# Utility Committee Meeting

## AGENDA

## November 1, 2016

## I. CALL TO ORDER

## II. MATTERS BEFORE COMMITTEE

1. Purchase - Mapper Kit
2. Approval - Out of State Travel
3. Approval - Water Treatment Plant Roof Repair
4. Approval - Council Chamber Remodel

## III. ADJOURN

# Utility Committee Meeting

# AGENDA

# November 1, 2016

**Item:**

Purchase - Mapper Kit

**Department:**

**Additional Information:**

**Financial Impact:**

**Budgeted Item:**

**Recommendation / Request:**

**Viewing Attachments Requires Adobe Acrobat. Click here to download.**

**Attachments / click to download**

Mapper Kit

Cover Memo

Item # 1

# CITY OF MONROE
## GEORGIA

**SUBJECT:** Approval to purchase Current Mapper

**DATE SUBMITTED:** 10/16/2016

**DIVISION:** Gas

**AUTHORIZED BY:** Rodney Middlebrooks

**AGENDA DATE REQUESTED:** 11/1/2016

**TYPE:**
- ☒ Council
- ☒ Committee
- ☐ Administrator

**CONTACT PERSON:** Rodney Middlebrooks

**DEPARTMENT:** Water & Gas

**MOTION/RECOMMENDATION:** Approval to purchase a PCM + Current Mapper from C&S Solutions East in the amount of $11,023.000

**BACKGROUND:** Allows gas department to perform the following.....

1. Accurately find buried pipes, establish centerline depth, then troubleshoot coating defects.

2. Store up to 1000 measured PCM and location data points in memory in the receiver.

3. Upload saved data in real time from the received to a PDA or PC via Bluetooth® for GPS synchronization.

4. Display uploaded data in graphical format for immediate or post-survey analysis.

Once the pipe has been located, the technician can map the leakage currents along the pipe both in magnitude and direction, and quickly identify coating defects.

Competitively bid to 3 vendors per procurement policy

**ATTACHMENTS:**
1. C&S Solutions East
2. Eastcom Associates
3. Radiodetection
4.

☐ None

**REVIEWED BY (INITIALS):**
- Legal:
- Finance:
- Purchasing: GLB
- Other:

**USER DEPT.:** Natural Gas

**SUBMITTED BY:** R Middlebrooks

City Administrator

**ADVERTISED:**
- Date:
- Paper:
- ☐ Not Required

**COSTS:** $11,023.00

**FISCAL YEAR:** 2016

**BUDGET CODE:** CIP

**AFFECTED PARTIES:** ☐ Notified ☒ N/R

**COUNCIL ACTION:**
- ☐ Approved
- ☐ Approved w/Conditions
- ☐ Denied
- ☐ Continued to:

**FUNDING SOURCE:**
- ☒ Capital Improvement
- ☐ Operating Expense
- ☐ Grant
- ☐ Loan
- ☐ Other

Item # 1

# C&S SOLUTONS EAST

MONROE GA OFFICE Phone: 770-500-4485 Fax: 888-235-3140

| Date | Sales Representative | Quote Number | Ship Via |
|---|---|---|---|
| 9/20/2016 | BRADLEY SORRELLS | 122 | |

## QUOTATION

Account #

**Company** City of Monroe
**Attention** Kyle Hamby
**Address** 215 N. Broad St.
**City** Monroe
**State** GA **Zip** 30655

**Phone**
**Mobile** 404-427-5338
**Fax**
**Email** khamby@monroega.gov

**Terms** NET 10 DAYS

| Qty | Item # | Name | Price | Total |
|---|---|---|---|---|
| 1 | 10/PCM+KitUSAH | PCM+ Kit (with TX Transmitter USA)<br>Contains PCM+,TX Transmitter, A Frame, Hard RX Carry Bag | $10,850.00 | $10,850.00 |
| 1 | 97/CALCERT | Calibration Certificate | $58.00 | $58.00 |
| | Freight | Shipping and Handling | $115.00 | $115.00 |
| | INCLUDED FREE | FREE ONSITE TRAINING<br>FREE LOANER IF EQUIPMENT GOES IN FOR SERVICE<br>C&S SOLUTIONS IS AUTHORIZED REPAIR FACILITY<br>ADDRESS ANY QUESTIONS TO BRADLEY SORRELLS 770-500-4485 | | |
| | | | Sub Total | $11,023.00 |
| | | | Taxes 0.000% | |
| | | | **TOTAL** | $11,023.00 |

## QUOTE GOOD FOR 30 DAYS

**Prices quoted include**: delivery in our truck, on-site training (minimum 2 hours) of your personnel and manufacturer's warranty of one year (90 days) parts and labor. In addition to the manufacturer's warranty, C&S Solutions East will provide free loaner equipment anytime your equipment needs to be sent in for repair (in or out of manufacturer's warranty period).

Eastcom Associates, Inc.
1214 Route 28 North Branch, NJ 08876
Phone: (908) 722-7774
Fax: (908) 722-9299
www.EastcomAssoc.com

# QUOTATION

Quotation #: GA92016ED

Date: September 20, 2016

Company: City of Monroe

E-Mail: khamby@monroega.gov

| Qty | Part No. | Item Description | Item Price |
|---|---|---|---|
| 1 | PCM+KIT | **Pipeline Current Mapper Kit** | $ 11,000.00 |
| | | *Includes: PCM+ Receiver, PCM+ Transmitter,* | |
| | | *A-Frame and Carrying Bag* | |
| | | | |
| | FREIGHT | **Estimated Shipping Charges** | $200.00 |
| | | | |
| | | **On-Site Equipment Training** | $150 / Hour |

**Sales Tax:** For Shipments to NJ or NY, Add Applicable Local Sales Tax
**Payment Terms:** Net 30 Days (w/approved credit) or Credit Card
**Delivery:** 4 Weeks
**Freight:** UPS Insured, Freight Charges Prepaid and Added to Invoice
**Quote Validity:** 30 Days

***Thank you for your interest in our products and the opportunity to provide this quotation. Please contact us with any questions or to place an order.***

**Prepared By: Eric Denslow**

# RADIODETECTION

## QUOTATION No.: M12137

Please reference the above number in all correspondence

Date: 09/20/2016
Valid Until: 10/20/2016

**Customer Address:**

,
-

**Customer:**
**Ref:**
**RFQ No.:**
**Delivery Address:**
CITY OF MONROE
,
-



Please Contact Chelsea Campbell @ 207-655-8462 for any questions.

**Sales Person:** NONE
**Phone No:**

**Payment Term:** Credit Card
**Ship Via:** Ground
**Delivery Term:** Prepay and Add - Origin

RADIODETECTION DOES NOT PROVIDE TRAINING

| Part No. | Cust Part No | Description | Qty | Price USD | Disc % | Total USD |
|---|---|---|---|---|---|---|
| PCMPLUSKITUSA | | PCM PLUS KIT | 1 | 10,760.00 | 0.00 | 10,760.00 |
| 10/AFRAMEPCM+ | | Aframe for PCM+ With Cable | 1 | 457.00 | 0.00 | 457.00 |
| 10/AFBAG | | RD carry Bag for A-Frame Accessory | 1 | 70.00 | 0.00 | 70.00 |
| | | | Sub Total | 11,287.00 | | 11,287.00 |
| | | | *** Total** | **USD** | | **11,287.00** |

- Price does not include Tax or Shipping
- Order Subject to Radiodetection Terms & Conditions
- Order Cancellation Fee or Return subject to 25% Restocking/Cancellation Fee
- Terms: N30 with approved credit or Visa, Mastercard, American Express, Wire Transfer.

***** Important Note: If this is for Export, we must know the complete name and address of the end user so the correct information may be provided for export compliance.**

| Approved By: | Print Name: | Payment Type: PO ☐ VISA M/C ☐ Cash/Check ☐ |
|---|---|---|

**SPX Corporation**
**Radiodetection**
**28 Tower Rd**
**Raymond**
**Maine 04071**
**United States of America**

**Telephone** +1 207 655 8525
**Fax** +1 207 655 8535
**www** www.radiodetection.com

**Federal ID** 38-1016240

43040585 L7

Item # 1

# Utility Committee Meeting

## AGENDA

## November 1, 2016

**Item:**

Approval - Out of State Travel

**Department:**

**Additional Information:**

**Financial Impact:**

**Budgeted Item:**

**Recommendation / Request:**

**Viewing Attachments Requires Adobe Acrobat. Click here to download.**

**Attachments / click to download**

Out of State Travel Info

Cover Memo

Item # 2

# CITY OF MONROE
## GEORGIA

**SUBJECT:** Approval for Out-of-State travel

**DATE SUBMITTED:** 10/16/2016

**DIVISION:** Water

**AUTHORIZED BY:** Rodney Middlebrooks

**AGENDA DATE REQUESTED:** 11/1/2016

**TYPE:**
- ☒ Council
- ☒ Committee
- ☐ Administrator

**CONTACT PERSON:** Rodney Middlebrooks

**DEPARTMENT:** Water & Gas

**MOTION/RECOMMENDATION:** Approval to send 2 employee's to Tallassee, Alabama to attend Neptune Meter training school.

**BACKGROUND:** This training would provide our new meter specialists and leak detection specialists with the working knowledge in the following areas.....

1. Size and select meters properly for the application
2. Install meters and radio endpoints correctly
3. Repair and test meters as needed
4. Troubleshoot meter and radio endpoints in the field
5. Download and review data logging information to address consumption anomalies

Costs $295 each = $590
Lodging $119/night x 2 for 3 nights = $714
Meals - $58/ea = $116

Grand Total - $1,420

**ATTACHMENTS:**
1. Neptune Meter School brochure
2.
3.
4.

☐ None

**REVIEWED BY (INITIALS):**
- Legal:
- Finance: RHP
- Purchasing: GCB
- Other:

**USER DEPT.:** Water

**SUBMITTED BY:** R Middlebrooks

City Administrator

**ADVERTISED:**
- Date:
- Paper:
- ☒ Not Required

**COSTS:** $1,420.00

**FISCAL YEAR:** 2016

**BUDGET CODE:** 520-527-04440-00523-523700

**AFFECTED PARTIES:** ☐ Notified ☒ N/R

**COUNCIL ACTION:**
- ☐ Approved
- ☐ Approved w/Conditions
- ☐ Denied
- ☐ Continued to:

**FUNDING SOURCE:**
- ☐ Capital Improvement
- ☒ Operating Expense
- ☐ Grant
- ☐ Loan
- ☐ Other

NEPTUNE Take Control.

# Marketing Information Letter (*MIL*)

**Date:** May 23, 2016 **MIL #:** M16-008

**Product Line:** None

**Priority:** High **X** Medium Low

**Distribution:**

- **X** Executive Staff
- **X** Regional Managers
- **X** Territory Managers
- **X** Marketing
- **X** Engineering & Quality Control
- **X** Customer Support
- **X** Customer Service
- **X** Water Distributors
- ___ Energy Distributors
- ___ Resellers

**Subject: 2016 N_GAGE Meter School**

**PURPOSE:** To announce Neptune's 2016 N_GAGE Meter School.

**BACKGROUND:** Following on the great success of last year's event, and in response to numerous customer requests, we are planning the 2016 N_GAGE Meter School for **November 15-17, 2016 in Tallassee, AL.**

**COURSE DESCRIPTION:** Neptune's 2016 N_GAGE Meter School is specifically designed to train utility personnel and provide you with the skills to:

- Size and select meters properly for the application
- Install meters and radio endpoints correctly
- Repair and test meters as needed
- Troubleshoot meter and radio endpoints in the field
- Download and review data logging information to address consumption anomalies

A detailed agenda of course topics and breakout sessions is attached to this MIL.

Participation in Neptune's 2016 N_GAGE Meter School will provide for 16 (sixteen) Continuing Education Hour (CEH) credits in Water/Distribution.

You can register for the event at http://www.neptunetg.com/meterschool2016. The fee for the 2016 N_GAGE Meter School is $295 per person and includes all training materials, daily lunch, and one group dinner. The registration fee can be paid by credit card online (preferred method) or by check mailed to Niki Peterson's attention at Neptune Technology Group, 1600 Alabama Highway 229, Tallassee, AL 36078.

**METER MADNESS COMPETITION:** In addition to the course material, we will host an optional Neptune Meter Madness competition. Patterned after the annual AWWA ACE event, participants will

# Marketing Information Letter *(MIL)*

compete against each other to see who can assemble a 5/8" Direct Read T-10® (plastic bottom) the fastest. Meter Madness will culminate on Wednesday evening with a trophy awarded to the Champion.

Please indicate on your course registration if you plan to participate.

**LOGISTICS**: Airfare, car rental, hotel, and miscellaneous expenses will be the responsibility of the participant. The event will be limited to sixty (60) attendees, so please register as soon as possible.

We have a room block secured at The Hotel at Auburn University for $119/night. Please make hotel reservations early as there are a limited number of rooms available each night. The link to reserve your hotel room is http://bookings.ihotelier.com/bookings.jsp?groupID=1644597&hotelID=6493.

Flight arrangements should be made to depart from the **Montgomery (MGM) airport at any time after 3:30pm CST or the Atlanta (ATL) Airport at any time after 6:00pm EST on Thursday, November 17, 2016.**

Please encourage your customers to participate in this valuable training event.

If you have any questions about the Neptune 2016 N_GAGE Meter School, please contact me at (334) 283-7464 or cbrunson@neptunetg.com.

Regards,

**Chuck Brunson**
**Director of Marketing**

# Utility Committee Meeting

# AGENDA

# November 1, 2016

**Item:**

Approval - Water Treatment Plant Roof Repair

**Department:**

**Additional Information:**

**Financial Impact:**

**Budgeted Item:**

**Recommendation / Request:**

**Viewing Attachments Requires Adobe Acrobat. Click here to download.**

**Attachments / click to download**

Roof Repair Bids

Cover Memo

Item # 3

# CITY OF MONROE
## GEORGIA

**SUBJECT:** Roof repair at Wastewater Treatment Plant

**DATE SUBMITTED:** 10/27/2016

**DIVISION:** Sewer Treatment

**AUTHORIZED BY:** Rodney Middlebrooks

**AGENDA DATE REQUESTED:** 11/1/2016

**TYPE:**
- ☒ Council
- ☐ Committee
- ☐ Administrator

**CONTACT PERSON:** Rodney Middlebrooks

**DEPARTMENT:** Water & Gas

**MOTION/RECOMMENDATION:** Approval to hire Horizon Roofing to replace membrane on buildings A, B, & C at the Jacks Creek Sewer plant. Low bidder was Horizon Roofing in the amount of $56,931.00

**BACKGROUND:** Remove existing roofs and replace with .045 TPO roofing membrane. Contractor will provide a 2 year warranty on workmanship and the the manufacturer will provide a I5 year material warranty.

**Job was competitively bid to 3 roofing contractors**

**ATTACHMENTS:**
1. Horizon Roofing, Monroe Ga
2. Skyline Roofing, Monroe Ga
3. Skyline Development LLC, Buford Ga
4.

☐ None

**REVIEWED BY (INITIALS):**
- Legal:
- Finance: LHP
- Purchasing: CB
- Other:

**USER DEPT.:** Sewer Treatment

**SUBMITTED BY:** R Middlebrooks

City Administrator

**ADVERTISED:**
- Date:
- Paper:
- ☒ Not Required

**COSTS:** $56,931.00

**FISCAL YEAR:** 2016

**BUDGET CODE:** CIP

**AFFECTED PARTIES:** ☐ Notified ☒ N/R

**COUNCIL ACTION:**
- ☐ Approved
- ☐ Approved w/Conditions
- ☐ Denied
- ☐ Continued to:

**FUNDING SOURCE:**
- ☒ Capital Improvement
- ☐ Operating Expense
- ☐ Grant
- ☐ Loan
- ☐ Other

## Bids for Wastewater Treatment Plant Building A, B, & C Roof Replacements

| | Chlorine Building | Primary Building | Digestor Building | Totals |
|---|---|---|---|---|
| *Horizon Roofing* | $ 17,782.00 | $ 15,877.00 | $ 23,272.00 | $ 56,931.00 |
| *Skyline Roofing* | $ 22,500.00 | $ 19,250.00 | $ 28,500.00 | $ 70,250.00 |
| *Skyline Development LLC* | $ 21,200.00 | $ 18,300.00 | $ 27,150.00 | $ 66,650.00 |

# Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB127 |

## CONTACT


**Main Office**

(770) 207-0759

**Jennifer Millwood**

1557 South Broad St.
P.O. Box 1309
Monroe, GA 30655

**Agent Information**

(470) 222-9218

**Ron Patterson**

ronp@horizonroofs.com

www.horizonroofs.com


---

**COMPANY INFORMATION**

City Of Monroe GA

**Rodney Middlebrooks**

420 South Broad St.
Monroe, GA 30655

(770) 404-3482

Since 1821 THE CITY OF Monroe

**JOB SITE INFORMATION**

City Of Monroe GA

**Rodney Middlebroks**

2200 Hwy 83
Bldg A
Monroe, GA 30655

(770) 404-3482

Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB127 |

## JOB DETAILS

### Scope of Work Includes The Following:

1. 3" ISO insulation board
2. TPO Roofing Membrane
3. TPO Flashings, Trim and Sealants
4. Through The Wall Scuppers
5. Parapet Walls
6. Expansion Joints
7. Installation, Tools and Equipment
8. Material Warranty
9. Workmanship Warranty

---

### Exclusions:

1. Roof Deck Elevation
2. Utility Lines (Electric, Gas, Water)
3. Below Deck Utility Lines
4. Tapered Insulation
5. Satellite Dishes
6. Abatement
7. Debris displaced on the underside of the roof deck while installing the new roof
8. Falling debris due to installation of the new roof

Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB127 |

# SCOPE OF WORK

## Scope of Work - Details:

1. Remove The Existing Flat Roof (Upper & Lower Elevations) To Decking and Reroof Using .045 TPO Roofing Material According To Manufacturer's Specifications (Incl. Parapet Walls)
2. Inspect, Clean and Prep the existing metal roof deck to facilitate installation of new TPO roof system. Report any deficiencies.
3. Deteriorated Metal and Lightweight Concrete Decking To Be Replaced As Necessary.
4. Add to Contract: $15.25 per SQFT for metal and $15.50 per SQFT for Lightweight Concrete. Also, Replace Deteriorated Wood Blocking and/or Nailer's Perimeter Of Roof As Required. Add to Contract: $5. 75 per LF
5. Fully Adhere 3" ISO Insulation To The Entire Lightweight Concrete Roof Deck (Approx. 8,206 SQFT) According To The Manufacturer's Specifications
6. Fully Adhere ISO Tapered Insulation System (Crickets) 1/4" Slope Per FT. As Needed To Drain Water.
7. Fully Adhere .045 TPO (Thermoplastic Polyefin) Roofing Membrane Entire Roof Area (Upper & Lower)
8. Flash Roof Penetrations (HVAC Curbs, Heater Stacks, Vent Pipes, Pitch Pans, Exhaust Fans, Roof Curbs, Etc.) Using .045 TPO Roofing Membrane According To The Manufacturer's Specifications.
9. Flash Roof/Wall Tie-Ins Using Prefinished 24-Gauge Galvanized Flashing According To The Manufacturer's Specifications.
10. Remove The Existing Coping, Gravel Stop and Roofing Materials (At Parapet Wall) To Facilitate Roof Installation. Install .045 TPO Flashing Sheet On Parapet Wall According To The Manufacturer's Parapet Wall Flashing Specifications. Re-Install Coping.
11. Clean up and dispose of project related debris properly.
12. 2 year warranty on workmanship furnished by Horizon Roofing, LLC
13. 15 year material warranty furnished by manufacturer

Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB127 |

# NOTES & CONDITIONS

**NOTE 1**

**Some of the existing HVAC units and other stub outs may need to be disconnected and removed to facilitate the installation of your new roof system. These elements are to be removed and replaced by others or Horizon Roofing will provide pricing from a qualified HVAC contractor.**

**NOTE 2**

**Installation according to the manufacturer's specifications**

**NOTE 3**

**Work will be performed in compliance with Federal and State Occupational Safety and Health Act (OSHA) regulations.**

**NOTE 4**

**Due to the possibility of material price increases, the proposed contract amount (after 30 days) may be increased to cover those costs.**

**CONTRACT AMOUNT** **$17,782.00**

## Terms Of Payment

**Horizon Roofing requests a 50% mobilization payment upon signing the contract. The balance of the contract is due upon completion fo the project and your acceptance of our work.**

**Horizon Roofing, LLC** **Date** **Purchaser** **Date**

# Skyline Roofing

308 N. Midland Ave
Monroe, Ga. 30655
Office: 770-266-0186
Fax: 1-844-270-2688

Shawn Mills Cell: 404-427-5845

## JOB ESTIMATE

Monroe City Water
420 South Broad St
Monroe, Ga 30655

| JOB DESCRIPTION |
| --- |
| Water Treatment plant buildin A Reroof<br>2200 Hwy 83<br>Monreo, Ga, |

| ITEMIZED ESTIMATE: TIME AND MATERIALS | AMOUNT |
| --- | --- |
| Remove existing roof and inspect roof decking<br>Remove or repair any rotton or damaged decking<br>Install new TPO membrain roof over ISO<br>Install or repair flashing as needed<br>Remove and dispose of all debris | |
| **TOTAL ESTIMATED JOB COST** | **$22,500.00** |

This is an estimate only, not a contract. This estimate is for completing the job described above, based on our evaluation. It does not include unforeseen price increases or additional labor and materials which may be required should problems arise.

Betty Mills/ Skyline Roofing
PREPARED BY

Date 9/15/16

Item # 3

# CONSTRUCTION PROPOSAL

Skyline Development

# PROPOSAL

**July 24 2016**

Between the Owner: **Monroe City Water**
**420 South Broad Street**
**Monroe GA 30655**

And the Contractor: **Skyline Development L.L.C.**
**4850 Golden Parkway, Suite B-310**
**Buford, Ga. 30518**
**404-683-9159**

For the Project: **TPO Re-roof**
**building A**
**2200 Hwy. 83**
**Monroe, GA. 30655**

## SCOPE OF WORK

1. Remove existing roof to deck
2. Remove and repair any damaged decking
3. flash plumbing vents and roof curbs
4. Install new GAF, 15 yr. TPO roof over 3 Inch ISO
5. Dispose of roof debris in a qualified landfill.
6. Supply the owner with a two year labor warranty and the manufacturers material warranty.

**Total Base price according to scope of work $ 21,200.00**

# Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB128 |

## CONTACT


**Main Office**

(770) 207-0759

**Jennifer Millwood**

1557 South Broad St.
P.O. Box 1309
Monroe, GA 30655

**Agent Information**

(470) 222-9218

**Ron Patterson**

ronp@horizonroofs.com

www.horizonroofs.com


## COMPANY INFORMATION

City Of Monroe GA

**Rodney Middlebrooks**

420 South Broad St.
Monroe, GA 30655

(770) 404-3482

Since 1821 THE CITY OF Monroe

## JOB SITE INFORMATION

City Of Monroe GA

**Rodney Middlebroks**

2200 Hwy 83
Bldg B
Monroe, GA 30655

(770) 404-3482

Item # 3

Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB128 |

**JOB DETAILS**

## Scope of Work Includes The Following:

1. 3" ISO insulation board
2. TPO Roofing Membrane
3. TPO Flashings, Trim and Sealants
4. Through The Wall Scuppers
5. Parapet Walls
6. Expansion Joints
7. Installation, Tools and Equipment
8. Material Warranty
9. Workmanship Warranty

## Exclusions:

1. Roof Deck Elevation
2. Utility Lines (Electric, Gas, Water)
3. Below Deck Utility Lines
4. Tapered Insulation
5. Satellite Dishes
6. Abatement
7. Debris displaced on the underside of the roof deck while installing the new roof
8. Falling debris due to installation of the new roof

Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB128 |

# SCOPE OF WORK

## Scope of Work - Details:

1. Remove The Existing Flat Roof (Upper & Lower Elevations) To Decking and Reroof Using .045 TPO Roofing Material According To Manufacturer's Specifications (Incl. Parapet Walls)
2. Inspect, Clean and Prep the existing metal roof deck to facilitate installation of new TPO roof system. Report any deficiencies.
3. Deteriorated Metal and Lightweight Concrete Decking To Be Replaced As Necessary.
4. Add to Contract: $15.25 per SQFT for metal and $15.50 per SQFT for Lightweight Concrete. Also, Replace Deteriorated Wood Blocking and/or Nailer's Perimeter Of Roof As Required. Add to Contract: $5. 75 per LF
5. Fully Adhere 3" ISO Insulation To The Entire Lightweight Concrete Roof Deck (Approx. 8,206 SQFT) According To The Manufacturer's Specifications
6. Fully Adhere ISO Tapered Insulation System (Crickets) 1/4" Slope Per FT. As Needed To Drain Water.
7. Fully Adhere .045 TPO (Thermoplastic Polyefin) Roofing Membrane Entire Roof Area (Upper & Lower)
8. Flash Roof Penetrations (HVAC Curbs, Heater Stacks, Vent Pipes, Pitch Pans, Exhaust Fans, Roof Curbs, Etc.) Using .045 TPO Roofing Membrane According To The Manufacturer's Specifications.
9. Flash Roof/Wall Tie-Ins Using Prefinished 24-Gauge Galvanized Flashing According To The Manufacturer's Specifications.
10. Remove The Existing Coping, Gravel Stop and Roofing Materials (At Parapet Wall) To Facilitate Roof Installation. Install .045 TPO Flashing Sheet On Parapet Wall According To The Manufacturer's Parapet Wall Flashing Specifications. Re-Install Coping.
11. Clean up and dispose of project related debris properly.
12. 2 year warranty on workmanship furnished by Horizon Roofing, LLC
13. 15 year material warranty furnished by manufacturer

Horizon Roofing

DATE
09/23/2016

PROPOSAL #
AB128

# NOTES & CONDITIONS

## NOTE 1

**Some of the existing HVAC units and other stub outs may need to be disconnected and removed to facilitate the installation of your new roof system. These elements are to be removed and replaced by others or Horizon Roofing will provide pricing from a qualified HVAC contractor.**

## NOTE 2

**Installation according to the manufacturer's specifications**

## NOTE 3

**Work will be performed in compliance with Federal and State Occupational Safety and Health Act (OSHA) regulations.**

## NOTE 4

**Due to the possibility of material price increases, the proposed contract amount (after 30 days) may be increased to cover those costs.**

**CONTRACT AMOUNT** **$15,877.00**

## Terms Of Payment

**Horizon Roofing requests a 50% mobilization payment upon signing the contract. The balance of the contract is due upon completion fo the project and your acceptance of our work.**

**Horizon Roofing, LLC** **Date** **Purchaser** **Date**

# Skyline

## Roofing

308 N. Midland Ave
Monroe, Ga. 30655
Office: 770-266-0186
Fax: 1-844-270-2688

Shawn Mills Cell: 404-427-5845

**JOB ESTIMATE**

Monroe City Water
420 South Broad St
Monroe, Ga 30655

| JOB DESCRIPTION |
| --- |
| Water Treatment plant buildin B Reroof<br>2200 Hwy 83<br>Monreo, Ga, |

| ITEMIZED ESTIMATE: TIME AND MATERIALS | AMOUNT |
| --- | --- |
| Remove existing roof and inspect roof decking<br>Remove or repair any rotton or damaged decking<br>Install new TPO membrain roof over ISO<br>Install or repair flashing as needed<br>Remove and dispose of all debris | |
| **TOTAL ESTIMATED JOB COST** | **$19,250.00** |

This is an estimate only, not a contract. This estimate is for completing the job described above, based on our evaluation. It does not include unforeseen price increases or additional labor and materials which may be required should problems arise.

Betty Mills/ Skyline Roofing
PREPARED BY

Date 9/15/16

Item # 3

# CONSTRUCTION PROPOSAL

Skyline Development

# PROPOSAL

**July 24 2016**

Between the Owner: **Monroe City Water**
**420 South Broad Street**
**Monroe GA 30655**

And the Contractor: **Skyline Development L.L.C.**
**4850 Golden Parkway, Suite B-310**
**Buford, Ga. 30518**
**404-683-9159**

For the Project: **TPO Re-roof**
**building b**
**2200 Hwy. 83**
**Monroe, GA. 30655**

## SCOPE OF WORK

1. Remove existing roof to deck
2. Remove and repair any damaged decking
3. flash plumbing vents and roof curbs
4. Install new GAF, 15 yr. TPO roof over 3 Inch ISO
5. Dispose of roof debris in a qualified landfill.
6. Supply the owner with a two year labor warranty and the manufacturers material warranty.

**Total base price according to scope of work** **$ 18,300.00**

# Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB129 |

## CONTACT


**Main Office**

(770) 207-0759

**Jennifer Millwood**

1557 South Broad St.
P.O. Box 1309
Monroe, GA 30655

**Agent Information**

(470) 222-9218

**Ron Patterson**

ronp@horizonroofs.com

www.horizonroofs.com


## COMPANY INFORMATION

City Of Monroe GA

**Rodney Middlebrooks**

420 South Broad St.
Monroe, GA 30655

(770) 404-3482

## JOB SITE INFORMATION

City Of Monroe GA

**Rodney Middlebroks**

2200 Hwy 83
Bldg C
Monroe, GA 30655

(770) 404-3482

Since 1821 THE CITY OF Monroe

Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB129 |

**JOB DETAILS**

## Scope of Work Includes The Following:

1. 3" ISO insulation board
2. TPO Roofing Membrane
3. TPO Flashings, Trim and Sealants
4. Through The Wall Scuppers
5. Parapet Walls
6. Expansion Joints
7. Installation, Tools and Equipment
8. Material Warranty
9. Workmanship Warranty

## Exclusions:

1. Roof Deck Elevation
2. Utility Lines (Electric, Gas, Water)
3. Below Deck Utility Lines
4. Tapered Insulation
5. Satellite Dishes
6. Abatement
7. Debris displaced on the underside of the roof deck while installing the new roof
8. Falling debris due to installation of the new roof

Horizon Roofing

| DATE | PROPOSAL # |
|---|---|
| 09/23/2016 | AB129 |

# SCOPE OF WORK

## Scope of Work - Details:

1. Remove The Existing Flat Roof (Upper & Lower Elevations) To Decking and Reroof Using .045 TPO Roofing Material According To Manufacturer's Specifications (Incl. Parapet Walls)
2. Inspect, Clean and Prep the existing metal roof deck to facilitate installation of new TPO roof system. Report any deficiencies.
3. Deteriorated Metal and Lightweight Concrete Decking To Be Replaced As Necessary.
4. Add to Contract: $15.25 per SQFT for metal and $15.50 per SQFT for Lightweight Concrete. Also, Replace Deteriorated Wood Blocking and/or Nailer's Perimeter Of Roof As Required. Add to Contract: $5. 75 per LF
5. Fully Adhere 3" ISO Insulation To The Entire Lightweight Concrete Roof Deck (Approx. 8,206 SQFT) According To The Manufacturer's Specifications
6. Fully Adhere ISO Tapered Insulation System (Crickets) 1/4" Slope Per FT. As Needed To Drain Water.
7. Fully Adhere .045 TPO (Thermoplastic Polyefin) Roofing Membrane Entire Roof Area (Upper & Lower)
8. Flash Roof Penetrations (HVAC Curbs, Heater Stacks, Vent Pipes, Pitch Pans, Exhaust Fans, Roof Curbs, Etc.) Using .045 TPO Roofing Membrane According To The Manufacturer's Specifications.
9. Flash Roof/Wall Tie-Ins Using Prefinished 24-Gauge Galvanized Flashing According To The Manufacturer's Specifications.
10. Remove The Existing Coping, Gravel Stop and Roofing Materials (At Parapet Wall) To Facilitate Roof Installation. Install .045 TPO Flashing Sheet On Parapet Wall According To The Manufacturer's Parapet Wall Flashing Specifications. Re-Install Coping.
11. Clean up and dispose of project related debris properly.
12. 2 year warranty on workmanship furnished by Horizon Roofing, LLC
13. 15 year material warranty furnished by manufacturer

Horizon Roofing

DATE 09/23/2016

PROPOSAL # AB129

# NOTES & CONDITIONS

## NOTE 1

**Some of the existing HVAC units and other stub outs may need to be disconnected and removed to facilitate the installation of your new roof system. These elements are to be removed and replaced by others or Horizon Roofing will provide pricing from a qualified HVAC contractor.**

## NOTE 2

**Installation according to the manufacturer's specifications**

## NOTE 3

**Work will be performed in compliance with Federal and State Occupational Safety and Health Act (OSHA) regulations.**

## NOTE 4

**Due to the possibility of material price increases, the proposed contract amount (after 30 days) may be increased to cover those costs.**

**CONTRACT AMOUNT** **$23,272.00**

## Terms Of Payment

**Horizon Roofing requests a 50% mobilization payment upon signing the contract. The balance of the contract is due upon completion fo the project and your acceptance of our work.**

**Horizon Roofing, LLC** **Date** **Purchaser** **Date**

# Skyline Roofing

308 N. Midland Ave
Monroe, Ga. 30655
Office: 770-266-0186
Fax: 1-844-270-2688

Shawn Mills Cell: 404-427-5845

## JOB ESTIMATE

Monroe City Water
420 South Broad St
Monroe, Ga 30655

| JOB DESCRIPTION |
| --- |
| Water Treatment plant buildin C reroof<br>2200 Hwy 83<br>Monreo, Ga, |

| ITEMIZED ESTIMATE: TIME AND MATERIALS | AMOUNT |
| --- | --- |
| Remove existing roof and inspect roof decking<br>Remove or repair any rotton or damaged decking<br>Install new TPO membrain roof over ISO<br>Install or repair flashing as needed<br>Remove and dispose of all debris | |
| **TOTAL ESTIMATED JOB COST** | **$28,500.00** |

This is an estimate only, not a contract. This estimate is for completing the job described above, based on our evaluation. It does not include unforeseen price increases or additional labor and materials which may be required should problems arise.

Betty Mills/ Skyline Roofing
PREPARED BY

Date 9/15/16

Item # 3

# CONSTRUCTION PROPOSAL

Skyline Development

# PROPOSAL

**July 24 2016**

Between the Owner: **Monroe City Water**
**420 South Broad Street**
**Monroe GA 30655**

And the Contractor: **Skyline Development L.L.C.**
**4850 Golden Parkway, Suite B-310**
**Buford, Ga. 30518**
**404-683-9159**

For the Project: **TPO Re-roof**
**building c**
**2200 Hwy. 83**
**Monroe, GA. 30655**

## SCOPE OF WORK

1. Remove existing roof to deck
2. Remove and repair any damaged decking
3. flash plumbing vents and roof curbs
4. Install new GAF, 15 yr. TPO roof over 3 Inch ISO
5. Dispose of roof debris in a qualified landfill.
6. Supply the owner with a two year labor warranty and the manufacturers material warranty.

**Total base price according to scope of work $27,150.00**

# Utility Committee Meeting

# AGENDA

# November 1, 2016

**Item:**

Approval - Council Chamber Remodel

**Department:**

**Additional Information:**

**Financial Impact:**

**Budgeted Item:**

**Recommendation / Request:**

**Viewing Attachments Requires Adobe Acrobat. Click here to download.**

**Attachments / click to download**

Remodel Info

Cover Memo

Item # 4

# CITY OF MONROE
## GEORGIA

**SUBJECT:** Council Chamber Remodel

**DATE SUBMITTED:** 10-27-16

**DIVISION:** City Hall

**AUTHORIZED BY:** Ron Rabun

**AGENDA DATE REQUESTED:** 11-1-16

**TYPE:**
- ☒ Council
- ☒ Committee
- ☐ Administrator

**CONTACT PERSON:** Chris Bailey

**DEPARTMENT:** City Hall

**MOTION/RECOMMENDATION:**
Staff recommends the approval of the Council Chamber remodel and communication upgrades as provided in this request document. Bids were sought for all aspects of the project as outlined in the procurement policy, supporting documentation is provided as attachments. The approval request is for J. Key Construction ($30,736.00), Clark Powell ($25,381.00), B&H Photo ($43,273).

**BACKGROUND:**
The Council Chambers as they currently stand are original to the building that was built in 2001. The current design provides fewer seats for departments, attorneys, and clerical staff. The visual, audio, and recording system has all at some point quit working with few available options for repair or maintenance due to the outdated equipment and technical support. There have been numerous visual and audio issues with the existing system, thus requiring the need for an upgrade to the overall system.

**ATTACHMENTS:**
1. Communication/Construction Quotation Summary (1 page)
2. Construction Quotes (2 pages) – McClellan Homes, J. Key Construction
3. Communication Quotes (18 pages) – B&H Photo, Full Compass, WH Platts, Clark Powell, Diversified

**REVIEWED BY (INITIALS):**
- **Legal:** N/A
- **Finance:** LHP
- **Purchasing:** GCB
- **Other:**

**USER DEPT.:** City Hall

**SUBMITTED BY:** Chris Bailey

City Administrator

**ADVERTISED:**
- **Date:** N/A
- **Paper:** N/A
- ☒ **Not Required**

**COSTS:** $99,390.00

**FISCAL YEAR:** 2016

**BUDGET CODE:** MCT

**AFFECTED PARTIES:** ☐ Notified ☒ N/R

**COUNCIL ACTION:**
- ☐ Approved
- ☐ Approved w/Conditions
- ☐ Denied
- ☐ Continued to:

**FUNDING SOURCE:**
- ☐ Capital Improvement
- ☐ Operating Expense
- ☐ Grant
- ☐ Loan
- ☒ Other

## Video & Communication Quotes

| Description | Part Number | Quantity | WH Platts | Clark Powell | Diversified | B&H Photo | Full Compass |
|---|---|---|---|---|---|---|---|
| Chassis | BC12-R | 1 | $6,584.00 | $2,728.00 | $3,850.60 | no bid | no bid |
| Channel | Blade-A | 2 | $9,408.00 | $9,329.00 | $9,633.73 | no bid | no bid |
| Storage | LGX-4TBR-N | 1 | $4,495.00 | $3,995.00 | $4,603.31 | no bid | no bid |
| Camera | AW-HE130 | 4 | no bid | no bid | no bid | $8,350.00 | $8,900.00 |
| Camera Controller | AW-RP120G | 1 | no bid | no bid | no bid | $4,495.00 | $4,495.00 |
| Video Switcher | AW-HS50N | 1 | no bid | no bid | no bid | $3,520.00 | $3,520.00 |
| Monitor | V-LCD-17HR-3G-DT | 2 | no bid | no bid | no bid | $929.00 | $929.00 |
| | | **Total** | **$29,895.00** | **$25,381.00** | **$27,721.37** | **$43,273.00** | **$45,473.00** |

## Construction Quotes

| Description | McClellan Homes | J. Key Construction | Gerald Atha Construction | Premium Construction |
|---|---|---|---|---|
| Chamber Remodel/Construction | $36,250.00 | $30,736.00 | no bid | no bid |
| **Total** | **$36,250.00** | **$30,736.00** | **$0.00** | **$0.00** |

| | |
|---|---|
| **Total Council Chamber Remodel Expense** | **$99,390.00** |

**Chris Bailey**

**From:** Rodney Middlebrooks
**Sent:** Thursday, October 27, 2016 10:08 AM
**To:** Chris Bailey
**Subject:** FW: Council Chambers Remodel

---

**From:** Michael Mcclellan [mailto:mcclellanhomes@gmail.com]
**Sent:** Monday, October 10, 2016 11:33 AM
**To:** Rodney Middlebrooks
**Subject:** Council Chambers Remodel

Mcclellan Homes
770-616-3040

Frame floor
Frame and finish walls including paint and stain.
Set desk tops.

Total. $36,250.00

Item # 4

# ESTIMATE

**J. Key Construction, LLC**

*2040 Dally Trail, Covington, GA 30014*
*770-351-6724*

DATE: OCTOBER 17, 2016
*REVISED*

TO: Rodney Middlebrooks

Job Location:
Monroe City Hall

| | DESCRIPTION | PRICE |
|---|---|---|
| | Install judges paneling trim on rough framed knee walls | |
| | Custom build and install Formica counter tops | |
| | Custom build and install supports for counter tops | |
| | Stain, sand and seal all finished carpenter work | |
| | Install approx. 1,176 sq.ft. of 2x6 raised floor system | |
| | Install approx. 1,176 sq.ft. of ¾ Vantech subfloor | |
| | Note: All materials used will be stain grade material for judges panels | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | TOTAL ESTIMATE = | $30,736.00 |
| | Revised total of estimate due to rise in cost of materials from effects of recent bad weather | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | *All materials and labor furnished* | |
| | | |

Thank you for your business!

Panasonic

# AW-HE130W/K

**HD Integrated Camera**

AW-HE130W AW-HE130K

**For indoor use**


## Production Quality HD Video via 3G-SDI and IP Streaming

Item # 4

# Full HD Camera with Integrated Pan-Tilt Provides Video Output via 3G-SDI or IP Streaming Transmission for an Expanded Range of Applications

Introducing a new PTZ camera capable Production Quality

Full HD video output up to 1080/60p via IP transmission,

in addition to 3G-SDI and HDMI.

Equipped with three newly developed 1/2.86 MOS sensors for high sensitivity,

a superior S/N ratio and high resolution.

The AW-HE130W/K also supports PoE+*, so the camera only needs one LAN cable

for its power supply, control and video output.

Presenting the new standard in versatile, high-quality remote production

with 3G-SDI, IP-Streaming, and POE+.


Item # 4

* Abbreviation of Power over Ethernet Plus.

# A Single Cable Solution for Remote Video and Audio Capture

## Full HD video output via IP transmission

In addition to 3G-SDI and HDMI output, production quality full HD video output via IP transmission is supported with the AW-HE130W/K. The camera delivers up to four channels of IP streaming video (H.264), with a maximum quality level of 1080/60p at 24 Mbps*1. Simultaneous transmission to as many as 14 devices is also supported.*2 Flexible system setup is possible to meet various application needs.

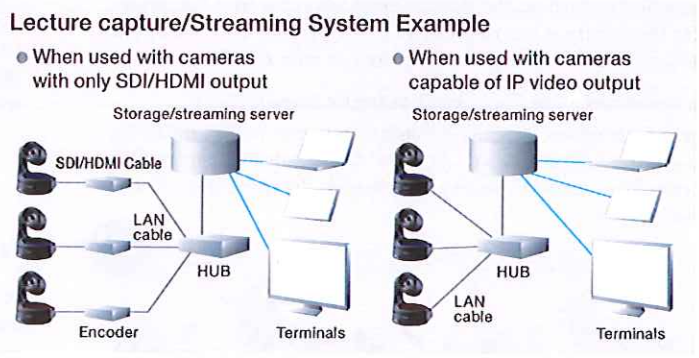
### List of Supported Multi-streaming Outputs

| Settings | | H.264 | | | JPEG |
|---|---|---|---|---|---|
| | | CH1 | CH2 | CH3/CH4 | CH1/CH2/CH3 |
| Resolution | | 1920×1080/ 1280×720 | 1920×1080/ 1280×720/640×360/ 320×180/160×90 | 1280×720/ 640×360/320×180/ 160×90 | 1920×1080/ 1280×720/640×360/ 320×180/160×90 |
| Frame rate | 60 Hz | 60 fps | 5 fps/15 fps/30 fps | 5 fps/15 fps/30 fps | 5 fps/15 fps/30 fps |
| | 50 Hz | 50 fps | 5 fps/12.5 fps/25 fps | 5 fps/12.5 fps/25 fps | 5 fps/12.5 fps/25 fps |
| Bit rate | | Up to 24 Mbps | | | |
| Voice transmission | | Yes (AAC48 kHz) | | | |
| PoE+ | | Yes | | | |

## Transmit IP video without a separate encoder reduces cost and simplifies installation

There is no need for the separate encoder normally required when streaming video and audio via IP. Systems can be built with exceptional cost/performance benefits.

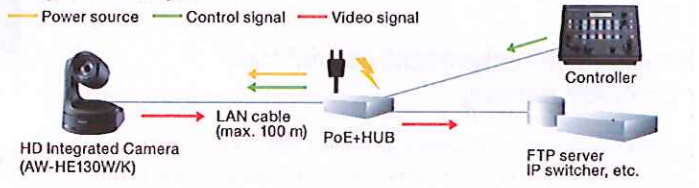
### Lecture capture/Streaming System Example




## Supporting POE+*3 for lower installation cost

By connecting to network devices that support the IEEE 802.3at POE+ standard, power can be supplied via LAN cable. Since it is not necessary to install a power supply or even a local A.C. outlet, installation costs can be significantly reduced.

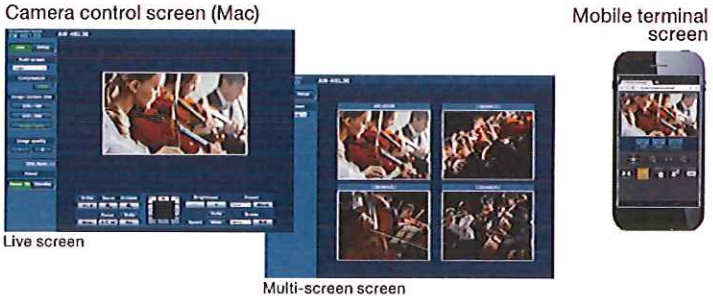
### Diagram Example




## IP control with image monitoring using PC, Mac and mobile terminals

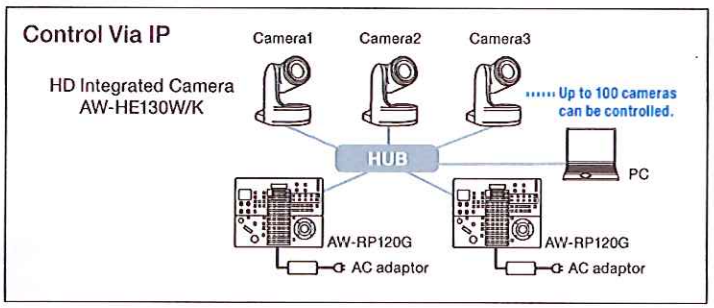
Using an IP browser, such as Internet Explorer or Safari, it is possible to set up and control the camera from a remote location, This feature simplifies the management of cameras around a campus, or across a worldwide enterprise network. IP video monitoring and remote camera control can also be performed from mobile terminals such as an iPhone, iPad or Android device.

* For the latest information on supported OS/brower, please refer to the "service and support" on the Panasonic website (http://pro-av.panasonic.net).




## Flexible IP Control Architecture Simplifies System Design and Operation*4

Up to 100 x AW-HE130W/K cameras can be controlled via IP from a single AW-RP120G, AW-RP50, or PC. An AW-HE130W/K can also be simultaneously controlled by up to five AW-RP120G or AW-RP50's via IP. AK-HRP200G can be used for precise color adjustment.




* 1: 1920 x 1080 60 fps output is 1ch display only. For 2ch or more, display is max. 30 fps. Also, JPEG output is up to 3ch.
* 2: The number varies depending on distribution settings or network environment. Only one Android™ device can be connected to one camera.
* 3: Abbreviation of Power over Ethernet Plus.
* 4: Controller upgrade required. For details, please refer to the "service and support" on the Panasonic website (http://pro-av.panasonic.net).

# Advanced Video Processing for High Quality Video Image.

## Three newly developed 1/2.86-type MOS sensors for high-level video capture and production.

Equipped with three newly developed 1/2.86-type full HD MOS sensors and DSP (Digital Signal Processor), AW-HE130W/K achieves high sensitivity, a high S/N ratio and high resolution through the use of advanced video processing.

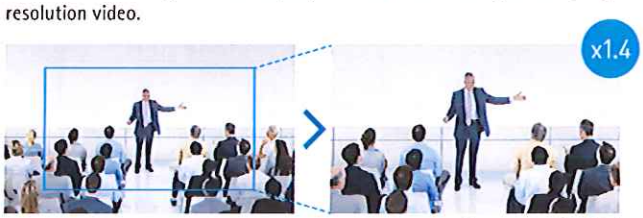
## Optical Image Stabilizer and Digital Extender for capturing clear images at any distance.

### Optical Image Stabilization System (OIS)

Automatically minimizes the effect of small vibrations from the surface where the camera is mounted caused ; whether this is caused by the opening and closing of doors, nearby speakers, or other disturbances.

### High Performance 20x Zoom Lens/1.4x Digital Extender Zoom

In addition to a sharp, fast F1.6, 20x optical zoom lens, the AW-HE130W/K is equipped with an innovative 1.4x digital extender that can increase the effective focal length of the lens by 40% while delivering smooth, high resolution video.




*Images are simulated

## Advanced color adjustment capabilities for precision imaging

### Independent Color Correction Function with 12 Color Axes + 3 Skin Tone Axes

In addition to the conventional 12 axes, three additional axes have been added for the skin tone area. This makes it possible to reproduce skin tones with greater precision.

Conventional model

AW-HE130W/K

*Images are simulated

### Color Temperature Adjustment Mode

In addition to the usual white balance modes, a new vari able Color Temperature-based function has been added. This makes it easier to make the precise camera adjustments required for different lighting conditions.

*Images are simulated

## Dynamic Range Stretch (DRS) / Hybrid Digital Noise Reduction (Hybrid DNR)

Black defects, halation and washed-out colors are minimized for video images with a visually broad dynamic range (DRS). In addition, with Hybrid Digital Noise Reduction (Hybrid DNR), two types of noise reduction, 2D and 3D, are used together to enable clear video capture under a wide range of lighting conditions, with minimal after-image blurring or image degradation.

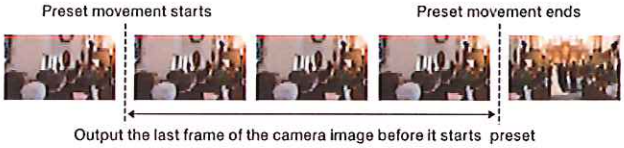
## Equipped with Night Mode for infrared shooting

The AW-HE130W/K can deliver high-quality monochrome video in total darkness, when the camera's Night Mode is used in conjunction with an optional IR illuminator.


*Images are simulated

## Freeze During Preset function

The new Freeze During Preset function may be enabled to freeze the video during preset playback. The immediately preceding still image is output during preset movements so that the swiveling movement is not displayed, making operations possible with one camera.




## Supports multiple formats for flexible output

In addition to typically supported formats, the camera supports output formats required for specialized applications, including 1080/29.97p, 1080/25p, 1080/23.98p. Remote control video capture can now be more easily performed for specialized applications such as teleproduction, and scientific research.

*1 Native output

Supported formats

1080/59.94p 1080/29.97p*1 1080/23.98p 1080/59.94i 1080/29.97PsF 1080/23.98PsF 720/59.94p 480/59.94p(HDMI) or 480/59.94i(SDI) 1080/50p 1080/25p*1 1080/50i 1080/25PsF 720/50p 576/50p(HDMI) or 576/50i (SDI)

## Audio input function

The AW-HE130W/K also supports audio input, embedding, and encoding. The input from the camera's switchable mic/line input can be combined with the HD-SDI, HDMI, and streaming outputs for mixing, recording or transmission.

## Excellent quietness

Thanks to its fan-less design and advanced pan-tilt mechanism, the AW-HE130W/K is very quiet and greatly reducing audio noise during video capture.

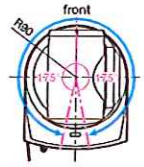
Item # 4

## Exceptional Pan-Tilt mechanism performance for smooth moves during video capture.

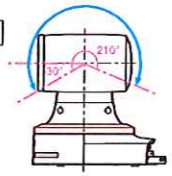
Thanks to a highly evolved pan-tilt design, the AW-HE130W/K achieves smoother and more natural movement during on-air shots. The pan-tilt head also has a wide shooting range*, with a pan range of ±175° and a tilt range of -30° to 210° . The newly developed pan-tilt drive provides high-speed operation at maximum 60°/s, excellent response to remote control operation, and highly precise stop control. These features combine to accurately capture fast-action sports scenes or smooth concert footage. The noise level during operation is also very low, at NC35 or less, which is ideal for use in quiet environments.

* Depending on the position of the pan and tilt, its own unit may be reflected in the image.

Top view



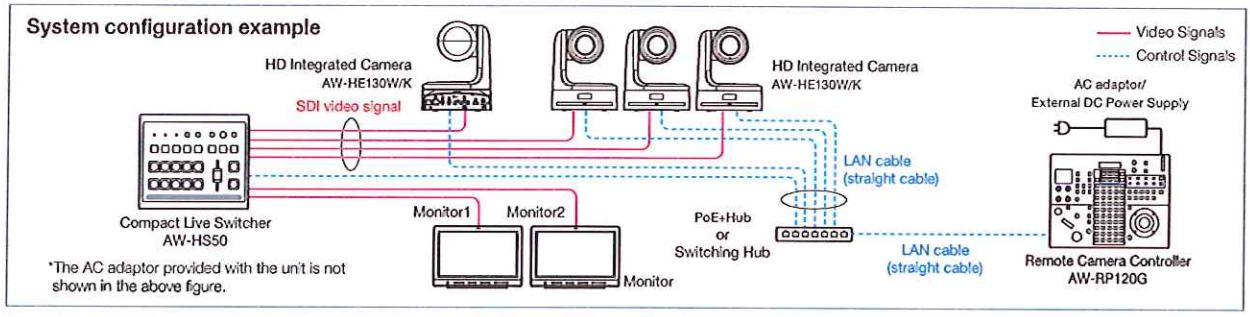

Side view




## Other Functions

- Equipped with ND filters (Through, 1/8, 1/64).
- Equipped with four types of scene files that can be set by the user.
- Preset memory of up to 100 positions.
- Functions such as freeze during preset, digital extender zoom, color temperature settings can be assigned to the user buttons on Panasonic controllers.
- Equipped with RS422 remote terminal; up to five units can be controlled via serial control from a controller.
- Equipped with RS232C remote terminal (Standard serial communication support).
- Up to four units can be operated with a wireless remote controller (AW-RM50G sold separately).
- Easy installation thanks to use of turn-lock mechanism.
- Color variations (black/white) that can be chosen for different applications or conditions.

### System configuration example




*The AC adaptor provided with the unit is not shown in the above figure.

## Specifications

| | | | |
|---|---|---|---|
| GENERAL | Power requirements | | DC 12 V (AC adaptor supplied) DC 42 - 57 V (PoE+ power supply) |
| | Current consumption | | 1.8 A (AC adaptor supplied) 0.6 A (PoE+ power supply) |
| | Ambient operating temperature | | 0 °C to 40 °C (32 °F to 104 °F) |
| | Storage temperature | | –20 °C to 50 °C (–4 °F to 122 °F) |
| | Allowable humidity ranges | | 20 % to 90 % (no condensation) |
| | Mass | | Approx. 3.1 kg (6.83 lb) [Including mount bracket] |
| | Dimensions (W x H x D) | | 180 mm x 228 mm x 234 mm (7-3/32 inches x 9 inches x 9-3/16 inches) (excluding protrusions, cable cover, direct ceiling mount bracket) |
| | Finish | | AW-HE130WP/AW-HE130WE: Pearl white<br>AW-HE130KP/AW-HE130KE: Metallic black |
| | Controller supported*1 | | AW-RP120, AW-RP50, AK-HRP200 |
| INPUT | Input connector | | DC 12 V IN, G/L IN (BNC)<br>• BBS (Black Burst Sync), tri-level sync supported<br>• Locking to a color subcarrier is not possible with BBS.<br>PoE+ (IEEE802.3at standard) |
| OUTPUT | Video output | HDMI | HDMI connector<br>• HDCP is not supported.<br>• Viera Link is not supported. |
| | | HD/SD SDI OUT | SMPTE424/SMPTE292/SMPTE259 standards 75 Ω (BNC×1) |
| | | VIDEO OUT | NTSC/PAL 1.0 V [p-p]/75 Ω (BNC×1) |
| INPUT/ OUTPUT | Input/ Output connector | LAN | LAN connector for IP control (RJ-45) |
| | | RS-422 | CONTROL IN RS-422A (RJ-45) |
| | | MIC/LINE input | φ3.5 mm stereo mini jack<br>Input impedance: High impedance<br>• During MIC input<br>Supported mic: Stereo mic (plug-in power ,on/off switching via menu)<br>• Supply voltage: 2.5 V ± 0.5 V<br>Mic input sensitivity: Approx. -40 dBV ± 3 dBV (0 dB=1 V/Pa, 1 kHz)<br>• During LINE input<br>Input level: Approx. -10 dBV ±3 dBV |
| FUNCTIONS AND PERFORMANCE | [Camera unit] | | |
| | Imaging sensors | | 1/2.86-type Full-HD 3MOS |
| | Lens | | Motorized 20 zoom, F1.6 to F3.4<br>(f=4.5 mm to 90 mm; 35 mm equivalent: 32.13 mm to 642.5 mm) |
| | Focus | | Switching between auto and manual |
| | Focus distance | | Entire zooming range: 800 mm (2.62 ft) Wide end: 400 mm (1.31 ft) |
| | Color separation optical system | | 3MOS |
| | Minimum illumination | | 2 lx (50 %, F1.6, 36 dB) |
| | Horizontal resolution | | 1000 TV lines Typ (Center area) |

| | | |
|---|---|---|
| FUNCTIONS AND PERFORMANCE | Gain selection | Auto, 0 dB to 36 dB |
| | Frame mix*2 | 0 dB, 6 dB, 12 dB, 18 dB, 24 dB |
| | Electronic shutter speed | 59.94p/59.94i: 1/100, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000 |
| | | 29.97p: 1/30, 1/60, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000 |
| | | 23.98p: 1/24, 1/60, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000 |
| | | 50p/50i: 1/60, 1/120, 1/250, 1/500,1/1000, 1/2000, 1/4000, 1/10000 |
| | | 25p: 1/25, 1/60, 1/120, 1/250, 1/500, 1/1000, 1/2000,1/4000,1/10000 |
| | Synchro scan | 59.94 Hz.60.15 Hz to 642.21 Hz<br>50 Hz.50.15 Hz to 535.71 Hz |
| | Gamma | HD, SD, FILMLIKE1, FILMLIKE2, FILMLIKE3<br>0.30 to 0.75 (Manual setting) |
| | White balance | AWB A, AWB B, ATW, 3200K, 5600K, VAR (2000K to 15000K) |
| | Chroma amount variability | OFF, -99 % to 40 % |
| | Scene file | Scene1, Scene2, Scene3, Scene4 |
| | Output format | 1080/59.94p,1080/29.97p*3,1080/23.98p, 1080/59.94i,1080/29.97PsF,1080/23.98PsF, 720/59.94p,480/59.94p(i)*4,1080/50p,1080/25p*3, 1080/50i,80/25PsF,720/50p,576/50p(i)*4 |
| | Synchronization system | Internal/External synchronization (BBS/Tri-level sync) |
| | [Pan-tilt head unit] | |
| | Installation method | Stand-alone (Desktop) or suspended (Hanging)*5 |
| | Camera/pan-tilt head control | IP connecting cable<br>• When connecting through a hub:<br>LAN cable*6 (category 5e or above, straight cable), max. 100 m (328 ft)<br>• When a hub is not used<br>LAN cable*6 (category 5 or above, crossover cable) max.100 m (328 ft)<br>RP connecting Cable<br>LAN cable*6 (category 5 or above, straight cable), max. 1000 m (3280 ft)<br>RS-422A, AW series protocol |
| | Pan-tilt operation speed | 0.08°/s to 60°/s |
| | Panning range | ±175° |
| | Tilting range*7 | –30° to 210° |
| | Quietness | NC35 or less |

*1: It may be necessary to upgrade the version of the controller in order to support the unit. For details on upgrading, visit the support page on the following website. http://pro-av.panasonic.net/ *2. This cannot be configured when the format is 1080/29.97p, 1080/23.98p, 1080/29.97PsF 1080/23.98PsF, 1080/25p, or 1080/25PsF. *3: Native output *4: A 'P' signal is output as HDMI output, an 'I' signal is output as SDI and an analog output for output formats of 480/59.94p(i) and 576/50p(i). *5: To ensure safety, the unit must be secured using the mount bracket supplied. *6: Use of an STP (shielded twisted pair) cable is recommended. *7: Depending on the pan or tilt position, the camera may be reflected in the image.

## Computer requirements

| | | |
|---|---|---|
| CPU | Intel® Core™ 2 DUO 2.4 GHz or more | |
| Memory | For Windows: | 1 GB or more (2 GB or more for 64-bit editions of Microsoft® Windows® 8.1, Microsoft® Windows® 8, and Microsoft® Windows® 7) |
| | For Mac: | 2 GB or more |
| Network function | 10BASE-T or 100BASE-TX port × 1 | |
| Image display | Resolution: 1024 × 768 pixels or more | Color generation: True Color 24-bit or more |
| Supported operating systems and web browsers | For Windows: | Microsoft® Windows® 8.1 Pro 64-bit / 32-bit *1<br>Windows® Internet Explorer® 11.0*1 *3<br>Microsoft® Windows® 8 Pro 64-bit / 32-bit *1<br>Windows® Internet Explorer® 10.0*1 *3<br>Microsoft® Windows® 7 Professional SP1 64-bit / 32-bit *2<br>Windows® Internet Explorer® 11.0 / 10.0 / 9.0 / 8.0 *3 |
| | For Mac: | OS X 10.9 Safari 7.0.2 OS X 10.8 Safari 6.1.2<br>OS X 10.7 Safari 6.1.2 |
| | For iPhone, iPad, iPod touch: | iOS 7.1 Standard web browsers |
| | For Android | Android OS Standard web browsers |
| Other | CD-ROM drive (for using the Operating Instructions and various software)<br>Adobe® Reader® (for viewing the Operating Instructions on the CD-ROM) | |

* 1 Use the desktop version of Internet Explorer. (Internet Explorer for Windows UI is not supported.)
* 2 Windows® XP compatibility mode is not supported.
* 3 The 64-bit version of Internet Explorer® is not supported.

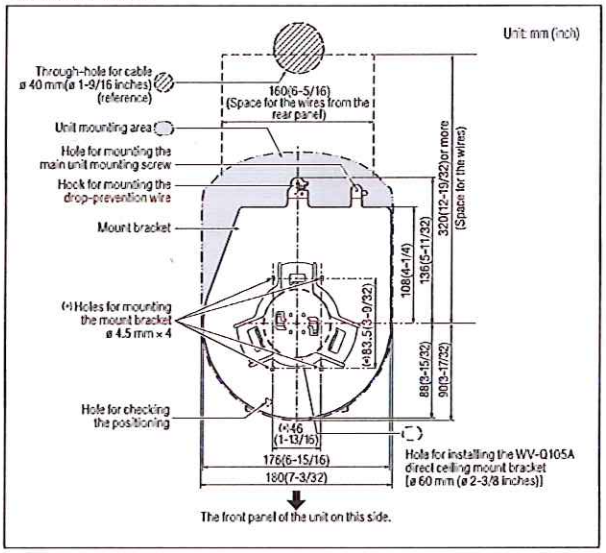
* For the latest information on supported OS/browser, please refer to the "service and support" on the Panasonic website (http://pro-av.panasonic.net).

## Standard Accessories

- Mount bracket for installation surface (Hanging / Desktop)
- Drop-prevention wire
- Drop-prevention wire mounting screw (comes attached to the unit)
- Bracket mounting screws (bind-head) M4 x 10 mm
- Main unit mounting screw (with flat washer,spring washer) M3 x 6 mm
- Cable cover
- Power cable
- CD-ROM
- AC adaptor

## Rear view


## Bottom view




## System Camera Option

| | | |
|---|---|---|
| Remote Camera Controller<br>**AW-RP50** | Remote Camera Controller<br>**AW-RP120G**<br>(AC adaptor(DC12 V) is required separately.) | Remote Operation Panel<br>**AK-HRP200G** |
| Wireless Remote Controller<br>**AW-RM50G**<br>("AA", "R6" or "LR6" battery x 2 are not included.) | Compact Live Switcher<br>**AW-HS50** | Direct Ceiling Mount Blacket<br>**WV-Q105A** |

Please refer to the latest Information, etc. at the following Panasonic web site. **http://pro-av.panasonic.net/**

**Panasonic**

**Panasonic Corporation**
**AVC Networks Company**
2-15 Matsuba-cho, Kadoma, Osaka 571-8503
Japan
**http://pro-av.panasonic.net/**

**[Countries and Regions]**

| | | | | | |
|---|---|---|---|---|---|
| Argentina | +54 11 4122 7200 | Lebanon | +96 11665557 | Turkey | +90 216 578 3700 |
| Australia | +61 (0) 2 9491 7400 | Malaysia | +60 3 7809 7888 | U.A.E. (for All Middle East) | +971 4 8862142 |
| Bahrain | +973 252292 | Mexico | +52 55 5488 1000 | Ukraine | +380 44 4903437 |
| Brazil | +55 11 3889 4035 | Netherlands, Belgium | +31 73 640 2729 | U.K. | +44(0)1344 70 69 13 |
| Canada | +1 905 624 5010 | New Zealand | +64 9 272 0100 | U.S.A. | +1 877 803 8492 |
| China | +86 10 6515 8828 | Norway | +47 67 91 78 00 | Vietnam | +65 6277 7284 |
| Hong Kong | +852 2313 0888 | Pakistan | +92 5370320 (SNT) | | |
| Czech Republic | +421 (0) 903 447 757 | Palestine | +972 2 2988750 | | |
| Denmark | +45 43 20 08 57 | Panama | +507 229 2955 | | |
| Egypt | +20 2 23938151 | Philippines | +65 6277 7284 | | |
| Finland, Latvia, Lithuania, Estonia | +358 (9) 521 52 53 | Poland | +48 (22) 338 1100 | | |
| France | +33 (0) 1 47 91 64 00 | Portugal | +351 21 425 77 04 | | |
| Germany, Austria, Switzerland | +49 (0) 6103 313887 | Romania, Albania, Bulgaria, Macedonia | +40 (0) 729 164 387 | | |
| Greece | +30 210 96 92 300 | Russia & CIS | +7 495 9804206 | | |
| Hungary | +36 (1) 382 60 60 | Saudi Arabia | +96 626444072 | | |
| India | +91 1860 425 1860 | Singapore | +65 6277 7284 | | |
| Indonesia | +65 6277 7284 | Slovak Republic, Croatia, Serbia, Bosnia, Montenegro, Slovenia | +421 (0) 903 447 757 | | |
| Iran (Vida) | +98 21 2271463 | South Africa | +27 11 3131622 | | |
| (Panasonic Office) | +98 2188791102 | Spain | +34 (93) 425 93 00 | | |
| Italy | +39 02 6788 367 | Sweden | +46 (8) 680 26 41 | | |
| Jordan | +962 6 5859801 | Syria | +963 11 2318422/4 | | |
| Kazakhstan | +7 727 298 0891 | Taiwan | +886 2 2227 6214 | | |
| Korea | +82 2 2106 6641 | Thailand | +662 731 8888 | | |
| Kuwait | +96 522431385 | | | | |

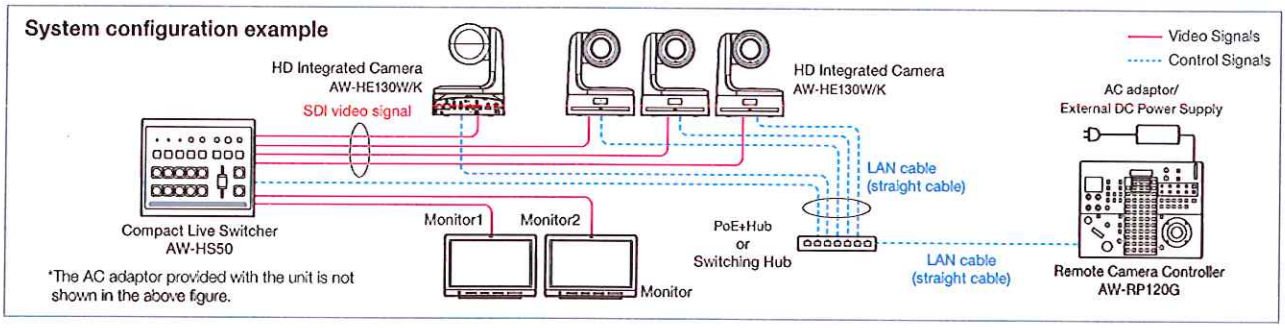
JQA-0443

EC98J2010

051

Factories of AVC Networks Company have received ISO14001:2004-the Environmental Management System certification. (Except for 3rd party's peripherals.)

Item # 4


System configuration example
HD Integrated Camera
AW-HE130W/K
SDI video signal
HD Integrated Camera
AW-HE130W/K
Video Signals
Control Signals
AC adaptor/
External DC Power Supply
LAN cable
(straight cable)
Compact Live Switcher
AW-HS50
Monitor1
Monitor2
Monitor
PoE+Hub
or
Switching Hub
LAN cable
(straight cable)
Remote Camera Controller
AW-RP120G
*The AC adaptor provided with the unit is not shown in the above figure.

Item # 4

Panasonic
ideas for life

# AW-RP120G

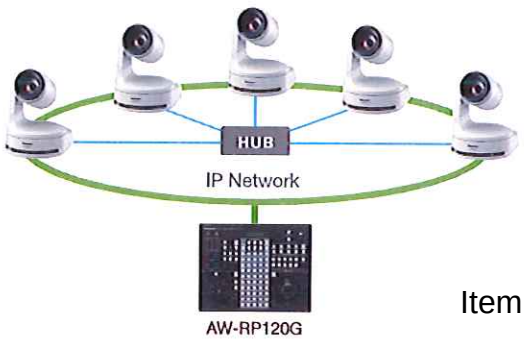
Remote Camera Controller

**Preliminary**

## IP Connection and Control of Up to 100 Remote Cameras. Highly Functional Remote Controller with New Joystick and Other Operating Enhancements.

The AW-RP120G Remote Camera Controller supports a variety of Panasonic remote camera systems. IP connection allows a large-scale, flexible, and simple system configuration for controlling up to 100 remote cameras and the simultaneous use of multiple controllers. A new joystick enables high-response pan and tilt operation, and a newly designed control panel adds color adjustment dials. A preset memory with a new batch recall function and tracing memory save labor by allowing single-person operation.

Equipped with Paint and other camera adjustment functions, the AW-RP120G meets a wide range of high-end needs. It is the ideal all-in-one controller for many applications such as event, conference hall, public facility, wedding and broadcasting use.




Item # 4

## IP Connection and Control of Up to 100 Remote Cameras

- **IP connection:** Up to 100 remote cameras can be connected and controlled via a switching hub. Automatic IP allocation simplifies the configuration of large-scale systems.
- **Multi-control:** IP connection allows five AW-RP120G controllers to simultaneously control one remote camera.
- **Serial control compatibility:** Up to five remote cameras can be connected and controlled. Also compatible with existing systems, and an RS232C port enables external control.
- **AW-HS50N/E linking:** IP connection allows linking with an AW-HS50N/E Compact Live Switcher, for a highly efficient operating environment.

## High-Response Pan, Tilt, Zoom and Memory Functions

- **Newly designed control panel:** Features a pan/tilt joystick, seesaw zoom lever, focus dial, and iris dial. A special speed adjustment dial is provided for each of the pan/tilt, zoom and focus functions.
- **Tracing memory:** The remote camera operations (pan, tilt, zoom, focus, iris, and white balance modes) can be memorized and recalled. Up to ten memory items can be stored for each camera.
- **Preset memory:** Up to 100 camera angle settings (pan, tilt, zoom operation) can be registered and retrieved for each camera to greatly simplify a variety of camera controls.
- **New preset batch retrieval function:** By creating groups of any desired preset memories (up to four groups), multiple camera angle settings (up to ten cameras) can be retrieved in a single batch. This enables one-touch control of routine operations.

## Image Adjustments, Easy Operation and Versatile Functions

- **Camera image adjustments:** Gain, Shutter, Detail, AWB, ABB, Master Pedestal, R/B Pedestal, and R/B Gain can be adjusted.
- **Direct selection buttons:** Features ten camera selection buttons. Numerical buttons (1-50) on the panel allow retrieval of 50 preset memories and ten tracing memories.
- Zoom, focus, and iris indicator display.
- Equipped with an LCD panel for menu operation.
- Functions can be allocated to eight User buttons for one-touch ease.
- SCENE one to four buttons allow one-touch switching of remote camera shooting modes (Scene Files).
- Settings can be backed up on a SD memory card. This also allows settings to be copied to other controllers.

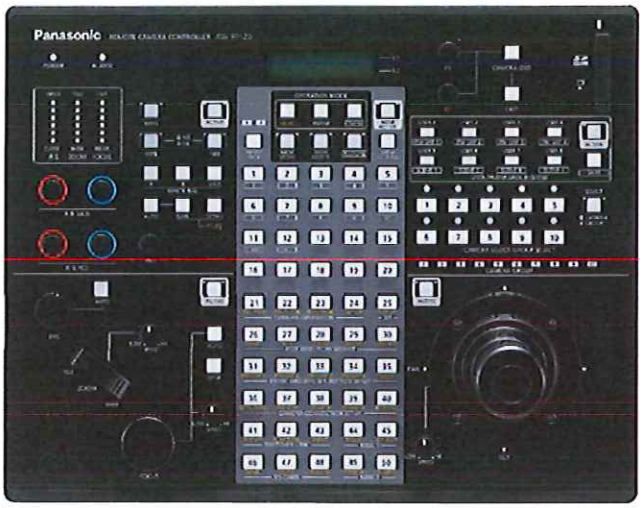
## Supporting Remote Camera Systems*1 (Tentative)

- **HD integrated cameras:** AW-HE50HN/HE/SN/SE, AW-HE60HN/HE/SN/SE, AW-HE120WP/WE/KP/KE, AW-HE100N/E,*2 AW-HE2P/E
- **Cameras (used with supporting pan/tilt head):** AK-HC1500G, AK-HC1800G, AW-HE870N/E, AW-E860N/L*2, AW-E750P/E*2, AW-E650P/E*2, AW-E350P/E*2
- **Pan/tilt heads:** AW-PH360N/L, AW-PH405N/E, AW-PH650N/L, AW-PH400P/E (requires AW-IF400G)

*1: Controllable items vary depending on the model. *2: Production discontinued.

## Specifications (Tentative)

| | |
|---|---|
| Power supply: | DC 12 V |
| Power consumption: | 8 W |
| Weight: | Approx. 3. 1 kg (Approx. 6.9 lb) |
| Dimensions (W x H x D): | Approx. 342 mm x 77 mm x 265 mm (Approx. 13-1/2 inches x 3-1/16 inches x 10-7/16 inches) excluding protrusions |
| Connectors: | DC 12 V IN (XLR 4-pin)<br>LAN (RJ-45) 10BASE-T/100BASE-TX, to control remote cameras<br>SERIAL (RJ-45) RS-422, to control remote cameras x 5<br>TALLY/GPI (D-sub 25-pin)<br>REMOTE (D-sub 9-pin) RS-232C, for external control |




Operation Panel

Specifications and design are subject to change without notice.

# Panasonic

**Panasonic Corporation**
**Professional AV Business Unit**
2-15 Matsuba-cho, Kadoma, Osaka 571-8503
Japan
**http://pro-av.panasonic.net/**

**(Countries and Regions)**

| | | | | | |
|---|---|---|---|---|---|
| Argentina | +54 1 308 1610 | Kuwait | +96 522431385 | Taiwan | +886 2 2227 6214 |
| Australia | +61 (0) 2 9491 7400 | Lebanon | +96 11665557 | Thailand | +66 2 731 8888 |
| Bahrain | +973 252292 | Malaysia | +60 3 7809 7888 | Turkey | +90 216 578 3700 |
| Belgium | +32 (0) 2 481 04 57 | Mexico | +52 55 5488 1000 | U.A.E. (for All Middle East) | |
| Brazil | +55 11 3889 4035 | Netherlands | +31 73 64 02 577 | | +971 4 8862142 |
| Canada | +1 905 624 5010 | New Zealand | +64 9 272 0100 | Ukraine | +380 44 4903437 |
| China | +86 10 6515 8828 | Norway | +47 67 91 78 00 | U.K. | +44(0)1344 70 69 13 |
| Hong Kong | +852 2313 0888 | Pakistan | +92 5370320 (SNT) | U.S.A. | +1 877 803 8492 |
| Czech Republic | +420 236 032 552/511 | Palestine | +972 2 2988750 | Vietnam | +848 38370280 |
| Denmark | +45 43 20 08 57 | Panama | +507 229 2955 | | |
| Egypt | +20 2 23938151 | Peru | +51 1 614 0000 | | |
| Finland, Latvia, Lithuania, Estonia | +358 (9) 521 52 53 | Philippines | +63 2 633 6163 | | |
| | | Poland | +48 (22) 338 1100 | | |
| France | +33 (0) 1 47 91 64 00 | Portugal | +351 21 425 77 04 | | |
| Germany, Austria, Switzerland | +49 (0) 611 235 459 | Puerto Rico | +1 787 750 4300 | | |
| | | Romania | +40 21 211 4855 | | |
| Greece | +30 210 96 92 300 | Russia & CIS | +7 495 6654205 | | |
| Hungary | +36 (1) 382 60 60 | Saudi Arabia | +966 26444072 | | |
| India | +91 120 247 1000 | Singapore | +65 6270 0110 | | |
| Indonesia | +62 21 385 9449 | Slovak Republic | +421 (0) 2 52 92 14 23 | | |
| Iran (Vida) | +98 21 2271463 | Slovenia, Albania, Bulgaria, Serbia, Croatia, Bosnia, Macedonia, Montenegro | +36 (1) 382 60 60 | | |
| (Panasonic Office) | +98 2188791102 | | | | |
| Italy | +39 02 6788 367 | South Africa | +27 11 3131622 | | |
| Jordan | +962 6 5859801 | Spain | +34 (93) 425 93 00 | | |
| Kazakhstan | +7 727 298 0891 | Sweden | +46 (8) 680 26 41 | | |
| Korea | +82 2 2106 6641 | Syria | +963 11 2318422/4 | | |

JQA-0443

EC98J2010 051

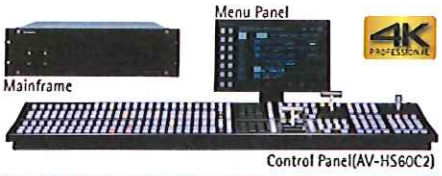
Factories of Business Solutions Business Group have received ISO14001:2004 the Environmental Management System certification. (Except for 3rd party owned facilities)

Item # 4

SP-RP120PRE

25K201211ZP-1 Printed in Japan

# 2ME Live Switcher –AV-HS6000–




## 2ME Live Switcher

### AV-HS6000 Series Composition

| | | Model no. |
|---|---|---|
| Mainframe | Redundant Power Supply Model | AV-HS60U2 |
| Control Panel | Redundant Power Supply Model | AV-HS60C2 |
| | Redundant Power Supply Model | AV-HS60C4 |
| Menu Panel | | AV-HS60C3G |
| Storage Module | | AV-HS60D1G |
| Chroma Key Software | | AV-SFU60G |

2 ME | 34 Inputs | 16 Outputs | 4 Keyers Per ME
4 DSK | 4 USK | 4 P-in-P Per ME (dual-use with keyers)
4ch MultiViewer | 16 Aux Buses | Redundant Power Supply

### 2ME Live Switcher with complete system adaptability, intuitive operations, high reliability, and advanced 4K compatibility*

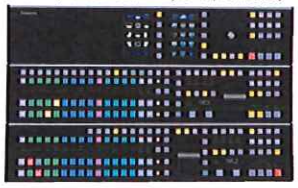
- Supports a range of video formats including, 2160/59.94p, 50p (4K mode)*, 1080/59.94p, 50p (3G mode), 1080/59.94i, 1080/50i, 480/59.94i and 576/50i.
- 32 SDI and two DVI-D inputs, and 16 SDI with two outputs.
- All inputs are provided with a 10 bit frame synchronizer. Eight inputs equipped with color corrector. Four inputs equipped with frame delay.
- Four outputs equipped with color correctors, and two with downconverters.
- 4 ch of 3D DVE and 2 ch of 2D DVE systems are provided to support background and keys for each ME.
- A luminance key, linear key, chroma key, full key, and PinP are provided for 4 ch per ME (8 ch in total), plus 4 ch of DSK and 4 ch of upstream key (USK).
- Comes with event memory, shot memory and macro memory for recording complex operations.
- Multi-Selection Panel for each ME. The switch-style panel helps in operations by providing a direct, tactile response.
- Crosspoint buttons can be grouped with any eight colors, and bitmap characters can be displayed on the label display panel (OLED).
- 10.1-type(256.5 mm) Menu Panel with touch screen allows quick and easy menu operation
- Operation of up to three control panels is possible through an IP connection.
- System settings and memory information can be stored on an SD card, PCs, and optional storage module.
- Functions are scalable using plug-in software.

* Compatibility scheduled to be provided from June 2016. Firmware Ver. 4 or later required. For details, see "Service and Support" on the Panasonic website (http://pro-av.panasonic.net/en/).

## Control Panel

Control Panel AV-HS60C2
- 24 XPT, Width: 980 mm (38-19/32 inches)

Control Panel AV-HS60C4
- 16 XPT, Width: 656 mm (25-13/16 inches)



## Rear Panel

Mainframe

Control Panel

As of April, 2016

## 3G/4K format compatibility (Advanced support for high-definition)

This advanced switcher can be used to produce 4K*1 high-definition video as well as HD/SD-SDI and 3G-SDI by switching between three use modes.
*1: Compatibility scheduled to be provided from June 2016. Firmware Ver. 4 or later required. For details, see "Service and Support" on the Panasonic website (http://pro-av.panasonic.net/en/).

### Functions supported by format

| | | Standard mode | 3G mode | 4K mode*2 |
|---|---|---|---|---|
| Input function | Number of SDI inputs | 32 | 16 (3G Level A/B*3) | 8 (SQD 3G Level A/B*3 x 4) |
| | Number of DVI inputs | 2 | Not possible | Not possible |
| | Number of up-converter channel | 4 | - | - |
| | Dot by Dot | Possible | - | - |
| | Number of delay function channel | 4 | 2 | - |
| | Number of color corrector channel | 8 | 4 | - |
| | Number of upstream keyer channel | 4 | 2 | - |
| Output function | Number of SDI output | 16 | 8 | 3 (SQD 3G Level B x 4) |
| | Number of down-converter channel | 2 | 2*4 | 2*4 |
| | Number of color corrector channel | 4 | 2 | - |
| ME1 function | Number of utility bus | 2 | 1 | 1 |
| ME2 function | BKGD transition pattern | MIX / WIPE / DVE | MIX / WIPE | MIX / WIPE |
| | IMAGE | Possible | Not possible | Not possible |
| | Number of keyer | 4 | Not possible | Not possible |
| | Number of utility bus | 2 | Not possible | Not possible |
| Number of DSK keyer | | 4 | 2 | 2*4 |
| Number of still image (Still) memory channel | | 4 | 2 | 2*4 |
| Moving image (Clip) memory function | Number of channel | 4 | 2 | 2*4 |
| | Recording time per channel (standard image quality) | Approximately 60 seconds | Approximately 30 seconds | Approximately 30 seconds |
| | Recording time per channel (high image quality) | Approximately 30 seconds | Approximately 15 seconds | Approximately 15 seconds |
| Number of MultiViewer | | 4 | 2 | 2*4 |
| Number of AUX | | 16 | 8 | 4*4 |

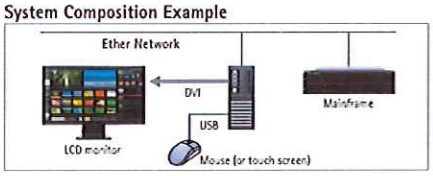
*2: Compatibility scheduled to be provided from June 2016. *3: When FS function is active and 3G-SDI Level A signal is input, it is converted to Level B signal to perform signal processing. When FS function is off and 3G-SDI Level A signal is input, a black screen will be displayed. *4: SDI OUT 14 outputs down-converted HD-SDI signal of SDI OUT 13, and SDI OUT 16 outputs down-converted HD-SDI signal of SDI OUT 15. *5: Same video output on SDI OUT 13 (3G-SDI) and SDI OUT 14 (HD-SDI). Same video output on SDI OUT 15 (3G-SDI) and SDI OUT 16 (HD-SDI). *6: 2K resolution video scaled to 4K resolution when playing (Play function only).

## Easy Direct Switching by Touch and Mouse Operations

### Software Control Panel AV-SF6000G
(Free download for Mac and Windows)

The AV-HS6000 control panel is also available as a PC based application software. Equipped with the MJPEG codec, it allows display of video and image in the application. Intuitive and simple operations while viewing source video or using the display as a sub-panel is possible.
* For information on downloading software control panel, see "Software download" on the Panasonic website (http://pro-av.panasonic.net/en/).

System Composition Example




# AV-HS6000 Main Features

*For information on other switchers, see Specification & Function Comparison on page 56-59.

## Ample Input / Output Functions

Inputs and outputs are provided with frame synchronizer, freeze, frame delay, format converter, dot by dot, color corrector and video process functions. The AV-HS6000 supports incorporation of asynchronous signals, virtual system delay difference compensation, and color correction based on differences in camera and display device characteristics, for a smoother program production process.

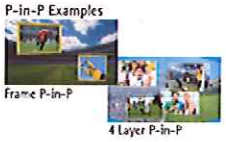
## Multi-Format Support

The AV-HS6000 supports multiple HD/SD formats including 1080/24PsF and 1080/23.98PsF to enable digital cinema production and worldwide operation. It is also compatible with the 3G/4K format*1.

## Various Keyers for Flexible Operations

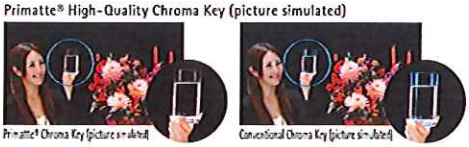
The AV-HS6000 comes with luminance key, linear key, chroma key and full key as well as keyers that can be used with P-in-P. Chroma keying employs the Primatte® algorithm, which is widely used as a plug-in for nonlinear editors. Superior blue-spill processing naturally combines translucent objects, such as silk and glass, with background colors, making it possible to faithfully reproduce extremely fine objects such as individual strands of hair at a very high level of detail. It also comes with upstream and downstream keyers to support a wide range of video renderings. In addition, the preset function lets you register key settings for each DSK keyer and the keyers for each ME.

P-in-P Examples



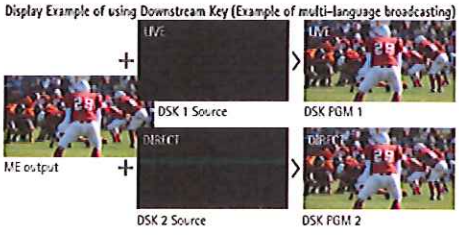

Sample of 4 keyers in use

Primatte® High-Quality Chroma Key (picture simulated)




Display Example of Using Upstream Key

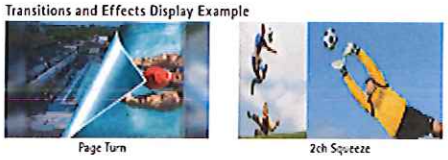

Display Example of using Downstream Key (Example of multi-language broadcasting)




## Diverse DVE Transitions

In addition to wipe, mix and cut transitions, 3D DVE effects such as page turn or DVE transitions using dual channel squeeze can be performed. Various renderings of image effects are also possible, including mosaic and defocus.

Transitions and Effects Display Example

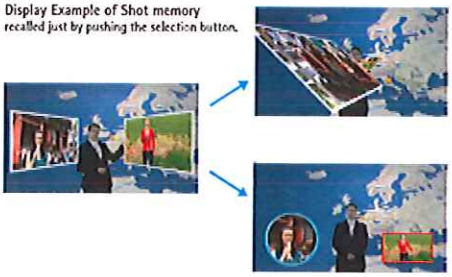



## Memory Functions

Using memory function, setting, video and effects can be easily stored and recalled. It allows quick operation of switching and recalling effects in live video production, supports efficient operation and making it easy to perform video effects for more complicated operations.

•Shot memory: This function recalls background transition patterns or other video effects, including PinP size, position, border width, and key on. Effect dissolve can be set to ensure smooth switching from the current effect to the next effect registered in shot memory.

Display Example of Shot memory recalled just by pushing the selection button.



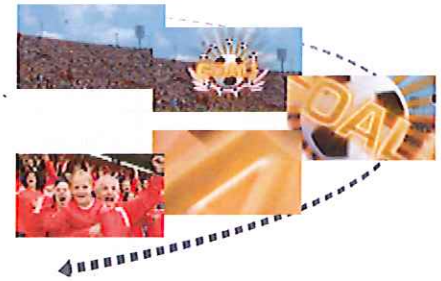
•Event memory: This function allows continuous image effects to be registered and played back in a timeline.
•Macro memory: This function allows record and playback of a series of operations on the Control Panel. It can also record and play back setting information, such as input/output and keyers. Macro memories can be played back by assigning them to the cross point buttons, such as macro bus, PGM, and PST.
•Video memory: Moving images (Clip) and still images (Still) can be recorded for use as video sources. Up to 60 seconds of moving images can be saved in standard mode, and up to 30 seconds in high image quality mode.



Item # 4

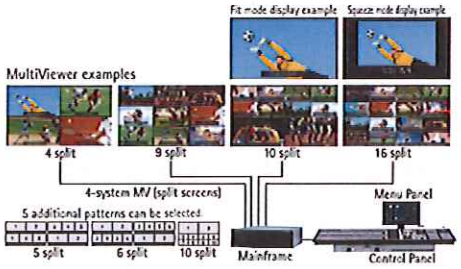
•Animation wipe: Animation wipes can be easily created using moving images (clips) recorded in video memory. Playback linked to a fader transition is also possible.

Animation Wipe Examples



## MultiViewer Function

PGM, PVW and video from all sources can be displayed on a single screen as split frames with the MultiViewer function. Display source names, tallies, audio level meters, clocks and safety markers. You can also select between fit mode and squeeze mode.




## Multi-Selection Panel

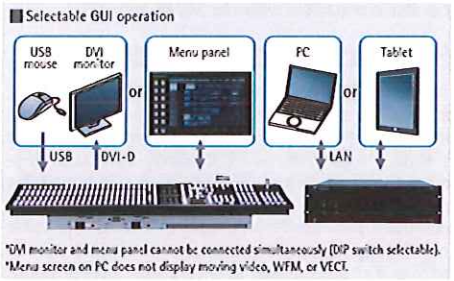
A color panel that can display thumbnail images with high visibility. The switches provide a tactile response which allows quick and precise memory operation.

Wipe Pattern

Video memory (Clip: moving images)

## Flexible System Scalability

•Aux buses are provided. Bus transition functions include not only Cut but the Mix transition as well. Combined with M/E sections, various operations are possible in a variety of scenarios.
•Menu operations can be performed from a PC or tablet via a network connection.
•Features a range of external interfaces for plug-ins created with the SDK*2, providing flexible functional scalability through the installation of plug-ins. Six plug-in software is provided. In addition, the software development kit (SDK) provided by Panasonic makes it possible for software to be freely developed by third parties and SI providers.




*DVI monitor and menu panel cannot be connected simultaneously (DIP switch selectable).
*Menu screen on PC does not display moving video, WFM, or VECT.

## Backup System for Peace of Mind

•The redundant power supply increases reliability for use at live events.
•Operation of up to two control panels is possible through an IP connection.
•ME rows can be switched by swapping the ME panel and changing the output of the system when ME faults.
•Web server function allows access to the GUI menu from a web browser of PC.
•Settings and memory information can be exported and saved as a project file on internal mainframe storage*3 or on an external SD memory device or PC.

*1: Compatibility scheduled to be provided from June 2016. Firmware Ver. 4 or later required.
*2: Contact your dealer for more details.
*3: The AV-HS6000 requires an optional AV-HS60D1G storage module.

*For more details, see Specification & Function Comparison on page 56-59.

# Live Switcher


## Multi-Format Live Switcher

### AV-HS450

1 ME | Max. 20 Inputs*1 | Max. 10 Outputs*2 | 1 Keyer | 2 DSK
2 P-in-P | 2ch MultiViewer | 4 Aux Buses | Redundant Power Supply

**This high-performance switcher handles the switching needs of broadcast studios, OB vans and multi-camera systems anywhere.**

- 16 SDI inputs, four SDI outputs and two DVI-D outputs.
- Luminance and chroma keying, two DSK channels, two P-in-P buses and two DVE channels.
- Supports a variety of HD/SD formats, including 1080/24PsF,*3 as standard.
- A wide range of optional boards also allows the input and output of analog component and various other signals. (For details, see the list of optional boards below.)
- Equipped with an SD/HD up-converter function for four standard inputs, and a dot by dot function for 16 standard inputs.
- A video processing function with color correction is also provided for eight inputs.
- Aux 1 bus equipped with Mix transition function.
- Panel layout offers direct control of functions with 16 crosspoint buttons and pattern select buttons.
- Six user buttons.
- Mounting the optional AV-HS04M7D 3D SDI Output Board provides 3D compatibility. Switch up to Nine 3D Image Inputs.

### Rear Panel


## Live Switcher

### AV-HS410

1 ME | Max. 13 Inputs*1 | Max. 10 Outputs*2 | 1 Keyer
1 DSK | 2 P-in-P | 1ch MultiViewer | 4 Aux Buses

**This compact, integrated unit includes levels of performance and function that approach many high-end switchers.**

- Eight SDI inputs, one DVI-D input, five SDI outputs and one DVI-D output.
- Supports a variety of HD/SD formats, including 1080/24PsF, as standard.
- A wide range of optional boards also allows the input and output of analog component and various other signals. (For details, see the list of optional boards below.)
- Equipped with an SD/HD up-converter function for four standard inputs, and a dot by dot function for eight inputs.
- A video processing function with brightness, pedestal level, saturation, and color phase correction is also provided for eight inputs.
- The Memory Preview function lets you preview shot memory and event memory content. It allows image effects to be easily confirmed while on-air with this 1 M/E switcher.
- Two inputs for still (STILL) and moving (CLIP) images can be saved in Video Memory, and selected as bus footage.
- A 178 mm (seven inches) color LCD monitor with WVGA (800 x 480) resolution is built into the control panel. It can be switched to a wide variety of display modes, including setting menus, image monitoring and waveform/vectorscope.
- 12 crosspoint buttons in each A bus and B bus (for a maximum of 22 with the Shift function) provide direct control. Also comes with eight user buttons.
- Plug-ins allow flexible expansion of software-based functions.

### Rear Panel

**Input Option Boards**

**AV-HS04M1**
SDI Input Board
SDI (HD/SD) x 2 (BNC)
(Built-in Up-converter)

**AV-HS04M2**
Analog Component Input Board
HD/SD Analog Component x 2 ($Y/P_B/P_R$)
(Built-in Up-converter)

**AV-HS04M3**
DVI Input Board
DVI-I x 2 (Built-in Scaler)

**AV-HS04M6**
Analog Composite Input Board
Analog Composite x 2
(Built-in Up-converter)

**AV-HS04M8**
Full HD DVI Input Board
DVI-D x 2
(compatible with WUXGA)

**Output Option Boards**

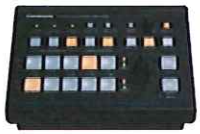
**AV-HS04M4**
Analog Output Board
HD/SD Analog Component x 2
($Y/P_B/P_R$)

**AV-HS04M5**
DVI/Analog Output Board
DVI-I x 1, HD/SD Analog Component x 1 ($Y/P_B/P_R$)

**AV-HS04M7**
SDI Output Board
SDI (HD/SD) x 2
(Each one has 2 outputs)
(BNC) (Built-in Down-converter)

**AV-HS04M7D**
3D SDI Output Board
SDI (HD/SD) x 2
(Each one has 2 outputs)
(BNC) (Built-in Down-converter)

As of April, 2016



## Compact Live Switcher

### AW-HS50

| | | | |
|---|---|---|---|
| 1 ME | 5 Inputs | 3 Outputs | 1 Keyer |
| 1 P-in-P | 1ch MultiViewer | 1 Aux Buses | |

## Highly functional live switcher in compact, half-rack-size package.

- Four SDI inputs, one DVI-D input, two SDI outputs and one DVI-D output.
- The AW-HS50 is equipped with an SD/HD up-converter function for two inputs.
- All four inputs equipped with a dot by dot function and a video processing function for brightness, pedestal level, saturation and color phase correction.
- Transitions: 13 wipe patterns and mixes.
- Two 8 bit still images can be saved in Frame Memory, and used as bus footage.
- Five crosspoint buttons in each A bus and B bus (for a maximum of 10 with the Shift function), a Cut button, a P-in-P button, a Key button and an FTB button allow direct control with this simple panel layout.
- two user buttons (for a maximum of four with the Shift function).
- Linking the AW-HS50 to the optional AW-RP50 Remote Camera Controller with an IP connection*4 over a network makes remote operation of Panasonic HD Integrated Cameras and other devices possible.

### Rear Panel

*1: When using two input boards. *2: When using two output boards. *3: 1080/24PsF (or 23.98PsF) input signals are supported only by the standard input terminals of the AV-HS450. These signals are not supported by the optional AV-HS04M1/M2/M3/M4/M5/M6/M7/M7D/M8 boards. *4: Only one AW-RP50 can be connected to the switcher via an IP connection. And connection is not possible with a public network.

## Live Switcher Specification Comparison

| | | AV-HS6000 | AV-HS450 |
|---|---|---|---|
| ME | | 2ME | |
| Video Format | HD | 2160/59.94p (4K mode)*1, 2160/50p (4K mode)*1, 1080/59.94p (3G mode), 1080/50p (3G mode), 1080/59.94i, 1080/50i, 1080/24PsF, 1080/23.98PsF, 1080/25PsF, 1080/29.97PsF, 720/59.94p, 720/50p | 1080/59.94i, 1080/50i, 1080/24PsF*3, 1080/23.98PsF*3, 720/59.94p, 720/50p |
| | SD | | |
| Video Processing | Y:PB:PR | 4 : 2 : 2 10 bit | 4 : 2 : 2 10 bit (8 bit for FMEM) |
| | RGB | | |
| Video Input | Input | 34 signal lines | 16 signal lines, standard<br>20 signal lines, maximum |
| | SDI | 32 lines, BNC x 32<br>HD (SMPTE292M)/3G (SMPTE424M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ± 10 %(75 Ω) | Standard SDI: 16 lines, BNC x 16<br>HD (SMPTE292M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ±10 % (75 Ω) |
| | DVI-D/DVI-I | 2 signal line DVI-D x 2<br>Digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050), UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Vertical frequency: 60 Hz<br>Video format inputs: 1080/59.94p, 1080/50p, 1080/59.94i, 1080/50i, 720/59.94p, 720/50p | — |
| | Optional Board | — | Maximum of 4 inputs (IN A1, A2, B1, B2)(Up to 2 optional |
| Video Output | Output | 16 signal lines | 6 signal lines, standard<br>10 signal lines, maximum |
| | SDI | 16 lines, BNC x 32 (2 distributed outputs per line)<br>HD (SMPTE292M)/3G (SMPTE424M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ± 10 % | Standard SDI: 4 lines, BNC x 5<br>(2 output distribution for OUT 1)<br>HD (SMPTE292M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ±10 % (75 Ω) |
| | DVI-D | — | Standard DVI-D: 2 lines, DVI-D x 2, (OUT 5, 6)<br>Digital RGB: XGA (1024 x 768),<br>WXGA (1280 x 768), SXGA (1280 x 1024),<br>WSXGA+ (1680 x 1050), UXGA (1600 x 1200),<br>WUXGA (1920 x 1200)<br>Vertical frequency: 60 Hz<br>Video format outputs: 1080/50P, 1080/59.94P<br>(Analog output signals are not supported) |
| | Optional Board | — | Maximum of 4 outputs (OUT A1, A2, B1, B2)(Up to 2 optional |
| Reference Input/Output | | Mainframe BNC<br>GENLOCK mode: Black burst or Tri-level Sync input signals (with loop-through)<br>• Same field frequencies as those of the system formats supported.<br>• With the 1080/23.98PsF, 1080/24PsF format, only GENLOCK mode supported.<br>• With the 1080/23.98PsF format, black burst with 10F-ID (SMPTE318M standard met) or TRI signals supported.<br>Internal sync mode: Black burst output signals x 2 | |
| Interface | PANEL/MAIN-FRAME | RJ45 x 1, Compatible with 100Base-TX and AUTO-MDIX<br>(to connect between the mainframe and the control panel) | RJ45 x 1, 100 Mbps<br>(to connect between the mainframe and the control panel) |
| | EDITOR | — | Mainframe, D-sub 9 pin x 1,<br>RS-422 (GVG protocol compatible) |
| | COM | Mainframe, D-sub 9 pin x 4, RS-422*2<br>Control Panel: D-sub 9 pin x 2 (RS-422 x 1, RS-232C x 1) | Mainframe, D-sub 9 pin x 1,<br>RS-422 (pan-tilt system control) |
| | TALLY/GPI | Mainframe: D-sub25 pin x 1<br>GPI IN x 18 (general-purpose, photocoupler sensing),<br>GPIOUT x 48 (selected from general purpose, tally, Open collector output),<br>ALARM OUT x 1 (open collector output, negative logic)<br>Control Panel: D-sub 25 pin x 1<br>GPI IN x 8 (general-purpose, photocoupler sensing),<br>GPIOUT x 10 (selected from general purpose, tally, Open collector output),<br>ALARM OUT x 1 (open collector output, negative logic) | Mainframe: D-sub 50 pin x 1<br>GPI IN x 8 (general-purpose, photocoupler sensing),<br>GPI OUT x 31 (general-purpose, selected from R/G tally, open collector output),<br>ALARM OUT x 1 (open collector output, negative logic)<br>Control Panel: D-sub 25 pin x 1<br>GPI IN x 8, GPI OUT x 8, ALARM OUT x 1 |
| | LAN | Mainframe: Compatible with 100Base-TX and AUTO-MDIX<br>(For IP control) | Mainframe, RJ45 x 1, 10 BASE-T/100 BASE-TX |
| Control Panel | | Discrete (menu DVI-D output; USB mouse menu control) | Discrete |
| Menu Panel | | Discrete | |
| Multi-Selection Panel | | Provided for each ME | |
| Removable Media | | SD Memory Card<br>Supported by the control panel,<br>Capacity: Maximum 32 GB (SDHC Memory Card compatible)<br>Still image file/movie clip file/Project file (including memories): Loading/saving, Software: Loading, Log data: saving | SD Memory Card<br>Supported by the control panel,<br>Capacity: Maximum 32 GB (SDHC Memory Card compatible)<br>Still image file: Loading/saving, setup data: backup |

*1: Compatibility scheduled to be provided from June 2016. Firmware Ver. 4 or later required. For details, see "Service and Support" on the Panasonic website (http:// pro-av.panasonic.net/en/ ).



Item # 4

As of April, 2016

| AV-HS410 | AW-HS50 |
|---|---|
| 1ME | |
| 1080/59.94i, 1080/50i, 1080/24PsF*3, 1080/23.98PsF*3, 720/59.94p, 720/50p | 1080/59.94i, 1080/50i, 1080/24PsF, 1080/23.98PsF, 720/59.94p, 720/50p |
| 480/59.94i, 576/50i | |
| 4 : 2 : 2 10 bit (8 bit for video memory) | 4 : 2 : 2 10 bit (8 bit for FMEM) |
| 4 : 4 : 4 , 8 bit | |
| 9 signal lines, standard<br>13 signal lines, maximum | 5 signal lines |
| Standard SDI: 8 lines, BNC x 8 (IN 1 to 8)<br>HD (SMPTE292M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ±10 % (75 Ω) | 4 lines, BNC x 4<br>HD (SMPTE292M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ± 10 %(75 Ω) |
| Standard DVI-D: 1 signal line, DVI-D x 1<br>Digital RGB: XGA (1024 x 768), WXGA (1280 x 768),<br>SXGA (1280 x 1024), WSXGA+(1680 x 1050),<br>UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Vertical frequency: 60 Hz<br>Video format inputs: 1080/50p, 1080/59.94p<br>(Analog input signals are not supported) | |
| boards may be inserted into the 2 input/output optional slots) | — |
| 6 signal lines, standard<br>10 signal lines maximum | 3 signal lines |
| Standard SDI: 5 lines, BNC x 6<br>(2 output distribution for OUT 1)<br>HD (SMPTE292M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ±10 % (75 Ω) | SDI: 2 lines, BNC x 3 (2 output distribution for OUT1)<br>HD (SMPTE292M)/SD (SMPTE259M) standard,<br>0.8 V [p-p] ±10 % (75 Ω) |
| Standard DVI-D: 1 lines, DVI-D x 1<br>Digital RGB: XGA (1024 x 768), WXGA (1280 x 768),<br>SXGA (1280 x 1024), WSXGA+ (1680 x 1050),<br>UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Vertical frequency: 60 Hz<br>Video format outputs: 1080/50p, 1080/59.94p,<br>1080/50i, 1080/59.94i, 720/50P, 720/59.94p<br>(Analog output signals are not supported) | Standard DVI-D: 1 lines, DVI-D x 1<br>Digital RGB: XGA (1024 x 768), WXGA (1280 x 768),<br>SXGA (1280 x 1024), WSXGA+ (1680 x 1050),<br>UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Video format outputs: 60 Hz<br>Video format outputs: 1080/50p, 1080/59.94p<br>(Analog output signals are not supported) |
| boards may be inserted into the 2 input/output optional slots) | — |
| GENLOCK mode: Black burst<br>or Tri-level Sync input signals (with loop-through)<br>• Same field frequencies as those of the system formats supported.<br>• With the 1080/24PsF format, only GENLOCK mode supported.<br>• With the 1080/23.98PsF format, black burst with 10F-10<br>(SMPTE318M standard met) or TRI signals supported.<br>Internal sync mode: Black burst output signals x 2 | — |
| — | |
| D-sub 9 pin x 1, RS-422 | — |
| D-sub 9 pin x 1, RS-422 | — |
| D-sub15 pin x 2<br>GPI IN x 8 (general-purpose, photocoupler sensing),<br>GPI OUT x 19 (general-purpose, selected from R/G tally,<br>open collector output),<br>ALARM OUT x 1 (open collector output, negative logic) | D-sub 15 pin x 1,<br>GPI IN x 5 (photocoupler sensing),<br>GPI OUT x 7 (open collector output, negative logic) |
| RJ45, 10 BASE-T/100 BASE-TX | |
| Integrated | |
| Integrated | |
| — | |
| SD Memory Card<br>Capacity: Maximum 32 GB (SDHC Memory Card compatible)<br>Still image file/movie clip file/shot memory/<br>event memory: Loading/saving, Setup data: backup | — |

*2: Switchable between master connection and slave connection via menu
*3: 1080/24PsF and 23.98PsF are not supported with the AV-HS04M option board series.

## Live Switcher Function Comparison

| | | AV-HS6000*1 | AV-HS450 |
|---|---|---|---|
| BKGD | Wipe/DVE Pattern | Wipe x 16, Squeeze x 16, Slide x 8, 3D x 12, 2ch squeeze x 4, 2ch slide x 4, 2ch 3D x 4 | Wipe x 12, Squeeze x 11, Slide x 8, 3D x 12, 2ch squeeze x 4, 2ch slide x 4, 2ch 3D x 4 |
| | Transition Type | Cut, Mix, Wipe (including DVE), EMEMLINK | Cut, Mix, |
| | Image | Image effect: PGM/A, PST/B Bus<br>Effect: Mosaic, Defocus, Mono, Paint | |
| Keyer | Number of Keys | 8 | |
| | Key Type | Linear key, Luminance key, Chroma key*2, Full key | Linear key, Luminance key, Chroma key, Full key |
| | Transition Type | Cut, Mix, Wipe (including DVE) | |
| | Wipe/DVE Pattern | Wipe x 12, Squeeze x 11, Slide x 9, 3D x 12 | |
| USK | Number of Keys | 4 | |
| | Key Type | Linear key, Luminance key, Full key | |
| | Transition Type | Cut | |
| DSK | Number of Keys | 4 | 2 |
| | Key Type | Linear key, Luminance key | |
| | Transition Type | Cut, Mix | |
| P in P | Number of PinP | 8*3 | |
| | Transition Type | | |
| AUX Bus | | AUX Bus 1 to 16*4 | AUX Bus |
| Input Function | Frame Synchronizer | SDI IN 1 to 32, DVI IN1, 2 | SDI IN 1 to 16*5 |
| | Freeze | SDI IN 1 to 32, DVI IN1, 2 | SDI IN 1 to 16*5 |
| | Frame Delay | SDI IN 27, 28, 31, 32 | |
| | Dot by Dot | SDI IN 1 to 32 | SDI IN 1 to 16 |
| | Up-Converter | SDI IN 27, 28, 31, 32 | SDI IN 13 to 16*5 |
| | Color Corrector | SDI IN 25 to 32 | SDI IN 9 to 16 |
| | Video Processing | SDI IN 25 to 32 | SDI IN 9 to 16 |
| Output Function | MultiViewer | 4 ch, Labels, Tally indication, Audio level meter, Safety marker, Split-screen (9 Patterns: 4, 5a/5b, 6a/6b, 9, 10a/10b and 16 sections) | 2 ch, Labels, Tally indication, Split-screen (4 Patterns: 4, 9, 10 and 16 sections)*7 |
| | Down-Converter | SDI OUT 14, 16 | SDI output |
| | Color Corrector | SDI OUT 13 to 16 | |
| | Other Function | Phase adjustment, Chroma key sample marker | OSD (PVW and several MULTI outputs), Phase adjustment, Chroma key sample marker |
| Memory Function | Frame Memory | — | 4 channels (save to flash memory on mainframe; data retained even when power off) |
| | Video Memory | Still (still images): 4 systems (save to volatile memory on mainframe; data erased when power off)*5<br>Clip (movie clips): 4 systems (save to volatile memory on mainframe; data erased when power off)*5 | — |
| | Shot Memory | Register 81 shots (effect dissolve function) | Register 10 shots |
| | Event Memory | Register 64 events in 81 memories | — |
| | Macro Memory | Register 81 memories (can remember a total of 3,000 procedure operations) | |
| | BKGD/Wipe Memory | — | Register 10 memories |
| | P in P Memory | — | Register 10 memories |
| | Camera Memory | — | Register 10 memories *10 |
| | Key Preset | Register 4 presets for 1 keyer | |
| Other Function | Project Management Function | ✓ (Save/retrieve current settings and memory data as batch file) | |
| | Plug-in Function | ✓ (Register plug-in software created with SDK to add functions/ external interface function) | — |
| | Redundant Power Supply | ✓ (Redundant power model for mainframe and control panel) | ✓ |
| | Multiple Panel Connection | ✓ (1 mainpanel, 2 subpanels)*5 | |
| | Web Browser Function | ✓ (Menu operations from local PC)*6 | |

*1: For information on 4K/3G mode, see page 51.
*2: Chroma keying only available on the Key 1 bus; additions possible by installing the optional AV-SFU60G.
*3: Dual use with keyer; Rotation available only on Key 1 and Key 2 buses.
*4: Mix transition available on Aux 1-4 buses.
*5: Data in volatile memory can be exported and saved on the internal mainframe storage (optional), an SD memory card or LAN port-connected PC.
*6: The subcontrol panel and local PC connects to the mainframe LAN port.
*7: Mix transition available on Aux 1 buses.



Item # 4

As of April, 2016

| AV-HS410 | AW -HS50 |
|---|---|
| Wipe x 16, Squeeze x 15, Slide x 8, 3D x 12 | Wipe x 13 |
| Wipe(including DVE) | Cut, Mix, Wipe |
| — | |
| 1 | |
| Linear key, Luminance key, Chroma key, Full key | Linear key, Luminance key, Chroma key*11 |
| | Mix |
| Wipe x 16, Squeeze x 16, Slide x 8, 3D x 12 | — |
| — | |
| 1 | — |
| | — |
| Mix | — |
| 2 | 1 |
| Mix | |
| 1 to 4*7 | AUX Bus 1 |
| SDI IN 1 to 8 (IN 9 is DVI IN)*8 | SDI IN 1 to 4, DVI IN (always-on) |
| SDI IN 1 to 8 (IN9 is DVI IN)*8 | SDI-IN1 to 4, DVI-IN |
| — | |
| SDI IN 1 to 8 | SDI IN 1 to 4 |
| SDI IN 5 to 8*8 | SDI IN 3 , 4 |
| — | |
| SDI IN 1 to 8*8 | SDI IN1 to 4 |
| 1 ch, Labels, Tally indication, Audio level meter, Safety marker Split-screen (9 Patterns: 4, 5a/5b, 6a/6b, 9, 10a/10b and 16 sections) | 1 ch*12, Labels, Tally indication, Audio level meter, Split-screen (8 Patterns: 4, 5a/5b, 6a/6b, 9 and 10a/10b sections) |
| board(Option) only | — |
| — | |
| Phase adjustment, Chroma key sample marker | OSD (Single Screen Display: SDI-OUT 2,DVI-OUT (unshown on SDI-OUT 1)), Chroma key sample marker, Audio Level Meter: SDI embedded audio (group1/ 1 ch, 2 ch) |
| — | 2 channels*13 (save to 1 internal flash memory; data retained even when power off) |
| 2 systems: still images and movie clips (save to flash memory; data retained when power off) | — |
| (effect dissolve function) | — |
| Register 10 memories | — |
| — | |
| — | Register 4 memories |
| — | Register 4 memories (effect dissolve function) |
| — | |
| — | |
| — | |
| ✓ | — |
| — | |
| — | |
| — | |

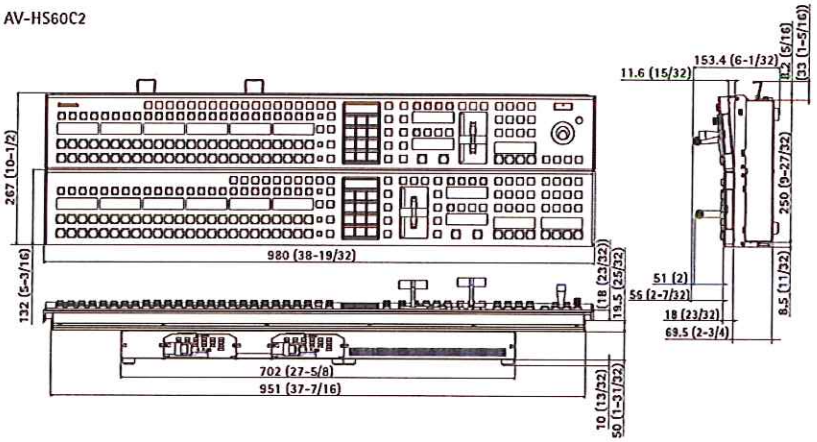
*8: Specifications for IN A1, A2, B1, and B2 depend on the specs of the mounted optional equipment.
*9: Maximum 20 channels may be simultaneously displayed on two screens.
*10: May store and recall up to 10 presets (per camera) with current Panasonic pan-tilt systems.
*11: May also be used for DSK applications by changing the key layer.
*12: OSD, MV frames, Labels, Tally indications, Audio Level Meters, and Camera setting information are not shown on SDI-OUT 1.
*13: OSD, MV frames, Labels, Tally indications, Audio Level Meters, and Camera setting information for MultiViewer Display are not stored in the Frame Memory.

# Live Switcher Dimensions

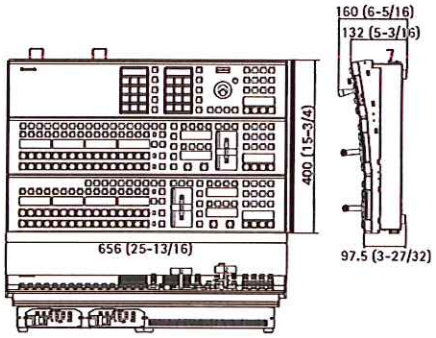
## AV-HS6000

Unit: mm(inches)

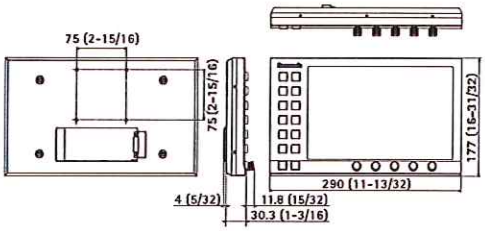
Control Panel AV-HS60C2



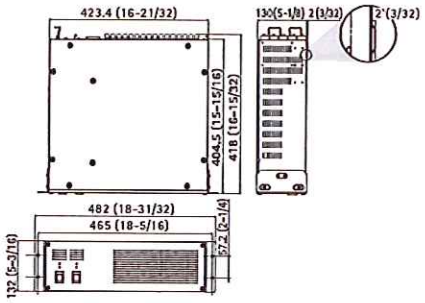

Control Panel AV-HS60C4




Menu Panel




MainFrame





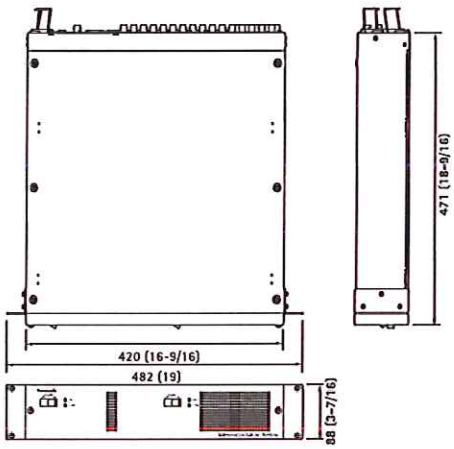

Item # 4

As of April, 2016

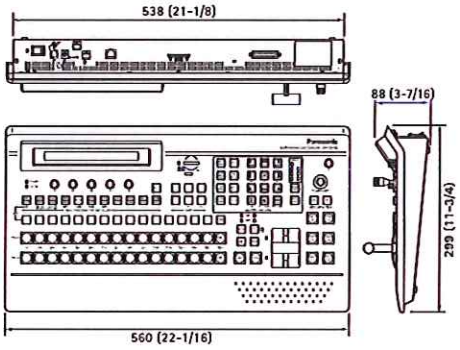
## AV-HS450

Unit: mm(inches)

MainFrame

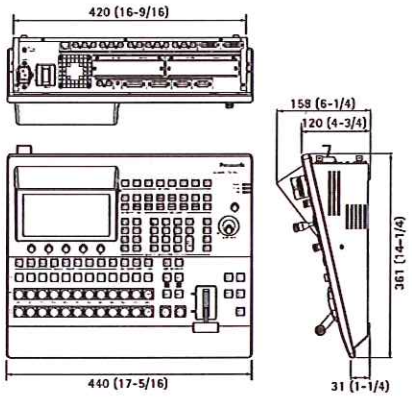



Control Panel



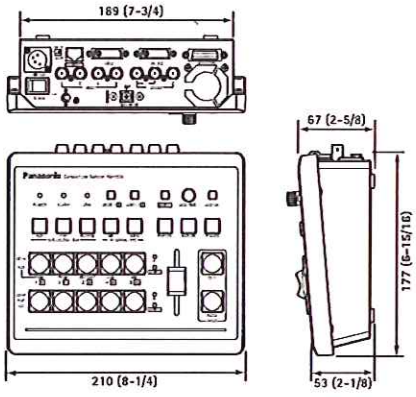

## AV-HS410

Unit: mm(inches)




## AW-HS50

Unit: mm(inches)






Item # 4

# Live Switcher – Specifications

## AV-HS6000

■Mainframe (AV-HS60U2P/E)

| General | |
|---|---|
| Power Supply | AC100 V to 240 V, 50 Hz/60 Hz<br>(AV-HS60U2 supports redundant power supply) |
| Power Consumption | 110 W |
| Ambient Operating Temperature | 0°C to 40°C (32°F to 104°F) |
| Operating Ambient Humidity | 10% to 90% (no condensation) |
| Storage Temperature | 0°C to 40°C (32°F to 104°F) |
| Storage Humidity | 10% to 90% (no condensation) |
| Weight | Approx. 13.5 kg(29.7 lbs.) [excluding accessories] |
| Dimensions (W x H x D) | 482 mm x 132 mm x 418 mm<br>(18-31/32 inches x 5-3/16 inches x 16-15/32 inches)<br>[excluding protrusions] |

| Video Terminal | | |
|---|---|---|
| SDI IN 1 to SDI IN 32 Terminals | During Standard mode<br>32 lines<br>• Connectors: BNCx32<br>• SDI IN 27, SDI IN 28, SDI IN 31, SDI IN 32 terminals are equipped with up-converters.<br>• SDI IN 25 to SDI IN 32 terminals are equipped with color correctors. | |
| | HD-SDI | SMPTE292M (BTA S-004) standard compliant<br>• 0.8 V [p-p] ±10% (75 Ω)<br>• Automatic equalizer more than 100 m(328 ft) (when 1.5 Gbps/5C-FB cable is used) |
| | SD-SDI | SMPTE259M standard compliant<br>• 0.8 V [p-p] ±10% (75 Ω)<br>• Automatic equalizer 200 m (656 ft) (when 5C-2V cable is used) |
| | During 3G mode<br>16 lines<br>• Connector: BNCx16 (only the odd numbered terminals can be used)<br>• The even numbered terminals <SDI IN 2>, <SDI IN 4> ... <SDI IN 32> cannot be used.<br>• <SDI IN 25>, <SDI IN 27>, <SDI IN 29>, and <SDI IN 31> terminals are equipped with color correctors. | |
| | During 4K mode*1<br>8 lines<br>• Connector: BNC x 32 (3G-SDI x 4 SQD) | |
| | 3G-SDI | 3G serial digital, SMPTE424M standard compliant<br>• 0.8 V[p-p] ±10% (75 Ω)<br>• Automatic equalizer 100 m (328 ft) (when 3 Gbps/5C-FB cable is used)<br>• 3G SDI Level B<br>• 3G SDI Level A (FS ON) |
| DVI-D IN 1 to DVI-D IN 2 Terminals | 2 lines<br>Digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050), UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Vertical frequency: 60 Hz<br>Video format inputs: 1080/59.94p, 1080/50p, 1080/59.94i, 1080/50i, 720/59.94p, 720/50p<br>• Connectors: DVI-D x 2<br>• The terminals do not support HDCP.<br>• The DVI-I connector cable cannot be used.<br>• For the DVI-D connector cable, use a cable with a length of up to 5 m.(16.4 ft)<br>• <DVI-D IN1>/<DVI-D IN2> terminals cannot be used during 3G/4K*1 mode. | |
| SDI OUT 1 to SDI OUT 16 Terminals | During Standard mode<br>16 lines (2 distributed outputs per line)<br>• Connectors: BNC x 32<br>• ME1PGM, ME1PVW, ME1CLN, ME1KEYPVW, ME2PGM, ME2PVW, ME2CLN, ME2KEYPVW, DSKPGM1, DSKPGM2, DSKPVW1, DSKPVW2, DSK1CLN, DSK2CLN, DSK3CLN,DSK4CLN, SEL KEYPVW, MV1 to MV4, and AUX1 to AUX16 can be assigned. | |
| | HD-SDI | SMPTE292M (BTA S-004) standard compliant<br>• Output level: 0.8 V [p-p] ±10% |
| | SD-SDI | SMPTE259M standard compliant<br>• Output level: 0.8 V [p-p] ±10% |
| SDI OUT 1 to SDI OUT 16 Terminals | During 3G mode<br>3G-SDI output: 8 lines (2 distribute outputs per line)<br>HD-SDI output: 2 lines (2 distribute outputs per line)<br>• Connector<br>3G-SDI: BNCx16 (odd numbered terminals only)<br>HD-SDI: BNCx4 (<SDI OUT 14> and <SDI OUT 16> terminals only)<br>• 3G-SDI signal is not output from the even numbered terminals.<br>– No signal is output from the <SDI OUT 2>, <SDI OUT 4> ... <SDI OUT 16> terminals.<br>– The HD-SDI signal converted to the 1080i format is output from the <SDI OUT 14> and <SDI OUT 16> terminals. This signal is converted to the 1080i format by decimating the 1080p signal from the <SDI OUT 13> and <SDI OUT 15> terminals. | |
| SDI OUT 1 to SDI OUT 16 Terminals | • <SDI OUT 13> and <SDI OUT 15> terminals are equipped with color correctors. The same color corrector setting is also applied to <SDI OUT 14> and <SDI OUT 16> terminals.<br>• ME1PGM, ME1PVW, ME1CLN, ME1KEYPVW, ME2PGM, ME2PVW, ME2CLN, DSKPGM1, DSKPGM2, DSKPVW1, DSKPVW2, DSK1CLN, DSK2CLN, SEL KEYPVW, MV1 to MV2, and AUX1 to AUX8 can be assigned. | |
| | 3G-SDI | 3G serial digital, SMPTE424M standard compliant<br>• Output level: 0.8 V [p-p] ±10%<br>• 3G-SDI Level B Mapping |
| Signal Formats | SD | 480/59.94i, 576/50i |
| | HD | 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 1080/24PsF, 1080/23.98PsF, 1080/25PsF, 1080/29.97PsF |
| | 3G | 1080/59.94p, 1080/50p <Level B> |
| | 4K*1 | 2160/59.94p, 2160/50p <SQD> |
| Signal Processing | | Y:Pb:Pr 4:2:2 10 bit |
| | | R:G:B 4:4:4 8 bit |
| ME Number | | 2 ME |

| Synchronous Terminal | | |
|---|---|---|
| REF Terminal | • Connectors: BNC<br>• Same field frequencies as those of the system formats supported<br>In Genlock mode: Black burst or Tri-level Sync input signals (with loop-through)<br>• If the loop-through output is not used, provide a 75 Ω termination.<br>• In the 1080/24PsF and 1080/23.98PsF formats, only Genlock mode supported<br>• In the 1080/23.98PsF format, black burst signals with 10 Field ID (SMPTE318M standard compliant) or Tri-level Sync signals supported<br>• In the 1080/24PsF format, Tri-level Sync signals supported<br>In internal sync mode: Black burst output signal x 2 | |
| LTC IN Terminal | This is the LTC (linear time code) input terminal.<br>• Connectors: BNC<br>• Impedance: 1 kΩ<br>• Level: 1 to 2 V [p-p] | |
| Video Delay Time | During Standard mode | |
| | 1 line (H) | When the frame synchronizer is set to "Off" and the up-converter is set to "Off" |
| | 2 field (V) | When the frame synchronizer is set to "On", or the up-converter is set to "On" |
| | • When the signals have passed through PinP, DVE, MultiView, down-converter, or DVI-IN, a maximum delay of 1 frame is applied in each case. | |
| | During 3G mode | |
| | 2 line (H) | When the frame synchronizer is set to [Off] |
| | 2 frame (V) | When the frame synchronizer is set to [On] |
| | • Maximum of 2 frame delay is added to each when passed through PinP, DVE, or MultiView. | |

| Control Terminal | |
|---|---|
| LAN Terminal | Compatible with 100Base-TX and AUTO-MDIX (For IP control)<br>• Connection cable: LAN cable (CAT5E), max. 100 m (328 ft), STP (Shielded Twisted Pair) cable recommended<br>• Connector: RJ-45 |
| PANEL Terminal | Compatible with 100Base-TX and AUTO-MDIX<br>(For Control Panel AV-HS60C2/AV-HS60C4connection)<br>• Connection cable (supplied with AV-HS60C2/AV-HS60C4): LAN cable (CAT5E), straight cable, STP (Shielded Twisted Pair), 10 m (32.8 ft)<br>• Connector: RJ-45 |
| COM1(M)/COM2(M)/ COM3(M)Terminals | RS-422 Control Terminal<br>For master connection for controlling external devices<br>• Connector: D-sub 9-pin (female) x 3, inch screw |
| COM4(M/S) Terminal | RS-422 Control Terminal<br>For master/slave connection for controlling external devices<br>• Connector: D-sub 9-pin (female), inch screw<br>• Switchable between master connection and slave connection via menu |
| GPI IN Terminal | GPI IN: 18 inputs, general-purpose, photocoupler sensing<br>ALARM OUT: 1 output, open collector output (negative logic)<br>• Connector: D-sub 25-pin (female), inch screw |
| GPI OUT1/GPI OUT 2 terminal | GPI OUT: 48 outputs, selected from general purpose, tally<br>Open collector output<br>• Connector: D-sub 25-pin (female) x 2, inch screw |

| Accessories |
|---|
| AC cable -AV-HS60U2P: 2 cables -AV-HS60U2E: 4 cables<br>Rack-mounted rear panel support bracket<br>Screws for the rack-mounted rear panel support bracket: 8 screws<br>Operating Guide for the AV-HS6000 series (Excerpted Version) |

*1: Compatible after the June 2016 Firmware Ver. 4.

As of April, 2016

## ■Control Panel [AV-HS60C2P/E]

| General | |
|---|---|
| Power Supply | AC100 V to 240 V, 50 Hz/60 Hz<br>(AV-HS60C2 supports redundant power supply) |
| Power Consumption | 40 W |
| Operating Ambient Temperature | 0°C to 40°C (32°F to 104°F) |
| Operating Ambient Humidity | 10% to 90% (no condensation) |
| Storage Temperature | 0°C to 40°C (32°F to 104°F) |
| Storage Humidity | 10% to 90% (no condensation) |
| Weight | Approx. 13.9 kg (30.6 lbs.) (excluding accessories) |
| Dimensions (W x H x D) | 980 mm x 153.4 mm x 267 mm<br>(38-19/32 inches x 6-1/32 inches x 10-1/2 inches)<br>(excluding protrusions) |

| Control Terminal | |
|---|---|
| Mainframe Terminal | Compatible with 100Base-TX and AUTO-MDIX<br>(For Mainframe AV-HS60U2 connection)<br>Connection cable (supplied with AV-HS60C2): LAN cable (CAT5E), Straight cable, STP (Shielded Twisted Pair), 10 m (32.8 ft)<br>• Connector: RJ-45<br>When connected to the <LAN> terminal, no video will be displayed on the Menu Panel AV-HS60C3G. |
| MENU PANEL Terminal | Used only for the Menu Panel AV-HS60C3G<br>• Connector: DVI-D<br>• Because an independent signal format is used,cannot be displayed on a DVI-D monitor.<br>• Cannot be used concurrently with a DVI-D monitor (computer) connected to the <DVI-D> terminal. Select with the display selector switch. |
| DVI-D Terminal | Used for displaying menus to the DVI monitor (computer)<br>• Connector: DVI-D<br>• Monitor resolution: 1366 x 768 compatible monitor<br>• Cannot be used concurrently with the <MENU PANEL> terminal. Select with the display selector switch. |
| USB Terminal | For DVI monitor (computer) menu operation<br>• Connector: USB (type A, female)<br>• Cannot be used for the Menu Panel AV-HS60C3G. |
| Display Selector Switch | Switch for selecting <MENU PANEL> terminal or <DVI-D> terminal |
| COM1(M) Terminal | RS-422 Control Terminal<br>For master connection for controlling external devices<br>• Connector: D-sub 9-pin (female), inch screw |
| COM2(RS-232) Terminal | RS-232 Control Terminal<br>For master/slave connection for controlling external devices<br>• Connector: D-sub 9-pin (male), inch screw |
| GPI I/O Terminal | GPI IN: 8 inputs, general-purpose, photocoupler sensing<br>ALARM OUT: 1 output, open collector output (negative logic)<br>GPI OUT: 10 outputs, selected from general purpose, tally<br>Open collector output<br>• Connector: D-sub 25-pin (female), inch screw |
| ME Number | 2 ME |

**Accessories**

AC Cable -AV-HS60C2P: 2 cables -AV-HS60C2E: 4 cables
LAN Cable: 1 cable (used to connect with the Mainframe AV-HS60U2)
Switch blank cap (large): 24 caps Switch blank cap (small): 12 caps

## ■Control Panel AV-HS60C4P/E

| | |
|---|---|
| Power Supply | AC100 V to 240 V, 50 Hz/60 Hz<br>(Supports redundant power supply) |
| Power Consumption | 40 W |
| Operating Ambient Temperature | 0°C to 40°C (32°F to 104°F) |
| Operating Ambient Humidity | 10% to 90% (no condensation) |
| Storage Temperature | 0°C to 40°C (32°F to 104°F) |
| Storage Humidity | 10% to 90% (no condensation) |
| Weight | Approx. 15.0 kg (33.0 lbs.) (excluding accessories) |
| Dimensions (W x H x D) | 656 mmx160 mmx400 mm<br>(25-53/64 inchesx6-19/64 inchesx15-3/4 inches)<br>(excluding protrusions) |

| Control Terminal | |
|---|---|
| Mainframe Terminal | Compatible with 100Base-TX and AUTO-MDIX<br>(For Mainframe AV-HS60U2 connection)<br>Connection cable (supplied with AV-HS60C4): LAN cable (CAT5E), Straight cable, STP (Shielded Twisted Pair), 10 m (32.8 ft)<br>• Connector: RJ-45<br>When connected to the <LAN> terminal, no video will be displayed on the Menu Panel AV-HS60C3G. |
| MENU PANEL Terminal | Used only for the Menu Panel AV-HS60C3G<br>• Connector: DVI-D<br>• Because an independent signal format is used, cannot be displayed on a DVI-D monitor.<br>• Cannot be used concurrently with a DVI-D monitor connected to the <DVI-D> terminal. Select with the display selector switch. |
| DVI-D Terminal | Used for displaying menus to the DVI monitor<br>• Connector: DVI-D<br>• Monitor resolution: 1366x768 compatible monitor<br>• Cannot be used concurrently with the <MENU PANEL> terminal. Select with the display selector switch. |
| USB Terminal | For DVI monitor menu operation<br>• Connector: USB (type A, female)<br>• Cannot be used for the Menu Panel AV-HS60C3G. |
| Display Selector Switch | Switch for selecting <MENU PANEL> terminal or <DVI-D> terminal |
| COM1(M) Terminal | RS-422 Control Terminal<br>For master connection for controlling external devices<br>• Connector: D-sub 9-pin (female), inch screw |
| COM2(RS-232) Terminal | RS-232 Control Terminal<br>For external device control connections<br>• Connector: D-sub 9-pin (male), inch screw |
| GPI I/O Terminal | GPI IN: 8 inputs, general-purpose, photocoupler sensing<br>ALARM OUT: 1 output, open collector output (negative logic)<br>GPI OUT: 10 outputs, selected from general purpose, tally Open collector output<br>• Connector: D-sub 25-pin (female), inch screw |
| ME Number | 2 ME |

**Accessories**

AC Cable: 2 cables
LAN Cable: 1 cable (used to connect with the Mainframe AV-HS60U2)
Switch blank cap (large): 16 caps Switch blank cap (small): 8 caps

## ■Menu Panel [AV-HS60C3G]

| General | |
|---|---|
| Power Supply | DC12 V/0.54 A<br>(Supplied from AV-HS60C2/AV-HS60C4 using the supplied cable) |
| Power Consumption | 6.48 W |
| Operating Ambient Temperature | 0°C to 40°C (32°F to 104°F) |
| Operating Ambient Humidity | 10% to 90% (no condensation) |
| Storage Temperature | 0°C to 40°C (32°F to 104°F) |
| Storage Humidity | 10% to 90% (no condensation) |
| Weight | Approx. 1.7 kg (3.7 lbs.) (excluding accessories) |
| Dimensions (W x H x D) | 290 mm x 177 mm x 46.1 mm<br>(11-13/32 inches x 6-31/32 inches x 1-13/16 inches)<br>(excluding protrusions)<br>4RU |

| Control Terminal | |
|---|---|
| Control Panel Terminal | Used only for the Control Panel AV-HS60C2/AV-HS60C4<br>• Connectors: DVI-D<br>• Because an independent signal format is used,DVI-D source cannot be displayed.<br>• Cannot be used concurrently with a DVI-D monitor connected to the <DVI-D> terminal of the Control Panel AV-HS60C2/AV-HS60C4. Set the display selector switch of the Control Panel AV-HS60C2/AV-HS60C4 to the <MENU PANEL> terminal side. |

**Accessories**

Connecting cable (with ferrite core) for the Control Panel AV-HS60C2/AV-HS60C4: 1cable
Bracket for mounting the Control Panel AV-HS60C2/AV-HS60C4
Screws for the bracket for mounting the Control Panel AV-HS60C2/AV-HS60C4: 6 screws

## ■Storage Module [AV-HS60D1G]

| General | |
|---|---|
| Weight | Approx. 7.0 g (0.3 ozs.) |
| Dimensions (W x H x D) | 29.85 mm x 4.0 mm x 50.8 mm<br>(1-3/16 inches x 5/32 inches x 2 inches) |

**Accessories**

AV-HS60D1 Installation Guide

Due to device characteristics, the storage module AV-HS60D1G is subject to data damage and overwriting restrictions.
Backup of important data is recommended.

*For information on "AV-HS6000 Block Diagrams", see page 69.

# Live Switcher – Specifications

## AV-HS450

■Mainframe [AV-HS450U1N/E]

| | | |
|---|---|---|
| **General** | | |
| Power Supply | | AC 100 V to 120 V, 50/60 Hz<br>• Redundant power supply standard supported |
| Power Consumption | | 120 W |
| Ambient Operating Temperature | | 0 °C to 40 °C (32 °F to 104 °F) |
| Humidity | | 10 % to 90 % (no condensation) |
| Dimensions (W x H x D) | | 2RU size 482 x 88 x 471 mm (19" x 3-7/16" x 18-9/16") [excluding protrusions] |
| Weight | | 9.8 kg (21.605 lbs.) [excluding accessory parts when no options have been installed]<br>10.3 kg (22.707 lbs.) [excluding accessory parts when all the possible options have been installed] |
| **Video Terminal** | | |
| Video Inputs (20 signal lines, maximum) | | Standard SDI: 16 signal lines BNC x 16 (IN1 to IN16) |
| | | Optional: Up to 4 additional signal lines (IN A1, IN A2, IN B1, IN B2) (Up to two option boards can be installed in the two input/output slots.) |
| Video Outputs (10 signal lines, maximum) | | Standard SDI: 4 signal lines BNC x 5 (OUT1 to OUT4 x 1 line each, 2 distributed outputs for OUT1 only) |
| | | Standard DVI-D: 2 signal lines DVI-D x 2 (OUT5, OUT6) |
| | | Optional: Up to 4 additional lines (OUT A1, OUT A2, OUT B1, OUT B2) (Up to two option boards can be installed in the two input/output slots.) |
| | | • PGM, PVW, AUX1 to AUX4, MV1 (MULTI_PVW1), MV2 (MULTI_PVW2), CLN and KEYOUT can be allocated to each output.<br>• CLN can be pre-selected from KEY, DSK1 or DSK2 using a menu. |
| Signal Formats | SD | 480/59.94i, 576/50i |
| | HD | 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 1080/24PsF*, 1080/23.98PsF*<br>*The following option boards are not supported:<br>AV-HS04M1, AV-HS04M2, AV-HS04M3, AV-HS04M4, AV-HS04M5, AV-HS04M6, AV-HS04M7, AV-HS04M7D |
| Signal Processing | | Y:CB:CR 4: 2: 2, 10 bit (8 bits for frame memory)<br>RGB 4:4:4, 8 bit |
| ME Number | | 1ME |
| SDI Inputs | | HD: Serial digital component (SMPTE 292M)<br>SD: Serial digital component (SMPTE 259M) |
| | | 16 signal lines, standard: IN1 to IN16<br>20 signal lines, maximum: IN A1, IN A2, IN B1, IN B2<br>(When two AV-HS04M1 boards are used; with active through) |
| | | HD (SMPTE 292M (BTA S-004B) standard complied with]<br>• 0.8 V [p-p] ±10 % (75 Ω)<br>• Input return loss More than 15 dB (5 MHz to 750 MHz)<br>More than 10 dB (750 MHz to 1.5 GHz)<br>• Automatic equalizer 100 m (328 ft.) (when SC-FB cable is used) |
| | | SD (SMPTE 259M standard complied with]<br>• 0.8 V [p-p] ±10 % (75 Ω)<br>• Input return loss More than 15 dB (5 MHz to 270 MHz)<br>• Automatic equalizer 200 m (656 ft.) (when SC-2V cable is used) |
| SDI Outputs | | HD: Serial digital component (SMPTE 292M)<br>SD: Serial digital component (SMPTE 259M) |
| | | 4 signal lines, standard: OUT1 x 2; OUT2, OUT3, OUT4 x 1 each<br>8 signal lines, maximum: OUT A1, OUT A2, OUT B1, OUT B2<br>(When two AV-HS04M7 boards are used) |
| | | HD (SMPTE 292M (BTA S-004B) standard complied with]<br>• Output return loss More than 15 dB (5 MHz to 750 MHz)<br>More than 10 dB (750 MHz to 1.5 GHz)<br>• Output level 0.8 V [p-p] ±10 % (75 Ω)<br>• Rise time Less than 270 ps<br>• Fall time Less than 270 ps<br>• Difference between rise time and fall time Less than 100 ps<br>• Alignment jitter Less than 0.2 UI (130 ps)<br>• Timing jitter Less than 1.0 UI<br>• Eye aperture ratio More than 90 %<br>• DC offset 0±0.5 V |
| SDI Outputs | | SD (SMPTE 259M standard complied with]<br>• Output return loss More than 15 dB (5 MHz to 270 MHz)<br>• Output level 0.8 V [p-p]±10 % (75 Ω)<br>• Rise time Less than 1.5 ns<br>• Fall time Less than 1.5 ns<br>• Difference between rise time and fall time Less than 0.5 ns<br>• Jitter Less than 0.2 UI |
| Composite Input (Option) | | Analog composite signal (NTSC/PAL) (1.0 V [p-p], 75 Ω) |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M6 boards are used; with loop-through) |
| Analog Input (Option) | | SD/HD analog component Y/PB/PR (1.0 V [p-p], 75 Ω) |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M2 boards are used) |
| Analog Output (Option) | | SD/HD analog component Y/PB/PR (1.0 V [p-p], 75 Ω) |
| | | 4 signal lines, maximum: OUT A1, OUT A2, OUT B1, OUT B2 (When two AV-HS04M4 boards are used)<br>• 2 signal lines (OUT A1, OUT B1) when two AV-HS04M5 boards are used |
| DVI-I Input (Option) | | Analog/digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024) Vertical frequency: 60 Hz |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M3 boards are used) |
| DVI-I Output (Option) | | Analog/digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+*(1680 x 1050), UXGA* (1600 x 1200), WUXGA* (1920 x 1200)<br>*Selectable only when digital signals are output<br>Vertical frequency: 60 Hz |
| | | 2 signal lines, maximum: OUT A2, OUT B2 (When two AV-HS04M5 boards are used) |
| DVI-D Input (Option) | | Digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050),UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Vertical frequency: 60 Hz<br>Digital RGB: 1080/50P, 1080/59.94P<br>• This board is incompatible with the HDCP (High-bandwidth Digital Content Protection).<br>• Analog input signals are not supported. |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M8 boards are used)<br>• The DVI-I connector cable cannot be used.<br>• For the DVI-D connector cable, use a cable with a length of up to 5 m (16.4 ft.). |
| DVI-D Output | | Digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050), UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Vertical frequency: 60 Hz<br>Digital RGB: 1080/50P, 1080/59.94P<br>(The vertical frequency is the same as that of the system format. When the system format is 1080/23.98PsF or 24PsF, the images cannot be output.)<br>• Analog output signals are not supported.<br>• High-resolution multi view mode supported: Signals are also output with a high resolution even when SD has been selected as the system mode. With this mode setting, MV1 is output to OUT5 and MV2 to OUT6; MV1 and MV2 cannot be output to any other outputs. |
| | | 2 lines, standard: OUT5, OUT6<br>• The DVI-I connector cable cannot be used.<br>• For the DVI-D connector cable, use a cable with a length of up to 5 m (16.4 ft.). |

As of April, 2016

| Synchronous Terminal | |
|---|---|
| Reference Input/Output | In gen-lock mode: Black burst or Tri-level Sync input signals (with loop-through)<br>In internal sync mode: Black burst output signals x 2<br>• Same field frequencies as those of the system formats supported<br>• With the 1080/23.98PsF and 24PsF formats, only GENLOCK mode supported<br>• With the 1080/23.98PsF format, black burst with 10F-ID (SMPTE318M standard met) or TRI signals supported |
| Video Delay Time | FS OFF, U/C OFF<br>1 line (H) |
| | FS ON or U/C ON<br>1 frame (F) |
| | • When the signals have passed through DVE, multi view, down-converter, DVI-IN or DVI-OUT, a maximum delay of 1 frame is applied in each case. |

| Control Terminal | |
|---|---|
| PANEL | RJ45 x 1 100 Mbps<br>• When the control panel is connected |
| LAN | RJ45 x 1 100/10 Mbps<br>• Used for maintenance purposes |
| EDITOR | D-sub, 9-pin, female RS-422 control connector<br>• GVG standard protocol subset supported |
| COM | D-sub, 9-pin, female RS-422 control connector<br>• For Panasonic pan-tilt head system control, etc. |
| TALLY/GPI | D-sub, 50-pin, female<br>INPUT: 8 inputs, general-purpose, photocoupler sensing<br>OUTPUT: 31 outputs; selected from R/G tally, general-purpose<br>ALARM: 1 output, open collector output (negative logic) |

■Control panel [AV-HS450C1N/E]

| General | |
|---|---|
| Power Supply | DC 12 V, 0.8 A<br>• Redundant operation enabled by connecting two AC adapters<br>• Power consumption when using the AC adapter: AC 14 W |
| | Supplied AC adapter<br>Input: AC 100 V to 240 V, 1.3 A, 47-63 Hz<br>Output: DC 12 V, 3.5 A, 42 W<br>Supplied power cord<br>Maximum rating: AC 125 V<br>• Use within AC 100 V to 120 V. |
| Ambient Operating Temperature | 0 °C to 40 °C (32 °F to 104 °F) |
| Humidity | 10 % to 90 % (no condensation) |
| Dimensions (W x H x D) | 560 x 88 x 293 mm (22-1/16" x 3-7/16" x 11-3/4") [excluding protrusions] |
| Weight | 3.9 kg (8.598 lbs.) [excluding accessory parts] |

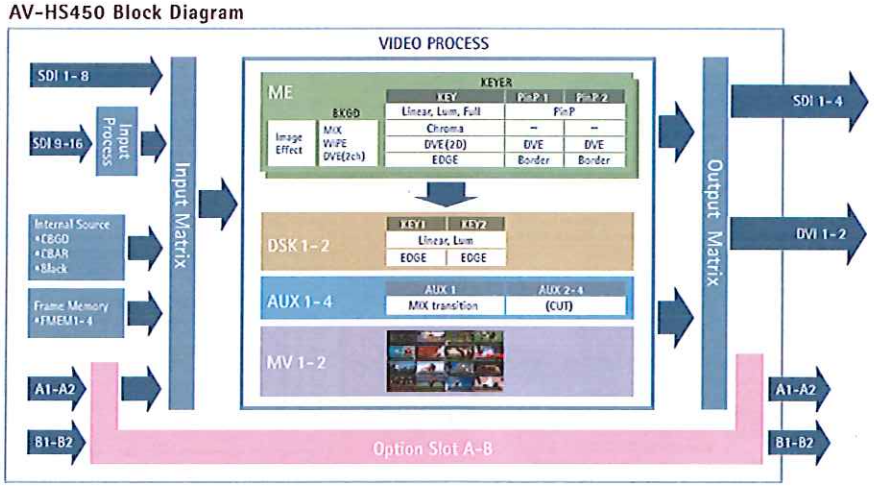
| Control Terminal | |
|---|---|
| MAINFRAME | RJ45 x 1 100 Mbps<br>• For connecting the mainframe |
| TALLY/GPI | D-sub, 25-pin, female<br>INPUT: 8 inputs<br>OUTPUT: 8 outputs<br>ALARM: 1 output |

| Other | |
|---|---|
| SD Memory Cards | Memory size supported: Max. 32 GB (SDHC memory cards supported)<br>Still image files: Load, save<br>Setup data: Backup |

**Accessories**

Operating instructions, CD-ROM (Operating instructions/Image transmission software), AC adapters (for control panel), Power cords (for mainframe and AC adapter), CAT5E cable (STP, straight cable, 10 m (32.8 ft.) long)

**AV-HS450 Block Diagram**






Item # 4

# Live Switcher – Specifications

## AV-HS410 (AV-HS410N/E)

| | | |
|---|---|---|
| **General** | | |
| Power Supply | | AC 100 V to 240 V, 50/60 Hz |
| Power Consumption | | 88 W |
| Ambient Operating Temperature | | 0 °C to 40 °C (32 °F to 104 °F) |
| Humidity | | 10 % to 90 % (no condensation) |
| Dimensions (W x H x D) | | 440 mm x 158 mm x 361 mm (17-5/16 inches x 6-7/32 inches x 14-7/32 inches) [excluding protrusions] |
| Mass | | Approx. 6.2 kg (13.669 lb) [excluding accessory parts when no options have been installed] Approx. 6.6 kg (14.550 lb) [excluding accessory parts when all the possible options have been installed] |
| **Video Terminal** | | |
| Video Inputs (13 signal lines, maximum) | | Standard SDI: 8 signal lines BNC x 8 (SDI INPUT 1 to SDI INPUT 8) • The up-converter function can be used for the SDI INPUT 5 to SDI INPUT 8 connectors. |
| | | Standard DVI-D: 1 signal line DVI-D x 1 |
| | | Optional: Up to 4 additional signal lines (IN A1, IN A2, IN B1, IN B2) (Up to two option boards can be installed in the two input/output slots.) |
| Video Outputs (10 signal lines, maximum) | | Standard SDI: 5 signal lines BNC x 6 (SDI OUTPUT 1 to SDI OUTPUT 5 x 1 line each, 2 distributed outputs for SDI OUTPUT 1 only) |
| | | Standard DVI-D: 1 signal line DVI-D x 1 |
| | | Optional: Up to 4 additional lines (OUT A1, OUT A2, OUT B1, OUT B2) (Up to two option boards can be installed in the two input/output slots.) |
| | | • PGM, PVW, AUX1 to AUX4, MV (MULTI_VIEW), CLN, KEYOUT and MEM PVW can be assigned to SDI OUTPUT 1 to SDI OUTPUT 5, DVI-D OUT, OUT A1, OUT A2, OUT B1 and OUT B2. • CLN can be pre-selected from KEY or DSK using a menu. |
| Signal Formats | SD | 480/59.94i, 576/50i |
| | HD | 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 1080/24PsF*, 1080/23.98PsF* *The following option boards are not supported: AV-HS04M1, AV-HS04M2, AV-HS04M3, AV-HS04M4, AV-HS04M5,AV-HS04M6, AV-HS04M7 |
| Signal Processing | | Y:Pʙ:Pʀ 4: 2: 2, 10 bit (8 bits for video memory) RGB 4:4:4, 8 bit |
| ME Number | | 1ME |
| SDI Inputs | | HD-SDI: HD Serial digital (SMPTE 292M) SD-SDI: SD Serial digital (SMPTE 259M) |
| | | 8 signal lines, standard: IN1 to IN8 12 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M1 boards are used; with active through) |
| | | HD: SMPTE 292M (BTA S-004B) standard complied with • 0.8 V [p-p] ±10 % (75 Ω) • Automatic equalizer More than 100 m (328 ft) (when 1.5 Gbps/5C-FB cable is used) |
| | | SD: SMPTE 259M standard complied with • 0.8 V [p-p] ±10 % (75 Ω) • Automatic equalizer 200 m (656 ft) (when 5C-2V cable is used) |
| SDI Outputs | | HD-SDI: HD Serial digital (SMPTE 292M) SD-SDI: SD Serial digital (SMPTE 259M) |
| | | 5 signal lines, standard: OUT1 x 2; OUT2 to OUT5 x 1 each 9 signal lines, maximum: OUT A1, OUT A2, OUT B1, OUT B2 (When two AV-HS04M7 boards are used) |

| | | |
|---|---|---|
| SDI Outputs | | HD: SMPTE 292M (BTA S-004B) standard complied with • Output level 0.8 V [p-p]±10 % • Rise time HD: Less than 270 ps • Fall time HD: Less than 270 ps • Difference between rise time and fall time HD: Less than 100 ps • Alignment jitter HD: Less than 0.2 UI (130 ps) • Timing jitter HD: Less than 1.0 UI • Eye aperture ratio More than 90 % • DC offset 0 ±0.5 V |
| | | SD: SMPTE 259M standard complied with • Output level 0.8 V [p-p] ±10 % • Rise time Less than 1.5 ns • Fall time Less than 1.5 ns • Difference between rise time and fall time Less than 0.5 ns • Jitter Less than 0.2 UI |
| Composite Input (Option board) | | Analog composite signal (NTSC/PAL) (1.0 V [p-p], 75 Ω) |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M6 boards are used; with loop-through) |
| Analog Input (Option board) | | SD/HD analog component Y/Pʙ/Pʀ (1.0 V [p-p], 75 Ω) |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M2 boards are used) |
| Analog Output (Option board) | | SD/HD analog component Y/Pʙ/Pʀ (1.0 V [p-p], 75 Ω) |
| | | 4 signal lines, maximum: OUT A1, OUT A2, OUT B1, OUT B2 (When two AV-HS04M4 boards are used) • 2 signal lines (OUT A1, OUT B1) when two AV-HS04M5 boards are used. |
| DVI-I Input (Option board) | | Analog/digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024) Vertical frequency: 60 Hz • This connector does not support the HDCP technologies. |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M3 boards are used) |
| DVI-I Output (Option board) | | Analog/digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+* (1680 x 1050), UXGA* (1600 x 1200), WUXGA* (1920 x 1200) *Selectable only when digital signals are output. Vertical frequency: 60 Hz • This connector does not support the HDCP technologies. |
| | | 2 signal lines, maximum: OUT A2, OUT B2 (When two AV-HS04M5 boards are used) |
| DVI-D Input (Option board) | | Digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050), UXGA (1600 x 1200), WUXGA (1920 x 1200) Vertical frequency: 60 Hz Digital RGB: 1080/50p, 1080/59.94p • Analog input signals are not supported. • This connector does not support the HDCP technologies. |
| | | 4 signal lines, maximum: IN A1, IN A2, IN B1, IN B2 (When two AV-HS04M8 boards are used) • The DVI-I connector cable cannot be used. • For the DVI-D connector cable, use a cable with a length of up to 5 m (16.4 ft). |
| DVI-D Input/Output | | Digital RGB: XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050), UXGA (1600 x 1200), WUXGA (1920 x 1200) Vertical frequency: 60 Hz Video format inputs: Digital RGB: 1080/50p, 1080/59.94p Vertical frequency: Same as system formats Video format outputs: Digital RGB: 1080/50p, 1080/59.94p, 1080/50i, 1080/59.94i, 720/50p, 720/59.94p • The input and output of analog signals are not supported. • Output support the high-resolution multi view mode: Signals are output with a high resolution even when SD is set as the system mode. (When high-resolution multi view mode has been enabled, MV is selected as the DVI-D OUT output, and it is not possible to select MV with SDI OUT.) • This connector does not support the HDCP technologies. |
| | | Standard input/output: 1 line each (DVI-D IN, DVI-D OUT) • The DVI-I connector cable cannot be used. • For the DVI-D connector cable, use a cable with a length of up to 5 m (16.4 ft). |

As of April, 2016

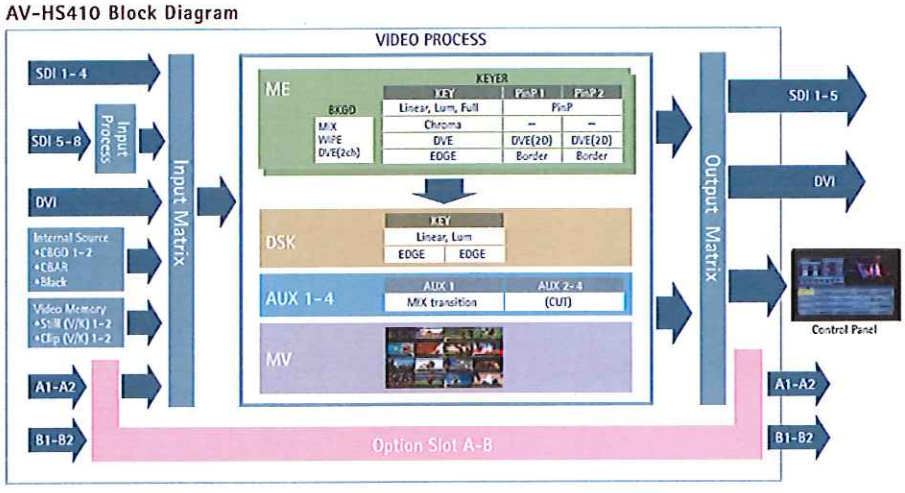
| Synchronous Terminal | |
|---|---|
| Reference Input/ Output | In gen-lock mode: Black burst or Tri-level Sync input signals (with loop-through)<br>In internal sync mode: Black burst output signals x 2<br>• Same field frequencies as those of the system formats supported.<br>• With the 1080/24PsF format, only gen-lock mode supported.<br>• With the 1080/23.98PsF format, black burst with 10F-ID (SMPTE318M standard met) or TRI signals supported. |
| Video Delay Time | 1 line (H)<br>When the frame synchronizer setting is "Off" and the up-converter setting is "Off".<br>1 frame (F)<br>When the frame synchronizer setting is "On" or the up-converter setting is "On".<br>• When the signals have passed through PinP, DVE, multi view, down-converter, DVI-IN or DVI-OUT, a maximum delay of 1 frame is applied in each case. |
| **Control Terminal** | |
| LAN | RJ-45 x 1<br>10BASE-T/100BASE-TX (For IP control)<br>Connecting cable:<br>LAN cable (category 5 or above), max. 100 m (328 ft), STP (Shielded Twisted Pair) cable recommended<br>• When connecting to a hub (switching hub), use a straight cable. Use a crossover cable when connecting the unit and computer on a 1:1 basis without going through a hub.<br>• Use with the same segment is recommended for the equipment which is connected to the unit. If the unit is connected to equipment whose segments are different, events dependent upon the settings inherent to the network equipment, for instance, may occur so thoroughly check the connections with the equipment to which the unit will be connected prior to the start of operation. |

| | |
|---|---|
| EDITOR | D-sub, 9-pin, female<br>Used to control an editor<br>RS-422 control connector<br>Communication format<br>Baud rate: 38400 bps<br>Character length: 8 bit<br>Parity: Odd<br>Stop bit: 1 bit<br>Flow control: None |
| COM | D-sub, 9-pin, female<br>Used to control an external device<br>RS-422 control connector<br>Communication format (selected using a menu)<br>• Mode: 1 (default setting)<br>Baud rate: 9600 bps<br>Character length: 8 bit<br>Parity: None<br>Stop bit: 1 bit<br>Flow control: None<br>• Mode: 2<br>Baud rate: 38400 bps<br>Character length: 8 bit<br>Parity: Odd<br>Stop bit: 1 bit<br>Flow control: None<br>• Mode: 3<br>Baud rate: 38400 bps<br>Character length: 8 bit<br>Parity: None<br>Stop bit: 1 bit<br>Flow control: None |
| TALLY/GPI 1<br>TALLY/GPI 2 | D-sub, 15-pin, female ( x 2)<br>Input: 8 inputs, general-purpose, photocoupler sensing<br>Output: 19 outputs; selected from R/G tally, general-purpose<br>Alarm: 1 output, open collector output (negative logic) |

| Other |
|---|
| BOOT switch [SV/NM (service/normal)] (for maintenance purposes)<br>Normally, this switch is used as the "NM" position. |

| Accessories |
|---|
| CD-ROM (Operating Instructions <Basics>, Operating Instructions <Operations and Settings>, User Guide "AV-HS410 Image Transmission Software", DVI input level adjustment file (BW.bmp), Image Transmission Software (ImageTrans.exe)), Power cable (2 m [6.6 ft]) |

## AV-HS410 Block Diagram






Item # 4

# Live Switcher – Specifications

## AW-HS50 [AW-HS50N/E]

| General | |
|---|---|
| Power Requirements | DC 12 V ±10 % (AC adapter provided) |
| Current Consumption | 2.0 A (DC 12 V) |
| Ambient Operating Temperature | 0 °C to 40 °C (32 °F to 104 °F) |
| Humidity | 10 % to 90 % (no condensation) |
| Dimensions (W x H x D) | 210 x 67 x 177 mm (8-1/4" x 2-5/8" x 6-15/16") (excluding protrusions) |
| Mass | 1.4 kg (3.08 lbs.) |

| Video Terminal | | |
|---|---|---|
| Inputs | | 5 video lines<br>SDI 4 signal lines: SDI IN 1 to SDI IN 4<br>DVI-D 1 signal line: DVI IN |
| Outputs | | 3 video lines, 4 outputs<br>SDI 2 signal lines: SDI OUT 1, SDI OUT 2<br>(Only the SDI OUT 1 signals are split into two)<br>DVI-D 1 signal line: DVI OUT |
| Signal Formats | SD | 480/59.94i, 576/50i |
| | HD | 1080/59.94i, 1080/50i, 720/59.94p, 720/50p, 1080/24PsF, 1080/23.98PsF |
| Signal Processing | | $Y_CC_R$ 4:2:2, 10 bit (8 bits for frame memory)<br>RGB 4:4:4, 8 bit |
| ME Number | | 1ME |
| SDI Inputs | | HD: Serial digital component (SMPTE 292M)<br>SD: Serial digital component (SMPTE 259M) |
| | | 4 signal lines: SDI IN 1 to SDI IN 4 |
| | | HD: SMPTE 292M (BTA S-004B) standard complied with<br>• 0.8 V [p-p] ±10 % (75 Ω)<br>• Input return loss More than 15 dB (5 MHz to 1.5 GHz)<br>• Automatic equalizer 100 m (328 ft.) (when 5C-FB cable is used) |
| | | SD: SMPTE 259M standard complied with<br>• 0.8 V [p-p] ±10 % (75 Ω)<br>• Input return loss More than 15 dB (5 MHz to 270 MHz)<br>• Automatic equalizer 200 m (656 ft.) (when 5C-2V cable is used) |
| DVI-D Input | | Digital RGB (Vertical frequency: 60 Hz):<br>XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050), UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Digital RGB: 1080/50p, 1080/59.94p<br>• Analog input signals are not supported. |
| SDI Outputs | | HD: Serial digital component (SMPTE 292M)<br>SD: Serial digital component (SMPTE 259M) |
| | | 2 signal lines: SDI OUT 1, SDI OUT 2<br>(Only the SDI OUT 1 signals are split into two) |

| SDI Outputs | |
|---|---|
| | HD: SMPTE 292M (BTA S-004B) standard complied with<br>• Output return loss More than 15 dB (5 MHz to 1.5 GHz)<br>• Output level 0.8 V [p-p] ±10 % (75 Ω)<br>• Rise time Less than 270 ps<br>• Fall time Less than 270 ps<br>• Difference between rise time and fall time Less than 100 ps<br>• Alignment jitter Less than 0.2 UI (130 ps)<br>• Timing jitter Less than 1.0 UI<br>• Eye aperture ratio More than 90 %<br>• DC offset 0±0.5 V |
| | SD: SMPTE 259M standard complied with<br>• Output return loss More than 15 dB (5 MHz to 270 MHz)<br>• Output level 0.8 V [p-p] ±10 % (75 Ω)<br>• Rise time Less than 1.5 ns<br>• Fall time Less than 1.5 ns<br>• Difference between rise time and fall time Less than 0.5 ns<br>• Jitter Less than 0.2 UI |
| DVI-D Output | Digital RGB (Vertical frequency: 60 Hz):<br>XGA (1024 x 768), WXGA (1280 x 768), SXGA (1280 x 1024), WSXGA+ (1680 x 1050), UXGA (1600 x 1200), WUXGA (1920 x 1200)<br>Digital RGB: 1080/50p, 1080/59.94p<br>• High-resolution multi view mode supported: Signals are also output with a high resolution even when SD has been selected as the system mode.<br>When the high-resolution multi view mode is enabled, MV is assigned to the DVI OUT connector, and MV cannot be assigned to the SDI OUT 1 connectors or SDI OUT 2 connector.<br>• Analog output signals are not supported. |

| Synchronous Terminal | |
|---|---|
| Video Delay Time | 1 frame (F)<br>• Video signals that have passed through the PinP, multi view display, DVI-D input or DVI-D output will be delayed in each case by up to one frame. |

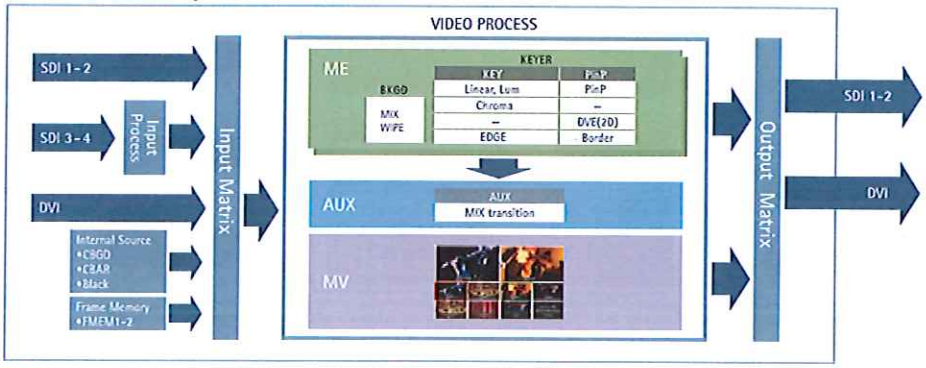
| Control Terminal | |
|---|---|
| LAN | RJ-45 x 1 10BASE-T/100BASE-TX (For IP control)<br>Connecting cable: LAN cable (category 5 or above), max. 100 m (328 ft.), STP (Shielded Twisted Pair) cable recommended<br>• When connecting to a hub (switching hub), use a straight cable. Use a crossover cable when connecting the unit and another device on a 1:1 basis without going through a hub. |
| TALLY/GPI | D-sub 15-pin, female, inch thread<br>INPUT: 5 inputs, photocoupler sensing<br>OUTPUT: 7 outputs, open collector output (negative logic) |

| Other | |
|---|---|
| Other | SERVICE switch (SV/NM) (for maintenance purposes)<br>Normally, this switch is used as the "NM" position. |

**Accessories**

Operating Instructions <Basics> (this manual), CD-ROM (Operating Instructions <Basics>, Operating Instructions <Operations and Settings>, Data Transmission Software), AC adapter, Power cable (2 m (6.6 ft.))

### AW-HS50 Block Diagram



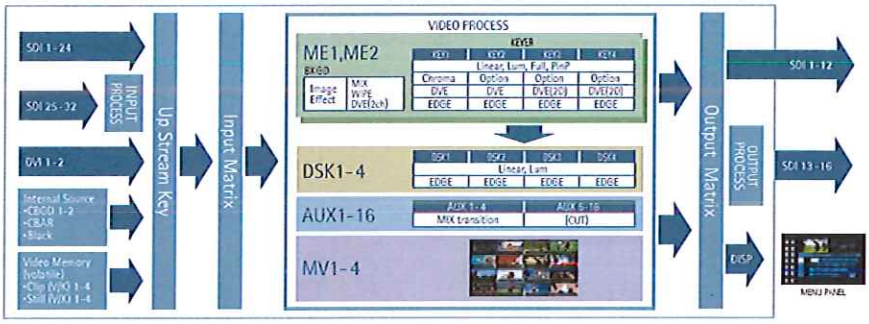



Item # 4

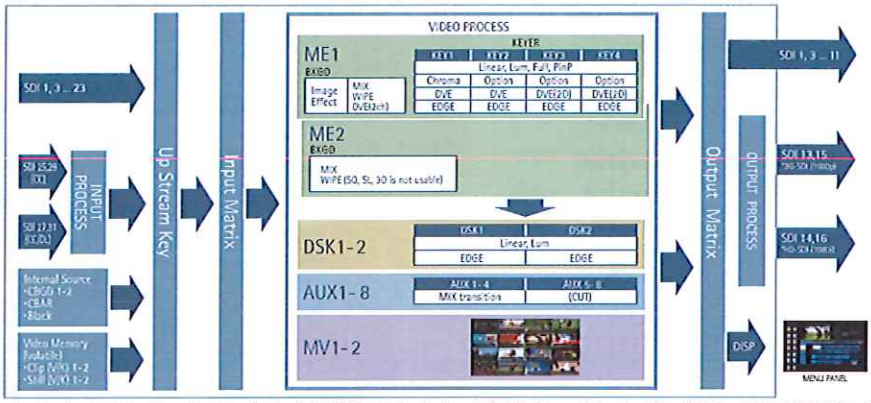
As of April, 2016

## AV-HS6000 Block Diagrams

### AV-HS6000 Block Diagram (Standard mode)

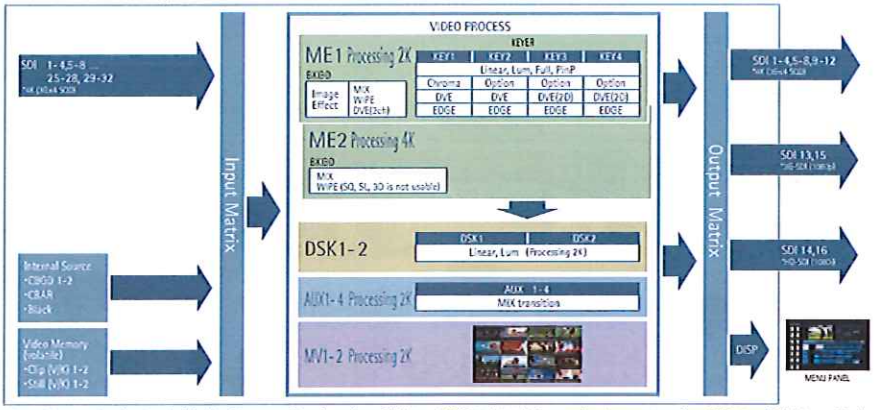



### AV-HS6000 Block Diagram (3G mode)




*Input and output is by odd-numbered terminals only. *1080i format signals where half of the lines are thinned out from OUT13 and OUT15 (1080p) format signals are output from OUT14 and OUT16 terminals.

### AV-HS6000 Block Diagram (4K mode)




*1080i format signals where half of the lines are thinned out from OUT13 and OUT15 (1080p) format signals are output from OUT14 and OUT16 terminals.



Item # 4

LEIGHTRONIX

RECORD BROADCAST STF

**Video Servers** UltraNEXUS-HD□
□**Encoders/Recorders** IncodeX Vier□IncodeX Stream□LABvault-HD□LABvault-SD□□**Services** VieBit Streaming Solutions□TOTAL INFO□□**Packages** LuxeVision IPTV Systems□IncodeX One Point-to-Point Broadcasting□□

**Recent**
**Blog**
**Press**
**Events**
**Newsletters**
**About Us**

The E-HD2™ high-definition video server is equipped with two independent
HD video channels and a fully integrated television automation interface, making
the server a highly flexible, two channel record/playback solution.
Outperforming other HD codecs,
the E-HD2's H.264 hardware records and plays amazingly high quality video images at surprisingly low bit rates.

Start Dynamic Content Area
Start Technical Specs Section

**All-Digital Interface**: features HD/SD-SDI video inputs/outputs with support for embedded, digital AES, and analog audio connections.

**Video I/O**: 2 BNC digital video inputs, 2 BNC digital video outputs, NTSC, HD-SDI digital video (SMPTE 292M) and SD-SDI digital video (SMPTE 259M), support for 2 channels of embedded

Item # 4

digital audio (SMPTE 272M and SMPTE 299M, audio pair selectable during record)

**Digital Audio I/O**: 2 digital audio inputs, 2 digital audio outputs, 2 channel AES digital audio (IEC 60958 type 1 balanced), terminal block

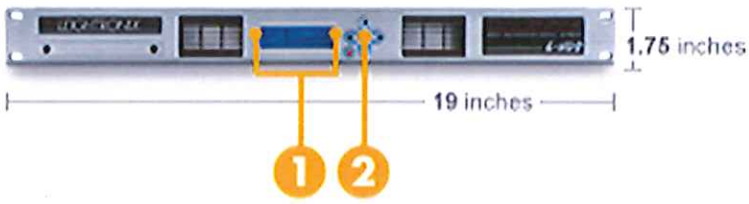
**Analog Audio I/O**: 2 analog audio inputs, 2 analog audio outputs, 2 channel balanced audio, terminal block

**Communication Port 2:** for external time control in addition to expanded switching, connect "COM2" to a supported master clock. Converts to DB9M RS-232 port with included serial cable.

**Power Cord Connector**

## Dimensions and Weight

**Height**: 1.75 inches (1 RU)
**Width**: 19 inches
**Depth**: 15 inches
**Weight**: 14 pounds




**Front Panel**

**Display**: 2 x 16 character liquid crystal display provides information on time/date, digital video channels (play/record), switcher, schedule activity, hardware/firmware versions, serial number, and IP address.

**Keypad**: six push buttons are used to display the status and information screens, provide password-protected access to the system configuration menu, and start up/shut down the □E-HD2. Quickly and easily configure the □E-HD2 for network connection (IP address, subnet, gateway).

## Back Panel

**Communication Port 1**: for expanded switching, connect DB9M RS-232 port to a supported video/audio routing switcher for system control of up to 250 inputs and 250 outputs. Alternately, connect to a supported master clock for external time control.

**Ethernet Port 1**: eight-position/eight-conductor RJ-45 modular Ethernet Port 1 provides a high speed 10/100/1000BASE-T Ethernet connection to a TCP/IP network with user-configurable IP address, subnet, and gateway. Remotely control system and manage digital media using the provided WinLGX software.

**Ethernet Port 2**: eight-position/eight-conductor RJ-45 modular Ethernet Port 2 provides a high speed 10/100/1000BASE-T Ethernet connection to a private, local media storage network using the TOTAL SHARE™ feature. Add up to 16 more terabytes of local media storage

using approved network attached storage (NAS) devices.

**USB Ports**: local digital media storage via four USB 2.0 ports allows configuration of up to four terabytes of local media storage on approved external hard drives.

## Internal Specs

**Product Safety**:
Conforms to UL Standard 60065
Certified to CSA Standard C22.2 No. 60065
Audio, Video, & Similar Electronic Apparatus

**Compliance**: FCC Part 15, Subpart A

**Digital Media Licensing**: licensed under MPEG-LA® LL's AVC/H.264 Patent Portfolio

**Warranty**: five years, parts and labor

**Video Standard**: NTSC, high definition, 16x9 aspect ratio, and standard definition, 4x3 aspect ratio

**HD Encoding and Decoding**: H.264 High Profile Level 4, 1080i and 720p, 1.5-10Mb/s variable bit rate encoding, 3-8Mb/s constant bit rate encoding

**SD Encoding and Decoding**: H.264 High Profile Level 3, 480i, 1.5-10Mb/s variable bit rate encoding, 3-8Mb/s constant bit rate encoding

**Audio Encoding**: MPEG-1 layer II, 48K sampling rate, 192Kb/s, 224Kb/s, and 256Kb/s audio bit rates

**Video/Audio Recording Capacity**: maximum individual digital program length 23 hours, 59 minutes

**Internal Hard Drive**: 250GB

**Power Supply**: Internal, accepts 100 to 240VAC @ 50 to 60Hz

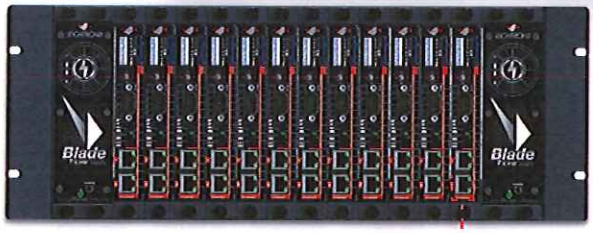
End Technical Specs Section


# FEATURES

The **UltraNEXUS-HD™** provides high-definition, H.264 digital media content with many of the advanced graphics and automation features the NEXUS® series is famous for. For larger workflows, easily manage up to 12 channels with the **UltraNEXUS-HD Blade™**, a compact, four rack unit chassis facilitating the seamless implementation of multiple broadcast channels without sacrificing rack space.

- **Simultaneous** HD and SD (Composite) Signal Output, Scaled on Both HD-SDI and Composite Outputs
- High Quality, High-Definition H.264 Technology - H.264 HD and MPEG-2 SD Decoding
- Internal High Performance 1TB Solid State Drive (SSD) with Industry-Leading 3D V-NAND Technology*
- Fully Automated Scheduling
- HD-SDI (Input/Output) and Composite Video (Output) H.264/MPEG-2 Server
- RS-232 External Switcher Control
- Compact 1 Rack Unit Chassis
- Less than 20 Watts of Power Consumption
- Embedded Digital Audio, AES Digital Audio, Balanced Analog Audio (Input/Output)
- File Compatibility Optimized for Direct Output from Popular Non-Linear Editors
- Scalable RAID Storage up to 16 TB NAS and 4TB external USB per channel
- Licensed MPEG-LA
- ETL Product Safety and FCC Compliant

* One rack unit UltraNEXUS-HD video server only.




| Server Wattage | Annual Wattage | Annual Cost |
|---|---|---|
| 220w | 1,927,200w (1,927.2kw) | $192.72 |

*Assuming 24/7/365 operation at $0.10 cost per Kwh

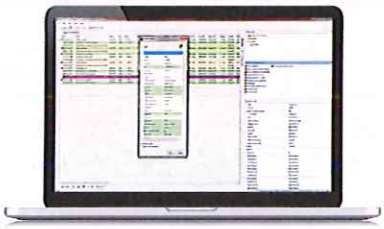
**Run 12 HD/SD Channels in a Space Saving 4 Rack Unit Chassis with the UltraNEXUS-HD Blade**

Energy Efficient Technology

$300 to $500 in annual energy cost savings in comparison to other typical server set-ups that operate at 600 to 900 watts.

As with any standard LEIGHTRONIX product, the UltraNEXUS-HD/UltraNEXUS-HD Blade comes with the peace of mind of working with an industry expert with over 35 years of experience. Both products also come with a free support package that includes a five year warranty, software and firmware upgrades, and access to our top-notch technical support team for the life of the product.

## EASY TO USE MANAGEMENT CONTROL SOFTWARE



**WinLGX™**

- System Configuration
- Drag & Drop Scheduling
- System Status
- Local & Remote System Control

## ADVANCED MESSAGING FEATURES

- Full or Partial Screen Text and Graphic Overlays
- Emergency Messaging
- Twitter Feed Integration
- Easily Insert Bug over Scheduled Programming
- Digital Video Messaging with the Feature Packed, Browser-Based Advanced Slide Editor
- Integration with the TOTAL INFO-HD™ Live Dynamic Video Content Subscription

## CUSTOMIZABLE ZONE TEMPLATES


**Full Screen**
(Template 1)

- Video Playback
- Full Screen Messaging
- Full Screen TOTAL INFO-HD
- Bug Overlay


**Lower Third**
(Template 2)

- Twitter Feed
- Lower Third Messaging


**Squeeze Back**
(Template 3)

- Right Side of Screen Messaging
- Twitter Feed
- Squeeze Back Video Playback

**FREE** 5-Year Warranty | **TOLL FREE** Telephone Calls | **FREE** Email Support | **FREE** Online Support | **FREE Access** to Support Center

www.leightronix.com | (800) 243-5589 | 1125 N Cedar Rd, Mason, MI 48854

06/16/16



*Preliminary Product Information

LEIGHTRONIX