

DVDO Matrix⁶™ Serial Automation Protocol

This document describes the Matrix⁶ serial protocol when it is connected to an automation system controller.

At the highest level, the protocol consists of a set of commands and queries that can be given to Matrix⁶ over the serial port. Matrix⁶ responds to a command with an acknowledgement and responds to a query with the requested information such as status information.

1. Connection

The RS-232 interface port at the rear panel of the Matrix⁶ is used to communicate with the system controller. The DB-9 (female) connector pin-out is given below.

Pin 2	TXD	Output
Pin 5	GND	
Pin 3	RXD	Input
Pin 8	RTS	Input <i>Optional</i>
Pin 7	CTS	Output <i>Optional</i>

The Matrix⁶ uses a standard RS-232 1:1 (extension) DB9 Male to DB9 Female cable to connect to the system controller.

The communications (COM) port parameters for the Matrix⁶ are:

Baud Rate	19200 (default)
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

2. Notation and Convention

\$	Any number or alphabet that is preceded with a \$ is considered a hexadecimal number; Otherwise it is considered an ASCII character, except for NULL, STX and ETX which are described below.
Host	The computer or system controlling the Matrix ⁶
Transaction	Communication in either direction between Host and Matrix ⁶
ASCII hexadecimal	An ASCII character representing a hexadecimal value, for example the ASCII letter 'A'

3. Protocol Summary

The system controller always initiates a transaction by sending a packet to the Matrix⁶ which, always responds back with an acknowledgement. The Matrix⁶ never initiates a transaction to the system controller.

The protocol is based on ASCII characters including five ASCII non-printable control characters shown below

ASCII	Hex	Description
NULL	\$00	Ignore or End of String
STX	\$02	Start of transaction
ETX	\$03	End of transaction
SPACE	\$20	'Space' key on keyboard
CR	\$0D	Carriage Return or ENTER key on keyboard
u	\$75	Start of text

Note: The lower case 'u' can be used for STX and a Carriage Return can be used as ETX. This allows a simple terminal emulator in ASCII mode to be used to test commands. It is recommended that STX and ETX be used for automated systems.

The list of all ASCII characters used by the Matrix⁶ serial automation protocol and their hexadecimal equivalent values are given in Section 8.

Each transaction from either the system controller or the Matrix⁶ has the following formats

STX [Transaction] SPACE [ID] SPACE [Value] ETX
 STX [Transaction] SPACE [ID] ETX

Each portion of the packet is described below.

STX	Start of transaction
Transaction	Type of transaction in 2 ASCII hexadecimal characters.
Value	Data section of the transaction. The protocol supports variable data sizes and types. Value = <Parameter1> Some transactions have no entry for Value
ETX	End of transaction

3.1 Recommended practices

- Monitor the response from Matrix⁶ to a command to ensure reliable communications.
- When multiple commands are required to be sent to the Matrix⁶, send one command at a time. A complete response should be received by the Host before sending the next command.
- There is a possibility that an error may occur in during communication between the Host and the Matrix⁶. The Host should re-send the command if
 - a) Matrix⁶ acknowledge packet shows that an error has occurred
 - b) Matrix⁶ does not respond after 1 second.

4. Transaction Types

The supported transaction types are summarized in the table below.

Transaction	Code	Description
Command	30	Host sends a command to Matrix ⁶
Response	1	Matrix ⁶ acknowledges the command from Host
Query	20	Host queries the Matrix ⁶ for information
Reply	21	Matrix ⁶ responds to Host query command
Error	2	Matrix ⁶ responds to Host control command with an error

4.1. Command (30) and Response (01)

The controller sends a Command packet to change a setting in the Matrix⁶. The Matrix⁶ acknowledges with a Response packet.

The Command packet is described below.

STX 30 SPACE ID SPACE Value ETX

ID Type of command (2 characters)
Value Depends on ID, typically 1 or 2 ASCII characters

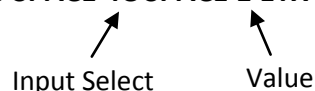
The Response packet is described below.

STX 1 SPACE ID SPACE Value ETX



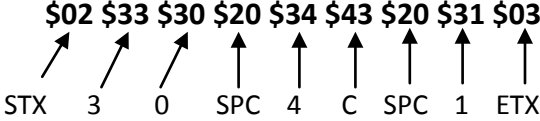
Example: Select HDMI 1 input

STX 30 SPACE 4C SPACE 1 ETX





In Hex (using \$XX to represent a hex byte) this would be:



In ASCII (as entered from a keyboard) this would be:

u30 4c 1 cr

note no space between u and 30 and cr at end is just hitting enter

Matrix⁶ responds with

STX 1 SPACE 4C SPACE 01 ETX

4.2 Query (20) and Reply (21)

The Host sends a Query packet to read a setting in the Matrix6 as shown below. There are 2 types of query commands: 1) with value 2) with no value

STX 20 SPACE ID SPACE Value ETX
STX 20 SPACE ID ETX (no Value)

ID Type of command (2 bytes)
Value Depends on ID, may not be present

Matrix6 responds to the Query packet with a Reply packet, shown below.

STX 21 SPACE ID SPACE Value ETX

ID Type of command (2 bytes)
Value Depends on ID

Example: Query which is the active HDMI input

STX 20 SPACE 4C SPACE ETX

Matrix6 replies with

STX 21 SPACE 4C SPACE 1 ETX

Note that the Query packet above does not have a parameter for Value.

Query packets can also have parameters just like Command packets. The reply packet is the same for these packets. These packets will be addressed if needed in the future.

4.3. Error (02)

The Matrix⁶ responds to an invalid packet from the system controller with an Error packet. The Error packet has the following format.

STX 2 SPACE ERR ETX

ERR: Error code, one ASCII character

Example: Error code 2 is returned

STX 2 SPACE 2 ETX

The error codes are listed below:

- 2 Invalid packet id (query, command, etc...)
- 3 Invalid ID
- 4 Range error. The host attempts to set a value outside the range of the setting.
- 9 Too many or too few data values were passed for the packet type.

In general, programmer should look for STX 2 ... and if received, resend the packet.

5. List of Commands

The table below describes the supported commands in the Matrix⁶ with current release software. All commands can be queried unless otherwise specified.

Command Names designated with # will be saved to nvram upon execution – others are instant commands only

Command Name	ID	Parameter Name	Parameter Value
Input Select Zone1	4C		
		HDMI 1	1
		HDMI 2	2
		HDMI 3	3
		HDMI 4	4
		HDMI 5	5
		HDMI 6	6
Input cycle	53	Zone1 cycle	1
		Zone2 cycle	2
Input Select Zone2	4D	HDMI1	1
		HDMI 2	2
		HDMI 3	3
		HDMI 4	4
		HDMI 5	5
		HDMI 6	6
# Set Input Names	41	Input 1	6 ASCII characters
	42	Input 2	6 ASCII characters
	43	Input 3	6 ASCII characters
	44	Input 4	6 ASCII characters
	45	Input 5	6 ASCII characters
	46	Input 6	6 ASCII characters
Matrix Mode Select	61	Compatibility Mode	0
		Performance Mode	1
		Custom EDID Mode	3
Custom EDID	62	#1	1
		#2	2

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		#3	3
		#4	4
#Output Select	60	Mirror HDMI outputs	1
		AVR via HDMI Mode	3
Power	A1	Off	0
		On	1
Reset to factory defaults	BB	Reset	1
Port 6 Power	BC	Port 6 5V power	0=off, 1=On
Firmware Update	AD	Send firmware update	0
CEC Control	AF	CEC off	0
		CEC on	1
Info Screen	A5	Off	0
		On	1
ARC	58	ARC off	0
		ARC initiate ARC command send to TV	1
		ARC terminate command send to TV	2
Remote Navigation	A2	Left	1
		Right	2
		Up	3
		Down	4
		Menu	5
		Enter/OK	6
		Exit	7
Query Output EDIDS	CC	Main output	0
		Aux output	1
	CD	Composed EDID	0

Query only Commands

Command Name	ID	Parameter Name	Parameter Value
Product Name	A8	None	None
Firmware Version Number	A9	None	None

Current Input on Zone 1	B1		
Current Input on Zone 2	B2		
Current Matrix Mode	B3	Compatibility Mode	0
		Performance Mode	1
		Custom EDID Mode	3
Get EDID from Output	CC	Main	0
		Aux	1
Return Current EDID	CD	Current combined EDID based on mode and syncs	0

6. Command Examples

This section provides detailed examples of commands in ASCII that the controller will generate to change Matrix⁶ settings

COMMANDS EXAMPLES

STX	3	0	SPACE	A	1	SPACE	1	ETX		Turn Power On
STX	3	0	SPACE	A	1	SPACE	0	ETX		Turn Power Off

Note that for testing purposes, using a simple terminal emulator, the following command can also be used to turn the device on and off respectively since 'u' and [CR] (Carriage Return) can be used for STX and ETX

```
u30 a1 1[CR]
u30 a1 0[CR]
```

7. Error Packet Examples

Sometimes the Matrix⁶ will send an Error packet in response to a packet sent from the Host. Refer to section 4.3 for a complete list of error codes.

The common error packets are described below.

a. Invalid Setting

```
STX 2 2 ETX
```

Error Code 2: This packet is sent typically when the controller is querying an invalid setting.



8. ASCII to Hex Conversion Table

ASCII	HEX
0	\$30
1	\$31
2	\$32
3	\$33
4	\$34
5	\$35
6	\$36
7	\$37
8	\$38
9	\$39
A	\$41
B	\$42
C	\$43
D	\$44
E	\$45
F	\$46
-	\$2D
+	\$2B
.	\$2E
STX	\$02
ETX	\$03
NULL	\$00
SPACE	\$20
CR	\$0D
u	\$75