Chapter 65

Using DAS Studio 3 to configure the AXN/VID/401

TEC/NOT/097

This paper discusses the following topics:

The Serial Digital Interface (SDI) is a well documented format on the web. The goal of this technical note is not to describe it but to describe how to set up the module with DAS Studio 3.

65.1 Module overview

The AXN/VID/401 is an H.264 video encoder with digital video inputs. The module supports two MPEG2 streams simultaneously for storage/onboard monitoring (high data rate) and telemetry (low data rate).

The supported video input formats are:

- HD-SDI (SMPTE 292M)
- 3G-SDI (SMPTE 424M)

The AXN/VID/401 occupies two slots in a chassis, this is due to internal components, which require a heat sink. DAS Studio 3 discovers the module as a two-slot module. For example, the module sitting in slot 2 and slot 3, is shown as occupying slot 2 in the DAS Studio 3 GUI.

IMPORTANT: Only use SDI rated 75-ohm connectors and cables with the AXN/VID/401. The pin in these connectors and the corresponding cable is narrower than the standard 50-ohm connector found on most lab equipment. Failure to do so may damage the connector.

65.2 AXN/VID/401 DAS Studio 3 settings

This technical note describes how to configure the AXN/VID/401 in DAS Studio 3. This module is supported from DAS Studio 3.4.34 onwards.

There are two MPEG2 video registers: MPEG2TSIn for high video data rate; and MPEG2TSInTelemetry with a lower video data rate (mainly used for telemetry/PCM transmission).

The following section explains how to configure the module for PCM IRIG-106 Chapter 4 transmission, while the rest of the document focuses on Ethernet transmission.

65.2.1 PCM IRIG-106 Ch.4 MPEG2TSInTelemetry FIFO mode (placed data)

Packetizer mode is not suitable for transmission over a PCM IRIG-106 Chapter 4 link; MPEG2TSInTelemetry should be used instead.

The MPEG2TSInTelemetry parameter is implemented in a FIFO buffer that can be placed irregularly in the PCM using DAS Studio’s Transmission Assistant burst mode placement.

The FIFO Enabled setting must be enabled in DAS Studio, while the MPEG2TSInTelemetry settings such as Video Bit Rate, Frame Rate Divider and GOP mode must be set up as shown in the following figure.

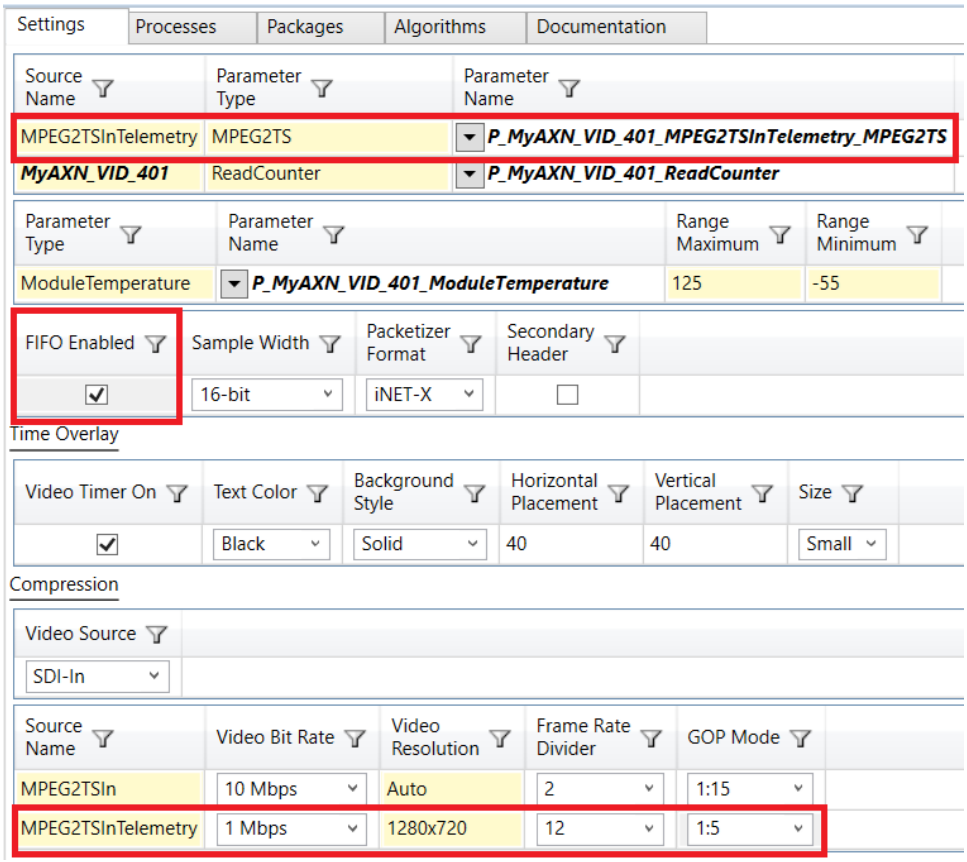


Figure 65-1: DAS Studio video MPEG2TSInTelemetry settings for PCM Ch.4 transmission

The AXN/VID/401 data sheet contains a table with recommended settings for MPEG2TSInTelemetry as shown below.

Table 65-1: Recommended setting for MPEG2TSInTelemetry channel

Video Bit Rate	Frame Rate Divider	GOP	Video Resolution	FIFO Mode Sample Rate
5M	2	1:5 to 1:30	1280x720	> 5.1M
5M	4	1:5 to 1:15	1280x720	> 5.1M
2M	4	1:5 to 1:15	1280x720	> 2.1M
2M	12	1:1 to 1:5	1280x720	> 2.1M
1M	4	1:5 to 1:15	1280x720	> 1.1M
1M	12	1:1 to 1:5	1280x720	> 1.1M
900K	12	1:1 to 1:5	1280x720	> 1M
900K	30	All I	1280x720	> 1M
700K	12	All I to 1:5	1280x720	>800K
700K	30 to 60	All I	1280x720	>800K
500K	30 to 60	All I	1280x720	>600K

Example: Looking at the table, for a Video Bit Rate of 1 Mbps, Frame Rate Divider of 12, and GOP mode of 1:5, the required sampling rate is at least 1.1 Mbps. Note an additional 100 kbps are added to the input rate.

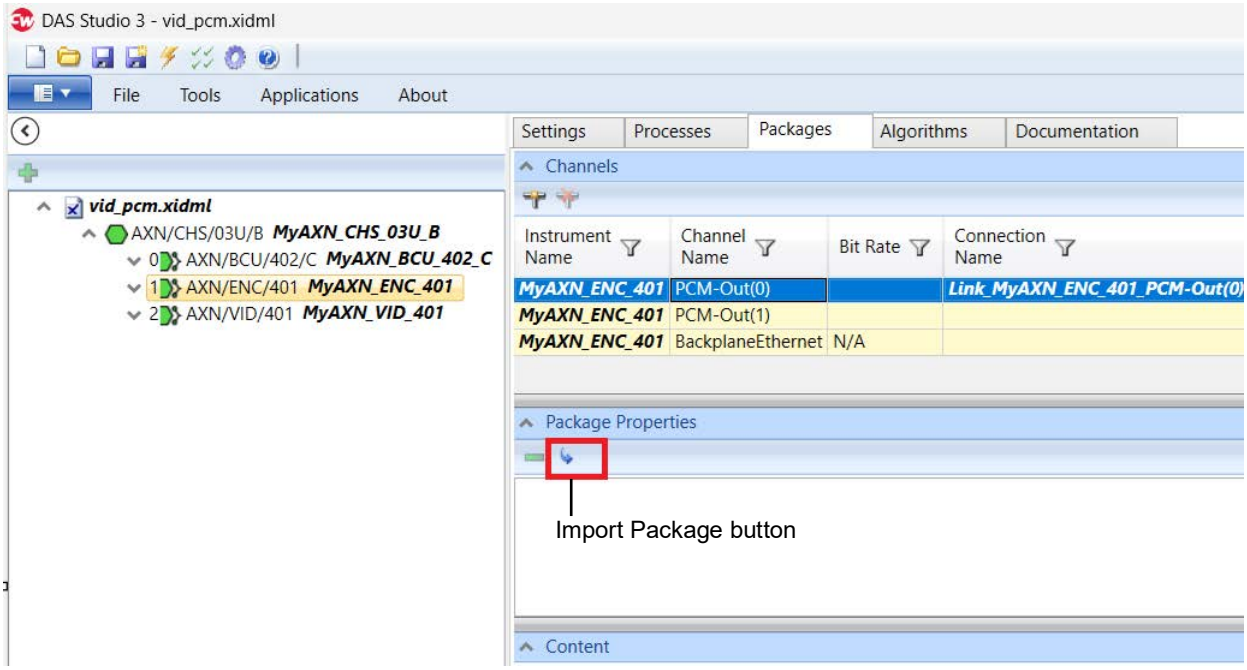
NOTE: DAS Studio compiler does not enforce this additional 100 kbps being added to the sampling rate on top of the video input rate, that is, it is up to the user to add this overhead.

The sampling rate for FIFO mode can be calculated with the following formula:

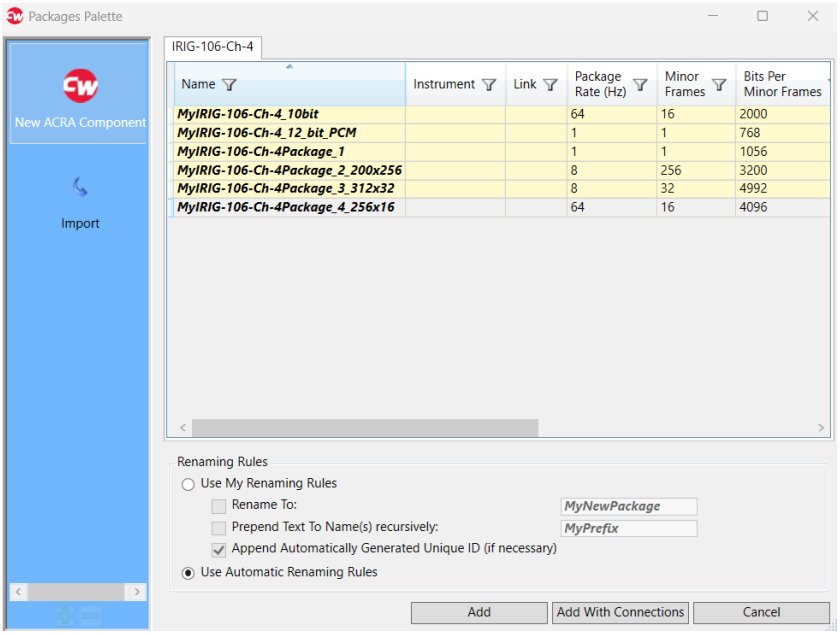
FIFO mode sampling rate = PCM Major Frame Rate × number of video words × sampling width (video size in bits)

To add a PCM IRIG-106 Chapter 4, link refer to the following.

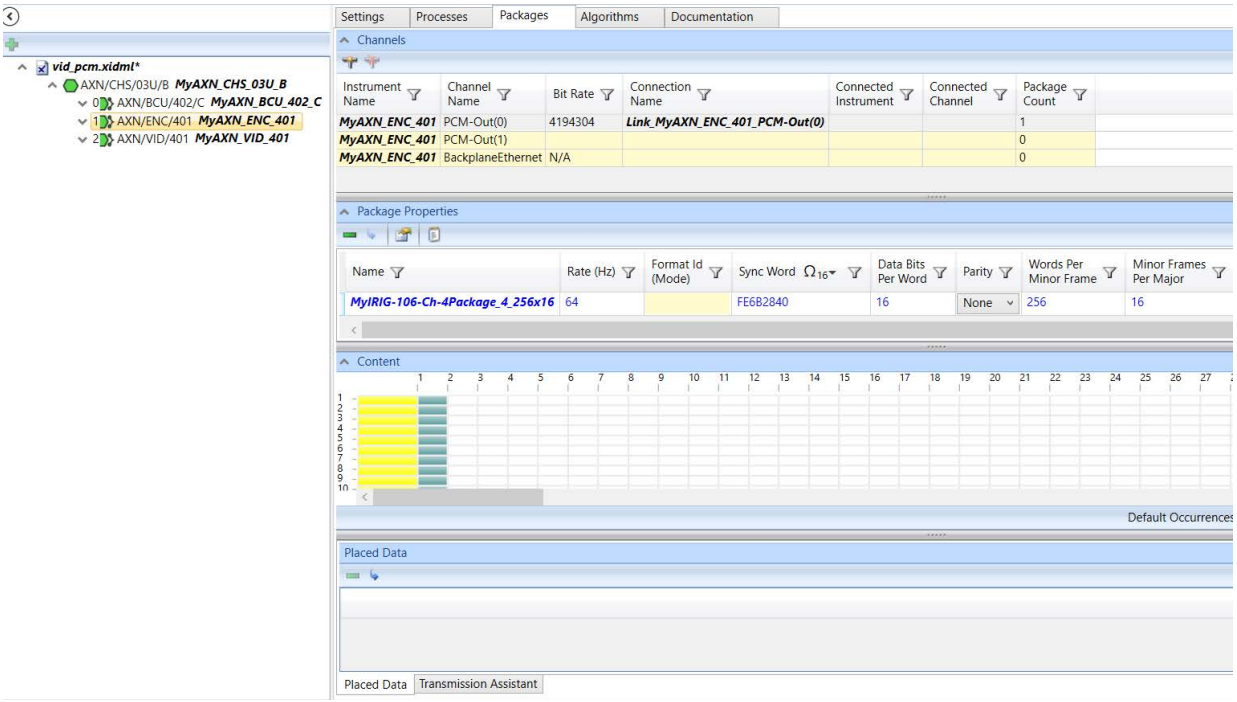
1. Select AXN/ENC/40x in the Navigator and then click the **Packages** tab.
2. Click the **Import Package** button in the **Package Properties** pane.



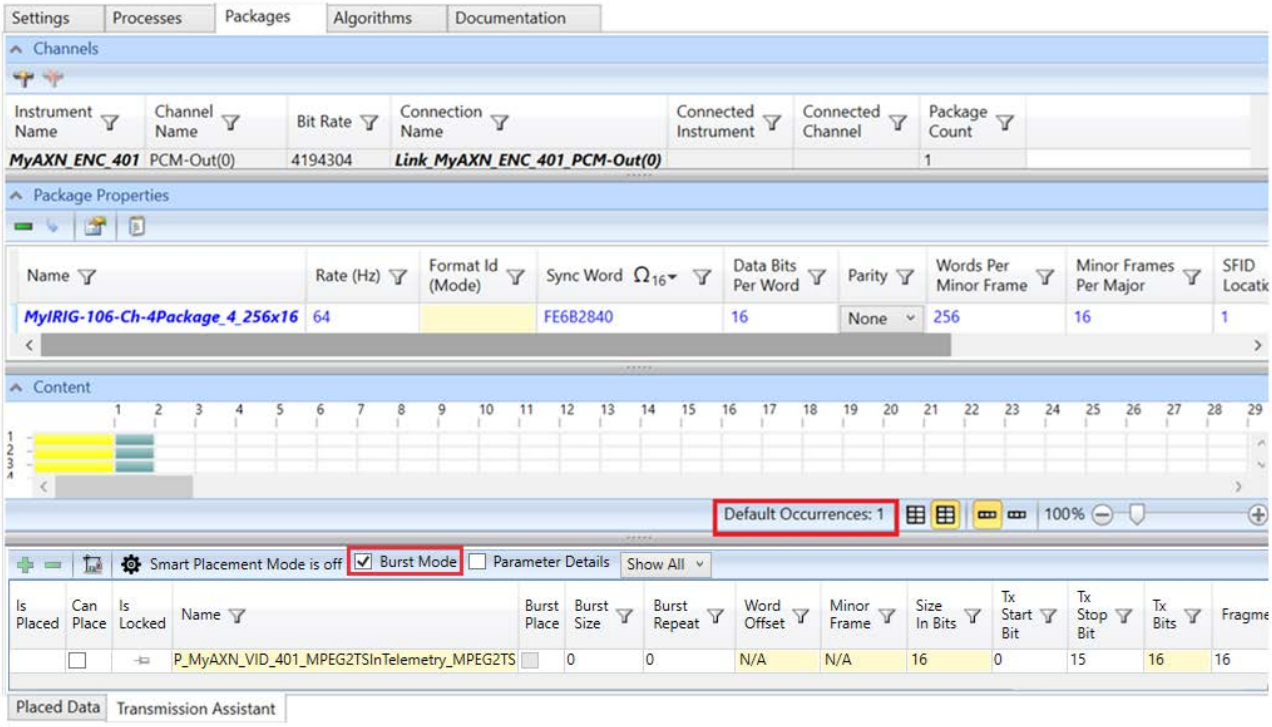
Packages Palette opens.



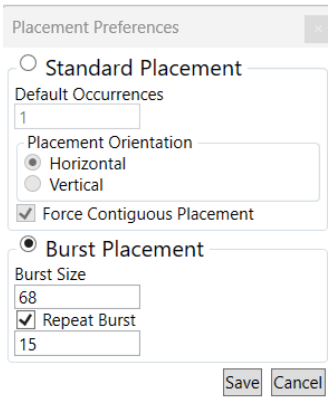
3. Select a package, such as **MyIRIG-106-Ch-4Package_4_256x16** and then click **Add**.
   The package is added to the **Package Properties** pane.



4. Now you can modify the PCM settings such as the number of minor frames.
   In this example, the default PCM settings are kept, and the PCM Frame has a major frame rate of 64 Hz, 16 minor frames per major frame, and 256 words per major frame, giving a bit-rate of 4,194,304 bps.
5. At the bottom of the **Packages** tab, click the **Transmission Assistant** tab.
6. Select the **Burst Mode** check box.
   This filters non-burst parameters and only shows MPEG2TSInTelemetry on the parameter list.



7. Select the **Default Occurrences** check box as shown above.
   The **Placement Preferences** dialog opens.



In this example, applying the sampling rate for FIFO mode shown previously, the basic calculations are as follows:

FIFO mode sampling rate = PCM Major Frame Rate × number of video words × sampling width (video size in bits)

FIFO mode sampling rate = 1,100,000 bps = 64 × number of video words × 16 bits

Number of video words = 1,100,000 /(64 ×16) = 1075

Taking into account the PCM as 16 Minor Frames per Major, the approximate number of **Repeat Burst** can be calculated as 1075 / 16 = 67.1875 which can be rounded up to 68.

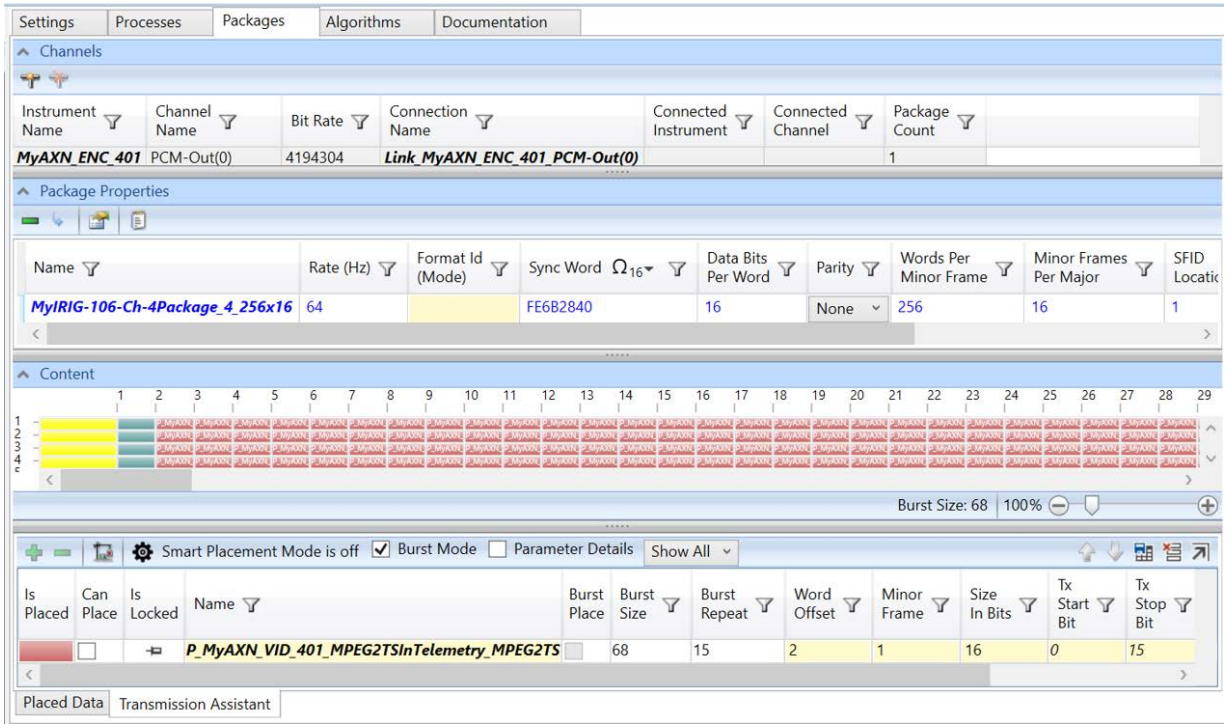
NOTE: In DAS Studio, the number of minor frames start from 0, therefore for configuration purposes we use 15 as the number of minor frames.

In summary, a Burst Size of 68 and a Repeat Burst of 15 results in 68 × (15+1) = 1088 words, which is a sufficient video rate.

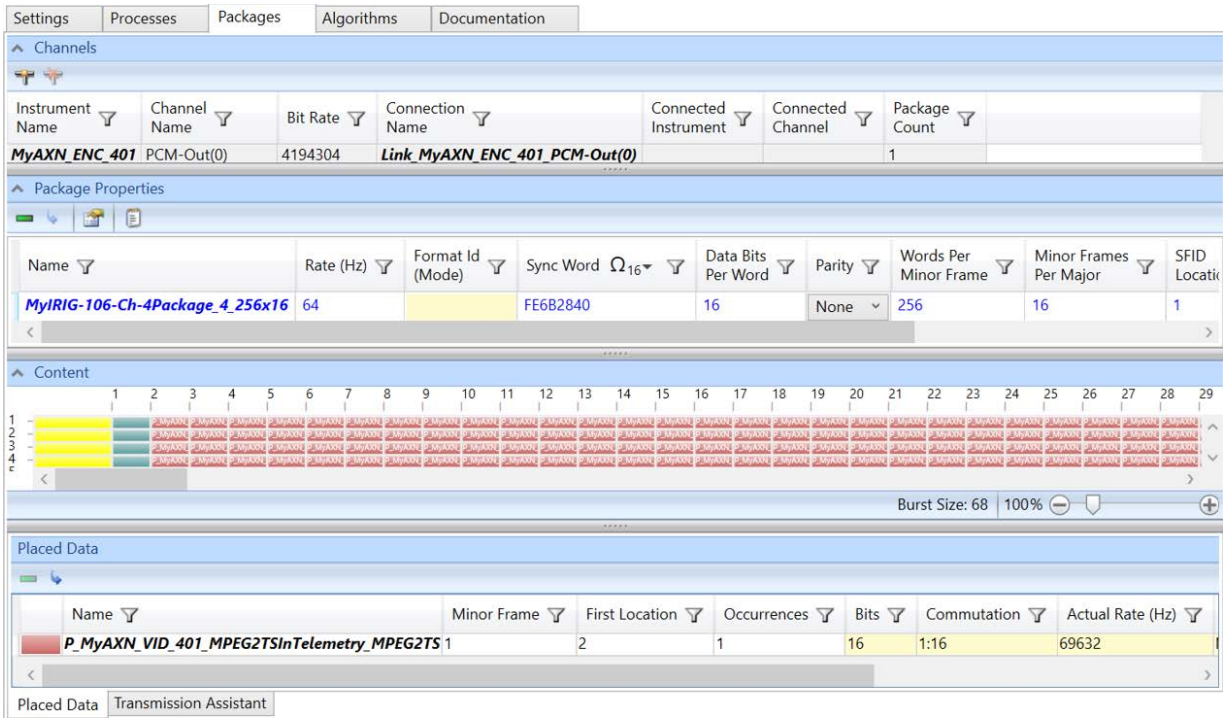
NOTE: Refer to *DAS Studio 3 User Manual* for more information on burst mode.

8. After configuring Burst Placement in step 7 above, click **Save**.
9. Then select the **Can Place** check box and drag and drop **MPEG2TSInTelemetry** parameter into the PCM (in the example use word 2 of the first minor frame).

Alternatively click this icon  to automatically place the burst parameter onto the PCM as shown in the following figure.



10. Click the **Placed Data** tab at the bottom of the **Packages** tab.
This shows the actual rate being calculated to 69632 sps which is correct for 16 bits, 69632 × 16 = 1,114,112 bps.



NOTE: Video registers do not support the sampling rate decimation in different sinks, which means if the MPEG2TSInTelemetry parameter is sampled in two destinations (sink), for example PCM and Ethernet, with different rates, then DAS Studio will not verify it.

65.2.2 Ethernet packetizer

The Ethernet packetizer can be used for Ethernet transmission/recording.

To start using packetizer mode, select the **Packetization Enabled** check box and then select a unique **Stream ID** as shown in the following figure.

During verification, DAS Studio automatically creates the packetizer packet, which shows up in the packages section of the sink selected in the **Packetization Sink** drop-down menu.

The supported Packetizer formats are iNET-X (block), IENA (Type Q) or Chapter 10.

NOTE: This technical note only discuss the iNET-X packetizer.

To packetize MPEG2TSIn, first define the settings: Video Bit Rate, Frame Rate Divider and GOP mode as shown in the following figure. For recommended settings see Table 65-2 on page 8.

The AXN/VID/401 module can output two packetizer streams: MPEG2TSIn and MPEG2TSInTelemetry

MPEG2TSIn auto detects the 1920 × 1080 or 1280 × 720 resolution and returns compressed video, which matches the input resolution while MPEG2TSInTelemetry can only output 1280 × 720 resolution.

Typically MPEG2TSIn video bit-rate is faster than MPEG2TSInTelemetry. You can record, for example, the MPEG2TSIn stream over Ethernet and transmit MPEG2TSInTelemetry over Chapter 7 at a different rate (normally lower in order to save bandwidth).

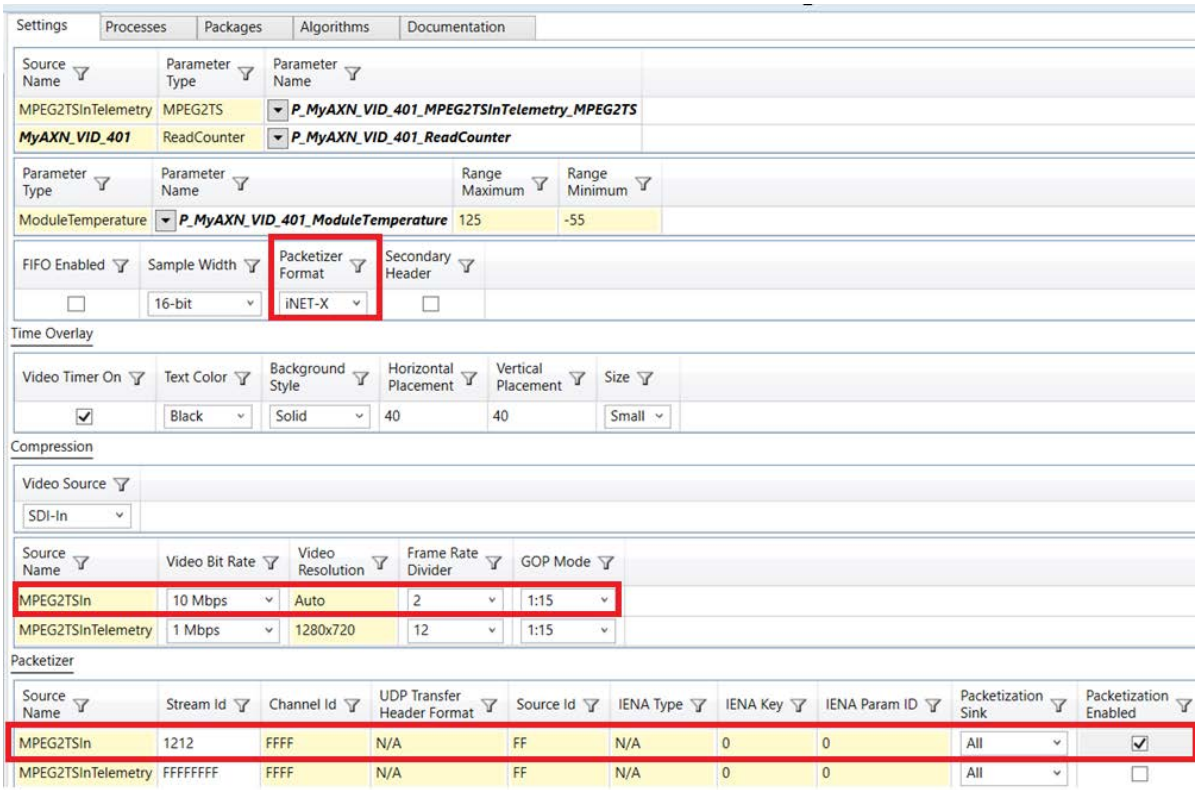


Figure 65-2: Setting up the Packetizer in DAS Studio 3

Table 65-2: Recommended setting for MPEG2TSIn channel (as published in the AXN/VID/401 data sheet)

Video Bit Rate	Frame Rate Divider	GOP	Video Resolution
40M	1	1:5 to 1:60	1920x1080
20M	1	1:5 to 1:60	1920x1080
10M	1 to 2	1:5 to 1:60	1920x1080
5M	2 to 4	1:5 to 1:30	1920x1080
2M	4 to 12	1:5 to 1:15	1920x1080
1M	4 to 12	1:5 to 1:15	1920x1080
900K	12 to 30	1:1 1:15	1920x1080
700K	12 to 30	All I to 1:1	1920x1080
500K	30 to 60	All I to 1:1	1920x1080

Once the AXN/VID/401 is set up in DAS Studio 3, the configuration can be verified.

65.2.3 MPEG2TSInTelemetry transmitted over Ethernet in FIFO mode

When using Ethernet transmission, the recommendation is to use Packetizer mode, however it is possible to transmit MPEG2TSInTelemetry over Ethernet. For the previous example, transmitting video over PCM, the sampling rate is 69,632 samples or 1,114,112 bps.

An iNET-X placed packet can be created with the following configuration: 128 packets per second and 544 occurrences of MPEG2TSInTelemetry inside the packet (this number is chosen to avoid packet fragmentation).

This configuration can be used as a standalone Ethernet transmission, or since the sampling rate is the same, in combination with a PCM frame as shown in the following figure.

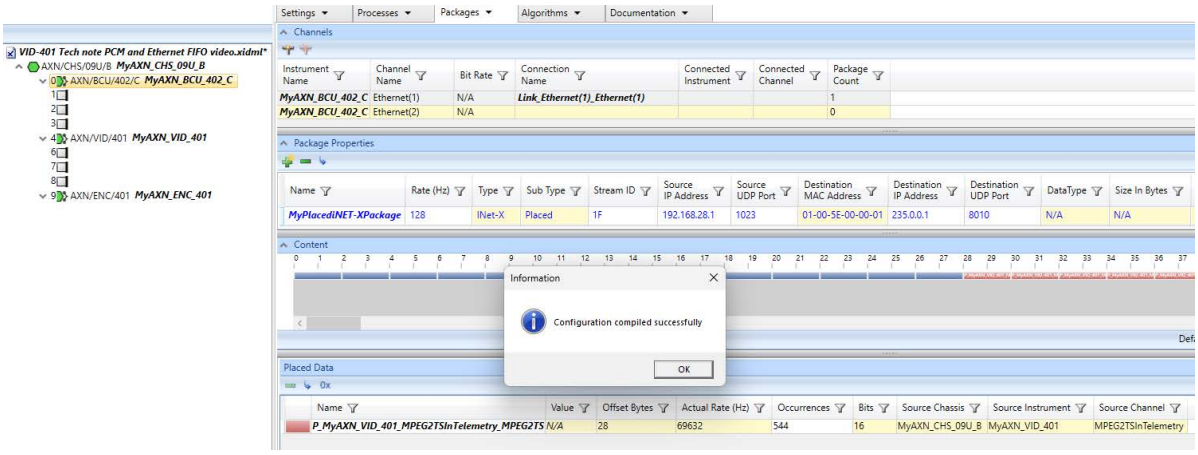


Figure 65-3: PCM frame and Ethernet transmission of MPEG2TSInTelemetry as two sinks with the same sampling rate

65.3 Appendix

65.3.1 Time overlay

The AXN/VID/401 has no REPORT word in order to detect if the camera is present or not. However, you can determine if the module is set up correctly by using time overlay. The time display shows if the module is sampled correctly.

Also, if the camera is not present, the module displays a color bar test picture.

The time overlay size can be configured to be small or large.

Figure 65-4: Time overlay: Small size (top) – Large size (bottom)

65.3.2 IADS RT Station

IADS 9.2.9 supports the AXN/VID/401. No specific codec/LAV filter is required.

65.3.3 VLC player

The same VLC version used in TSD-AA-014 can be used to decom the video in iNET-X placed/packetizer and IENA positional. To get this VLC version, contact Curtiss-Wright support (acra-support@curtisswright.com).

NOTE: VLC does not reproduce correctly high frame rate divider such as 12. Mplayer or IADS can be used for this case.

65.3.4 Camera

HDC-330 can be used. This camera supports HD-SDI output (SMPTE 292M).

65.3.5 Related documentation

To better understand this paper, read the following documents.

Table 65-3: Data sheets

Document	Description
AXN/ENC/401	IRIG-106 PCM encoder (PMF output)
AXN/ENC/402	IRIG-106 PCM encoder (PMF output) with Chapter 7
AXN/VID/401	H.264 video encoder (HD-SDI/3G-SDI video input) - 1ch

Table 65-4: User manual

Document	Description
DOC/MAN/030	DAS Studio 3 User Manual

Table 65-5: Technical notes

Document	Description
TEC/NOT/067	IENA and iNET-X packet payload formats

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