



## RS-232 Protocol Description

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## 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

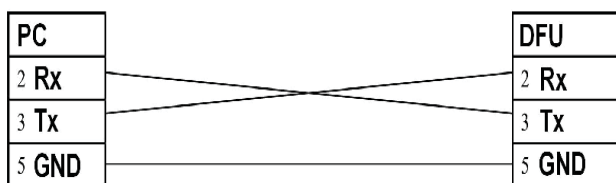
Connect the DFU and host using a crossed serial cable with 9-pin female to the host, and 9-pin male to the projector. Pin 2 connects to pin 3, pin 3 connects to pin 2 and pin 5 connects to pin 5.

Fig. 1 RS232 socket



9-pin D-subminiature socket (male)      2=RXD, 3=TXD, 5=GND

Fig. 2 Scheme of cross linked serial cable



### 2.2 RS232 Communication Parameters

Fig. 3 RS232 parameters

Parameter	Data
Baud Rate	9600, 19200, <b>38400 (default)</b>
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).

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 INPUT to HDMI1								
&	S	R	C	:	H	D	1	<CR>

&SRC:HD1<CR>

Acknowledge Sleep Timer								
%	S	R	C	:	H	D	1	<CR>

% SRC:HD1<CR>

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

&VOL:UP\*<CR>

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

%VOL:063<CR>

## 2.6 RS232 Commands

Fig. 7 RS232 command list

Function	Command ASCII	Command Hex
POWER	&PWR:TOG	26 50 57 52 3A 54 4F 47
Power ON	&PWR:ON*	26 50 57 52 3A 4F 4E 2A
Power OFF	&PWR:OFF	26 50 57 52 3A 4F 46 46
SLEEP	&SLP:TOG	26 53 4c 50 3A 54 4f 47
DIGIT 1	&NUM:001	26 4E 55 4D 3A 30 30 31
DIGIT 2	&NUM:002	26 4E 55 4D 3A 30 30 32
DIGIT 3	&NUM:003	26 4E 55 4D 3A 30 30 33
DIGIT 4	&NUM:004	26 4E 55 4D 3A 30 30 34
DIGIT 5	&NUM:005	26 4E 55 4D 3A 30 30 35
DIGIT 6	&NUM:006	26 4E 55 4D 3A 30 30 36
DIGIT 7	&NUM:007	26 4E 55 4D 3A 30 30 37
DIGIT 8	&NUM:008	26 4E 55 4D 3A 30 30 38
DIGIT 9	&NUM:009	26 4E 55 4D 3A 30 30 39
DIGIT 0	&NUM:000	26 4E 55 4D 3A 30 30 30
DIGIT -/--	&NUM:-/--	26 4e 55 4d 3A 2D 2F 2D
TEXT	&KEY:TXT	26 4B 45 59 3A 54 58 54
EPG	&KEY:EPG	26 4B 45 59 3A 45 50 47
TV/RADIO	&KEY:TVR	26 4B 45 59 3A 54 56 52
MENU	&KEY:MNU	26 4B 45 59 3A 4D 4E 55
AUDIO	&KEY:AUD	26 4B 45 59 3A 41 55 44
FAV	&KEY:FAV	26 4B 45 59 3A 46 41 56
ZOOM	&KEY:ZUM	26 4B 45 59 3A 5A 55 4D
OK/ENTER	&CRS:OK*	26 43 52 53 3A 4F 4B 2A
UP	&CRS:UP*	26 43 52 53 3A 55 50 2A
DOWN	&CRS:DN*	26 43 52 53 3A 44 4E 2A
LEFT	&CRS:LT*	26 43 52 53 3A 4C 54 2A
RIGHT	&CRS:RT*	26 43 52 53 3A 52 54 2A
RED	&CLR:RED	26 43 4C 52 3A 52 45 44
GREEN	&CLR:GRN	26 43 4C 52 3A 47 52 4E
BLUE	&CLR:BLU	26 43 4C 52 3A 42 4C 55
YELLOW	&CLR:YLO	26 43 4C 52 3A 59 4C 4F
VOLUME +	&VOL:UP*	26 56 4F 4C 3A 55 50 2A
VOLUME -	&VOL:DN*	26 56 4F 4C 3A 44 4E 2A
MUTE	&MUT:TOG	26 4D 55 54 3A 54 4F 47
INFO	&KEY:NFO	26 4B 45 59 3A 4E 46 4F
CH+	&CHN:UP*	26 43 48 4E 3A 55 50 2A
CH-	&CHN:DN*	26 43 48 4E 3A 44 4E 2A
EXIT	&EXT:***	26 45 58 54 3A 2A 2A 2A
INPUT	&SRC:TOG	26 53 52 43 3A 54 4F 47
Input HDMI 1	&SRC:HD1	26 53 52 43 3A 48 44 31
Input HDMI 2	&SRC:HD2	26 53 52 43 3A 48 44 32
Input AV	&SRC:AV*	26 53 52 43 3A 41 56 2A
Input Component	&SRC:RGB	26 53 52 43 3A 52 47 42
Input USB	&SRC:USB	26 53 52 43 3A 55 53 42
Input PC	&SRC:VGA	26 53 52 43 3A 56 47 41
Input ATV	&SRC:ATV	26 53 52 43 3A 41 54 56
Input DTV	&SRC:DTV	26 53 52 43 3A 44 54 56

Function	Command (Tx)	Command Hex
P-MODE	&KEY:PMD	26 4B 45 59 3A 50 4D 44
S-MODE	&KEY:SMD	26 4B 45 59 3A 53 4D 44
HOLD	&KEY:HLD	26 4B 45 59 3A 48 4C 44
LANG	&KEY:LNG	26 4B 45 59 3A 4C 4E 47
SUBTITLE	&KEY:STL	26 4B 45 59 3A 53 54 4C
INDEX	&KEY:IDX	26 4B 45 59 3A 49 44 58
SIZE	&KEY:SIZE	26 4B 45 59 3A 53 5A 45
REVEAL	&KEY:RVL	26 4B 45 59 3A 52 56 4C
SUBPAGE	&KEY:SPG	26 4B 45 59 3A 53 50 47