# CCD CONTROLLERS

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## SUMMARY

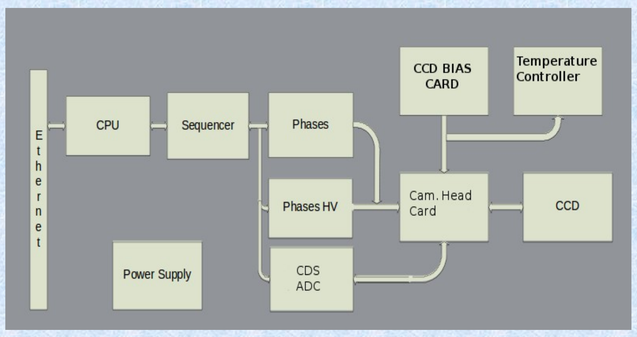
This paper presents the CCD controller development carried out in the last 10 years in the Institute of Astronomy of UNAM in Ensenada.


## INTRODUCTION

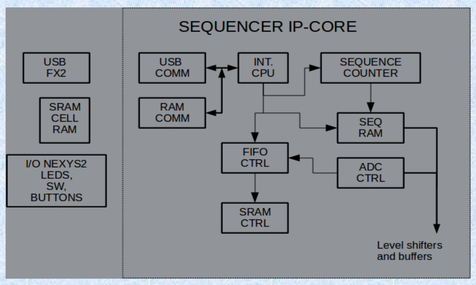
For the last 10 years the instrumentation group in the IA-UNAM in Ensenada has been developing CCD controllers for scientific cameras, some special purpose controllers have been developed also. Several versions of the controller have been built. The main goal of the controller is to develop a system that can be adapted without major modifications to diferent types of CCD chips.

The ccd controller has the following features:
1.- Modular design.
2.- Ethernet interface TCP/IP protocol (no extra cards to insert in a computer).
3.- 16 bit ADC resolution with read noise of less than one count.
4.- Clock sequence defined by programming.
5.- Expandable up to 24 clok phases.
6.- Programmable sampling frequency.

## BLOCK DIAGRAMS

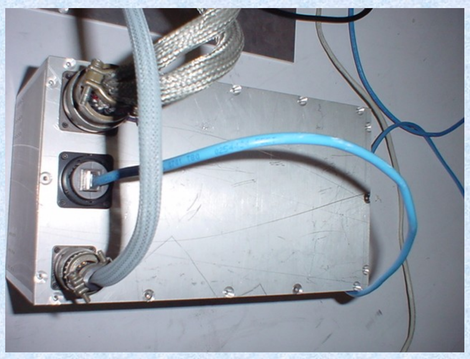



CPU – ARM based or PC compatible SBC running embedded Linux.
Sequencer – FPGA based card with USB or 16 bit parallel port connection to CPU, 25 Mb/s transfer capability.

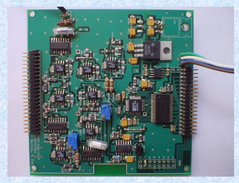



## NIGHT VISION CAMERAS
## EM-CCD CONTROLLER

Camera Head

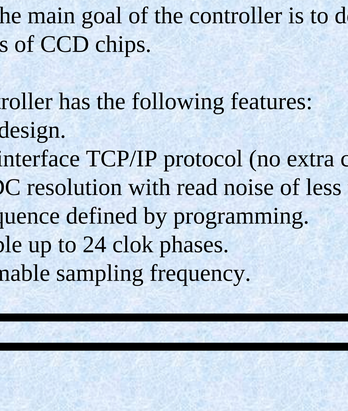


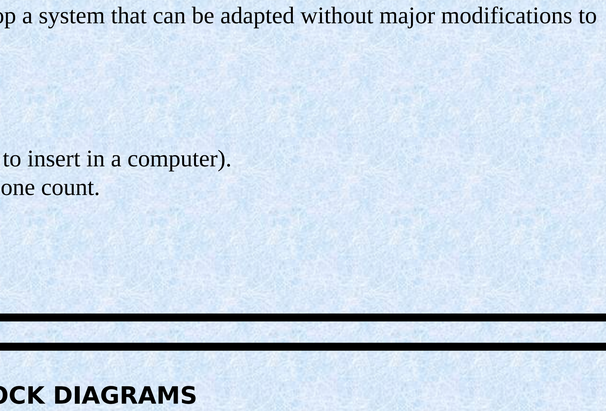
Controller



Electronic cards

## CONTROLLER FOR AN E2V CCD-42-40 2k x 2k CCD



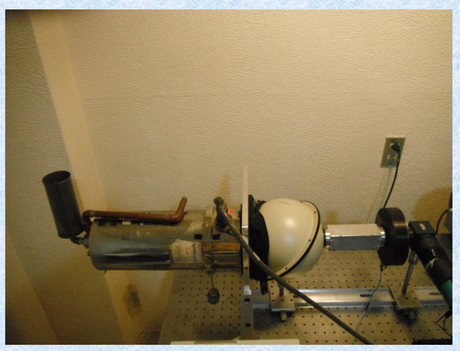


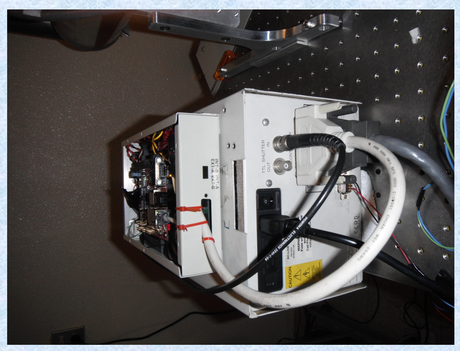


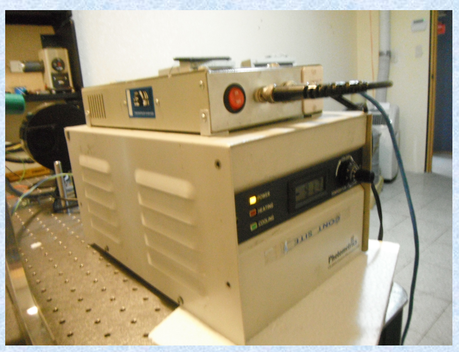


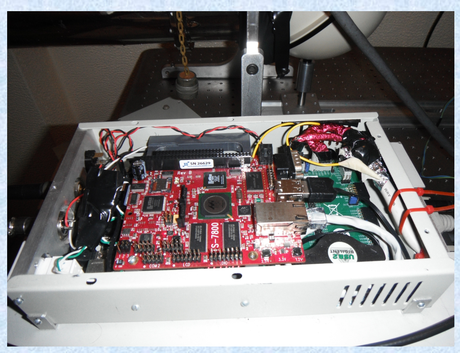


## UPGRADING A PHOTOMETRICS SITE CCD CONTROLLER

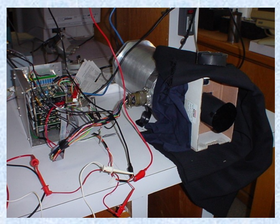


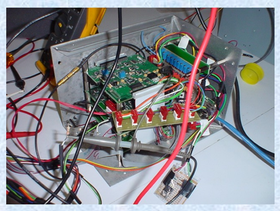


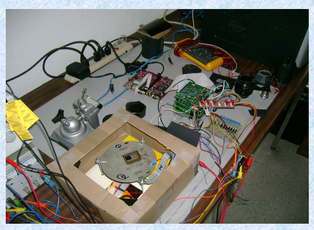




## EM CCD FAST READOUT CONTROLLER



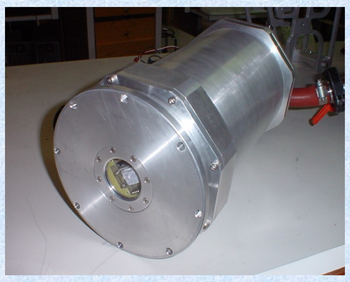


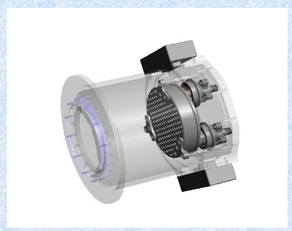


CCD CHIPS WITH WORKING PROTOTIPES
- CCD97 (512x512)
- CCD201 (1kx1k)
- CCD65 (576x244)
- Tc285, Tc253

2 Mhz readout speed
HV card limited.

## CRYOSTAT DEVELOPMENT





Cryostats for LN2 and TEC cooling have been designed and constructed to hold the CCD.