

Application Note DT-AN-2178-1

DTA-2178 – Firmware Variants

1. Overview of DTA-2178 Firmware Variants

The DTA-2178 is an 8-port SDI/ASI card for reception and transmission of SD, HD, 3G and 4K SDI signals, and ASI. The DTA-2178 firmware is split into three **firmware variants** (or “variants”), each targeting specific applications. Only one variant can be active at a time.

Note: After selecting a firmware variant, the DTA-2178 always starts with that variant after a power cycle.

The 3 variants are combined into a single image called a **firmware package**, which is stored – together with the variant number to boot – in the flash memory on the DTA-2178. Switching between firmware variants is covered in Section 6 of this document.

Table 1 - Variants in the DTA-2178 firmware package.

Variant	Port configuration	Typical applications
1	8x 12G-SDI/ASI	<ul style="list-style-type: none">Multi-port SDI and/or ASI applications: live production mixer, multiplexer, multi viewer, stream processor.Multi-channel decoder, encoder, gateway, transcoder, etc.Monitoring of eight 6G or 12G-SDI streams.
2	2x (12G-SDI or 4x 3G-SDI)	<ul style="list-style-type: none">2x 4K decoder with 12G-SDI or 4x 3G quad-link output.2x 4K encoder with 12G-SDI or 4x 3G quad-link input.
3	2x (12G-SDI + 3G-SDI/ASI)	<ul style="list-style-type: none">2x 4K decoder with 12G-SDI output + 3G-SDI monitoring.2x 4K encoder with 12G-SDI input and ASI input.

Notes:

- Ports can be configured from software as input, output or double-buffered copy, see variant details.
- Each variant supports locking of outputs to the genlock input.

Variant 1 is the general-purpose firmware variant with 8 fully independent 3G-SDI/ASI ports. A special mode allows 12G-SDI monitoring by scaling down to 3G-SDI. However, full 12G-SDI input or output is not supported, nor quad-link 4K.

Variant 2 is intended for 4K applications where the user should be able to choose between 12G-SDI and 4x 3G-SDI quad-link interfacing.

Variant 3 is intended for 4K applications with 4K input or output with 12G-SDI interfacing only (no quad-link). In addition to each 12G-SDI port, a 3G-SDI/ASI port is available, the main application of which is a secondary 3G-SDI output next to the 12G-SDI main output.

Note: You can only upgrade a firmware package in its entirety.
It is not possible to upgrade a single firmware variant to a newer version.

2. Variant 1 - 8x 12G-SDI/ASI with Genlock

Firmware variant 1 is the main workhorse for applications with multiple ASI/SDI inputs and/or outputs. It is also the default variant when the DTA-2178 is shipped from the factory.

2.1. Variant 1 – Block Diagram

This variant has eight independent ports, each configurable to operate as ASI, or as SD-, HD- or 3G-SDI input or output. Each port can be connected to a receive or transmit channel. An output port can also be configured as a double-buffered copy of another port (in the same group of four ports), to create multiple copies of the same output signal.

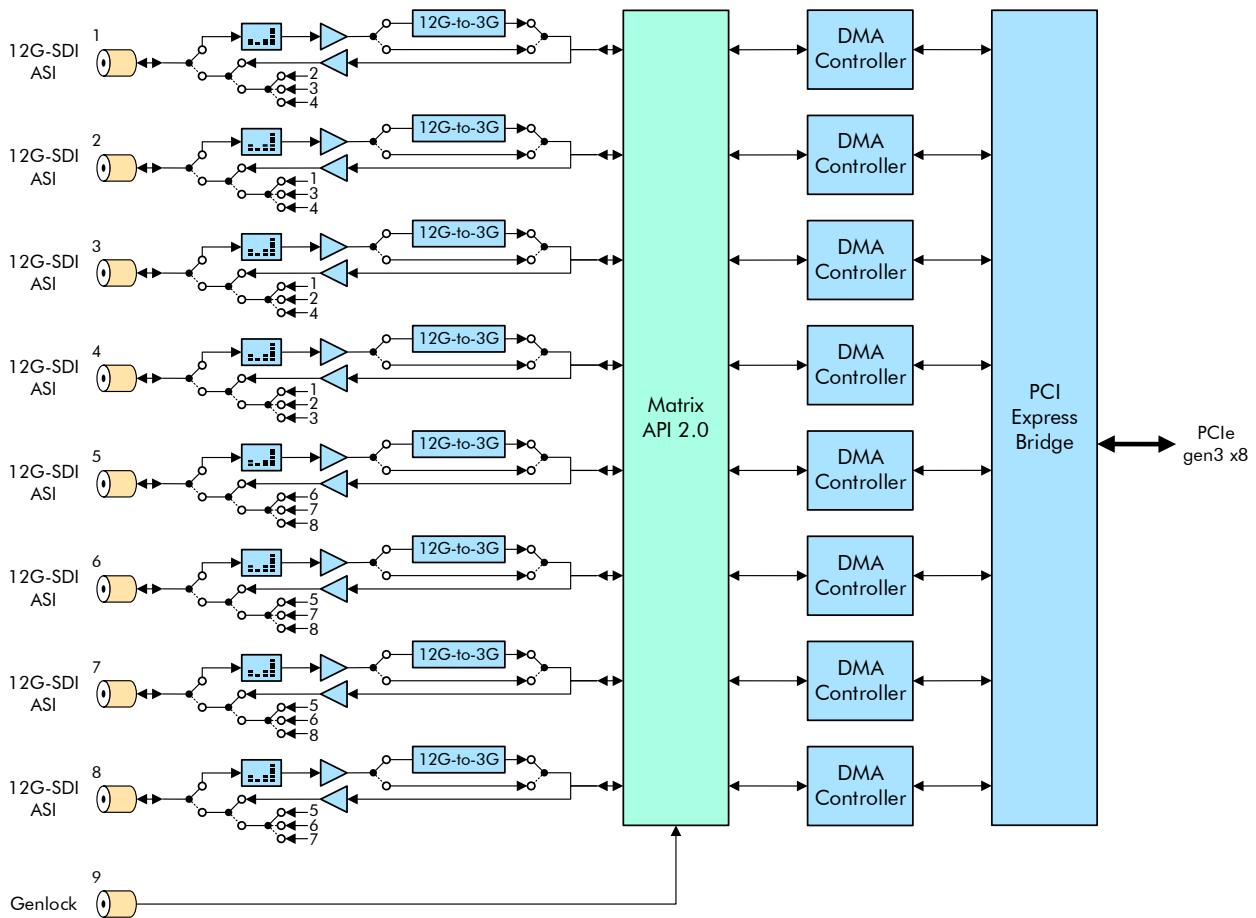


Figure 1. Firmware variant 1 functional block diagram.

When configured as input, each port can also receive 12G-SDI by scaling to 3G (i.e. 2160p to 1080p). This feature can be used to monitor eight 12G-SDI signals. Likewise, 6G-SDI can be scaled to HD.

Ports configured as output can be genlocked to a bi-/tri-level genlock reference signal applied to the genlock port on the DTA-2178.

2.2. Variant 1 - Typical Applications

Firmware variant 1 is a general-purpose variant with which many types of applications can be built that need ASI and SDI ports. The examples shown below are just a few examples of high port-count applications that fit the DTA-2178 well.

2.2.1. Live Production Mixer

With a single DTA-2178 in a PC you can build a software-based 7-input, 1-output live production mixer. Any combination of SD, HD, 3G and even ASI signals can be input.

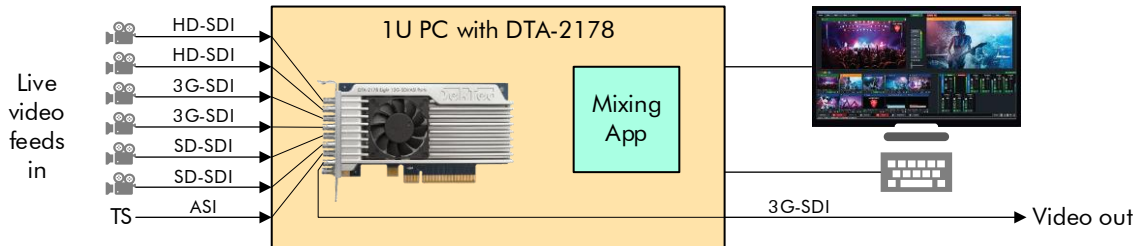


Figure 2. Software-based live production mixer with 7 inputs and 1 output.

2.2.2. 12G-SDI Multi Viewer

With the 12G-to-3G scaling ability of variant 1, a multi-viewer application can be created that displays a mosaic of up to eight 12G-SDI UHD inputs.

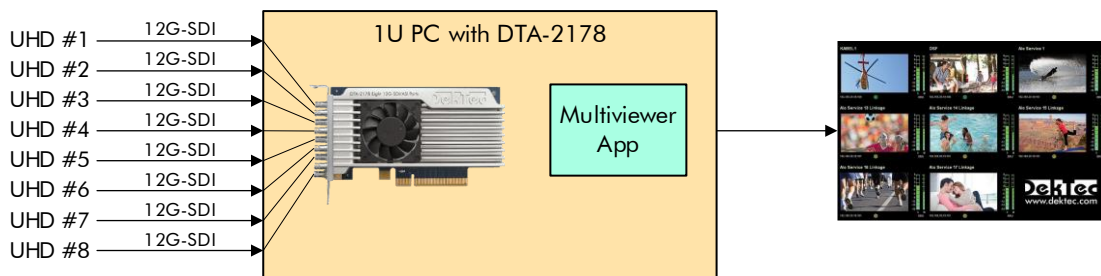


Figure 3. 12G-SDI multi-viewer application using DTA-2178 variant 1.

It is also possible to combine scaled 12G and 6G inputs with unscaled 3G, HD and SD-SDI signals, as well as with compressed ASI signals, to create a universal multiviewer.

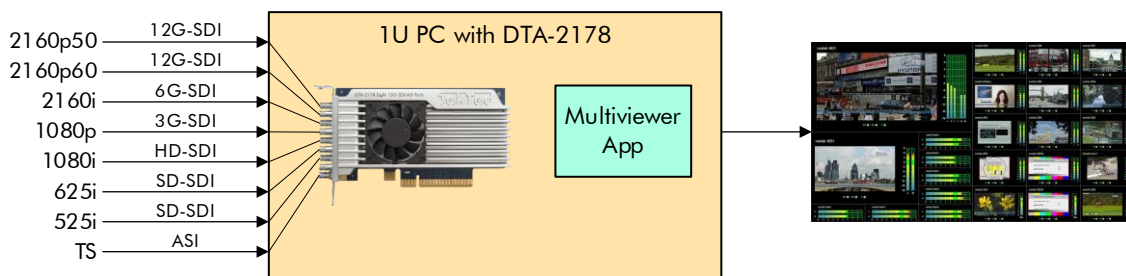


Figure 4. Multi-viewer with a mix of compressed and uncompressed inputs.

3. Variant 2 - 2x (12G-SDI or 4x3G Quad-Link 4K)

Firmware variant 2 is intended for 4K applications (typically encoders, decoders and “4K in, 4K out” applications) where the end user should be able to choose between single-link 12G-SDI and quad-link 4x 3G-SDI interfacing. 6G-SDI and quad-link 4x HD-SDI are also supported.

3.1. Variant 2 – Block Diagram

Variant 2 has two independent 4K input or output channels (versus eight 3G channels for variant 1), each supporting a single link up to 12G-SDI or SMPTE 425-5 quad-link over 4x 3G-SDI.

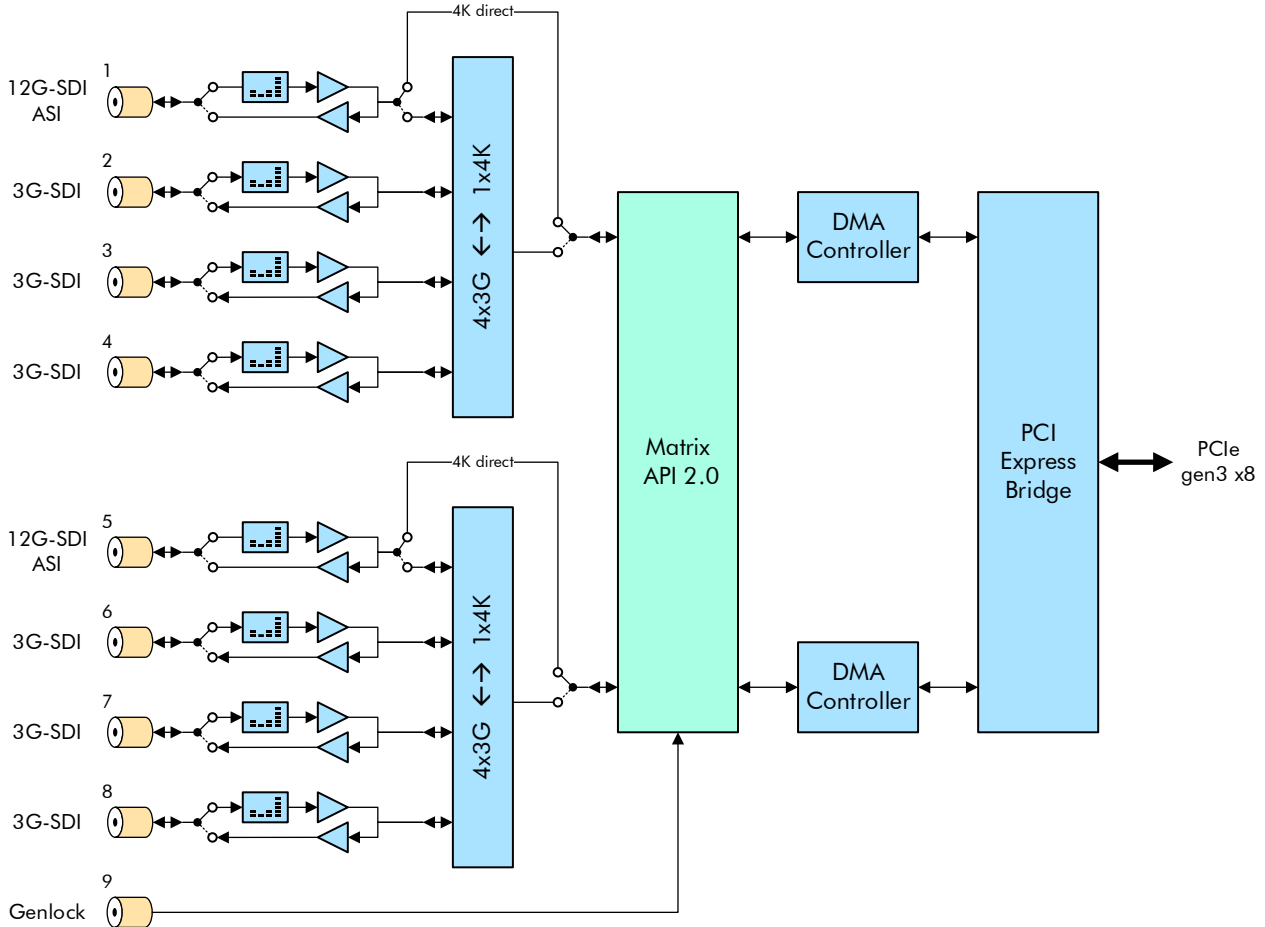


Figure 5. Firmware variant 2 functional block diagram.

Ports 1 and 5 are used for single-link 6G or 12G-SDI interfacing. If port 1 is used for single-link 6G or 12G, ports 2, 3 and 4 cannot be used; If port 5 is used, ports 6, 7 and 8 cannot be used.

Note: Typically ports 1 and 5 are used for 6/12G, but other SDI rates (SD, HD, 3G) and ASI are also supported.

Alternatively, ports 1-4 and 5-8 can be combined to receive or transmit 4K over a quad-link. In this variant, ports 2-4 and 6-8 cannot be used in any other way than as part of a quad link.

As with variant 1, output ports can be synchronized to the genlock input.

3.2. Variant 2 - Typical Applications

The typical application for variant 2 is a dual software-based 4K encoder or decoder, where the end user can choose between single-link 12G-SDI and quad-link 4x 3G-SDI interfacing.

3.2.1. Dual 4K Encoder

A single DTA-2178 in a PC can be used to provide uncompressed 4K input to two encoder (e.g. HEVC) applications running on the PC's CPU and/or GPU. The compressed video is output over IP through the PC's network interface card (NIC).

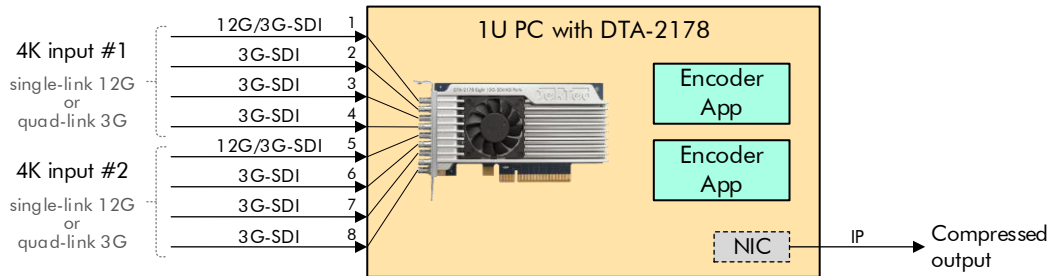


Figure 6. Dual software-based 4K encoder.

3.2.2. Dual 4K Decoder

Similarly, a dual software-based 4K decoder can be created.

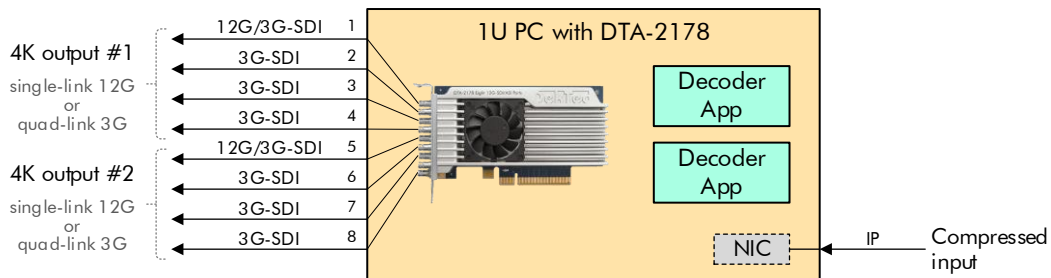


Figure 7. Dual software-based 4K decoder.

4. Variant 3 - 2x (12G-SDI+3G-SDI/ASI) with Genlock

Firmware variant 3 primarily targets a dual 4K software-based decoder with two 12G-SDI main outputs and two additional, downscaled (in software) monitoring outputs.

4.1. Variant 3 – Block Diagram

Variant 3 supports two main 4K channels and two additional channels that can go up to 3G-SDI.

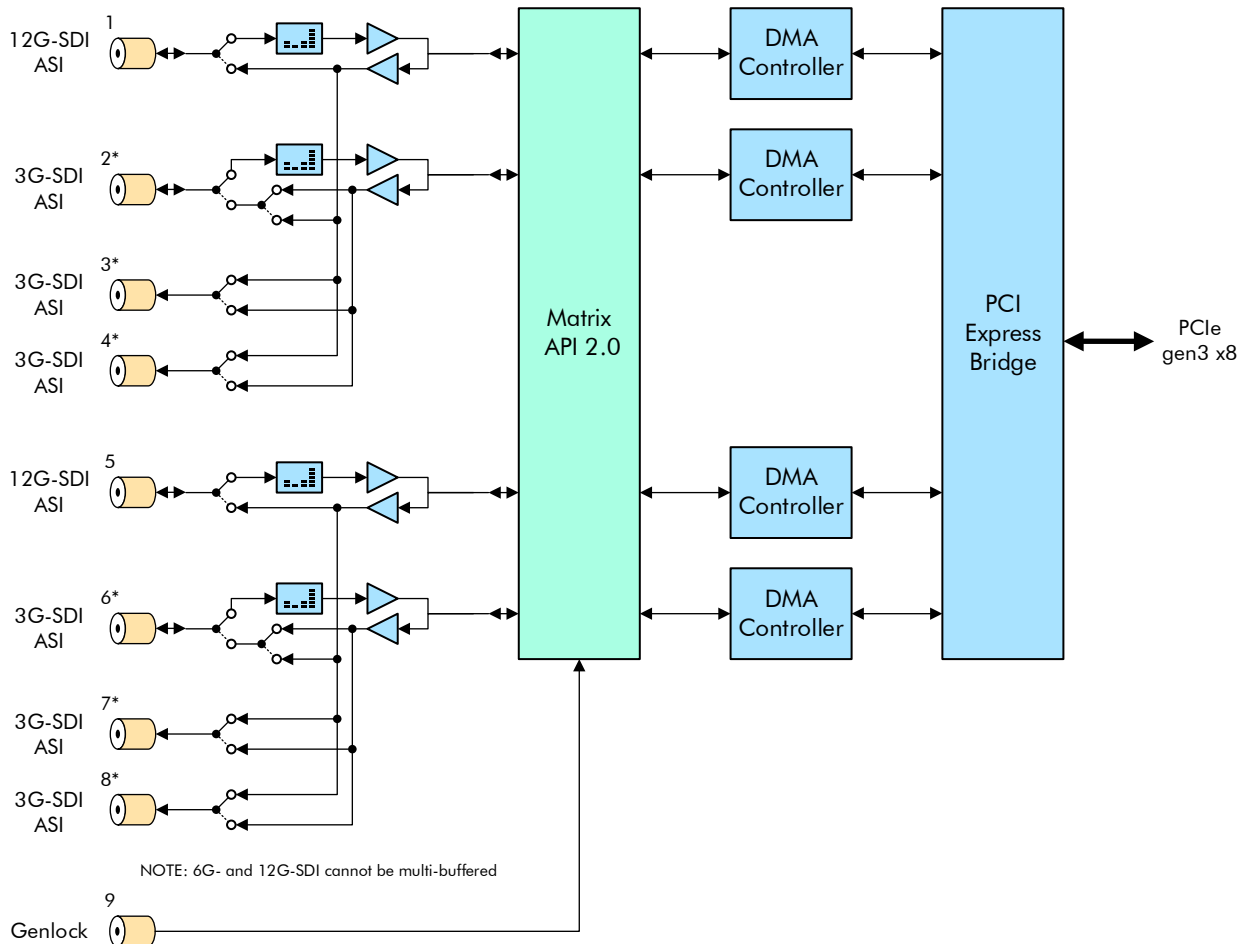


Figure 8. Firmware variant 3 functional block diagram.

The characteristics of the different ports available are described in the table below.

Table 2 – Properties and description per DTA-2178 port for firmware variant 3.

Port#	Supported standards	Direction	Description
1, 5	12G, 6G, 3G, HD, SD, ASI	In or Out	Main channel
2, 6	3G, HD, SD, ASI	In or Out	Auxiliary channel
3, 4	3G, HD, SD, ASI	Out only	Double-buffered copy of port 1* or 2
7, 8	3G, HD, SD, ASI	Out only	Double-buffered copy of port 5* or 6

* 6G and 12G-SDI cannot be double buffered on port 3, 4, 7 and 8.

As with the other variants, output ports can be synchronized to the genlock input.

4.2. Variant 3 - Typical Applications

Compared to variant 2, variant 3 loses the ability to be used in applications that require 4K quad-link 4x 3G-SDI input or output. However, two fully functional auxiliary channels (port 2, 6) are available, allowing for some interesting applications.

4.2.1. Dual 4K Decoder with Main 12G-SDI and Monitoring Output

Two software-based 4K decoders with IP input, each with 12G-SDI output and scaled-down (to 3G) copy of the 4K output for monitoring purposes. Each 3G monitoring signal is available on 3 ports.

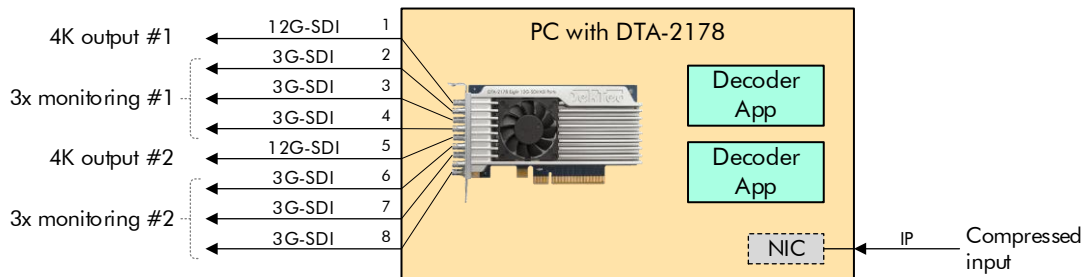


Figure 9. Dual 4K decoder with 12G-SDI main and 3G-SDI monitoring output using variant 3.

Please note that the scaling from 12G-SDI to 3G-SDI must be done in software by your application (not provided by the DekTec SDK). However, the multi-buffering of the monitoring output to ports 2, 3, 4 and 6, 7, 8, respectively, is done by the hardware.

4.2.2. Dual 4K Decoder with 12G-SDI Output and ASI Input

The auxiliary channel can also be used to create a dual 4K decoder with ASI transport-stream input.

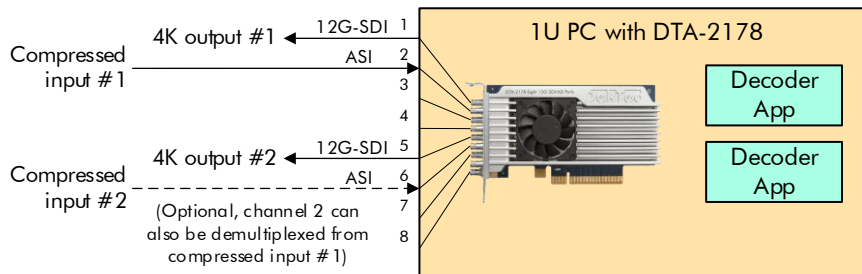


Figure 10. Dual 4K decoder with ASI input.

4.2.3. Dual 4K Encoder with 12G-SDI Input and ASI Output

Similarly, a dual 4K encoder with ASI output can be created.

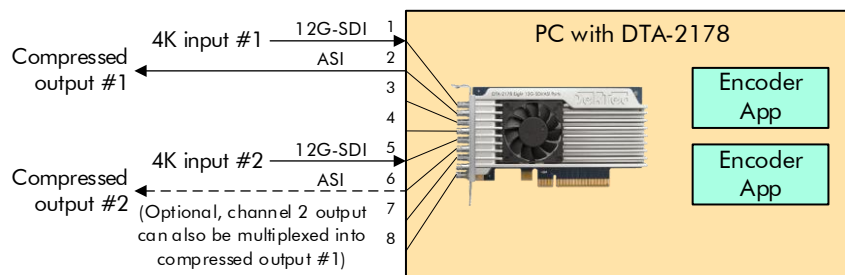


Figure 11. Dual 4K decoder with ASI input.

5. Switching Between Firmware Variants

The DTA-2178 supports in-the-field switching between firmware variants.

5.1. Which Firmware Variant Is Started After a Cold Boot?

The firmware variant number used to boot is persisted in the flash memory on-board the DTA-2178. If the variant is changed, the variant number that will be used after the next PC reboot is written to flash memory. The desired variant therefore needs to be selected only once; after each power cycle the DTA-2178 automatically loads the last used firmware variant.

5.2. PC Reboot Required?

After changing the firmware variant (see sections below), depending on the operating system being used, a PC reboot (warm or cold) of your system may be required to activate the new variant.

OS	PC reboot required?	Notes
Linux	Yes, a reboot is required.	
Windows	No, reloading another firmware variant can be done from the DekTec API (DTAPI) without rebooting the PC. During the process, the DekTec driver will be stopped and restarted.	If another application is using the card while trying to change the firmware variant, a reboot is required. Another reason why a reboot may be required is if the address space required by the new variant increases. It so, it will be noted in the firmware-package release notes.

5.3. Switching Variants

Switching can be done programmatically through a call in the DTAPI. This can be done from a user application, or via the freely downloadable utility [DtInfo](#) (Windows) or [DtInfoCI](#) (Linux).

Note: Switching between variants takes a few seconds, not counting the time it takes to perform a PC reboot if this is required.

5.4. Switching Variants using DtInfo (Windows)

Activating another firmware variant can be done at different locations in the DtInfo GUI.

5.4.1. Variant Switching with DtInfo – Via Main Window

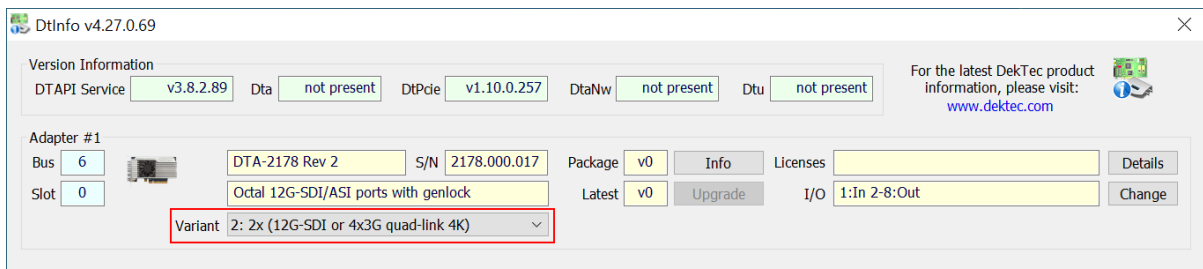


Figure 12. Activating a variant from the main DtInfo window using a drop-down list.

5.4.2. Variant Switching with DtlInfo – Via ‘Package Info’ Dialog

The ‘Package Info’ dialog box appears when – in the main DtlInfo window – the ‘Info’ button behind the package version is pressed. This dialog box lists the variants available in the firmware package currently loaded in the flash memory of the DTA-2178.

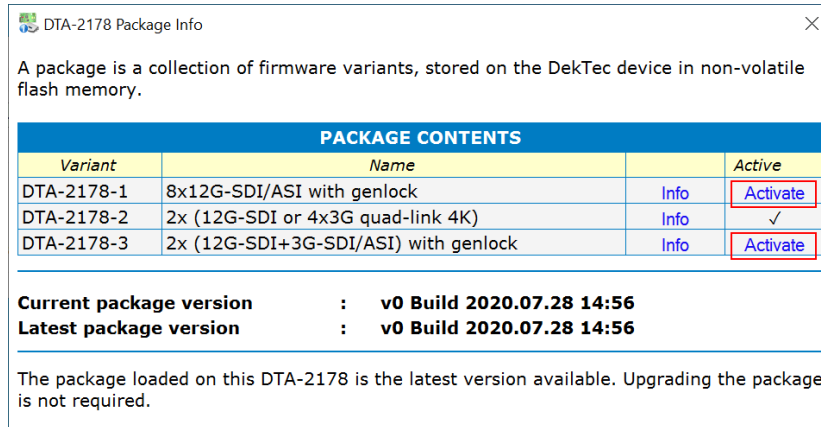


Figure 13. Variant activation from the ‘Package Info’ dialog.

- 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.
- Clicking on the ‘Activate’ link behind a variant will activate that firmware variant.

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

Note: You can only upgrade a firmware *package* in its entirety.
It is not possible to upgrade a single firmware variant to a newer version.

5.4.3. Variant Switching with DtlInfo – Via Port Configuration Info Dialog

The final location for switching firmware variants is the ‘Port Configuration’ dialog box, which appears when – in the main DtlInfo window – the ‘Change’ button behind the I/O pane is pressed.

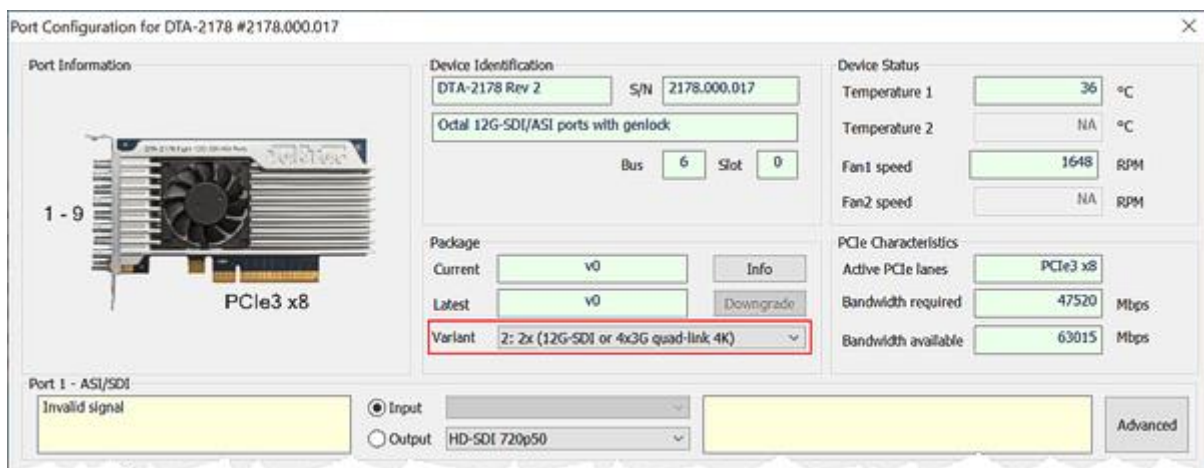


Figure 14. Variant selection from the ‘Port Configuration’ dialog using a drop-down list.

5.5. Programmatic Change of Firmware Variant

Programmatically switching from one firmware variant to another can be done with the static DTAPI method `DtDevice::SetFirmwareVariant`. Before calling this method, the application must fully detach from the DTA-2178 hardware, otherwise the switch will fail.

The pseudocode below shows the steps to follow to programmatically change the firmware variant. In this example, a switch is made to variant 2.

```
// Detach from the DTA-2178. Changing variant while attached will fail.
detach_from_Dta2178();

// Switch to firmware variant 2 on the DTA-2178 with serial# 2178.001.234.
DTAPI_RESULT dr = DtDevice::SetFirmwareVariant(2178001234, 2);

// Check whether a PC reboot (warm or cold) is required.
// - Under Linux a PC reboot will always be required.
// - Under Windows a PC reboot will not be required, unless a special
//   conditions applies, see Section 5.2 of this document.
if (dr == DTAPI_E_RESTART_REQD)
    exit_and_schedule_a_warm_reboot();
else if (dr != DTAPI_OK)
    exit_with_error_message();

// Successfully switched to firmware variant 2.
// Re-attach and start processing with variant 2.
reattach_to_Dta2178();
configure_and_run_application_with_new_variant();
```

After executing this code, the new variant number (2) has been persisted in on-board flash memory. After a power cycle, the DTA-2178 will start up with firmware variant 2.