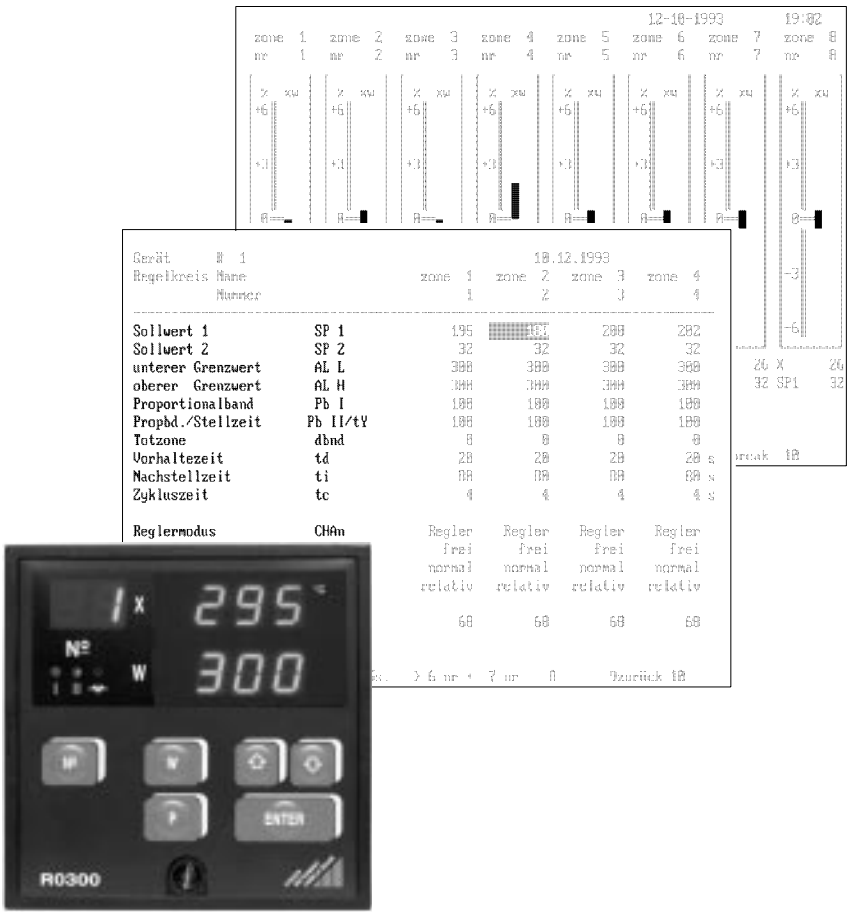
Operating Instructions

SC 300

Configuration program for R0300

3.348.627.15
Edition 3



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1 Configuration program SC300

Description

The SC300 program package permits convenient configuration and parameter setting of the R0300 multi-channel controller. In addition, deviations of as many as 8 control zones can be displayed simultaneously and clearly. The configuration program for personal computers (IBM XT, AT or compatible computers) includes explanations in German or English.

Scope of delivery

The SC300 program package contains the following files:

- ❍ READSC3.ME
- ❍ SC300.EXE
- ❍ SC300.BAS

The program files are delivered on a $5^1/_4$" disk (formatted for 360 kbytes) and $3^1/_2$" disk (formatted for 720 kbytes).

Contents of the SC300 program

1. The "READSC3.ME" describes

   - ❍ the requirements to the personal computer
   - ❍ the program structure
   - ❍ the electrical data of the interface
   - ❍ the making of the connection cable

2. By way of a possible application, the executable program "SC300.EXE" shows the interface dialog between the GTR 0300 controller and the personal computer. With menu-guided operation, it is possible to

   - ❍ enter configuration and control parameters
   - ❍ display parameters and values in tabular form
   - ❍ show the deviations on the bar graph display
   - ❍ store and copy parameters to disk
   - ❍ name control loops

   optionally in German or English.

   For operation, the user should be familiar with the DOS operating system. To make the interface connection, it is required to be familiar with the hardware of the personal computer.

3. The associated source program „SC300.BAS" in MS BASIC shows the interface dialog between the controller and the personal computer. The user can tailor the program to his needs.

   Conversion into other program languages, such as C or PASCAL, is facilitated by the structured program presentation.

2 Startup

2.1 Personal computer requirements

- ❍ Personal computer IBM XT, AT or compatible.
- ❍ Operating system PC/MS-DOS, version 3.1 or higher.
- ❍ Floppy disk drive 3.5" 720 kByte or 5.25" 360 kbytes.
- ❍ Hard disk.
- ❍ Main memory 512 kbytes.
- ❍ 1 serial interface TTY or RS 485 or
  1 serial interface RS 232 and 1 adapter RS 485/RS 232
  (e.g. GOSSEN-METRAWATT type 1799-V5040) or
  1 serial interface RS 232 and 1 adapter TTY/RS 232.

2.2 R0300 controller requirements

- ❍ R0300 controller version with data interface
  (order code F1 for RS 485 or F2 fr TTY).

2.3 Program installation

- ❍ Turn on the personal computer.
- ❍ Insert the original disk SC300 into the floppy disk drive, e.g. A:
- ❍ Create a directory on the hard disk of the computer, e.g. C:\SC300
- ❍ Copy all files from the disk in the floppy disk drive into the path on the hard disk, e.g. COPY A:*.* C:\SC300*.*

2.4 Connection of the controller R0300 to the computer

See file "READSC3.ME".

3 Program Operation

3.1 Getting started

After call-up, various settings must be performed in the SC300 program:

- ❍ Choose the directory in which the SC300 program has been installed C:\SC300
- ❍ Enter: SC300
  Press the ENTER key.
- ❍ A startup window appears.
- ❍ Select the language of the menu prompting: d = German
  e = English
  Enter the desired letter.
- ❍ Select the name of the PC port 1 = COM 1
  to which the controllers are connected 2 = COM 2
  Enter the desired digit.
- ❍ Enter the number of the connected controllers R0300.
  Press the ENTER key.
- ❍ End the program: press the key F10.

3.2 Definitions

Data: Parameters and values that are transmitted between PC and controller
Parameter: Numeric quantity that can be read and written
Value: Numeric quantity that can be read only

1 controller has a maxim. of 4 channels whereby 1 channel corresponds to one control zone.

1 data block comprises all parameters of one channel
1 value block contains the values of all 4 channels of one controller.

3.3 Program functions

The program functions can be selected from the working screen through the function keys.

- *F1 = Display of control parameters in tabulated format*
  Control parameters are displayed. The modification of values is not possible here.

- *F2 = Paramter entry, monitor data communication*
  All data of the connected controllers is being displayed. Data entry is possible. Enter in close order to prevent the program from exiting the Enter mode:
  - number of the desired control channel (three digits). Press the ENTER key.
  - number of the desired control parameter (two digits). Press the ENTER key.
  - new parameter value. Press the ENTER key.

  In the lower right third of the screen surface the data requests to the controllers and the controller responses are symbolically displayed.

- *F3 = Entry of configuration and parameter data*
  The more relevant controller data is displayed and can be modified comfortably
  - Select the desired box with the cursor.
  - Confirm numerical entries with the ENTER key.
  - Select configuration data with the space bar. Confirm with the ENTER key.

- *F4 = Bar graph diagram of the control deviation*
  For a group of eight control zones the control deviation, set point, actual value and alarm states are displayed. Change screen for the display of further zones. For the display of further zones press keys F6 or F7.

- *F6 = Load a parameter set*
  Attention: The previously stored data in the controller is overwritten
  Configuration and parameter data are sent from a file on the hard disk or a diskette to the connected controllers.

- *F7 = Store a parameter set*
  Configuration and parameter data of the connected controllers are saved into a file on the hard disk or a floppy disk.

- *F8 = Enter names for the control loops*
  Enter desired names for the control loops.

4 Interface protocols

Transfer rate	9600 bits / s
Parity	none
Number of data bits	8
Number of stop bits	1
Operating mode	half-duplex
Character font	ASCII $0A_H$, $0D_H$, 20_H ... $7F_H$

4.1 Request for a data block

With this interrogation, the parameters of a selected control channel are called up.

Inquiry R x x x N T ? <CRLF>

Response S x x x ■ ■ T ■ D D D...D D D q q q q Q <CRLF>

4.2 Send a data block

With this interrogation, the parameters are sent to a selected control channel. There is no reply message.

Transmitted S x x x ■ ■ T ■ D D D ... D D D q q q q Q <CRLF>

4.3 Request for actual values

With this interrogation, the actual values from the control channels 1 to 4 of a controller are read out.

Inquiry R y y y N F ? <CRLF>

Response S y y y ■ ■ F ■ W W W ... W W W q q q q Q <CRLF>

Meaning of the short form characters

R, S, N, T, F oder Q .....Delimiter (46_H to 54_H)

■ .....Space (20_H)

<CRLF> .....Carriage return, line feed ($0A_H$, $0D_H$)

x x x .....Number of control loop, three digits (e.g. 0 1 5) (30_H ... 39_H)

y y y .....Number of control loop of the first channel, three digits

D D D ... D D D .....Data block, 92 ASCII characters (20_H to $5F_H$)

W W W ... W W W .....Value block, 92 ASCII characters (20_H to $5F_H$)

q q q q .....Checksum of DDD ... DDD or WWW ... WWW

4.4 Assignment of the data block

Symbol	Characters	Integer paramters in channel mode
nr	D1...D3	Number of control loop
SP 1	D4...D6	Set point
SP 2	D7...D9	Second set point
SP L	D10...D12	Low set point limit
SP H	D13...D15	High set point limit
	D16...D21	Reserved
rn o	D22...D24	Actual value offset (with B01...B11)
rn L	D22...D24	Graduation of lower measuring range limit (with B12)
rn H	D25...D27	Graduation of upper measuring range limit
AL L	D28...D30	LOW alarm value
AL H	D31...D33	HIGH alarm value
Y SE	D34...D36	Manipulated quantity with sensor error
	D37...D39	Reserved
tc	D40...D42	Output cycle time
Pb I	D43...D45	Proportional band I (xpI)
PbII	D46...D48	Proportional band II (xpII) (with YtYP=nor)
ty	D46...D48	Motor position time (with YtYP=StEP)
ti	D49...D51	Integral action time (Tn)
td	D52...D54	Derivative action time (Tv)
dbnd	D55...D57	Dead band, switching point distance
YdrY	D58...D60	Overlaid regulation ratio
EdrY	D61...D63	Limit for overlay of regulation ratio
	D64...D69	Reserved

Symbol	Characters	Byte parameters in channel mode	Value
CHAn	D70	Function of the channel	0=on; 1=AL; 2=Pro; 3=oFF; 4=MAn
PtYP	D71	Controller type (input)	0=nor; 2=diff; 4=SLA
unit	D72	Unit of measured quantity	0=Cel; 1=Fahr; 2=%; 3=none
dPnt	D73	Location of decimal point	0 ... 3 digits behind decimal point
YtYP	D74	Controller type (output)	0=nor; 1=StEP
oPt	D75	Enable optimizing	0=diS; 1=En
d SE	D76	Action with sensor error	0=nor; 1=in
dir	D77	Direction of action of x-w	0=nor; 1=in
out	D78	Switching outputs	0=nor; 1=in
AL	D79	Action of limit values	0=rEL; 1=AbS
	D80	Reserved	
drY	D81	Overlay of regulation ratio	0=oFF; 1=InP; 2=on
	D82	Reserved	

Symbol	Characters	Byte parameters in system mode	Value
	D83	Reserved	
out	D84	Switching outputs	0=oFF; 1=on
oPt	D85	Start optimizing	0=StoP; 1=Strt
r n	D86	Measuring range (type of sensor)	0=J, K, S,two-wire, dead zero, 1=L, K, R, three-wire, live zero
CJ	D87	Cold junction compensation	0=on; 1=0°C; 2=50°C
	D88...D92	Reserved	

Depending upon the characteristic of the controller, some parameters in the controller are inactive, e.g. the parameters of the 3rd and 4th channel on 2-channel controllers.
The ranges marked Reserved contain special quantities, e.g. for service purposes.

4.5 Assignment of the value block

The actual values (controlled variables) and regulation ratios captured by the controller are transmitted in a value block. Three ASCII characters (W_{x1} ... $W_{x3)}$ are available for each channel.
Conversion is internal in integer format. Hereby the numbers are further processed as integer positive quantities.

Characters	Integer quantities		Values
W1...W3	Controlled	channel 1	Measured value without decimal point
W4...W6	quantity x	channel 2	Measured value without decimal point
W7...W9		channel 3	Measured value without decimal point
W10...W12		channel 4	Measured value without decimal point
W13...W24	Reserved		
W25...W27	Regulation	channel 1	– 100%...+100% = – 4000_H ...+4000_H
W28...W30	ratio y	channel 2	– 100%...+100% = – 4000_H ...+4000_H
W31...W33		channel 3	– 100%...+100% = – 4000_H ...+4000_H
W34...W36		channel 4	– 100%...+100% = – 4000_H ...+4000_H
W37...W60	Reserved		

The states of a controller are transmitted in the value block of each channel as 1 ASCII character. Hereby the states are coded by bits and further processed as byte quantity.

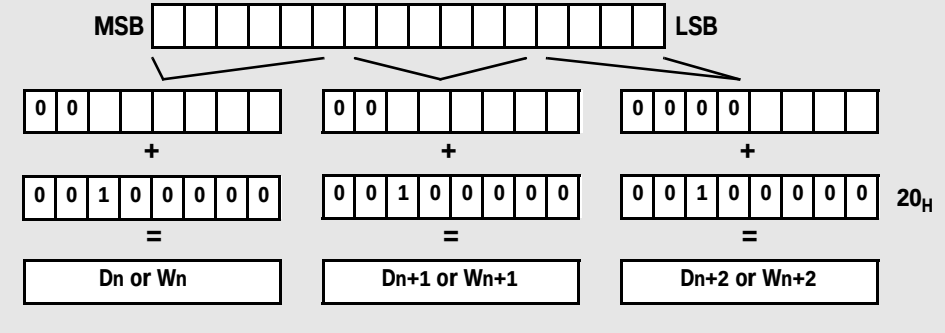
Characters	Byte size		Values
W61	Status of	Channel 1	0 = end; 1 ... 8 = running; 16 = stop
W62	optimizing	Channel 2	0 = end; 1 ... 8 = running; 16 = stop
W63		Channel 3	0 = end; 1 ... 8 = running; 16 = stop
W64		Channel 4	0 = end; 1 ... 8 = running; 16 = stop
W65	Status of	Channel 1	bit 1: 0 / 1 = sensor error no / yes
W66	output	Channel 2	bit 2: 0 / 1 = AL H inactive / active
W67		Channel 3	bit 3: 0 / 1 = AL L inactive / active
W68		Channel 4	bit 0, 4, 5 = (res)
W69...W92	Reserved		

The ranges marked Reserved contain special quantities, e.g. for service purposes.

4.6 Coding of the data

4.6.1 Coding of an integer into 3 ASCII characters

The display parameters and quantities are internally stored as 16-bit integer with sign in two´s complement. Thereby, the decimal points appear on the display only. To determine the corresponding ASCII characters, the following rule applies:



or as formula:

Parameter=1024 * ($3F_H$ AND ($Dn - 20_H$))+16 * ($3F_H$ AND ($Dn+1 - 20_H$))+(F_H AND $Dn+2$)

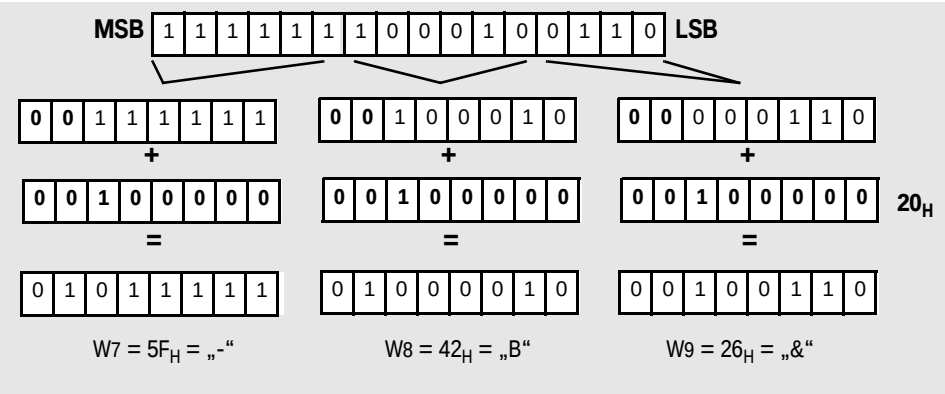
Note processing of Dn with correct sign (eventually process bit 5 and bit 6 of Dn separately).

Example

Actual value of channel 3 = – 47.4 °C
Transmission is in the value block W7 ... W9, see section 4.5. for assignment.

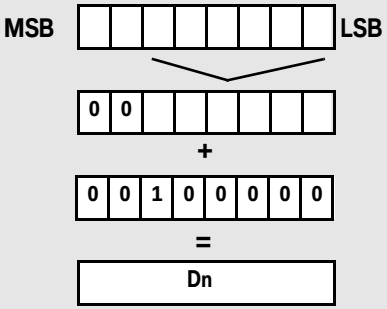
Internaly, the measured value is further processed as integer without sign: – 474. Conversion into the hexadecimal code results in: $FE26_H$.

This results in the following byte presentation: 1 1 1 1 1 1 1 0 0 0 1 0 0 1 1 0



4.6.2 Coding of a byte into 1 ASCII character

The status is shown in the least significant bits of the byte parameter and/or byte value.



Or as formula: parameter = ($3F_H$ AND (Dn – 20_H))

4.6.3 Coding of the checksum into 4 ASCII characters

The 92 ASCII characters of the data and/or value block are added. The integer value thus obtained is regarded as four-digit hexadecimal number, and these four digits (0 ... 9, A ... F) are transferred as ASCII characters

Example

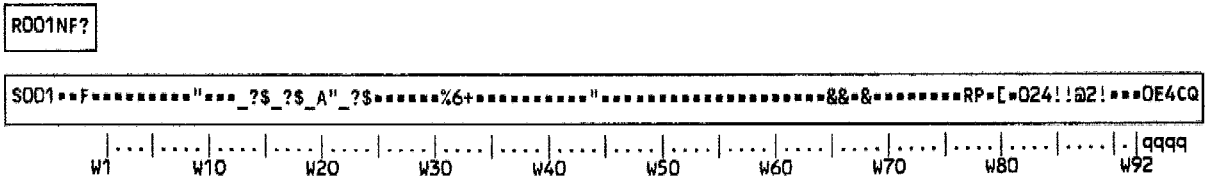
Let the checksum be	7803 = $1E7B_H$
then it follows	qqqq = ”1”, ”E”, ”7”, ”B” = 31_H, 45_H, 37_H, 42_H

4.7 Time limits

Operation of the bus interface is half-duplex with NRZI code. A PC or a memory-programmable controller acts as master on the bus. All controllers, being slaves, are ready to receive. The master addresses 1 controller and a defined channel. Only the addressed channel responds.
With the preset transfer rate of 9600 bits/s select a time interval of š 1 s for transfers and/or inquiries to the controllers. This goes for the transmission on the bus.

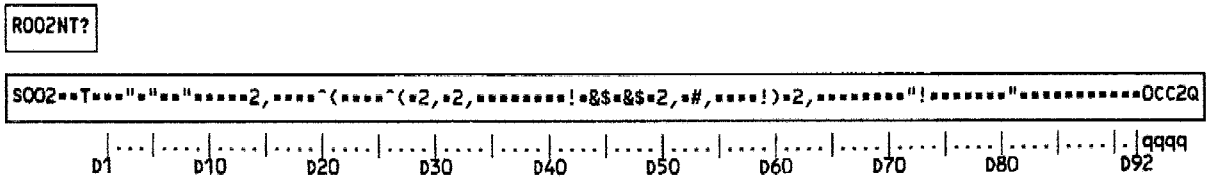
If there is no response to an inquiry within one second, there is a transmission error. The cause may be a faulty connection or an incorrectly set channel number.

4.8 Example for an arbitrary value block



4.9 Example for a data block

Channel 2, factory setting, measuring range0 °C ... 300 °C



Conversion of 3 ASCII characters into a parameter

Computation for the integral action time *ti* transmitted in the above example
(3 ASCII characters „■ 2 ," at position D49 ... D51 in the data block)

D49 =	"■"	=	20_H	→	00_H *	1024 =	0 *	1024=	0
D50 =	"2"	=	32_H	→	12_H *	16 =	18 *	16=	288
D51 =	","	=	$2C_H$	→	$0C_H$ *	1 =	12 *	1=	12
									300 = *ti*

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