XCAM XCU-19D FO Image Capture System
Product Specification Notes

Introduction

XCAM have developed a Fibre Optic Image Capture System (XCU-19D FO) which operates almost any type of e2v Technologies CCD imaging sensor; it is perfect for use for CCD evaluation studies, or used as the basis for a custom CCD camera system as the Image Capture Unit when coupled with suitable cables and a camera head or headboard.

Due to the fibre optic cables and with a custom vacuum camera design, this system can provide cameras suitable for use in extremely clean vacuum conditions at XHV or even the new UCV standard.

The controller:

- Drives any e2v Technologies ***CCD*** or ***L3 CCD*** (also referred to as ***EMCCD***)
- Drives e2v Technologies CMOS sensors
- Drives 2, 3 or 4 phase CCDs
- Drives ***Swept Charge Devices*** (SCDs)
- Drives other manufacturer's CCDs with interface box; it has been used to drive Kodak and Atmel (now e2v Technologies) CCDs
- Allows complete control of the clock and bias voltages and timings
- Enables operation in unusual operating modes
- Has trigger input and outputs to allow synchronisation with your experiment

Image Capture System Block Diagram

The XCU-19D FO (Fibre optic) system is the result of many years of development of systems which are ideally suited to the operation of clean vacuum camera systems due to the fibre optic cables for control and data transmission. They are also ideal for detector characterisation work due to their flexibility of operation.

The block diagram below show the key elements in the system.

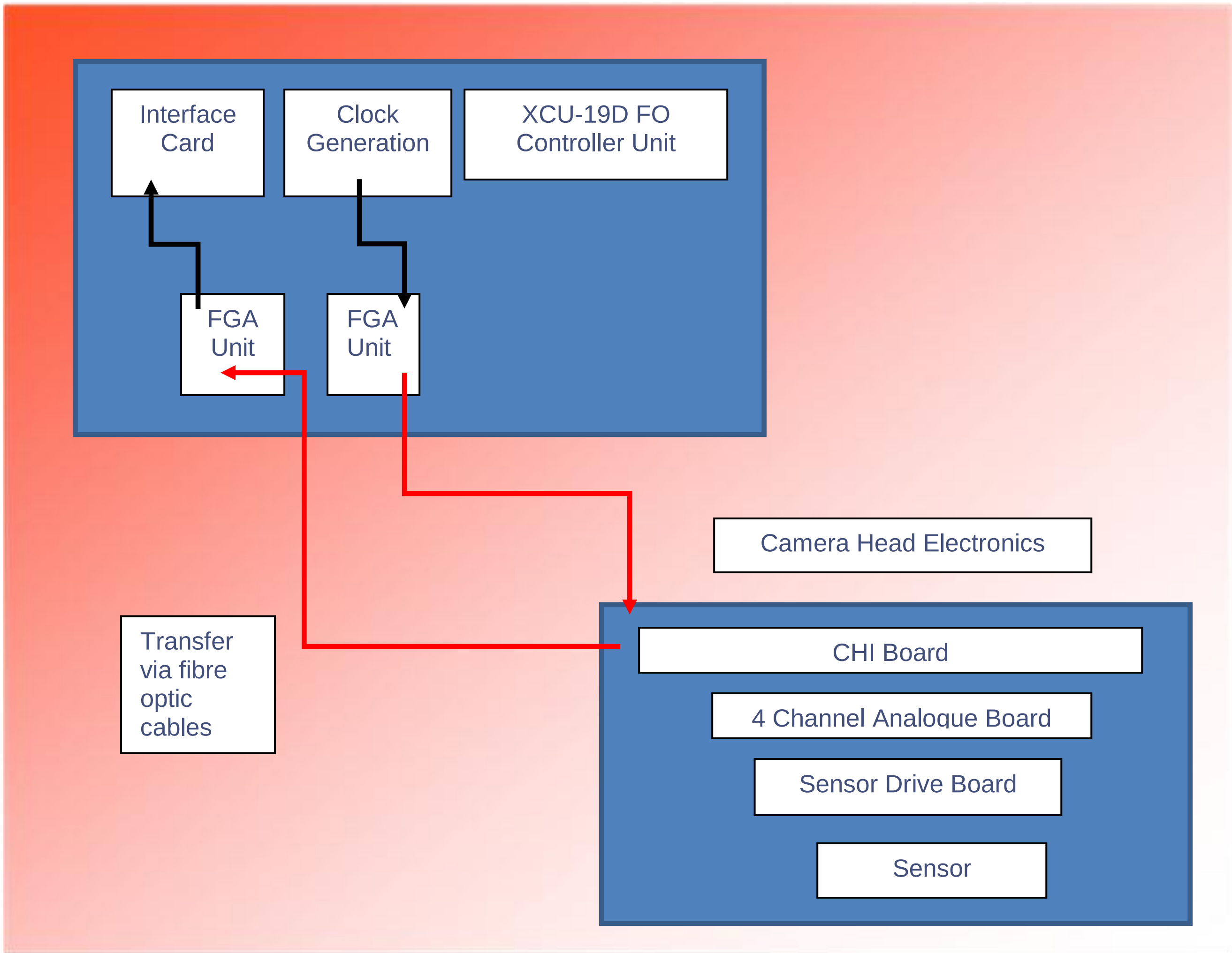

Figure 1 showing a block diagram of the XCU-19D FO Image Capture System

Clock signals are generated inside the controller and converted in the FGA unit to optical signals which are transmitted down the multi-mode fibre optic cables to the camera head unit.

The camera head electronics comprises the digital board which is called the CHI board (Camera Head Interface), the 4 channel analogue board, and the Sensor drive board which has the local drivers. This Sensor Drive Board is designed to be specific to the device which is to be driven and can take a variety of formats depending on whether the sensor is to be directly plugged into the electronics, or is to reside in a vacuum camera head.

Digital data is transmitted from the fibre optic transciever on the CHI board back to the FGA unit on the interface card and from the interface card to the PC via a Cameralink protocol electrical cable into a National Instruments PCIe 1426 card (PC and frame grabber card are not supplied as part of the system).

A single power cable is used between the controller and the stack for power.

Multi-Sensor Operation

For multi-sensor synchronised operation one controller may be used to supply the sequencer signal together with a fibre optic splitter so that the controlling signals can supply multiple stacks.

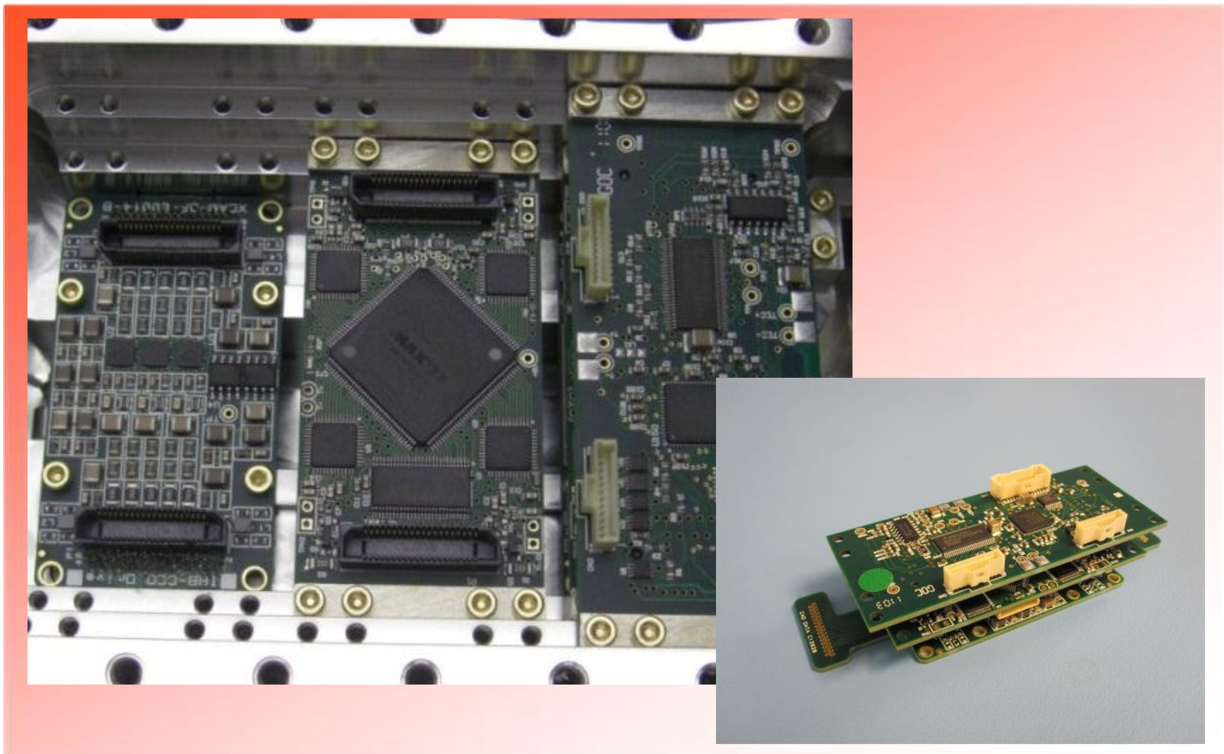

Figure 2: Three Camera Head Stacks inside a Multi-CCD Camera Head

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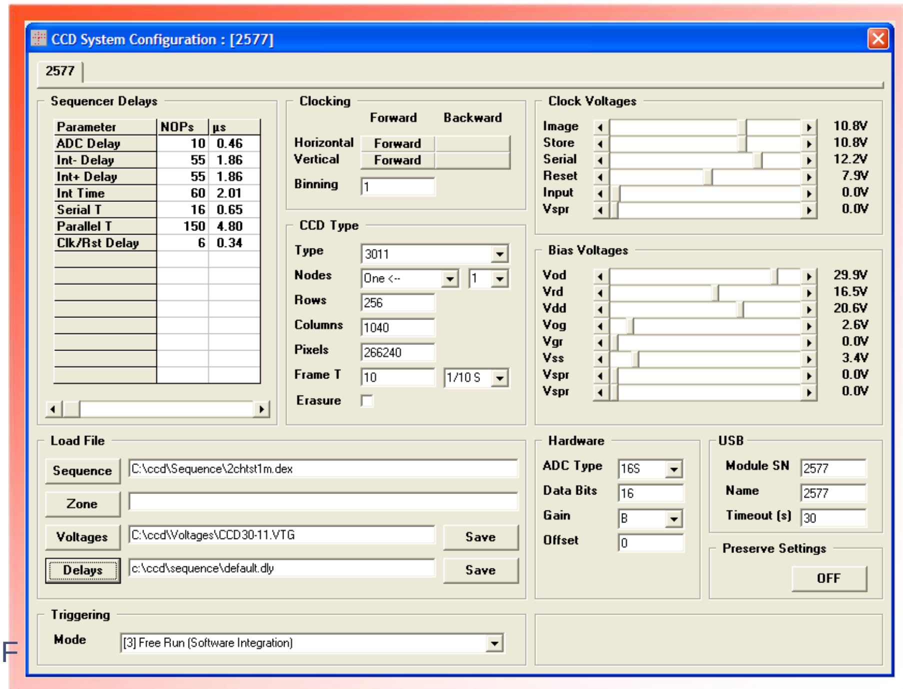
Figure 2 above shows a very triple similar system (but not fibre optic in this case). The images show three stacks of electronics in which each stack is driving one CCD230-42 which are placed very closely together in a single camera head. The left most stack has only the bottom board present (in this case the CCD drive board), the central stack has both the CCD drive board and the analogue board present, and in this case you can see the analogue board; the right most stack has all three boards present, so you can see the uppermost board, which is the CHI board in this case. Separately to the side you can see this triple stack which is the width of the CCD230-42 2k x 2k detector to allow close positioning.

XCAM Controller Software Options

The ***Application User Software Package*** (API) provides users with an easy interface with which to control and communicate with the controller and do simple analysis and data visualisation; please see separate product note which covers the software in more detail.

Alternatively, a ***Software Developer's Manual*** is provided for users who would prefer to write or use their own software, calling the XCAM dll files.

Many XCAM Controller users, use programs such as ***Matlab*** to control the drive unit, and a library of code is being developed to assist these users; this code will be made available on request.



The minimum specification for a PC to operate the system is Windows 7, XP Pro or Vista operating system; 2 GHz processor; 2 GB memory minimum; hard drive 100GB minimum; CD drive; 3 USB2 ports.

Figure 3, left shows a typical configuration window for XCAM software.

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Technical Specifications and Details

Dimensions and Weight

The controller is a 19” 3U standard controller and has dimensions of approximately 450mm width, 310mm height and 130mm depth. The weight is 6.35Kg

Front Panel Connections

Figure 4: Image of the Front Panel of the Controller

The front of the controller has several connections.

A CameraLink cable connects a PC framegrabber card to the ‘PC Out’ connector on the front panel of the XCU19C-FO drive box.

The CCD camera head is connected using two fibre optic cables for ‘Camera Out’ and ‘Camera In’ signals and a 9-way D-type for camera head power.

All of these connectors are on the front panel of the XCU19D-FO drive box. .

A BNC plug ‘Trigger’ is provided for connection of an external CCD trigger. This trigger accepts a TTL level input. A BNC plug ‘Sync’ is provided as an output for oscilloscope triggering. The BNC plug sync provides an output pulse before line readout, which can be used as an oscilloscope trigger when examining the CCD output directly.

Back Panel Connections

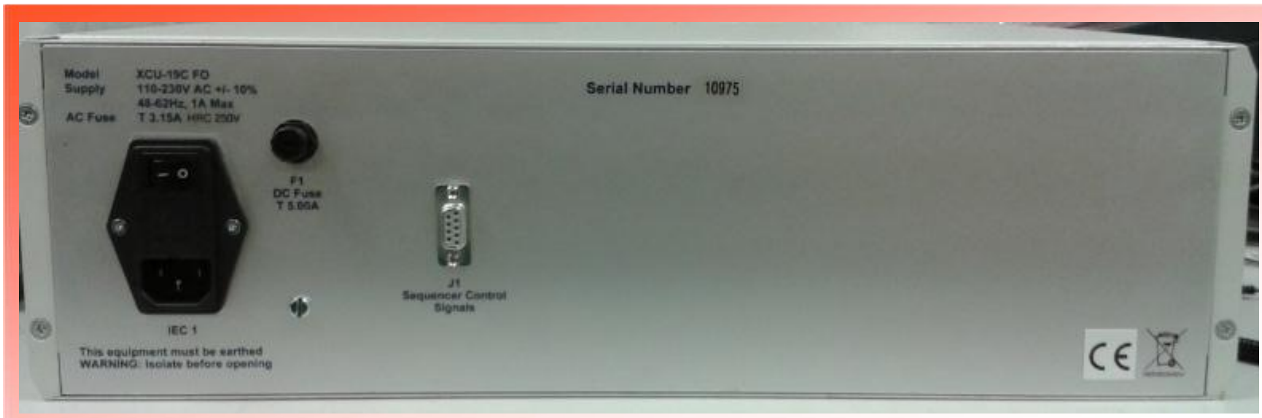

Figure 5: Image of the Back Panel of the Controller

The XCU19D-FO drive unit requires a 220/240V mains input and is supplied via an IEC connector on the rear of the control unit. The IEC input incorporates a fuse and an on/off switch. There is also a secondary DC fuse holder on the rear panel which supplies the control electronics.

Mains input supply: 230VAC +/- 10%, 50Hz, 0.6A. The equipment must be connected to a protective earth.

IEC connector fuse rating: T 3.15A (See note 1)

Secondary DC fuse rating: T 5A (see note 1)

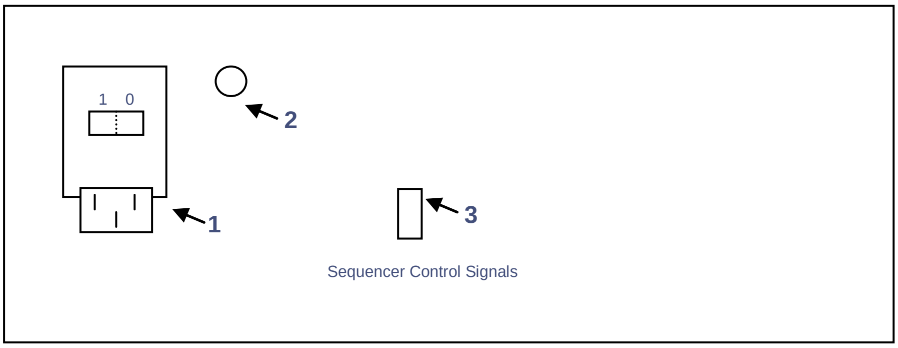

Figure 6: Back Panel Connections – see notes below

1. The mains input fuse is part of the input socket. Fitted with a 250V T 3.15A (see note 1)
2. Secondary DC fuse. Fitted with a 250V T 5A (see note 1)
3. The 9 way D-type socket provides a connection to the Sequencer I/O (Flags) for external triggering and integration of the camera system into a wider process. The interface is provided using RS485 transceivers. Table 1 below details the pin assignments

Pin	Function
1	
2	Trigger B (A)
3	Trigger C (A)
4	
5	
6	
7	Trigger B (B)
8	Trigger C (B)
9	

Table 1 – Sequencer Control Signals Pin Out

Note 1: to maintain CB qualification the correct types of replacment parts must be used. Please contact XCAM for details, if CB certification is essential to your application.

Noise performance and Speed of Operation

The current sequencer card can operate at frequencies of approximately 3MHz, although this may be lower depending on the sequencer program that is operating the CCD and various factors such as number of phases of operation of the CCD. The clock frequency of the CCD is usually 16-20MHz, giving the possibility of programming in 33-20ns steps.

This speed of operation will be increased for this system in the near future

Noise performance is heavily dependent on the sensor device to be used. Additionally, an alternative lower noise analogue board will also become available in the near future. Please enquire for details specific to the sensor and system of interest.

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