

RS232 control of DD1535.

The surround decoder DD1535R with software version 1.31 or higher is compatible to be controlled by any P/PA/R master device control device with software version 1.60 connected to a control-system having a RS232 serial output port (PC, CRESTRON home automation system etc.) through the RS232/R-Link interface adapter. The DD1535R cannot be controlled directly because it works as an add-on for the master device. All surround related commands are passed on by the master device to the surround decoder when in surround-mode. The DD1535R adds the Surround Control commands. When the system is in surround mode it additionally takes over volume control and Loudness and Tone control. The speaker output is tied to the speaker A.

For details about connecting and operating the adapter see the user manual of the adapter "UM_RS232_Adapt.doc".

Settings for the RS232 interface of the control device are as follows:

Baud rate:	115.200
Data bits:	8
Stop bits:	1
Parity:	none
Flow Control:	none

T+A RS_232 Protocol

The R-series devices use the standard T+A RS232 command protocol as described in detail in the documents "TA_RS232_protocol.doc" and "RS_232_Command_Codes.doc".

Format of the command telegrams

A command telegram to the R-system master device consists of 6 bytes. The complete telegram should be sent without pauses between the bytes.

Example: SYSTEM_ON command

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
RS232 adapter address	Telegram length	R-Link address	R-Link command	R-Link flag byte	Check sum
(always 0x01)	(R-Link address + R-Link command + R-Link flag byte = 0x03)	(0xC8=Amplifier/master device → see also note below)	(here: SystemON = 0x57) → see command table "appendix 1"	(always 0x02)	= sum of bytes 1..5 mod. 0xFF
0x01	0x03	0xC8	0x57	0x02	0x25

Byte 1, 2, 3, 5 : these bytes have the fixed values as shown in the table above for all R-system master devices

Byte 4 : R-Link command according to the table of RCII commands (see "RS_232_Command_Codes.doc")

Byte 6 : check sum == (byte1+byte2+byte3+byte4+byte5) modulo 0xFF

Note: The R-Link address **0xC8** is used for all standard amplifier commands. There exist a few additional commands (system commands) for some special functions. For these commands the address **0xC2** has to be used.

Format of the acknowledge (ACK) telegrams

The R-System master device will process each received command telegram and it will send an acknowledge telegram approx. 25...35 ms after receiving the command.

The ACK telegram consists of 2 bytes:

Byte_1 is the RS232 address of the command telegram received before (=byte 1 of the command telegram = 0x01).

Byte_2 is the acknowledge byte. If this byte is equal to the check sum of the command telegram (byte6 of the command) then the command was received correctly.

If byte 2 has a value different from the check sum of the command, an error has occurred (see table below).

Format of the ACK telegram:

Byte 1	Byte 2
RS232 address	ACK byte
0x01	<div>= check sum of command: command correctly received</div> <div>= check sum -1: command ignored (system busy)</div> <div>= check sum -2: command not executed</div>
	<div>Note:</div> <div>If no ACK telegram is received within 35 milli-seconds after sending a command, there is either a hardware problem (cable etc.) or the telegram is erroneous (wrong address, wrong check sum)</div>

After the ACK telegram, the master device is ready for the next command.

Special System Commands

Beginning with version 1.31 the DD1535R automatically pushes the status information after it has changed. Additionally the status can be requested by sending the command 0x64 (Status_1) or 0x43 (Status_2) to the RLink-address **0xC2** but normally this should not be necessary. We strongly recommend to keep the number of status requests low to avoid unnecessary RLink-Bus load. The information given is different for each device and has to be decoded and displayed individually. For further information see the user manual 'Crestron T+A Macro'.

Responses of the DD1535R are as follows:

Status 1:

The STATUS_1 is automatically pushed by the DD1535R when any contained information has changed or the command STATUS_1 was sent to the DD1535R. It is answered by a 9 byte long status telegram having the following format:

0x01, 0x05, 0xC2, 0x64, Stat_Byte_1, Stat_Byte_2, Stat_Byte_3, Stat_Byte_4 , Checksum		
----- ----- -----		
HEADER (4)	STATUS BYTES (4)	CHK-SUM (1)

The 4 header bytes (0x01/0x05/0xC2/0x64) are constant.

The 4 status bytes are defined as follows:

Stat_Byte_1	b0	Protection	1:= Amplifier is in protection mode (overload / overheat)		
	b1	Speaker_A	1:= speaker A output is ON		
	b2	Speaker_B	1:= speaker B output is ON		
	b3				
	b4				
	b5				
	b6	STANDBY	1:= System is in STANDBY		
	b7	ON	1:= System is ON		
Stat_Byte_2	b0	Listen Source (0...15)	0:= not defined		8:= AUX 3
	b1		1:= CD		9:= DVD
	b2		2:= TUNER		10:= STB
	b3		3:= TAPE 1		11:= VCR
	b4	Recording Source (0...15)	4:= TAPE 2		12:= AUX/AV 1
	b5		5:= TV/Video		13:= AUX/AV 2
	b6		6:= AUX 1		14:= DBR (Digital Radio)
	b7		7:= AUX 2		15:= not def. / future use
Stat_Byte_3	b0	LOUDness	1:= Loudness is ON		
	b1	FLAT	1:= FLAT is ON (= Tone defeat)		
	b2	DirectStereo	1:= High Quality stereo mode		
	b3				
	b4	SurroundMode (0...15)	0:= Surnd (5.1)	5:= Disco	10:= Church
	b5		1:= Stereo	6:= Hall	11:= MCH-Input
	b6		2:= Mono	7:= Opera	
	b7		3:= Mono I	8:= Arena	15:= Surnd EX/ES (7.1)
Stat_Byte_4	b0	SourceFormat (0...4)	0:= analog		4:=AAC
	b1		1:= PCM		
	b2		2:= Dolby Digital		
	b3		3:= DTS		
	b4	DecodingMode (0...10)	0:= None		
	b5		1:= Dolby Pro Logic II Movie Mode		
	b6		2:= Dolby Pro Logic II Music Mode		
	b7		3:= Dolby Pro Logic II Matrix Mode		
		4:= Dolby Pro Logic IIx Movie Mode			
		5:= Dolby Pro Logic IIx Music Mode			
		6:= Dolby Pro Logic IIx Matrix Mode			
		7:= Dolby Pro Logic IIx EX compatible Mode			
		8:= DTS Neo:6 Cinema Mode			
		9:= DTS Neo:6 Music Mode			
		10:= DTS ES			

Status 2:

The STATUS_2 command to the DD1535R is answered by a 7 byte long status telegram giving information about the volume. This information is pushed automatically after volume setting is completed. Due to RLink-Bus limitation this status is not updated while the Volume-keys are still pressed but only after releasing them. This might be improved in later releases.

Status_2 has the following format:

0x01, 0x05, 0xC2, 0x43, Status_Byte_1, Status_Byte_2,	Checksum
----- ----- -----	
HEADER (4)	STATUS BYTES (2)
	CHK-SUM (1)

The 4 header bytes (0x01/0x05/0xC2/0x43) are constant.

The 2 status bytes are defined as follows:

Status_Byte_1	b0	Volume of main room (0...63)	
	b1		
	b2		
	b3		
	b4		
	b5		
	b6		
	b7		
Stat_Byte_2	b0	0	
	b1		
	b2		
	b3		
	b4		
	b5		
	b6		
	b7		

Appendix 1: List of Master (Amplifier) commands (Address 0xC8)

Command	Command Code (HEX)	toggle	Remark
System ON	0x57		Switch the master device ON
System Standby	0x77		Switch the system (master and source devices) to STANDBY
System OFF	0x7A		Switch the system completely OFF
Volume + Tone Control			
VOL +	0x00		Performs 1 volume step
VOL -	0x20		Hint: Repeat these commands for continuous volume increase/decrease (command repetition rate = 100...110 ms)
LOUDness	0x2C	x	
LOUDness ON	0x75		
LOUDness OFF	0x55		
FLAT	0x0C	x	
FLAT ON	0x7B		tone control defeat
FLAT OFF	0x47		tone control on
Speaker Control			
SPKR	0x13	x	Switches the speaker outputs insequence ON and OFF: A -> B -> A+B -> OFF Hint: better use the "discrete" Speaker_A/Speaker_B ON + OFF commands
Speaker_A ON	0x68		Speaker A output ON
Speaker_A OFF	0x48		Speaker A output OFF
Surround control			
Surround EX/ES	0x6F		Surround EX/ES mode
Surround 5.1	0x6D		Surround 5.1 mode
Stereo	0x4D		Stereo mode
Mono	0x5D		Mono mode
Mono I	0x3D		use left channel for Mono
Mono II	0x53		use right channel for Mono
Disco	0x63		Soundfield: Disco
Hall	0x76		Soundfield: Hall
Opera	0x7E		Soundfield: Opera
Arena	0x71		Soundfield: Arena
Club	0x69		Soundfield: Club
Church	0x79		Soundfield: Church
MCH-Input	0x67		Use Multichannel-Input if assigned to active source
SURND	0x37	x	toggle between Surround- and Preamp-Mode
Stereo HQ	0x70		switch to Preamp-Mode
Hint: All 'Surround control' keys but "PRE" can be used to switch the DD1535 from Standby to On or from Preamp-Mode to Surround-Mode.			

Revision history:

01.09.2005	release
02.09.2005	replaced “PRE” code (0x0e) by “Stereo HQ” (0x70) in Appendix 1: List of Master commands.
07.09.2005	added STATUS_BYTE_4 – DecodingMode – Message “DTS ES” for value=10. (without the DTS ES operation is falsely indicated as “DTS” “PLIIX...”) (supported by DD1535R V1.32 and later).