SDS-1047 RS422 Control Protocol

Document Conventions & Definitions

All data bytes are shown in hexadecimal.

Angle brackets (and anything within them) **<>** represent 1 byte of data.

User – refers to a user terminal made up of a receiver connected to the USB matrix with one or more attached USB devices e.g. keyboard & mouse.

All port (user and PC) numbers are 'zero based' meaning that port numbers start at 0. E.g. When referring to 'user 5', the number needed for a command would be **<04>**.

Port Configuration

These are the settings that are required for successful communication with a USB matrix.

Baud Rate: 9600
Data Bits: 8
Parity: None
Stop Bits: 1

RS232 → RS422 Converter

The Frame control interface uses RS422. A full duplex 4 wire balanced communications standard that allows communications to be multi-dropped to more than one Frame.

Since PCs only come with RS232 ports a small converter is required to convert the RS232 signals to RS422.

If you purchased a USB matrix you will have received a suitable converter and cable.

Connecting Up

1. Plug the RS232 end of the RS232 to RS422 converter directly onto the selected comms port on the rear of your computer.
2. Plug the comms cable (D9 end) onto the end of the RS422 end of the RS232/RS422 converter.
3. Plug the RJ45 end of the comms cable into the IN port on the front of the USB matrix

USB Frame Switches

The communications port on the USB matrix allows for multiple chassis to be connected together.

This is achieved by creating a loop between chassis using the comms IN and OUT ports on the front of the chassis.

Address Settings

In order to ensure good communications it is essential that the hex address switch on the front of the matrix is set correctly. The hex switch can be adjusted using a small flat blade screwdriver.

An incorrect setting or having more than one chassis set to the same address will result in comms errors.

Addressing Table

Hex Switch Setting	Comms Address	ACK Byte
0	<A0>	<0B>
1	<A1>	<1B>
2	<A2>	<2B>
3	<A3>	<3B>
4	<A4>	<4B>
5	<A5>	<5B>
6	<A6>	<6B>
7	<A7>	<7B>
8	<A8>	<8B>
9	<A9>	<9B>
A	<AA>	<AB>
B	<AB>	<BB>
C	<AC>	<CB>
D	<AD>	<DB>
E	<AE>	<EB>
F	<AF>	<FB>

Command Structure

The general structure of commands to be sent to a USB matrix is detailed below:

`<header1>,<header2>,<addr>,<reserved>,<command>,<data 1>,...,<data n>,<chksum>`

Where:

`<header1>`:	Always **`<BE>`**
`<header2>`:	Always **`<EF>`**
`<addr>`:	Set by the hex switch on the front of the matrix. See table above.
`<reserved>`:	Always **`<00>`**
`<command>`:	Command byte
`<data 1➔n>`:	Data bytes associated with the above command byte.
`<chksum>`:	Xor of all bytes in the command excluding **`<chksum>`**

On receipt of a valid data packet the matrix will either respond with an ACK (See table above) or a valid packet containing the requested data.

Start Up Message

When the USB matrix powers up it outputs a single message to show that it has initialized:

`<BE><EF><addr><00><50><chksum>`

`<addr>` and **`<chksum>`** are as defined in the 'Command Structure' section of this document.

Feedback Modes

There are 3 different feedback modes that the USB matrix can be put into for when a crosspoint changes on the matrix. For modes 2 & 3, a feedback message is also sent if a change is made from an alternative source e.g. a control panel.

1. Simple ACK

Single byte determined by the address of the matrix (see above table).

2. Single change

This message contains only the change that has just occurred on the matrix. The structure is as follows:

`<BE><EF><addr><00><00><command><user><pc><chksum>`

Where:

`<command>`:   **`<00>`**

`<user>`:   The port number that the user is connected to.

`<pc>`:   The PC port that the user is now switched to.

`<addr>` and **`<chksum>`** are as defined in the 'Command Structure' section of this document.

If a salvo command is sent to the matrix while in this mode then the response message is as defined below in 'Entire Status'.

3. Entire status

In this mode, any changes to the crosspoints on the matrix result in a message being sent with the entire status of the matrix. The structure for these messages is as follows:

`<BE><EF><addr><00><command><user0><user1>…<user7><chksum>`

Where:

Command: **`<08>`**

User X: There is 1 byte per user, each denoting the PC port that that user is connected to.

`<addr>` and **`<chksum>`** are as defined in the 'Command Structure' section of this document.

Commands

For all commands **`<addr>`** and **`<chksum>`** are as defined in the 'Command Structure' section of this document.

Switch USB Crosspoint

Use this command to change which PC a particular user is controlling. The structure for these messages is as follows:

<div align="center">

`<BE><EF><addr><00><command><user><pc><chksum>`

</div>

Where:

Command:	**`<00>`**
User:	**`<00>`–`<07>`**
PC:	**`<00>`–`<17>`**

Example, User 3 is switched to control PC 7:

<div align="center">

`<BE><EF><addr><00><00><02><06><chksum>`

</div>

Response: Standard ACK (see table above)

Disable PC Access (per user)

It is possible to restrict users from accessing certain PCs. The structure for these messages is as follows:

<div align="center">

`<BE><EF><addr><00><command><user><pc><enable><chksum>`

</div>

Where:

Command:	**`<06>`**
User:	**`<00>`–`<07>`**
PC:	**`<00>`–`<17>`**
Enable:	**`<00>`** (disabled) or **`<01>`** (enabled)

Example, User 5 is restricted from accessing PC 2:

<div align="center">

`<BE><EF><addr><00><06><04><01><00><chksum>`

</div>

Response: Standard ACK (see table above)

Get Matrix Status

In addition to the asynchronous feedback, it is possible to poll the USB matrix for its current state. The structure for these messages is as follows:

<BE><EF><addr><00><command><data><chksum>

Where:

Command: **<08>**
Data: **<FF>**

Example:

<BE><EF><addr><00><08><FF><chksum>

Response (the format is identical to a mode 3 feedback message):

<BE><EF><addr><00><08><user0><user1>…<user7><chksum>

USB Switching Salvo

It is possible, using this command, to change multiple crosspoints in one go. The structure for these messages is as follows:

<BE><EF><addr><00><command><user0><user1>…<user7><chksum>

Where:

Command: **<09>**
User 0-7: **<00>-<17>** (select PC) or **<FF>** (don't change)

Example, all users are set to PC 1 except user 7 which is left on its current PC and user 8 which is switched to PC 7:

<BE><EF><addr><00><09><00><00><00><00><00><00><FF><06><chksum>

Response (the format is identical to a mode 3 feedback message):

<BE><EF><addr><00><08><user0><user1>…<user7><chksum>

Change Feedback Mode

This command is used to select which feedback mode is to be used. Once set the change will be remembered through a power cycle. The structure for these messages is as follows:

<BE><EF><addr><00><command><mode><chksum>

Where:

Command: <45>
Mode: <00>-<02>

Example, set USB matrix to feedback mode 2:

<BE><EF><addr><00><45><01><chksum>

Response: Standard ACK (see table above)

Appendix A: RS232/422 Converter and Comms Cable

RS232/RS422 Converter

A suitable RS232/RS422 converter will be supplied as standard when purchasing a USB matrix. However if a replacement or extra converter is needed, the part code is AL300.

Comms Cable

A cable will also be supplied that sits between the RS422 port of the AL300 converter and the Frame. It should be wired as shown below. (Tip: Cut the end off a CAT5 Patch lead and attach a DB9 Plug)

DB9 cable ended plug	Function	UTP Wire Colours (RJ45)
1	-	-
2	RX- (A)	Orange
3	TX+ (B)	White & Brown
4	0V	Blue
5	-	-
6	0V	Green
7	RX+ (B)	White & Orange
8	TX- (A)	Brown
9	-	-