Motion Controller RS232 ASCII Protocol

Abstract

The Motion Controller has a Standard RS232 communication profile. This AppNote describe the settings for the superordinate system (like TwinCat, S7, Labview or C).

Setting

Baud rate and node number

The serial interface must be configured as follows:

- 8 data bits
- 1 stop bit
- No Parity

The Xon/Xoff protocol must be used for rapid command sequences or transfer of sequence programs and parameter sets.

An extensive set of ASCII commands is available for configuring and operating FAULHABER Motion Controllers. The structure of the command telegrams is described in the following.

Command frame

The ASCII commands have the following structure:

[Node No.]	Command	[Argument]	CR

The node number is optional and is only required if several drives are being operated on one interface.

The command consists of a letter character string.

The optional argument consists of an ASCII numeric value.

The end is always a CR character (Carriage Return, ASCII decimal code 13). Space characters are ignored, and no distinction is made between upper and lower case.

Response frame

The response to query commands or asynchronous events is also an ASCII character string, followed by a CR character (Carriage Return, ASCII decimal code 13) and an LF character (Line Feed, ASCII decimal code 10).

Response	CR	LF

Response in bus mode

The response frames do not contain a node number. In bus mode you must therefore ensure that the response of the contacted node is received before a new command is sent!

Example:

Actual position queries:

- Transmit: POS[CR]
- Receive: 98956[CR][LF]

Drive nodes at 500 rpm:

- Transmit: V500[CR]

ASCII-Hex-Code

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040		Space	64	40	100	@	@	96	60	140	`	`
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38	26	046	&	&	70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39	27	047	'	'	71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40	28	050	(	(	72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41	29	051	)	)	73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	;	91	5B	133	[	[	123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174			|
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135	]	]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177	&#127;	DEL

Source: www.LookupTables.com

Once you are able to send and receive data on the RS232, all you have to do is convert the hex bytes received as ASCII values into decimal numbers.
0 = 0x30, 1 = 0x31, ... 9 = 0x39. So just subtract 0x30 to each byte and you have the corresponding decimal number to play with.

Example Program

In case of NO Node address, the command is considered as broadcast, so ALL the connected nodes will react to the broadcast command.

Consider the infos of an RS-232 analyser:

Request: 3/19/2010 5:23:21 AM.20364 (+9.3737 seconds)
50 4F 53 0D POS.
Have a look at the ASCII table (you can find one at www.asciitable.com):
0x50 0x4F 0x53 + 0x0D = "POS" + [CR]
Answer: 3/19/2010 5:23:21 AM.21864 (+0.0150 seconds)
31 0D 0A 1..
So 0x31 + 0x0D + 0x0A= "1" + [CR] + [LF]

The customer must only write the routines for sending and receiveing the RS232 information data, checking for the [CR] and the [LF] characters to identify the end answer.

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