

Planar Simplicity Series 4K Displays



SL4364K
SL5064K
SL5564K
SL6564K
SL7564K
SL8664K

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Part Number: 020-1344-00B

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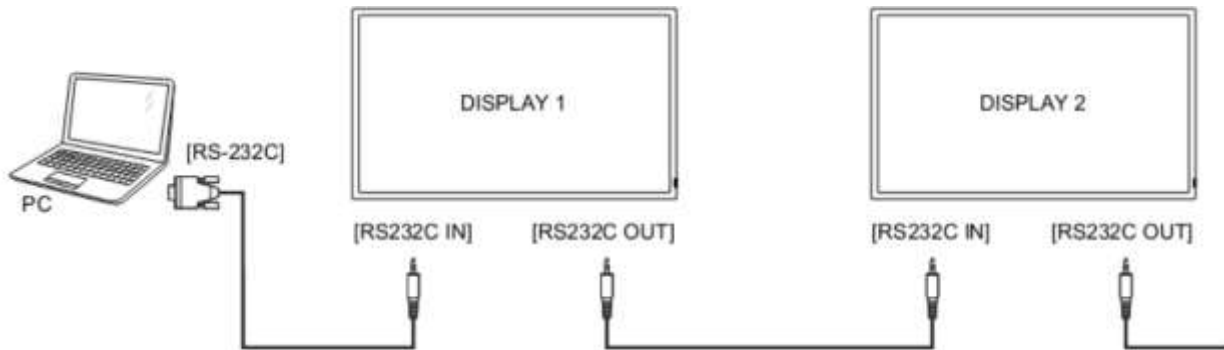
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Introduction

1. Purpose

The purpose of this document is to explain in detail the commands and steps that can be used to control a Planar Simplicity Series 4K display via RS232C.



2. Definitions, Abbreviations and Acronyms

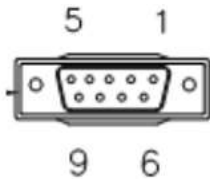
- ACK Acknowledge
- NAK Not Acknowledge
- NAV Not Available
- ID Identification

Command Packet Format

3. Physical Specifications

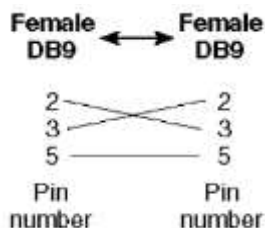
1. Baud Rate : 9600
2. Data bits: 8
3. Parity : None
4. Stop Bit : 1
5. Flow Control : None
6. The Pin Assignments for DB9 male connector:

Male D-Sub 9-Pin (outside view)



| Pin# | Signal | Remark |
|-------|--------|-------------------------|
| 1 | NC | |
| 2 | RXD | Input to LCD Monitor |
| 3 | TXD | Output from LCD Monitor |
| 4 | NC | |
| 5 | GND | |
| 6 | NC | |
| 7 | NC | |
| 8 | NC | |
| 9 | NC | |
| Frame | GND | |

Note: Use a crossover cable (null modem) for connection to the host controller:



Planar Simplicity Series 4K displays use RXD, TXD and GND pins for RS232C control. For RS232C cable, use the reverse type cable.

4. Communication Procedure

Send control commands from a host controller via the RS232 connection. Do not send a new command until the previous command is acknowledged. However, if a response is not received within 500 milliseconds, a retry may be triggered. Every valid command receives an ACK. A command that is valid, but not supported in the current implementation, will be responded to with NAV (Not Available). If the command buffer is corrupt, (transmission errors) the command will be responded to with NAK. The display operates according to the received command. If the command is a valid “Get” command, the display responds with the requested info. If the command is a valid “Set” command allowed, the display performs the requested operation.

Note: For LAN control, the port number is 5000

5. Command Format

The RS232 packet format:

| | | | | | | | | | | |
|--------|------------|----------|-------|-------|--------|--------------|---------|-----|---------|----------|
| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | ... | Data[N] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|-----|---------|----------|

In Detail:

| Number of Field | Name of Field | Description |
|------------------|-------------------|---|
| Byte 1 | Header | Header = 0xA6 |
| Byte 2 | Monitor ID | Monitor ID Range: 1 ~ 255 Signal Mode: Display Address range from 1 to 255 Broadcast Mode: Display Address is 0, so no ACK or Report is expected |
| Byte 3 | Category | 0x00 |
| Byte 4 | Code0 (Page) | 0x00 |
| Byte 5 | Code1 (Function) | 0x00 |
| Byte 6 | Length | Length has to be calculated in the following way: Length = N + 3 |
| Byte 7 | Data Control | Data Control = 0x01 (fixed) |
| Byte 8 ~ Byte 44 | Data[0] ~ Data[N] | This field can be also empty. If not empty then the range of Data Size, N = 0 to 36. |
| Last Byte | Checksum | Checksum Range = 0 to 255 (0xFF). Algorithm: The EXCLUSIVE-OR (XOR) of all bytes in the message except the checksum itself. Checksum = [Header] XOR [Monitor ID] XOR ... DATA[0] ... XOR DATA[N] |

System

6. Communication Control

This defines the feedback command from the monitor to the host controller. When the device receives a display command from the host controller the command reported to host controller will be ACK, NAK or NAV.

Note: There is no reply message when the wrong ID address is used.

6.1 Message Report

| Number of Field | Name of Field | Description |
|-------------------|-----------------|---|
| Byte 1 | Header | Header = 0x21 |
| Byte 2 | Monitor ID | Monitor ID Range: 1 ~ 255 |
| Byte3 | Category | 0x00 |
| Byte4 | Page | 0x00 |
| Byte5 | MsgLen | Length of message plus Checksum code. Calculate the length from Control Byte to Checksum Byte. |
| Byte6 | Control | 0x01 |
| Byte7 | Data[0] | Copy the received Command code |
| Byte8~Byte8+(N-1) | Data[1]~Data[N] | Returned data associated with command code |
| Byte 8+N | Checksum | XOR of all byte in reply/report packet (except checksum itself) |

Example ACK Reply: (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Control | Data[0] | Data[1] | Checksum | Description |
|--------|------------|----------|------|--------|---------|---------|---------|----------|---------------------------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x00 | 0x00 | 0x25 | Command is well executed. |

Example NAK Reply: (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Control | Data[0] | Data[1] | Checksum | Description |
|--------|------------|----------|------|--------|---------|---------|---------|----------|--|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x00 | 0x03 | 0x26 | If the command code is Data(0), the system will reply "NAK." |

Example NAV Reply: (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Control | Data[0] | Data[1] | Checksum | Description |
|--------|------------|----------|------|--------|---------|---------|---------|----------|---|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x00 | 0x04 | 0x21 | Checksum error- "NAV". Command Code Data(1)-"NAV". |

7. Monitor Information

This command provides the SICIP protocol and the display software versions to the host controller.

7.1 Model Number, FW Version, Build Date Message Get

| Bytes | Bytes Description | Bits | Description |
|--------------------|---|------|---|
| DATA[0] | 0xA1 = Model Number & FW version of device with Date- Get | | Request the Model Number and FW version of the device |
| DATA[1] to DATA[N] | Codes to request | | 0x00 = Model Number 0x01 = FW version 0x02 = Build Date |

Example: Get model number (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0xA1 | 0x00 | 0x03 |

7.2 Model Number, FW Version, Build Date Message Report

| Bytes | Bytes Description | Bits | Description |
|--------------------|--|------|---|
| DATA[0] | 0xA1 = Model Number & FW version of device with Date- Report | | Request the Model number, FW version, FW build date |
| DATA[1] to DATA[N] | Character[0] to Character[N-1] | | 36 (0x24) characters maximum. No. of characters, N = 1 to 36 (0x24). The actual size determines the value of the message size byte. |

General

8. Power State

Use this command to get/set the power state as defined below.

8.1 Power State Get

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------|------|--|
| DATA[0] | 0x19 = Power State - Get | | Command requests the display to report its current power state |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x19 | 0xBC |

8.2 Power State Report

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------|------|-------------------------------|
| DATA[0] | 0x19 = Power State - Report | | Command reports power state |
| DATA[1] | Power State | | 0x01 = Power Off 0x02 = On |

Example: Power State On (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x19 | 0x02 | 0x3E |

8.3 Power State Set

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------|------|--|
| DATA[0] | 0x18 = Power State - Set | | Command to change the Power State of the display |
| DATA[1] | Power State | | 0x01 = Power Off 0x02 = On |

Example: Power State Deep Sleep (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0x18 | 0x01 | 0xBB |

9. IR Remote Control Lock Functions

Use the following commands separately to lock or unlock the Remote Control and Keypad.

9.1 IR Remote Lock Status Get

| Bytes | Bytes Description | Bits | Description |
|---------|---|------|---|
| DATA[0] | 0x1D = IR Remote Control Lock Status- Get | | Get unlock all /lock all /lock all but power/lock all but volume/primary/secondary status |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x1D | 0xB8 |

9.2 IR Remote Lock Status Report

| Bytes | Bytes Description | Bits | Description |
|---------|--|------|--|
| DATA[0] | 0x1D = IR Remote Control Lock Status- Report | | Report unlock all /lock all /lock all but power/lock all but volume/primary/secondary status |
| DATA[1] | Status indicator byte for Remote Control | | 0x01 = Unlock All 0x02 = Lock All 0x03 = Lock All but Power 0x04 = Lock All but Volume 0x05 = Primary (Master) 0x06 = Secondary (daisy chain PD) 0x07 = Lock All except Power & Volume |

Example: Lock Keyboard and unlocked Remote Control (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x1D | 0x01 | 0x39 |

9.3 IR Remote Lock Status Set

| Bytes | Bytes Description | Bits | Description |
|---------|---|------|--|
| DATA[0] | 0x1C = IR Remote Control Lock Status- Set | | Set unlock all/lock all /lock all but power/lock all but volume/ Primary/Secondary status |
| DATA[1] | Status indicator byte for Remote Control | | 0x01 = Unlock All 0x02 = Lock All 0x03 = Lock All but Power 0x04 = Lock All but Volume 0x05 = Primary (Master) 0x06 = Secondary (Daisy chain PD) 0x07 = Lock All except Power & Volume |

Example: Unlock local remote control (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0x1C | 0x01 | 0xBF |

9.4 Keypad Lock Status Get

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------------|------|---|
| DATA[0] | 0x1B = Keypad Lock Status- Get | | Set unlock all/lock all /lock all but power/lock all but volume/ Primary/Secondary status |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x1B | 0xBE |

9.5 Keypad Lock Status Report

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------------|------|--|
| DATA[0] | 0x1B = Keypad Lock Status- Report | | Report unlock all /lock all/lock all but power/ lock all but Volume |
| DATA[1] | Status Indicator Byte for Keypad | | 0x01 = Unlock All 0x02 = Lock All 0x03 = Lock All but Power 0x04 = Lock All but Volume 0x07 = Lock All except Power & Volume |

Example: Reporting status of Keypad indicating Lock All (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x1B | 0x02 | 0x3C |

9.6 Keypad Lock Status Set

| Bytes | Bytes Description | Bits | Description |
|---------|----------------------------------|------|--|
| DATA[0] | 0x1A = Keypad Lock Status- Set | | Report unlock all /lock all/lock all but power/ lock all but Volume |
| DATA[1] | Status Indicator Byte for Keypad | | 0x01 = Unlock All 0x02 = Lock All 0x03 = Lock All but Power 0x04 = Lock All but Volume 0x07 = Lock All except Power & Volume |

Example: Set Lock All on Keypad (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0x1A | 0x01 | 0xB9 |

10. Power State at Cold Start

Use this command is to set, update, and store the cold start power state.

10.1 Power State at Cold Start Get

| Bytes | Bytes Description | Bits | Description |
|---------|--|------|-------------------------------------|
| DATA[0] | 0xA4 = Power State at Cold Start - Get | | Get Power State at Cold Start State |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0xA4 | 0x01 |

10.2 Power State at Cold Start Report

| Bytes | Bytes Description | Bits | Description |
|---------|--|------|--|
| DATA[0] | 0xA4 = Power State at Cold Start- Report | | Report from Power state at Cold Start state |
| DATA[1] | Power State at Cold Start | | 0x00 = Power Off 0x01 = Forced On 0x02 = Last Status |

Example: Report status of Forced On for Power State at Cold Start (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0xA4 | 0x01 | 0x80 |

10.3 Power State at Cold Start Set

| Bytes | Bytes Description | Bits | Description |
|---------|---------------------------------------|------|--|
| DATA[0] | 0xA3 = Power State at Cold Start- Set | | Set Power State at Cold Start |
| DATA[1] | Power State at Cold Start | | 0x00 = Power Off 0x01 = Forced On 0x02 = Last Status |

The value is stored and applied only when the display starts up from cold start power state the next time:

- **Power Off:** The monitor will automatically switch to Power Off mode (even if the last status was on) whenever the main power turns on, or resumes after a power interruption.
- **Forced On:** The monitor will automatically switch to Power On mode whenever the main power turns on or resumes after a power interruption.
- **Last Status:** The monitor will be automatically switch to the last status (either Power Off or On) whenever the main power turns on or resumes after a power interruption.

Example: Report status of Forced On for Power State at Cold Start (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0xA4 | 0x01 | 0x80 |

Input Sources

11. Input Source

Use this command to change the current input source.

11.1 Input Source Set

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------|------|--|
| DATA[0] | 0xAC = Input Source- Set | | Command requests the display to set the current input source |
| DATA[1] | Input Source Type | | 0x05 = VGA 0x06 = HDMI 2 0x0A = DisplayPort 0x0B= OPS 0x0D= HDMI 1 0x0E = DVI-D 0x0F = HDMI 3 0x10= BROWSER 0x11= CMS 0x16= Media Player 0x17= PDF Player 0x18= Custom 0x19 = HDMI 4 |
| DATA[2] | Reserved | | (Reserved, value is 0) |
| DATA[3] | Reserved | | (Reserved, value is 0) |
| DATA[4] | Reserved | | (Reserved, value is 0) |

Note: Certain sources only apply to specific models

- DisplayPort, HDMI 3, HDMI 4: 65/75/86 Only
- DVI-D: 43/55 Only

Example: Set on DVI-D (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Data[4] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|---------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x07 | 0x01 | 0xAC | 0x0E | 0x00 | 0x00 | 0x00 | 0x03 |

12. Current Source

12.1 Current Source Get

| Bytes | Bytes Description | Bits | Description |
|---------|---------------------------|------|---|
| DATA[0] | 0xAD = Current Source-Get | | Command requests the display to report the current input source in use. |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0xAD | 0x08 |

12.2 Current Source Report

| Bytes | Bytes Description | Bits | Description |
|---------|------------------------------|------|---|
| DATA[0] | 0xAD = Current Source-Report | | Command reports to the host controller the current input source used the display. |
| DATA[1] | Input Source Type/Number | | 0x05 = VGA 0x06 = HDMI 2 0x0A = DisplayPort 0x0B = OPS 0x0D = HDMI 1 0x0E = DVI-D 0x0F = HDMI 3 0x10 = BROWSER 0x11 = CMS 0x16 = Media Player 0x17 = PDF Player 0x18 = Custom 0x19 = HDMI 4 |
| DATA[2] | Reserved | | (Reserved, value is 0) |
| DATA[3] | Reserved | | (Reserved, value is 1) |
| DATA[4] | Reserved | | (Reserved, value is 0) |

Example: Current Input Source: DVI-D (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Data[4] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|---------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x07 | 0x01 | 0xAD | 0x0E | 0x00 | 0x01 | 0x00 | 0x84 |

Video

13. Video Parameters

Use the following commands to get/set video parameters as defined below.

13.1 Video Parameters Get

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------|------|--|
| DATA[0] | 0x33 = Video Parameters-Get | | Command requests the display to report its current video parameters. |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x33 | 0x96 |

13.2 Video Parameters Report

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------------|------|---|
| DATA[0] | 0x33 = Video Parameters-Report | | Command reports to the host controller the current video parameters of the display. |
| DATA[1] | Brightness | | 0 to 100 (%) of the user selectable range of the display |
| DATA[2] | Color | | 0 to 100 (%) of the user selectable range of the display |
| DATA[3] | Contrast | | 0 to 100 (%) of the user selectable range of the display |
| DATA[4] | Sharpness | | 0 to 100 (%) of the user selectable range of the display |
| DATA[5] | Tint (Hue) | | 0 to 100 (%) of the user selectable range of the display |
| DATA[6] | Black Level | | 0 to 100 (%) of the user selectable range of the display |
| DATA[7] | Gamma Selection | | 0x01= Native, 0x02 = S gamma, 0x03 = 2.2, 0x04 = 2.4 0x05 = D-image(DICOM gamma) |

Example: Video parameters are set to 55 % (0x37) and Gamma Curve is set to 2.2 (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Data[4] | Data[5] | Data[6] | Data[7] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x0A | 0x01 | 0x33 | 0x37 | 0x37 | 0x37 | 0x37 | 0x37 | 0x37 | 0x03 | 0x1B |

13.3 Video Parameters Set

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------|------|--|
| DATA[0] | 0x32 = Video Parameters-Set | | Command to change the current video parameters |
| DATA[1] | Brightness | | 0 to 100 (%) of the user selectable range of the display |
| DATA[2] | Color | | 0 to 100 (%) of the user selectable range of the display |
| DATA[3] | Contrast | | 0 to 100 (%) of the user selectable range of the display |
| DATA[4] | Sharpness | | 0 to 100 (%) of the user selectable range of the display |
| DATA[5] | Tint (Hue) | | 0 to 100 (%) of the user selectable range of the display |
| DATA[6] | Black Level | | 0 to 100 (%) of the user selectable range of the display |
| DATA[7] | Gamma Selection | | 0x01 = Native, 0x02 = S gamma, 0x03 = 2.2, 0x04 = 2.4, 0x05 = D-image(DICOM gamma) |

Example: Set all video parameters to 0x37 (55 %) (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Data[4] | Data[5] | Data[6] | Data[7] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x0A | 0x01 | 0x32 | 0x37 | 0x37 | 0x37 | 0x37 | 0x37 | 0x37 | 0x03 | 0xAC |

13.4 Color Temperature Get

| Bytes | Bytes Description | Bits | Description |
|---------|------------------------------|------|---|
| DATA[0] | 0x35 = Color Temperature-Get | | Command requests the display to report its current color temperature. |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x35 | 0x90 |

13.5 Color Temperature Report

| Bytes | Bytes Description | Bits | Description |
|---------|---------------------------------|------|--|
| DATA[0] | 0x35 = Color Temperature-Report | | Command reports to the host controller the current color temperature of the display. |
| DATA[1] | Color Temperature | | 0x00 = User 1 0x01 = Native 0x03 = 10000K 0x04 = 9300K 0x05 = 7500K 0x06 = 6500K 0x09 = 5000K 0x0A = 4000K 0x0D = 3000K 0x12 = User 2 |

Example: Color temperature is set to Nature (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x35 | 0x01 | 0x10 |

13.6 Color Temperature Set

| Bytes | Bytes Description | Bits | Description |
|---------|------------------------------|------|--|
| DATA[0] | 0x34 = Color Temperature-Set | | Command reports to the host controller the current color temperature of the display. |
| DATA[1] | Color Temperature | | 0x00 = User 1 0x01 = Native 0x03 = 10000K 0x04 = 9300K 0x05 = 7500K 0x06 = 6500K 0x09 = 5000K 0x0A = 4000K 0x0D = 3000K 0x12 = User 2 |

Example: The current Color Temperature is set to Nature (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0x34 | 0x01 | 0x97 |

13.7 Color Parameters Get

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------|------|---|
| DATA[0] | 0x37 = Color Parameters-Get | | Command requests the current video parameters of the display. |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x37 | 0x92 |

13.8 Color Parameters Report

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------------|------|---|
| DATA[0] | 0x37 = Color Parameters-Report | | Command reports to the host controller the current video parameters of the display. |
| DATA[1] | Red Color Gain Value | | 0 to 255 of the user selectable range of the display |
| DATA[2] | Green Color Gain Value | | 0 to 255 of the user selectable range of the display |
| DATA[3] | Blue Color Gain Value | | 0 to 255 of the user selectable range of the display |
| DATA[4] | Red Color Offset Value | | 0 to 255 of the user selectable range of the display |
| DATA[5] | Green Color Offset Value | | 0 to 255 of the user selectable range of the display |
| DATA[6] | Blue Color Offset Value | | 0 to 255 of the user selectable range of the display |

Example: All Color Parameters are set to 255 (0xFF) (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Data[4] | Data[5] | Data[6] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|---------|---------|---------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x09 | 0x01 | 0x37 | 0xFF | 0xFF | 0xFF | 0xFF | 0xFF | 0xFF | 0x1F |

13.9 Color Parameters Set

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------|------|--|
| DATA[0] | 0x36 = Color Parameters-Set | | Command sets the video parameters of the display. |
| DATA[1] | Red Color Gain Value | | 0 to 255 of the user selectable range of the display |
| DATA[2] | Green Color Gain Value | | 0 to 255 of the user selectable range of the display |
| DATA[3] | Blue Color Gain Value | | 0 to 255 of the user selectable range of the display |
| DATA[4] | Red Color Offset Value | | 0 to 255 of the user selectable range of the display |
| DATA[5] | Green Color Offset Value | | 0 to 255 of the user selectable range of the display |
| DATA[6] | Blue Color Offset Value | | 0 to 255 of the user selectable range of the display |

Example: All color parameters are set to 255 (0xFF) (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Data[4] | Data[4] | Data[5] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|---------|---------|---------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x09 | 0x01 | 0x36 | 0xFF | 0xFF | 0xFF | 0xFF | 0xFF | 0xFF | 0x99 |

14. Zoom Mode

Use this command to control the display screen format.

14.1 Zoom Mode Get

| Bytes | Bytes Description | Bits | Description |
|---------|----------------------|------|--|
| DATA[0] | 0x3B = Zoom Mode-Get | | Command requests the display to report its current picture format. |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x3B | 0x9E |

14.2 Zoom Mode Report

| Bytes | Bytes Description | Bits | Description |
|---------|---------------------------|----------|--|
| DATA[0] | 0x3B = Zoom Mode – Report | | Command report to the host controller the current picture format of the display. |
| DATA[1] | Zoom Mode | Bit 7..4 | Not used |
| | | Bit 3..0 | 0x00 = 4:3 0x01 = Custom 0x02 = Real 0x03 = Full 0x04 = 21:9 |

Example: Current Picture Format is Widescreen on Full Display (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x3B | 0x03 | 0x1D |

14.3 Zoom Mode Set

| Bytes | Bytes Description | Bits | Description |
|---------|----------------------|----------|---|
| DATA[0] | 0x3A = Zoom Mode-Set | | Command requests the display to set the specified picture format. |
| DATA[1] | Zoom Mode | Bit 7..4 | Not used. |
| | | Bit 3..0 | 0x00 = 4:3 0x01 = Custom 0x02 = 1:1 0x03 = Full 0x04 = 21:9 |

Example: Set Picture Format to Widescreen on Full Display (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0x3A | 0x03 | 0x9B |

Audio

15. Volume

Use this command to set/get the volume as defined below.

15.1 Volume Get

| Bytes | Bytes Description | Bits | Description |
|---------|-------------------|------|---|
| DATA[0] | 0x45 = Volume-Get | | Command requests the display to report its current Volume level |

- To mute the display, send Volume = 0. This command does not overwrite the system mute status of the display.

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x45 | 0xE0 |

15.2 Volume Report

| Bytes | Bytes Description | Bits | Description |
|---------|----------------------|------|--|
| DATA[0] | 0x45 = Volume-Report | | Command reports current volume level |
| DATA[1] | Volume | | 0 to 100 (%) of the user selectable range of the display |

Example: Volume 77% (0x4D) (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x04 | 0x01 | 0x45 | 0x4D | 0x2D |

15.3 Volume Set

This command can set the volume level for speaker and audio out, individually.

| Bytes | Bytes Description | Bits | Description |
|---------|------------------------|------|--|
| DATA[0] | 0x44 = Volume- Set | | Command requests the display to set the specified volume parameters. |
| DATA[1] | Volume | | 0 to 100 (%) of the user selectable range of the display. |
| DATA[2] | Audio Out Volume Level | | 0 to 100 (%) of the user selectable range of the display. |

Example: Set the Display Volume to 77% (0x4D) (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0x44 | 0x4D | 0x4D | 0xE7 |

16. Volume Limits

Use this command to set the volume limit for minimum, maximum and to switch on volume.

16.1 Volume Limits Get

| Bytes | Bytes Description | Bits | Description |
|---------|---------------------------|------|--|
| DATA[0] | 0xB7 = Volume Limits- Get | | Command requests the current volume limits |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0xB7 | 0x12 |

16.2 Volume Limits Report

| Bytes | Bytes Description | Bits | Description |
|---------|------------------------------|------|---|
| DATA[0] | 0xB8 = Volume Limits- Report | | The 3 values must conform to the rule: Min <= Switch On <= Max |
| DATA[1] | Minimum Volume | | 0 to 100 (%) of the user selectable range of the display. |
| DATA[2] | Maximum Volume | | 0 to 100 (%) of the user selectable range of the display. |
| DATA[3] | Power On Volume | | 0 to 100 (%) of the user selectable range of the display |

Example: Set the Display to the following: 10% (0x0A), 77% (0x4D), 50% (0x32) (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x06 | 0x01 | 0xB7 | 0x0A | 0x4D | 0x32 | 0xE5 |

16.3 Volume Limits Set

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------|------|---|
| DATA[0] | 0xB8 = Volume Limits-Set | | The 3 values must conform to the rule: Min <= Switch On <= Max |
| DATA[1] | Minimum Volume | | 0 to 100 (%) of the user selectable range of the display. |
| DATA[2] | Maximum Volume | | 0 to 100 (%) of the user selectable range of the display. |
| DATA[3] | Power On Volume* | | 0 to 100 (%) of the user selectable range of the display |

Note: To disable or reset the Power On Volume, set this value to the display default value of 0x14 (20%).

Example: Set the Display to the following: 10% (0x0A), 77% (0x4D), 50% (0x32) (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Data[2] | Data[3] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x06 | 0x01 | 0xB8 | 0x0A | 0x4D | 0x32 | 0x6D |

17. Audio Parameters

Use this command to set/get the audio parameters as defined below.

17.1 Audio Parameters Get

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------|------|---|
| DATA[0] | 0x43 = Audio Parameters-Get | | Command requests the display to report its current audio parameters |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x43 | 0xE6 |

17.2 Audio Parameters Report

| Bytes | Bytes Description | Bits | Description |
|---------|--------------------------------|------|--|
| DATA[0] | 0x43 = Audio Parameters-Report | | Command reports Audio Parameters |
| DATA[1] | Treble | | 0 to 100 (%) of the user selectable range of the display |
| DATA[2] | Bass | | 0 to 100 (%) of the user selectable range of the display |

Example: Current Display Settings: Treble 80% (0x50), Bass 93% (0x5D) (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Data[2] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x05 | 0x01 | 0x43 | 0x50 | 0x50 | 0x67 |

17.3 Audio Parameters Set

| Bytes | Bytes Description | Bits | Description |
|---------|-----------------------------|------|--|
| DATA[0] | 0x42 = Audio Parameters-Set | | Command to change the Audio Parameters of the display. |
| DATA[1] | Treble | | 0 to 100 (%) of the user selectable range of the display |
| DATA[2] | Bass | | 0 to 100 (%) of the user selectable range of the display |

The interface software must be set to modify the variables outlined by the parameters above.

Example: Set the Display: Treble 77% (0x4D), Bass77% (0x4D) (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Data[2] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x05 | 0x01 | 0x42 | 0x4D | 0x4D | 0xE1 |

Miscellaneous

18. Operating Hours

Use this command to record the working hours of the display.

18.1 Miscellaneous Info Get

| Bytes | Bytes Description | Bits | Description |
|---------|-------------------------|------|--|
| DATA[0] | 0x0F = Misc. Info - Get | | Command requests the display to report from miscellaneous information parameters |
| DATA[1] | Item | | 0x02 = Operating Hours (All other values are reserved) |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x04 | 0x01 | 0x0F | 0x02 | 0xAF |

18.2 Miscellaneous Info Report

| Bytes | Bytes Description | Bits | Description |
|--------------------------|--------------------------|------|---|
| DATA[0] | 0x0F = Misc. Info-Report | | Command reports current Operating Hours |
| DATA[1] to DATA[2] | Operating Hours | | DATA[1] forms MSByte DATA[2] forms LSByte 16-bit-wide operational hours value |

Example: Current Display Operation Hours Counter Value (Display Address 01)

| Header | Monitor ID | Category | Page | Length | Data Control | Data[0] | Data[1] | Data[2] | Checksum |
|--------|------------|----------|------|--------|--------------|---------|---------|---------|----------|
| 0x21 | 0x01 | 0x00 | 0x00 | 0x05 | 0x01 | 0x0F | 0x4D | 0x00 | 0x66 |

19. Auto Adjust

This command works for VGA (host controller) video auto adjust.

19.1 Auto Adjust Set

| Bytes | Bytes Description | Bits | Description |
|---------|------------------------|------|---|
| DATA[0] | 0x70 = Auto Adjust-Set | | Command requests the display to make auto adjustment on VGA input source. |
| DATA[1] | Item | | 0x40 = Auto Adjust (*All other values are reserved *) |
| DATA[2] | | | (Reserved, Default 0) |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Data[1] | Data[2] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|---------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x05 | 0x01 | 0x70 | 0x40 | 0x00 | 0x93 |

20. Serial Code

20.1 Serial Code Get

| Bytes | Bytes Description | Bits | Description |
|---------|-------------------------|------|---|
| DATA[0] | 0x15 = Serial Code- Get | | Command requests the display to report its Serial Code Number (Production code) 14 digits |

Example: (Display Address 01)

| Header | Monitor ID | Category | Code0 | Code1 | Length | Data Control | Data[0] | Checksum |
|--------|------------|----------|-------|-------|--------|--------------|---------|----------|
| 0xA6 | 0x01 | 0x00 | 0x00 | 0x00 | 0x03 | 0x01 | 0x15 | 0xB0 |

20.2 Serial Code Report

| Bytes | Bytes Description | Bits | Description |
|----------|-----------------------------|------|--|
| DATA[0] | 0x15 = Serial Code – Report | | Command reports Serial Code |
| DATA[1] | 1 st Character | | Character acc. ASCII character map (HEX) |
| DATA[2] | 2 nd Character | | |
| DATA[3] | 3 rd Character | | |
| ... | ... | | ... |
| DATA[14] | 14 th Character | | Character acc. ASCII character map (HEX) |

Command Summary

| Command Name | Set Command | Get Command | Command Code | Remarks |
|-------------------------------|-------------|-------------|--------------|------------------|
| Monitor Information | | √ | 0xA1 | |
| | | | | |
| Power State Get | | √ | 0x19 | |
| Power State Set | √ | | 0x18 | |
| Keypad Lock Status Get | | √ | 0x1B | |
| Keypad Lock Status Set | √ | | 0x1A | |
| IR Remote Lock Status Get | | √ | 0x1D | |
| IR Remote Lock Status Set | √ | | 0x1C | |
| Power State at Cold Start Get | | √ | 0xA4 | |
| Power State at Cold Start Set | √ | | 0xA3 | |
| | | | | |
| Current Source Get | | √ | 0xAC | |
| Input Source Set | √ | | 0xAD | |
| Auto Signal Detecting Get | | √ | 0xAF | |
| Auto Signal Detecting Set | √ | | 0xAE | |
| | | | | |
| Video Parameters Get | | √ | 0x33 | Brightness, etc. |
| Video Parameters Set | √ | | 0x32 | Brightness, etc. |
| Color Temperature Get | | √ | 0x35 | |
| Color Temperature Set | √ | | 0x34 | |
| Color Parameters Get | | √ | 0x37 | |
| Color Parameters Set | √ | | 0x36 | |
| Zoom Mode Get | | √ | 0x3B | |
| Zoom Mode Set | √ | | 0x3A | |
| | | | | |
| Volume Get | | √ | 0x45 | |
| Volume Set | √ | | 0x44 | |
| Volume Limits Get | | √ | 0xB7 | |
| Volume Limits Set | √ | | 0xB8 | |
| Audio Parameters Get | | √ | 0x43 | |
| Audio Parameters Set | √ | | 0x42 | |
| | | | | |
| Miscellaneous Info | | √ | 0x0F | Operating hours |
| Auto Adjust | √ | | 0x70 | VGA only |
| Serial Code Get | | √ | 0x15 | |