

Confidential

ad notam®

ad notam Display Frame Unit (DFU)

RS-232 Protocol Description

VERSION 4.xx



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Document Revisions

| Ver. | Date | Authors | Remarks |
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| 3.0 | May 23, 2013 | Dovi Engler | First Ver. 3.0 Release (For previous versions please see ver. 1.6 dated 15.03.2013) |
| 3.1 | November 20, 2013 | Dovi Engler | Front page image and logo changed Boot Power "Instant" option added |
| 4.0 | June 18, 2014 | Dovi Engler | New commands following new controller Board <ul style="list-style-type: none"> - Audio Out (Fixed; Variable) - Input VGA - DC Out (Off; Follow DFU; On) |
| 4.1 | September 1, 2015 | Dovi Engler | Added 2.4.3 Note for ACK generated by IR commands |
| | | | |

1 Introduction

The ad notam Display Frame Unit (DFU) can be controlled with RS232 commands from a host (a computer or similar device) or with IR commands from a remote control. This document describes the details of the two protocols.

2 RS232 Communication Protocol

This section describes the communication protocol to control the DFU remotely.

When the projects are connected to RS232 you can control the DFU through this ASCII based protocol.

Note: Some commands will generate OSD feedback.

2.1 Connect a Host to the DFU

Connect the DFU and host using a crossed serial cable with 9-pin female to the host, and 9-pin male to the projector. Pin 2 connects to pin 3, pin 3 connects to pin 2 and pin 5 connects to pin 5.

Fig. 1 RS232 socket

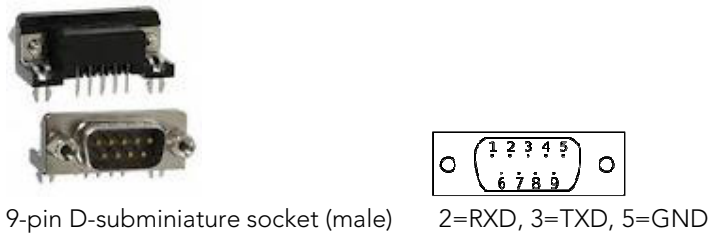
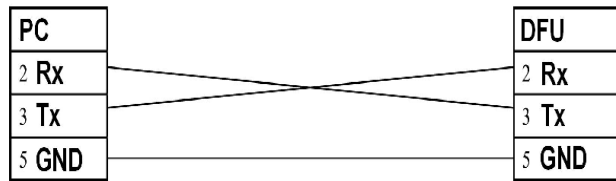


Fig. 2 Scheme of cross linked serial cable



2.2 RS232 Communication Parameters

Fig. 3 RS232 parameters

| Parameter | Data |
|--------------------------|---------------------------|
| Baud Rate | 9600, 19200, 38400 |
| Parity | N |
| Data Bits | 8 |
| Stop Bits | 1 |
| Flow Control (Handshake) | None |

Baud rate is configurable from the OSD service menu. Default baud rate is 38400.

2.3 Timing

General timing constraints:

- Wait 10 seconds after power on before sending next command.
- Wait for response before sending next command.
- Minimum 2 seconds delay before resending if no response received.
- Minimum 500ms delay between commands.
- Minimum 5 seconds delay after sending 20 commands

2.4 ad notam RS232 Protocol

2.4.1 Command Structure

An ad notam RS232 command consists of a header, an identifier, an optional separator and value and a terminator.

A command accepts no spaces between fields.

A command always starts with an '&' (ampersand).

A command is always 9 bytes long including the carriage return. If the value field uses less than 3 bytes the missing characters will be filled with '*' (asterisk).

Fig. 4 Command structure

| Field | Description | Length | Comment |
|------------|---------------------------------|---------|----------|
| Header | ASCII character '&' (ampersand) | 1 byte | Required |
| Identifier | Key identifier, case sensitive | 3 bytes | Required |
| Separator | Char symbol (: or ?) | 1 byte | Optional |
| Value | Value | 3 bytes | Optional |
| Terminator | CR carriage return (0x0D) | 1 byte | Required |

Examples for identifiers: PWR, BAS, SRC

Separators:

- : (colon) Value change. Value given will replace existing value.
Example: &SRC:USB will change the units input to USB
- ? (question mark) Get current value

2.4.2 Acknowledgement Structure

The DFU shall confirm each command it receives with an acknowledgement automatically. Acknowledgement is ON by default. Acknowledge can be turned on and off with ECHO command.

An acknowledgement consists of a header, an identifier, a separator, a value and a terminator.

An acknowledgement always starts with a '%' (percent).

An acknowledgement is always 9 bytes long including the carriage return. If the value field uses less than 3 bytes the missing characters will be filled with '*' (asterisk).

Fig. 5 The acknowledgement structure

| Field | Description | Length | Comment |
|------------|--------------------------------|---------|----------|
| Header | ASCII character '%' (percent) | 1 byte | Required |
| Identifier | Key identifier, case sensitive | 3 bytes | Required |
| Separator | ASCII character ':' | 1 byte | Required |
| Value | Value | 3 bytes | Required |
| Terminator | CR carriage return (0x0D) | 1 byte | Required |

Error Messages

Most acknowledgements return the actual value of the requested command. If the requested command is not valid an error message will be returned instead.

An error message always starts with an '!' (Exclamation mark).

Fig. 6 Error codes

| Code | Error Message | Description |
|----------|--------------------|--|
| !ERR:001 | Access denied | Command disabled by Unit Settings. Example: trying to switch to USB input while this input is disabled in Service Settings. |
| !ERR:002 | Not available | Command currently not available. Example: trying to change brightness while unit is in input scan mode |
| !ERR:003 | Not implemented | Command not implemented in this model. Example: &SRC:VGA |
| !ERR:004 | Value out of range | Value out of range Example: &SLP:080 |

2.4.3 ACK messages generated by incoming IR commands

All IR commands sent by the DFU's remote control are generating an RS232 ACK message accordingly.

Please note that IR commands are not available for all RS232 commands.

2.5 RS232 Examples

'CR' ASCII value carriage return, hex value 0x0D.

| Set Power ON | | | | | | | | |
|--------------|---|---|---|---|---|---|---|------|
| & | P | W | R | : | O | N | * | <CR> |

&PWR:ON*<CR>

| Acknowledge Power ON | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|------|
| % | P | W | R | : | O | N | * | <CR> |

%PWR:ON*<CR>

| Set Sleep Timer to 30 minutes | | | | | | | | |
|-------------------------------|---|---|---|---|---|---|---|------|
| & | S | L | P | : | 0 | 3 | 0 | <CR> |

&SLP:030<CR>

| Acknowledge Sleep Timer | | | | | | | | |
|-------------------------|---|---|---|---|---|---|---|------|
| % | S | L | P | : | 0 | 3 | 0 | <CR> |

%SLP:030<CR>

| Increment Volume | | | | | | | | |
|------------------|---|---|---|---|---|---|---|------|
| & | V | O | L | : | U | P | * | <CR> |

&VOL:UP*<CR>

| Acknowledge Volume | | | | | | | | |
|--------------------|---|---|---|---|---|---|---|------|
| % | V | O | L | : | 0 | 6 | 3 | <CR> |

%VOL:063<CR>

| Increment Balance to Left | | | | | | | | |
|---------------------------|---|---|---|---|---|---|---|------|
| & | B | A | L | : | L | T | * | <CR> |

&BAL:LT*<CR>

| Acknowledge Balance | | | | | | | | |
|---------------------|---|---|---|---|---|---|---|------|
| % | B | A | L | : | - | 0 | 1 | <CR> |

%BAL:-01<CR>

2.6 RS232 Commands and Acknowledgements

Fig. 7 RS232 command and acknowledgement list

| Function | Command (Tx) | ACK (Rx) |
|------------------------|--------------|---------------------------------|
| Power Toggle | &PWR:TOG | %PWR: XXX [XXX]= [ON*] or [OFF] |
| Power ON | &PWR:ON* | %PWR:ON* |
| Power OFF | &PWR:OFF | %PWR:OFF |
| Get Power Status | &PWR?*** | |
| | OFF | %PWR:OFF |
| | ON | %PWR:ON* |
| Boot set to ON | &BOT:ON* | %BOT:ON* |
| Boot set to Standby | &BOT:SBY | %BOT:SBY |
| Boot set to Last | &BOT:LST | %BOT:LST |
| Boot set to Instant | &BOT:INS | %BOT:INS |
| Get Boot Setup | &BOT?*** | |
| | ON | %BOT:ON* |
| | Standby | %BOT:SBY |
| | Last | %BOT:LST |
| | Instant | %BOT:INS |
| Signal Loss 5Sec | &SLS:05s | %SLS:05s |
| Signal Loss 10Sec | &SLS:10s | %SLS:10s |
| Signal Loss 30Sec | &SLS:30s | %SLS:30s |
| Signal Loss 1min | &SLS:001 | %SLS:001 |
| Signal Loss 2min | &SLS:002 | %SLS:002 |
| Signal Loss OFF | &SLS:OFF | %SLS:OFF |
| Get Signal Loss Setup | &SLS?*** | |
| | 5Sec | %SLS:05s |
| | 10Sec | %SLS:10s |
| | 30sec | %SLS:30s |
| | 1min | %SLS:001 |
| | 2min | %SLS:002 |
| | OFF | %SLS:OFF |
| | | |
| Sleep Timer 15min | &SLP:015 | %SLP:015 |
| Sleep Timer 30min | &SLP:030 | %SLP:030 |
| Sleep Timer 45min | &SLP:045 | %SLP:045 |
| Sleep Timer 60min | &SLP:060 | %SLP:060 |
| Sleep Timer 90min | &SLP:090 | %SLP:090 |
| Sleep Timer 120min | &SLP:120 | %SLP:120 |
| Sleep Timer OFF | &SLP:OFF | %SLP:OFF |
| Get Sleep Timer Status | &SLP?*** | |
| | 15min | %SLP:015 |
| | 30min | %SLP:030 |
| | 45min | %SLP:045 |
| | 60min | %SLP:060 |
| | 90min | %SLP:090 |
| | 120min | %SLP:120 |
| | OFF | %SLP:OFF |
| Digit 1 | &NUM:001 | %NUM:001 |
| Digit 2 | &NUM:002 | %NUM:002 |
| Digit 3 | &NUM:003 | %NUM:003 |
| Digit 4 | &NUM:004 | %NUM:004 |

| Function | Command (Tx) | ACK (Rx) |
|----------------------------|--------------|---------------------------------|
| Digit 5 | &NUM:005 | %NUM:005 |
| Digit 6 | &NUM:006 | %NUM:006 |
| Digit 7 | &NUM:007 | %NUM:007 |
| Digit 8 | &NUM:008 | %NUM:008 |
| Digit 9 | &NUM:009 | %NUM:009 |
| Digit 0 | &NUM:000 | %NUM:000 |
| Ok | &CRS:OK* | %CRS:OK* |
| Up | &CRS:UP* | %CRS:UP* |
| Down | &CRS:DN* | %CRS:DN* |
| Left | &CRS:LT* | %CRS:LT* |
| Right | &CRS:RT* | %CRS:RT* |
| Volume + | &VOL:UP* | %VOL:XXX [XXX]= [000]-[100] |
| Volume - | &VOL:DN* | |
| Get Volume Level | &VOL?*** | |
| Mute Toggle | &MUT:TOG | %MUT: XXX [XXX]= [ON*] or [OFF] |
| Mute On | &MUT:ON* | %MUT:ON* |
| Mute Off | &MUT:OFF | %MUT:OFF |
| Get Mute Status | &MUT?*** | |
| ON | | %MUT:ON* |
| OFF | | %MUT:OFF |
| Play | &FNC:PLY | %FNC:PLY |
| Pause | &FNC:PSE | %FNC:PSE |
| Stop | &FNC:STP | %FNC:STP |
| Skip forward / Chapter + | &FNC:NXT | %FNC:NXT |
| Skip backwards / Chapter - | &FNC:PRV | %FNC:PRV |
| Fast Forward | &FNC:FWD | %FNC:FWD |
| Fast Backward | &FNC:RWD | %FNC:RWD |
| Exit | &EXT:*** | %EXT:*** |
| OSD Access ON | &OSA:ON* | %OSA:ON* |
| OSD Access OFF | &OSA:OFF | %OSA:OFF |
| Get OSD Access Status | &OSA?*** | |
| Access ON | | %OSA:ON* |
| Access OFF | | %OSA:OFF |
| OSD Toggle (open/close) | &OSD:TOG | %OSD: XXX [XXX]= [ON*] or [OFF] |
| OSD ON (open) | &OSD:ON* | %OSD:ON* |
| OSD OFF(close) | &OSD:OFF | %OSD:OFF |
| Get OSD Status | &OSD?*** | |
| ON | | %OSD:ON* |
| OFF | | %OSD:OFF |
| Audio Out Level FIXED | &AOL:FIX | %AOL:FIX |
| Audio Out Level VARIABLE | &AOL:VAR | %AOL:VAR |
| Get Audio Out Level Status | &AOL?*** | |
| Level FIXED | | %AOL:FIX |
| Level VARIABLE | | %AOL:VAR |
| Input HDMI 1 | &SRC:HD1 | %SRC:HD1 |
| Input HDMI 2 | &SRC:HD2 | %SRC:HD2 |
| Input HDMI 3 | &SRC:HD3 | %SRC:HD3 |
| Input Component | &SRC:RGB | %SRC:RGB |
| Input USB / DMP | &SRC:USB | %SRC:USB |
| Input VGA | &SRC:VGA | %SRC:VGA |
| Function | Command (Tx) | ACK (Rx) |

| | | | |
|-----------------------|------------|-----------|-----------------------------|
| Get Input Status | | &SRC:?*** | |
| | Component | | %SRC:RGB |
| | HDMI 1 | | %SRC:HD1 |
| | HDMI 2 | | %SRC:HD2 |
| | HDMI 3 | | %SRC:HD3 |
| | USB / DMP | | %SRC:USB |
| | VGA | | %SRC:VGA |
| DC Out OFF | | &DCO:OFF | %DCO:OFF |
| DC Out Follow DFU | | &DCO:DFU | %DCO:DFU |
| DC Out ON | | &DCO:ON* | %DCO:ON* |
| Get DC Out Status | | &DCO:?*** | |
| | OFF | | %DCO:OFF |
| | Follow DFU | | %DCO:DFU |
| | ON | | %DCO:ON* |
| Aspect 16:9 | | &ASP:169 | %ASP:169 |
| Aspect 4:3 | | &ASP:043 | %ASP:043 |
| Zoom 1 | | &ASP:ZM1 | %ASP:ZM1 |
| Zoom 2 | | &ASP:ZM2 | %ASP:ZM2 |
| Get Aspect Status | | &ASP?*** | |
| | 16:09 | | %ASP:169 |
| | 04:03 | | %ASP:043 |
| | Zoom 1 | | %ASP:ZM1 |
| | Zoom 2 | | %ASP:ZM2 |
| Picture Mode Standard | | &PCT:STD | %PCT:STD |
| Picture Mode User | | &PCT:USR | %PCT:USR |
| Picture Mode Dynamic | | &PCT:DYN | %PCT:DYN |
| Picture Mode Mild | | &PCT:MLD | %PCT:MLD |
| Picture Temp Cool | | &PCT:COL | %PCT:COL |
| Picture Temp Medium | | &PCT:MED | &PCT:MED |
| Picture Temp Warm | | &PCT:WRM | &PCT:WRM |
| Brightness + | | &BRT:UP* | %BRT:XXX [XXX]= [000]-[100] |
| Brightness - | | &BRT:DN* | |
| Get Brightness Level | | &BRT?*** | |
| Contrast + | | &CON:UP* | %CON:XXX [XXX]= [000]-[100] |
| Contrast - | | &CON:DN* | |
| Get Contrast Level | | &CON?*** | |
| Saturation + | | &STR:UP* | %STR:XXX [XXX]= [000]-[100] |
| Saturation - | | &STR:DN* | |
| Get Saturation Level | | &STR?*** | |
| Sharpness + | | &SRP:UP* | %SRP:XXX [XXX]= [000]-[100] |
| Sharpness - | | &SRP:DN* | |
| Get Sharpness Level | | &SRP?*** | |
| Backlight + | | &BLT:UP* | %BLT:XXX [XXX]= [000]-[100] |
| Backlight - | | &BLT:DN* | |
| Get Backlight Level | | &BLT?*** | |
| Audio Mode Standard | | &AUD:STD | %AUD:STD |
| Audio Mode Music | | &AUD:MUS | %AUD:MUS |
| Audio Mode Movie | | &AUD:MOV | %AUD:MOV |
| Audio Mode Sports | | &AUD:SPR | %AUD:SPR |
| Audio Mode Use | | &AUD:USR | %AUD:USR |
| Bass + | | &BAS:UP* | %BAS:XXX [XXX]= [000]-[100] |

| | | |
|------------------------|----------|---------------------------------|
| Bass - | &BAS:DN* | |
| Get Bass Level | &BAS?*** | |
| Treble + | &TRB:UP* | %TRB:XXX [XXX]= [000]-[100] |
| Treble - | &TRB:DN* | |
| Get Treble Level | &TRB?*** | |
| Balance Left | &BAL:LT* | %BAL:XXX [XXX]= [-50][000][+50] |
| Balance Right | &BAL:RT* | |
| Get Balance Level | &BAL?*** | |
| Boot Volume Level + | &BVL:UP* | %BVL:XXX [XXX]= [000]-[100] |
| Boot Volume Level - | &BVL:DN* | |
| Get Boot Volume Level | &BVL?*** | |
| Set RS232 Echo ON [*] | &ECO:ON* | %ECO:ON* |
| Set RS232 Echo OFF [*] | &ECO:OFF | %ECO:OFF |

[*] Echo=ON enables, Echo=OFF disables RS232 ACK messages.