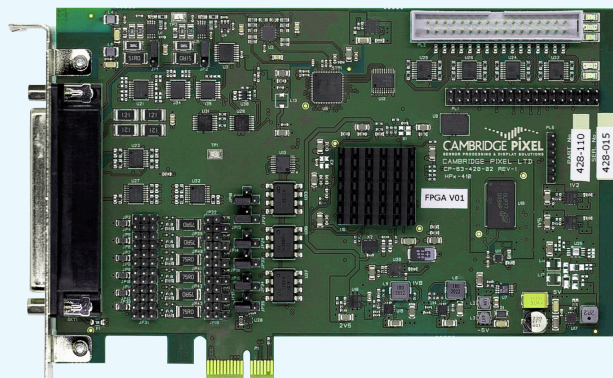


## HPx-410

### PCIe Radar Input Card



#### Features:

- High performance primary radar acquisition card
- PCIe x1 or x4 form factors
- Two sets of radar inputs:
  - Analogue radar video
  - Trigger
  - ACP/ARP
- Single or dual-stream versions
- All versions support dual redundant mode
- Dual-stream versions support dual independent radars or dual sampling of one radar
- 125 MHz sample rate
- 12-bit A-to-D for analogue samples
- Wide range of input signal support:
  - Single-ended, RS422 or open-collector
  - Single-ended voltages up to 55V
  - 50 Ohm, 75 Ohm or high impedance video input
- Signal status LEDs
- Opto-coupled inputs for noise immunity
- 8-bit digital inputs with clock
- Parallel azimuth
- Optional synchro input from companion synchro-to-parallel card (HPx-180 PCI/PCIe Synchro-Resolver Card)
- Programmable pre-trigger compensation
- Optional end-of-range input signal
- Programmable mixing of analogue and digital videos
- General purpose input/output lines
- Loss of signal detection
- High-speed DMA transfers
- Supported under Windows and Linux
- C/C++/.NET board support library
- On-board test pattern generator
- Fully supported by SPx software
- Wide range of radars supported including:
  - Furuno
  - Kelvin Hughes
  - Terma
  - JRC
  - Koden
  - Sperry
  - Raytheon
  - Specialist Military Radars

The HPx-410 is an enhanced-performance PCI express single or dual-stream radar input card. The card is capable of capturing and processing analogue and digital primary radar video from up to two radars. The card may be used with a board support library for basic radar signal acquisition, or else with Cambridge Pixel's SPx software for complex processing, tracking or display requirements.

The HPx-410 card supports a number of multi-channel input modes, including dual redundancy and fully independent dual-stream capture. This flexibility allows the number of radar input cards to be reduced while retaining system capability.

#### Radar Capture

The HPx-410 interfaces to analogue or digital radar signals, and provides a flexible set of input options to handle a wide range of radar types. A flexible mixing capability allows a combination of analogue and digital inputs to be captured and combined. All versions of the HPx-410 card provide two sets of inputs, allowing dual redundant operation or two different radars to be connected to the same card.

Analogue video is captured at up to 125 MHz using high precision analogue to digital converters at 12 bits resolution. The captured video(s) can be processed as single or dual-streams, depending upon the version of the card. The captured video can also be optionally down-sampled to reduce the data rate before transfer across the PCI express bus.

#### Input Signals

The HPx-410 accepts radar video, trigger and azimuth signals in the form of ACP/ARP or parallel data. A wide variety of signal types and input voltages are supported, allowing the card to support many different radar models. The card provides a capability to detect missing signals in order to provide software alarms for loss of triggers or azimuth data. The companion HPx-180 card may be used with synchro or resolver signals, providing synchro-to-parallel conversion.

#### Board Support Library and SPx Processing

A low-level board support library is available to provide a C++ class interface to configure the board and capture video, providing low-level access to the video samples. Example code is available for Windows and Linux.

Alternatively, Cambridge Pixel's extensive SPx software is available to provide advanced processing and display of the radar video data. SPx software can be supplied in the form of a library for use in custom application code or as ready-made applications, such as SPx Server, which have built-in support for the HPx-410 card.

The SPx library provides an extensible toolkit of radar specific functions that can be linked together to form a processing chain. Custom functions are easily incorporated into the processing chain, allowing an application to be built from a combination of SPx library functions and user-written processing modules. Cambridge Pixel's ready-to-run applications offer solutions for both server-side processing and network distribution and for client-side receipt and display.

#### Dual-Stream Functionality

Dual-stream versions of the HPx-410 can provide two fully independent radar processing channels, which may be used in a number of ways, including:

- Dual sampling of one radar video at different rates – typically this might be higher sampling for short ranges, to get maximum close-in detail, with lower sampling across the full radar range, to give maximum coverage.
- Dual independent radars – simultaneous, independent capture of two separate radars.

## DATASHEET



## Architecture

<b>Form Factor:</b>	PCIe (x1 or x4, half length, full height)
<b>Interface:</b>	PCIe Bus
<b>Programming:</b>	C/C++/.NET software library
<b>Platform:</b>	Windows 11, Linux
<b>Processor:</b>	x86

## Functional

<b>Radar Video:</b>	2x Analogue (configurable gain/offset in range -5V +5V), 50 Ohm, 75 Ohm or high impedance termination (link selectable). 8x Digital (RS422) with clock (7 in dual radar mode)
<b>Azimuth Data:</b>	2x ACP/ARP inputs, configurable for: RS422 differential, discrete single-ended signals. Single-ended options for: opto-coupled inputs for electrical isolation, selectable 75 Ohm or high impedance, open collector (1 kOhm pull-up to 5V) 1x parallel azimuth
<b>Trigger:</b>	2x trigger inputs, configurable for: RS422 differential, discrete single-ended signals. Single-ended options for: opto-coupled inputs for electrical isolation, selectable 75 Ohm or high impedance, open collector (1 kOhm pull-up to 5V)  Programmable range zero trigger delay
<b>Video Combiner:</b>	Programmable mix of analogue and digital inputs using LUT
<b>Test Generation:</b>	Built-in test pattern generator
<b>Output:</b>	Radar returns onto PCIe bus, via 4 lane (x4 versions) / 1 lane (x1 versions) edge connector
<b>Radar Capture:</b>	Single or dual-stream radar acquisition Programmable return length up to 64k Staggered PRFs supported 12-bit A-to-D
<b>General Purpose IO:</b>	3 general purpose input/output lines, each configurable as input or output

## Connectors

<b>Radar Input:</b>	37W D connector for videos, trigger and ACP/ARP On-board IDC connector for parallel azimuth input
<b>PCIe:</b>	Standard PCIe connector

## Performance

<b>Sample Frequency:</b>	125 MHz
<b>Maximum input BW:</b>	60 MHz
<b>PRF:</b>	0 to 16 kHz
<b>Samples per return:</b>	Up to 64k
<b>Returns per scan:</b>	Up to 16k
<b>Data transfer rate:</b>	x4 versions: Up to 500 MB/s peak (250 MB/s sustained) x1 versions: Up to 250 MB/s peak (150 MB/s sustained)
<b>Scan rate:</b>	Up to 120 rpm

## Environmental

<b>Cooling:</b>	Forced air cooling
<b>Temperature:</b>	0 to 55°C

## Software Support

Board support library (C/C++/.NET)  
SPx Development Library  
RadarView Radar Visualisation Client  
SPx Server (Distribution, Plot Extraction, Tracking)

## Ordering Information

<b>428-100</b>	HPx-410 PCIe x4 Radar Input Card (dual-stream)
<b>428-110</b>	HPx-410 PCIe x1 Radar Input Card (single-stream)
<b>428-120</b>	HPx-410 PCIe x1 Radar Input Card (dual-stream)

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