewer.
2	1x12G-SDI or 4x3G Quad-Link 4K 4K uncompressed input or output, either (i) a single 12G-SDI channel (port 1), or (ii) a quad-link 3G-SDI interface on ports 1 to 4. 4K output can be locked to the genlock input. This variant can also be used for non-4K single-channel reception or transmission of 6G, 3G, HD, SD, or ASI signals via port 1. Typical use cases <ul style="list-style-type: none">- 4K encoder with a quad-link or single-link SDI input;- 4K decoder with a quad-link or single-link SDI output;- 4K recorder/streamer with a single-link or single-link SDI input or output.
3	1x12G-SDI + 1x3G-SDI/ASI with Genlock A main 12G-SDI/ASI channel (port 1) and a secondary 3G-SDI/ASI channel (port 2), both also configurable for lower SDI rates. Outputs can be locked to the genlock input. Port 3 and 4 can be 'copies' of port 1 (up to 3G, 6G/12G copying is not supported) or port 2, provided that the source (port 1 or 2) is an output. Typical use cases <ul style="list-style-type: none">- 4K encoder with 12G-SDI input and a MPEG-2 transport-stream output on ASI;- 4K decoder with MPEG-2 transport-stream ASI input and a 12G-SDI output.

2. Variant 1 - 4x3G-SDI/ASI with genlock

Variant 1 is the main workhorse for applications that need multiple ASI, SD-, HD- and/or 3G-SDI inputs or outputs. It features four independent ports, each configurable to operate as ASI or SD/HD/3G-SDI input or output.

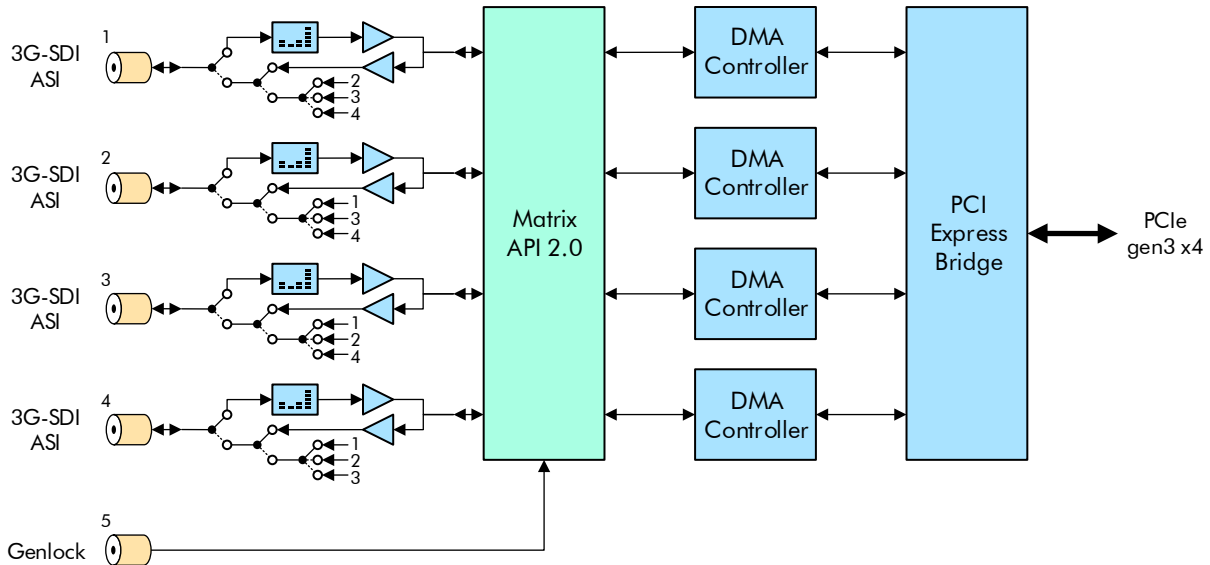


Figure 1. Firmware variant 1 functional block diagram.

Each port can operate as double-buffered copy of another port to create multiple copies of the same output signal. Ports configured as output can be genlocked to a bi-/tri-level genlock reference signal applied to the genlock port on the DTA-2174B.

2.1. Variant 1 - Typical use cases

The figure below shows a use case for a DTA-2174B being used to encapsulate multiple SDI streams in SMPTE 2022 IP streams and the use of a second DTA-2174B on the other side to de-encapsulate the SDI from the SMPTE 2022 IP stream.

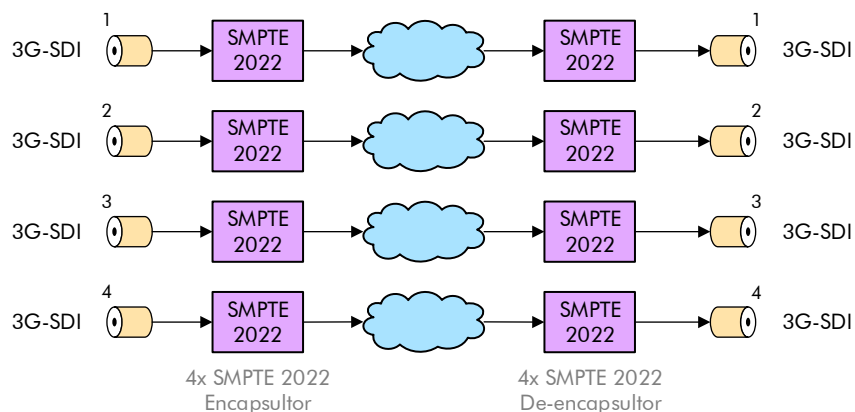


Figure 2. Multi-stream SMPTE 2022 encapsulation and de-encapsulation with variant 1.

Figure 3 shows the usage of variant 1, for general streaming, recording, monitoring and analysis of ASI and SDI signals.

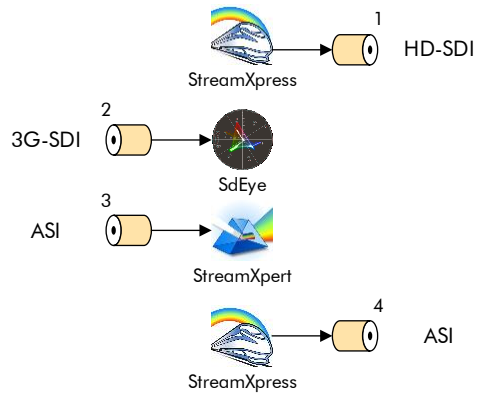


Figure 3. ASI/SDI streaming and analysing using DekTec apps and variant 1.

3. Variant 2 - 1x12G-SDI or 4x3G quad-link 4K

Variant 2 is intended for applications that need 4K input or output in the form of a 4x 3G-SDI quad-link or as a single-link 12G-SDI interface.

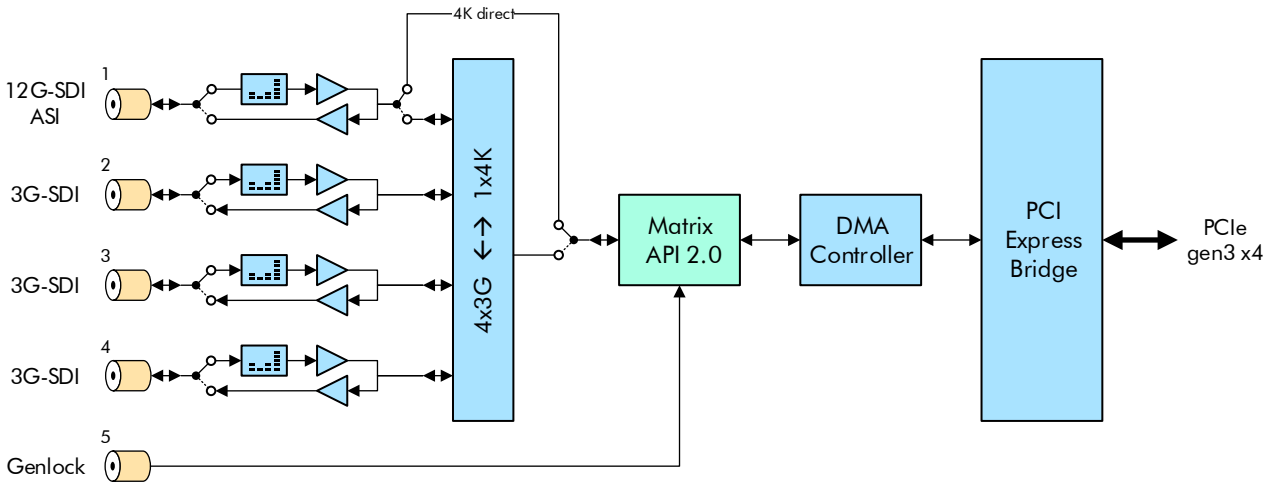


Figure 4. Firmware variant 2 functional block diagram.

Port 1 can be used as stand-alone ASI, SD-, HD-, 3G-, 6G- or 12G-SDI input or output, in which case ports 2-4 cannot be used. Alternatively, all four ports can be combined to operate as input or output for reception and transmission of 4K video over a SMPTE-425-5 quad-link. As with variant 1, the genlock input can be used to synchronize the generated output signal to a genlock reference source.

3.1. Variant 2 - Typical use cases

The below figures show some typical use scenarios for variant 2, where it is used in quad-link or single-link 4K encoder/decoder application.

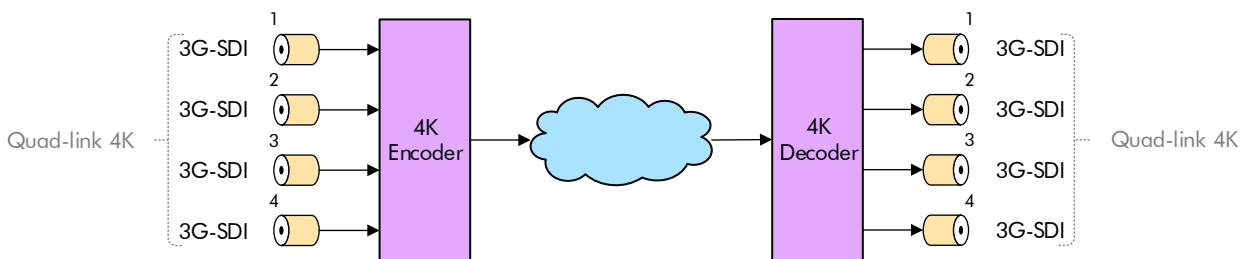


Figure 5. Quad-link 4K encoder/decoder using variant 2.

In quad-link mode the four ports of the DTA-2174B are used to transmit or receive four 3G-SDI signals. In single link mode port 1 is used to receive/transmit 4K video across 12G-SDI.

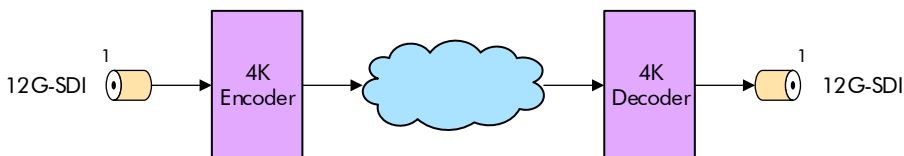


Figure 6. Single link 4K encoder/decoder using variant 2.

4. Variant 3 - 1x12G-SDI + 1x3G-SDI/ASI with genlock

Variant 3 targets 4K encoding/decoding applications with uncompressed input or output over ASI or a scaled down copy of the 4K content for monitoring purposes.

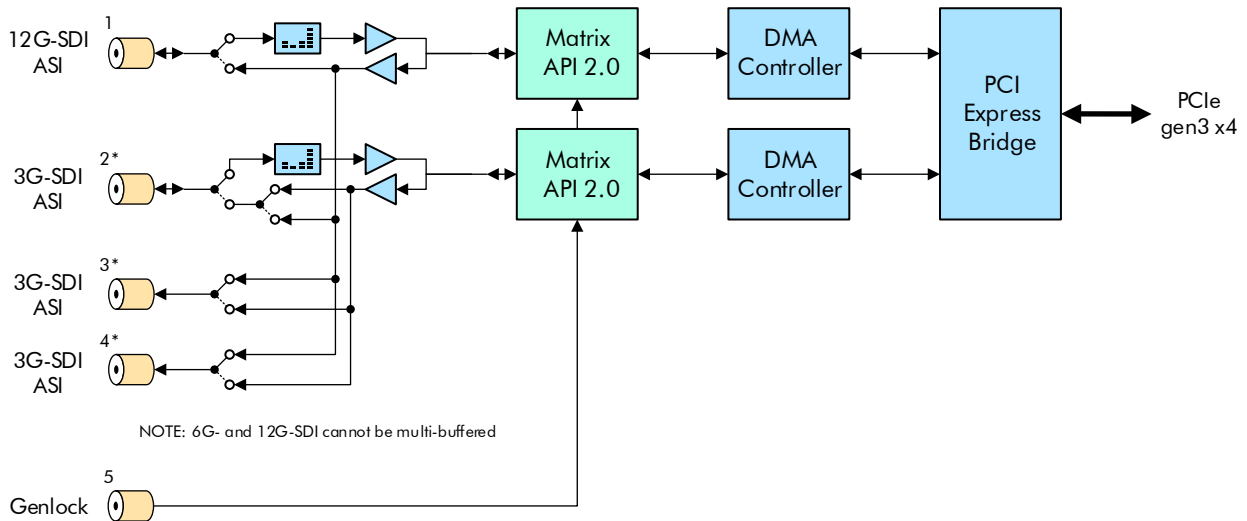


Figure 7. Firmware variant 3 functional block diagram.

Port 1 supports all input and output configurations with ASI, SD-, HD-, 3G, 6G and 12G-SDI. Port 2 can independently of port 1 be used as input and output for ASI, SD-, HD and 3G-SDI signals or as a double buffered copy of port 1. Ports 3 and 4 can be configured as double-buffered copy of either port 1 or 2. However, the ports 2-4 cannot be configured as double-buffered copy of port 1 when this port is used as 6G- or 12G-SDI output. As for the other variants port 5 is used as bi-/tri-level genlock input for genlocking the boards outputs to a genlock reference signal.

4.1. Variant 3 - Typical use cases

When compared to variant 2, variant 3 loses the ability to be used in applications which require quad-link 4K input or output. However, with a fully functional bi-directional second channel (i.e. port 2), variant 3 is ideal for making a 1U server based 4K encoder/decoder with ASI and 4K (12G-SDI) input or output, using a single DTA-2174B card as illustrated by Figure 8 and Figure 9.

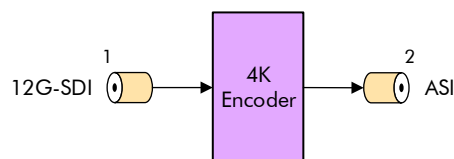


Figure 8. Single link 4K encoder with ASI input using variant 3.

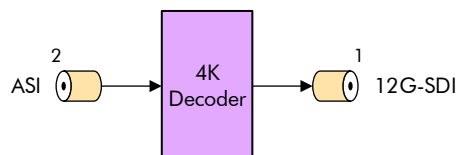


Figure 9. Single link 4K decoder with ASI input using variant 3.

Another use scenario for variant 3 is a 4K decoder with 12G-SDI output and a scaled-down copy for monitoring purposes as shown in the figure below.

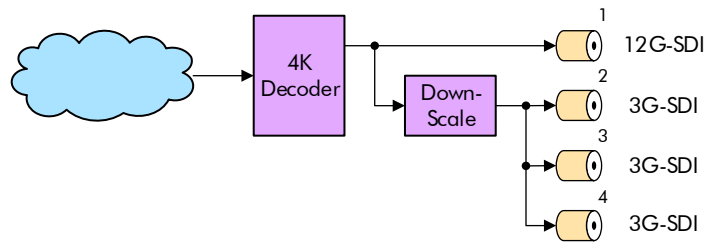


Figure 10. 4K decoder with multi-buffered down-scaled output for monitoring using variant 3.

5. Switching between Variants

The DTA-2174B supports runtime switching between firmware variants. Depending on whether the Windows or Linux OS is used a warm reboot of your system may be needed to complete activation of a different variant. For Windows a warm reboot is mostly unnecessary, while on Linux a warm reboot is mandatory.

Switching can be done programmatically, from a user application, through a call in the DTAPI or via the freely downloadable utility [DtInfo](#). Switching between variants takes a few seconds, not counting the time it takes to perform a warm reboot if this is required. The latest variant used is persisted, so that after a power cycle the DTA-2174B reboots to this variant. The following sections describe both methods of switching in more detail.

5.1. Switching Variants using DtInfo

Switching between firmware variants can be done at several locations in the DtInfo GUI, namely (1) through the variant drop-list in the main GUI windows or (2) by activating a variant from the “Package Info” dialog and finally (3) through selecting a variant from the variant drop-list in the “Port Configuration” dialog.



Figure 11. Variant selection from the main DtInfo dialog.

Besides switching between variants, the ‘Package Info’ dialog shown below also provides an overview of the variants available in the package currently loaded on the device. Clicking on the info link behind each variant opens a new dialog with a more detailed description of the variant as well as its release history.

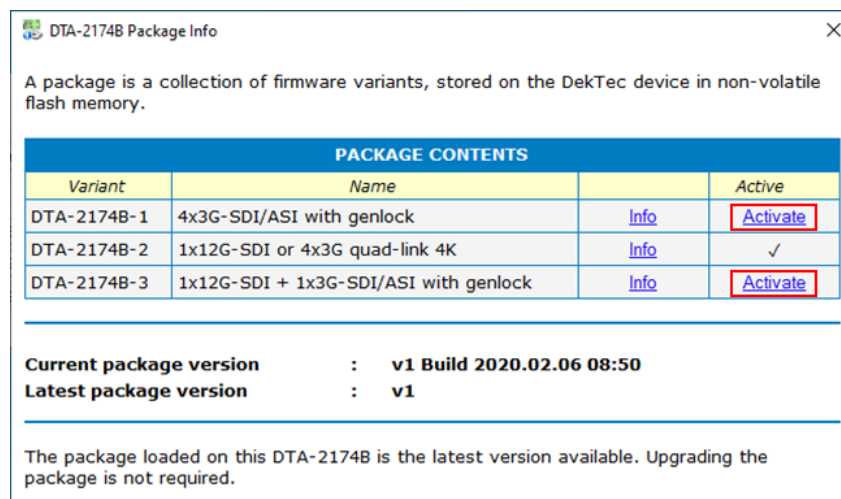


Figure 12. Variant activation from the ‘Package Info’ dialog.

If a new version of the package is available, upgrading to this new version can be done from this dialog as well.

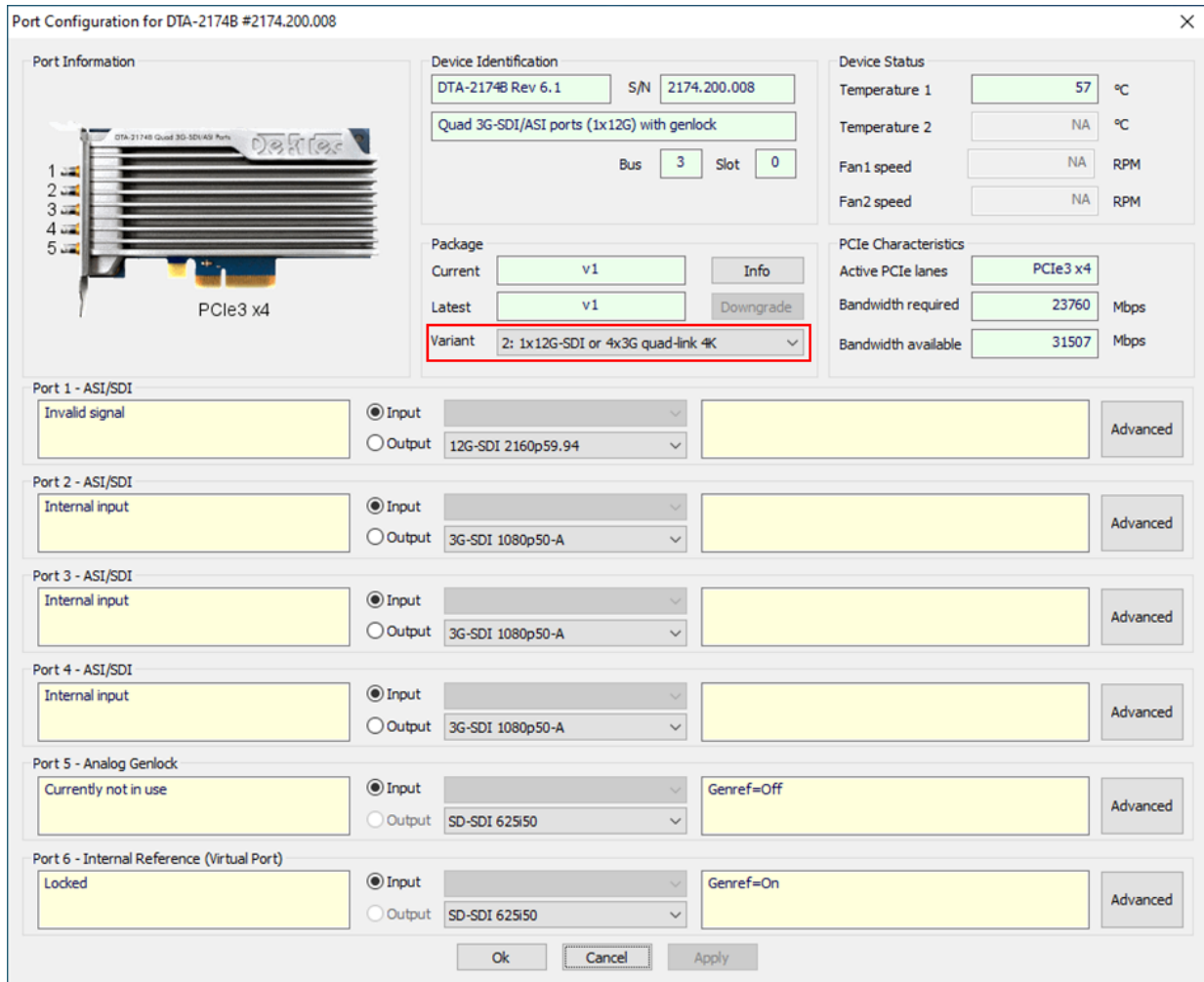


Figure 13. Variant selection from 'Port Configuration' dialog.

The final location for switching variants is 'Port Configuration' dialog as shown in the figure above.

5.2. Switching Variants Programmatically

Programmatic switching between variants is done using the `DtDevice::SetFirmwareVariant` method. Before switching to a different variant, the application should fully detach from the DTA-2174B hardware, otherwise the switch cannot be completed, and a warm-reboot is necessary to complete it. Due to limitations of the Linux OS a warm-reboot will be required by definition after calling

DtDevice::SetFirmwareVariant. The below pseudo code shows the steps that must be followed to perform a switch.

```
// Detach from the DTA-2174B. Switching while attached will fail
detach_from_Dta2174B();

// Switch to variant 2 on the DTA-2174B with serial 2174.200.008
DTAPI_RESULT dr = DtDevice::SetFirmwareVariant(2174200008, 2);
// Check if a warm-reboot is needed
if (dr == DTAPI_E_RESTART_REQD)
    exit_and_schedule_a_warm_reboot();
else if (dr != DTAPI_OK)
    exit_with_error_message();

// Successfully switched to variant 2, can re-attach and start processing
reattach_to_Dta2174B ();
configure_and_run_application_with_new_variant();
```