DATA SHEET

HPx-400e
Primary Radar Acquisition

The HPx-400e is a high-performance PCI express dual-stream radar acquisition 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-400e 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-400e 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. The HPx-400e card provides a dual set of inputs, allowing up to two independent radars to be connected to the same card.

The analogue video inputs are captured at up to 100 MHz using high precision analogue to digital converters at 12 bits resolution. The captured video can be optionally down-sampled to reduce the data rate before transfer across the PCI express bus, using high-speed DMA. On the host computer, a driver and board-support library for Windows or Linux is available. Additionally, the SPx software suite is available to provide a full complement of radar processing functions including scan conversion and target tracking.

An on-board FPGA provides data processing and control and offers capability for expanding the data processing functions for customised applications.

Input Signals
The HPx-400e 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-400e 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
The HPx-400e provides two fully independent radar input channels, which may be used in a number of ways:
- 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 redundant mode – software-controlled automatic failover from one input channel to the other in the event of loss of trigger, ACP or ARP signal.
- Dual independent radars – simultaneous, independent capture of two separate radars.
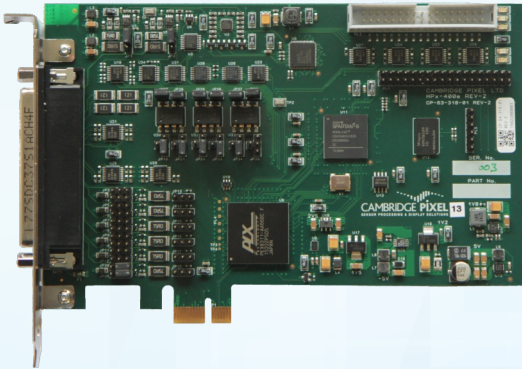
Features:

- PCIe Primary Radar Acquisition Card
- Dual radar inputs, two sets of:
  - Analogue video
  - Trigger
  - ACP/ARP
- Independent sampling on each channel
- Dual independent sampling on the same channel
- Dual redundancy support (auto-switch across channels)
- 100 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 60V
  - 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)
- 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++ board support package
- 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

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Architecture

Form Factor:	PCIe (x1, half length)
Interface:	PCIe Bus
Programming:	C/C++ software library
Platform:	Windows 10, Linux
Processor:	x86

Functional

Radar Video:	2 x Analogue (configurable gain/offset in range -5V +5V), 50 Ohm, 75 Ohm or high impedance termination (link selectable). 8 x Digital (RS422) with clock (7 in dual radar mode)
Azimuth Data:	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
Trigger:	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
Video Combiner:	Programmable mix of analogue and digital inputs using LUT
Test Generation:	Built-in test pattern generator
Output:	Radar returns onto PCIe bus
Radar Capture:	Programmable return length up to 64k Staggered PRFs supported 12-bit A-to-D.
General Purpose IO:	3 general purpose input/output lines, each configurable as input or output

Connectors

Radar Input:	37W D connector for videos, trigger and ACP/ARP On-board IDC connector for parallel azimuth input
PCIe:	Standard PCIe connector (x1) DMA transfers up to 100 MB/sec.

Performance

Sample Frequency:	100 MHz (for higher capture rates consult factory)
Maximum input BW:	50 MHz
PRF:	0 to 16 kHz
Samples per return:	Up to 64k
Returns per scan:	Up to 16k
Data transfer rate:	Up to 100 Mbytes/sec
Scan rate:	Up to 120 rpm

Environmental

Cooling:	Forced air cooling
Temperature:	0 to 55C

Software Support

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

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