

ROSEN
AVIATION

Electronic Revision Controlled

4K UHD Displays

Technical Manual

Part Numbers: 4KSxxx-xxx

Technical Manual, 4K UHD Displays**© 2021 by Rosen Aviation, LLC**

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1. INTRODUCTION

This manual provides installation guidance and references to all technical information required to install, service and maintain the Rosen 4K UHD Displays.

1.1. System Overview

The Rosen 4K Displays offer an all-in-one design which allows several installation options. Each display can be installed in flush mount and semi-proud orientations. The displays also accommodate a variety of input signals, resolutions and control capabilities allowing installation versatility.

1.1.1. Control Options

- External IR receiver
- RS232
- Ethernet
- USB
- WIFI (if equipped)

Please see interface control document P/N 111727

1.1.2. Mating Connectors

Recommended mating connectors are listed on the *4K Display Outline and Installation Drawings*.

2. LRU LIST

Table 1 Smart Display LRU List

| Monitor Model Number |
|----------------------|
| 4KS240-002 |
| 4KS320-004 |
| 4KS430-002 |
| 4KS480-001 |
| 4KS550-001 |

3. INSTALLATION GUIDELINES

3.1. Cooling and Ventilation

For venting requirements see *Outline and Installation* drawings.

3.2. Electrical Requirements

- Operational Voltage Range 18 to 32VDC (DC models)
- Operational Voltage Range 97 to 134 VAC 360 to 800 HZ (AC models)

For Max Current see *Outline and Installation* drawing for each display size.

3.3. Inputs and Connections

All Rosen Smart Displays use the following connections:

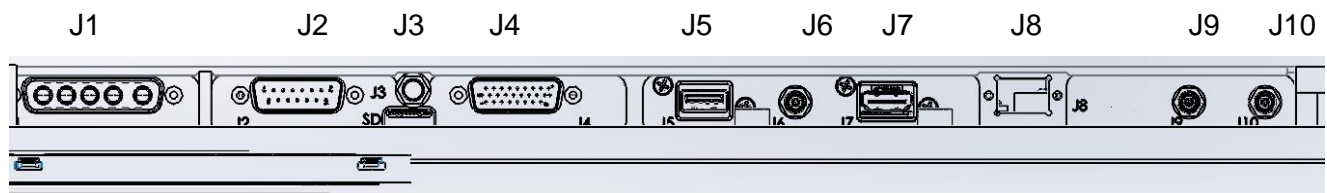


Figure 1 24" bulkhead display connections

1. Power (**J1**)
2. I/O (**J2**)
3. Wi-Fi (**J3**)
4. Ethernet/strapping (**J4**)
5. USB(**J5**)
6. SPDIF (**J6**)
7. HDMI (**J7**)
8. Fiber optic (**J8**)
9. SDI 1 (**J9**)
10. SDI 2 (**J10**)
11. SD Card (for future use)

3.4. Pinout Connections

There are several ways to connect the display to an aircraft's entertainment system.

Reference these pinout descriptions for the Smart Display Modules to assist in completing the wiring connections.

Note: This display is for entertainment purposes only; connect to a non-critical power bus.

3.4.1. Power Connector (J1) Pin-out Logic and Function

Table 2 Power Logic and Function for DC monitors

| Pin | Signal | Input/output | Description |
|-----|------------------|--------------|-----------------------|
| A1 | PRIMARY 28VDC | Input | Aircraft power supply |
| A2 | PRIMARY RETURN | Input | Aircraft power supply |
| A3 | SECONDARY 28VDC | Input | Aircraft power supply |
| A4 | SECONDARY RETURN | Input | Aircraft power supply |
| A5 | Chassis | | Chassis ground |

Table 3 Power Logic and Function for AC monitors

| Pin | Signal | Input/output | Description |
|-----|-----------------|--------------|-----------------------|
| A1 | Line 115 VAC | Input | Aircraft power supply |
| A2 | Earth (chassis) | Input | Aircraft power supply |
| A3 | Neutral 115 VAC | Input | Aircraft power supply |

3.4.2. I/O (J2) Pin-out Logic and Function

Table 4 I/O Logic and Function

| Pin | Signal | Input/output | Description |
|-----|--------------------|--------------|-----------------|
| 1 | RESERVED | Reserved | Reserved |
| 2 | RESERVED | Reserved | Reserved |
| 3 | RESERVED | Reserved | Reserved |
| 4 | Signal GND | Output | Audio line out |
| 5 | Audio left | Output | Audio line out |
| 6 | Audio Right | Output | Audio line out |
| 7 | Audio mute control | Input | audio control |
| 8 | Select control | input | Video control |
| 9 | IR +5V | Output | 5 volts out |
| 10 | SIGNAL GND | | |
| 11 | RESERVED-Debug | Reserved | Reserved |
| 12 | IR in | input | IR signal input |
| 13 | Debug RS232 TX | Output | RS232 Debug |
| 14 | Debug RS232 RX | Input | RS232 Debug |
| 15 | Discrete out3 | Output | Reserved |

3.4.3. Wi-Fi Connector (J3) Pin-out Logic and Function

Table 5 Wi-Fi Logic and Function

| Pin | Signal | Input/output | Description |
|--------|--------|--------------|-------------|
| Center | Wi-Fi | Input | Wi-Fi input |
| Outer | Return | Input | Wi-Fi input |

No Wi-Fi on the 4KS320-004 monitor

3.4.4. Ethernet Connector (J4) Pin-out Logic and Function

Table 6 Ethernet Logic and Function

| Pin | Signal | Input/output | Description |
|-----|-----------------|--------------|--|
| 1 | ENET A+ (TX+) | Input/output | Gigabit Ethernet capable. TX+ for fast Ethernet (100baseT). |
| 2 | ENET A- (TX-) | Input/output | Gigabit Ethernet capable. TX- for fast Ethernet (100baseT). |
| 3 | ENET B+ (RX+) | Input/output | Gigabit Ethernet capable. RX+ for fast Ethernet (100baseT). |
| 4 | ENET B- (RX-) | Input/output | Gigabit Ethernet capable. RX- for fast Ethernet (100baseT). |
| 5 | ENET C+ | Input/output | Gigabit Ethernet capable. |
| 6 | ENET C- | Input/output | Gigabit Ethernet capable. |
| 7 | ENET D+ | Input/output | Gigabit Ethernet capable. |
| 8 | ENET D- | Input/output | Gigabit Ethernet capable. |
| 9 | Gb ENET Ctrl in | Input | Open = 100baseT, Ground = Gigabit |
| 10 | ETH_ADDR_0 | Input | This pin is used to set the IP address. See Ethernet Strapping for more information. |
| 11 | ETH_ADDR_1 | Input | This pin is used to set the IP address. See Ethernet Strapping for more information. |
| 12 | ETH_ADDR_2 | Input | This pin is used to set the IP address. See Ethernet Strapping for more information. |
| 13 | ETH_ADDR_3 | Input | This pin is used to set the IP address. See Ethernet Strapping for more information. |
| 14 | ETH_ADDR_4 | Input | This pin is used to set the IP address. See Ethernet Strapping for more information. |
| 15 | ETH_ADDR_5 | Input | This pin is used to set the IP address. See Ethernet Strapping for more information. |
| 16 | Pwr Control In | Input | Open= off, Ground = on |
| 17 | SDI CTRL in | Input | Open = fiber, Ground = Copper |
| 18 | SIGNAL GND | | Typical return for strapping |
| 19 | SIGNAL GND | | Typical return for Ethernet strapping |

| Pin | Signal | Input/output | Description |
|-----|--------------|--------------|---|
| 20 | RESERVED | Reserved | Reserved |
| 21 | RESERVED | Reserved | Reserved |
| 22 | RESERVED | Reserved | Reserved |
| 23 | RESERVED | Reserved | Reserved |
| 24 | RESERVED | Reserved | Reserved |
| 25 | RESERVED | Reserved | Reserved |
| 26 | USB-A OTG ID | Input | Open = USB Debug, Ground = USB normal use |

3.4.5. USB (J5) Pin-out Logic and Function

Table 7 USB Logic and Function

| Pin | Signal | Input/output | Description |
|-----|--------|--------------|-------------------------|
| 1 | VBUS | Output | +5 volt Power |
| 2 | USB D- | Input/output | USB 2.0 Data- |
| 3 | USB D+ | Input/output | USB 2.0 Data+ |
| 4 | GND | | Ground |
| 5 | SSRX- | Input | Super speed receiver |
| 6 | SSRX+ | Input | Super speed receiver |
| 7 | GND | | Ground |
| 8 | SSTX- | Output | Super speed Transmitter |
| 9 | SSTX+ | Output | Super speed Transmitter |

3.4.6. SPDIF Out (J6) Pin-out Logic and Function

Table 8 USB Logic and Function

| Pin | Signal | Input/output | Description |
|--------|--------------|--------------|--------------------|
| Center | SPDIF | Output | SPDIF Audio Output |
| Outer | SPDIF Return | Output | SPDIF Audio Output |

3.4.7. HDMI (J7) Pin-out Logic and Function

Table 9 USB Logic and Function

| Pin | Signal | Input/output | Description |
|-----|-------------------|--------------|---------------------------------------|
| 1 | TMDS Data2+ | Input | |
| 2 | TMDS Data2 Shield | | |
| 3 | TMDS Data2- | Input | |
| 4 | TMDS Data1+ | Input | |
| 5 | TMDS Data1 Shield | | |
| 6 | TMDS Data1- | Input | |
| 7 | TMDS Data0+ | Input | |
| 8 | TMDS Data0 Shield | | |
| 9 | TMDS Data0- | Input | |
| 10 | TMDS Clock+ | Input | |
| 11 | TMDS Clock Shield | | |
| 12 | TMDS Clock- | Input | |
| 13 | CEC | Input/output | |
| 14 | Reserved | | |
| 15 | SCL | Input | I ² C serial clock for DDC |
| 16 | SDA | Input/output | I ² C serial data for DDC |
| 17 | Ground | | Ground |
| 18 | +5 V | Input | Power |
| 19 | Hot Plug Detect | Output | |

3.4.8. Fiber optic (J8) Pin-out Logic and Function

Table 10 Fiber Optic Logic and Function

| Pin | Signal | Input/output | Description |
|-----|---------------|--------------|-------------------|
| 1 | Ethernet 1 RX | Input | RX for Ethernet 1 |
| 2 | SDI-1 | Input | SDI video input 1 |
| 3 | Ethernet 2 RX | Input | RX for Ethernet 2 |
| 4 | SDI-2 | Input | SDI video input 2 |
| 5 | RESERVED | Reserved | Reserved |
| 6 | RESERVED | Reserved | Reserved |
| 7 | RESERVED | Reserved | Reserved |
| 8 | RESERVED | Reserved | Reserved |
| 9 | RESERVED | Reserved | Reserved |
| 10 | Ethernet 2 TX | Output | TX for Ethernet 2 |
| 11 | Reserved | Reserved | |
| 12 | Ethernet 1 TX | Output | TX for Ethernet 1 |

3.4.9. SDI Connectors (J9 and J10) Pin-out Logic and Function

Table 11 SDI Logic and Function

| Pin | Signal | Input/output | Description |
|--------|---------------|--------------|-----------------|
| Center | 3G-SDI | Input | SDI video input |
| Outer | 3G-SDI Return | Input | SDI video input |

3.4.10.

3.4.10. Ethernet Strapping

Setting the IP Address Mode in the Technician Settings to a static IP address will enable Ethernet Strapping.

The table below describes the Ethernet pinout configuration for the 4K Display when the IP Address Mode is set to 10.0.0.100. The table shows the first eight entries, but the addressing range uses all 5 pins for a total of 64 addresses

Reference the *4K Display Outline and Installation Drawing* for the pin locations in the Ethernet & strapping connector.

| Table 12 4K Display Ethernet Strapping IP Address | Ethernet Address Pins | | | | | | Logic |
|---|-----------------------|---|---|---|---|---|-----------------|
| | 5 | 4 | 3 | 2 | 1 | 0 | |
| 10.0.0.100 | 0 | 0 | 0 | 0 | 0 | 0 | 0=GND 1=OPEN |
| 10.0.0.101 | 0 | 0 | 0 | 0 | 0 | 1 | 0=GND 1=OPEN |
| 10.0.0.102 | 0 | 0 | 0 | 0 | 1 | 0 | 0=GND 1=OPEN |
| 10.0.0.103 | 0 | 0 | 0 | 0 | 1 | 1 | 0=GND 1=OPEN |
| 10.0.0.104 | 0 | 0 | 0 | 1 | 0 | 0 | 0=GND 1=OPEN |
| 10.0.0.105 | 0 | 0 | 0 | 1 | 0 | 1 | 0=GND 1=OPEN |
| 10.0.0.106 | 0 | 0 | 0 | 1 | 1 | 0 | 0=GND 1=OPEN |
| 10.0.0.107 | 0 | 0 | 0 | 1 | 1 | 1 | 0=GND 1=OPEN |

3.4.11. Pre-installation

- All required Rosen products are complete and available.
- Aircraft geometry as well as fastener locations have been manufactured within the tolerances defined in the Rosen *Outline and Installation* drawings.

3.4.12. Installation

The Following equipment is necessary to complete the installation.

Note: Installation assumes Aircraft interior has been designed and fabricated using mating dimensions provided on the *Outline and Installation* drawing.

- Customer supplied fasteners
- Tooling required for customer supplied aircraft hardware installation

For part details see *Outline and Installation* drawing.

3.5. Software upgrade

The 4K displays support field upgrade via Ethernet/USB which is detailed in P/N 110231 or 111727.

4. INITIAL POWER UP

Make sure that power is turned off and perform the following steps.

1. Ensure a low impedance ground connection on the chassis from the ground lug bosses indicated on the *Outline and Installation* drawing(optional).
2. Connect the power supply and video source to the appropriate connectors.
3. Supply power and wait for a video signal on the screen. The primary input is SDI



Do not plug or unplug the display connector while power is applied.

When cycling power, leave unit off for 20 seconds before restoring power.

4.1. OSD MAIN MENU

4.1.1. Video Settings

Reset video settings: use to reset to factory settings

Aspect Ratio: the Following are available

- 1 Normal - scale the video image horizontally to fit the width of the screen
- 2 Full screen- scale video horizontally & Vertically until input image fills the screen
- 3 Pillar box - create vertical bars on the right and left of the displayed image
- 4 Stretch - stretch the video image to fit the height and width of the screen

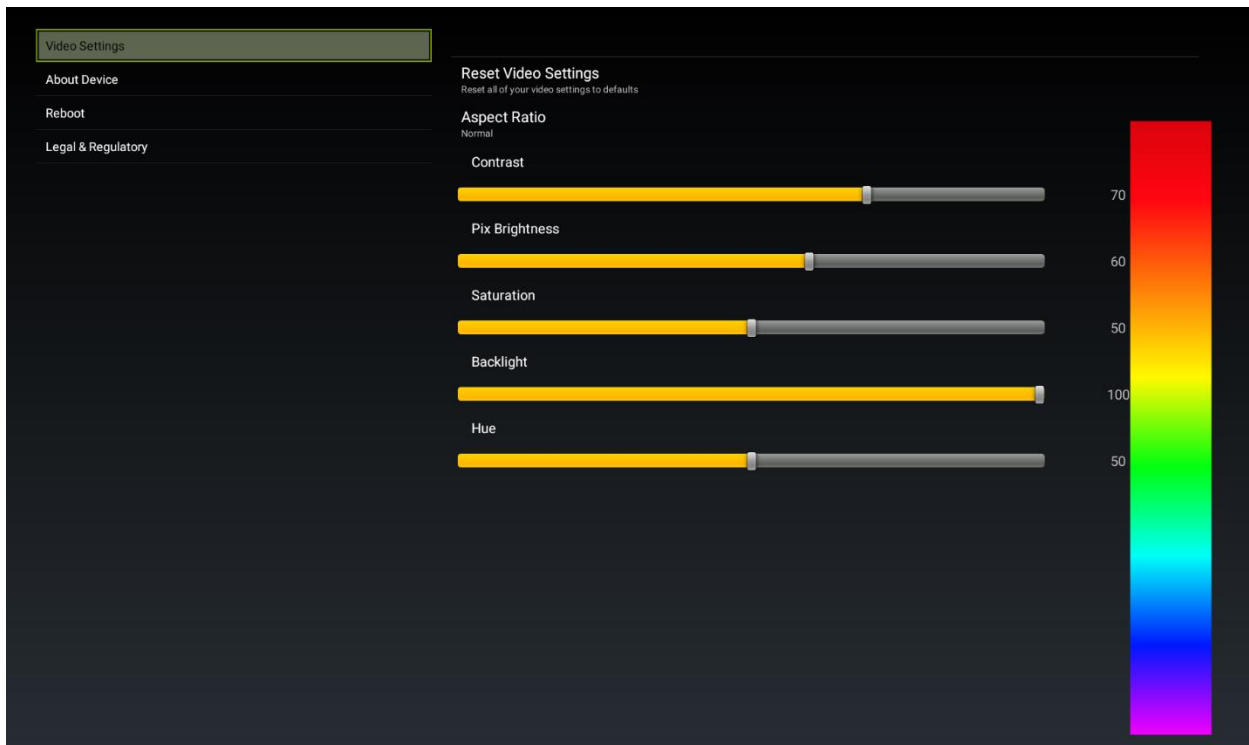
Contrast: Adjust picture contrast

Pix Brightness: Adjust picture brightness

Saturation: Adjust picture Saturation

Backlight: Adjust Backlight brightness

Hue: Adjust picture Hue



4.1.2. **About Device:** Gives user Information about the monitor

4.1.3. **Reboot:** Reboots the device so you don't need to pull power

4.1.4. Legal and regulatory: FCC info and rules

4.1.5. Technical settings

To protect the display from accidental or unintentional adjustments, the **Technical Menu** is accessible only with a special button combination. Changes made in the **Technical Menu** will take effect immediately, with the exception of **Power Modes and IP settings**. Power mode changes will take effect when the OSD is exited. IP Settings will take effect when the unit is rebooted.

To access the **Technical Menu** use the remote and quickly input the following with the arrow keys:

▲▼▲▼▲▲▲

The **Technical Menu** will pop up below the Legal & Regulatory. The following can be adjusted in the **Technical Menu**.

Remote Control Number: This allows you to change the remote ID 1-4 for use with Rosen's programmable remote.

Power Mode: Allows you to modify how power input pin 16 of the J4 connector is used. The following are available: Auto on, Auto off, Ground on, Open on, or Momentary.

Mute Mode: Allows you to modify how audio is muted from input pin 7 of the J2 connector is used. The following are available: Ground on, Open on, or Momentary on

Reset all setting: This will reset everything to the default mode.

Video Over scan: This is for over scanning of SDI video, the default is 25 which is 2.5%

Device Alias: This allows you to name your device. This helps when multiple devices are on the same network.

Launcher Wallpaper: Selects a Wallpaper. Supported wallpaper formats: BMP JPEG, GIF, and PNG

Select Boot Animation: Selects the animation shown during the boot process. Supports the Android-style .zip format

IP Address Mode: Choose between DHCP or specify a static IP address to use as the base of a range that takes strapping pins into account

Set Gateway IP Address: Lets you change the gateway IP Address.

Set Netmask IP Address: Lets you change the Netmask IP Address.

Set DNS IP Address: Lets you change the DNS IP Address.

Source Mode: Allows you to modify how Video is selected from input pin 8 of the J2 connector is used. The following are available: auto and Manual.

Note: when in manual mode the IR function like the select in pin every momentary/source press cycle to the next enabled source.

EXT_HDMI: Allows you to enable/disable the source and prioritize if in auto mode

SDI 1: Allows you to enable/disable the source and prioritize if in auto mode

- SDI 2:** Allows you to enable/disable the source and prioritize if in auto mode
- IMX8:** this is the settings menu it cannot be disabled.
- Wi-Fi :** Allows you to enable/disable the Wi-Fi
- Available Networks:** Allows you to choose wi-fi network

5. UPLOADING USER CONTENT

User content consists of, Wallpaper and Animation Configure file structure below on USB

RosenConfigFiles

- Wallpapers (Supported wallpaper formats: BMP JPEG, GIF, and PNG)
- BootAnimations (Supports Android-style .zip formats)

Once the media files are appropriately organized, plug the USB drive into a monitor and follow on screen instructions. Files can also be transferred via network update, contact Rosen Aviation for additional information.

5.1. Troubleshooting

Table 13 Troubleshooting tips and solutions

| Problem | Possible Solutions |
|-----------------|---|
| Screen is black | <ul style="list-style-type: none"> • Verify the unit is receiving power. • Verify the pinout is correct. • Verify you are on the correct input • Verify the Power Control In signal |

5.2. Cleaning the Display

If glass surfaces become contaminated, surfaces may be cleaned by wiping with a microfiber cloth. The cloth may be dampened (but not wet) with deionized water. Do not spray water directly on the monitor or glass.

5.3. RTCA DO-160G Qualifications for Displays

The table below shows the DO-160G compliance of the 4K UHD Display, unless otherwise noted. **Omitted test sections/categories are not applicable to this product or its expected installation.**

Table 14 The 4K UHD display is compliant with the following DO-160G test categories

| Description | Section | Category | Comments |
|---|---------------|-------------|---|
| Temperature and Altitude | 4 | | |
| Ground Survival/Short-Time Operating Low Temp | 4.5.1 | A1 | |
| Operating Low Temperature | 4.5.2 | A1 | |
| Ground Survival/Short-Time Operating High Temp | 4.5.3 | A1 | |
| Operating High Temperature | 4.5.4 | A1 | |
| In-Flight Loss of Cooling | 4.5.5 | – | Not Applicable |
| Altitude | 4.6.1 | A1 | +17,000ft |
| Decompression | 4.6.2 | A1 | Not Applicable |
| Overpressure | 4.6.3 | A1 | Not Applicable |
| Temperature Variation | 5 | | |
| Temperature Variation | 5.3.1 | C | -15°C to +55°C |
| Humidity | 6 | | |
| Standard Humidity | 6.3.1 | A | |
| Operational Shocks & Crash Safety | 7 | | |
| Operational Shocks | 7.2.2 | B | |
| Crash Safety (Impulse) | 7.3.2 | B | |
| Crash Safety (Sustained): Fixed-Wing Transport Aircraft, Random Orientation (≥9g/direction) | 7.3.3 | B | Satisfies Inertial Loads requirements per 14 CFR § 25.561(b)(3) |
| Vibration | 8 | | |
| Random Vibration – Fixed Wing Aircraft | 8.5.2 | S (Curve B) | |
| Waterproofness | 10 | Y | Substantiation by Company Testing |
| Fluids Susceptibility | 11 | | |
| Fluids Spray – Coffee, OJ, Cola, Cleaning Solvent (for all), Wine (for 32" and 43" only) | 11.4.1 | F | |
| Fungus Resistance | 13 | F | Substantiation by Analysis |
| Magnetic Effect | 15 | | |
| Magnetic Effect | 15.3 | B | Deflection Distance: $D \leq 300$ cm |
| Power Input (DC, Designation ZXI) | 16 | | |
| Normal Operating Conditions (DC) | 16.6.1 | | |
| Average Value Voltage (DC) | 16.6.1.1 | Z | |
| Ripple Voltage (DC) | 16.6.1.2 | Z | |
| Momentary Power Interruptions (DC) | 16.6.1.3 | Z (A) | |
| Normal Surge Voltage (DC) | 16.6.1.4 | Z | |

| Description | Section | Category | Comments |
|---|---------------|----------|--|
| Engine Starting Under Voltage Operation (DC) | 16.6.1.5 | Z | |
| Abnormal Operating Conditions | 16.6.2 | | |
| Voltage Steady State (DC) | 16.6.2.1 | Z | |
| Low Voltage Conditions | 16.6.2.2 | – | |
| Momentary Under Voltage (DC) | 16.6.2.3 | Z | |
| Abnormal Surge Voltage (DC) | 16.6.2.4 | Z | |
| Inrush Current | 16.7.5 | I | |
| Voltage Spike | 17 | | |
| Voltage Spike | 17.4 | A | |
| Audio Frequency Susceptibility | 18 | | |
| AF Conducted Susceptibility- Power Inputs | 18.3.1 | Z | |
| Induced Signal Susceptibility | 19 | | |
| Magnetic Fields Induced Into Equipment | 19.3.1 | AC | |
| Electric Fields Induced into Equipment | 19.3.2 | – | Not applicable to equipment with metal enclosure |
| Magnetic Fields Induced Into Interconnecting Cables | 19.3.3 | AC | |
| Electric Fields Induced Into Interconnecting Cables | 19.3.4 | AC | |
| Spikes Induced Into Interconnecting Cables | 19.3.5 | AC | |
| Radio Frequency Susceptibility | 20 | | |
| Conducted Susceptibility (CS) – 10 kHz to 400 MHz | 20.4 | T | |
| Radiated Susceptibility (RS) – 100 MHz to 8 GHz | 20.5 | T | |
| Emission of Radio Frequency Energy | 21 | | |
| Conducted RF Emission – 150 kHz – 152 MHz | 21.4 | M | |
| Radiated RF Emission – 100 MHz – 6 GHz | 21.5 | M | |
| Electrostatic Discharge (ESD) | 25 | | |
| Electrostatic Discharge (ESD) | 25.5 | A | |
| Flammability | 26 | – | Flammability compliance per 14 CFR § 25.853 |

5.4. Supported Video Specifications

5.4.1. 3G-SDI Resolutions

480i/29.97

576i/25

720p/50, 720p/59.94, 720p/60

1080i/25, 1080i/29.97, 1080i/30

1080p/23.97, 1080p/24, 1080p/25, 1080p/29.97, 1080p/30, 1080p/50, 1080p/59.94, 1080p/60

5.4.2. 3G-SDI 4K UHD Resolutions

3840x2160/23.97, 3840x2160/24, 3840x2160/25, 3840x2160/29.97, 3840x2160/30, 3840x2160/50, 3840x2160/59.94, 3840x2160/60

5.4.3. HDMI resolutions

480i/29.97, 480i/30

576i/25

480p/59.94, 480p/60

576p/50

720p/50, 720p/59.94, 720p/60

1080i/25, 1080i/29.97, 1080i/30

1080p/23.97, 1080p/24, 1080p/25, 1080p/29.97, 1080p/30, 1080p/50, 1080p/59.94, 1080p/60

3840x2160/23.97, 3840x2160/24, 3840x2160/25, 3840x2160/29.97, 3840x2160/30, 3840x2160/50, 3840x2160/59.94, 3840x2160/60



OLED displays are susceptible to screen burn in. Do not Display a static image.

6. DEFINITIONS

3G-SDI Newer, high-definition serial digital interface with a single 2.970 Gbit/s serial link

LRU Line Replaceable Unit

LCD Liquid Crystal Display

P/N Part Number

RS-232 Standard for serial data communication lines

VDC Volts direct current

7. REVISION HISTORY



Revision E is limited to draft or prototype documents. Revisions I, O, Q, S, X and Z are not to be used.

| Revision | Date | Revision Description | EC |
|----------|----------|----------------------|---------|
| A | 10/14/21 | Initial release | 21-0472 |