

# SMTBD1 AMPLIFIER

## PARAMETER SETTING INSTRUCTIONS

Serial\_inst

**PRELIMINARY ONLY**

### WARNING

\* \*  
\*

The SMT-BD1 amplifier is available with the BPCW software. BPCW is compatible with the WINDOWS® operating system for the parameter setting of each amplifier.

It is also possible, by mean of the ASCII instructions described in this manual, to set and modify the parameters of several amplifiers using a host system (DNC, PLC, PC), according to the following conditions.

- The customer has to develop himself the host system software for the amplifier parameter setting. This software is not developed by INFRANOR Lourdes who accepts no responsibility for the “programme / operating system / machine” compatibility or for any technical support for this work. All the instructions accessible via the BPCW software have no equivalent instructions listed in this manual. Therefore, the access to some functions is only possible via the BPCW software.
- INFRANOR LOURDES reserves the right to modify and / or complete the list of parameters and ASCII instructions without notice.
- The OEM or the end user assumes the final responsibility for the use of parameter setting softwares others than BPCW. INFRANOR LOURDES disclaims any responsibility for physical damage caused by the use of any parameter setting software other than BPCW.

© INFRANOR, June 1998. All rights reserved. Issue: 2.1

# Contents

<b>CONTENTS.....</b>	<b>2</b>
<b>CHAPTER 1 – GENERAL DESCRIPTION.....</b>	<b>3</b>
<b>CHAPTER 2 - DIALOGUES.....</b>	<b>4</b>
<b>CHAPTER 3 - INSTRUCTIONS LIST .....</b>	<b>5</b>
3.1 - MOTOR PARAMETERS.....	5
3.2 - CURRENT LIMITATION PARAMETERS .....	5
3.3 - REGULATOR PARAMETERS.....	6
3.4 - ANALOG INPUT COMMAND PARAMETERS .....	6
3.5 - ENCODER OUTPUT PARAMETERS.....	7
3.6 - STEPPER MOTOR EMULATION PARAMETERS FOR SMT-BD1/C .....	8
3.7 - ELECTRONIC GEARING PARAMETERS FOR SMT-BD1/D .....	8
3.8 - TENSION CONTROL PARAMETERS FOR SMT-BD1/E.....	9
3.9 - SPINDLE INDEXING PARAMETERS FOR SMT-BD1/F .....	10
3.10 - REGISTRATION CONTROL PARAMETERS FOR SMT-BD1/G.....	11
3.11 - WINDING/UNWINDING TENSION CONTROL PARAMETERS FOR SMT-BD1/I.....	13
3.12 - WINDING/UNWINDING ACCUMULATOR CONTROL PARAMETERS FOR SMT-BD1/J .....	14
3.13 - OTHER USEFUL INSTRUCTIONS .....	15
<b>CHAPTER 4 - MULTIAxis CONFIGURATION .....</b>	<b>18</b>
4.1 - STRUCTURES .....	18
4.1.1 - Serial link RS-232 .....	18
4.1.2 - Serial link RS-422/485 .....	18
4.2 - CONNECTION .....	19

# *Chapter 1 – General description*

SMT-BD1 amplifiers are based on a Digital Signal Processor (DSP). The parameters used for their operation are digital values processed by the DSP. These values are entered via the serial link, for the amplifier configuration.

This manual describes the parameter setting via the serial link for the standard SMT-BD1 amplifiers and for the options c, d, e, f, g, i, j. For more information regarding the use of these parameters, please refer to the SMT-BD1 amplifier and options manuals.

# Chapter 2 - Dialogues

The specifications of the SMT-BD1 amplifier serial link communication are listed below: 8 Data bits, 1 Stop bit, No parity, 4800 Bauds.

The parameters can be sent to the amplifier by an ASCII terminal using the instruction list given in this manual. Each instruction is coded as 2 ASCII characters with or without parameter.

There are two instruction types:

- The variables: These instructions allow to modify or to read the value of a variable. If there is a parameter, the variable corresponding to the instruction will take this value. Otherwise, the amplifier will send back the actual variable value via the serial link.
- The procedures: These instructions execute some specific functions of the amplifier.

Each instruction (which can be followed by an hexadecimal 16 bit parameter) sent to the amplifier must end with a “carriage return” character (ASCII code 13).

All these characters, except for the “carriage return”, will be sent back by the amplifier (echo).

The amplifier answer starts with a separation character “:” (ASCII code 58) possibly followed by an hexadecimal 16 bit value. The amplifier will then send a “carriage return”, a “line feed” and “>”.

## Notes

- If the amplifier does not know the instruction, it will send back “?” instead of “:”.
- Some instructions are only valid when the amplifier is disabled.
- If the entered parameter is out of the appropriate variable range or if the restrictive condition (amplifier disabled) is not answered, the parameter will not be taken into account (the amplifier will keep the former variable value).
- The parameters are always in hexadecimal and in an amplifier standard format. Conversions have to be made by the operator.

## Dialogue examples

The PC sends the NP instruction (number of motor pole pairs):

**NP4**

and a “carriage return” character (ASCII code 13) for ending the instruction.

The amplifier will answer with:

**NP4:**

>

“:” indicates that the instruction has actually been decoded. The value 4 is stored in the variable corresponding to the number of motor pole pairs. After the character “carriage return”, the amplifier will also send the “>” character in order to indicate that it has taken the instruction into account.

If the PC sends the instruction:

**NP**

The amplifier will answer with:

**NP:0004**

>

As there is no parameter, the amplifier sends back the number of pole pairs (in this case: 4 pole pairs) after the characters NP and “:”.

# Chapter 3 - Instructions list

The parameter conversion into a physical value is made by multiplying the variable value by a conversion factor indicated in the line "conversion", if necessary.

## 3.1 - Motor parameters

These parameters are necessary for the motor control. They can be modified only when the motor is disabled (ENABLE signal not active).

### **Pole pairs** Variable

<i>Instruction</i>	NP
<i>Parameter</i>	Possible values: between 1 and C
<i>Condition</i>	Amplifier disabled.
<i>Remarks</i>	This value is the ratio between the number of motor pole pairs and the number of resolver pole pairs.

### **Phase order** Variable

<i>Instruction</i>	PM
<i>Parameter</i>	Possible values: equal to 5555 (120°) or AAAA (240°).
<i>Condition</i>	Amplifier disabled.
<i>Remarks</i>	Depending on the wiring of the motor phases U. V and W.

### **Resolver offset** Variable

<i>Instruction</i>	CL
<i>Parameter</i>	Possible values: between 0 and FFFF (0 to 360°).
<i>Condition</i>	Amplifier disabled.
<i>Remarks</i>	Depending on the resolver adjustment. For a motor with a number of pole pairs NP>1, there are NP possible values for CL.

### **Current phase lead** Variable

<i>Instruction</i>	AF
<i>Parameter</i>	Possible values: between 0 and 7FFF.
<i>Conversion</i>	$4,577716546399 \cdot 10^{-8}$ (electrical degree) rpm
<i>Condition</i>	Amplifier disabled
<i>Remarks</i>	Calculated for maximum motor speed.

## 3.2 - Current limitation parameters

### **Maximum current** Variable

<i>Instruction</i>	IM
<i>Parameter</i>	Possible values: between 0 and 7FFF.
<i>Conversion</i>	$3.051850948^{-3}$ (for getting the amplifier max. current value in percent).
<i>Remarks</i>	7FFF corresponds to 100 % of the amplifier max. current (according to its current rating).

### **Rated current** Variable

<i>Instruction</i>	IN
<i>Parameter</i>	Possible values: between 0 and 4000. If IM < 4000 hexa, then IN < IM.
<i>Conversion</i>	$3.051850948^{-3}$ (for getting the amplifier max. current value in percent).

<b>I<sup>2</sup>t mode</b>		Variable
<i>Instruction</i>	IP	
<i>Parameter</i>	0 or 1	
<i>Conversion</i>	IP ≠ 0 --> mode fusing and IP= 0 --> mode limiting	
<i>Remarks</i>	The value is 0 or ≠ 0	

### 3.3 - Regulator parameters

<b>Speed error low pass filter</b>		Variable
------------------------------------	--	----------

<i>Instruction</i>	F1
<i>Parameter</i>	Filter cut-off frequency. Possible values: between 0B10 (1000 Hz) and F069 ( 20 Hz).
<i>Conversion</i>	Frequency = $\frac{1000}{\pi} \text{Ln}\left(\frac{65536}{\text{parameter}}\right)$ in Hz

<b>Anti-resonance filter</b>		Variable
------------------------------	--	----------

<i>Instruction</i>	FR (5.7 firmware EPROM version and higher)
<i>Parameter</i>	0 or 1
<i>Conversion</i>	FR ≠ 0 --> filter active and FR= 0 --> filter inactive
<i>Remarks</i>	The value is 0 or ≠ 0

<b>Proportional gain of the speed loop</b>		Variable
--	--	----------

<i>Instruction</i>	KP
<i>Parameter</i>	Possible values: between 0 and FFFF.
<i>Conversion</i>	1/16
<i>Remarks</i>	This term is used in P, PI, PI <sup>2</sup> and position mode.

<b>Integral 1 gain of the speed loop</b>		Variable
--	--	----------

<i>Instruction</i>	KI
<i>Parameter</i>	Possible values: between 0 and FFFF.
<i>Conversion</i>	1/256
<i>Remarks</i>	This term is used in PI, PI <sup>2</sup> and position mode.

<b>Integral 2 gain of the speed loop (Proportional gain of the position loop)</b>		Variable
---	--	----------

<i>Instruction</i>	KE
<i>Parameter</i>	Possible values: between 0 and FFFF.
<i>Conversion</i>	1/65536
<i>Remarks</i>	This term is used in PI <sup>2</sup> and position mode.

<b>Feedforward term of the position loop</b>		Variable
--	--	----------

<i>Instruction</i>	KV
<i>Parameter</i>	Possible values: between 0 and FFFF.
<i>Conversion</i>	1/65536
<i>Remarks</i>	This term is used in position mode.

### 3.4 - Analog input command parameters

<b>Accel/Decel time</b>		Variable
-------------------------	--	----------

<i>Instruction</i>	TL
<i>Parameter</i>	Possible values: between 0 and FFFF. The maximum value is about 32 s.
<i>Conversion</i>	0.0005 (for getting the time in seconds).

---

**Maximum speed** Variable

*Instruction* VL  
*Parameter* Possible values: between 0 and 1DDE.  
900 rpm -> 01EC  
3 600 rpm -> 07AE  
14 000 rpm -> 1DDE  
*Condition* Amplifier disabled.  
*Conversion* 1.8310546875 (for getting the speed in rpm).  
*Remarks* The maximum speed also depends on the motor. Check the compatibility.

---

**Analog input low pass filter** Variable

*Instruction* FC  
*Parameter* Filter cut-off frequency.  
Possible values: between 0B10 (1000 Hz) and F069 ( 20 Hz).  
*Conversion* 
$$\text{Frequency} = \frac{1000}{\pi} \text{Ln}\left(\frac{65536}{\text{parameter}}\right)$$

---

**Reverse movement** Variable

*Instruction* IV  
*Parameter* 0 or 1  
*Condition* Amplifier disabled.  
*Remarks* The value read is 0 or ≠ 0

### 3.5 - Encoder output parameters

---

**Encoder resolution** Variable

*Instruction* RC  
*Parameter* Depends on the motor maximum speed (VL).  
If VL < 01EC (900 rpm) RC ≤ 2000 (hexa)  
If 01EC ≤ VL < 07AE (3600 rpm) RC ≤ 1000 (hexa)  
If 07AE ≤ VL < 1DDE (14000 rpm) RC ≤ 400 (hexa)  
*Condition* Amplifier disabled.  
*Remarks* The encoder output on the X2 connector will not be modified by this instruction (see FE). But this value is immediately taken into account for the gearing ratio with options c,d,e,g.  
If this value is stored in the EEPROM, the encoder output on X2 will be updated at the next turning on of the amplifier.

---

**Number of zero pulses** Variable

*Instruction* ZN  
*Parameter* 1 to 4  
*Condition* Amplifier disabled.

---

**Zero pulse origin shift** Variable

*Instruction* ZP  
*Parameter* 0 to 7FFF (360°).  
*Condition* Amplifier disabled.  
*Remarks* The marker pulse reference position is calculated with regard to the resolver 0 position (absolute position over one revolution).  
The parameter is always represented in 15 bits but the actual resolution depends on the maximum speed:  
maximum speed < 900 rpm                      15 bits  
900 rpm < max. speed < 3600 rpm            14 bits  
3 600 rpm < max. speed < 14000 rpm        12 bits



---

**Slave alignment speed** Variable

*Instruction* VI  
*Parameter* 1 to VL parameter value  
*Conversion* 1.8310546875 (for getting the speed in rpm).  
*Remarks* This value defines the slave motor alignment speed

---

**Send master position to activate multidrop alignment mode** Procedure

*Instruction* TI (2.9C firmware EPROM version and higher)  
*Parameter* Master position value (0 to FFFF)  
*Conditions* Both master and slave motors must be lined up at standstill.  
*Remarks* \* This instruction sends the master motor position value to the slave amplifier for the position reference acquisition, and the multidrop alignment mode is activated.  
\* This instruction has no effect when the address 0 is selected (automatic alignment mode)

---

**Send master position for multidrop alignment on power up** Procedure

*Instruction* TS (2.9C firmware EPROM version and higher)  
*Parameter* Master position value (0 to FFFF)  
*Conditions* \* Both master and slave motors must be at standstill  
\* Both master and slave amplifiers must be turned on and disabled  
*Remarks* \* This instruction sends the master motor position value to the slave amplifier, in order to have the slave motor lining up the master when enabled (if multidrop alignment mode is activated).  
\* If this instruction has not been received before the amplifier enabling when the multidrop alignment mode is activated, the Position fault will be displayed.  
\* To disable the multidrop alignment mode, send the TS0 instruction when amplifier enabled; the **Busy** fault is displayed, indicating that the multidrop alignment mode is disabled.  
This instruction has no effect when the multidrop alignment mode is disabled.

---

**Enable/disable alignment mode** Variable

*Instruction* GP (3.0C firmware EPROM version and higher)  
*Parameter* 0 or 1.  
*Condition* Amplifier disabled  
*Conversion* GP ≠ 0 --> alignment mode activated and GP = 0 --> alignment mode disabled  
*Remarks* The value is 0 or ≠ 0

---

**Master/slave position offset** Variable

*Instruction* KS (3.0C firmware EPROM version and higher)  
*Parameter* 0 to FFFF  
*Remarks* Master /slave position offset on 16 bits

### 3.8 - Tension control parameters for SMT-BD1/e

---

**Speed ratio scaling** Variable

*Instruction* KR  
*Parameter* 0 to 7FFF.  
*Conversion* 0,0030517578 (for getting the reduction ratio in %);

---

**Maximum ratio variation** Variable

*Instruction* BM  
*Parameter* Possible values: between 0 and FFFF.  
*Conversion* 0.00152592 (for getting the maximum slave speed variation) in % of the maximum speed value.

---

**Speed following error** Variable

*Instruction* ET  
*Parameter* 1 to VL parameter value.  
*Conversion* 1.8310546875 (for getting the speed error in rpm)

<b>Tension input filter</b>		Variable
<i>Instruction</i>	FC	
<i>Parameter</i>	Filter cut-off frequency. Possible values: between 0B10 (1000 Hz) and F069 ( 20 Hz).	
<i>Conversion</i>	Frequency = $\frac{1000}{\pi} \text{Ln}\left(\frac{65536}{\text{parameter}}\right)$ in Hz	
<i>Remarks</i>	This term is used in the standard speed mode (with analog input command).	
<b>Tension input threshold</b>		Variable
<i>Instruction</i>	TB	
<i>Parameter</i>	Possible values: between 8000 and 7FFF.	
<i>Conversion</i>	0.000305185 (for getting the tension input threshold in Volts)	
<b>Tension set point ramp</b>		Variable
<i>Instruction</i>	TL	
<i>Parameter</i>	Possible values: between 0 and FFFF. The maximum value is about 32 s.	
<i>Conversion</i>	0.0005 (for getting the time in seconds).	
<i>Remarks</i>	This term is used in the standard speed mode (with analog input command).	
<b>Tension acquisition</b>		Variable
<i>Instruction</i>	TM	
<i>Parameter</i>	Possible values: between 8000 and 7FFF.	
<i>Conversion</i>	0.000305185 (for getting the load cell voltage in Volts)	
<i>Remarks</i>	This instruction allows the acquisition of the tension value given by the load cell. (low pass filtered with 25 Hz cut-off frequency)	
<b>Tension set point</b>		Variable
<i>Instruction</i>	TS	
<i>Parameter</i>	Possible values: between 8000 and 7FFF.	
<i>Conversion</i>	0.000305185 (for getting the tension set point in Volts)	
<b>Tension error scaling</b>		Variable
<i>Instruction</i>	KS	
<i>Parameter</i>	Signed values.The absolute value of KS is between CCC and 7FFF.	
<i>Conversion</i>	0.00305185 (for getting the error reduction gain in %)	
<i>Remarks</i>	The sign of this gain is chosen in order to have a stable load cell feedback.	
<b>Proportional gain of the tension loop</b>		Variable
<i>Instruction</i>	GP	
<i>Parameter</i>	Possible values: between 0 and FFFF.	
<i>Conversion</i>	1/512	
<b>Integral gain of the tension loop</b>		Variable
<i>Instruction</i>	GI	
<i>Parameter</i>	Possible values: between 0 and FFFF.	
<i>Conversion</i>	1/65536	
<b>Derivative gain of the tension loop</b>		Variable
<i>Instruction</i>	GD	
<i>Parameter</i>	Possible values: between 0 and FFFF.	
<i>Conversion</i>	1/32	

### 3.9 - Spindle indexing parameters for SMT-BD1/f

<b>Indexing speed</b>		Variable
<i>Instruction</i>	VI	
<i>Parameter</i>	0 to VL parameter value	
<i>Conversion</i>	1.8310546875 (for getting the speed in rpm).	

---

**Position error** Variable

*Instruction* BM  
*Parameter* 0 to 7FFF  
*Conversion* 0.00549931641 (for getting the error in mechanical degrees)

---

**Velocity accuracy** Variable

*Instruction* ET  
*Parameter* 28F to 7FFF  
*Conversion* 0.0015259255 (for getting the accuracy in %)

---

**Indexing position 1** Variable

*Instruction* TS  
*Parameter* 0 to FFFF  
*Conversion* 0.005493164 (for getting the shaft position in mechanical degrees)  
*Remarks* Selection by IDX0=ON and IDX1=ON

---

**Indexing position 2** Variable

*Instruction* TB  
*Parameter* 0 to FFFF  
*Conversion* 0.005493164 (for getting the shaft position in mechanical degrees)  
*Remarks* Selection by IDX0=ON and IDX1=OFF

---

**Indexing position 3** Variable

*Instruction* KS  
*Parameter* 0 to FFFF  
*Conversion* 0.005493164 (for getting the shaft position in mechanical degrees)  
*Remarks* Selection by IDX0=OFF and IDX1=ON

---

**Indexing position 4** Variable

*Instruction* KR  
*Parameter* 0 to FFFF  
*Conversion* 0.005493164 (for getting the shaft position in mechanical degrees)  
*Remarks* Selection by IDX0=OFF and IDX1=OFF

### 3.10 - Registration control parameters for SMT-BD1/g

---

**Registration mode** Variable

*Instruction* TB  
*Parameter* 0 or 1.  
*Condition* Amplifier disabled  
*Conversion* TB ≠ 0 --> Unidirectional and TB=0 --> Bidirectional  
*Remarks* The value is 0 or ≠ 0

---

**Product reference and Datum mode** Variable

*Instruction* GP  
*Parameter* Possible values: between 0 and 2.  
*Condition* Amplifier disabled  
*Conversion* GP = 0 --> Relative,  
GP = 1 --> Absolute with datum on the fly,  
GP = 2 --> Absolute with first product stop  
*Remarks* The value is 0 or 1 or 2

---

**Reference sensor** Variable

*Instruction* GI  
*Parameter* 0 or 1.  
*Condition* Amplifier disabled  
*Conversion* GI ≠ 0 --, DM input and GI= 0 --> encoder marker pulse  
*Remarks* The value is 0 or ≠ 0

---

**Reference shift** Variable

*Instruction* TS  
*Parameter* 0 or 1.  
*Condition* Amplifier disabled  
*Conversion* TS ≠ 0 --> Analog shift and TS= 0 --> Digital shift  
*Remarks* The value is 0 or ≠ 0

---

**Reference shift value** Variable

*Instruction* KS  
*Parameter* Signed values between 8000 and 7FFF.  
*Conversion* 0.00152592 (for getting the shift in % of the reference pitch)

---

**Reference pitch** Variable

*Instruction* KR  
*Condition* Amplifier disabled  
*Parameter* Possible values: between 64 and 3<sup>E</sup>80.  
*Conversion* Value in encoder edges (encoder pulse x 4)

---

**Maximum pitch error** Variable

*Instruction* IT  
*Parameter* Possible values: between KR/2 and 2.KR  
*Conversion* Value in encoder edges (encoder pulse x 4)

---

**Pitch correction limit** Variable

*Instruction* GD  
*Parameter* Possible values: between 0 and IT parameter value  
*Conversion* Value in encoder edges (encoder pulse x 4)

---

**Accumulator correction limit** Variable

*Instruction* RF  
*Parameter* Possible values: between 0 and GD parameter value  
*Conversion* Value in encoder edges (encoder pulse x 4)

---

**Registration distance** Variable

*Instruction* TM  
*Parameter* Possible values: between 0 and 2.KR  
*Conversion* Value in encoder edges (encoder pulse x 4)

---

**Registration speed** Variable

*Instruction* VI  
*Parameter* 1 to VL parameter value  
*Conversion* 1.8310546875 (for getting the speed in rpm).

---

**Registration accel/decel time** Variable

*Instruction* TI  
*Parameter* Possible values: between 0 and 800. The maximum value is about 1 s.  
*Conversion* 0.0005 (for getting the time in seconds).

---

**Motor deadband** Variable

*Instruction* BM  
*Parameter* 0 to 32767.  
*Conversion* Value in encoder edges (encoder pulse x 4).

---

**Following error** Variable

*Instruction* ET  
*Parameter* 0 to 32767.  
*Conversion* Value in encoder edges (encoder pulse x 4)

### 3.11 - Winding/unwinding tension control parameters for SMT-BD1/i

#### Maximum speed variation Variable

<i>Instruction</i>	BM
<i>Parameter</i>	Possible values: between 0 and FFFF.
<i>Conversion</i>	0.00152592 (for getting the maximum slave speed variation) in % of the maximum speed value.

#### Tension input filter Variable

<i>Instruction</i>	FC
<i>Parameter</i>	Filter cut-off frequency. Possible values: between 0B10 (1000 Hz) and F069 (20 Hz).
<i>Conversion</i>	Frequency= $\frac{1000}{\pi} \ln\left(\frac{65536}{\text{parameter}}\right)$ in Hz
<i>Remarks</i>	This term is used in the standard speed mode (with analog input command).

#### Tension sensor acquisition Variable

<i>Instruction</i>	TM
<i>Parameter</i>	Possible values: between 8000 and 7FFF.
<i>Conversion</i>	0.000305185 (for getting the tension sensor voltage in Volts)
<i>Remarks</i>	This instruction allows the acquisition of the tension value given by the load cell. (low pass filtered with 25 Hz cut-off frequency)

#### Tension set point 1 Variable

<i>Instruction</i>	TS
<i>Parameter</i>	Possible values: between 8000 and 7FFF.
<i>Conversion</i>	0.000305185(for getting the tension set point in Volts)
<i>Remarks</i>	Selection by TS1=OFF and TS2=OFF

#### Tension set point 2 Variable

<i>Instruction</i>	TI
<i>Parameter</i>	Possible values: between 8000 and 7FFF.
<i>Conversion</i>	0.000305185(for getting the tension set point in Volts)
<i>Remarks</i>	Selection by TS1=ON and TS2=OFF

#### Tension set point low Variable

<i>Instruction</i>	TB
<i>Parameter</i>	Possible values: between 8000 and 7FFF.
<i>Conversion</i>	0.000305185 (for getting the tension input threshold in Volts)
<i>Remarks</i>	Selection by TS2 = ON

#### Tension set point ramp Variable

<i>Instruction</i>	TL
<i>Parameter</i>	Possible values: between 0 and FFFF. The maximum value is about 32 s.
<i>Conversion</i>	0.0005 (for getting the time in seconds).
<i>Remarks</i>	This term is used in the standard speed mode (with analog input command).

#### Spool diameter ratio Variable

<i>Instruction</i>	KR
<i>Parameter</i>	100 to 6400.
<i>Conversion</i>	1/256=0,00390625 (for getting the ratio value).

#### Diameter sensor acquisition Variable

<i>Instruction</i>	RF
<i>Parameter</i>	Possible values: between 0 and 7FFF.
<i>Conversion</i>	0.000305185 (for getting the diameter sensor value in Volts)
<i>Remarks</i>	This instruction allows the acquisition of the voltage value given by the diameter sensor. (low pass filtered with 10 Hz cut-off frequency)

---

**Empty spool diameter sensor value** Variable

*Instruction* IT  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the diameter sensor value in Volts)

---

**Full spool diameter sensor value** Variable

*Instruction* ET  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the diameter sensor value in Volts)

---

**Speed regulator gain ratio** Variable

*Instruction* GC  
*Parameter* 10 to 3<sup>E</sup>80  
*Conversion* 1/16=0,0625 (for getting the ratio value)

---

**Diameter sensor value for maximum gain** Variable

*Instruction* VI  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the diameter sensor value in Volts)

---

**Tension error scaling** Variable

*Instruction* KS  
*Parameter* Signed values.The absolute value of KS is between 147 and 7FFF.  
*Conversion* 0.00305185 (for getting the error reduction gain in %)  
*Remarks* The sign of this gain is chosen in order to have a stable load cell feedback.

---

**Proportional gain of the tension loop** Variable

*Instruction* GP  
*Parameter* Possible values: between 0 and FFFF.  
*Conversion* 1/256

---

**Integral gain of the tension loop** Variable

*Instruction* GI  
*Parameter* Possible values: between 0 and FFFF.  
*Conversion* 1/65536

---

**Derivative gain of the tension loop** Variable

*Instruction* GD  
*Parameter* Possible values: between 0 and FFFF.  
*Conversion* 1/256

### 3.12 - Winding/unwinding accumulator control parameters for SMT-BD1/j

---

**Spool diameter ratio** Variable

*Instruction* KR  
*Parameter* 100 to 6400.  
*Conversion* 1/256=0,00390625 (for getting the ratio value)

---

**Diameter sensor acquisition** Variable

*Instruction* TM  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the diameter sensor voltage value in Volts)  
*Remarks* This instruction allows the acquisition of the tension value given by the diameter sensor. (low pass filtered with 1 Hz cut-off frequency).

---

**Empty spool diameter sensor value** Variable

*Instruction* TI  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the diameter sensor voltage value in Volts).

---

**Full spool diameter sensor value** Variable

*Instruction* TB  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the diameter sensor voltage value in Volts)

---

**Accumulator sensor acquisition** Variable

*Instruction* RF  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the accumulator sensor voltage value in Volts)  
*Remarks* This instruction allows the acquisition of the tension value given by the accumulator height sensor.

---

**Accumulator sensor value at standstill** Variable

*Instruction* GI  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the accumulator sensor voltage value in Volts)

---

**Accumulator sensor value for maximum speed** Variable

*Instruction* GD  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the accumulator sensor voltage value in Volts)

---

**Speed regulator gain ratio** Variable

*Instruction* KS  
*Parameter* 10 to 3<sup>F</sup>80  
*Conversion* 1/16=0,0625 (for getting the ratio value)

---

**Diameter sensor value for maximum gain** Variable

*Instruction* TS  
*Parameter* Possible values: between 0 and 7FFF.  
*Conversion* 0.000305185 (for getting the diameter sensor voltage value in Volts)

### 3.13 - Other useful instructions

---

**Amplifier Fault code** Variable

*Instruction* ER  
*Parameter* Reading only.

The fault code is a 16 bit word.  
Each bit corresponds to a fault defined below (1 = fault, 0 = no fault):

Bit (0 – 15)	Fault
1	I <sub>t</sub>
2	Resolver – digital converter
3	Position following error
4	EEPROM
7	Procedure execution error
8	Power stage fault
9	- power overvoltage - short-circuit - IGBT module overtemperature
10	Resolver cable interruption
11	Power undervoltage
12	Amplifier thermal sensor
13	Motor thermal sensor

The watch-dog fault is not accessible via the serial link.

---

**Logic inputs** Variable

*Instruction* LI  
*Parameter* Reading only.  
*Remarks* This variable indicates whether the amplifier logic inputs are activated or not.

Bit	Meaning
3	0 positive logic 1 negative logic
4	0 FC+ not activated 1 FC+ activated
5	0 FC- not activated 1 FC- activated
6	0 CI activated 1 CI not activated
7	0 CV0 activated 1 CV0 not activated

---

**System indicators** Variable

*Instruction* SS  
*Parameter* Reading only.  
*Remarks* This variable gives the indicators for the amplifier operation mode.

Bit (0 -15)	Meaning
10	PI speed mode.
11	Specific option control mode (c, d, e, g, i, j)
12	P speed mode
13	PI <sup>2</sup> speed mode

---

**P speed mode** Procedure

*Instruction* MU  
*Parameter* No parameter.  
*Condition* Amplifier disabled.  
*Remarks* Switching on to P speed mode.

---

**PI speed mode** Procedure

*Instruction* MV  
*Parameter* No parameter.  
*Condition* Amplifier disabled.  
*Remarks* Switching on to PI speed mode.

---

**PI<sup>2</sup> speed mode** Procedure

*Instruction* MW  
*Parameter* No parameter.  
*Condition* Amplifier disabled.  
*Remarks* Switching on to PI<sup>2</sup> speed mode.

---

**Enable/disable specific option (c, d, e, g, i, j)** Procedure

*Instruction* MI  
*Parameter* No parameter.  
*Condition* Amplifier disabled.  
*Remarks* Switching on to option control mode (c, d, e, g, i, j). The difference between each option is defined on the subprint itself.

---

**Resolver value** Variable

*Instruction* RE  
*Parameter* Reading only. 0 to FFFF.  
*Remarks* This instruction sends back the resolver position on 16 bits. It gives the motor absolute position over one revolution.

---

**Speed monitor** Variable

*Instruction* VM  
*Parameter* Reading only. -1DDE to 1DDE.  
*Conversion* 1.8310546875 (for getting the speed in rpm).  
*Remarks* This instruction sends back the motor speed on 16 bits.

---

**Current monitor** Variable

*Instruction* IA (from 2.8C firmware EPROM version)  
*Parameter* Reading only. -7FFF to 7FFF.  
*Conversion* 3.051850948<sup>e</sup>-3 (for getting the amplifier current in percent).  
*Remarks* This instruction sends back the amplifier current on 16 bits.

---

**Amplifier software version** Variable

*Instruction* VE  
*Parameter* Reading only.  
*Remarks* The amplifier software version is coded as 4 hexadecimal figures.  
Version 2.8C = 028C in hexadecimal.

---

**Reset amplifier faults** Procedure

*Instruction* RZ

---

**Parameter storage in the EEPROM** Procedure

*Instruction* ST  
*Condition* Amplifier disabled.

---

**Addressing** Variable

*Instruction* AD  
*Parameter* 0 to F.  
*Remarks* This instruction allows to initialise the communication with an amplifier in the multi-axis configuration.

# Chapter 4 - Multiaxis configuration

When the SMT-BD1 amplifiers are operating in a multi-axis rack, it is interesting to make the parameter setting of these amplifiers by means of a single host system without the need to connect and disconnect the serial link on each axis.

## 4.1 - Structures

The SMT-BD1 amplifiers allow a multi-axis connection according to both figures below: - RS-232 serial link with SMT-BD1 amplifiers (standard amplifier configuration) - RS-422/485 serial link with SMT-BD1 /2 amplifiers (amplifier option).

### 4.1.1 - Serial link RS-232

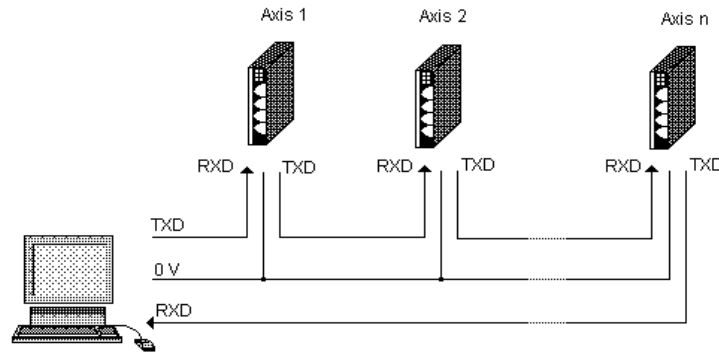


Figure 1: Ring connection of the amplifiers by means of the serial link RS-232

The connection of the various units (computer or amplifiers) is made as a ring: the transmission signal (TxD) of each unit is connected to the reception signal (RxD) of the next unit.

### 4.1.2 - Serial link RS-422/485

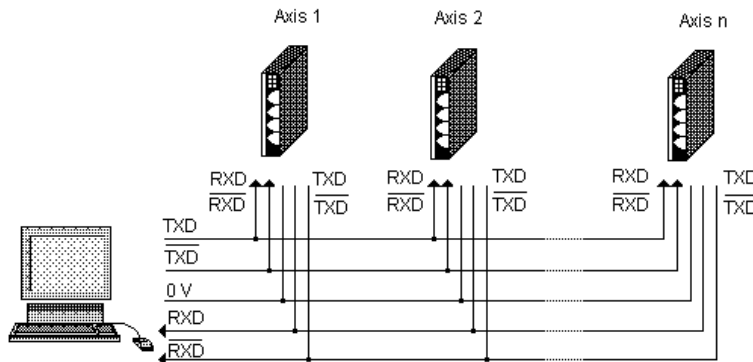


Figure 2: Parallel connection of the amplifiers by means of the serial link RS-422/485

All amplifiers are parallel connected to the computer.

The amplifiers reception signals (RxD) are connected to the computer transmission signal (TxD) and the amplifiers transmission signals (TxD) are connected to the computer reception signal (RxD).

## **4.2 - Connection**

Each amplifier has 4 micro-switches allowing an address assignment. The amplifiers of a same rack must have different addresses.

An address in multi-axis configuration must have a value between 1 and F (hexa). The 0 address corresponds to the standard configuration (no addressing).

The connection with an amplifier with address "x" requires the instruction ADx (see this instruction in § 3.10 ). The connection with another amplifier with address "y" requires to first disconnect the present amplifier by sending the instruction AD0 and to connect it by means of the instruction ADy.

After the connection, it is possible to dialogue with the amplifier via the instructions described in the paragraph re-garding the parameter setting.