RS232 control of **P1230R, PA1230/1530R + R1530R**

R-series master devices (preamplifiers, amplifiers and receivers) with software version 1.60 or higher can be controlled by any control device having a RS232 serial output port (PC, CRESTRON home automation system etc.) through the RS232/R-Link interface adapter.

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 (always 0x01)	**Telegram length** (R-Link address + R-Link command + R-Link flag byte = 0x03)	**R-Link Address** (0xC8=Amplifier/ master device → see also note below)	**R-Link command** (here: SystemON = 0x57) → see command table "appendix 1"	**R-Link flag byte** (always 0x02)	**Check sum** = 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 **0xC4** has to be used.
A list of these commands is given in appendix 2.

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	= check sum of command: = check sum –1: = check sum –2:	command correctly received command ignored (system busy) command not executed
	Note: 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 ....)	

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

Control of T+A Source devices

All T+A „R-Link“ source devices connected to the master device can be controlled through the RS232 adapter.

A) Control of the active listening source

All source commands (like PLAY, STOP, >| etc.) sent to the master R-Link address 0xC8 are forwarded by the master to the currently active listening source device.

Note1: The master device will need about 40 ms after the ACK telegram to forward the command to the source. Within this forwarding time the device will not respond to other RS232 commands !

Note2: A listening source command sent to the master address 0xC8 will be acknowledged by the master, not by the source device !

An “ACK” for such a command only means, that the command was received correctly ***by the master*** and that it will be forwarded to the active listening source.

Hint: If an acknowledge from the source device is needed, it is advisable to control the source devices directly by sending source commands to the source device directly (see chapter below).

B) Direct control of source devices

To control a source device directly (independent from the current listening source), use the R-Link device address of the source device instead of the master address. The ACK telegram received for a direct source command reflects if the command was correctly received by the source device.

Note: For the direct control of source devices there is no dead time after the ACK. The system will accept the next command right after the ACK.

Example: To control a **SACD1245R** CD/SACD player: use the R-Link address 0x22 (=CD)

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
RS232 Address	R-Link command length (R-Link address + R-Link command + R-Link flag byte = 0x03)	R-Link Address (0x22=CD)	R-Link command (here: NEXT = 0x34) *see note below	R-Link flag byte	check sum = sum of bytes 1..5 mod. 0xFF
0x01	**0x03**	**0x22**	**0x34**	**0x02**	**0x5C**

Byte 1, 2, 5 : these bytes have the fixed values as shown in the table above

Byte 3 : R-Link address of the source device

Byte 4 : R-Link command according to the table of RCII commands (see annex)

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

Note:
For a complete list of all R-Link source commands refer to the document ***"RS_232_Command_Codes.doc".***

Appendix 1: List of Master (Amplifier) commands (Address $C8)

Command	Command Code (HEX)	toggle	Remark
ON/OFF	0x01	x	**Hint**: better use the "discrete" System ON, OFF, STANDBY commands.
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 upwards/downwards **Hint**: Repeat these commands with a repetition rate of 100..110ms for a continuous volume increase/decrease.
VOL -	0x20		
LOUDness	0x2C	x	
LOUDness ON	0x75		
LOUDness OFF	0x55		
FLAT	0x0C	x	
FLAT ON	0x7B		tone control defeat
FLAT OFF	0x47		tone control on
Input Selection Note: If in STANDBY the master device and the addressed R-Link source device are both switched ON			
CD	0x45		
TAPE1	0x49		
TAPE2	0x56		
TUNER	0x46		
TV	0x59		
AUX 1	0x5E		
AUX 2	0x65		(*) not available on R1230R
AUX 3	0x61		(*) PA1535 only
Extended Input commands (only available in conjunction with DD1535R surround decoder)			
DVD	0x42		**Note:** These inputs are available only in conjunction with the DD1535R surround decoder !
STB	0x62		
AUX / AV1	0x72		
AUX / AV2	0x4A		
VCR 1	0x52		
VCR 2	0x66		
Output Control			
SPKR	0x13	x	Switches the speaker outputs in sequence ON and OFF: A -> B -> A+B -> OFF -> A -> ..... **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
Speaker_B ON	0x58		Speaker B output ON
Speaker_B OFF	0x78		Speaker B output OFF
Speaker_C ON	0x6C		Speaker C output control (*) external A1230/A1530 with special firmware required
Speaker_C OFF	0x4C		
Speaker_D ON	0x5C		Speaker D output control (*) external A1230/A1530 with special firmware required
Speaker_D OFF	0x7C		
PRE ON/OFF	0x0E	x	better use discrete commands below
PRE 1 ON	0x6B		XLR PreampOutput on (P1230R with XLR module only)
PRE 1 OFF	0x4F		XLR PreampOutput off (P1230R with XLR module only)
PRE ON	0x50		RCA PreampOutput on
PRE OFF	0x51		RCA PreampOutput off

Appendix 2: Special System commands (Address 0xC4)

Command	Command Code (HEX)	toggle	Remark
AMP_STAT	0x64		Master device returns status telegram (see A 2.1)

A 2.1 Amplifier Status (AMP_STAT)

An AMP_STAT command to the master will be answered by a 8 byte long status telegram having the following format:

AMP_STAT

0x01, 0x05, 0xC4, 0x64, **Status_Byte 1, Status_Byte 2, Status_Byte 3**, Checksum

HEADER (4) | STATUS BYTES (3) | CHK-SUM (1)

The 4 **header bytes** (0x01/0x05/0xC4/0x64) are constant.

The 3 **status bytes** are defined as follows:

Status_Byte_1	b0	Protection	1:= Amplifier in PROTECTION (overload / overheat)	
	b1	Speaker_A	1:= speaker A output is ON	
	b2	Speaker_B	1:= speaker B output is ON	
	b3	Speaker_C	1:= speaker C output is ON	
	b4	Speaker_D	1:= speaker D output is ON	
	b5	ON-DELAY	1:= ON-Delay active (speaker LEDs blinking)	
	b6	PRE 1	1:= PRE_AMP 1 output is ON	
	b7	PRE 2	1:= PRE_AMP 2 output is ON	
Status_Byte_2	b0	Listen Source (0...15)	0= reserved 1= CD 2= TUNER 3= TAPE 1 4= TAPE 2 5= TV/Video 6= AUX 1 7= AUX 2	8= AUX 3 9= DVD 10= STB 11= VCR 12= AUX/AV 1 13= AUX/AV 2 14= DBR (Digital Radio) 15= reserved
	b1			
	b2			
	b3			
	b4	Recording Source (0...15)		
	b5			
	b6			
	b7			
Status_Byte_2	b0	LOUDness	1:= Loudness is ON	
	b1	FLAT	1:= FLAT is ON (= Tone defeat)	
	b2	STEREO (Pre-AMP Mode)	1:= STEREO Mode (=PRE_AMP, not Surround-Dec.)	
	b3	not defined	for future use	
	b4	not defined	for future use	
	b5	QED Mode	1:= QED SystemLine / MRA Multi-Room Mode	
	b6	STANDBY	1:= System is in STANDBY	
	b7	ON	1:= System is ON	