RS232 control of E Amp

E-series master devices with software version 1.10 or higher can be controlled by any control device having a RS232 serial output port (PC, CRESTRON home automation system etc.).

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 E-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 E-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** (0xC4=Amplifier → 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. 0x100
0x01	**0x03**	**0xC4**	**0x57**	**0x02**	**0x21**

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

Byte 4 : E-Link command according to Appendix 1+2

Byte 6 : check sum == (byte1+byte2+byte3+byte4+byte5) modulo 0x100

Note:
The E-Link address **0xC4** 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. A list of these commands is given in appendix 1.

Format of the acknowledge (ACK) telegrams

The E-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 devices

All T+A „E-Link" source devices connected to the master device can be controlled through the RS232 connection between E-Link master (e.g. Power Plant) and the controller (PC / home automation system). The master device will process the commands and - if an slave device has been addressed - forward the command to the slave via E-Link bus. (No further RS232 connection is necessary)

A) System Addressing Mode (Control of system master / active listening source)

For an easy control of the whole system the system addressing mode can be used.
Therefore please send all commands to the E-Link master address (0xC2). The master will process these commands and – if necessary - forward them to the currently active listening source device. So you are able to control the system master device (e.g. Power Plant) and the current listening source by using only one address.

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 0xC2 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 Addressing Mode (separate control of each E-Link device)

To control a device directly (independent from the current listening source) send the command to the device address (e.g. Music Player 0x2E). The command will be processed only by the addressed device. So you can for example switch off a discrete device without affecting any of the other system devices.
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 **T+A** Music Player : use the E-Link address 0x2E.

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 (0x2E=M Player)	R-Link command (here: NEXT = 0x34) *see note below	R-Link flag byte	check sum = sum of bytes 1..5 mod. 0xFF
0x01	**0x03**	**0x2E**	**0x34**	**0x02**	**0x68**

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

Byte 3   : E-Link address of the source device

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

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

Appendix 1: List of System Master commands (Address $C2)

Command	Command Code (HEX)	toggle	short/ long	Remark
ON/OFF	0x01	x	x	*s*: switches system on and toggles selected source on/off *l*: switches system completely off **Hint**: better use the "discrete" System ON, OFF commands.
System ON	0x57			Switch the master device and the selected source ON
System OFF	0x7A			Switch the system completely OFF
Input Selection				
Note: If in STANDBY the PowerPlant will switched ON ce and the addressed E-Link source device are				
SCL	0x14			selects AMP DISC/MP and activates SCL (if available)
DISC	0x23	x		selects AMP DISC/MP and activates CD (if available)
A3/Tuner	0x17	x	x	s: (AMP only) selects AMP A3/TUNER s: (AMP + MP) selects AMP DISC/MP and activates MP/Tuner l: selects AMP A3
A1/PH	0x3D	x	x	s: (AMP only) selects AMP A1/PH s: (AMP + MP) selects AMP DISC/MP and activates MP/D1 l: selects AMP A1/PH
A2/TV	0x07	x	x	s: (AMP only) selects AMP A2/TV s: (AMP + MP) selects AMP DISC/MP and activates MP/D2 l: selects AMP A2
REC	0x35	x		selects AMP TAPE and activates TAPE (if avail.)
Output Control				
Speaker Off	0x2E			Speaker output OFF

Appendix 1: List of Amplifier commands (Address $C4)

Command	Command Code (HEX)	toggle	Remark
Amplifier ON	0x57		Switch the Amplifier ON
Amplifier OFF	0x7A		Switch the Amplifier OFF
Volume + Tone Control			
VOL +	0x00		Performs 1 volume step upwards/downwards
VOL -	0x20		**Hint**: Repeat these commands with a repetition rate of 100..110ms for a continuous volume increase/decrease.
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			
DBR	0x6A		select amplifier input DISC/MP
AUX 1	0x5E		select amplifier input A1/PH
TV	0x59		select amplifier input A2/TV
TUNER	0x46		select amplifier input A3/TUNER
TAPE1	0x49		select amplifier input RECORDER
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
Key_OFF	0x2E		Speaker output 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= reserved	8= AUX 3
	b1	(0...15)	1= CD	9= DVD
	b2		2= TUNER	10= STB
	b3		3= TAPE 1	11= VCR
	b4	Recording Source	4= TAPE 2	12= AUX/AV 1
	b5	(0...15)	5= TV/Video	13= AUX/AV 2
	b6		6= AUX 1	14= DBR (Digital Radio)
	b7		7= AUX 2	15= reserved

Status_Byte_3	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