High Definition System Camera

HDC-1000 / 1000R Series

Sony Korea

B&P Engineering Dept

방송의 연대표

라디오 방송

405라인
텔레비젼

525라인
텔레비젼

컬러 텔레비젼

HDTV
Test

ATSC
(Advanced Television Systems Committee)
DTV

1920 1930 1940 1950 1960 1970 1980 1990 2000 →

Black & White TV → Color TV → SDTV → HDTV → UHDTV (Super Hi-Vision)

색 만족도 디지털 해상도 최고 해상도

HDTV → 3DTV → Holographic TV

입체감

1. HD Camera의 역사

1980 1990 2000 2005 2009

1" Satico Tube
HDC-100

1" Satico Tube
HDC-300

1" 220M CCD
HDC-500

2/3" 220M CCD
HDC-700/750

2/3" 220M CCD
HDC-900/950

2/3" 220M CCD
Progressive CCD
HDC1000/1500/1400

2/3" 220M CCD
Progressive CCD / 14bit
HDC1000R/1500R/1400R

2/3" 220M CCD
HDW-700
HDCAM

2/3" 220M CCD
HDW-750
HDCAM

2/3" 220M CCD
HDW-790
HDCAM

2/3" 220M CCD
PDW-700 / F800
HD XDCAM

2/3" 220M CCD
HDW-F900
Cine Alta

2/3" 220M CCD
HDW-F900R
Cine Alta

2/3" 1~60P
4:4:4
SRW-9000
Cine Alta

HDTV와 현행 TV수상기의 최적시 거리

HDTV 연구의 출발점은 좀더 가까운 거리에서 인간의 시각적 경험에 충실할 수 있는 매체를 개발하기 위한 연구로부터 시작.

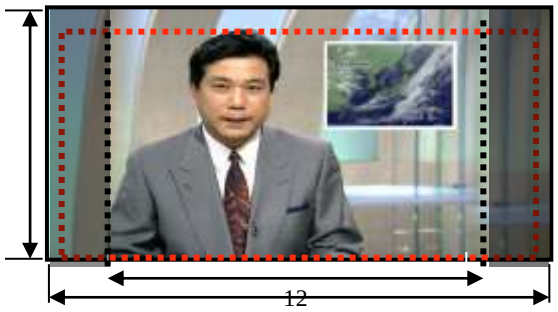
News의 제작시스템의 Hi-Vision 시작

Great Hanshin Earthquake(1995.1.17)

HD로 보니까 현장감이 있다. 하이비젼 촬영은 **NHK**가 세계 최초 보도.
이 사건 후 뉴스도 **HD**로 해야겠다는 판단을 **NHK**가 하게 됨.
HIVISION 뉴스의 가능성이 현실적으로 된 사건.

2. NTSC와의 차이점

- 기본적으로는 525에서의 제작기법과 동일
- 화면비 = 표현 공간의 확대
  구도(構図:Picture Composition)에 영향으로 셋트(Set)를 넓게 만들 필요가 있다
- 정밀도(Detail) = 영상 정보량의 증가
  셋트의 질감(質感)(Texture of Set)이 보인다 →구성(構成: Structure)에 영향
  포커스(Focusing)가 어려움
- 2방식(HD/SD)을 혼재하여 사용하는 과도기에서는 시스템에 대한 정확한 이해가 필요



<유효 화소와 데이터 량>

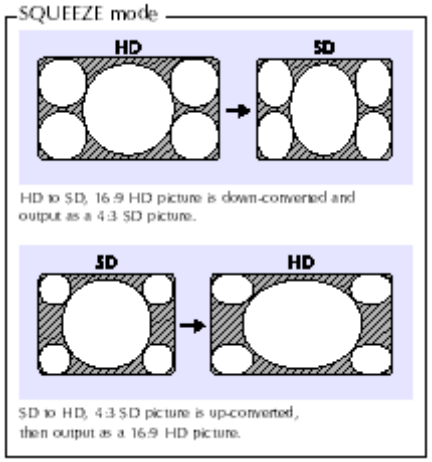
- 유효주사선 １０８０개
- 수평 화소 １９２０pix = １０８０×１６／９
- 데이터 량

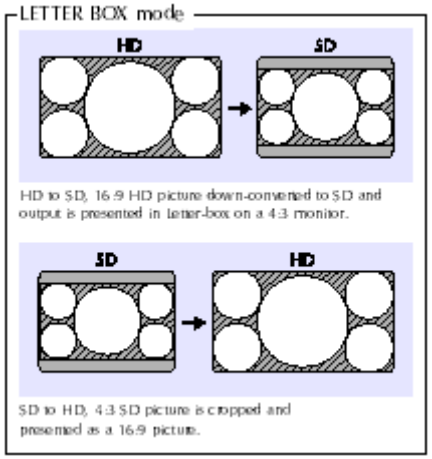
  1920pix×1080line×30fr×8bit(10bit) = 62.2Mbyte/s = 497Mbps（621Mbps）/ch

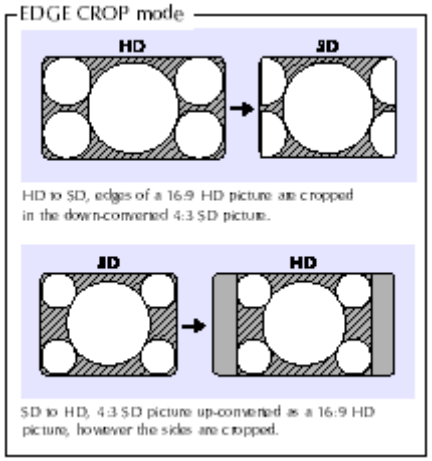
  R+G+B ≒ 1.5Gbps , Y+Pb+Pr ≒１ Gbps

  NTSC(4:2:2) 720×480×30×8×2≒ 166Mbps

  HDTV ≒NTSC× 6







3. HD Camera System의 변화

1080/60P 3Gbps와 3D Solution의 시작

1080/60P를 3 Gbps로 Single Link (BNC) 전송

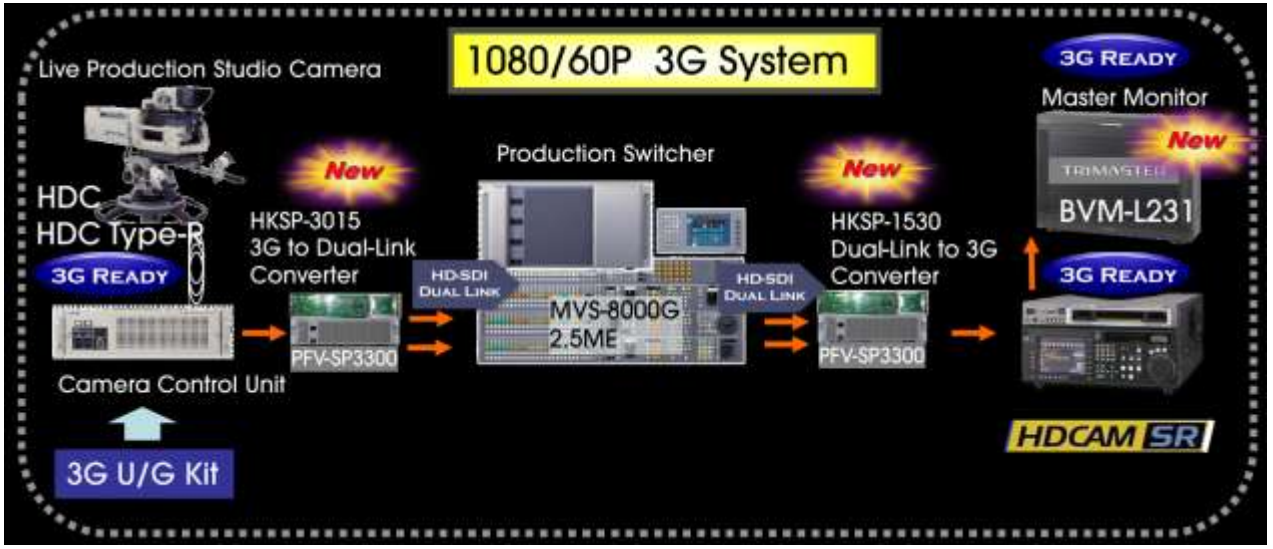
Why 1080/60P ?

→ Consumer 장비의 변화

- HDMI와 DVI로 1080P 이상이 지원
- FULL HD (1920 x 1080 Progressive)의 Large size의 LCD TV
- 1920 x 1080 Progressive CG

→ True Single Master for multi-purpose

- 1920 x 1080 Progressive Master
- Cinema 와 최상의 Sports를 위한 1080P Package Master
- 1080i / 720P HDTV & 625 /525 SDTV의 On-air Sports / Drama / CM에 원활한 대응



Sports & Live Production Progressive System

3G System 구성

Current System

HDC1000/1000R/1500/1500R/1400R

1.5Gbps 전송

HDCU1000/1500

1080/50i,59.94i

1.5G HD SDI

Standalone

1080/50P,59.94P

Dual Link

Optional Kit for 3G Upgrade

3G Up Grade

3Gbps 전송

1080/50P,59.94P

Dual Link

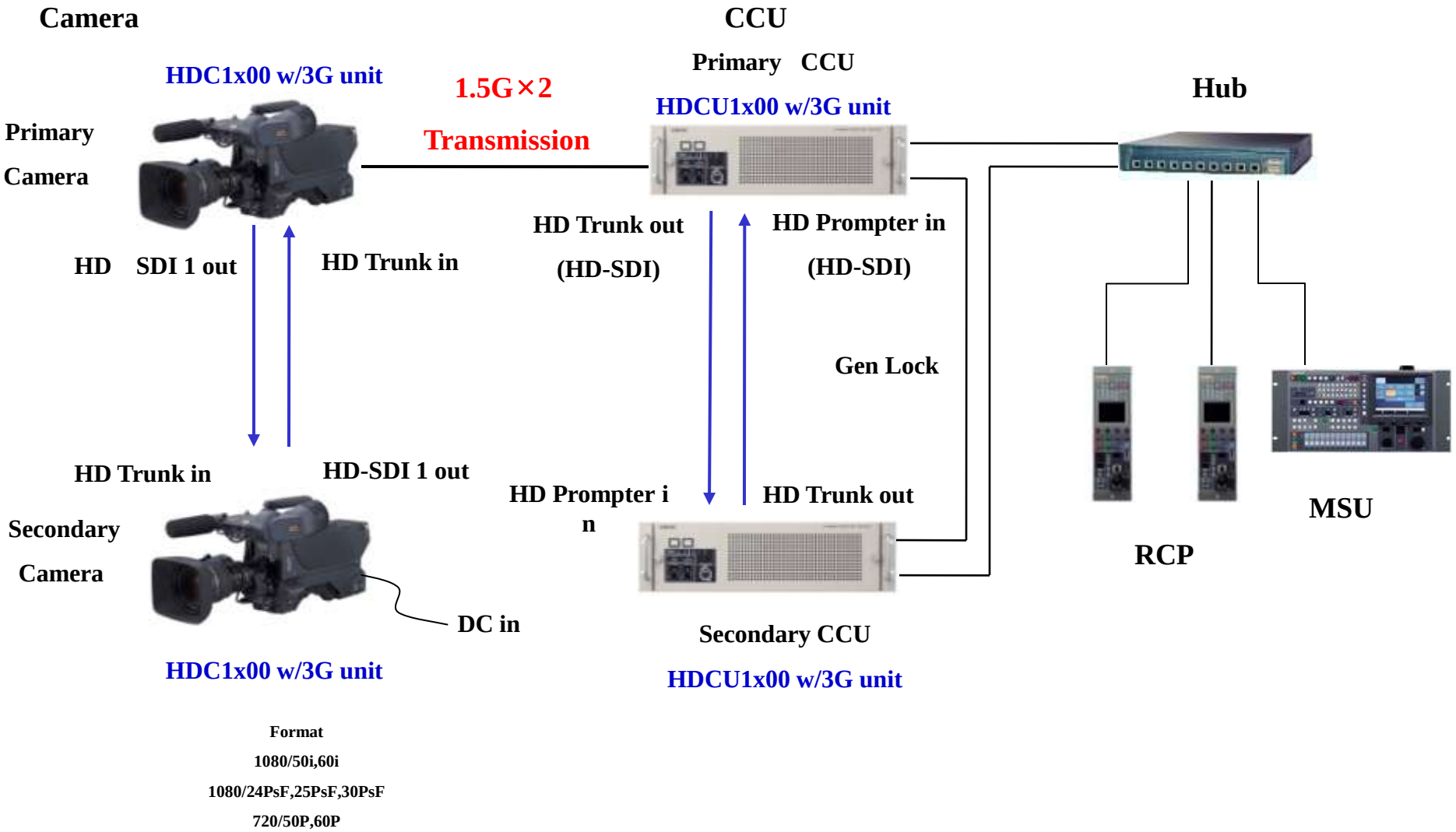
3G SDI

1080/50P,59.94P

Dual Link

3G SDI

3G Dual Camera Operation
(2Camera-2CCU-2RCP)



Format

1080/50i,60i

1080/24PsF,25PsF,30PsF

720/50P,60P

3G Sub Camera Operation
(CAMERA+POV – CCU - 2RCP)

Camera

HDC1x00 w/3G unit

Main Camera

1.5G×2 Transmission

CCU

HDCU1x00 w/3G unit

CNU

CCA

HD Trunk in

SYNC out

CCA (700Protocol)

AUX Remote (for POV)

HD Trunk out (POV HD-SDI)

RCP

No Tally

Gen Lock in

HD-SDI out

Sub Camera

DC in

HDC-P1

Format

1080/50i,60i

1080/24PsF,25PsF,30PsF

720/50P,60P

“3D”제작 환경의 배경

- This is 3rd time “boom” historically
  - 1950s(TV보급에 대항)
  - 1980s(저가의 애너글리프방식)
  - 2005 –

- Because of…
  - 제작 장비들의 기술적 진화
    - HD Digital Projector / HD Digital Camera
  - 디지털 상영관의 증가
    - Driven by Hollywood (배급권/비용효율/새로운 모티브)
  - Internet / Game 시장의 폭발적인 증가
    - Broadband / PS3
  - 디지털 기술 보급에 따른 다양성
    - Flat Panel Display
      (극장의 위기의식팽배)

3D 제작 시스템 구성

HDC-1500 / HKC-T1500
w/3rd vender 3D Rig

Right Steam 1.5Gbps

Left Steam 1.5Gbps

MVS-8000G
w/3D Software

Right

Left

SRW-5800

Right

Left

Monitor Output

3D Projection Unit

For Cinema
SRX-R110

SRX-R110

Fusion 3D Camera system

Left Eye

Right Eye

3DUtilities

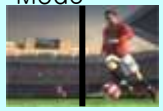
3D Field Sequence
Mode

Stream A
on odd

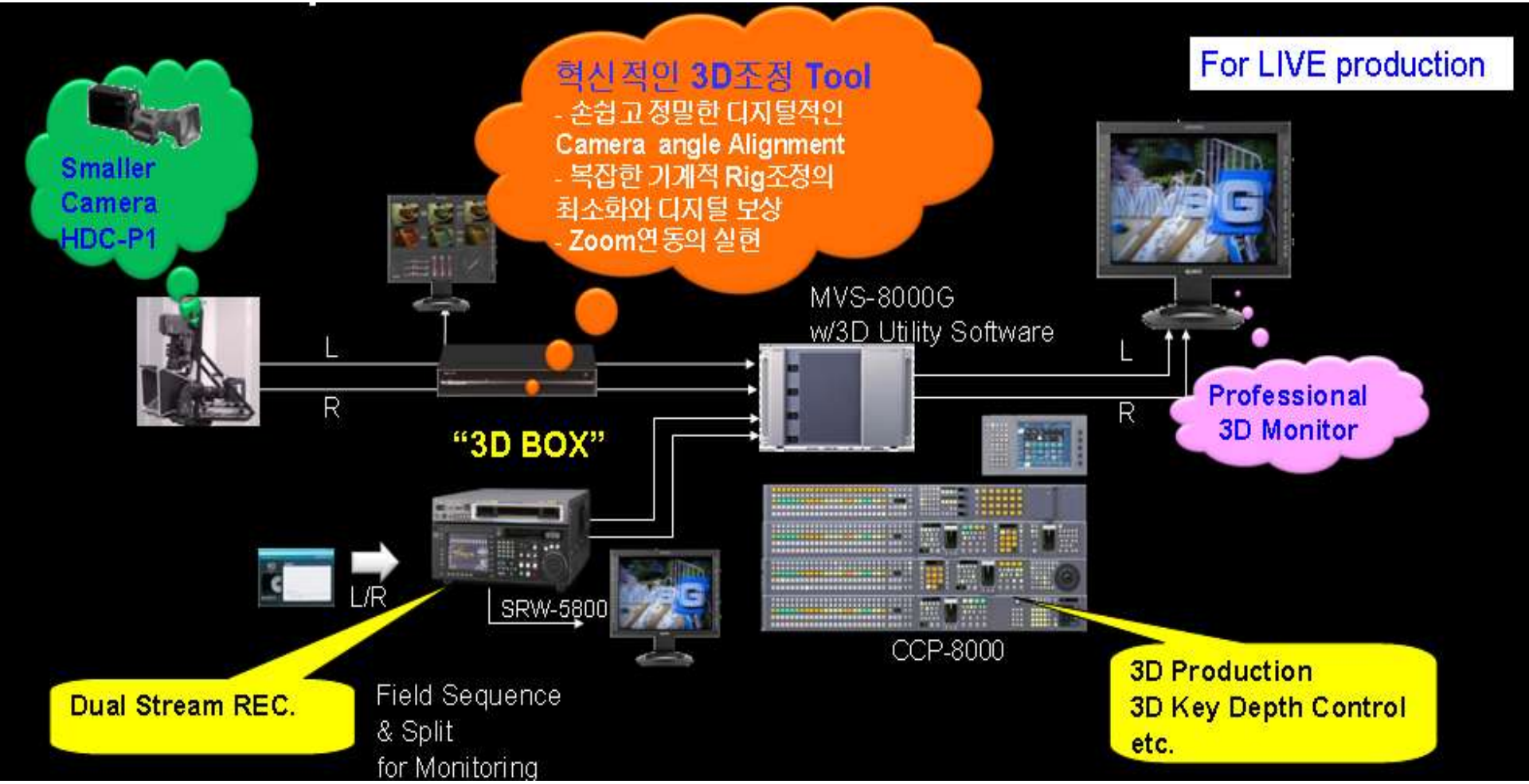
Stream B
on even

or

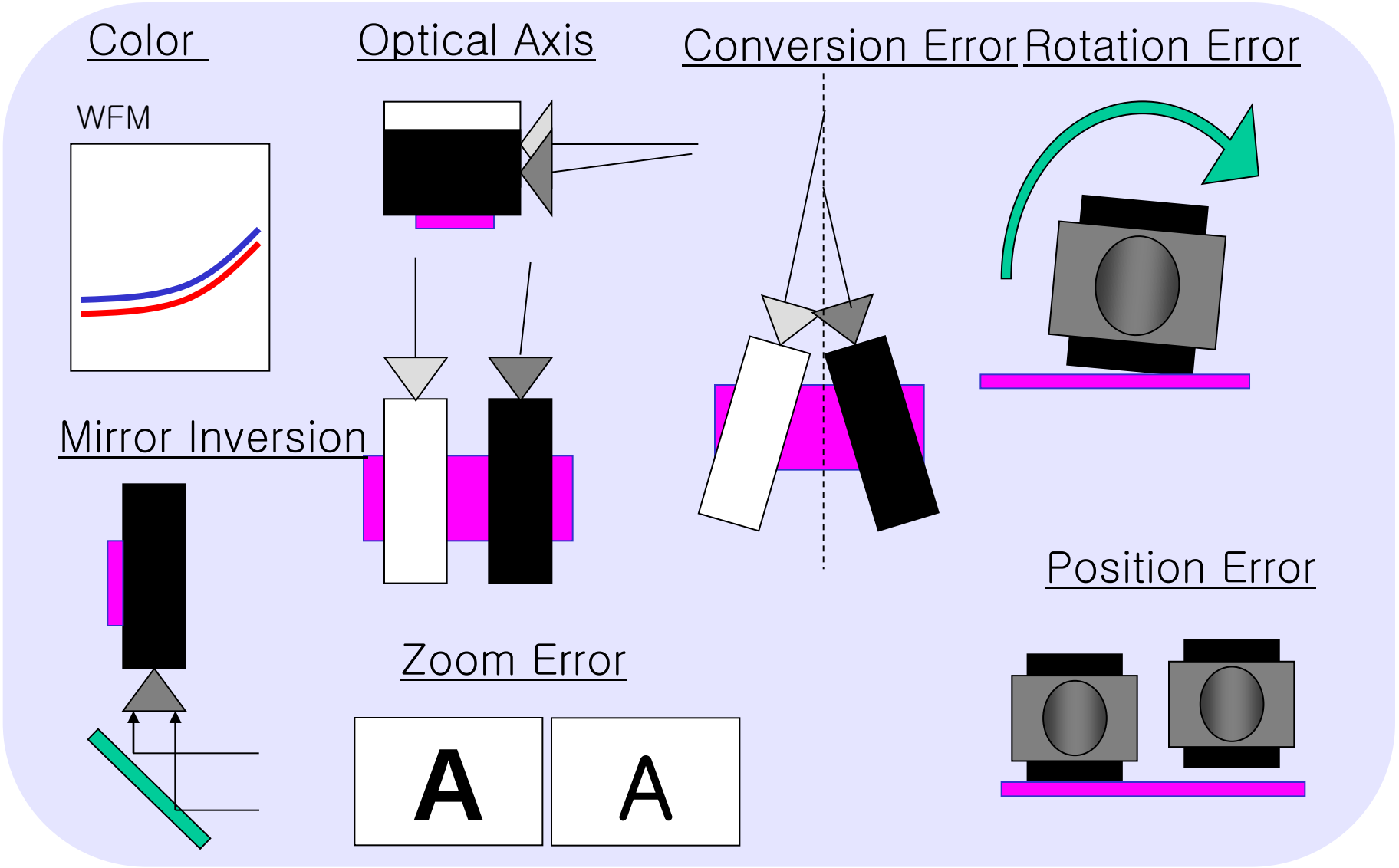
3D Split
Mode



Live 3D production 구현을 위한 해법

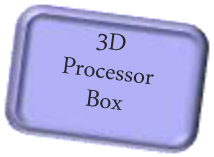


Adjustment Items by 3D BOX



Sony의 3D Box

- 3D 이미지의 조정
  - Convergence simulation
  - Keystone correction
  - Zooming correction
  - Colour correction
  - Position correction
  - Rotation correction
  - Axis correction
  - Image inversion
- 라이브 및 후반 작업 시 사용



Convergence simulation

Keystone correction

Zooming correction

Colour correction

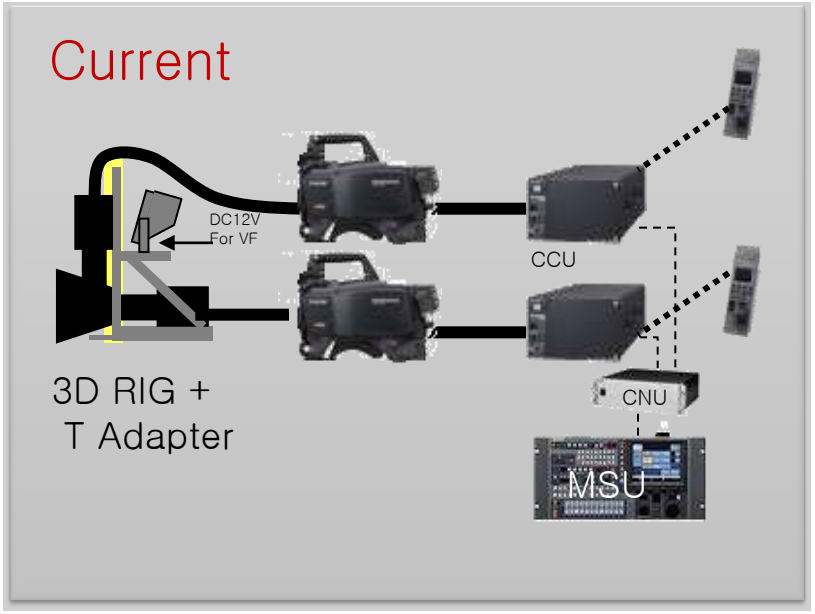
Position correction

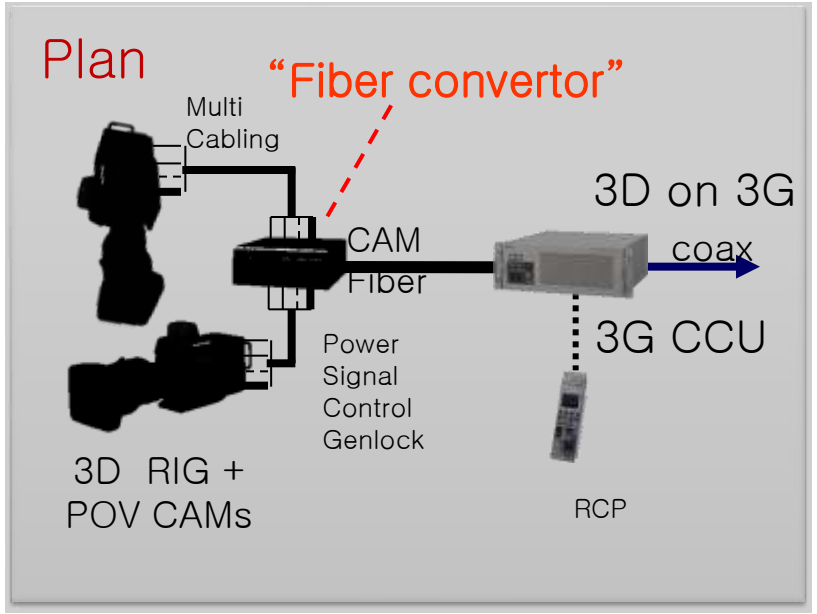
Rotation correction

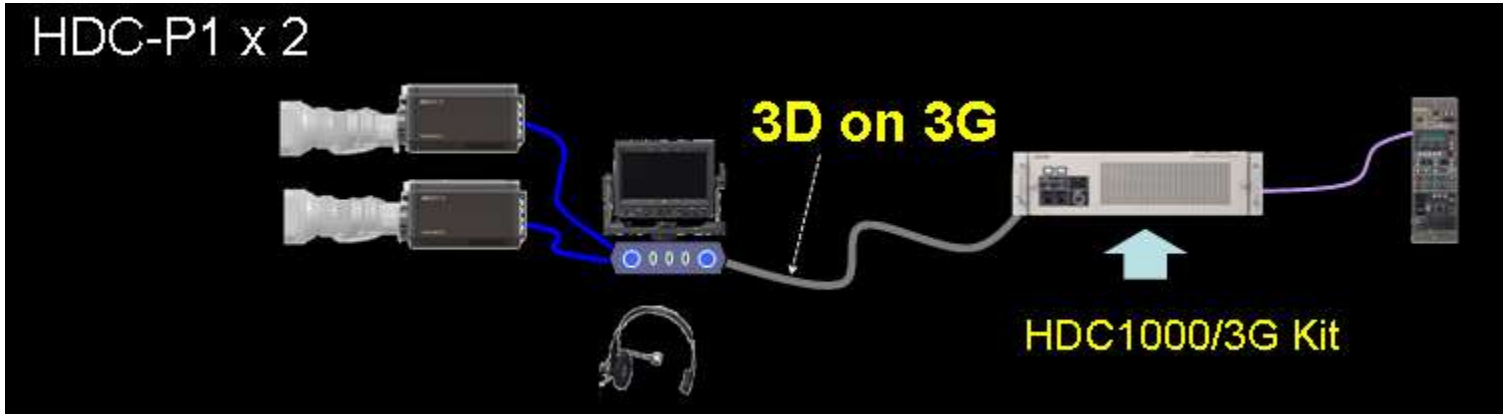
Axis correction

Image inversion

Dual Camera Control System Plan
- 3D on 3G Solution for live production







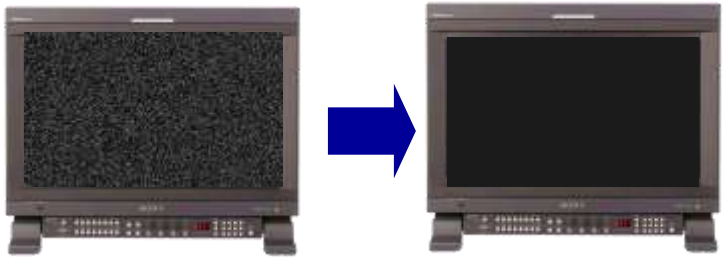
3D Live Contents

NBA의 Live Game-3D

개선된 HD Camera들의 스펙과 기능들...

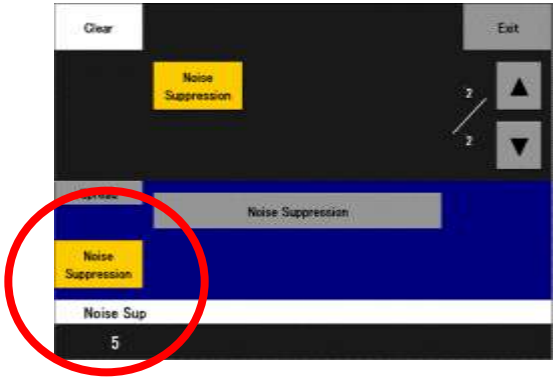
- 노이즈 부분 개선
  - 56dB → 2dB 개선 (S/N비)
  - 자체 NS (Noise Suppression)기능을 통해 64dB까지 확장가능

54dB → 56dB (NS off)



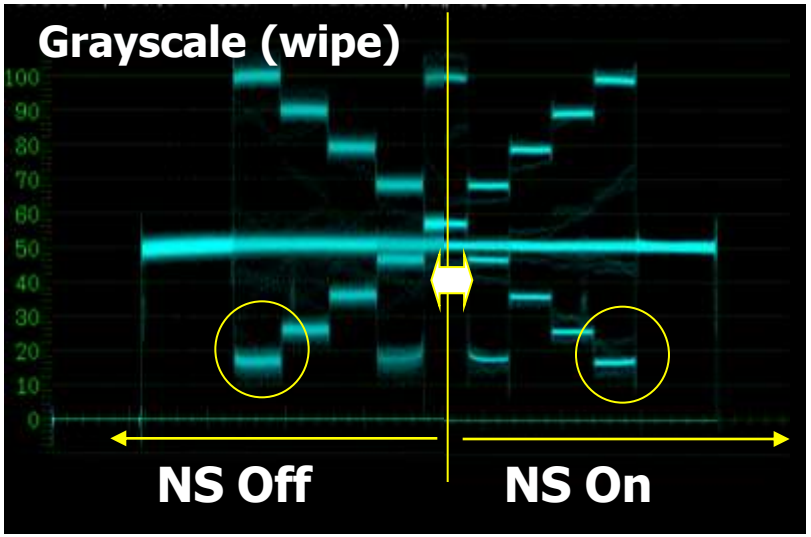
(Conceptual effect of Image)

- "NS" (Noise Suppression)로 노이즈 추가 개선



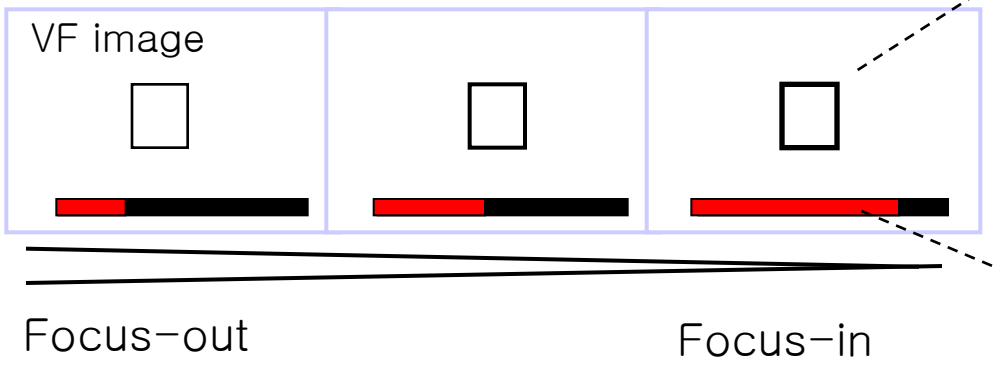
MSU display

56dB (normal)
→ 64dB (w/NS)



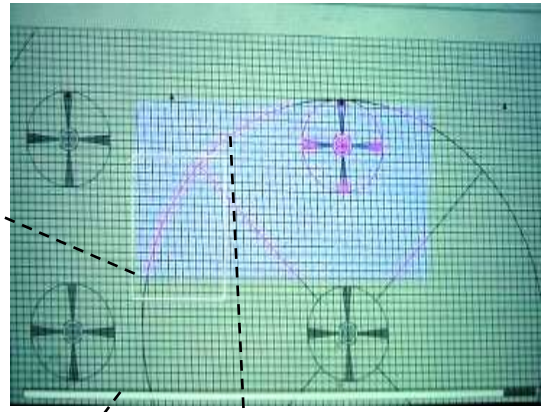
- **Focus Assist Function (포커스 보조 기능)**
  - Focus Assist Indicator : FAI
  - Colored VF Detail

HD Camera에서 어려워진 Focus 조정에 대한 보조 기능



포커스 위치탐지

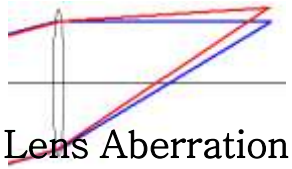
실제 화면표시 영상
(shoot resolution chart)



Bar표시

Colored or Scrawled
VF Detail

- **ALAC : Auto Lens Aberration Compensation (자동 색 수차 보정 기능)**
  - Reduce “Color Fringe” to achieve “Quality Image”
  - Compensate chromatic lens aberration at corner

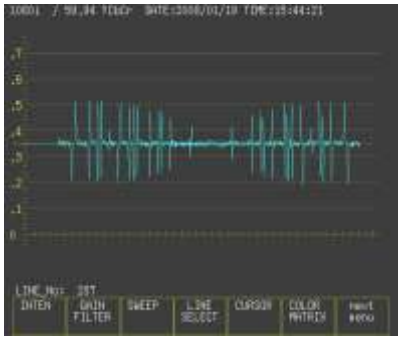


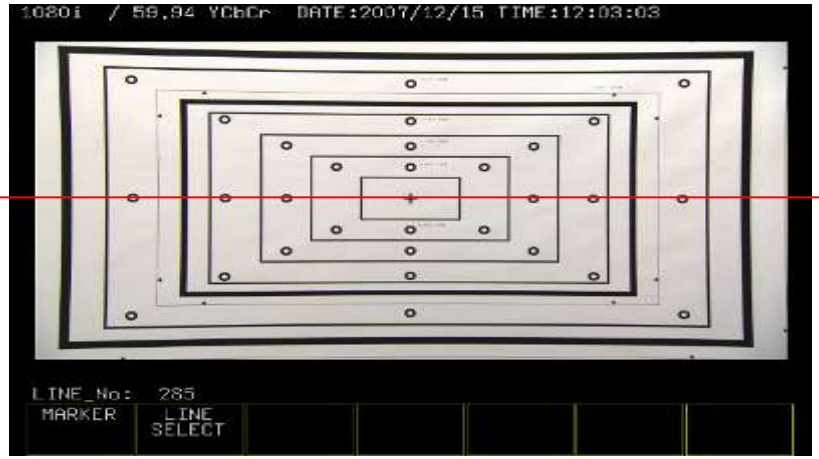
Lens Aberration

Waveform Image
of Lens Aberration

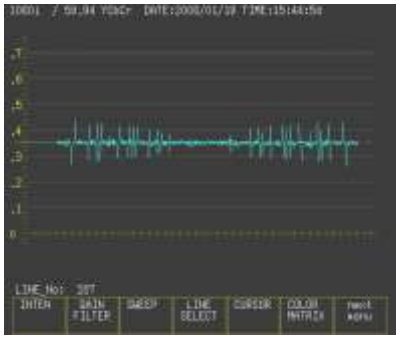
전용 Lens 사용시에 가능

Before

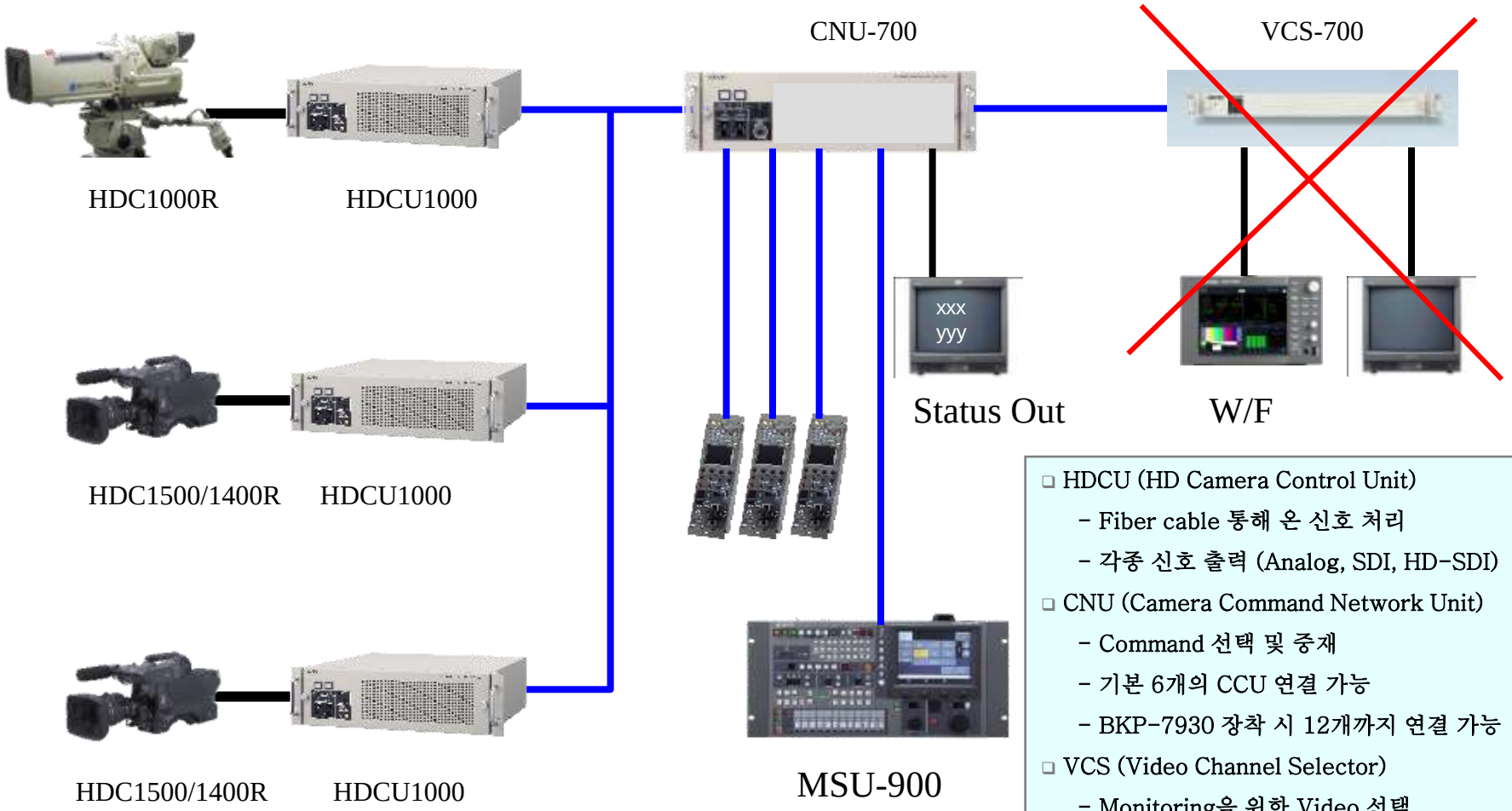




After

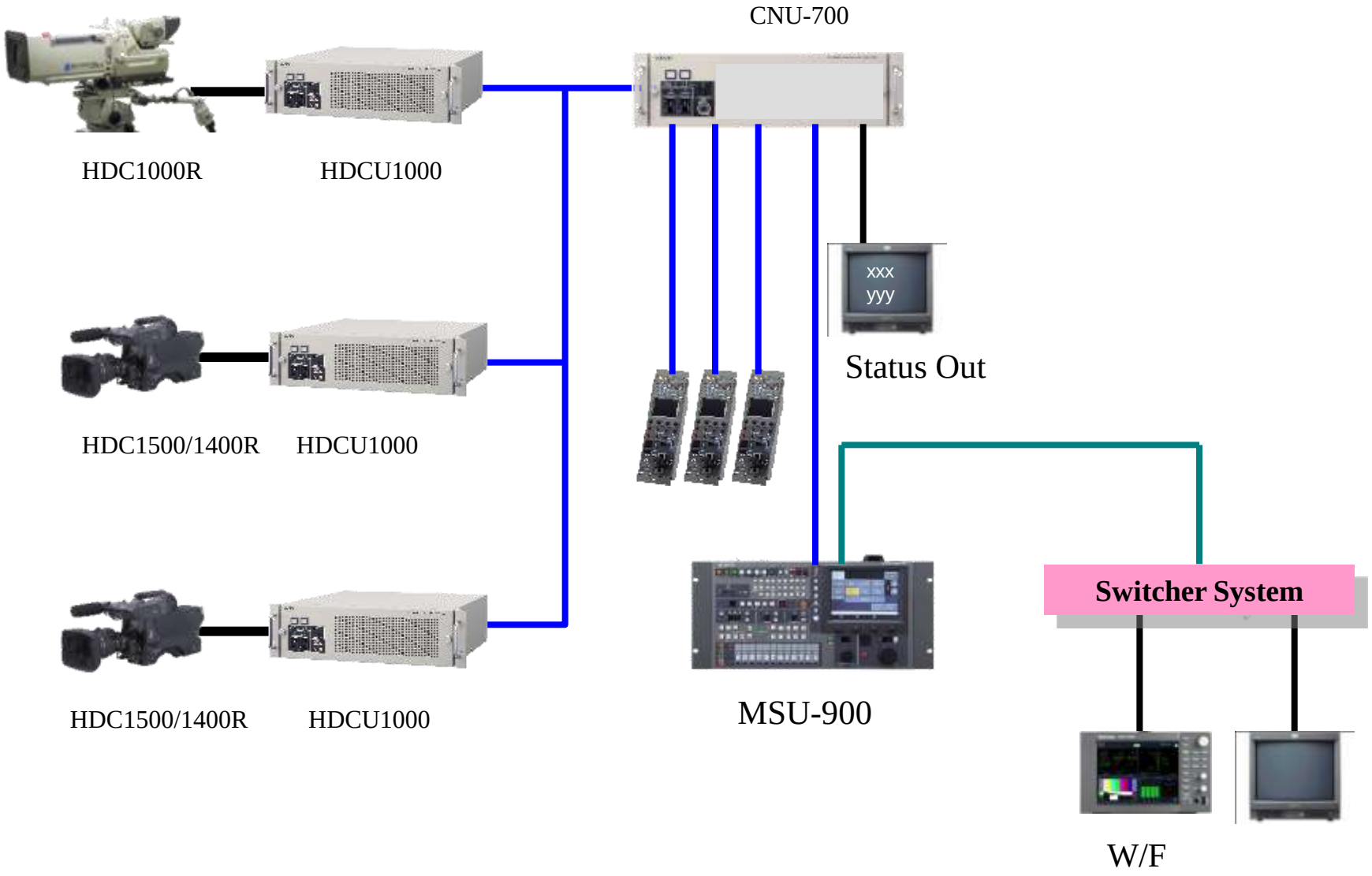


System Configuration의 변화



- HDCU (HD Camera Control Unit)
  - Fiber cable 통해 온 신호 처리
  - 각종 신호 출력 (Analog, SDI, HD-SDI)
- CNU (Camera Command Network Unit)
  - Command 선택 및 중재
  - 기본 6개의 CCU 연결 가능
  - BKP-7930 장착 시 12개까지 연결 가능
- VCS (Video Channel Selector)
  - Monitoring을 위한 Video 선택
- RCP (Remote Control Panel)
  - Iris, Filter 및 각종 Painting 조정
- MSU (Master Setup Unit)
  - 여러 개의 RCP 대신 및 정밀 조정용
- OHB (Optical Head Block, CCD)

System Configuration의 변화



System Configuration의 변화

Network System 1

Ethernet Hub

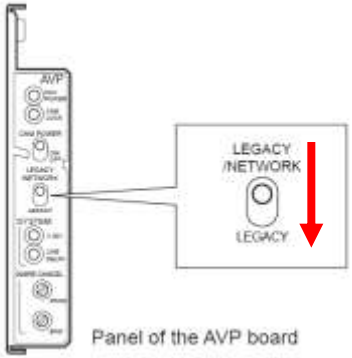
MSU

Ethernet cable

CCA-5 **CCA-5** **CCA-5** **CCA-5** **CCA-5**

RCP **CCU** **RCP** **CCU** **RCP** **CCU** **RCP** **CCU** **RCP** **CCU**

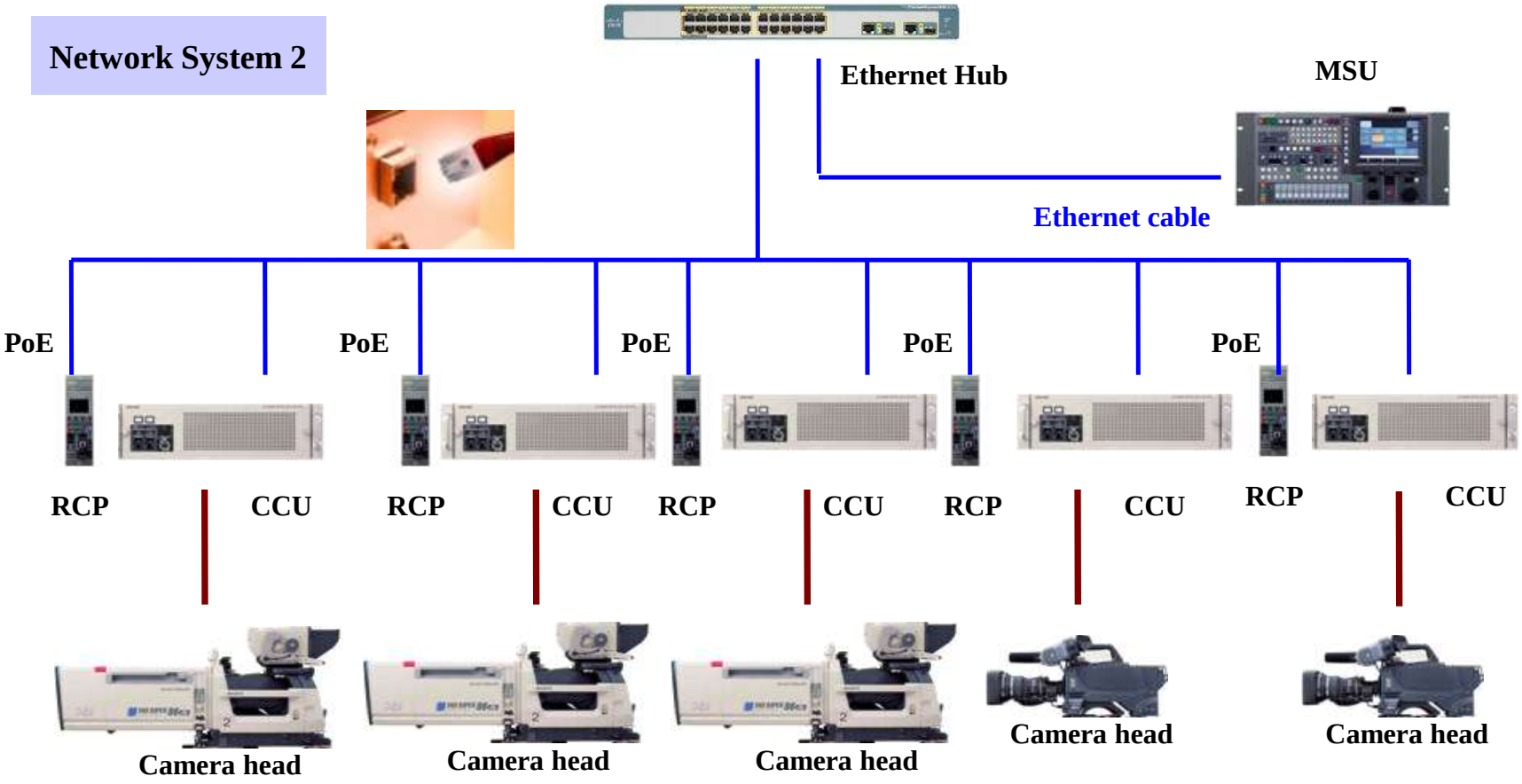
Camera head **Camera head** **Camera head** **Camera head** **Camera head**



Panel of the AVP board

Network이 Down 되었을 경우 HDCU의 AVP Bard의 LEGACY/NETWORK Switch를 LEARCY로만 전환 하면 바로 RCP 운용이 가능 함

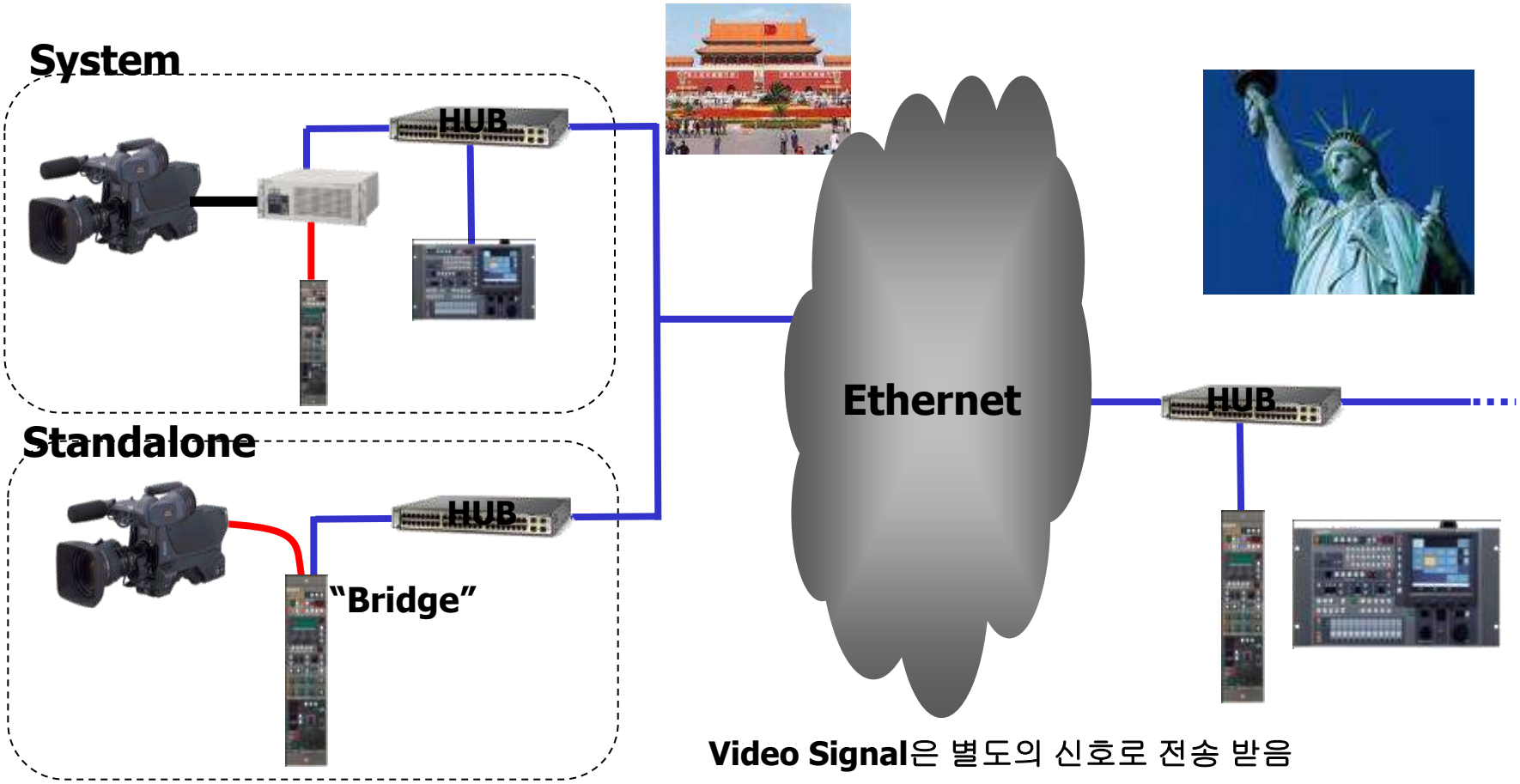
System Configuration의 변화



* RCP의 경우는 전원 공급이 필요하기에 PoE (Power of Ethernet) Type의 Hub와 연결이 필요함

System Configuration의 변화

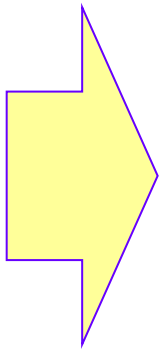
원거리 원격 제어 가능

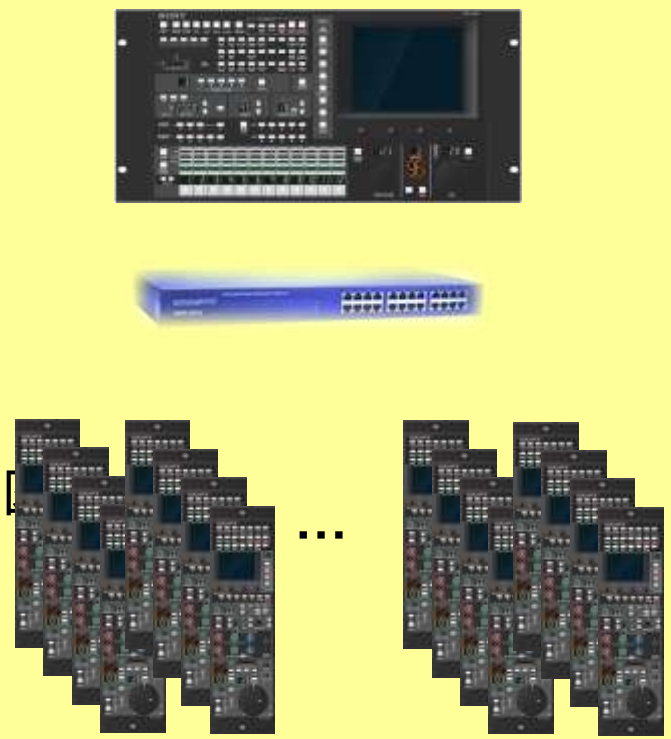


Video Signal은 별도의 신호로 전송 받음

System Configuration의 변화

Current system
Up to 24 cameras
As standard

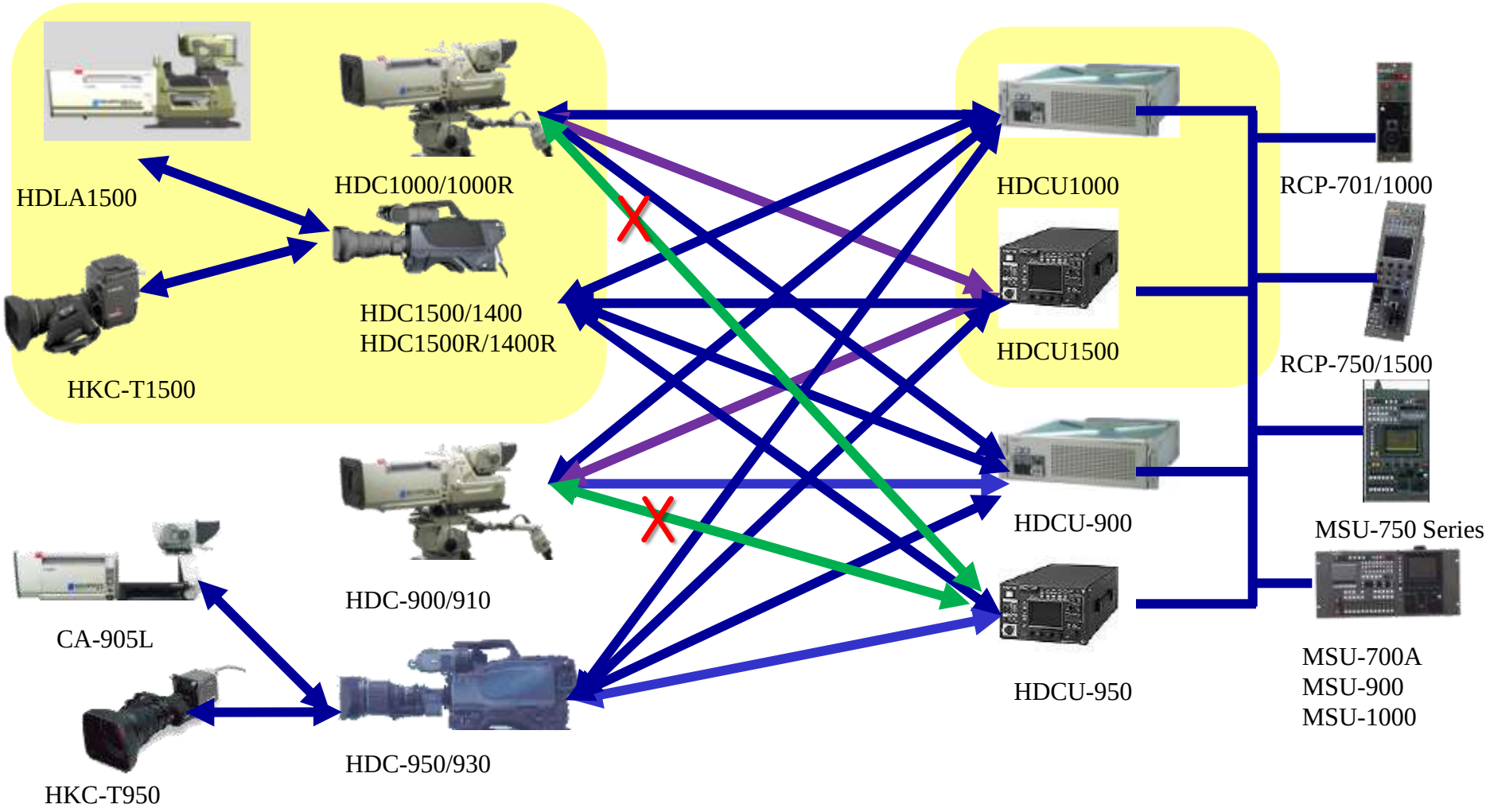




Current system
Up to 96 cameras
As standard

HDC-1000R/1500R Series Mechanism

HDC-1000R Series Camera system compatibility



HDC-1000 Series과 HDC-1000R Series 호환성

HDC-1000 Series 와 HDC-1000R Series 비교

Model	HDC-1000 /1500 /1400	HDC-1000R /1500R /1400R
S/N	54dB	56dB
Noise Suppuration (DNR)	62dB	64dB
VF Focus Assist 기능	불가능	가능
3G Upgrade	HDC-1400외 가능	가능

HDC-1000 /1500/1400 → 서로간에 CCD Block 과 주변 Board는 동일 부품 사용으로 모두 호환됨

단, HDC-1000 과 HDC-1500/1400 의 Power unit 만 제외

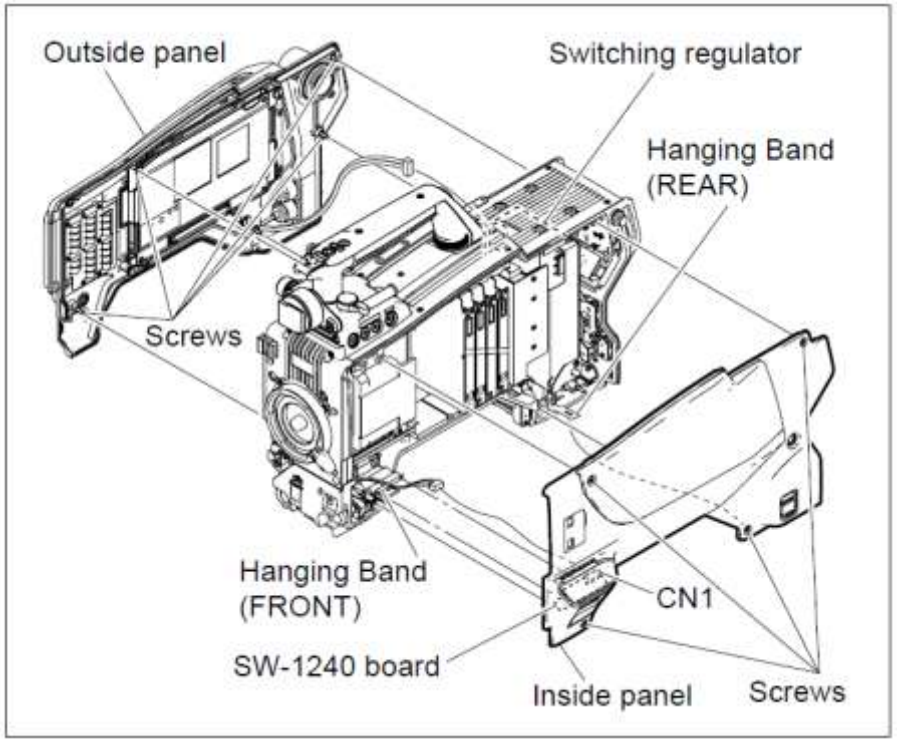
HDC-1000R /1500R/1400R → 서로간에 CCD Block 과 주변 Board는 동일 부품 사용으로 모두 호환됨

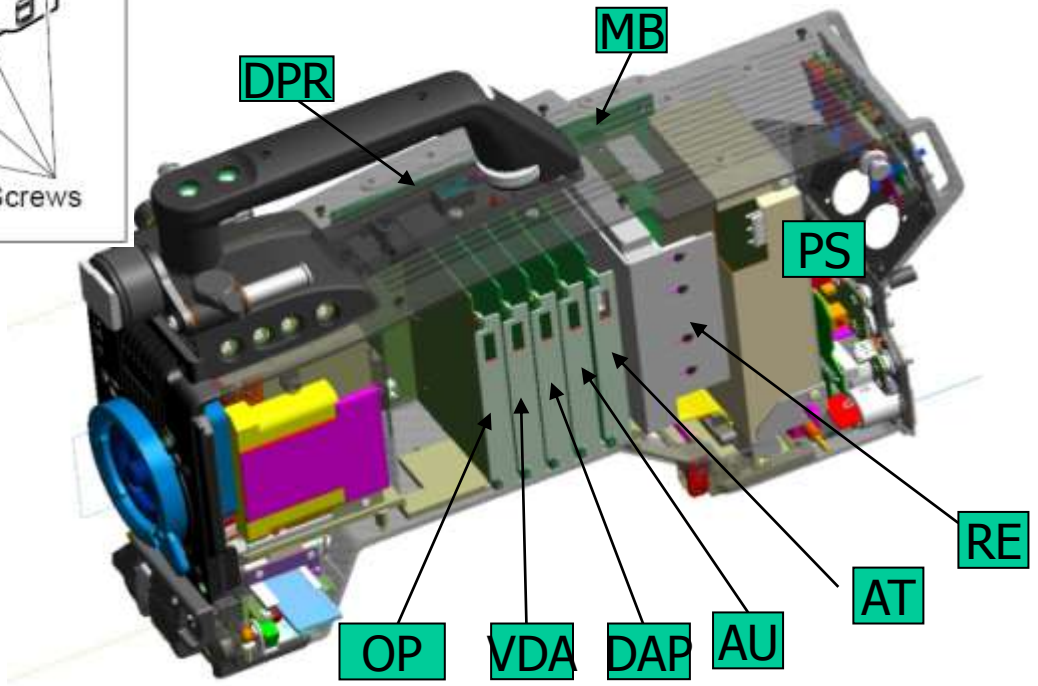
단, HDC-1000R 과 HDC-1500R/1400R 의 Power unit 만 제외

< 주의 >

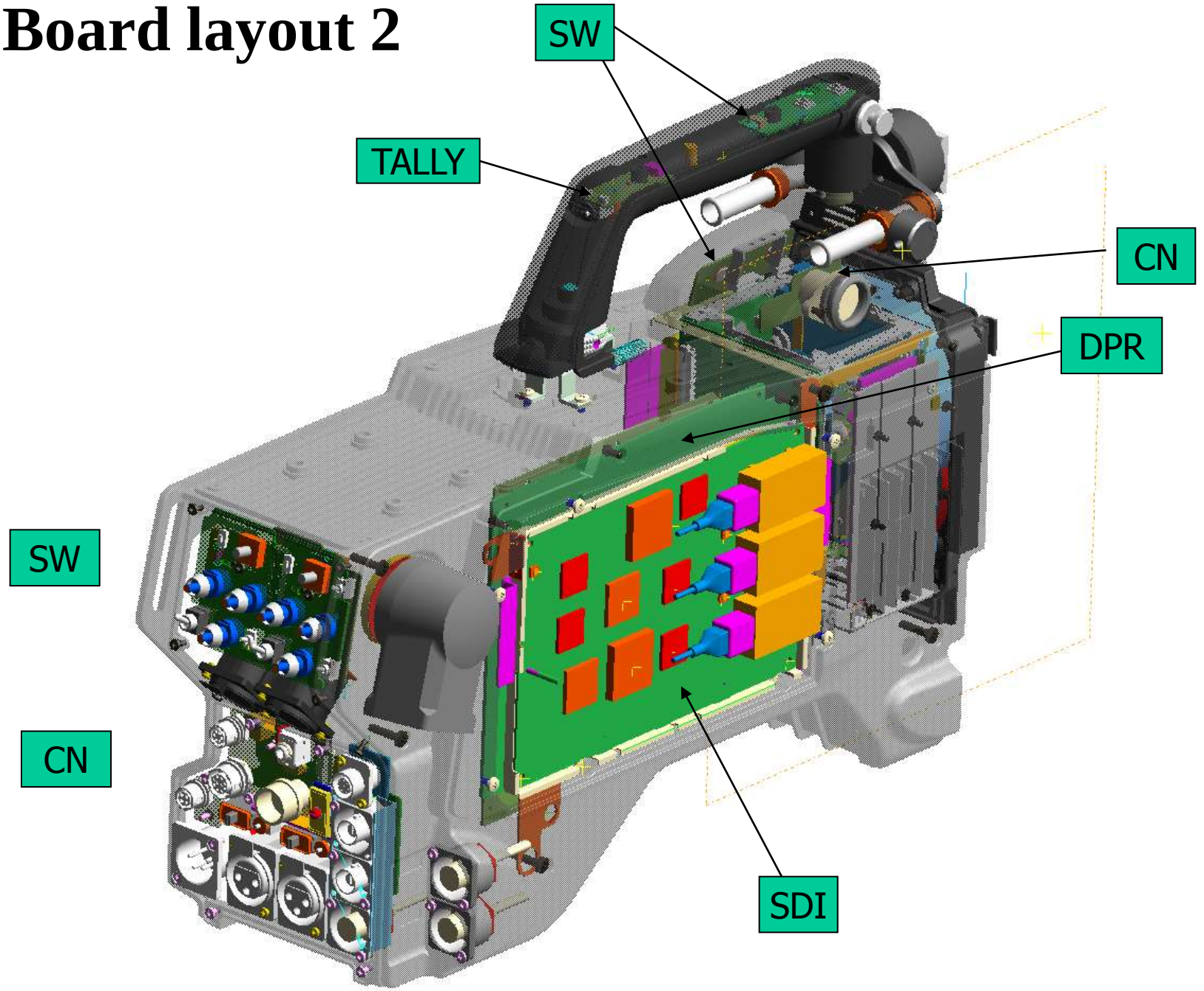
HDC-1000 Series와 HDC-1000R Series는 서로 다른 제품으로 서로 호환되는 부분이 없음

Board layout 1



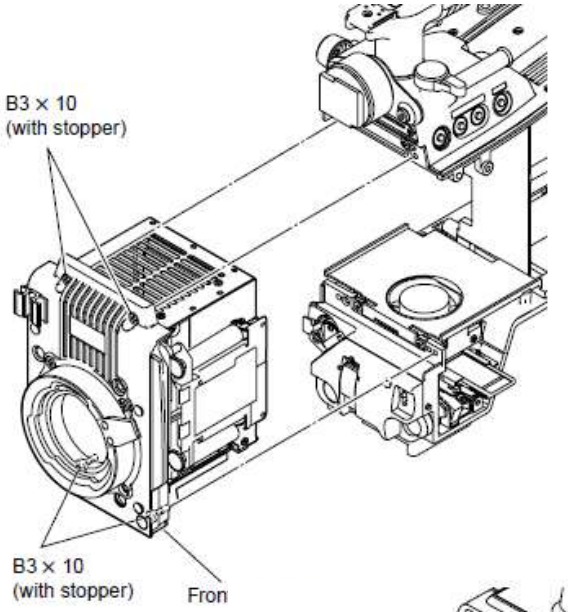


Board layout 2

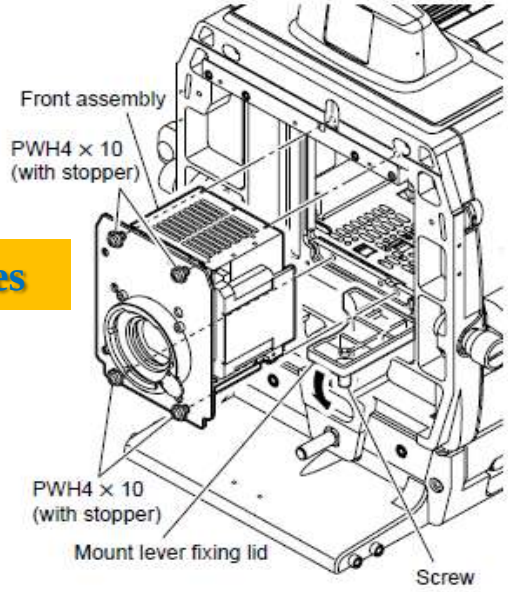


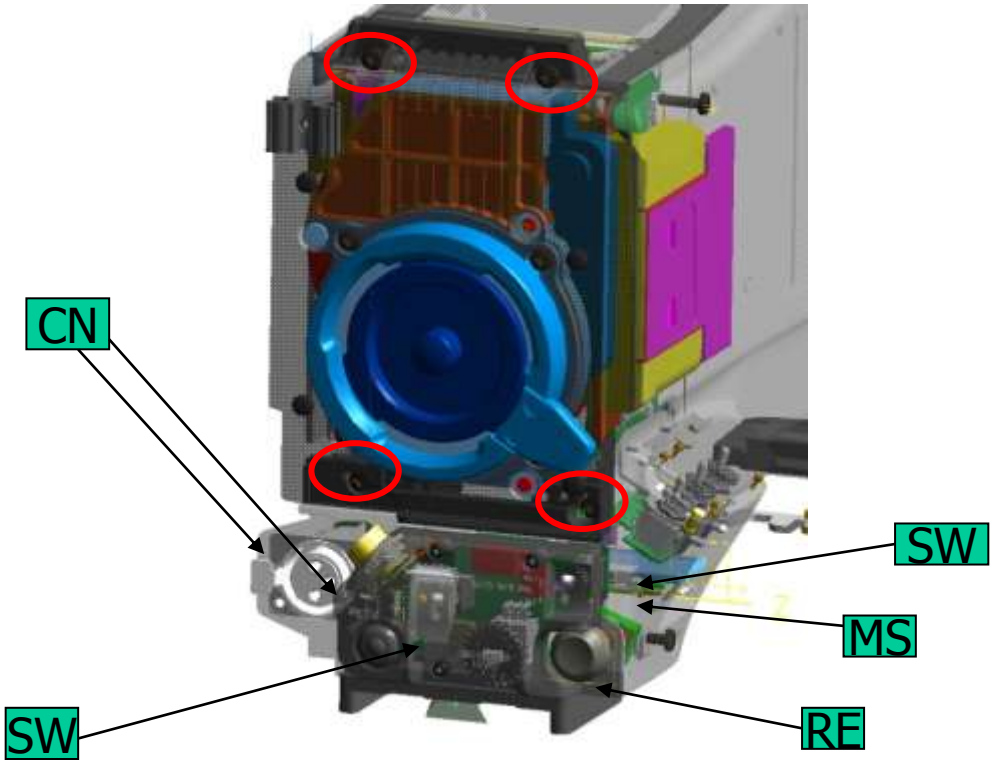
Front Switch Board layout

HDC-1500 Series



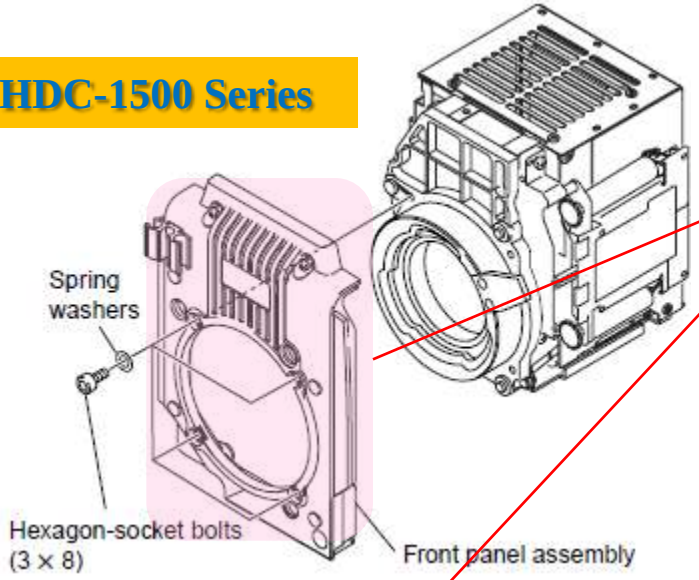
HDC-1000 Series





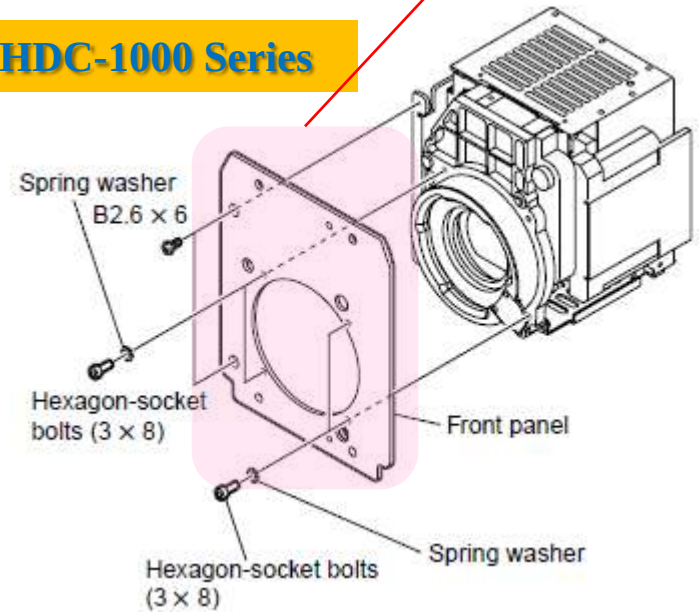
OHB (Optical Head Bock) Board layout

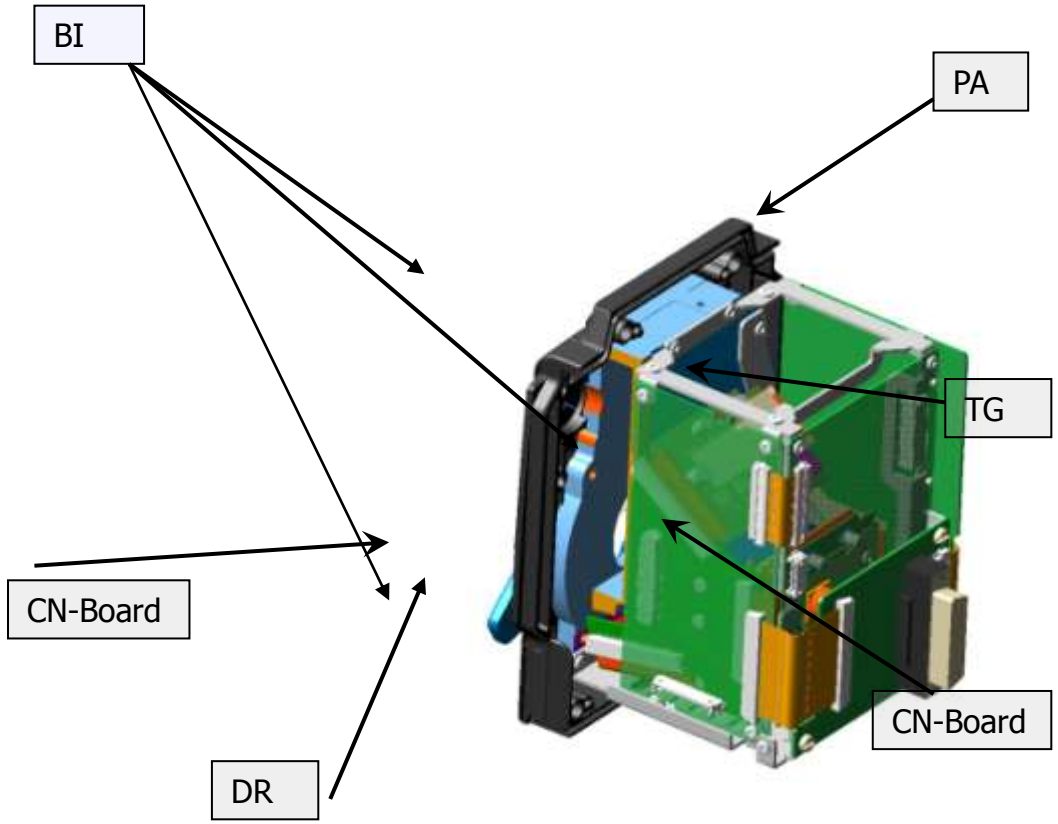
HDC-1500 Series



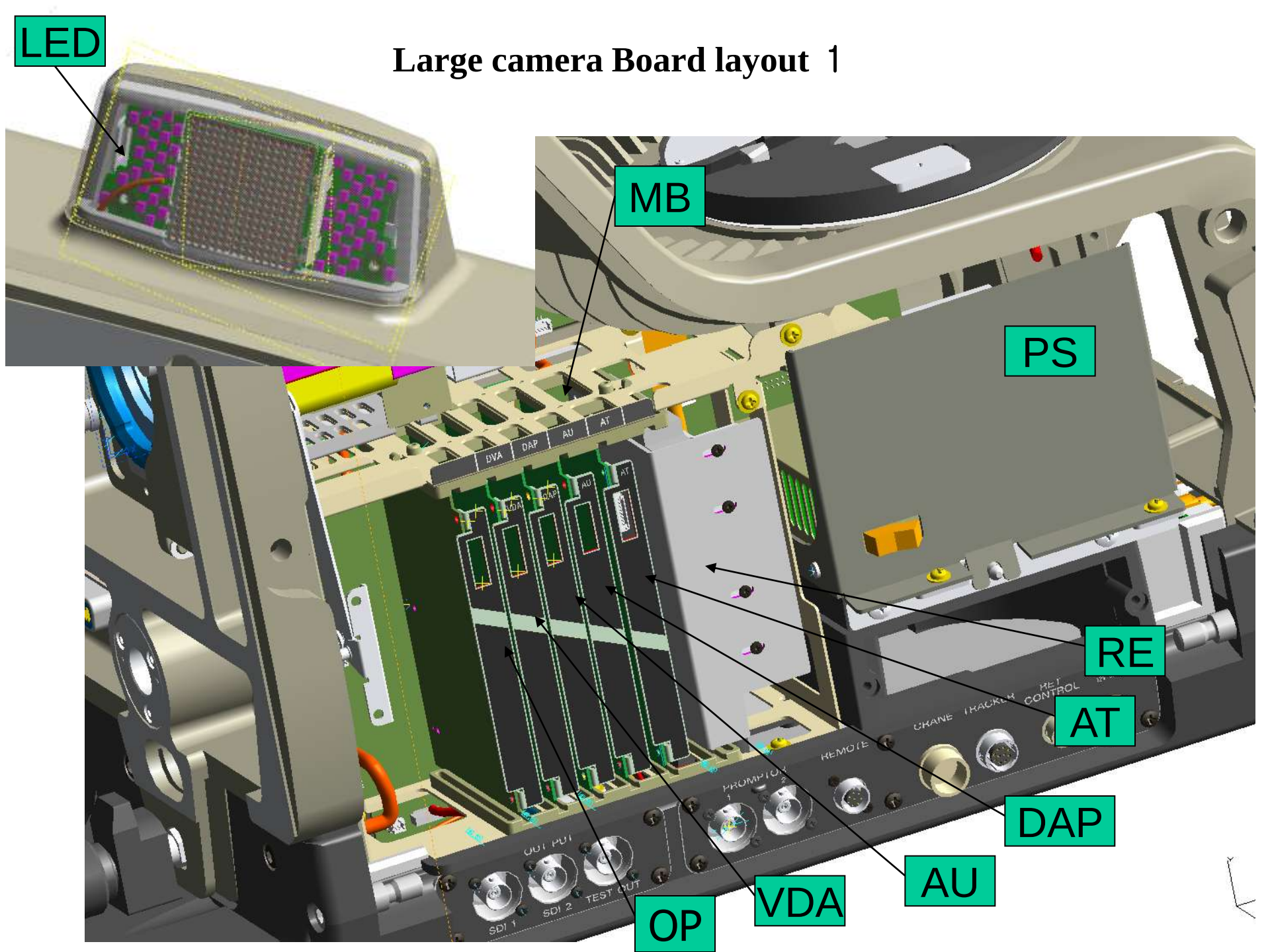
연결 **Frame**만 교체하여 상호 교환 가능

HDC-1000 Series

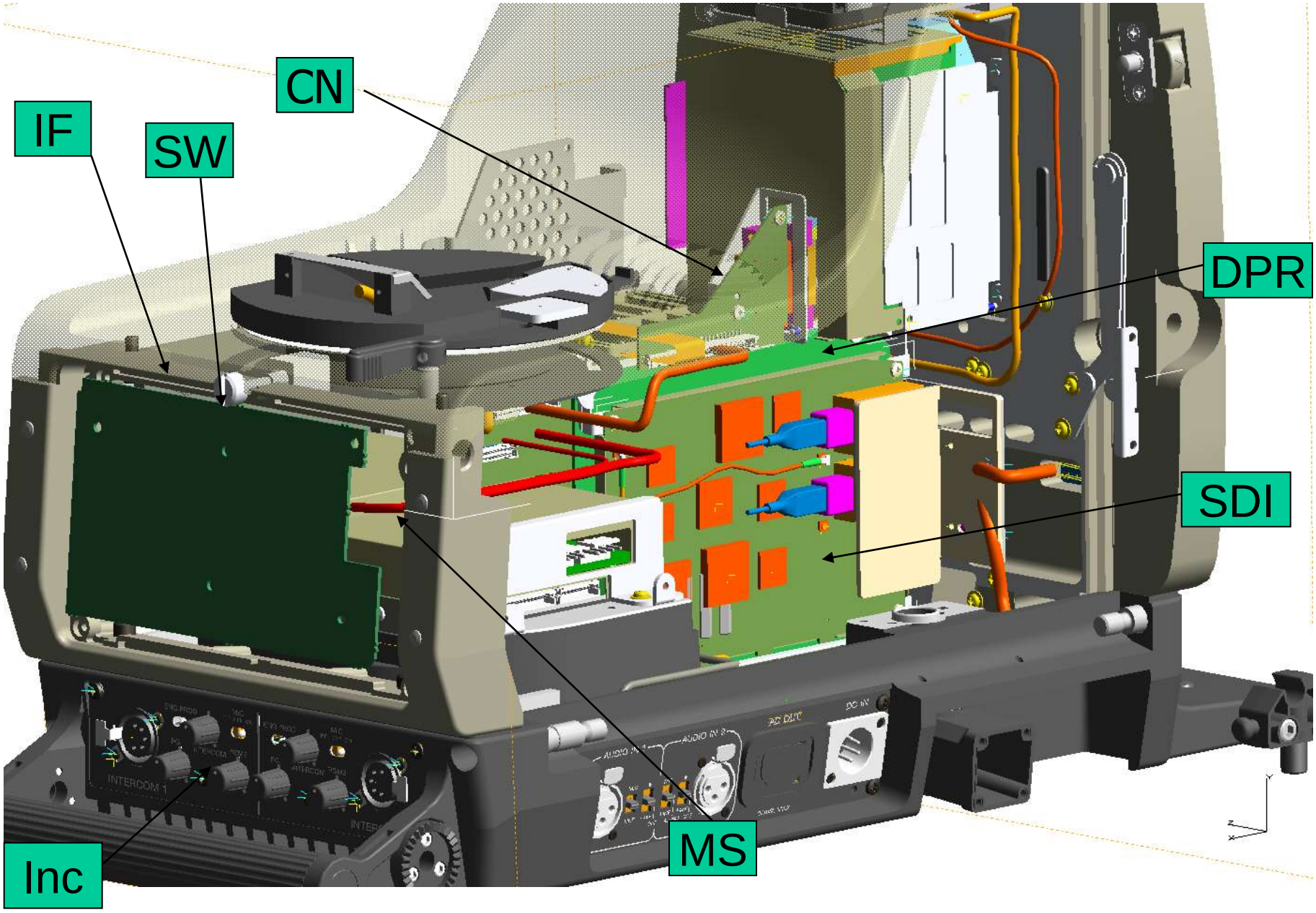




Large camera Board layout 1



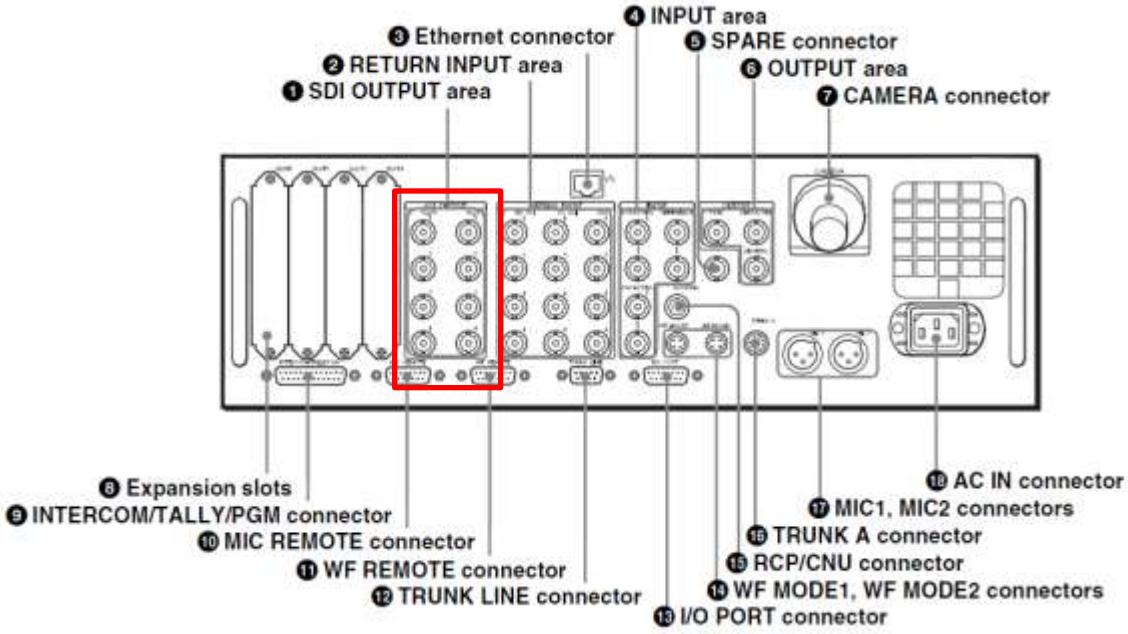
CAX-120 Board layout 2

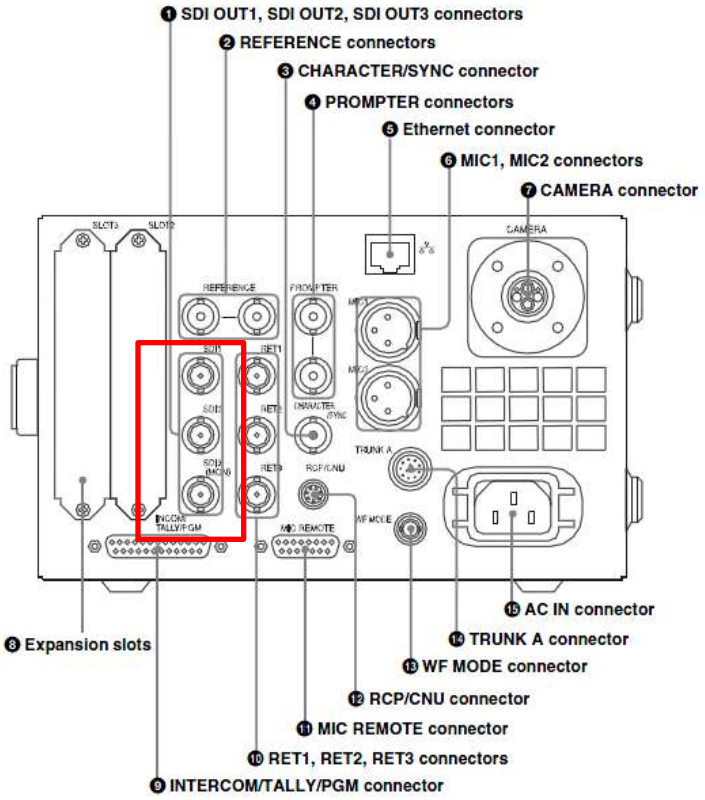


HDCU-1000/1500 Mechanism

HDCU-1000

HDCU-1500





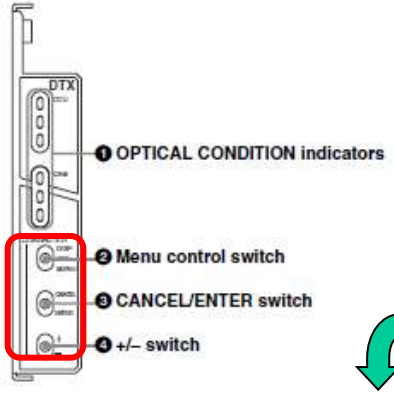
SDI Output이 총 8개 단자
HD SDI와 SD SDI Output을 Menu에서 변경하여 사용

SDI Output이 총 3개 단자
HD SDI와 SD SDI Output을 Menu에서 변경하여 사용

HDCU Menu structure

Menu SW

Status Display Page



DTX Board

Menu SW

CCU Menu Page

MSU/RCP에서 제어 가능

- VF Display
- Camera Status
- SD Signal Status
- System Status
- Diagnosis
- System Diag 1
- System Diag 2
- System Diag 3
- AT Board Diag
- AVP Board Diag
- DTX Board Diag
- DRX Board Diag
- DRX Board Diag
- SLOT3 Board Diag
- SLOT4 Board Diag
- SLOT5 Board Diag
- SLOT6 Board Diag
- SDP Board Diag
- CAMERA Diag
- ROM Version

** CCU-MENU **

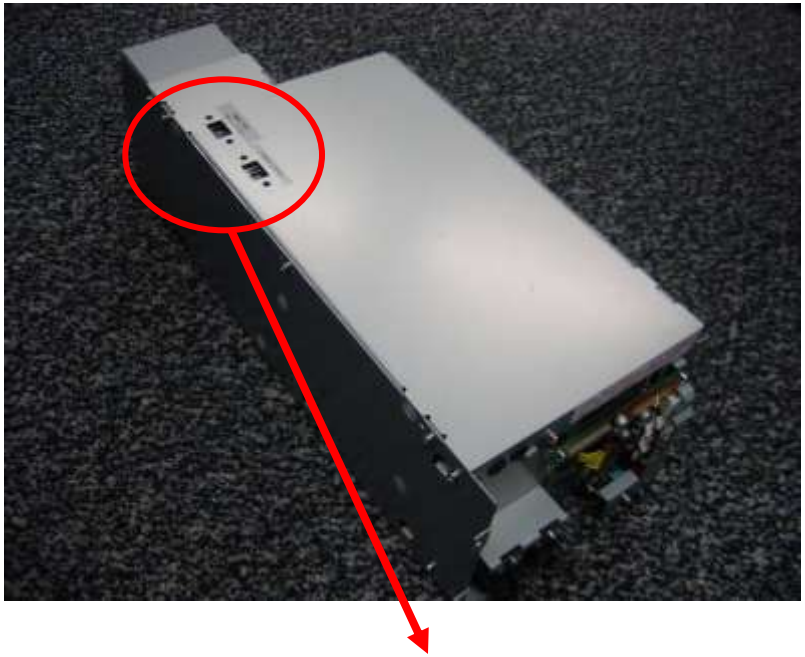
→SYSTEM OPERATION
CCU CONFIGURATION

- Output-Select S00
- GEN-LOCK PHASE S01
- MULTI FORMAT S02
- OUTPUT FORMAT S03
- SD ASPECT S04
- RETURN FORMAT S05
- RETURN SETUP S06
- CCU VIDEO S07

- COLOR BAR C00
- MONITOR1 C01
- MONITOR2 C02
- I/F SETUP C03
- MIC/AUDIO C04
- INCOM/PGM C05
- PROMPT/TRUNK C06
- VIDEO SETUP C07
- VIDEO ADJUST C08
- VIDEO ADJUST2 C09
- MENU SETTING C10
- DISPLAY C11
- DATE C12

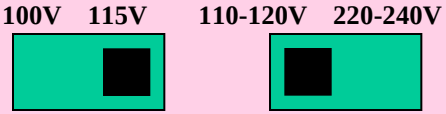
HDCU1000 Power supply unit

*** HDCU1500 → Free voltage**



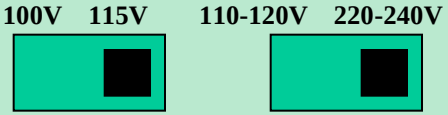
	FUSE	Parts No.
MAIN (for CCU)	3.15A	1-576-230-51

UC : 110-120V



CAMERA	6.3A	1-576-233-51

220-240V



CAMERA	4A	1-576-231-51

Optical Cable Cleaning

Optical Level Condition

Green

-8 ~ -17 dBm (+1,-1)

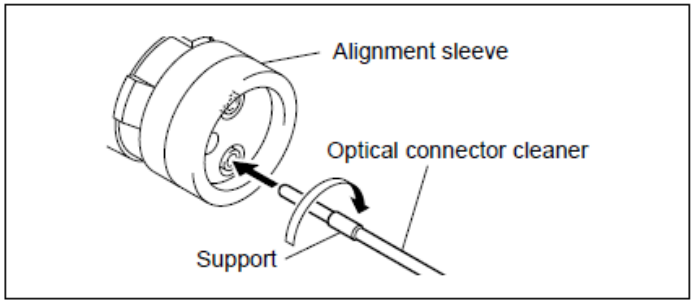
Yellow

-17 ~ -20 dBm (+1,-1)

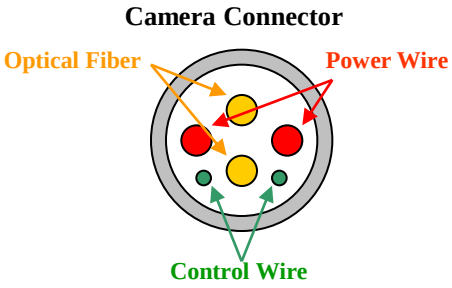
Red

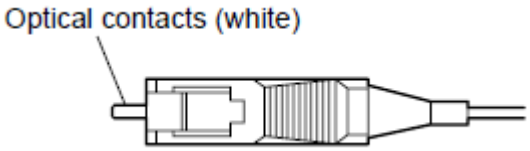
Less than -20 dBm (+1,-1)

<Less than about –24 dBm or wrong condition --> No_Signal

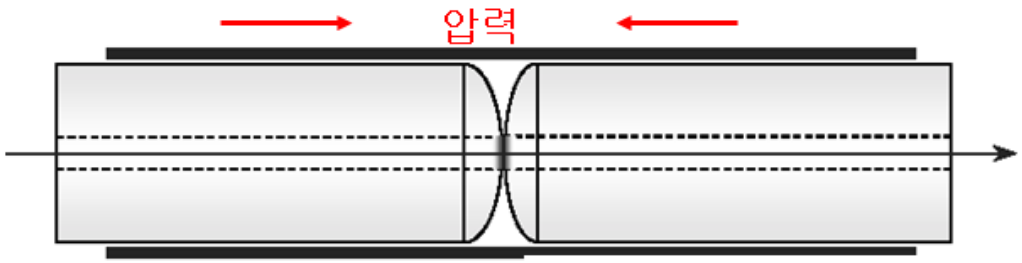


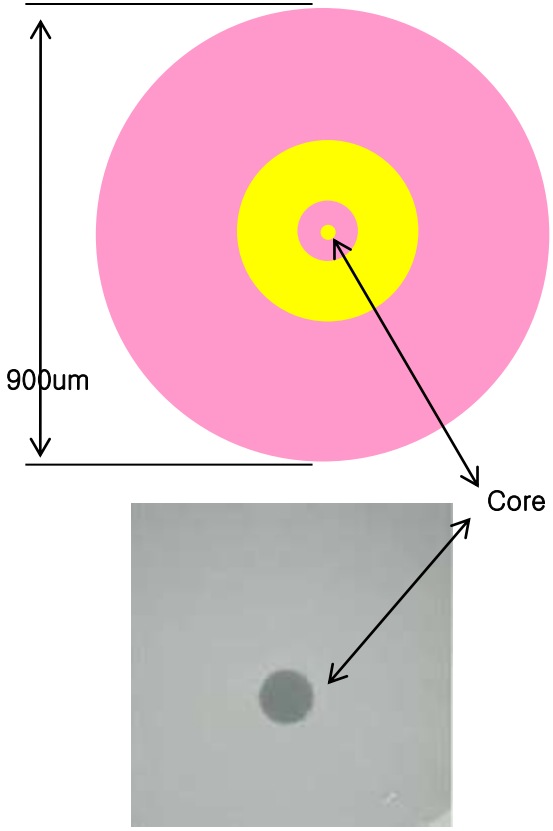
Optical Cleaner로 돌려 청소
(전용 Cleaner Tool 사용)

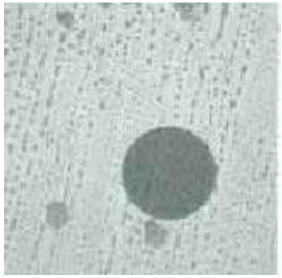


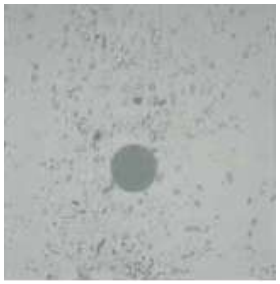


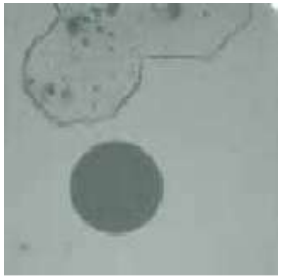
Optical Cable Cleaning











단면을 손으로 만진 상태

MSU / RCP Series Operation 활용

MSU-1000

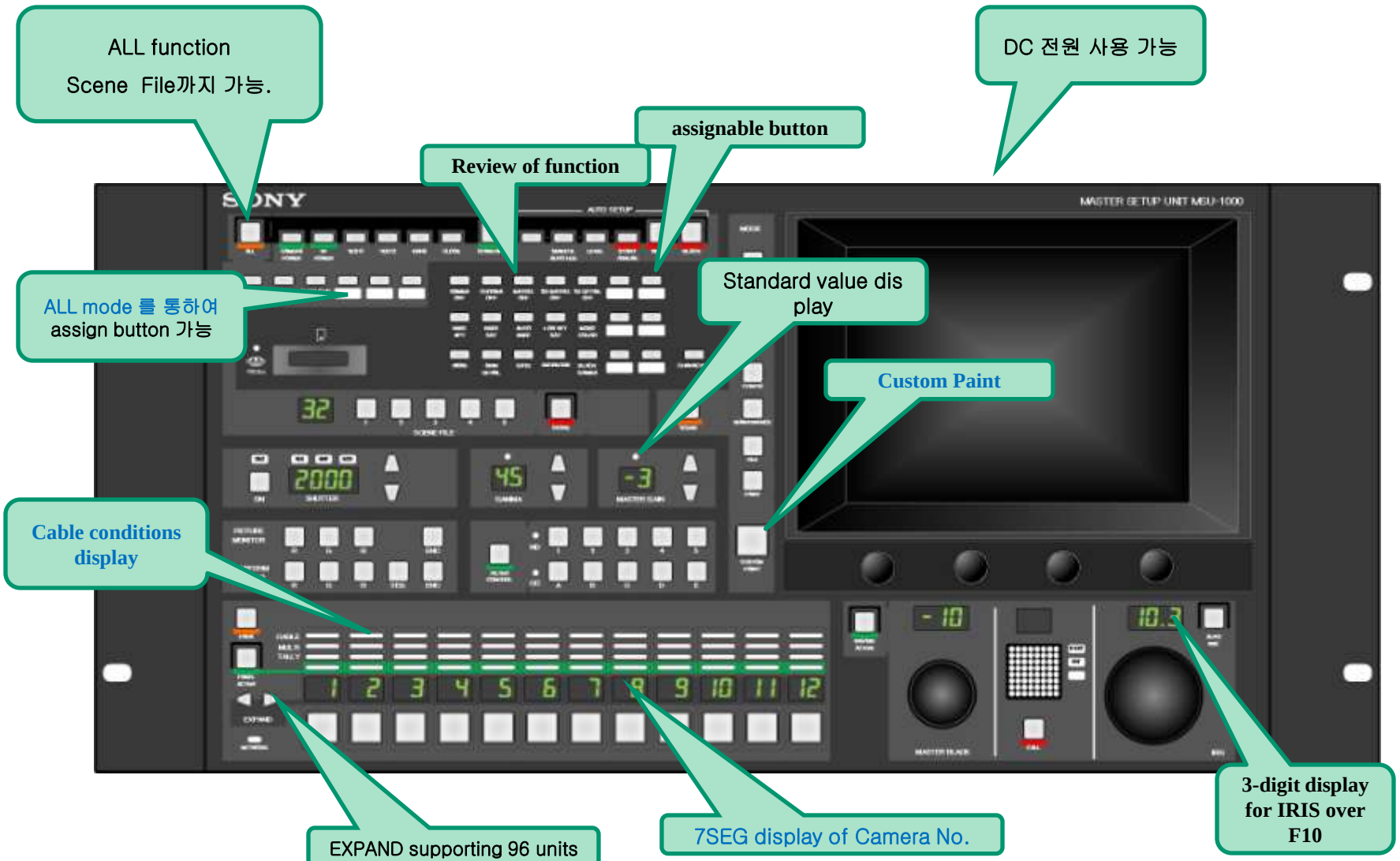
MSU-1500

RCP-1500/1501

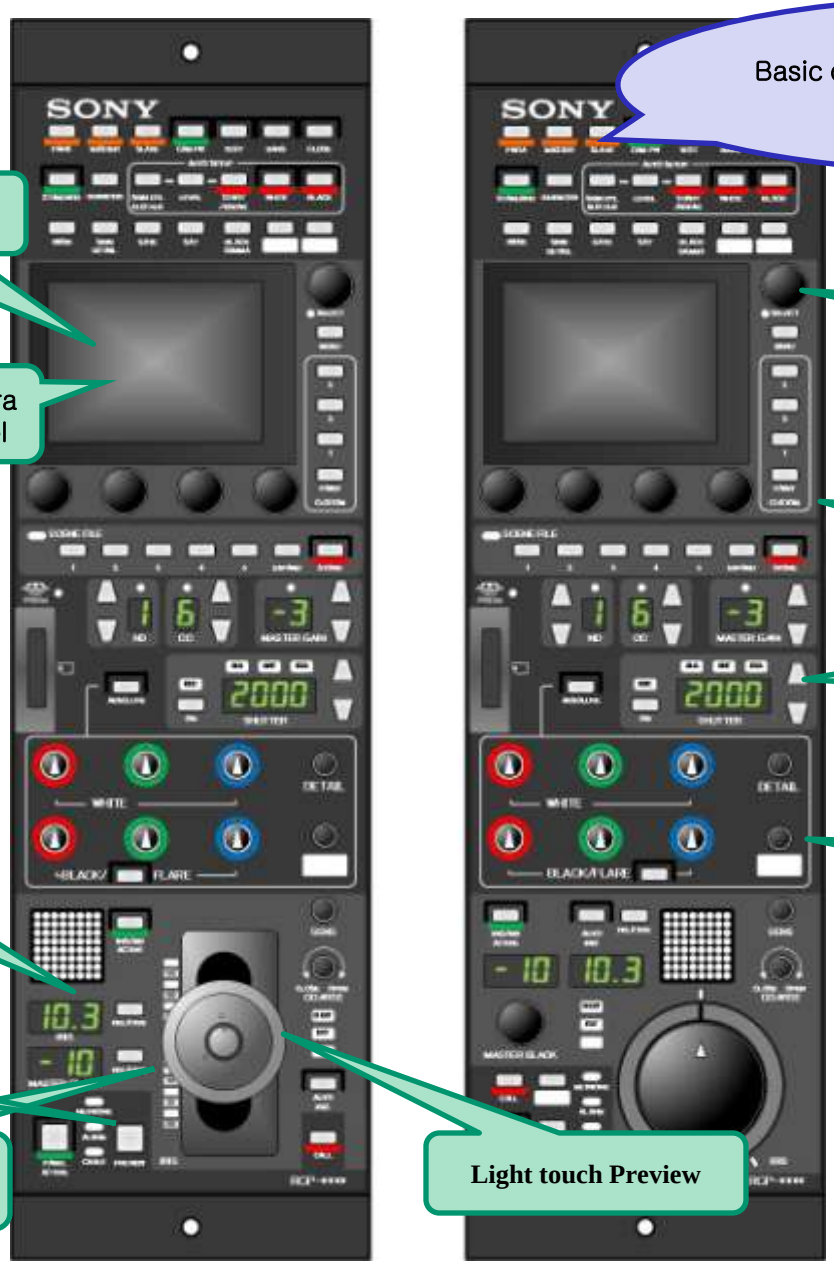
RCP-1530

RCP-1000/1001

MSU-1000 (Lotus- Horizontal MSU)



RCP-1500/1501 (Lotus-RCP （Standard Type))



Basic operation is possible without oper ating Menu

Wide viewing angle 3-inch LCD

Improvement in opera bility of Touch Panel

Rotary encoder is adopted for Menu operation

Custom supported

Direct control of Master Gain, ND, CC, and Shutter

Assignable volume

3-digit display for IRS over F10

Independent Preview switch

IRIS Indicator that indicates the variable range

Light touch Preview

RCP-1530 (Lotus-RCP (Slim Type))

Basic operation is possible without operating Menu

Custom supported

Wide viewing angle 3-inch LCD

Rotary encoder is adopted for Menu operation

Improvement in operability of Touch Panel

Direct control of Master Gain, ND, and CC

3-digit display for IRIS over F10

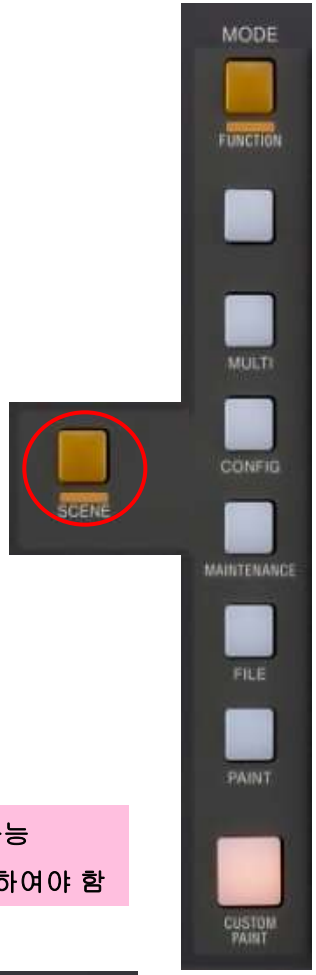
Light touch Preview

IRIS Indicator that indicates the variable range

Independent Preview switch

SCENE File 32개 활용

Scene Store/Recall



1~5 번은 MSU 전면의 1~5과 동일

SCENE File을 32개까지 확장하여 사용가능

* Camera에 SCEN file을 32개로 확장 변경을 하여야 함

Memory Stick 에 더 많은 Scene 값을 저장

Memory Stick Duo / Memory rick PRO Duo 사용 가능

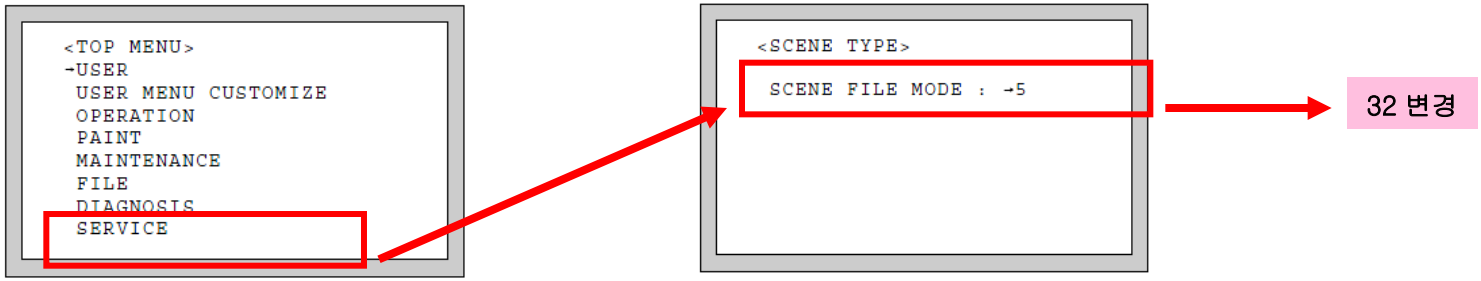
8GB 까지 사용 가능

SCENE File 32개 변경 방법

기본적으로 Sony의 HD System Camera는 32개까지 사용할 수 있으나 초기 납품시에는 5개로 설정되어 납품 됨

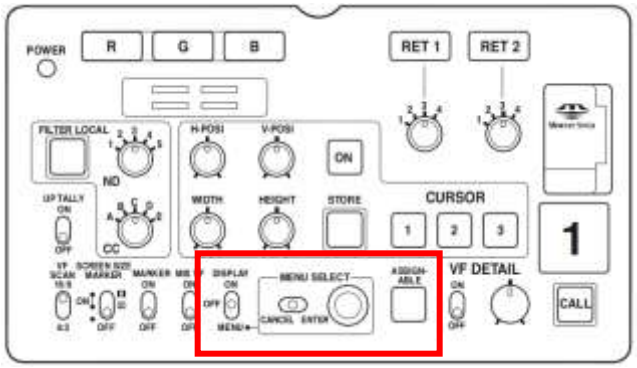
< HDC-900/950 Series 변경 방법 > (Camera Version 1.30 이상부터 가능)

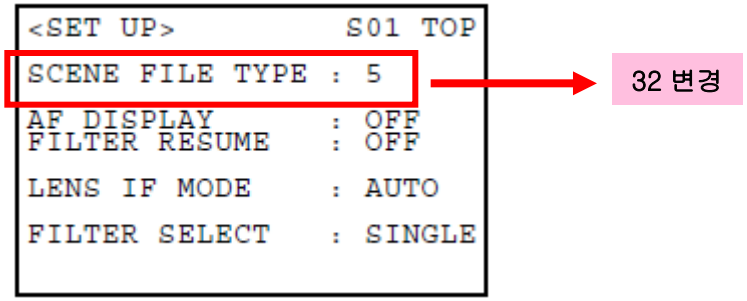
1. Service Menu 접근 : AT-130 Board의 S100 Dip Switch의 1~4번을 ON
2. Menu 다이얼을 이용하여 SERVICE 항목으로 진입
3. Menu < SCENE TYPE>에서 SCENE FILE MODE 를 5 → 32 로 변경
4. AT-130의 S100 Switch 원상 복귀



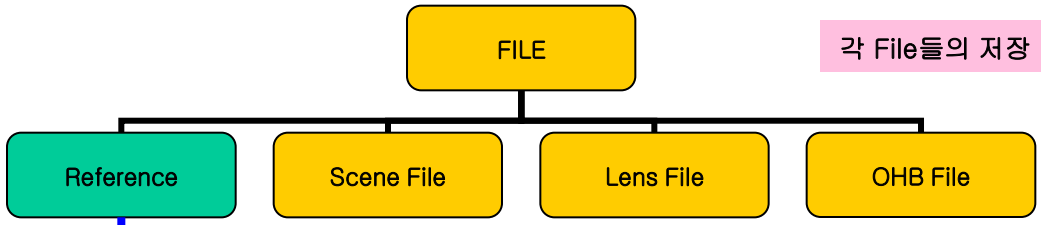
< HDC-1000/1500/1400 __ HDC-1000R/1500R/1400R Series 변경 방법 >

1. Service Menu 접근 : Camera의 ASSIGNABLE과 MENU SELECT Switch를 누른 상태에서 MENU Switch를 ON
2. Menu 다이얼을 이용하여 SERVICE 항목으로 진입
3. Menu S01 < SET UP>에서 SCENE FILE TYPE 를 5 → 32 로 변경





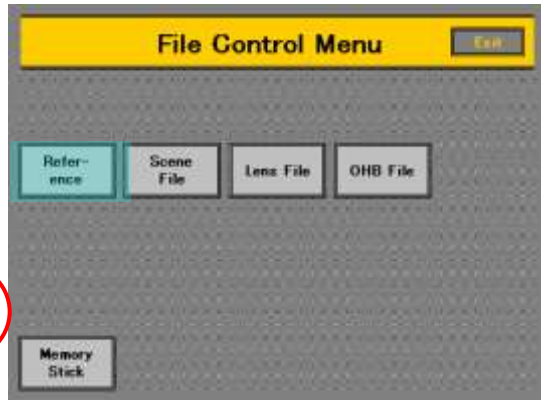
FILE System 운용



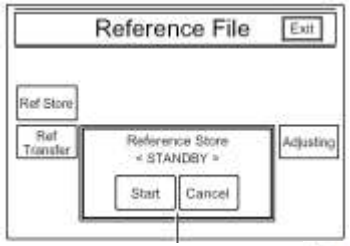
각 File들의 저장 메뉴

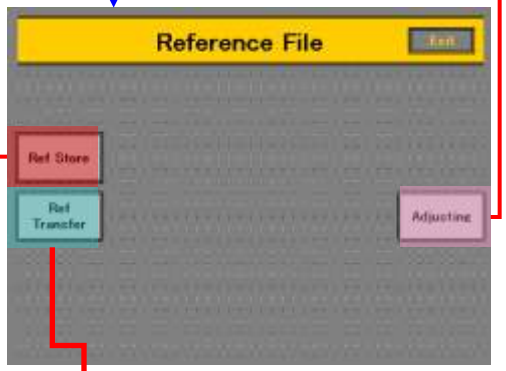
Camera의 조정 상태를 기준신호로 저장하는 메뉴

Adjusting을 누르면 Paint Menu로 이동

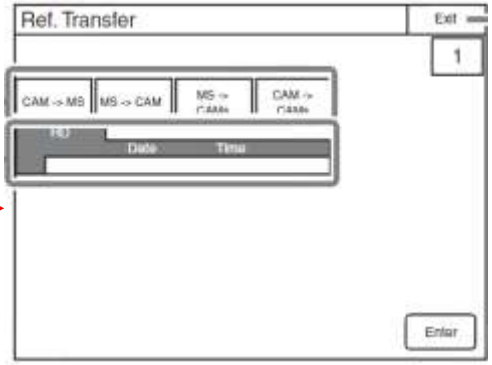


Reference File 저장





Reference File 전송



CAM→MS : Camera에서 Memory Stick으로 저장

MS→CAM : Memory Stick에서 Camera로 저장(불러오기)

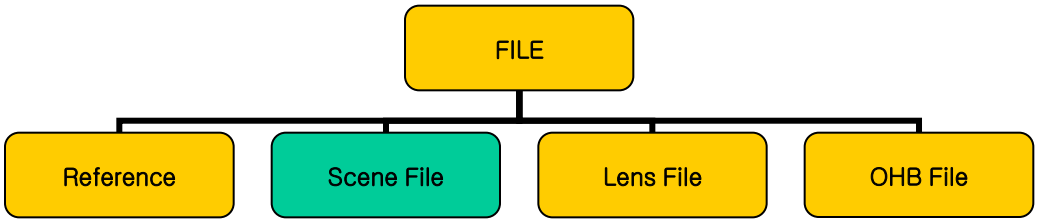
MS→CAMs : Memory Stick에서 여러 대의 Camera로 저장(불러오기)

CAM→CAMs : 선택한 Camera에 저장되어 있는 값을 다른 카메라로 전송

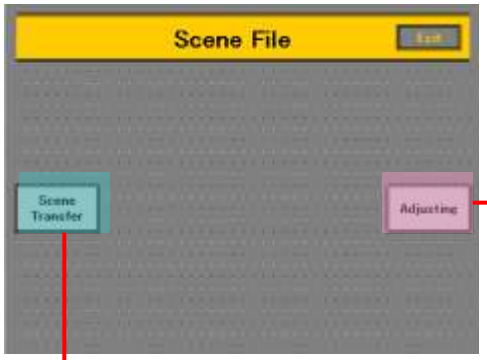
Memory Stick Duo / Memory rick PRO Duo 사용 가능

8GB 까지 사용 가능

FILE System 운용



Scene File 저장 → 5개 또는 32개의 Scene file이 하나의 file로 저장 전송 된다



Adjusting을 누르면 Paint Menu로 이동

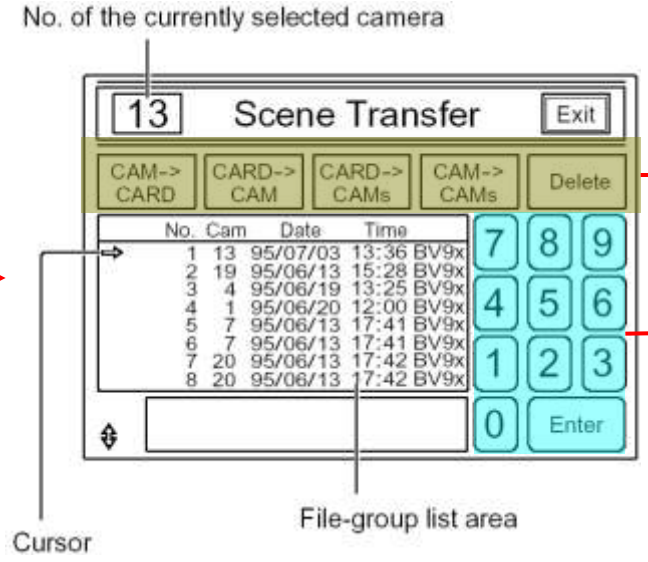
CAM→MS : Camera에서 Memory Stick으로 저장

MS→CAM : Memory Stick 에서 Camera로 저장(불러오기)

MS→CAMs : Memory Stick 에서 여러 대의 Camera로 저장(불러오기)

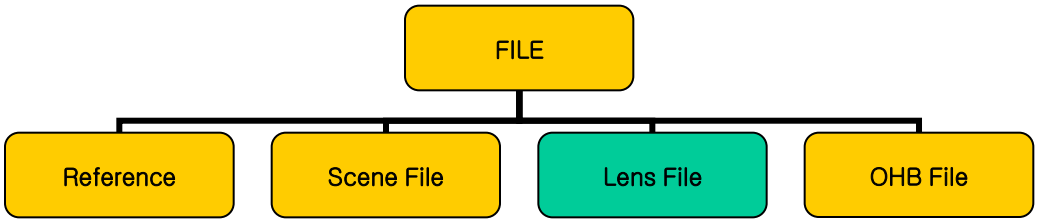
CAM→CAMs : Camera에 저장되어 있는 값을 다른 카메라로 전송

Delete : 삭제 기능

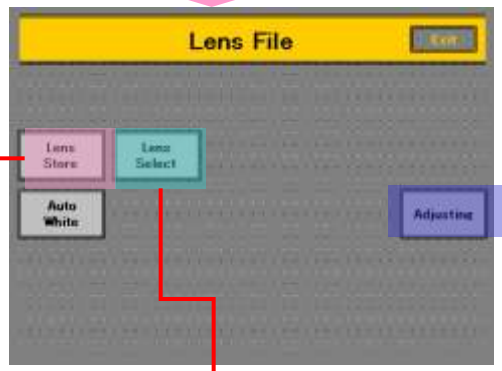


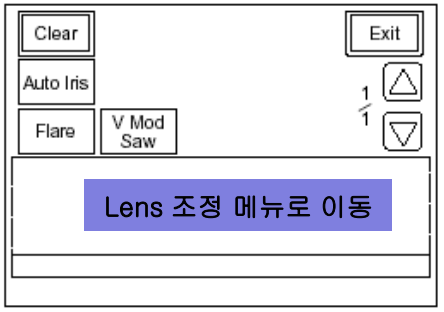
Camera NO 및 이름 지정

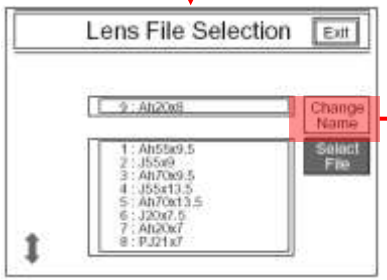
FILE System 운용



현재의 Lens File 저장

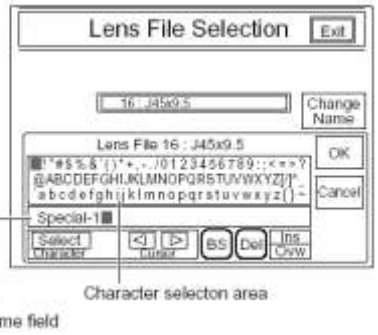






Lens File 선택

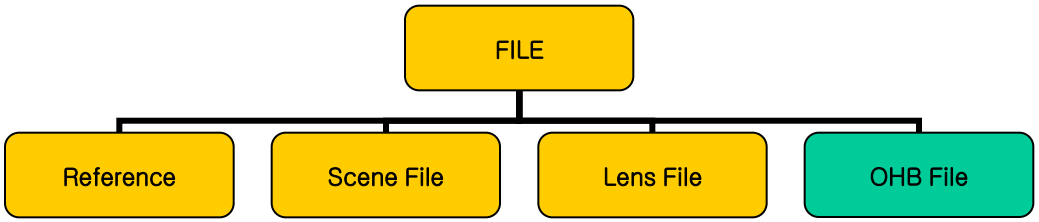
Lens File이 없을 경우 이름 변경 가능



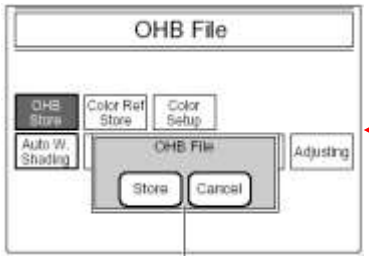
<Lens file 주요 저장 내용>

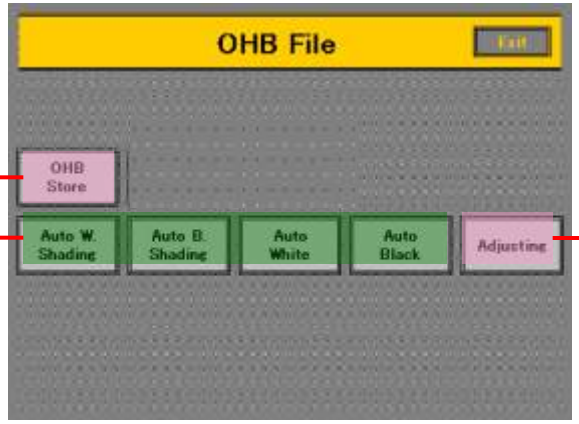
1) V Modulation Saw
2) Flare adjustment
3) Auto Iris

FILE System 운용



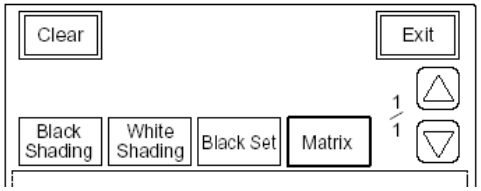
OHB (Optical Head Block) File 저장





OHB 자동 setup 메뉴

OHB 조정 메뉴



Black Shading	• Black Shading에 대한 R/G/B 조정 항목 메뉴
White Shading	• White Shading에 대한 R/G/B 조정 항목 메뉴
Black Set	• Black Set에 대한 R/G/B 조정 항목 메뉴
Matrix	• CCD 색감 조정 항목 (Matrix 관련 조정 항목)

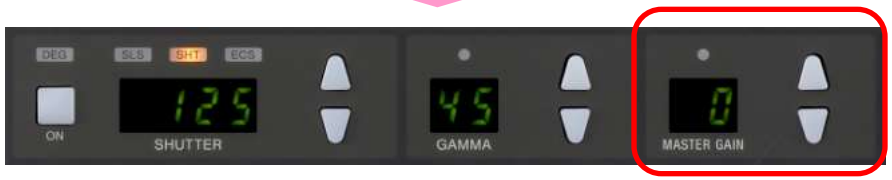
PAINT Menu 활용

1. Gain

*** Video의 Gain 설정**

1. Step Gain : Video의 Gain을 단계별로 변경 → -3, 0, 3, 6, 9, 12dB

→ Panel 의 MASTER GAIN 기능과 동일하게 연동 됨



2. M White : Master White Gain으로 0.1dB 단위로 Gain 변경 (범위 : -3 ~ 12dB)

M White Operation

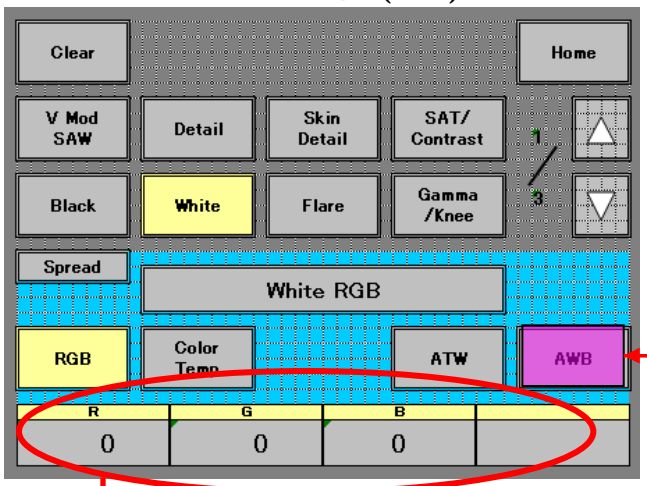
3dB "Step" Gain Up

"Picture Jump"

"Continuous" Gain Up by Master White Gain

2. White

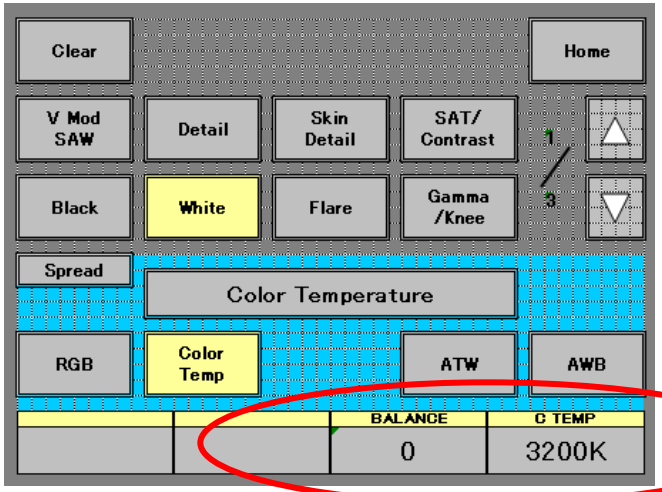
White : White Balance 조정 (RGB)



Auto White Balance

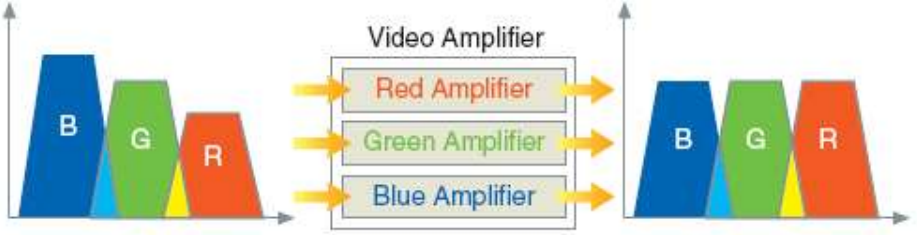
White Balance (R,G,B) 조정

C TEMP의 기능으로 쉽게 White의 색상 정보를 알수 있으며 R/G/B를 각각 조정하는 것 보다 White Balance를 빠르게 보정 할 수 있습니다.

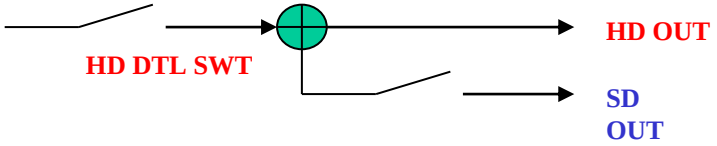


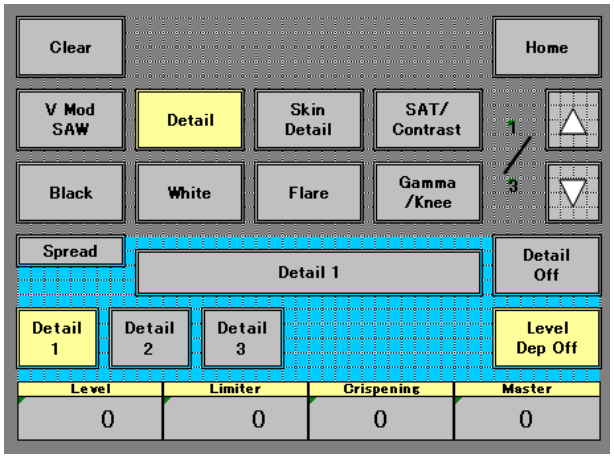
Color Temperature 값으로 Color Balance 조정

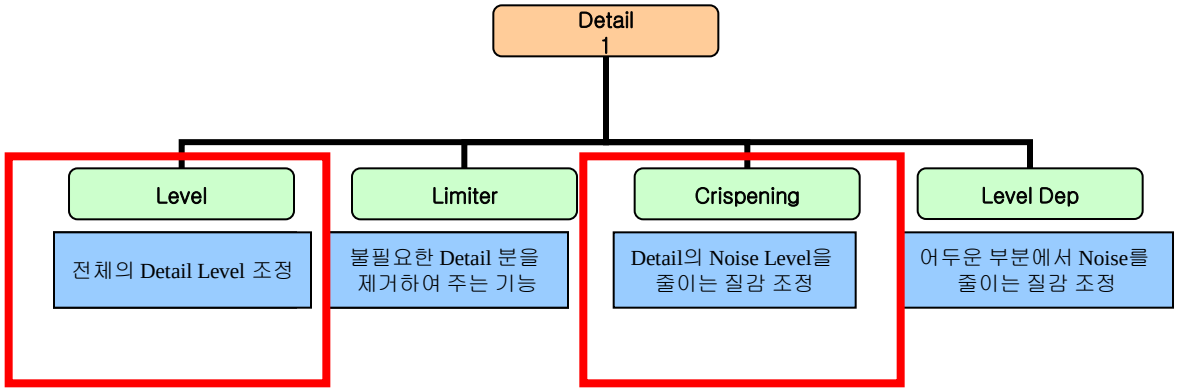
범위 : 1,682 ~13,008 K (CC Filter 3,200K 에서)



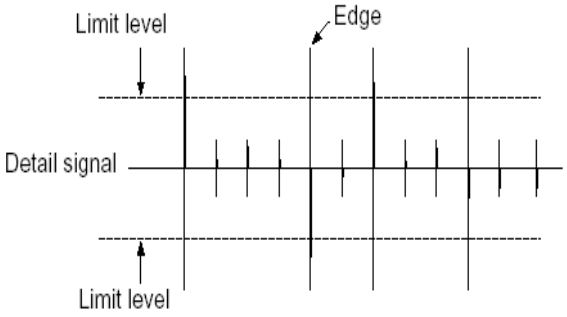
3. Detail



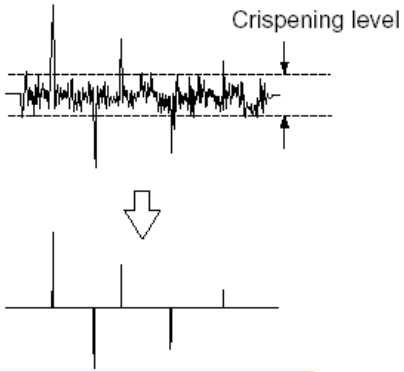




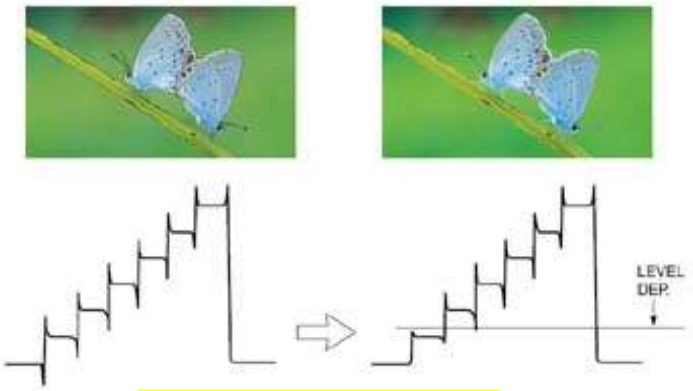
Detail Level과 Crispening 두 기능 만으로도 샤프하고 부드러운 영상을 만들 수 있음



Limiter



Crispening

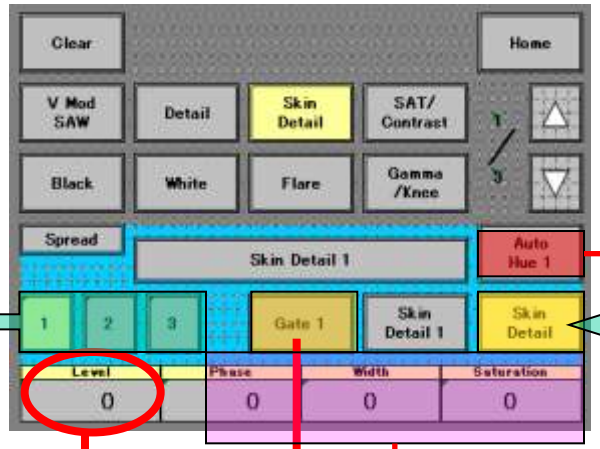


Level Dep

4. Skin Detail

Skin Detail : 특정한 색상에 대하여 **Detail**을 강화하거나 부드럽게 처리하는 기능.

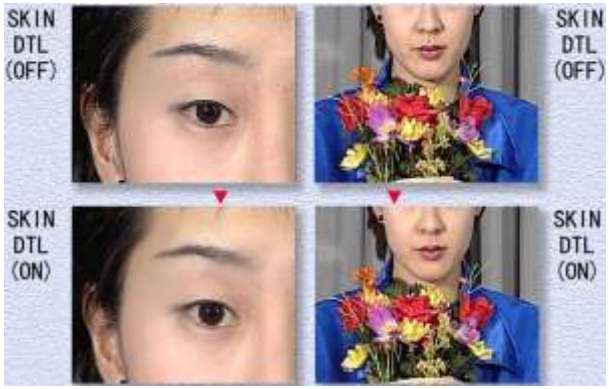
(3가지 색상에 대하여 따로 조정 할 수 있다**)**



색상 자동 선택 기능

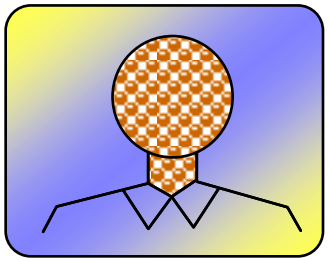
Skin Detail 선택 **1,2,3** 으로 **3**가지를 선택 할 수 있음

메인 **On/Off** 기능

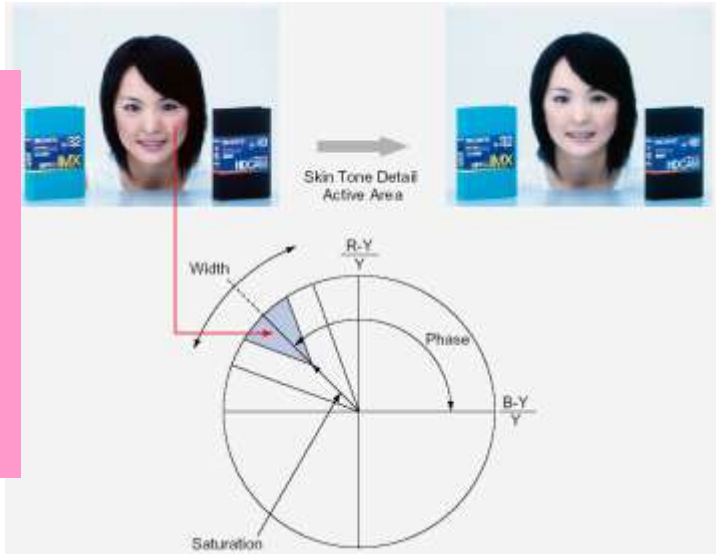


메인 **Skin Detail Level** 조정

PIX Output 모니터를 통하여 선택된 색상을 **Zebra** 로 표시하여 줌



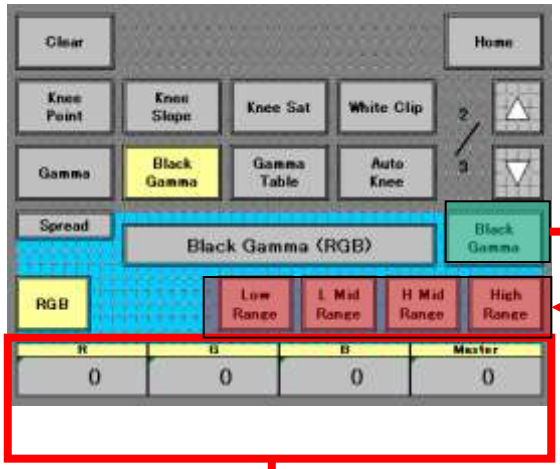
적용될 색상의 위치 지정



5. Black Gamma

블랙 신호 레벨 부근의 감마 곡선인 블랙 감마 특성을 이용하여 중간 톤(tone)과 높은 톤 부분의 감마 특성에 영향을 주지 않고
화상의 어두운 부분에 보다 큰 컨트라스트가 있는 화상을 표현 할 수 있으며, 반대의 경우는 어두운 부분만을 밝게 표현 할 수 있다.

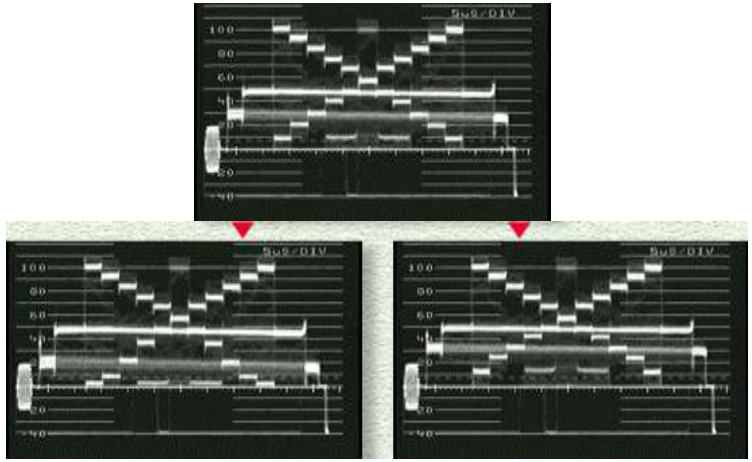
Black Gamma에 대한 조정



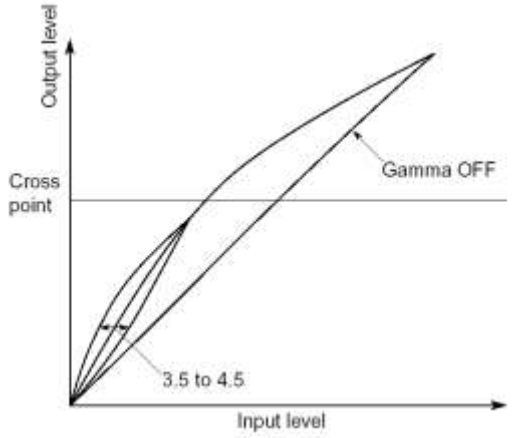
Black Gamma 메인 On/Off 기능

Black Gamma의 Range 설정

Black Gamma에 대한 Level 및 Balance조정



Master -99 **Master +99**

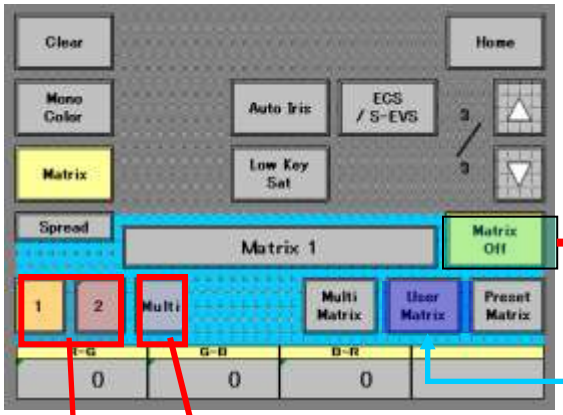


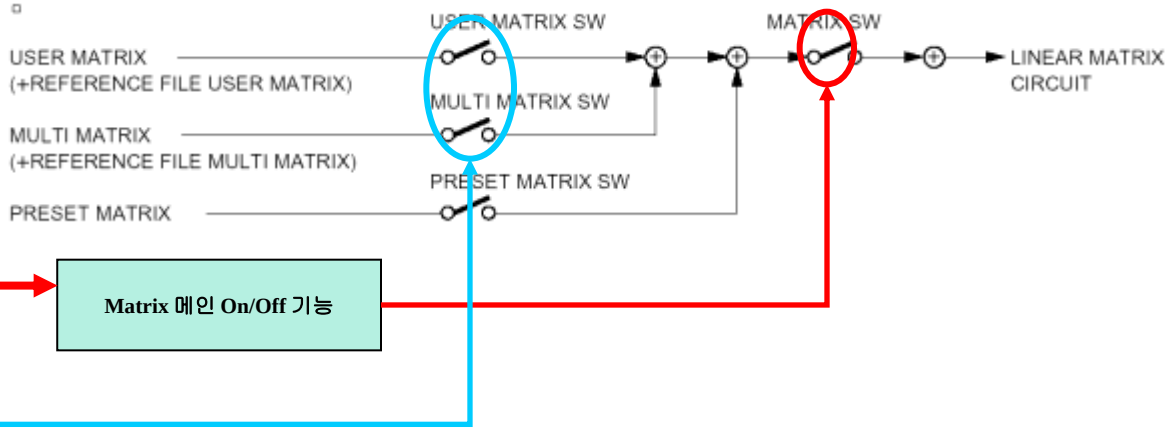
< Black Gamma 보정 전 >

< Black Gamma 보정 후 >

6. Matrix

Matrix에 대한 색상 조정





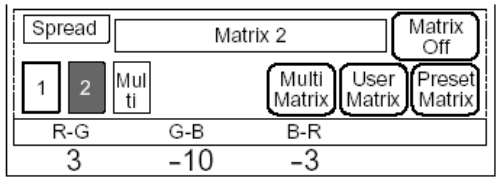
Matrix 메인 On/Off 기능

Multi Matrix가 ON되어 있을 때 동작

•**Preset Matrix: SMPTE-240M, ITU-709, SMPTE-wide, NTSC, EBU, ITU-601**

➔ **"Camera CONFIG mode"에서 변경 선택 가능!!**

User Matrix가 ON되어 있을 때 동작



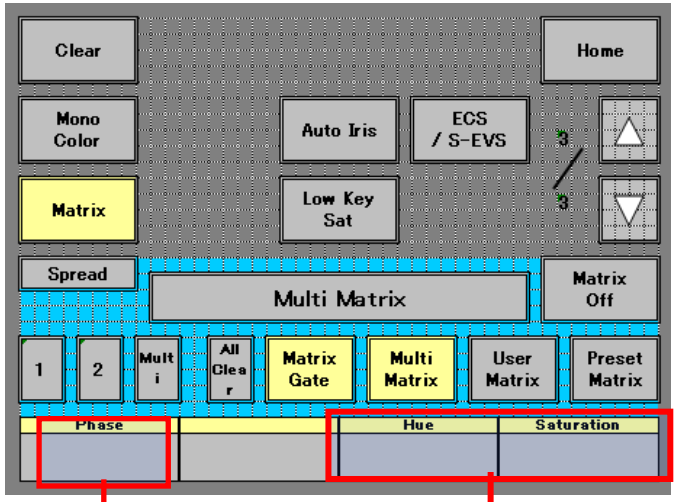
User Matrix는 1, 2 로 나누어 지며 총 6개의 축으로 조정이 가능하다.

1 ➔ R-G, G-B, B-R

2 ➔ R-B, G-R, B-G

User Matrix의 활용으로 특정한 색상만을 표현 할 수도 있다.

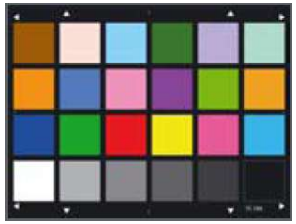
Multi Matrix에 대한 색상 조정

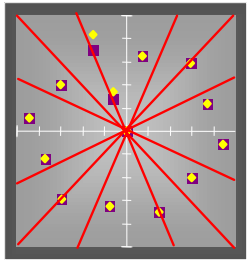


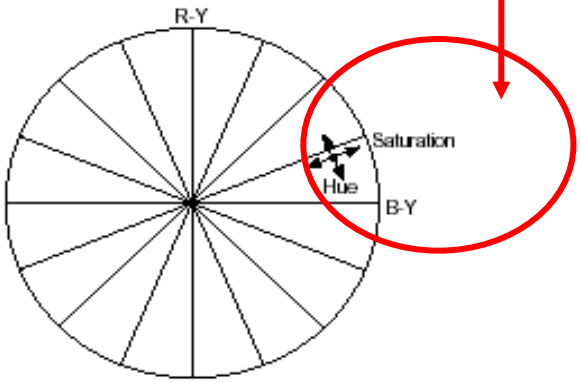
Off

On

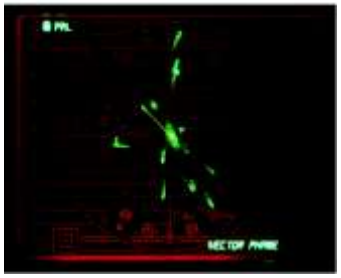
Multi Matrix 기능







Normal



Normal

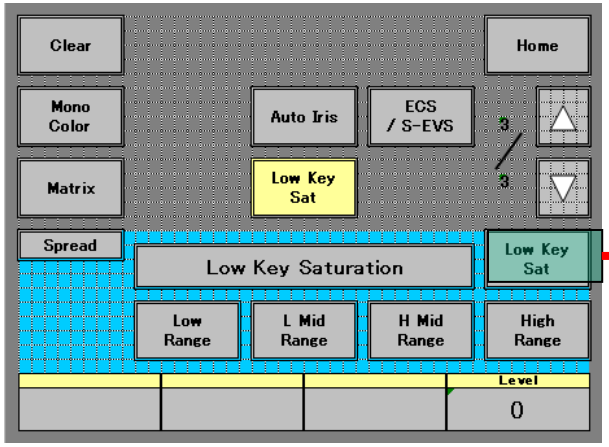
On

Multi Matrix에서는 Phase를 선택하여 16가지 색상을 변화시킬 수 있다.

다른 색상에는 영향을 주지 않으며 독립적인 16 색상을 변화 시킴

7. Low Key Sat

Low Key Saturation 을 통한 어두운 부분에 대한 Saturation 보정

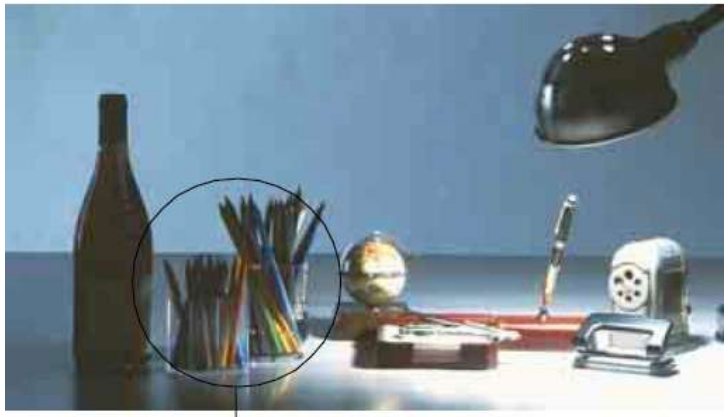


Low Key Sat 메인 On/Off 기능

Normal

Off

On

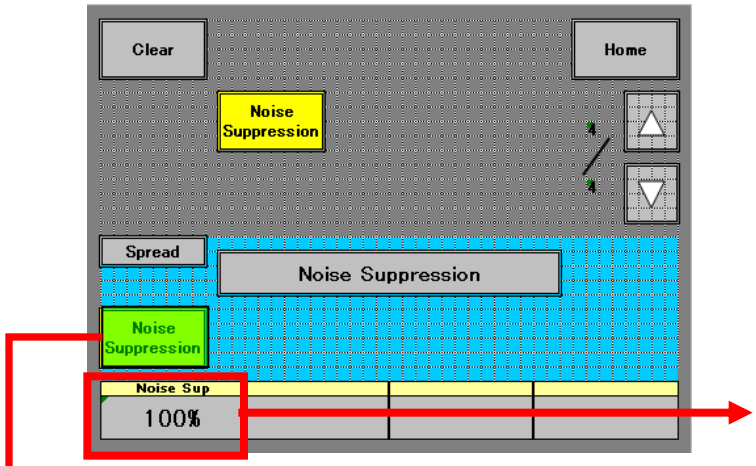


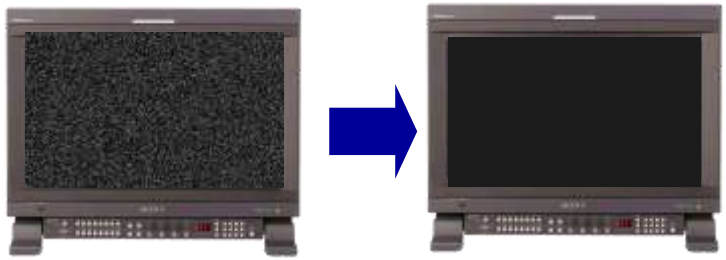
On

Colorimetry in dark areas are improved.

8. NS (Noise Suppression)

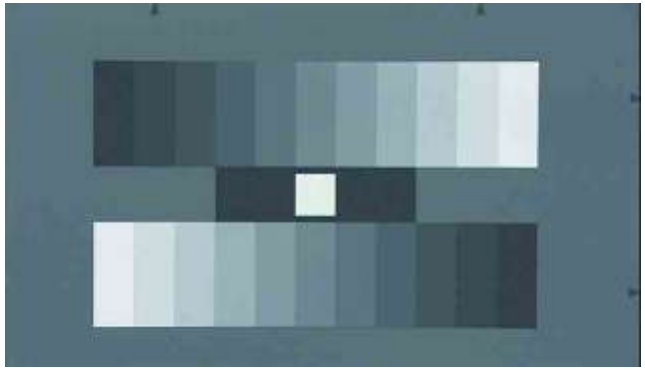
Noise에 대한 감쇄 기능 (S/N 비 향상 기능)

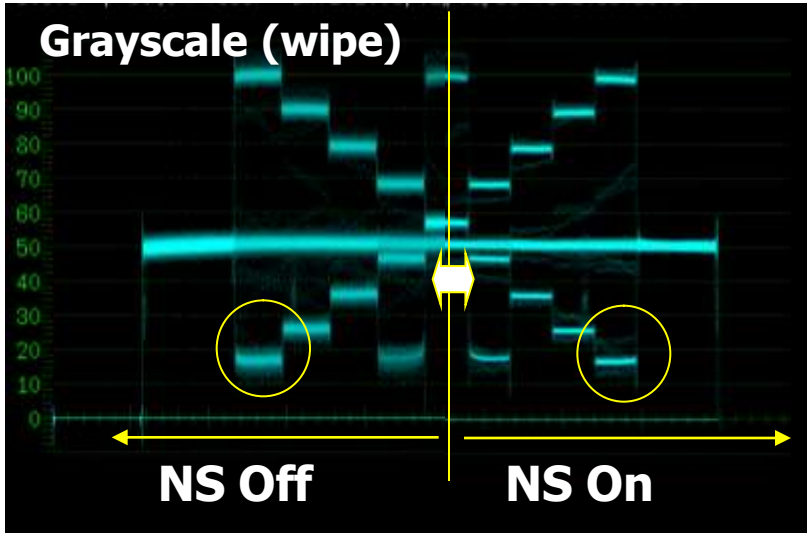




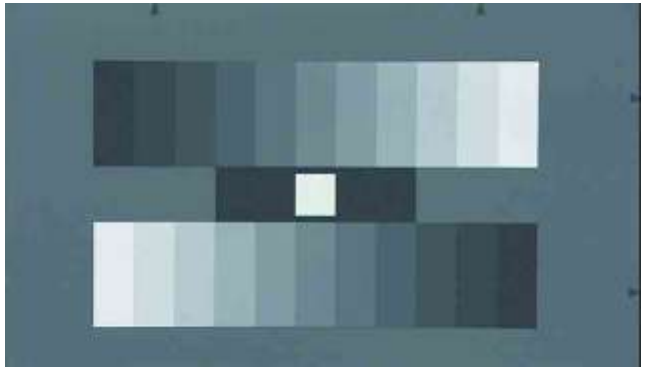
0 ~ 100 % 까지 Level 변경 가능

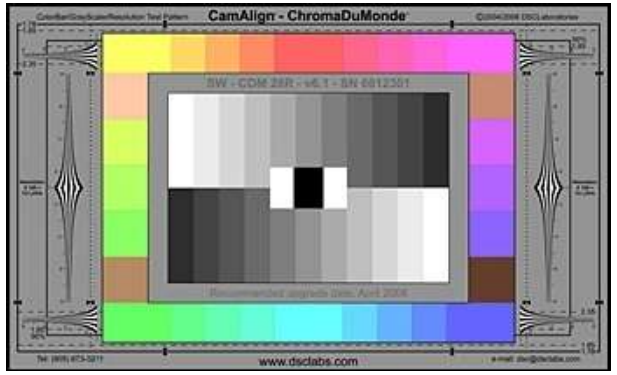
Noise Suppression의 On/Off 기능





5. HD Camera Basic Alignment





HD Camera Alignment (1)

1. LENS Select: LENS 이름 생성 (Lens Docking 후)

<참조> EFP는 생성이 필요하나, Studio Camera는 Serial Interface를 통해 렌즈로부터 정보가 넘어와 자동 생성.

(EFP Type의 경우도 Serial 지원이 가능한 Model은 자동 생성 됨)

2. OHB File 생성

<Black Shading 조정>

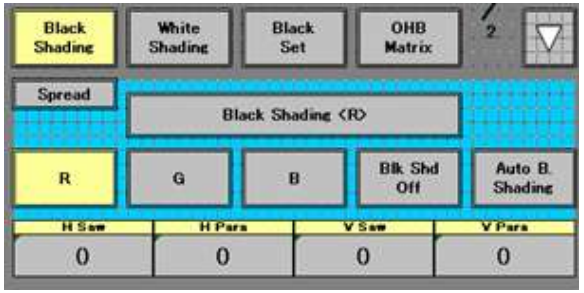
* 조건 → 1. Lens Iris Close

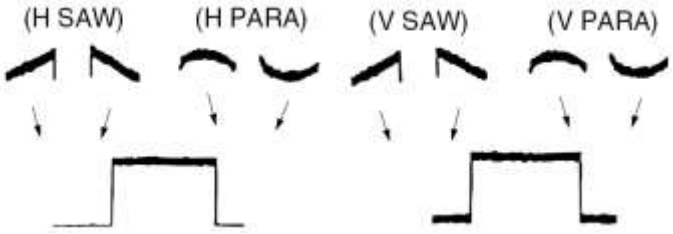
2. DTL → OFF / KNEE → OFF / Matrix → OFF

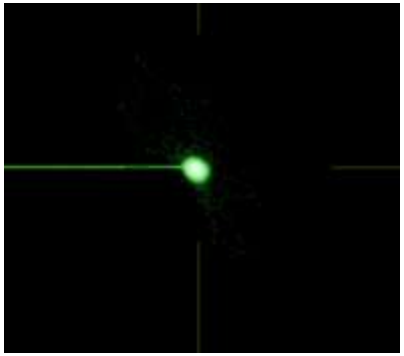
3. Gain 0~ 12 dB

조정 순서 : ABB → Auto Black Shading →필요 시 Manual Black Shading으로 수동 조정 → OHB File Store

조정 위치 : FILE → OHB File→ Adjusting → Black Shading →



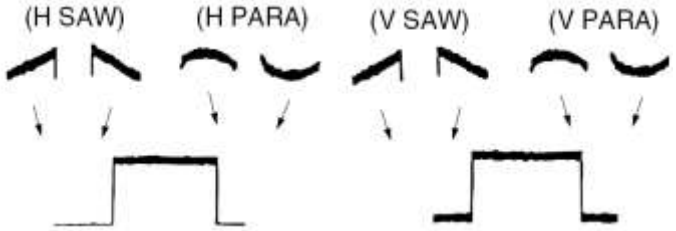




HD Camera Alignment (2)

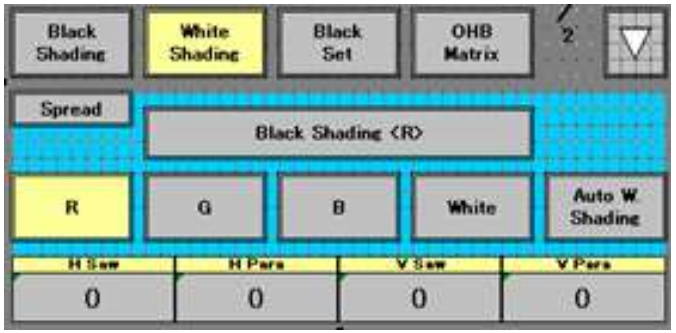
< White Shading 조정 >

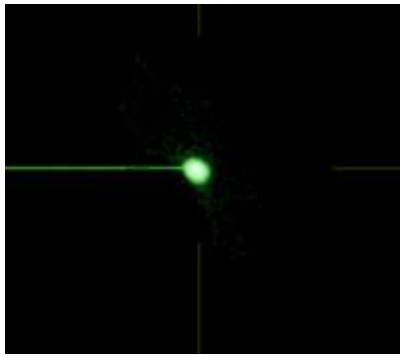
* 조건 → 1. Pattern BOX에 Lens 밀착
2. Zoom Mechanical Center
3. Focus 무한대
4. DTL → OFF / KNEE → OFF / Matrix → OFF
5. Video Level 600mV (+-20mV) / Iris F4~5.6



조정 순서 : AWB → Auto White Shading → 필요 시 Manual White Shading으로 수동 조정→ OHB file Store

조정 위치 : FILE → OHB File→ Adjusting → White Shading →





HD Camera Alignment (3)

< ND Offset 조정 >

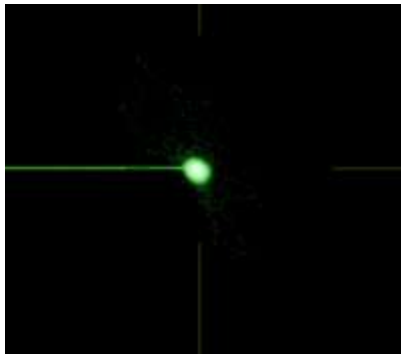
조정 목적 : 각각의 ND 를 변경하였을 때에 색상에는 변화가 없게 조정되어야 한다

* 조건 → 1. Pattern Box에 Lens 밀착 또는 Grayscale Chart
2. Lens Iris → Auto

* 조정 → 각 ND filter(1~5)별로 AWB를 실행한다.

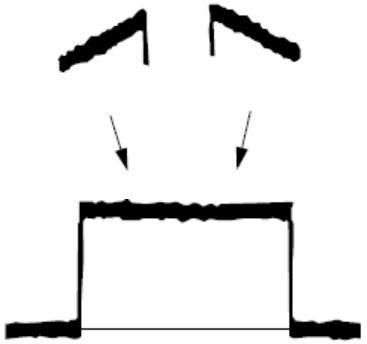
< note > ND 1~3 (0dB), ND 4 (6dB), ND 5 (12dB) 설정으로 실행

1. ND1 →AWB
2. ND2 → AWB
3. ND3 → AWB
4. ND4 (Gain 6dB) → AWB
5. ND5 (Gain 12dB) → AWB 후에 바로 OHB File Store 한다.



HD Camera Alignment (4)

3. LENS File 생성



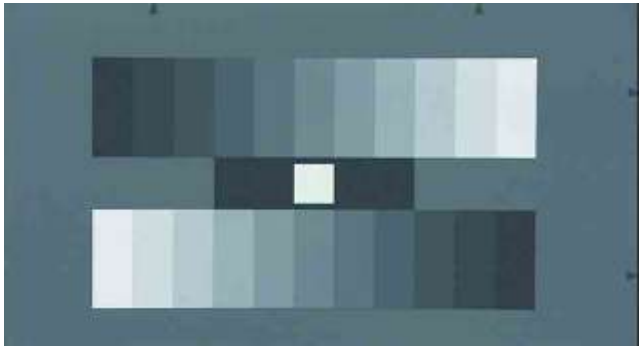
* 조건 → 1. Pattern Box에 Lens 밀착
2. Zoom Mechanical Center
3. Focus 무한대
4. Iris F4~5.6 정도 (Lens에 따라 조금 다름)
5. Knee OFF / Detail OFF / Matrix OFF
6. Waveform Monitor 는 Field 로 설정

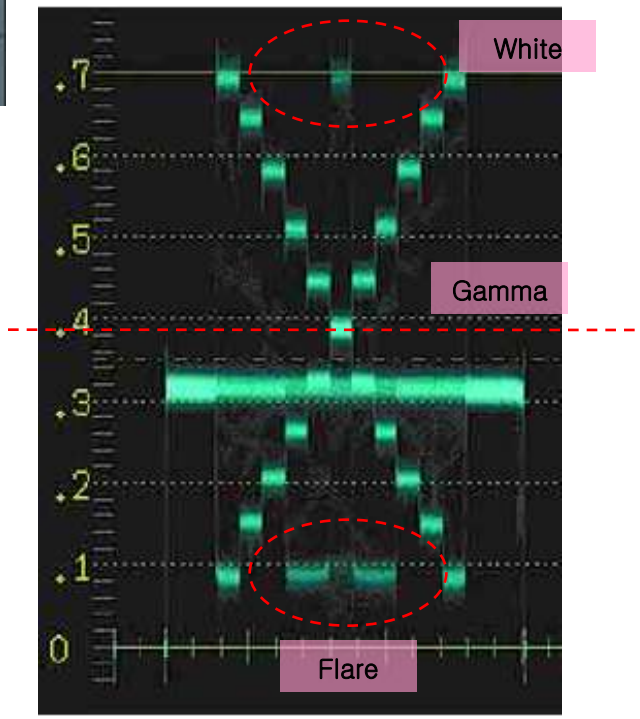
* V Mod Saw 조정 → 1. Lens x1 → AWB 실행 → V Mod Saw 조정 → Lens file Store
2. Lens x2 → AWB 실행 → V Mod Saw 조정 → Lens file Store

HD Camera Alignment (5)

4. Reference File 생성 → 조종 후 Reference File Store

	HDC-1000/1500 기준
White Clip	108% (12dB) (756 mV)
Knee Slope	105%(+6dB) (735 mV)
Knee Point	98% (686 mV)
Gamma	55% (385 mV)
Flare	Level이 낮은 Ch기준
Pedestal	3% (21 mV)
Detail	고객 취향





(상기의 DATA는 참조자료 수치이며 Chart의 종류에 따라 다름)

* 조건 →

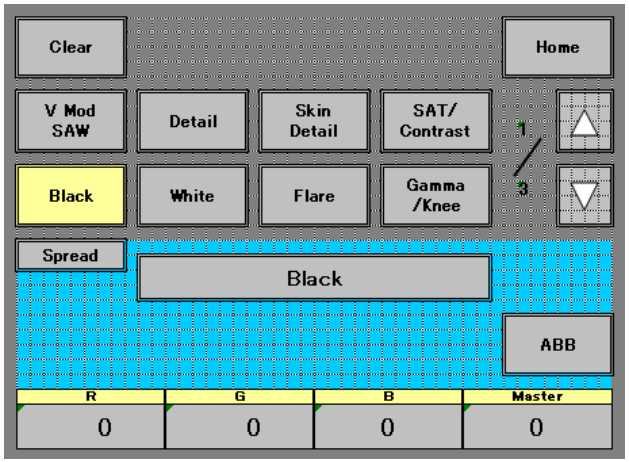
1. Pattern Box / Grayscale Chart
2. Zoom Mechanical Center 또는 1m 정도의 일직선 거리
3. Knee OFF / Detail OFF / Matrix OFF
4. White Level → 700 mV

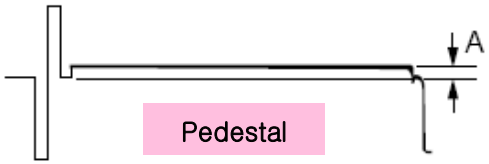
HD Camera Alignment (6)

<1> Black Pedestal 조정

*** 조건 : Lens는 Close → ABB**

*** 조정 위치 : Paint → Black →**





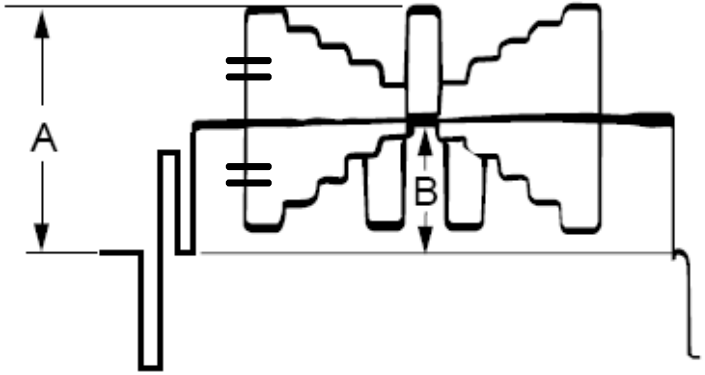
A = 21mV (3%)

HD Camera Alignment (7)

<2> Gamma 조정

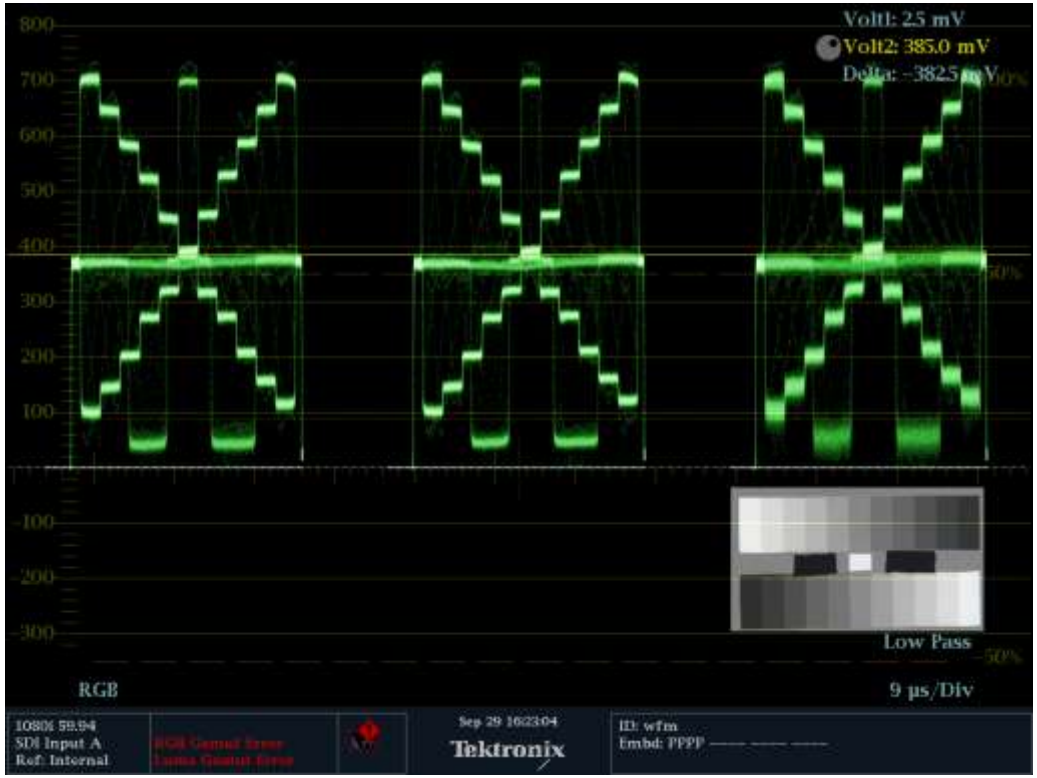
*** 조건 : Video Level → 700mV (A Position)**

*** 조정 위치 : Paint → Gamma →**



B = 385mV (55 %)

Chart의 종류에 따라 값이 다름

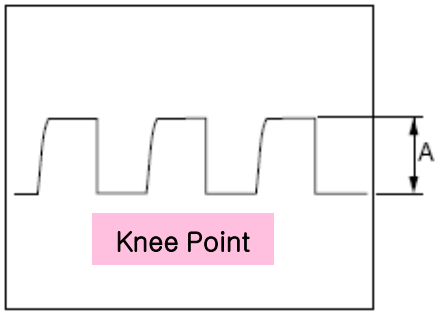


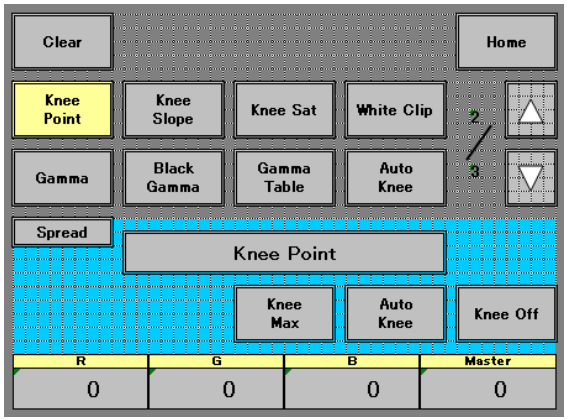
HD Camera Alignment (8)

<3> Knee Point 조정

*** 조건 → 1. Knee ON / TEST 1 ON**

*** 조정 위치 : Paint → Knee Point →**



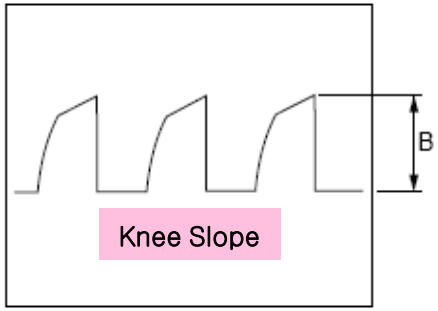


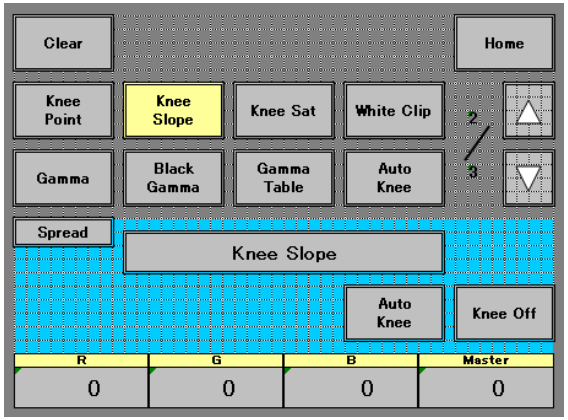
A = 686 mV (98 %)

<4> Knee slop 조정

*** 조건 → 1. Knee ON / TEST 1 ON / Gain 6dB**

*** 조정 위치 : Paint → Knee slop →**





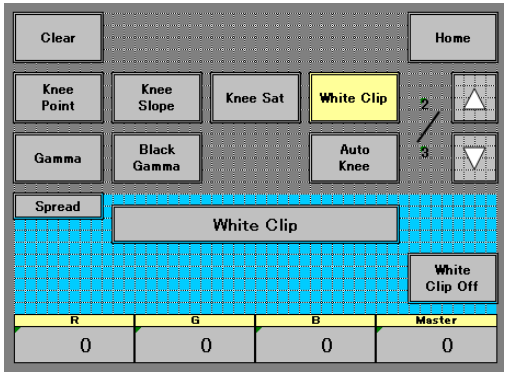
B = 735 mV (105 %)

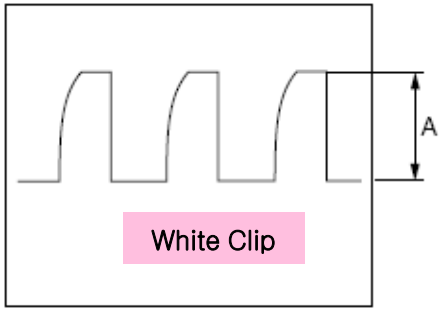
HD Camera Alignment (9)

<5> White Clip 조정

*** 조건 → 1. Knee Off / TEST 1 ON / Gain 12dB**

*** 조정 위치 : Paint → White Clip →**





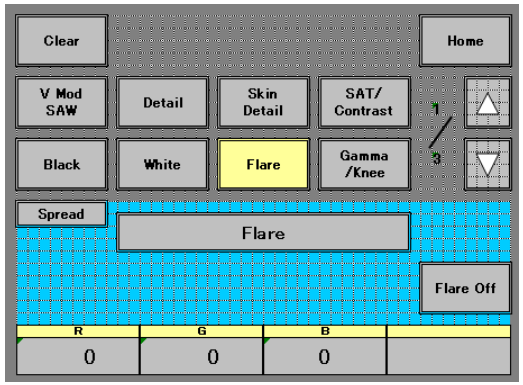
A = 756 mV (108 %)

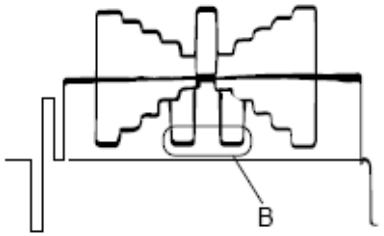
HD Camera Alignment (10)

<6> Flare 조정

*** 조건 → 1. Knee Off**

*** 조정 위치 : Paint → Flare →**





예) B = 36mV (6 %)

Flare는 정해진 값에 맞추는 방법과 Flare의 양이 가장 작은 값에 맞추는 방법이 있다.

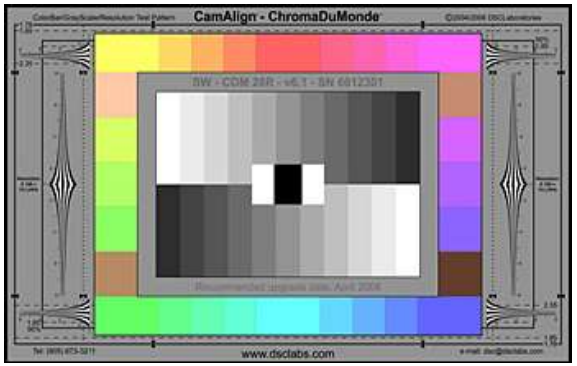
Video Level 이 700mV 일 경우

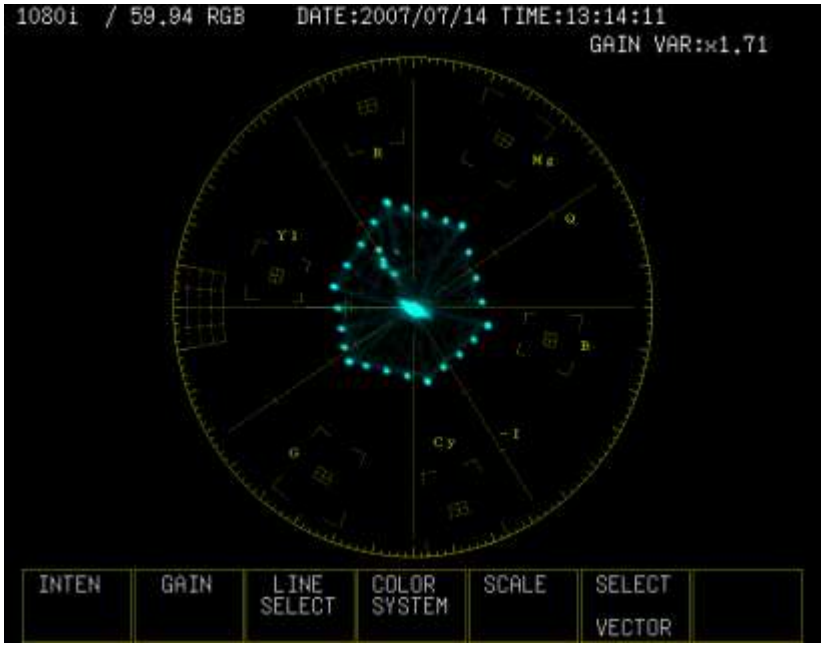
Lens의 Iris를 Open 한 일 경우

<7> 모든 조정이 완료되면 File에서 Reference File에 저장한다

<참조>

만약 카메라 별로 색감 차이가 조금 있다면 하기의 **Chart**를 이용하여 **Matrix**로 조정한다.





감사합니다.