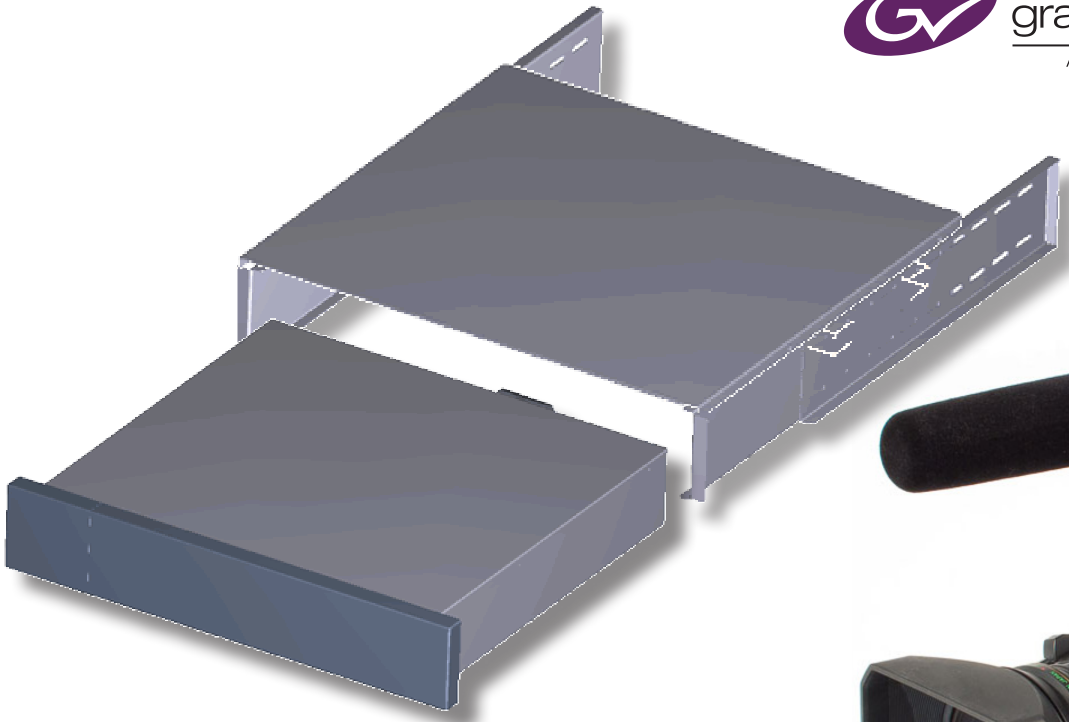
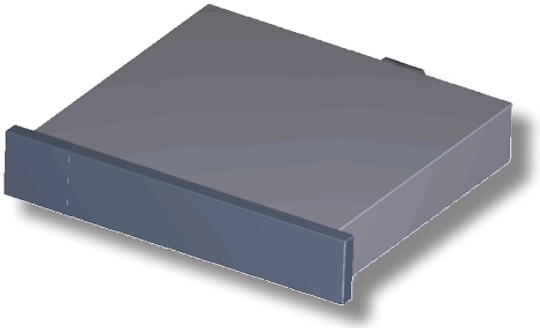
grass valley
A BELDEN BRAND

LDX TRAINING CENTER



LDX SERIES

LDX Service Training 2014 (v2)



Introduction

The Lumiere camera head is for the video processing mainly based on the LDK8000 Elite camera. Main differences compared to the LDK8000 Elite are the introduction of the Xensium FT imager, new video functions for lens corrections, improved combination of temporal noise reducer and a new leaking pixel corrector resulting in picture with “TrueTexture”.
The new video processing modules will deliver an image which keeps texture visible (TrueTexture) and correctly handles LED-wall artifact compensation.
A new menu structure with rotary knob and changed button layout will give a more user friendly interface. Together with more intuitive operational control will result in the so called “Art Touch”.

New is a ‘LookAtMe’ button on the camera head. With the LDK Connect Gateway, this function will be used to attract the director or shader’s attention if a cameraman knows he has some good footage for the program, or want to be shaded.
The mechanical design with traditional set-up with a motherboard and a print guiding frame is replaced by a setup with boards directly interconnected with flex cables. Reasons for this change in internal architecture is an improved airflow for better cooling and lower costs for the printed circuit boards.
Other advantage is the possibility to mount the boards directly to the camera frame what results in better EMC performance.

The Interconnection and Power board (IP board) with the new docking connector contains also the main power circuits. The Right Processor board (RP board) is a complex board with all video processing timing and the ARM-CPU. The right cover board (RC board) is the interface to all connectors on the right cover. The connections from front module to the Video processing board are without interfacing a mother board. The connection for each sensor is made with a flex cable and a power cable. The two motors for controlling the filter wheels are connected with flying leads. This means no “click” solution is available for the front module and special knowledge (instruction paper) is necessary to place (or replace) the front module.
FPN-calibration is only possible in the camera. Therefore a function in the camera will be available which will warm up the camera and start the calibration. This will be an automatic process. Usability of the FPN-data is checked when hardware in the camera is replaced. As indicated, all video modes are limited to single speed video only, but the
cooling concept has been prepared for triple speed video rates.
The Lumiere camera head is equipped with a new docking connector resulting in an upgrade kit for the adapters. A new and more ergonomic handgrip and shoulder pad are part of this project but the handgrip isn’t available at FCS.

Connections

Connectors:

The physical location of the external connectors will be as shown in both pictures.

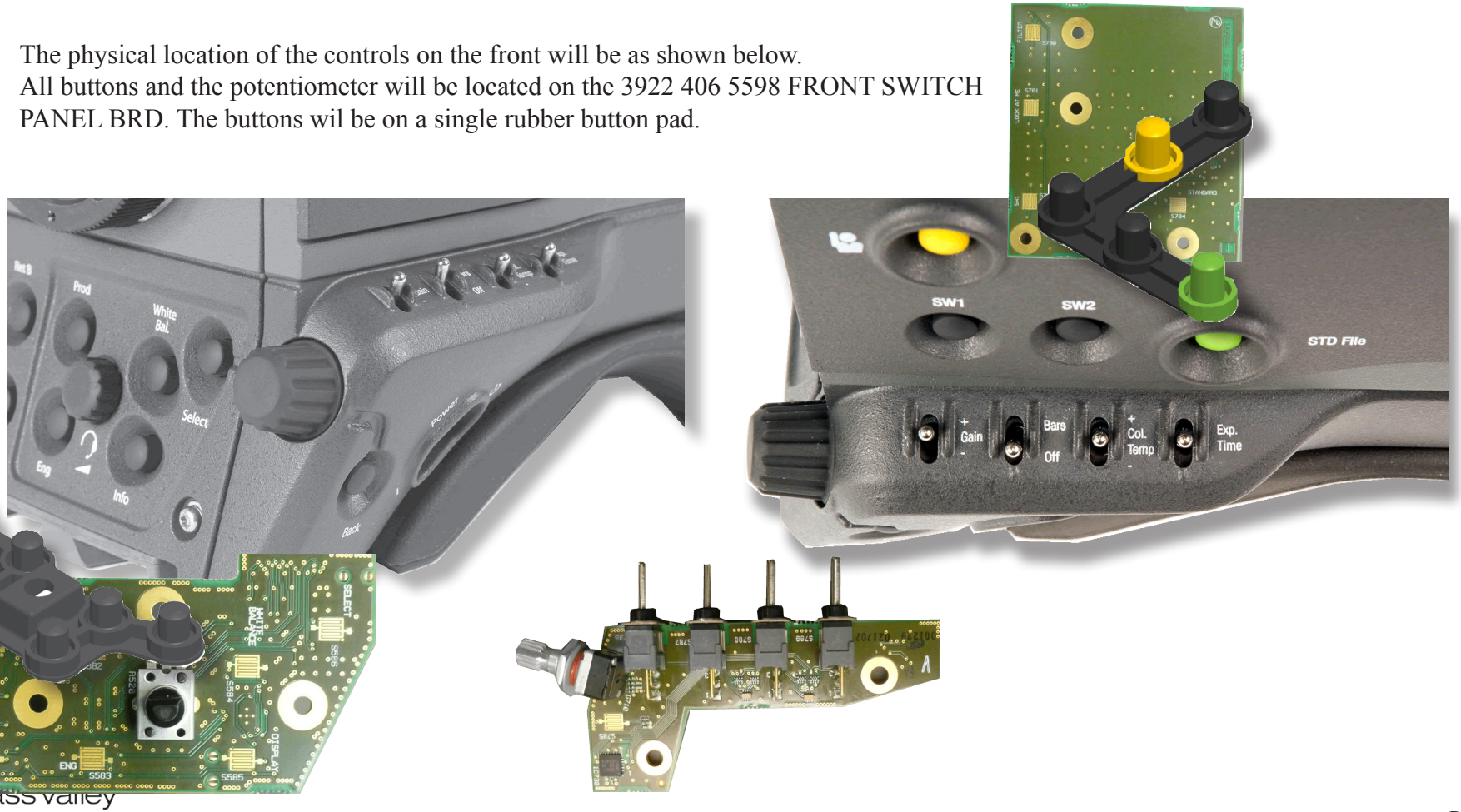
The VF connector is located on the 3922 406 5597 RIGHT COVER Board.
The UTP,USB, HDMI, and XLR are located on the 3922 406 5634 RC CONNECTOR BRDD.
The lens connector will be mounted on the separate 3922 406 5633 RC LENS BRD because of its peculiar mounting method. The position of the USB connector will fit a USB stick with a thickness and width of up to 12 and 22 mm respectively.

Controls

Controls:

The physical location of the controls on the left hand side will be as shown.
The buttons in the L shaped layout will be located on the 3922 406 5599 LEFT SWITCH PANEL BRD.
The toggle switches, the power switch, the info/back button and the rotary encoder will be on the 3922 406 5614 LEFT SWITCH PANEL ROTARY BRD.
We will use C&K toggle switches with a longer actuator than the current LDK8000 toggle switches in order to create a softer feel.

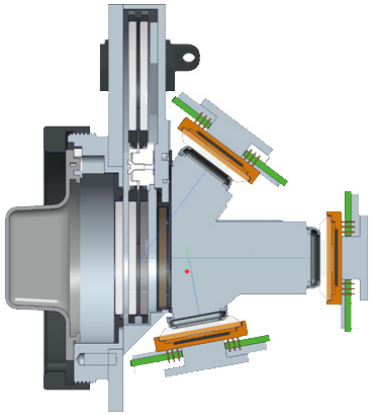
The physical location of the controls on the front will be as shown below.
All buttons and the potentiometer will be located on the 3922 406 5598 FRONT SWITCH PANEL BRD. The buttons wil be on a single rubber button pad.



Front

Optics:

The optical design (glass-lengths and –types) is identical to the LDK 8000 camera design, based on the use of standard and HD 2/3 inch lenses.
The following components are implemented:
2/3 Inch HDTV lens interface
Seal glass: IR Filter assy without UV-filter
Two 4-position filter wheels
Dummy. HLPF + Ret. Plate
Prism (beam splitter)
Xensium-FT-Sensor cover glass



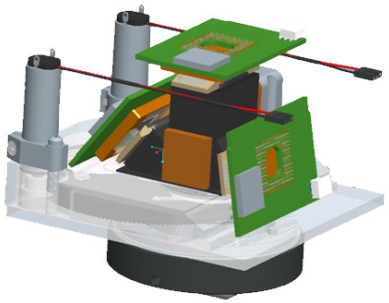
Lenses:

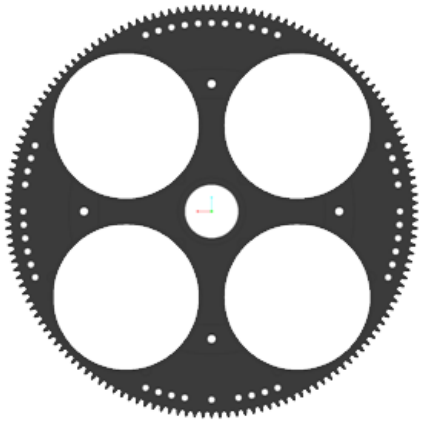
Together with the special designed HDTV 2/3 inch lenses also all standard broadcast 2/3 inch optics can be used on the “Lumiere” camera. The optical, mechanical and electrical interface is identical.
HDTV lenses are preferred because of resolution at higher spatial frequencies and because of registration accuracy at limiting iris and zoom settings. The electrical lens interface will accept lenses with analog and digital (digipower) interface. To guaranty smooth Iris control, the iris control will always use the analogue interface signals. If available in the lens chromatic lens aberrations will be corrected. (CLASS)
The lens ring of the B4 mount will be more ‘forgiving’ in its initial contact with the lens during the first degrees of rotation.

Filter wheels:

Two 4-position filter wheels are implemented:

Filter wheel 1:	1. Clear
	2. ND 0.6 (1/4) (transmission = 25%, 2 stops)
	3. ND 1.2 (1/16) (transmission = 6.3%, 4 stops)
	4. ND 1.8 (1/64) (transmission = 1.6%, 6 stops)
Filter wheel 2:	1. Clear
	2. CAP
	3. 4p Star filter
	4. Soft focus filter



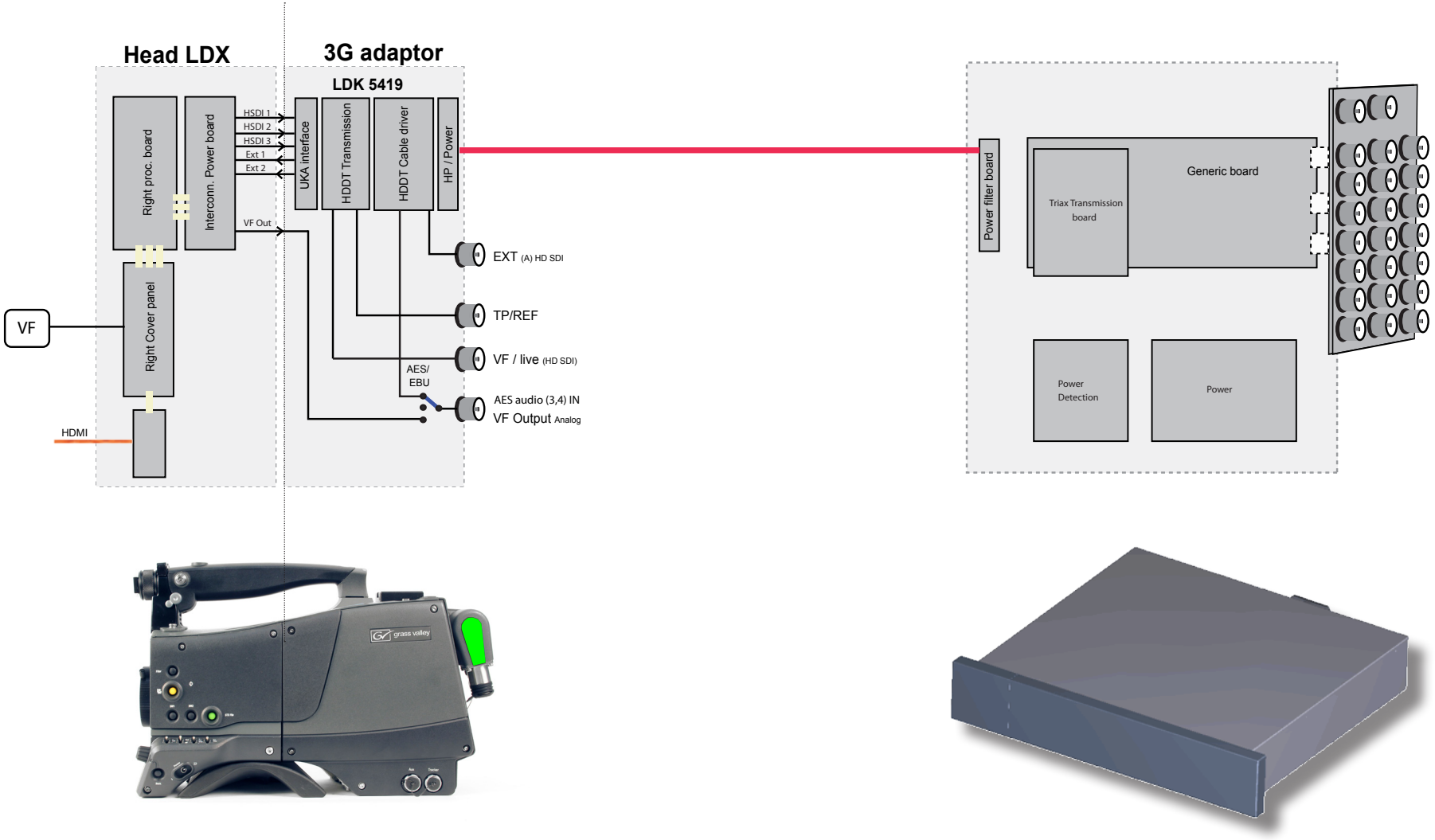


Max rotation error of 4p Star filter is 2°.
Filter wheel drive is done by use of the same motor gearbox combination as used in the LDK serie camera heads. The mount of the motor gearbox combination will be changed to allow the pinion to follow the shape of the filter wheel with the goal to minimize speed deviation.
The filter wheel positioning method is based on the patented method with one optical switch. The switch “looks” through holes in both filter wheels, by using and a unique pattern in all four quarters of the wheel all 4 filter-positions can be found and identified.

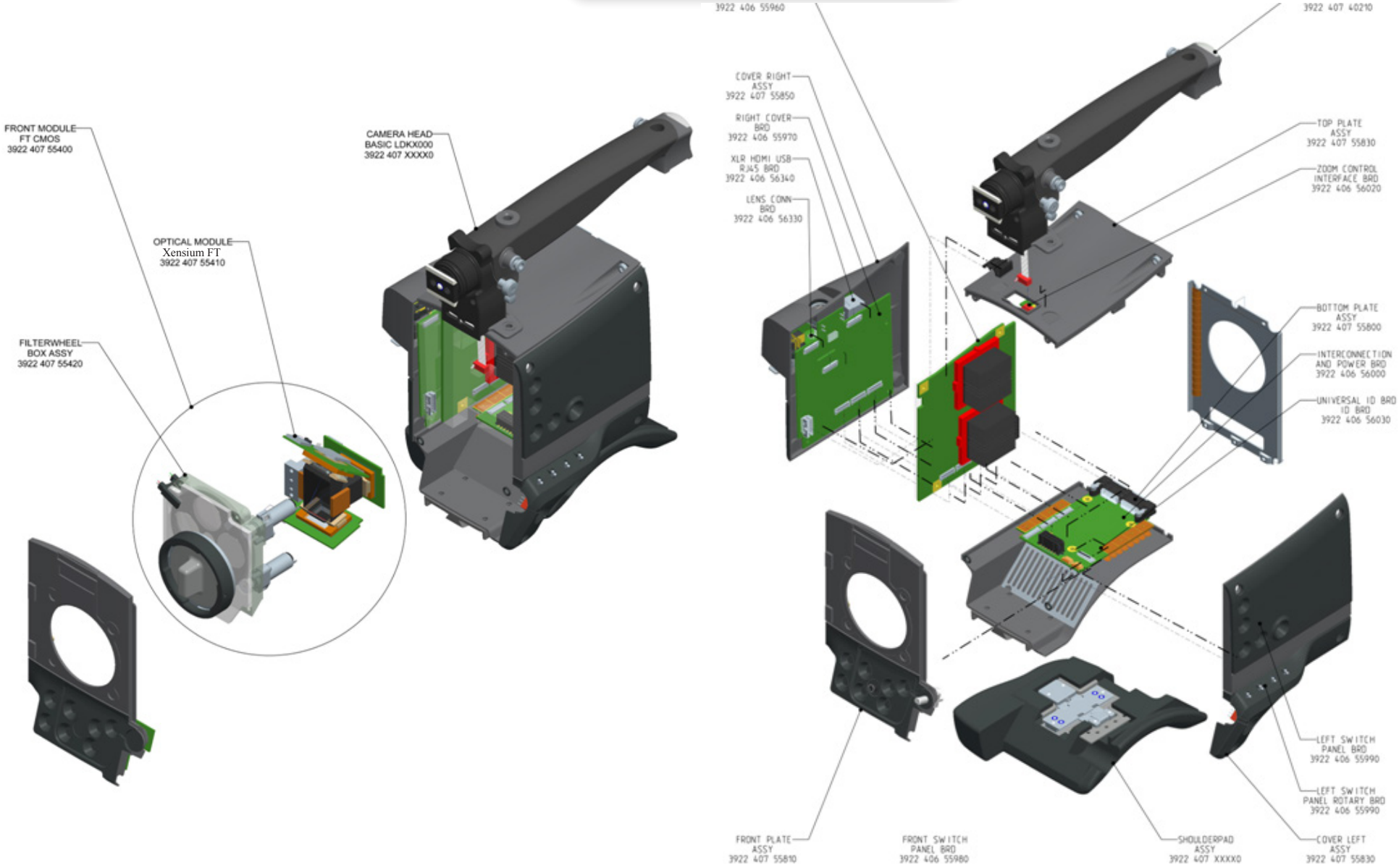
Video path LDX - XCU

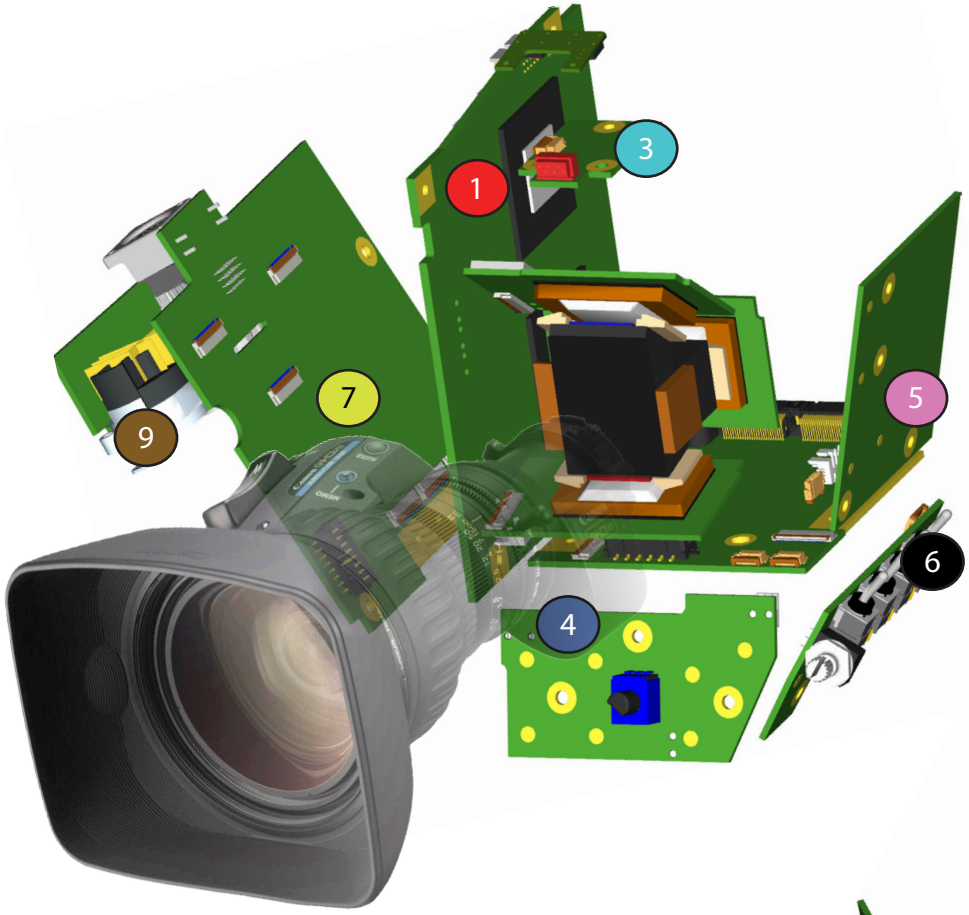
LDX
Lovely Dutch Xensium :)

XCU
eXchangeable Control Unit

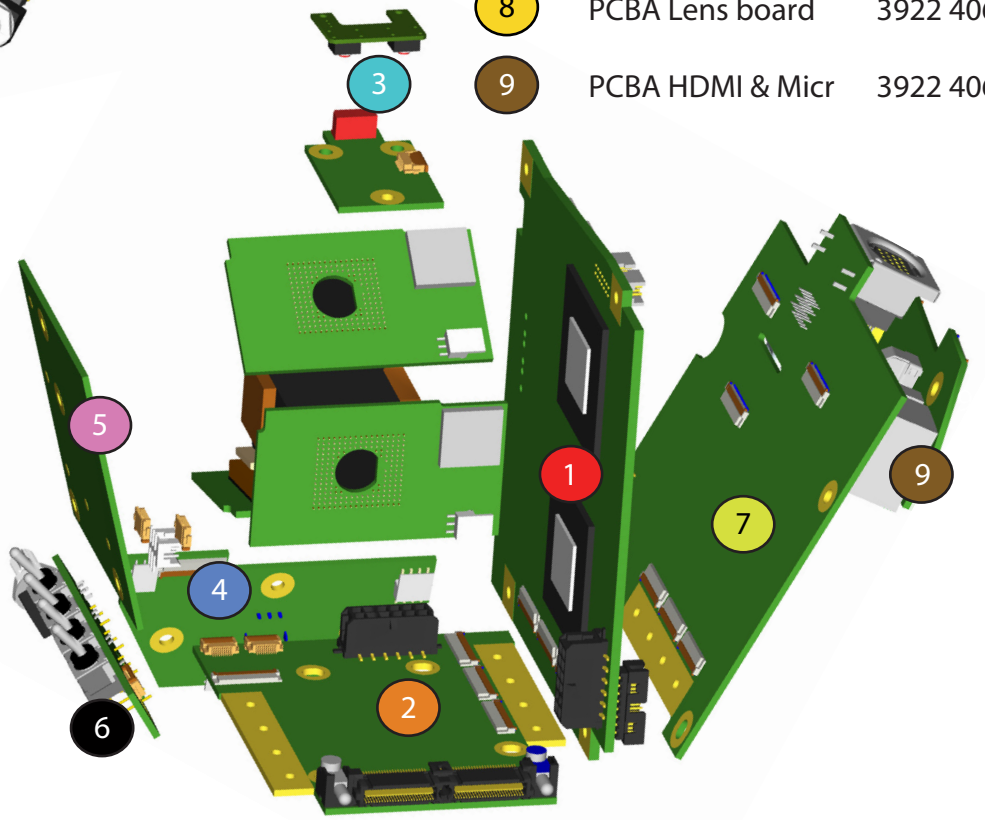


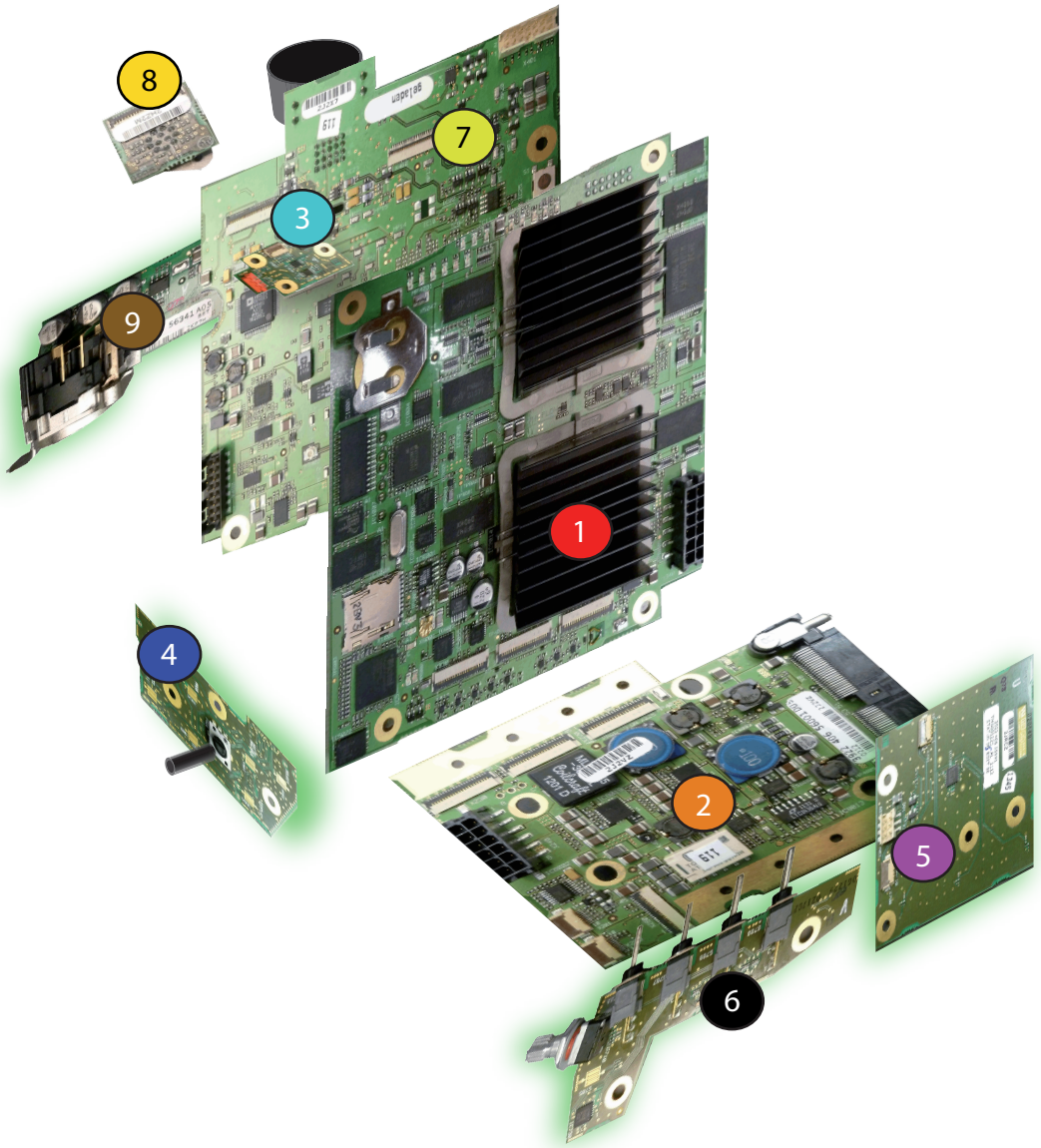
Exploded views





1	Right Proc. board	3922 406 55961
2	Interconn. power	3922 406 56001
3	Zoom Control Int Zoom grip switch	3922 406 56021 3922 406 50301
4	Front Switch panel	3922 406 56981
5	Left Switch panel	3922 406 56991
6	Left Switch Rotary	3922 406 56141
7	Right Cover panel	3922 406 55971
8	PCBA Lens board	3922 406 56331
9	PCBA HDMI & Micr	3922 406 56341





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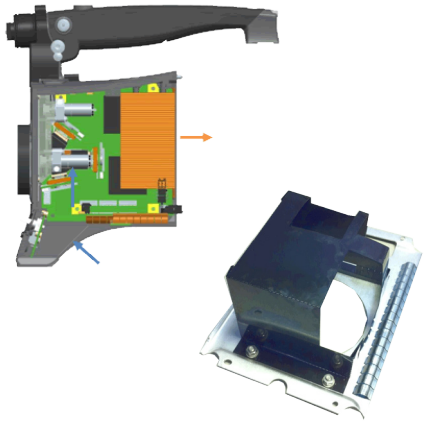
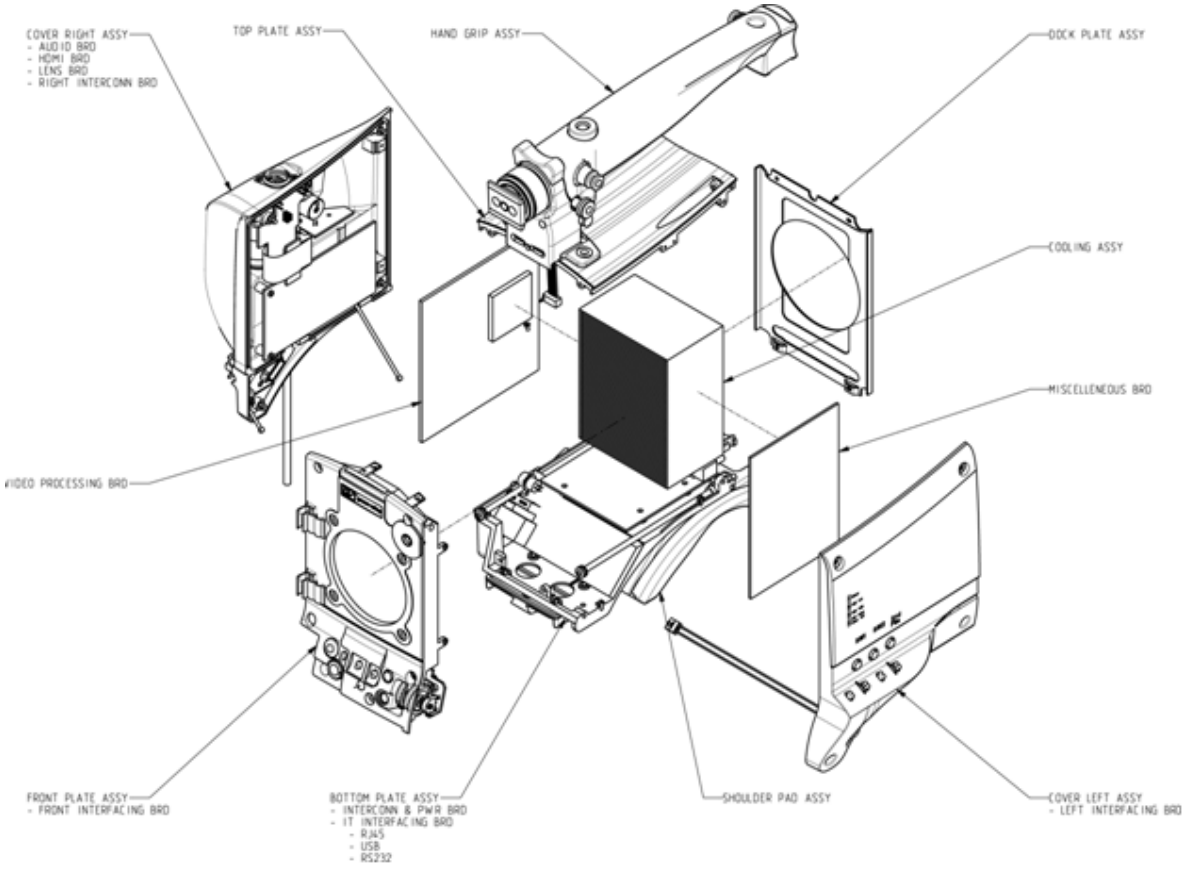
Power & Cooling

Cooling

The cooling concept for the Lumiere camera head must be prepared for triple speed (1080P180).
An estimated calculation must indicate what the the triplespeed power consumption in the head will be. The new camera head will therefore have a more open layout which leaves plenty of room for the air to flow through the front. In the initial cooling concept the created space is used to fit a large heatsink with fins in the direction of the airflow.

Close related to the cooling is the Fan Noise figure. Requested is a noise figure of 20dB conform the general requirements. The fan responsible for the cooling is located in the adapter.





Power concept
Input Voltage

The Lumiere head will running on a single power source delivered by the adapter. When the adapter is powered standalone, the power input voltage on the docking connector is 10.5V – 17V (Battery voltage) When the adapter is powered by a basestation the power input voltage is 15V fixed.
See for more information the LDK5418 or LDK5420 technical specification.

Input Power

The available power delivered by the adapter is dependant on the power source of the adapter. If the adapter is locally powered, a current limiter switches off power above 7 amps. If the adapter is powered by a basestation the available power for head and adapter is 10 amps. The cooling concept is capable of handling this dissipations.

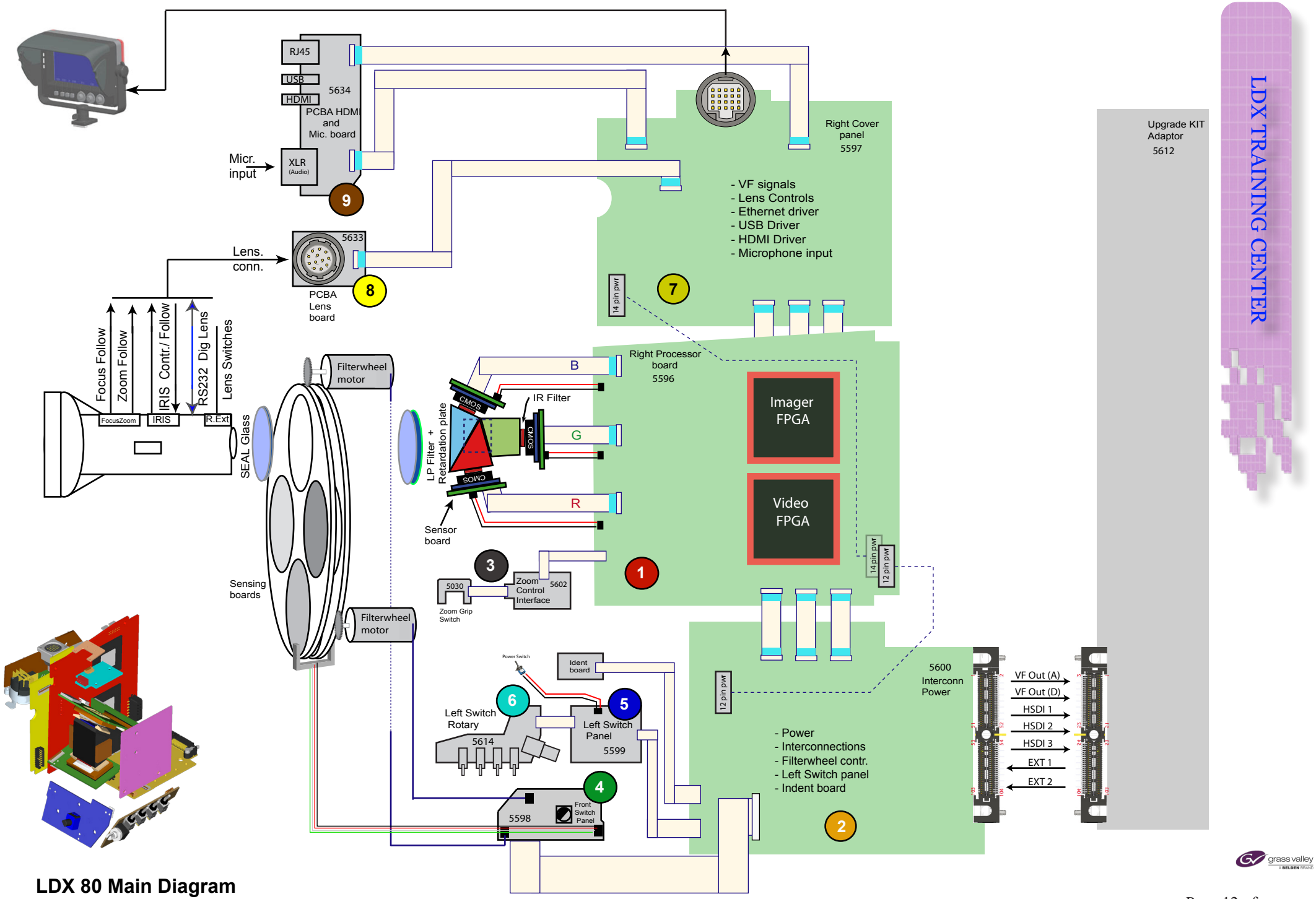
Adapter power input	Lumiere input voltage (V)	Adapter and head power (A)
Local (11.5-17)	11.5 – 17	7 (5)*
Basestation (300V)	15.0	10

* The current limiter in the adapter is electrical limited to 7 ampere max and the circuit breaker limts the power to 5 ampere.

The distributed powers to the different boards are generated from the VBATT on the Interconnection and Power (IP) Board.
The power derived from the dockingconnector will be current limited and available of delivering a 6.3 Ampere.
(See power concept Lumiere)

The distributed powers are:

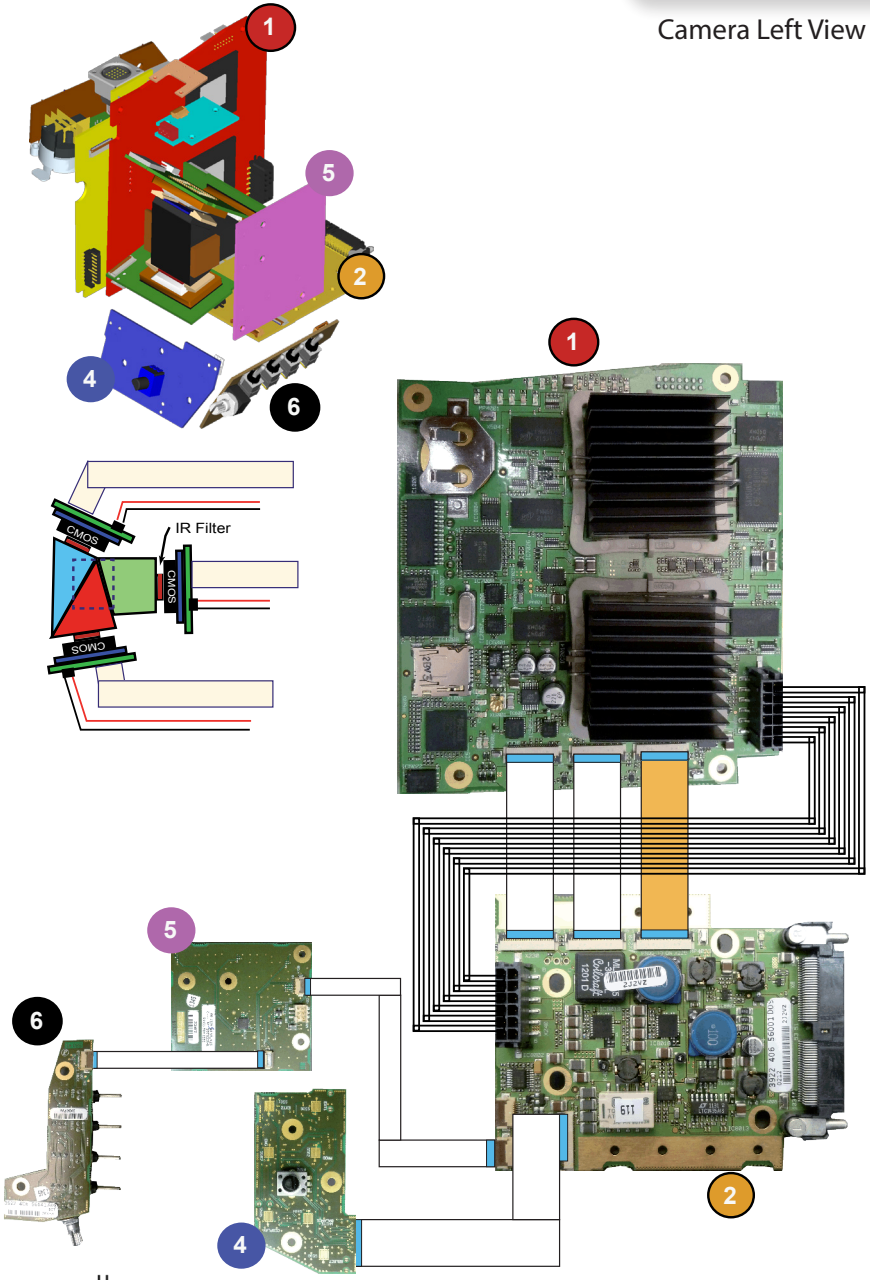
3V6 dedicated for sensorboard (max 3A)
3V3 general use (max 3A)
1V5 for RP-board (IC and VP FPGA) max 5A
+5VD max 1A
-5VD max 1A



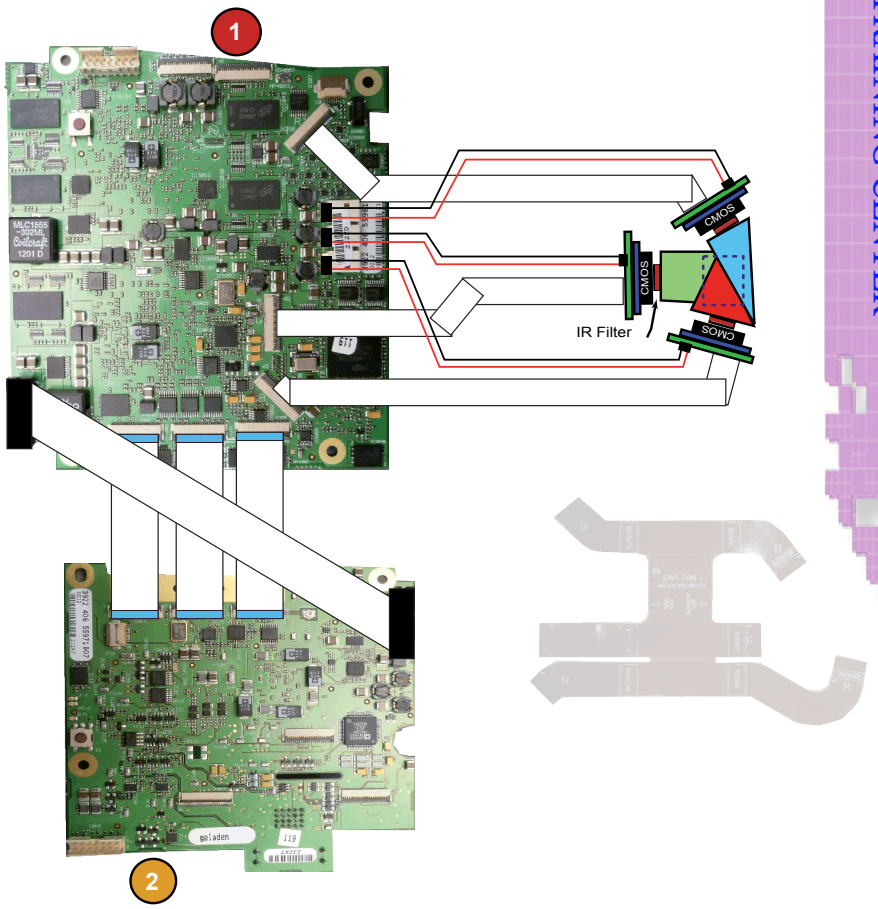
LDX 80 Main Diagram

Wiring (Flex)

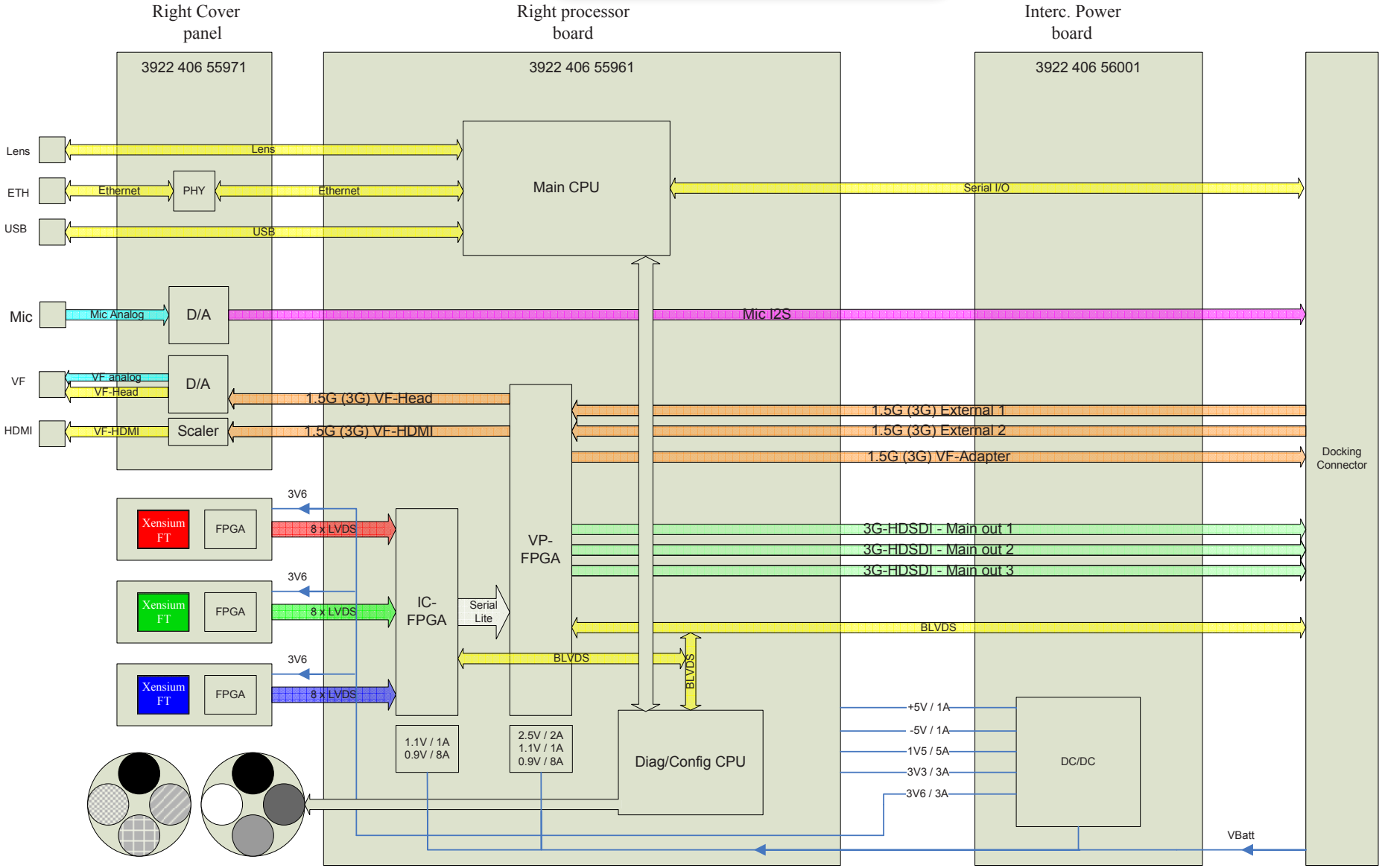
Camera Left View



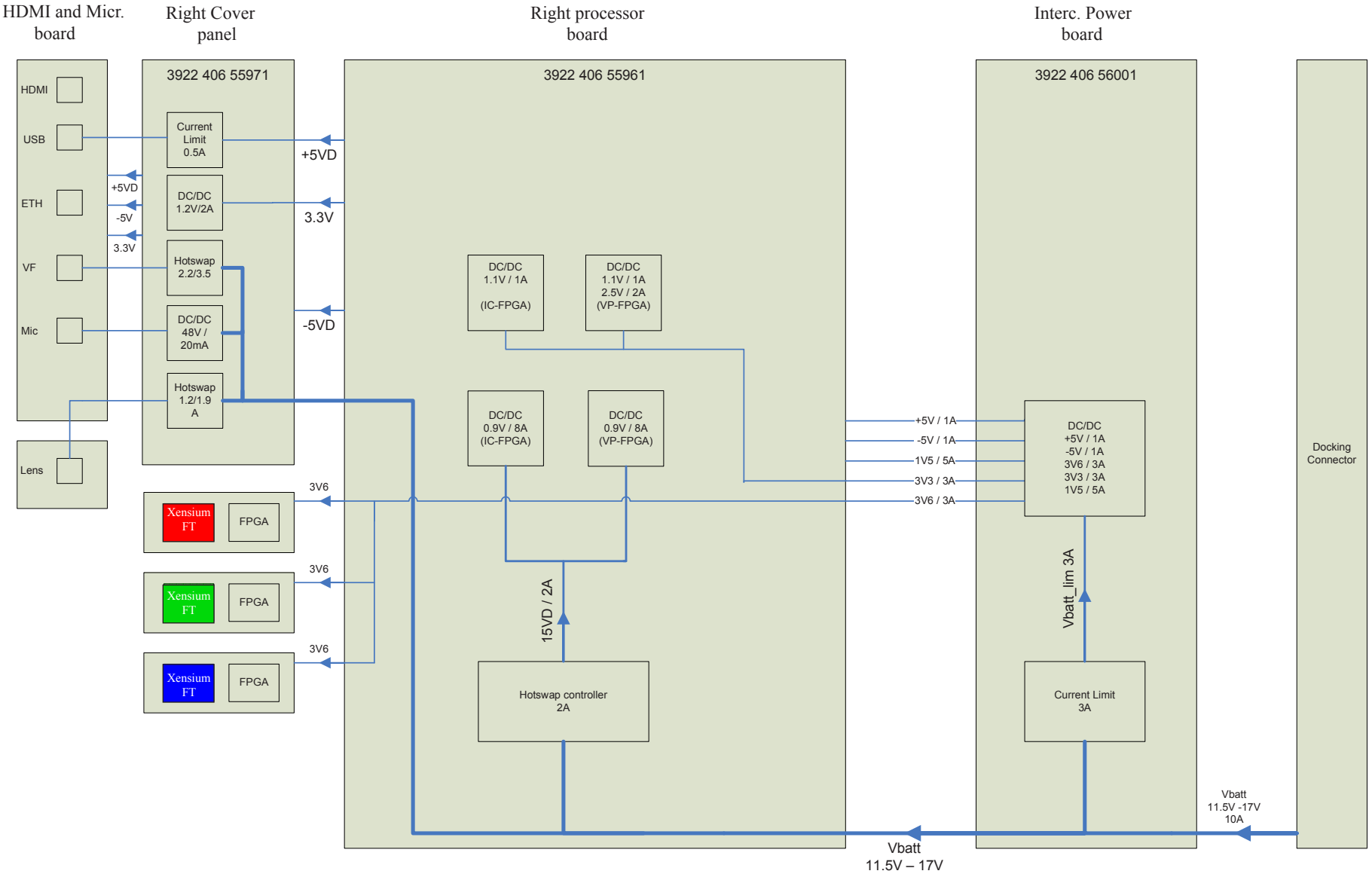
Camera Right View



Main Overview

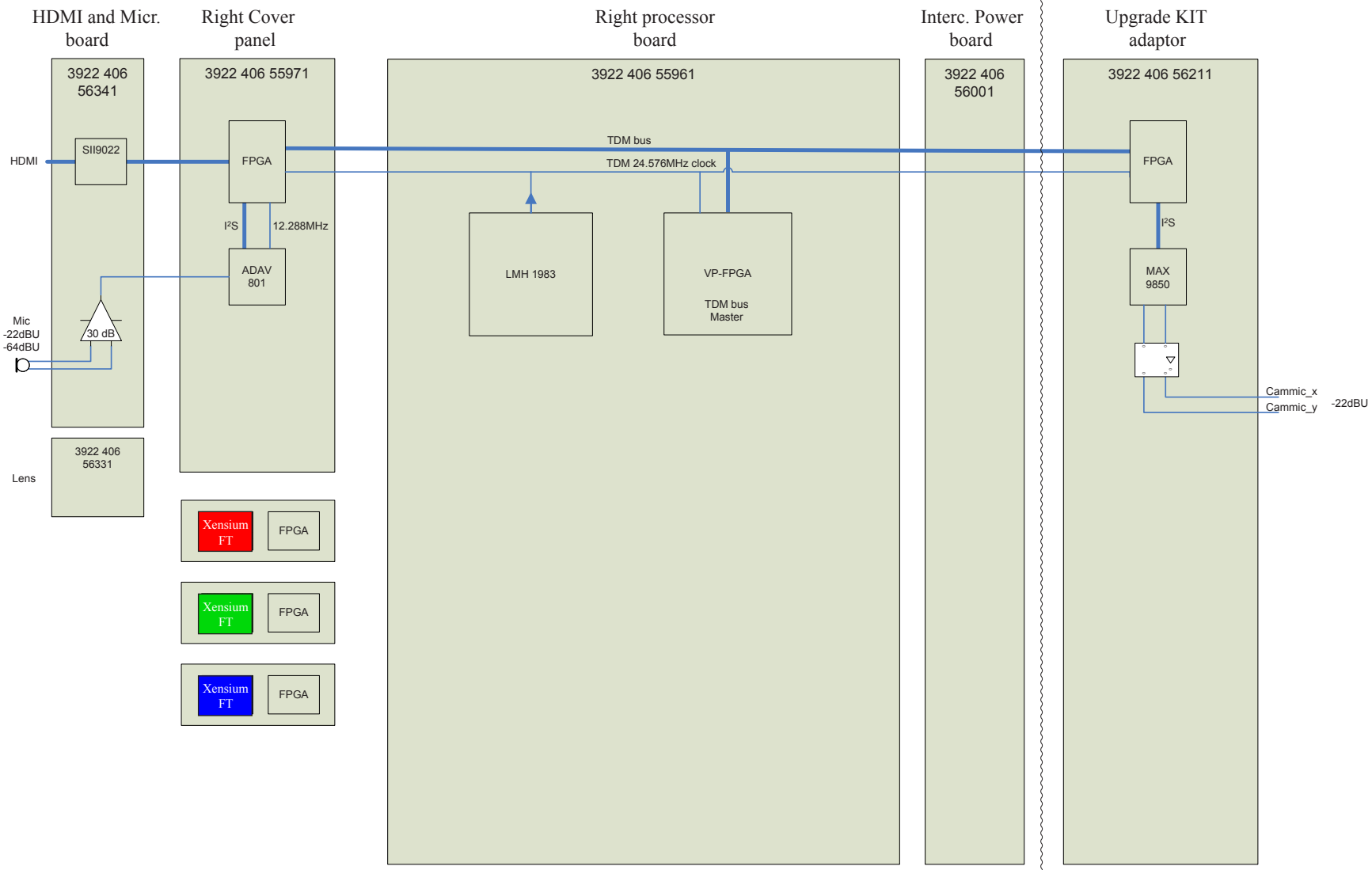


Power Overview

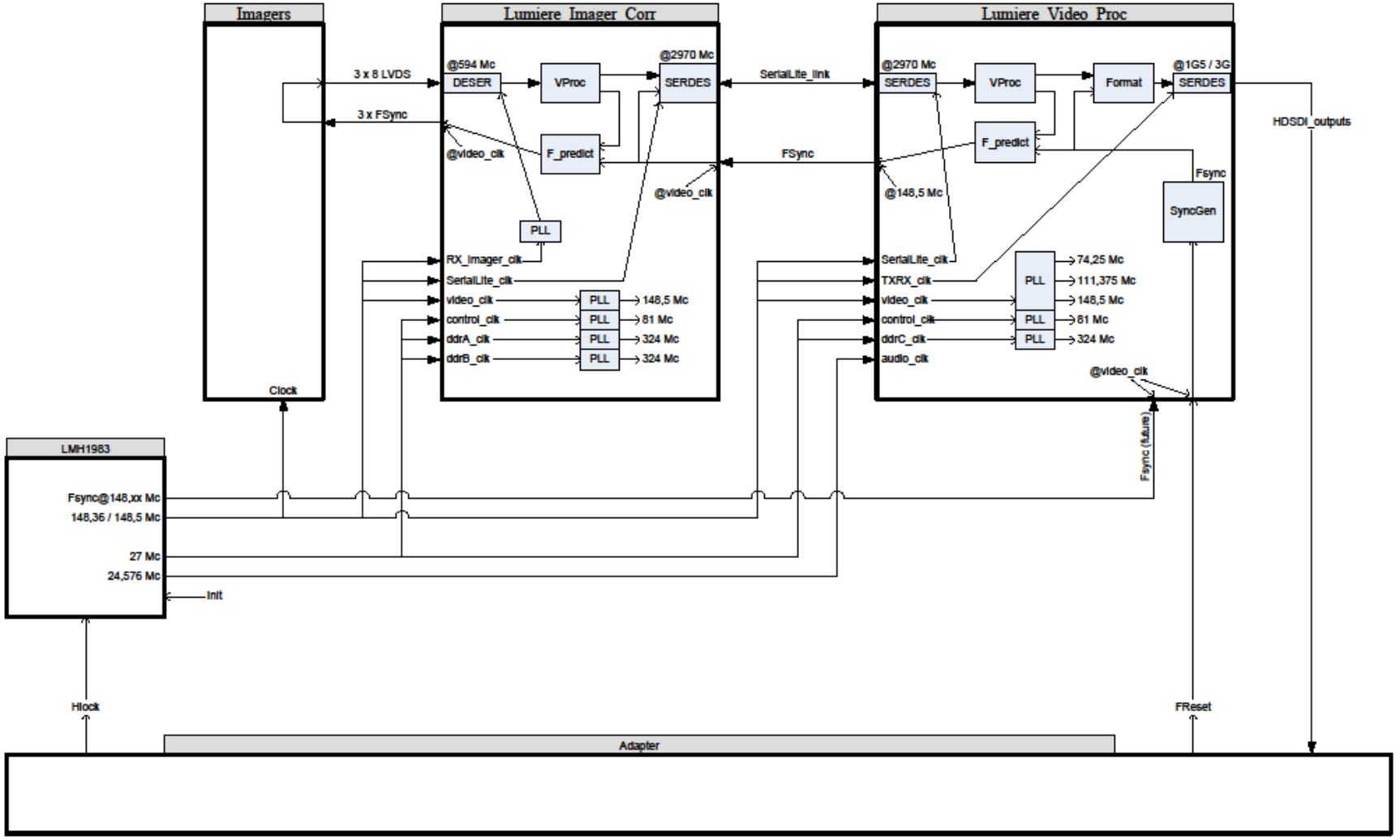


LDX TRAINING CENTER

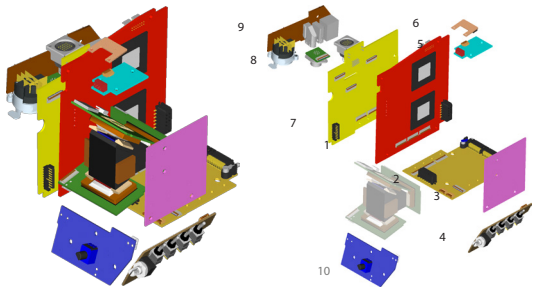
Audio Overview



Locking Overview



LDX Video connections



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- 4 3922 406 56141 LSP Rotary Head
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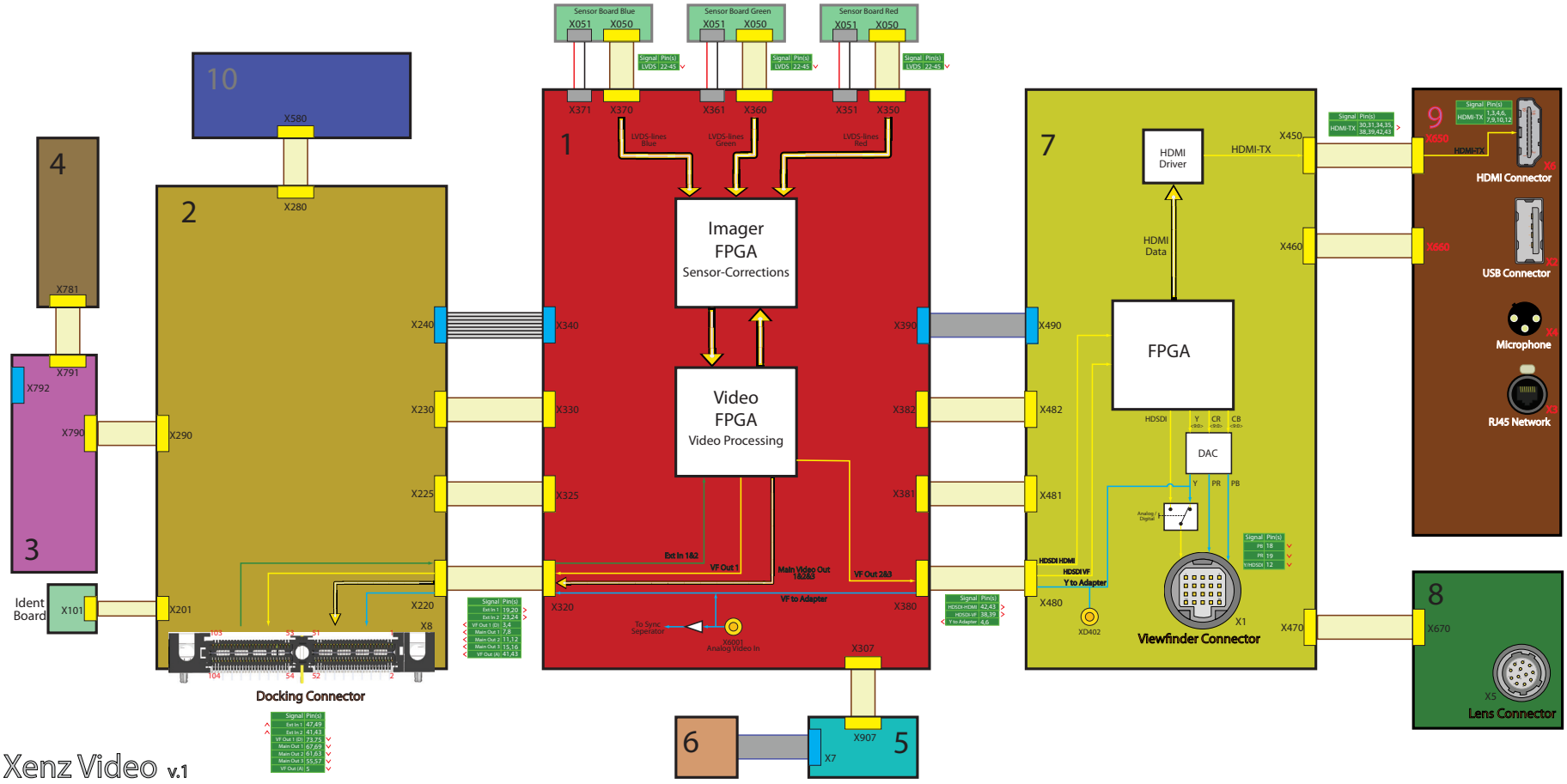
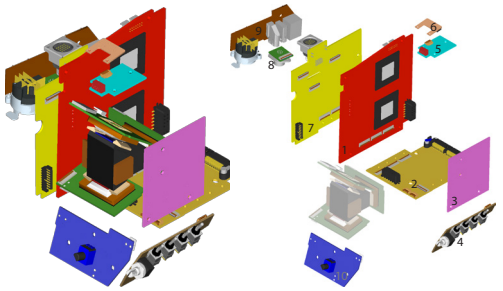


LDX Control connections



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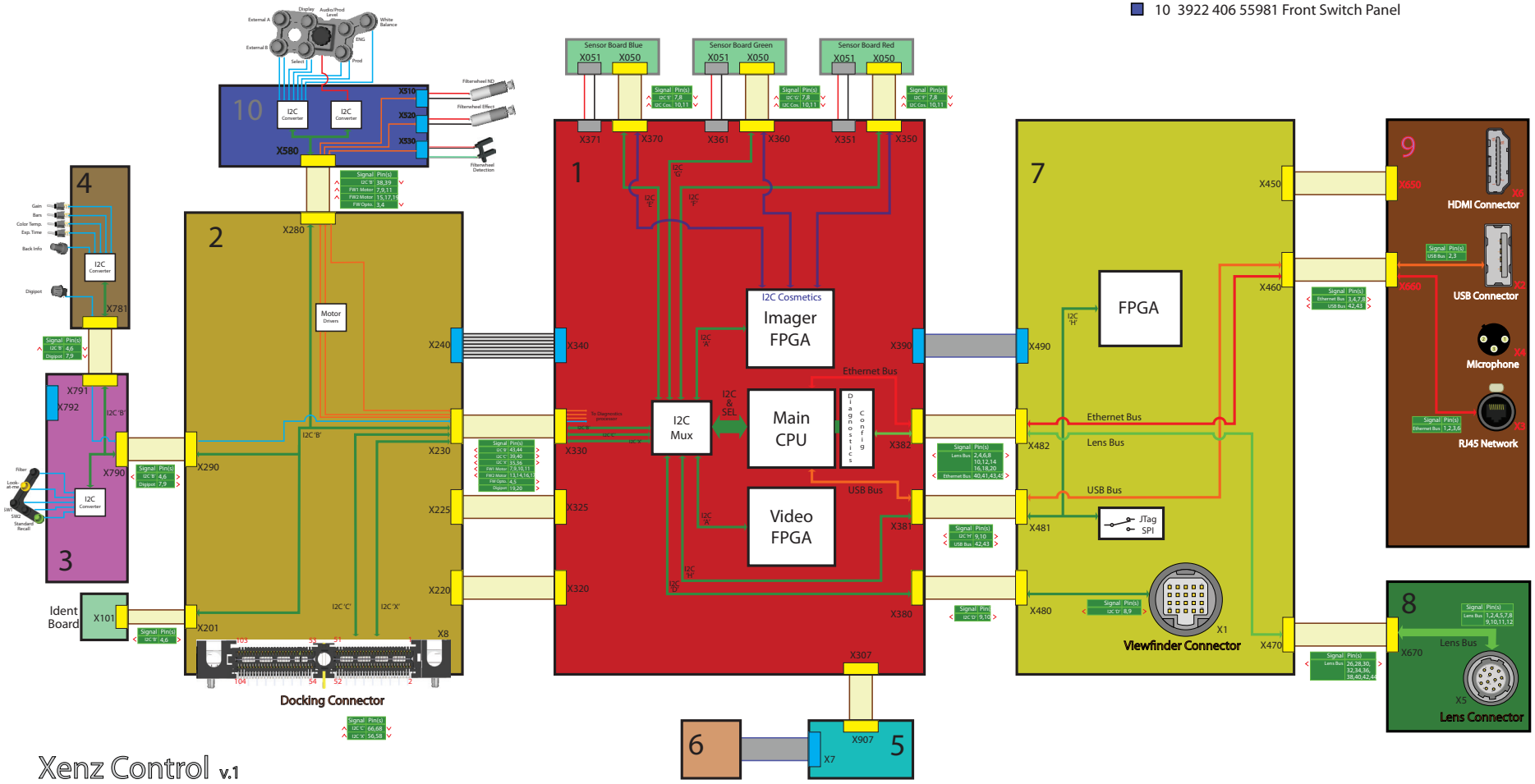
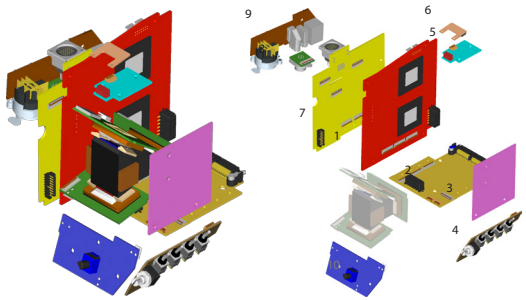


Xenz Control v.1

LDX Power connections



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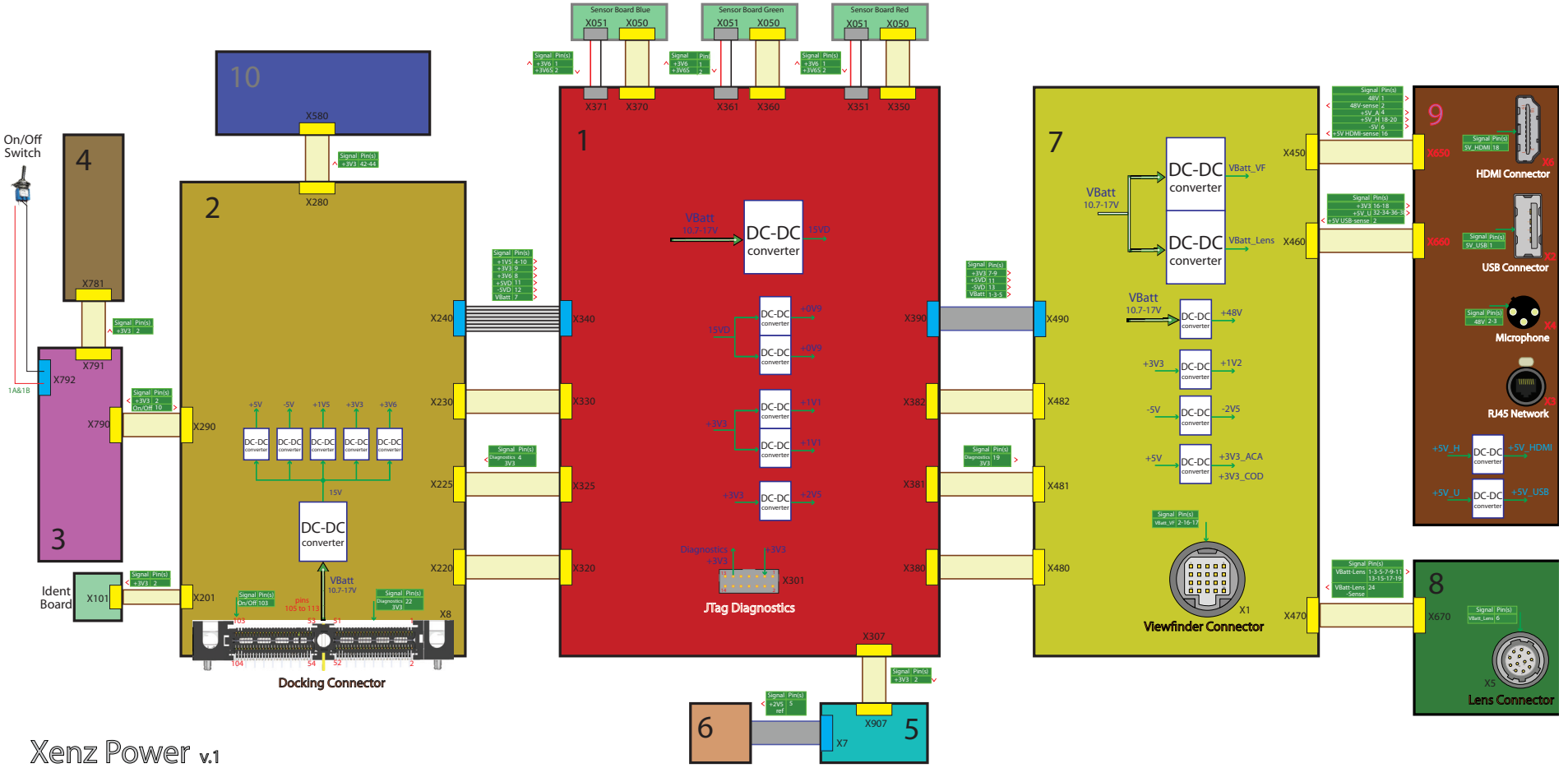
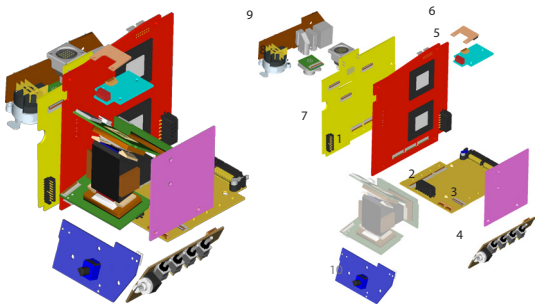


LDX Diagnostics connections



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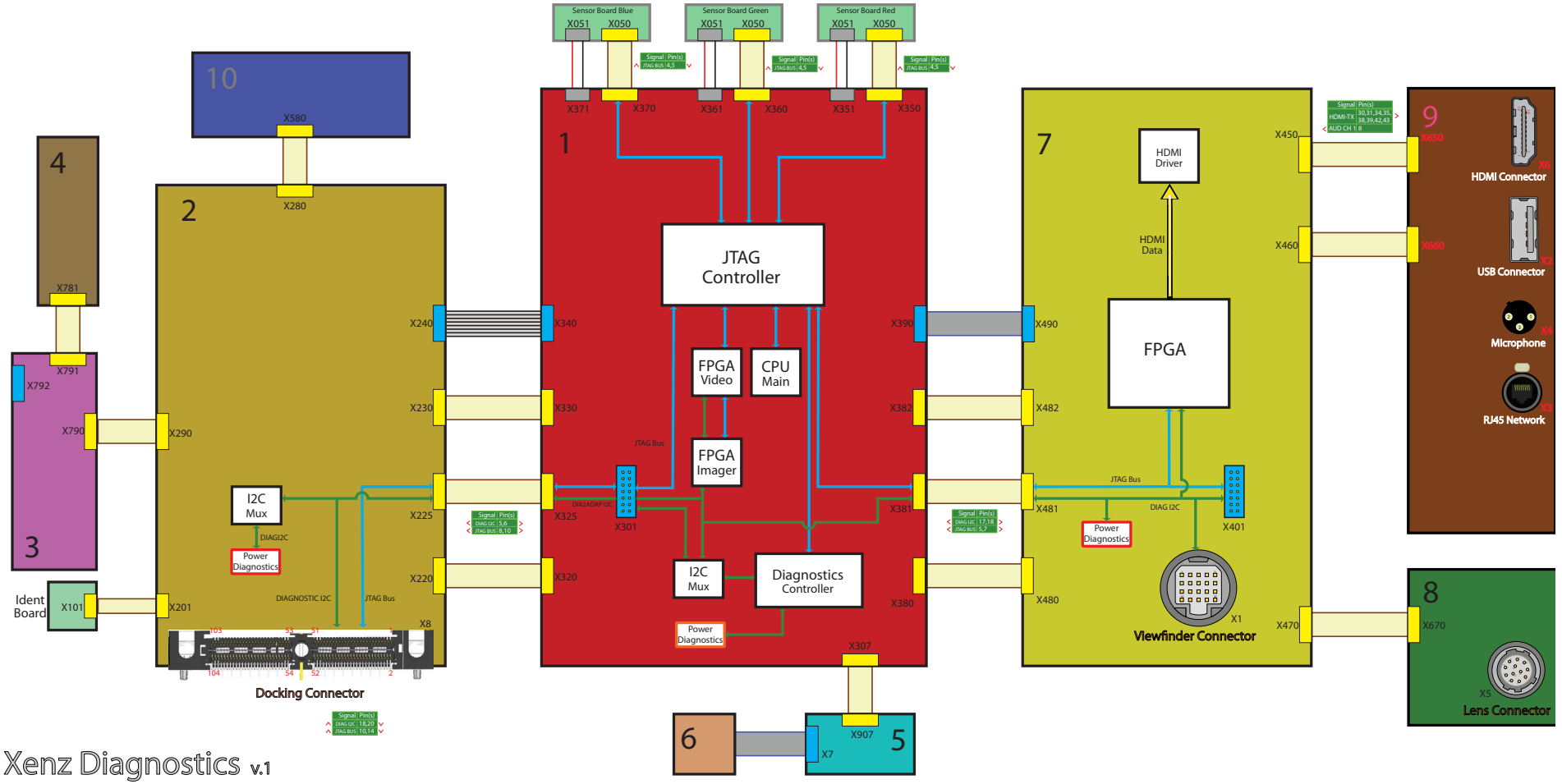
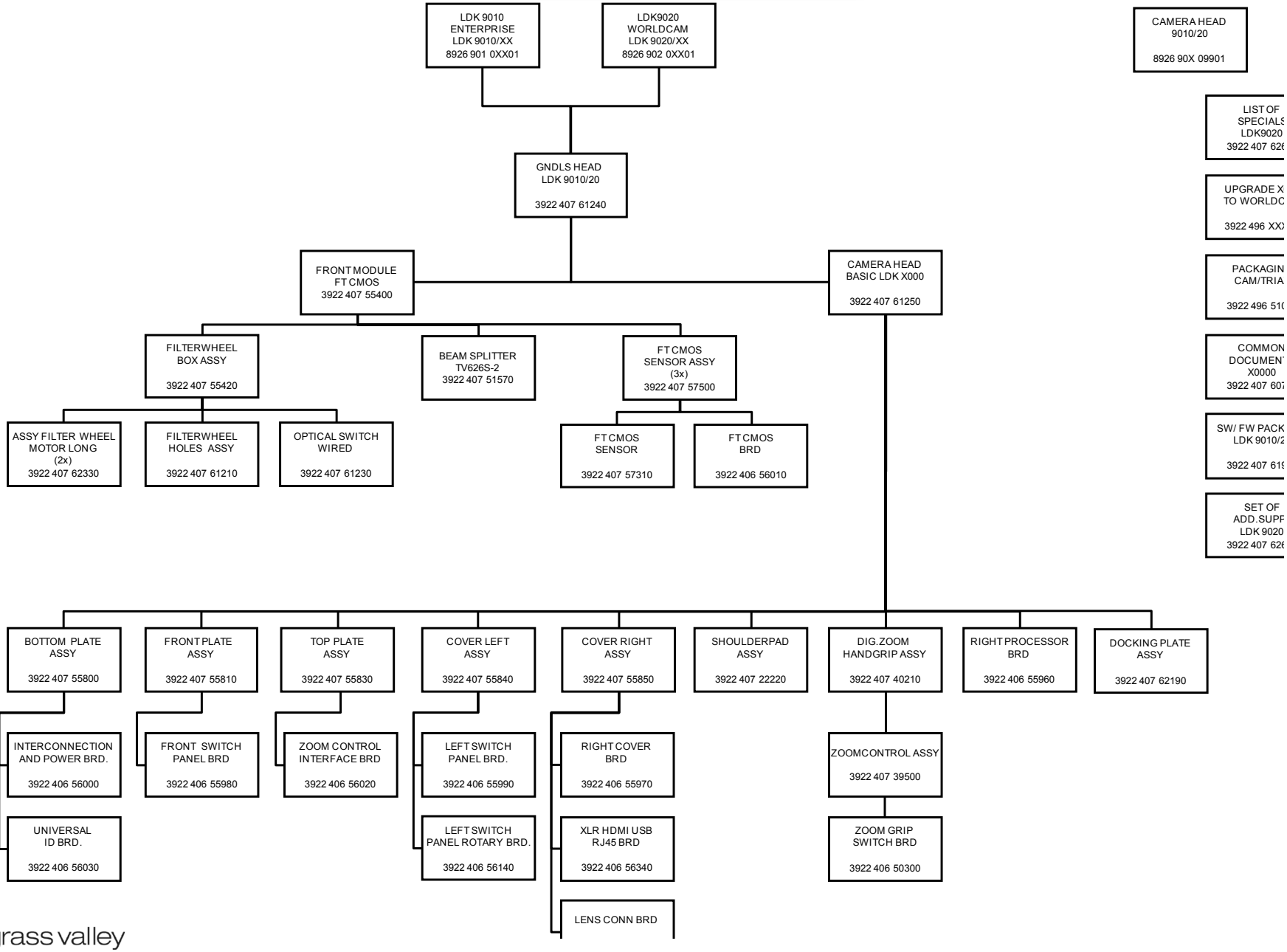


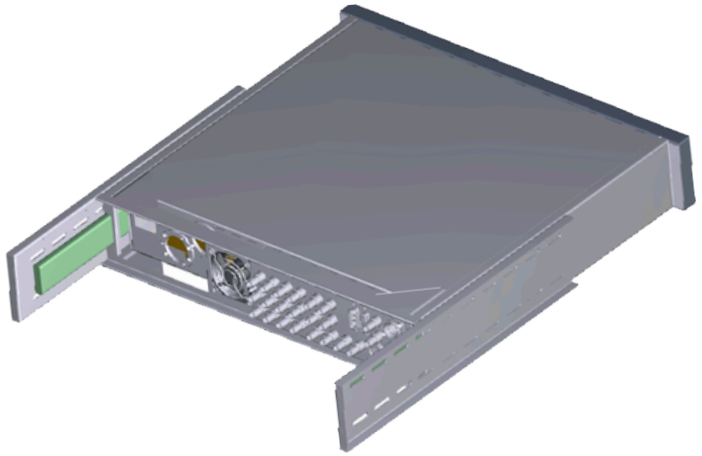
LDX Family Tree



XCU Basestation
eXchangeable Control Unit

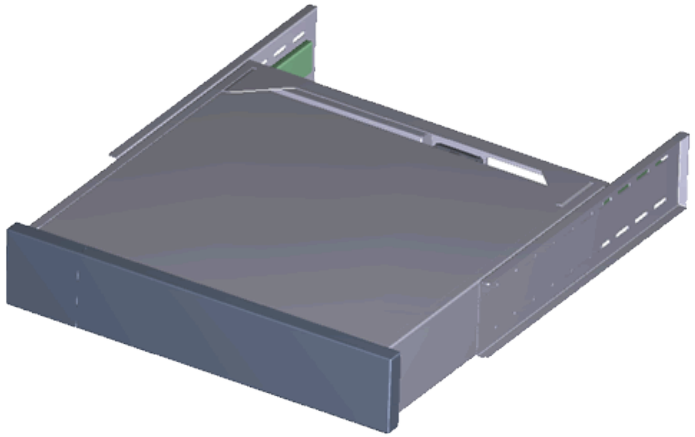
TECHNICAL OVERVIEW

The modularity of the current Base Station and the evolutionary design had lots of advantages, but has also led to a very high product price.
To lower the cost price by streamlining the design and avoiding redundancy, a complete redesign is necessary.



The base Station is the interface between de camera/adapter and the studio/OB-van and has the following functions:

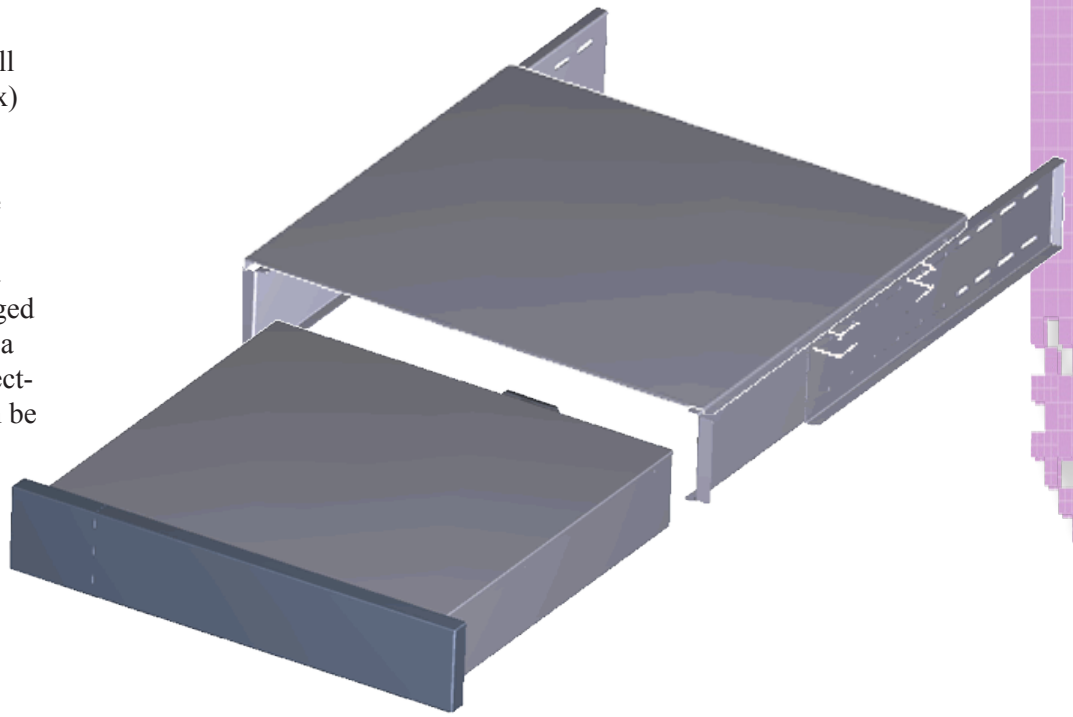
- Powering the camera
- Transmit and receive the signals to and from the camera
- Distribute the video signals from the camera (including down conversion)
- Interface for the monitoring system of the studio/OB-van and the camera signals
- Distribute and control the audio and intercom signals.
- Interface between the control panels and the camera.
- Interface for signaling (call, on-air, iso etc) to and from the camera
- Synchronizing the camera system to the studio/OB-van
- Input and synchronization of the return signals to the camera (VF-EXT, EXT out put and TP).

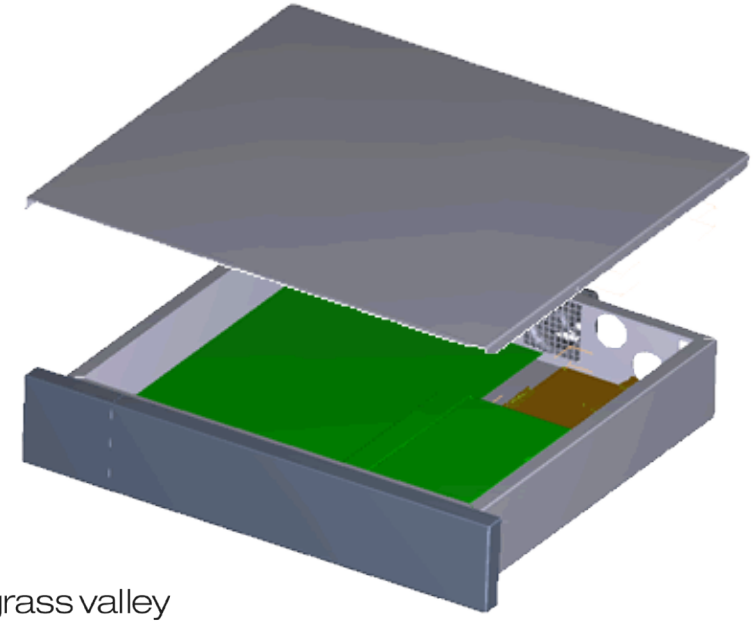


As the base station is compatible with the 3G fiber and 3G triax base station, the power system will remain identical to the system used for the 3G base stations (with the same power modules).
The basic system is developed for the transmission and handling of single speed signals (according 1080I, 720P as well as 1080p standard) over fiber, according our proprietary 3G fiber protocol, with an extension for the transmission over triax (3G triax protocol).
Two special versions (“twin base stations”) will be developed for the transmission of both triax and single/hybrid fiber.
The 1.5G Triax and 3G Triax versions have identical HW and FW as the 3G versions, the 1.5G Fiber and 3G Fiber versions have also identical HW and FW. The 1.5 G versions are limited in functionality by a (license) key (Only 1080i and 720P transmission)
More study is needed to decide if the 3-speed version (up to 180 fields/frames per second for 1080I and 720P) will be a different hardware version or a different software/firmware version.

MAJOR TECHNICAL CONCEPTS

The Base Station is based upon the current 3G base stations and will operate with the same transmission protocols (3G fiber and 3G triax) and power concept.
The housing of the BS consists of a 19" rack cradle module and a BS Box with a building height of 2 RU (rack units). The BS Cradle will contain the connector panel and a slide system for the BS Box. The camera connector and mains power connector will be mounted on the BS Box. The triax and/or fiber connector can easily be changed in production and in the field. All other connectors are mounted on a separate connector panel mounted in the BS-Cradle. After disconnecting the mains power wire and the Triax/Fiber cable the BS Box can be removed.



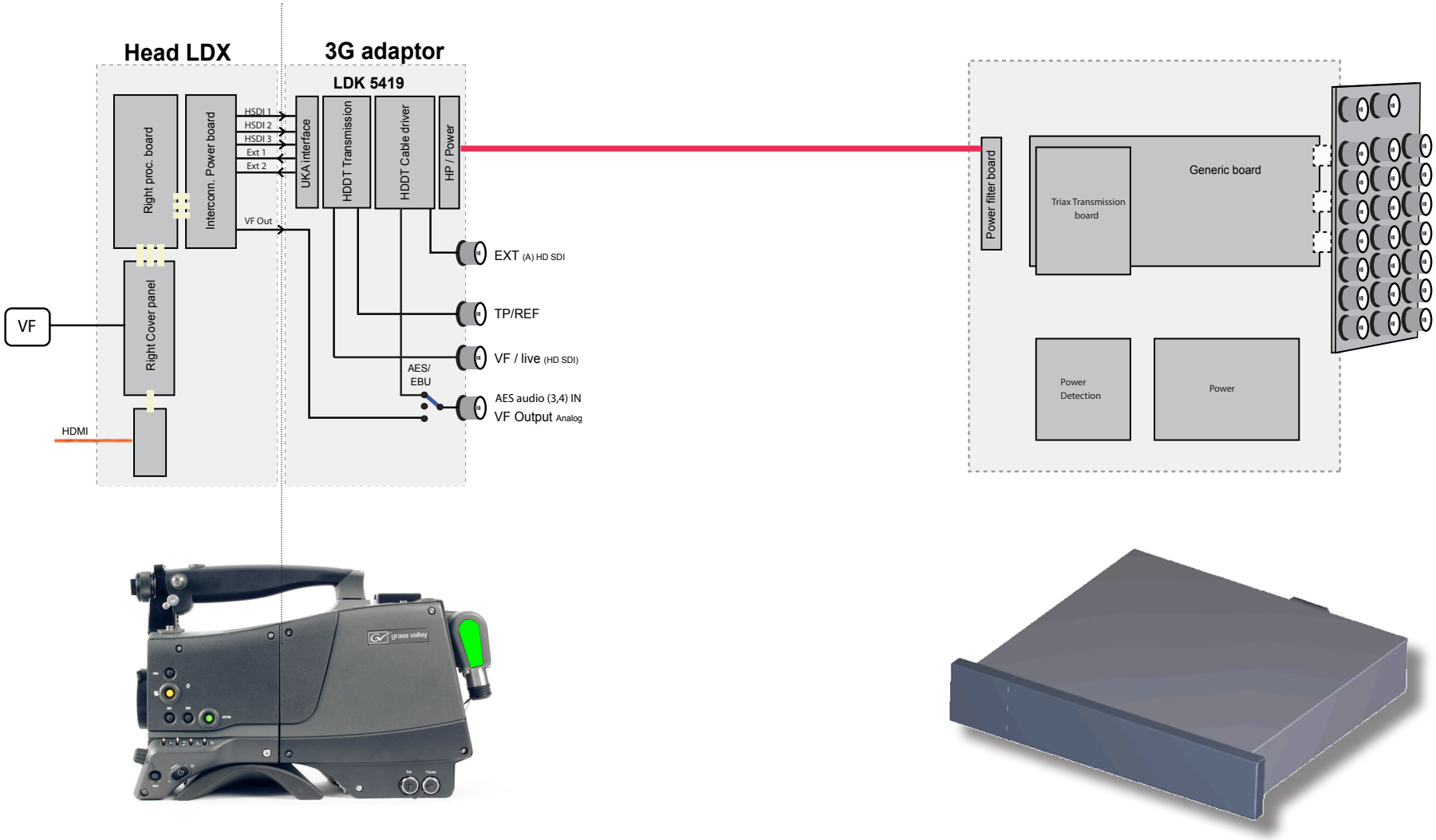


The BS Box contains a generic board, power modules, fiber/triax transmission and User Interface board. This User Interface board contains the display, customer diagnose led's (power, transmission, ….), power switch, and menu switches, the USB connector in the front is located on the generic board. In front of this panel a design front is mounted which gives the BS a universal Grass Valley look and hides all service diagnose led's and diagnose connector from view. This design front can easily be removed and has no operational function.

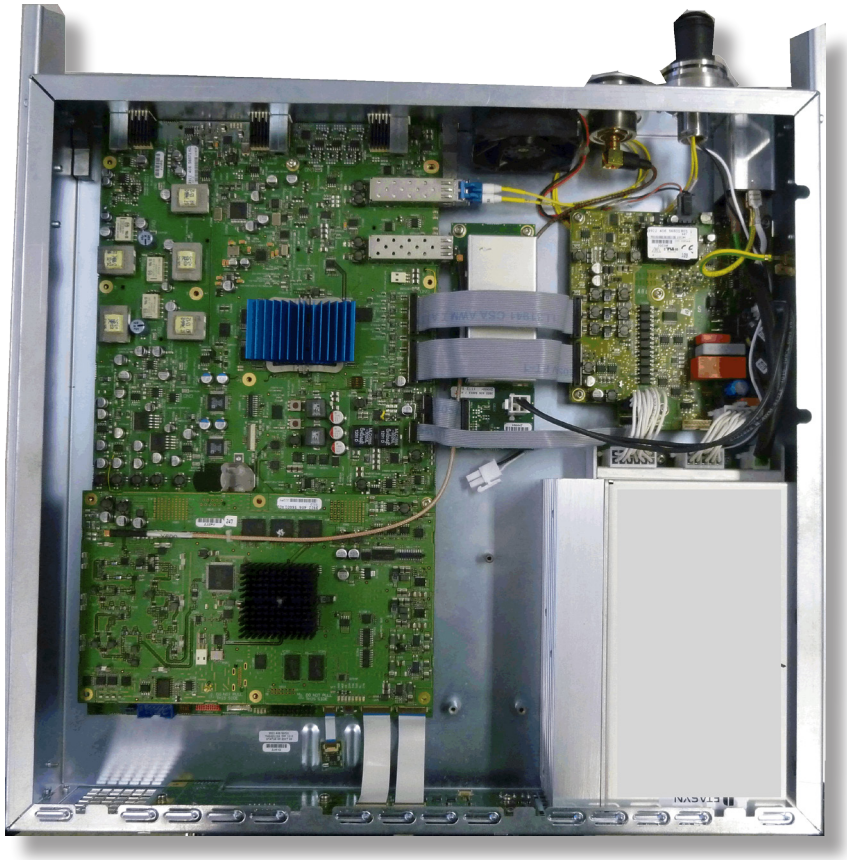
Video path LDX - XCU

LDX
Lovely Dutch Xensium :)

XCU
eXchangeable Control Unit



XCU Basestation



Back panel

Connector board 3922 406 56581	Transmission Connector and/or Fiber connector	Power Input

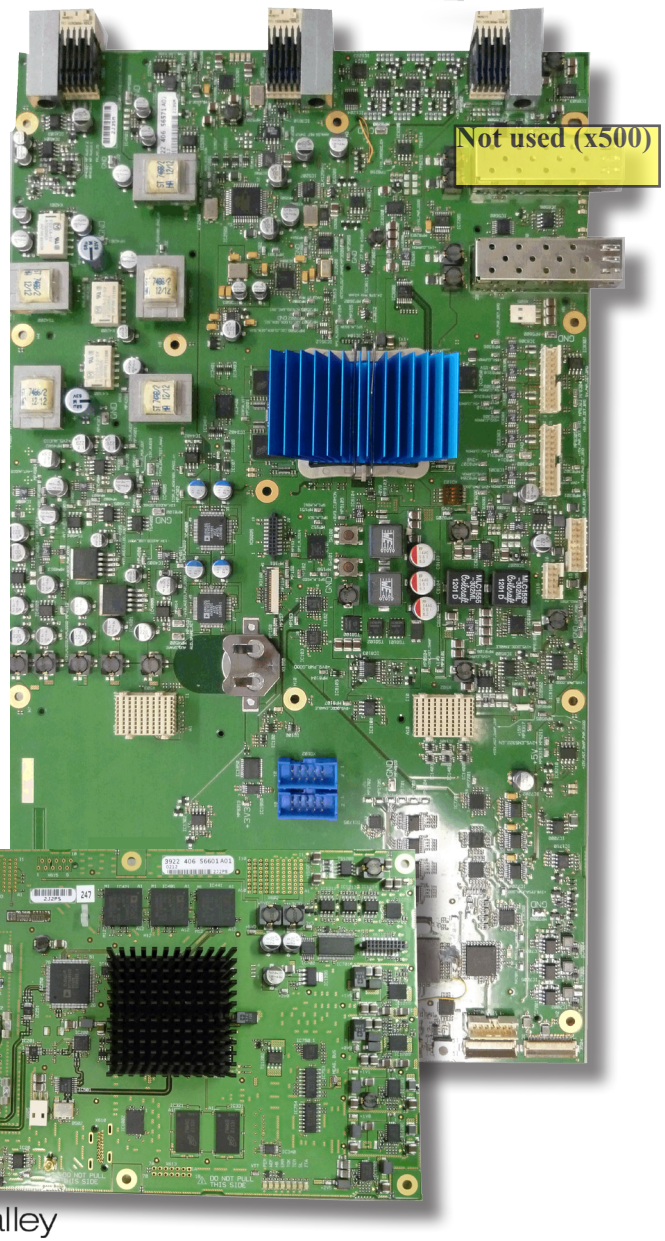
Generic Board 3922 406 56571 (incl Digital Output board, sync enc board, data board, audio/intercom board and HQ SDTV output board functionality) + SFP module (w/ fiber BS)	Power Filter Board 3922 406 56031	Base Station Power PCB 3922 406 55231
3G Triax Transmission Board 3922 406 56601		Etasyn Power supply 3922 407 56971

Front panel

User I/F Display + LEDs	User I/F Board 3922 406 56591	Power User I/F

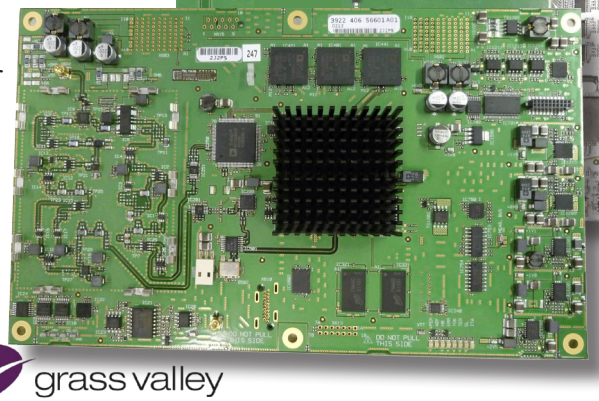
XCU Basestation

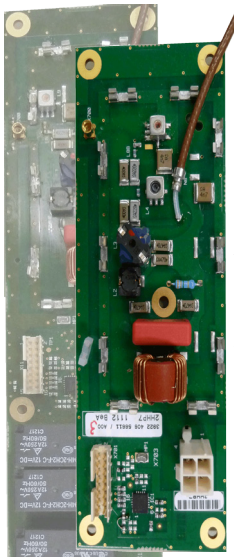
Generic board 5657



Triax Transm. board 5660

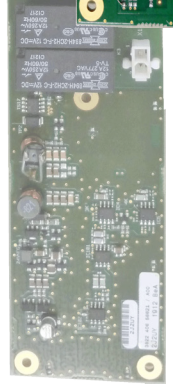
not used with fiber system





not used with fiber system

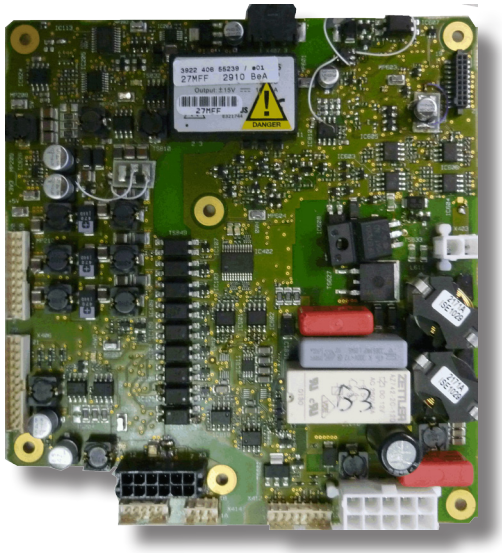
3G TRIAX power filter 5661

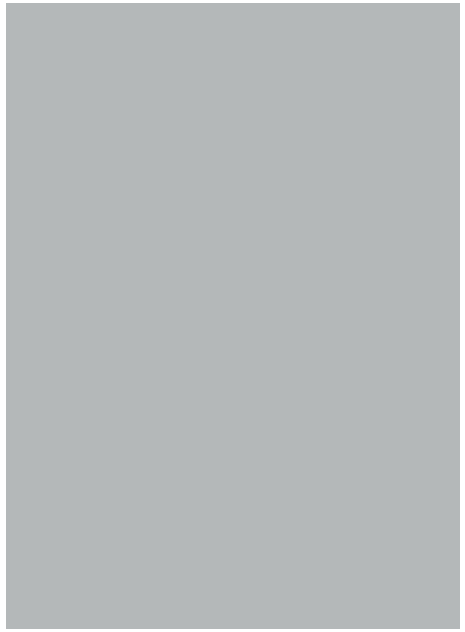


not used with fiber system

3G TWIN power filter 5662

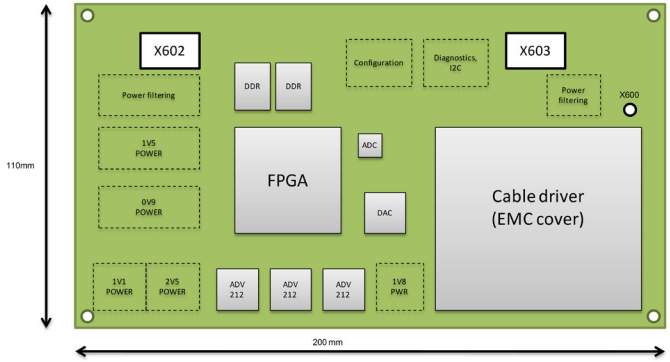
Power Detection board 5523



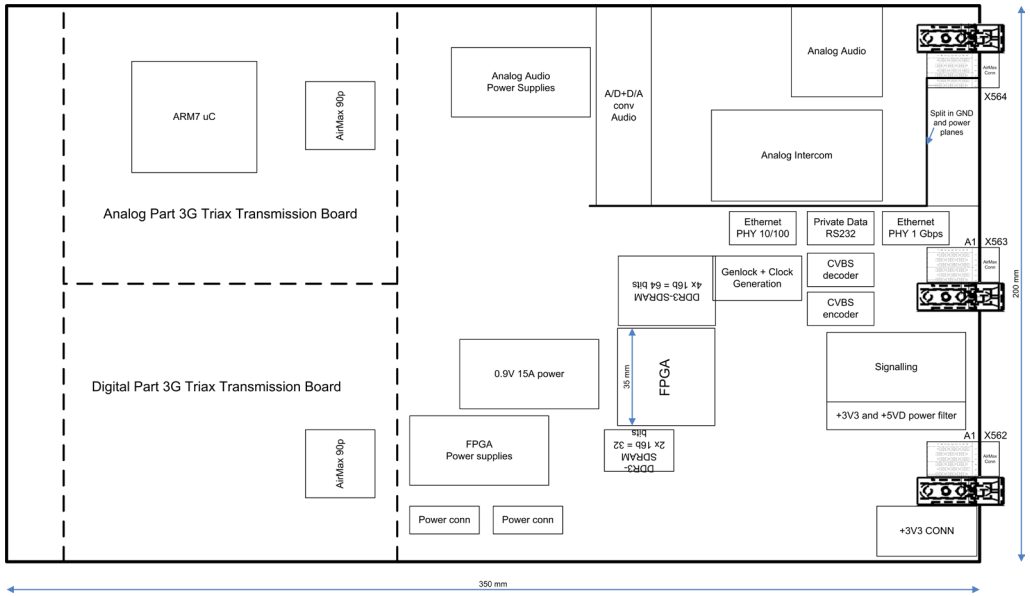


XCU Basestation

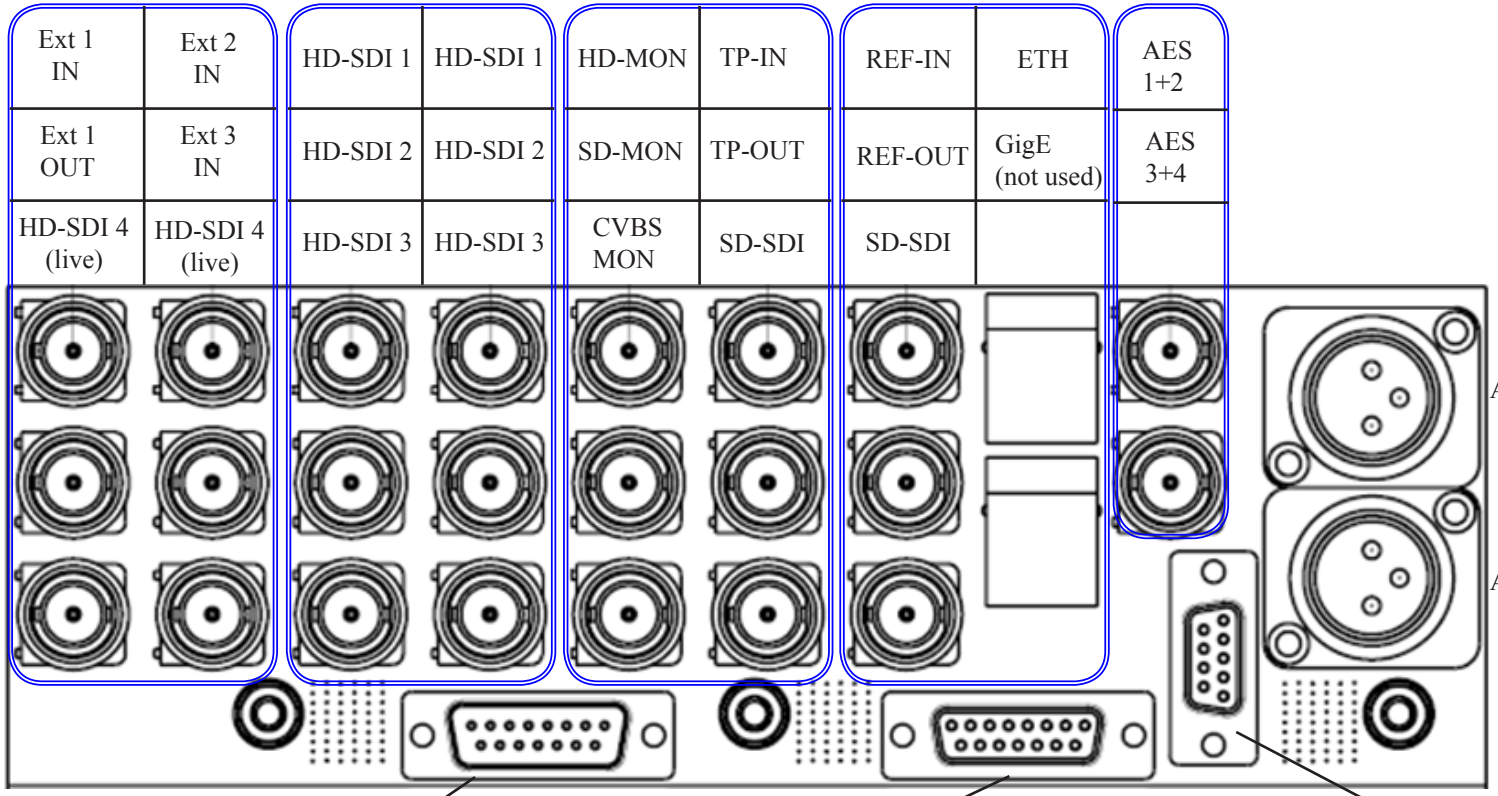
Triax Transm. board 5660



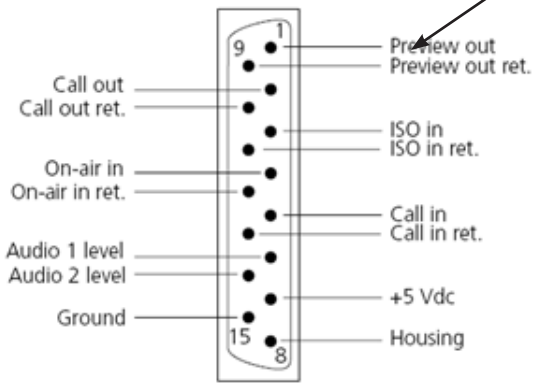
Generic board 5657



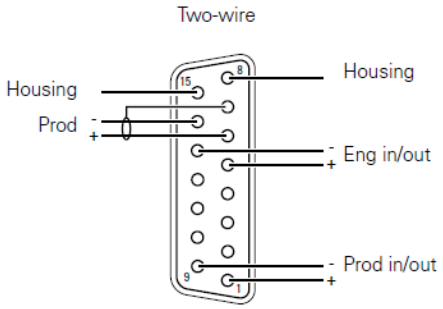
XCU Basestation

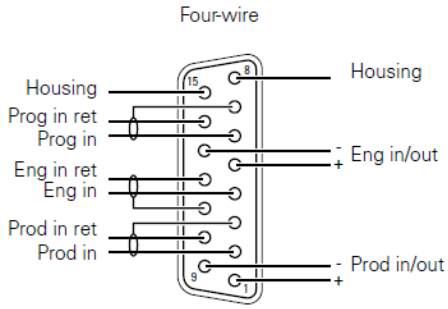


Signaling connections

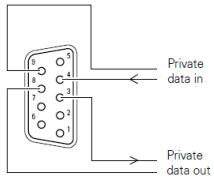


Audio/Intc connections





Aux connections



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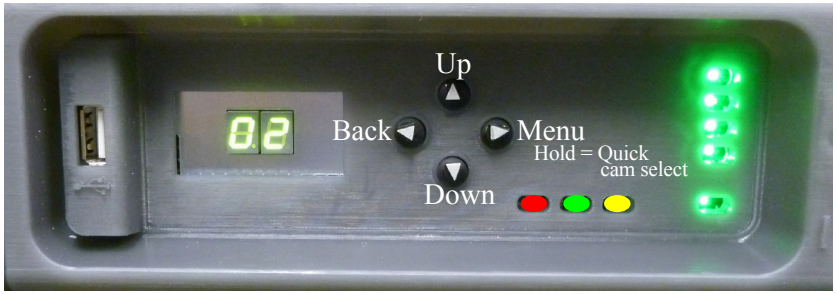
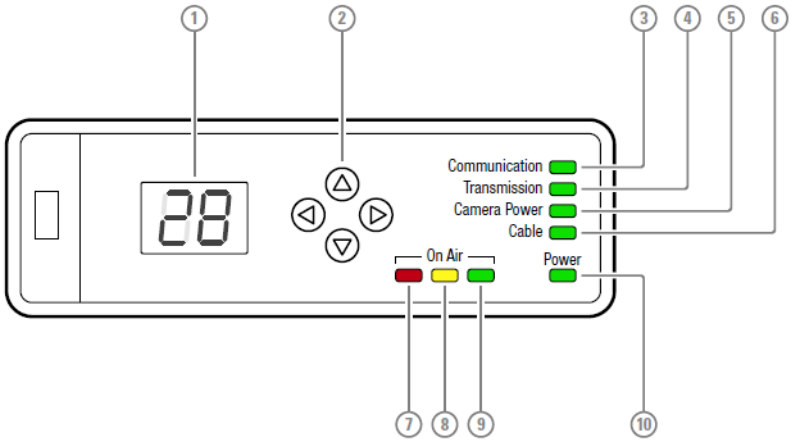
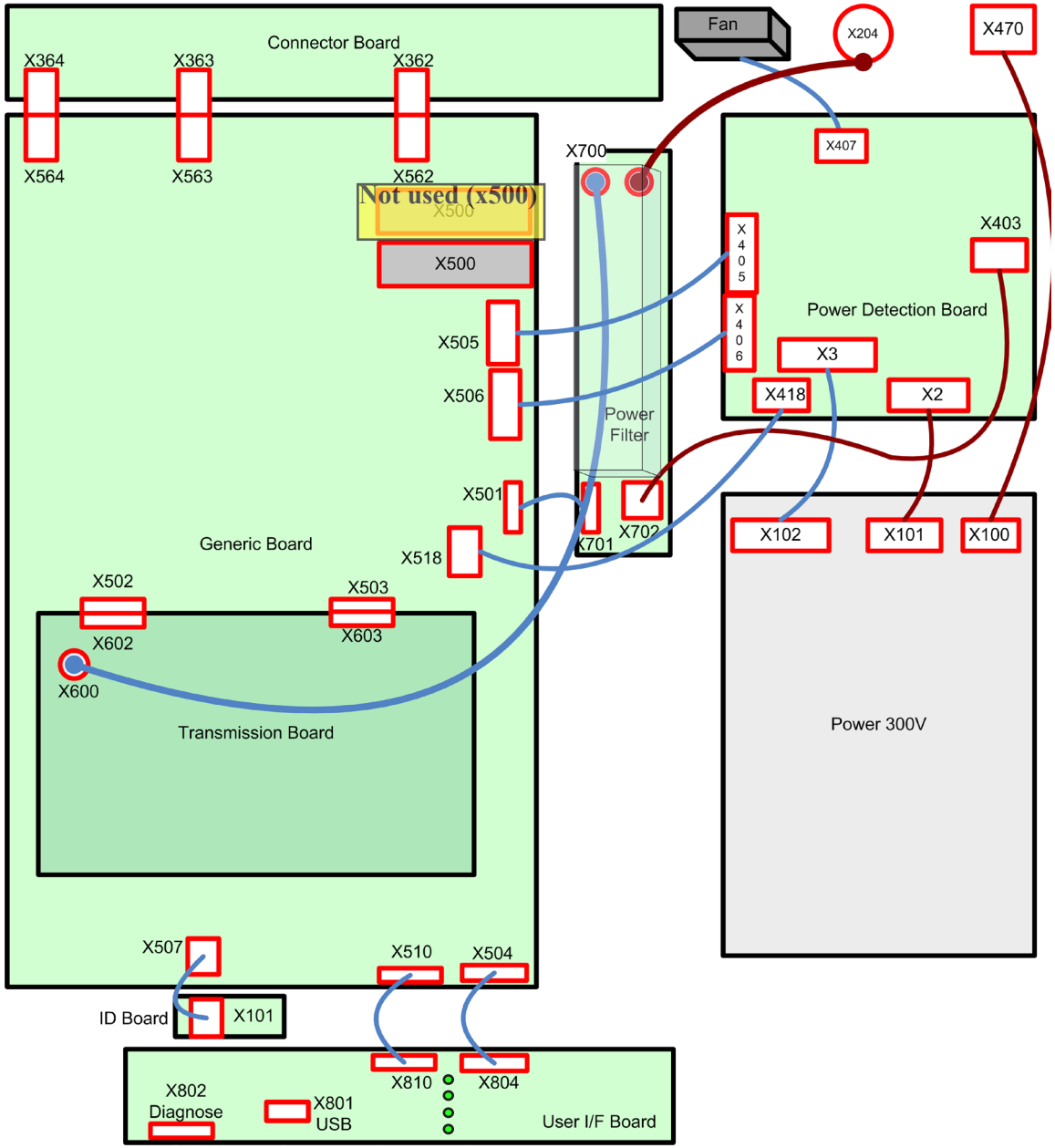




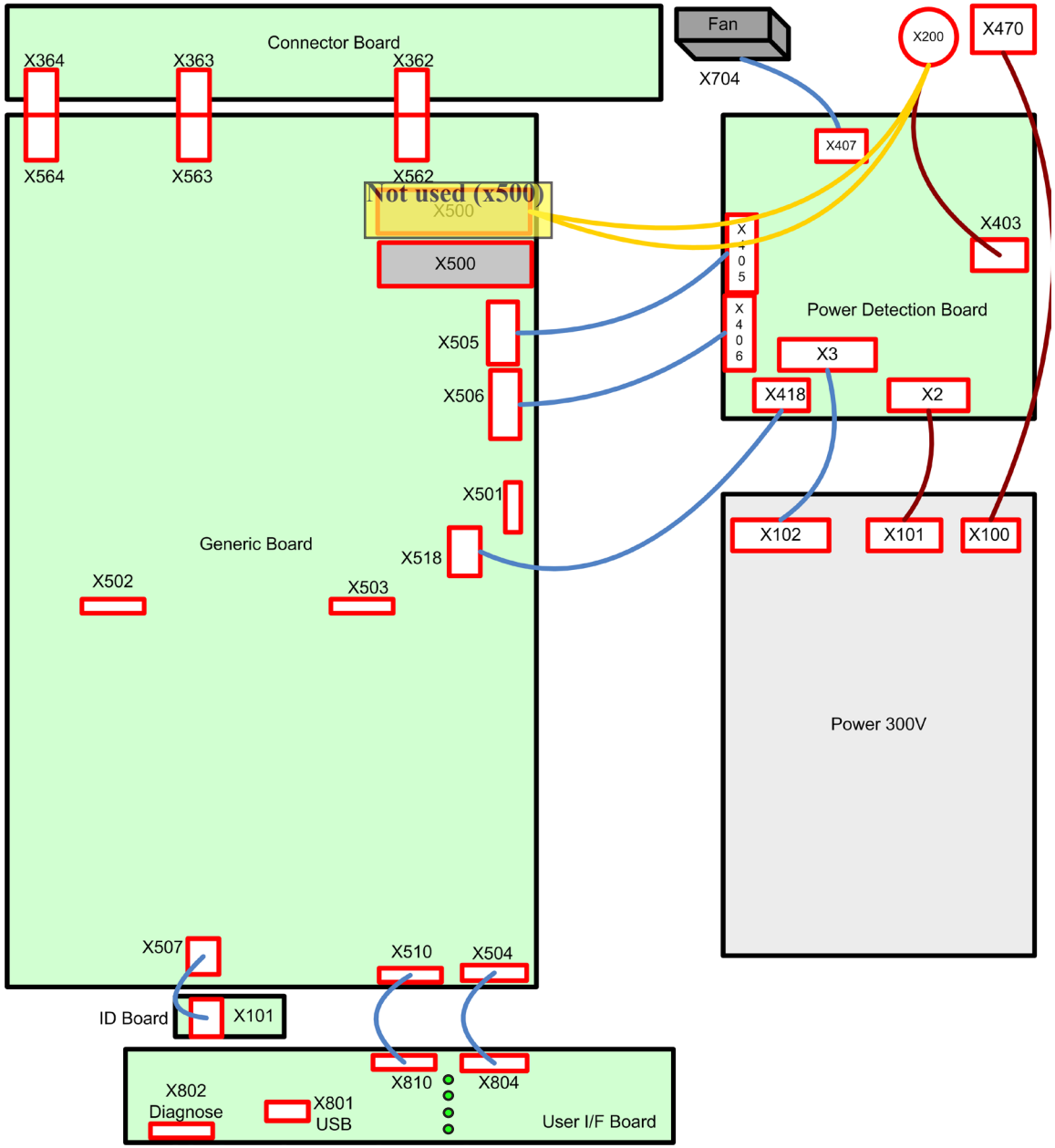
1: Camera Number
2: Menu Navigation buttons
   ▷ Hold for Quick access for Camera number.
3: Camera <=> Basestation Communication
4: Transmission type Triax or Fiber
5: Power to camera
6: Cable test
7; Red light (ONAir)
8: Yellow light
9: Green light (Call)
10: Main Power

Error	Triax	Fiber	
●	●	●	Communication
●	●	●	Triax or Fiber
●	●	●	Camera On
●	●	●	Cable Test

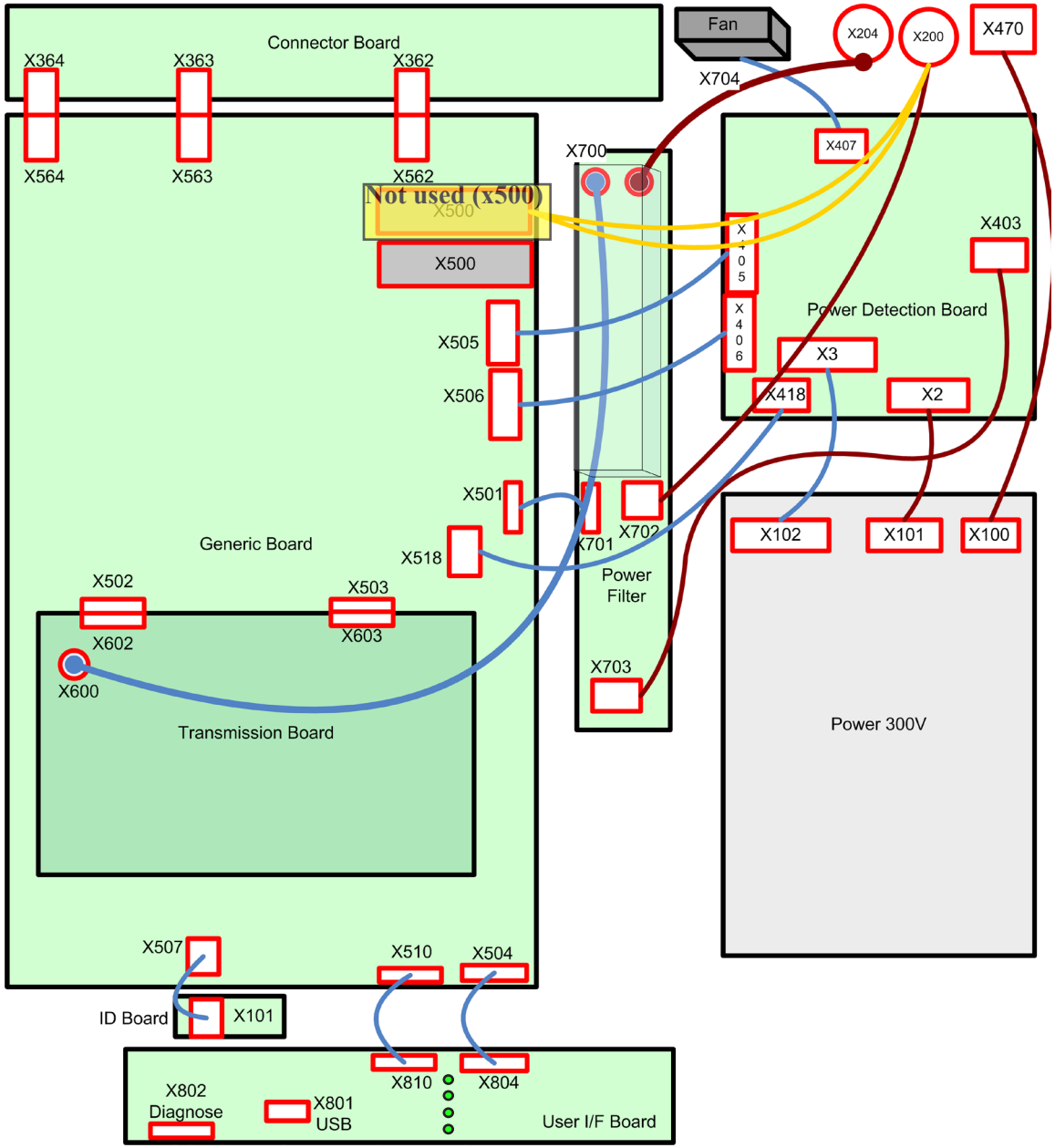
XCU Basestation TRIAX



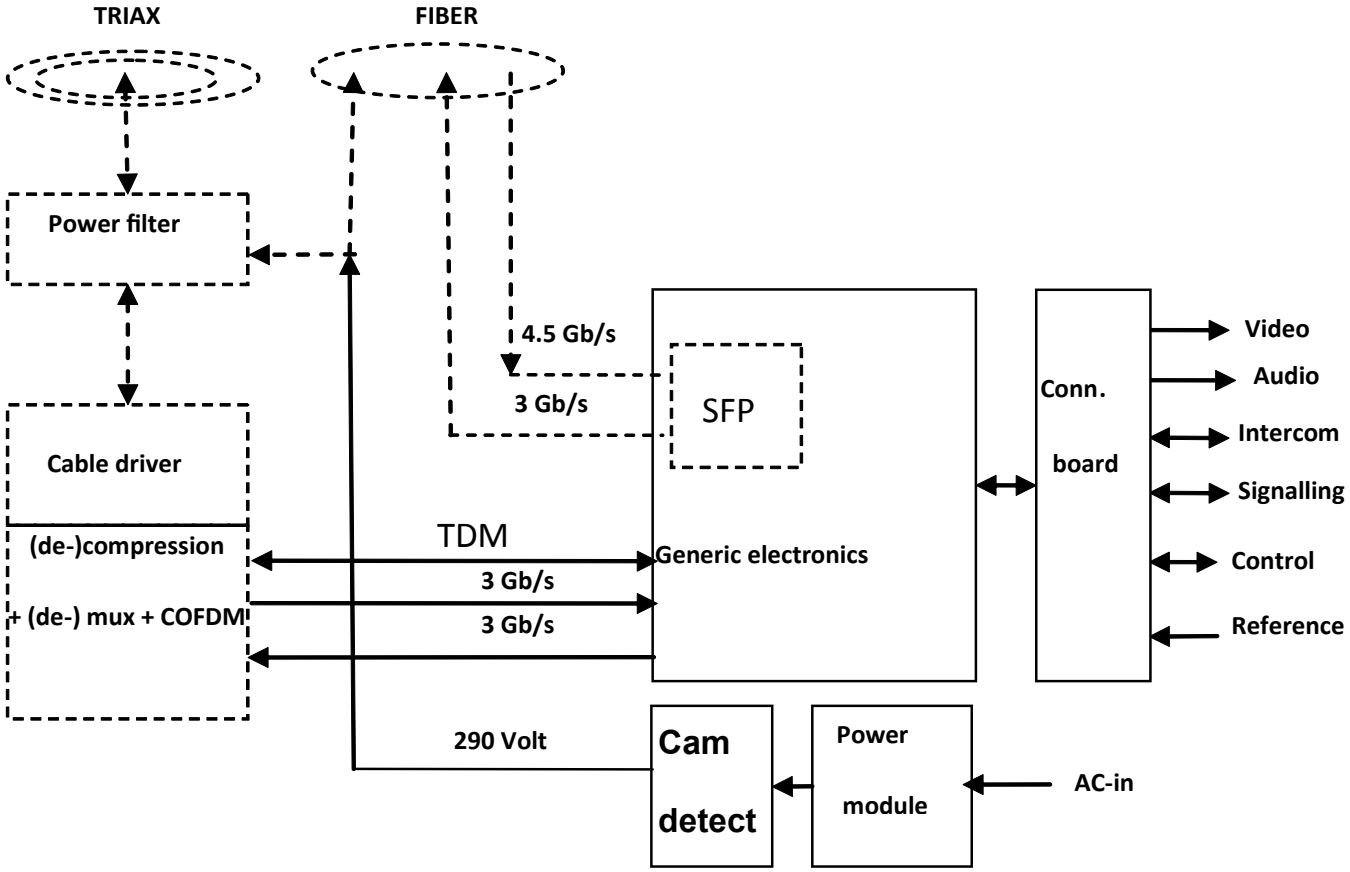
XCU Basestation Hybrid Fiber



XCU Basestation TWIN

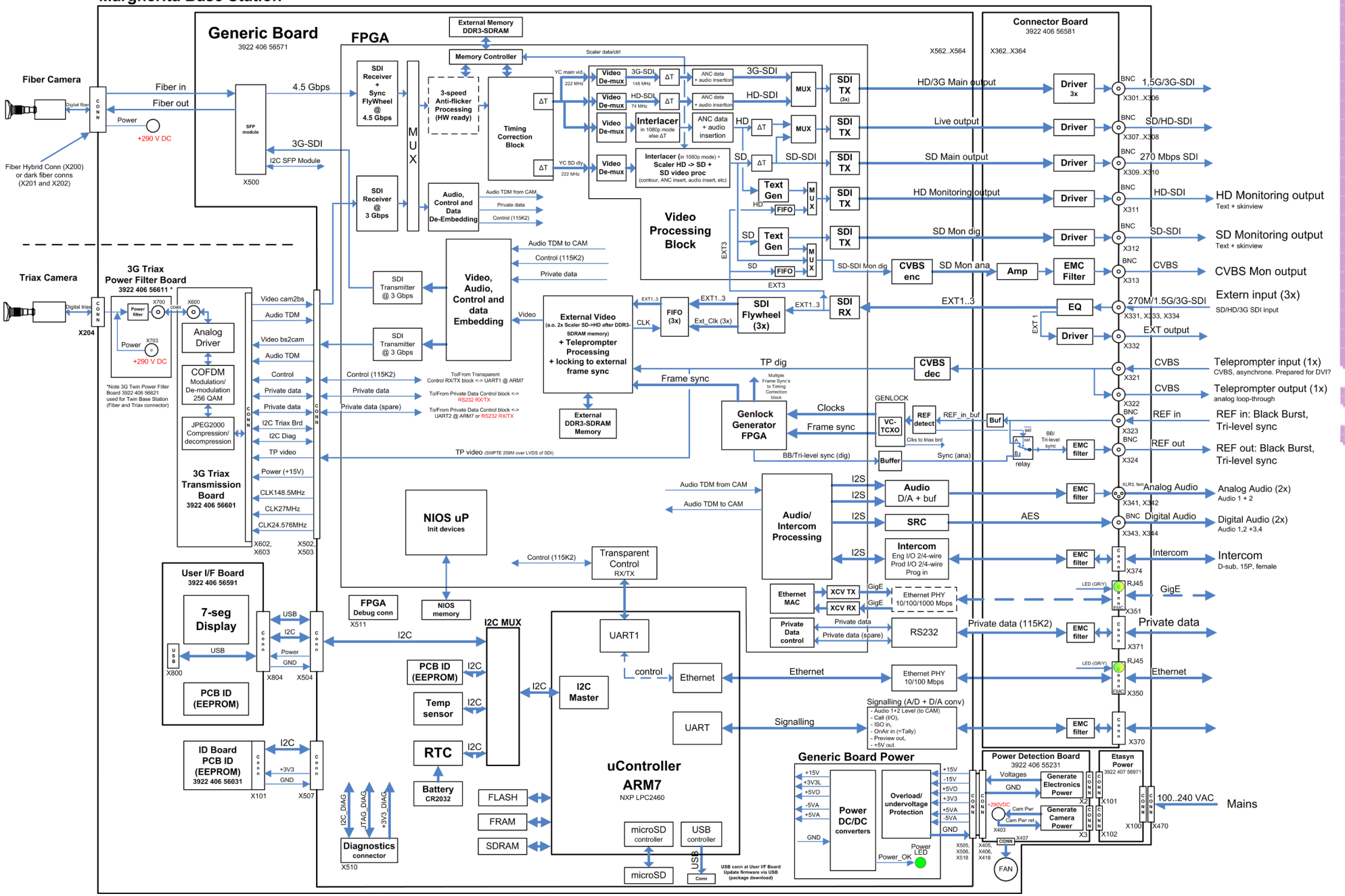


XCU Basestation

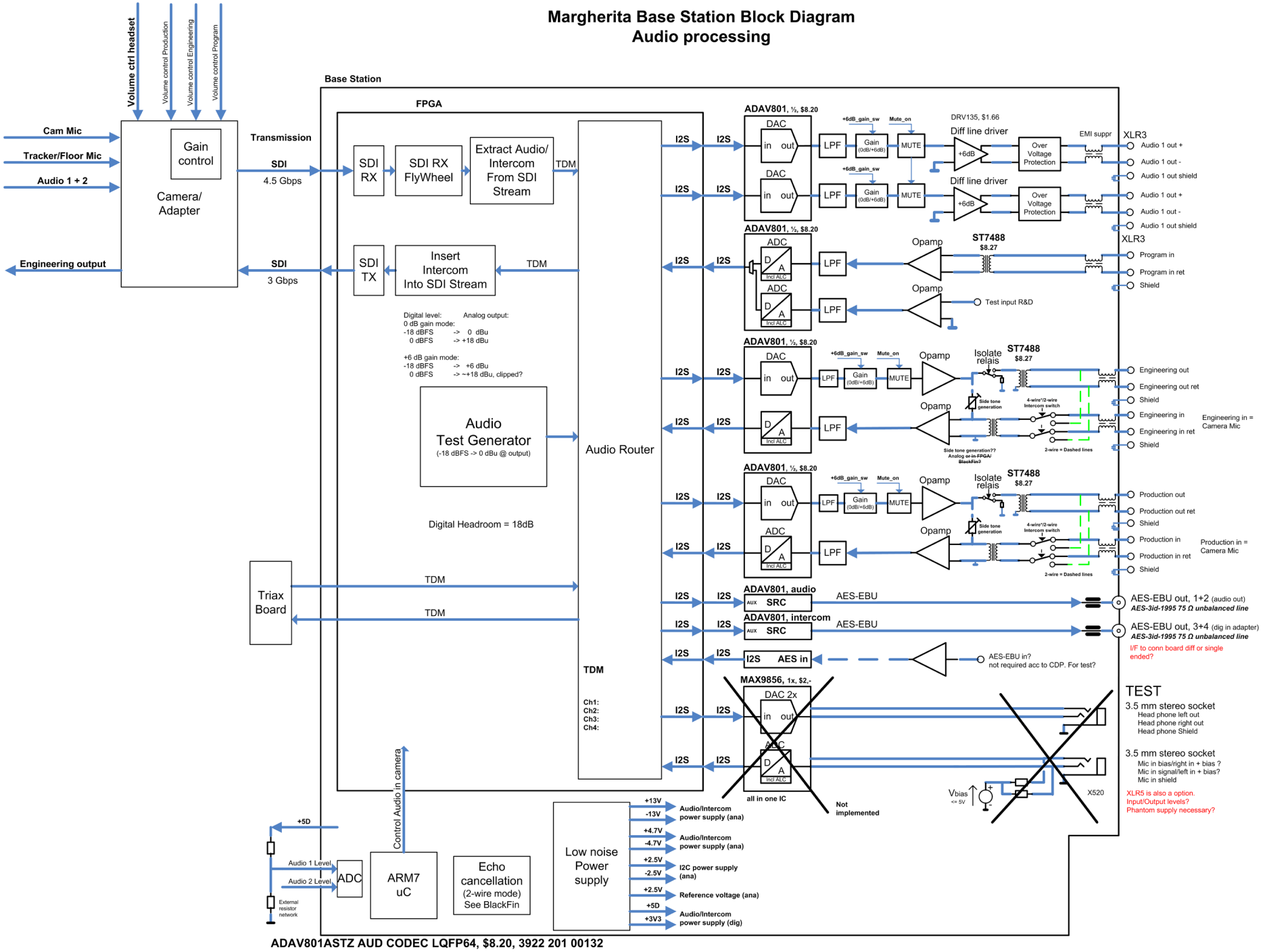


Margherita Base Station Block Diagram

Margherita Base Station



Margherita Base Station Block Diagram
Audio processing



LDK 5303 EyeCatcher
2,7 inch LCD VF

Mechanical design.

Replacing the traditional 2 inch CRT with a LCD flat panel, which result in a future proof design is a new mechanical challenge.
Design requirements include:

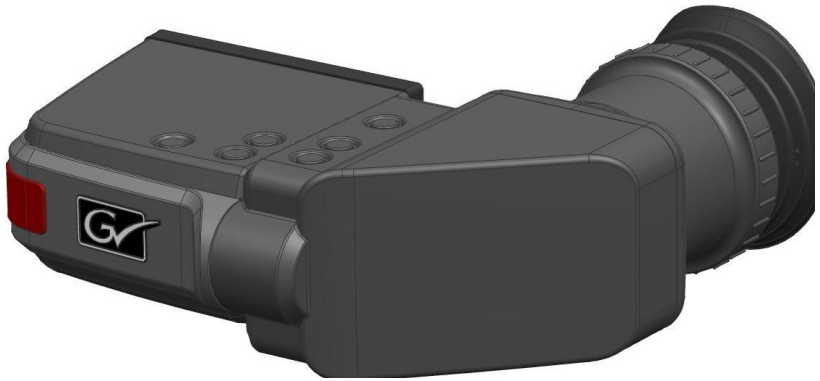
- No offence to the ergonomical benefits of the combination of the 2 inch CRT design with the current and future cameras.
- Weight
- Dimensions
- Balance of camera on shoulder and tripod
- Free sight above, beneath and in front of the viewfinder
- Good access to vf switches, rotary controls
- Enough displacement in x-, y-direction of vf with respect to the camera
- Easy pivoting the eyepeace and controlling the dioptre lens, but with proven reproducible look and feel
- No unwanted acoustic pick-up of lens servos and controls by the top microphone
- Tally indications for cameraperson and surroundings, noticeable in direct sunlight
- Robust design (at least compliant to the general requirements)
- EMC proof mechanical design

- The 2.7 inch viewfinder will make use of the platform design from the 7 inch lcd viewfinder project and the LDK5309/10 project.

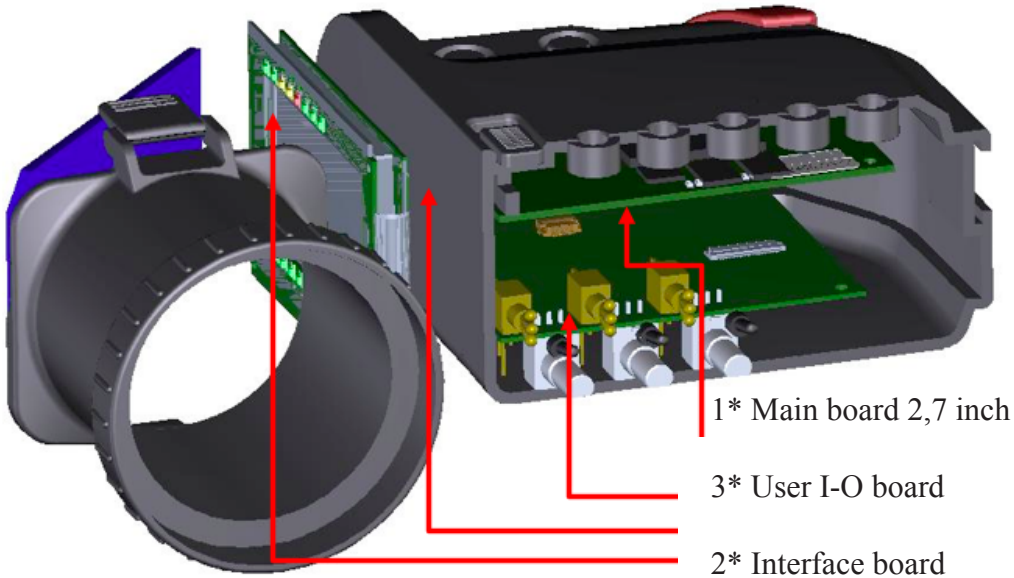
Technical specification.

The LDK 5303/20 is a multi-sync HDTV color viewfinder, designed for the Lumiere, LDK8x00 series cameras, the LDK3000 and the LDK4000 MKII/Elite cameras.
A software update for the above cameras is part of the project.
The LDK5303/20 will have basic functionality with the LDK6000/6200, provided the LDK6000 is upgraded with the latest field package.
The following typenumbers will be developed in this project:

- 8926 530 32001: 2.7 Inch LCD Viewfinder, LDK 5303/20
  Operational Features
- 2 assignable push buttons, one extra navigation button
- brightness, contrast, peaking adjustment with rotary controls
- Contour/crawling overlay at selectable color as focus assist
- Color/monochrome picture switchable
- +3 to -3 Diopter-adjustment
- An (optional) wide angle lens is required for “of-shoulder” shots
- Cursor box? (not in CDP)



LDK 5303 EyeCatcher
2,7 inch LCD VF

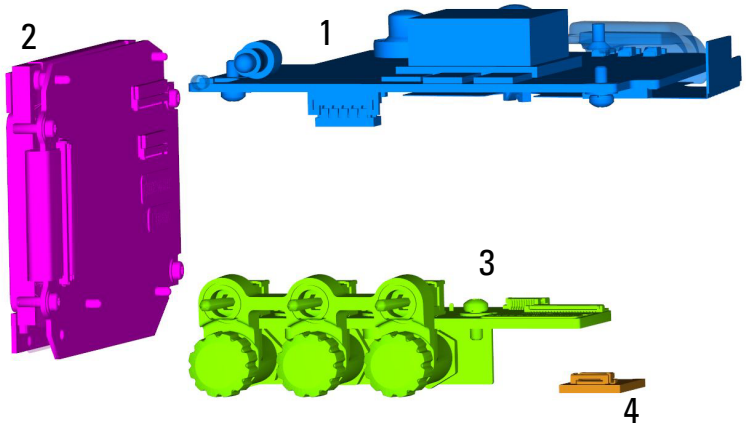


1* Main board 2,7 inch LCD VF

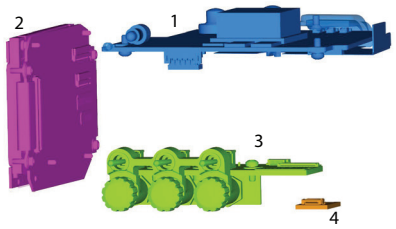
3* User I-O board

2* Interface board
2* LCD Led board

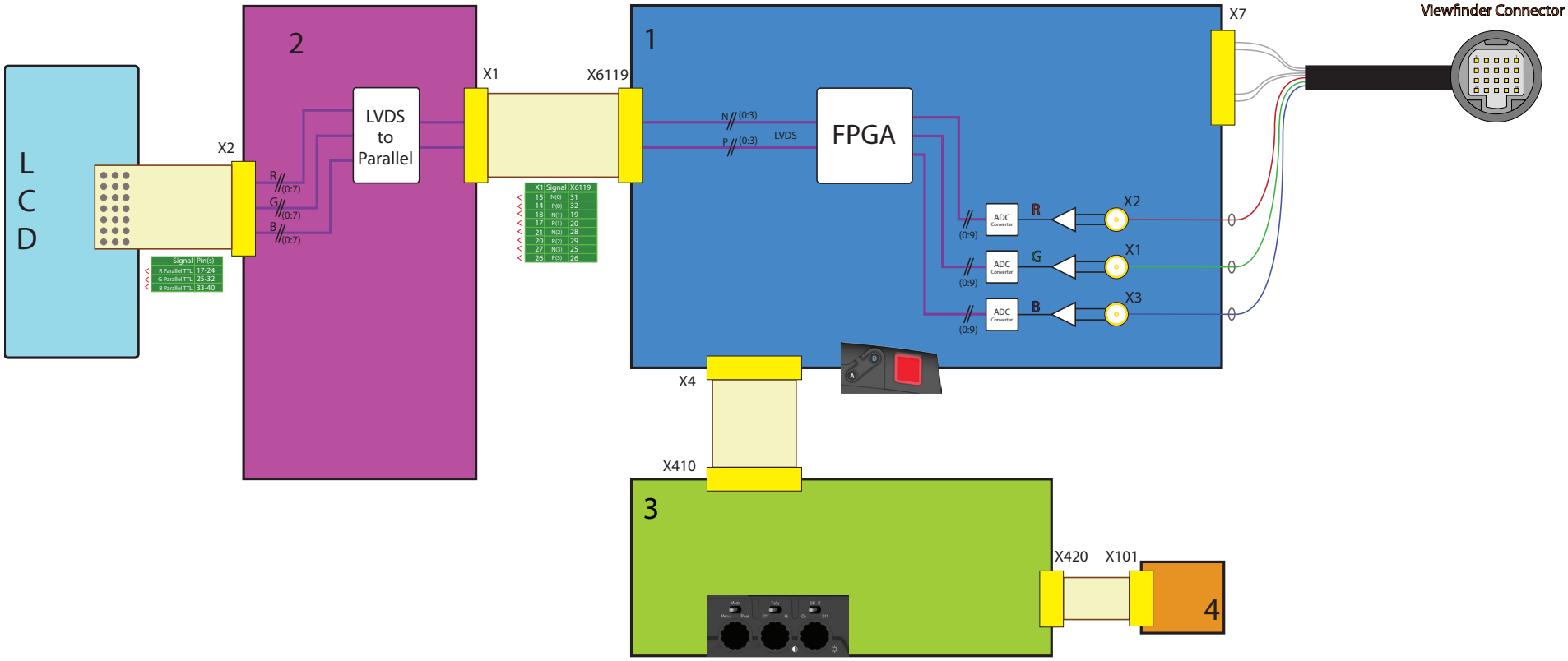
4* Universal ID board



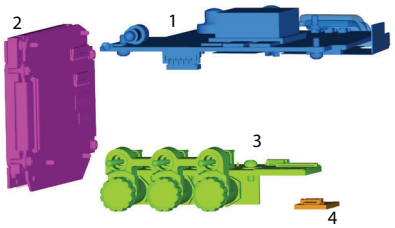
LDK 5303 EyeCatcher
2,7 inch LCD VF



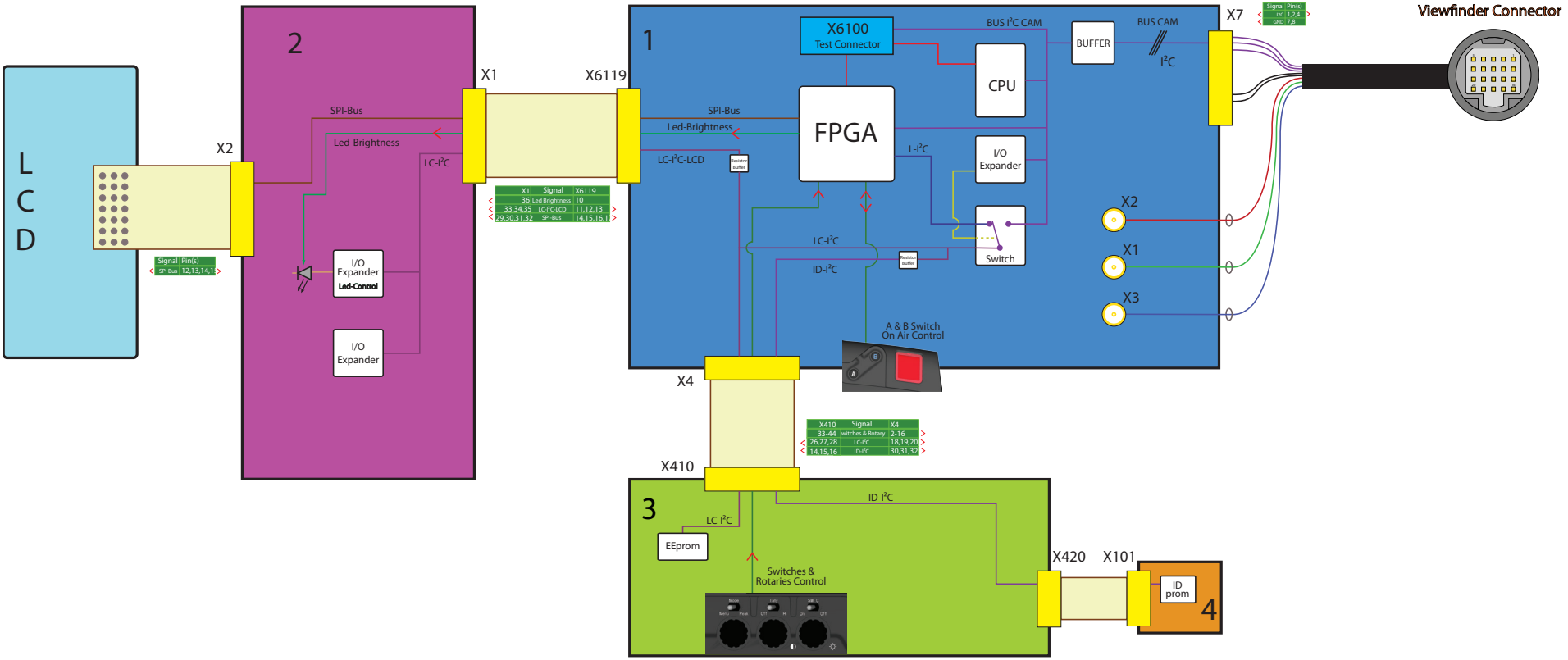
1 3922 406 56371 Main Board
2 LCD Board 2,7 Inch VF
3 3922 406 56381 User IO Board
4 Ident Board



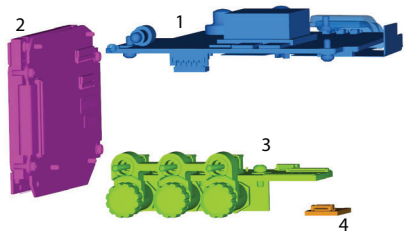
LDK 5303 EyeCatcher
2,7 inch LCD VF



- 1 3922 406 56371 Main Board
- 2 LCD Board 2,7 Inch VF
- 3 3922 406 56381 User IO Board
- 4 Ident Board



LDK 5303 EyeCatcher
2,7 inch LCD VF



1 3922 406 56371 Main Board
2 LCD Board 2,7 Inch VF
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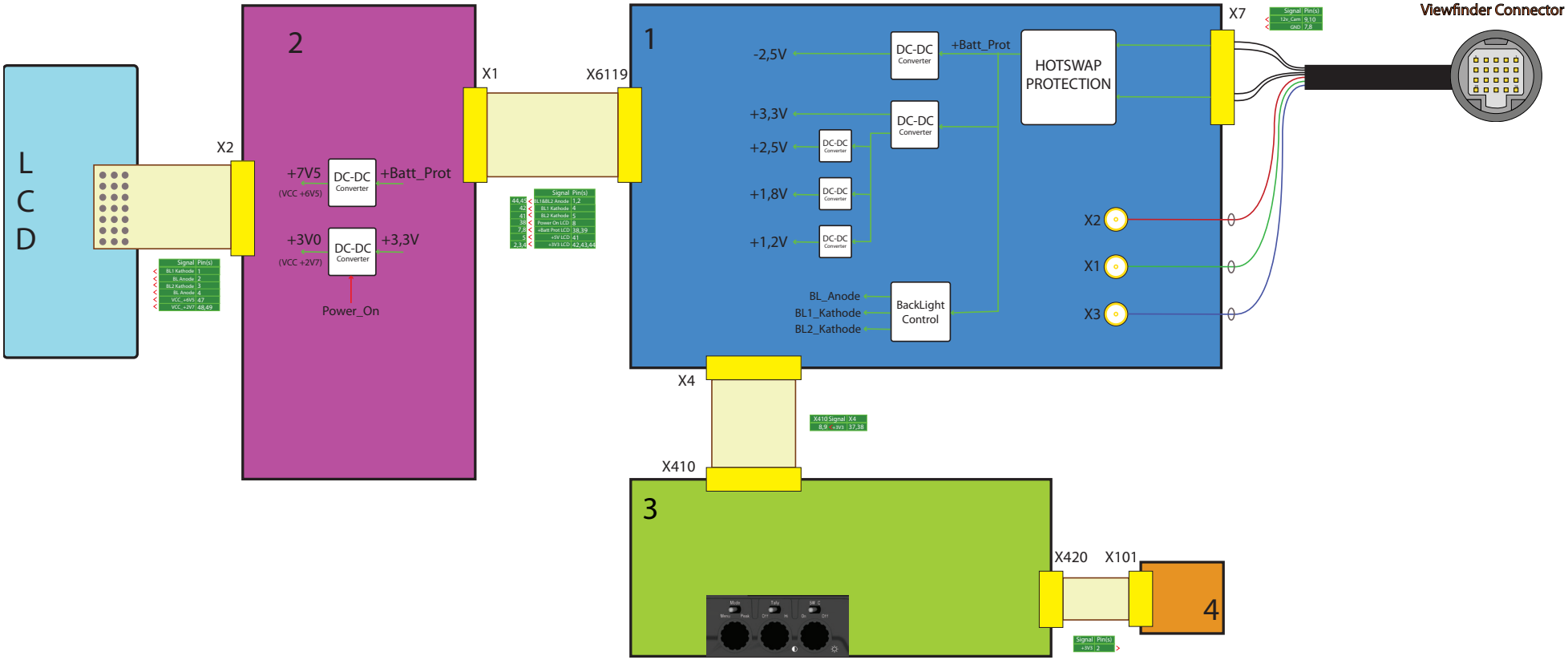
4 Ident Board



LDX TRAINING CENTER