



10 DIGITAL INTERFACE

The **MicroCal 10** portable calibrator is equipped with a digital interface.

The interface circuit is essentially based on the serial communication interface subsystem (SCI) on the chip of the microprocessor.

The output voltage levels are TTL at 0 to +5 V.

An optional adaptor to convert the voltage level from 0 to +5V to RS232 levels can be supplied on request. This adaptor is required to interface the MicroCal 10 with a Personal Computer.

10.1 Digital interface data program mode

- To enter the procedure, press the **<ENTER>** + **<ON>** keys. The display will indicate:

CAL? 65388 N=0

- To enter the program mode press the **<2>** key;

Baud Rate 19200

The numerical value of the "baud rate" can be one of the following : 19200, 9600, 4800, 2400, 1200, 600, 300

- Select, with the **<▲>** or **<▼>** key the "baud rate" used by the receiver unit and transmission lines.
- Press the **<2>** key to memory load the baud rate.
- The display will indicate:

ID-Name : 1

The number represents the address code assigned to the instrument.

- Press the **<▲>** or **<▼>** key to select a number from 00 to 99.
- Press the **<2>** key to memory load the programmed value.
- The display will return to the original indication:

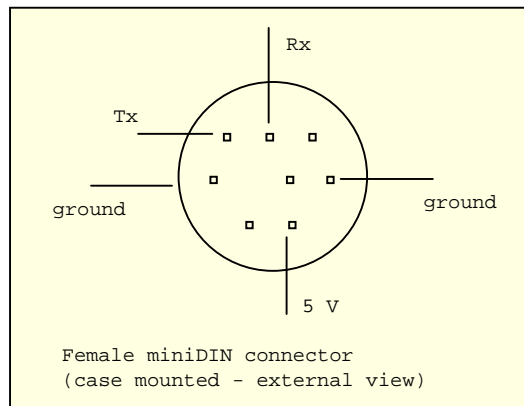
CAL? 65388 N=0

- To exit the procedure press the **<OFF>** key.

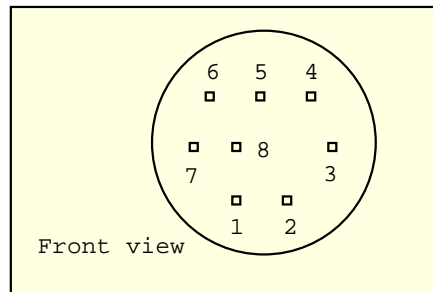
10.2 Digital output wiring practice

The wiring to the digital output signals is made through a mini DIN connector mounted on the lower end of the case.

The pertinent connections are indicated below.



For easy interconnections a miniDIN connector with cable (cat. EE420123) can be supplied on request. The conductors color codes can change with different supplier; please check before using.



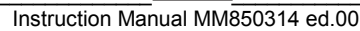
LINDY

CINCH

pin 1 :	brown	black
pin 2 :	red	green
pin 3 :	green	blue
pin 4 :	gray	gray
pin 5 :	purple	yellow
pin 6 :	blue	white
pin 7 :	orange	red
pin 8 :	yellow	brown

10.3 TTL to RS 232 adapter

The cat. BB530001 TTL to RS232 adapter consists of a cable to which are connected a male mini DIN connector (for the MicroCal 10) and a DB 25 connector, that contains the electrical circuitry (for the PC). The basic circuit and connections are as follows:



COMPUTER REQUEST

IDNAME, Instruction, DATA 1, DATA 2, DATA 3, DATA 4 and CHKSUM are 8-bit values (1 byte)

40



STO 0 Group B	168	x	x	Display (0)	Lin (0)
STO 0 Group B	169	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group B	169	x	x	Display (1)	Lin (1)
STO 1 Group B	170	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group B	170	x	x	Display (2)	Lin (2)
STO 2 Group B	171	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group C	172	x	x	Display (0)	Lin (0)
STO 0 Group C	173	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group C	173	x	x	Display (1)	Lin (1)
STO 1 Group C	174	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group C	174	x	x	Display (2)	Lin (2)
STO 2 Group C	175	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group D	176	x	x	Display (0)	Lin (0)
STO 0 Group D	177	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group D	177	x	x	Display (1)	Lin (1)
STO 1 Group D	178	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group D	178	x	x	Display (2)	Lin (2)
STO 2 Group D	179	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group E	180	x	x	Display (0)	Lin (0)
STO 0 Group E	181	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group E	181	x	x	Display (1)	Lin (1)
STO 1 Group E	182	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group E	182	x	x	Display (2)	Lin (2)
STO 2 Group E	183	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group F	184	x	x	Display (0)	Lin (0)
STO 0 Group F	185	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group F	185	x	x	Display (1)	Lin (1)
STO 1 Group F	186	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group F	186	x	x	Display (2)	Lin (2)
STO 2 Group F	187	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group G	188	x	x	Display (0)	Lin (0)
STO 0 Group G	189	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group G	189	x	x	Display (1)	Lin (1)
STO 1 Group G	190	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group G	190	x	x	Display (2)	Lin (2)
STO 2 Group G	191	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group H	192	x	x	Display (0)	Lin (0)
STO 0 Group H	193	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group H	193	x	x	Display (1)	Lin (1)
STO 1 Group H	194	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group H	194	x	x	Display (2)	Lin (2)
STO 2 Group H	195	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group I	196	x	x	Display (0)	Lin (0)
STO 0 Group I	197	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group I	197	x	x	Display (1)	Lin (1)
STO 1 Group I	198	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group I	198	x	x	Display (2)	Lin (2)
STO 2 Group I	199	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group J	200	x	x	Display (0)	Lin (0)
STO 0 Group J	201	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group J	201	x	x	Display (1)	Lin (1)
STO 1 Group J	202	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group J	202	x	x	Display (2)	Lin (2)
STO 2 Group J	203	Value Hi (2)	Value Lo (2)	x	x



STO 0 Group K	204	x	x	Display (0)	Lin (0)
STO 0 Group K	205	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group K	205	x	x	Display (1)	Lin (1)
STO 1 Group K	206	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group K	206	x	x	Display (2)	Lin (2)
STO 2 Group K	207	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group L	208	x	x	Display (0)	Lin (0)
STO 0 Group L	209	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group L	209	x	x	Display (1)	Lin (1)
STO 1 Group L	210	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group L	210	x	x	Display (2)	Lin (2)
STO 2 Group L	211	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group M	212	x	x	Display (0)	Lin (0)
STO 0 Group M	213	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group M	213	x	x	Display (1)	Lin (1)
STO 1 Group M	214	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group M	214	x	x	Display (2)	Lin (2)
STO 2 Group M	215	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group N	216	x	x	Display (0)	Lin (0)
STO 0 Group N	217	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group N	217	x	x	Display (1)	Lin (1)
STO 1 Group N	218	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group N	218	x	x	Display (2)	Lin (2)
STO 2 Group N	219	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group O	220	x	x	Display (0)	Lin (0)
STO 0 Group O	221	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group O	221	x	x	Display (1)	Lin (1)
STO 1 Group O	222	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group O	222	x	x	Display (2)	Lin (2)
STO 2 Group O	223	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group P	224	x	x	Display (0)	Lin (0)
STO 0 Group P	225	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group P	225	x	x	Display (1)	Lin (1)
STO 1 Group P	226	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group P	226	x	x	Display (2)	Lin (2)
STO 2 Group P	227	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group Q	228	x	x	Display (0)	Lin (0)
STO 0 Group Q	229	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group Q	229	x	x	Display (1)	Lin (1)
STO 1 Group Q	230	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group Q	230	x	x	Display (2)	Lin (2)
STO 2 Group Q	231	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group R	232	x	x	Display (0)	Lin (0)
STO 0 Group R	233	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group R	233	x	x	Display (1)	Lin (1)
STO 1 Group R	234	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group R	234	x	x	Display (2)	Lin (2)
STO 2 Group R	235	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group S	236	x	x	Display (0)	Lin (0)
STO 0 Group S	237	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group S	237	x	x	Display (1)	Lin (1)
STO 1 Group S	238	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group S	238	x	x	Display (2)	Lin (2)
STO 2 Group S	239	Value Hi (2)	Value Lo (2)	x	x
STO 0 Group T	240	x	x	Display (0)	Lin (0)



STO 0 Group T	241	Value Hi (0)	Value Lo (0)	x	x
STO 1 Group T	241	x	x	Display(1)	Lin(1)
STO 1 Group T	242	Value Hi (1)	Value Lo (1)	x	x
STO 2 Group T	242	x	x	Display (2)	Lin (2)
STO 2 Group T	243	Value Hi (2)	Value Lo (2)	x	x
RAMP 1	128	x	x	Time Hi (1)	Time Lo (1)
RAMP 1	129	Start Hi (1)	Start Lo (1)	Stop Hi (1)	Stop Lo (1)
RAMP 1	130	Step Hi (1)	Step Lo (1)	Lin (1)	Display (1)
RAMP 1	131	Soak Hi (1)	Soak Lo (1)	x	Mode (1)
RAMP 2	132	x	x	Time Hi (2)	Time Lo (2)
RAMP 2	133	Start Hi (2)	Start Lo (2)	Stop Hi (2)	Stop Lo (2)
RAMP 2	134	Step Hi (2)	Step Lo (2)	Lin (2)	Display (2)
RAMP 2	135	Soak Hi (2)	Soak Lo (2)	x	Mode (2)
X SCALING	136	x	x	LOX Hi	LOX Lo
X SCALING	137	HiX Hi	HiX Lo	Decimal point	Type X
X SCALING	138	Mode X	CHAR 1	CHAR 2	CHAR 3
X SCALING	139	CHAR 4	x	x	x
VARIE	141	x	STO group	x	x
VARIE	248	x	x	Program	Ramp
VARIE	32	Vbat	x	x	x
PROGRAM	244	x	x	From (Prog 1)	to (Prog 1)
PROGRAM	245	From (Prog 2)	to (Prog 2)	From (Prog 3)	to (Prog 3)
PROGRAM	246	From (Prog 4)	to (Prog 4)	From (Prog 5)	to (Prog 5)
PROGRAM	247	From (Prog 6)	to (Prog 6)	From (Prog 7)	to (Prog 7)

display (name).AND.10hex=	0	= Rj int
	10hex	= Rj ext
display (name).AND.8 =	0	= ITS68
	8	= ITS90
display (name).AND.07hex =	0	= 1.9999
	1	= 19.999
	2	= 199.99
	3	= 1999.9
	4	= 19999
display (name).AND.40hex =	0	= °C
	40hex	= °F
display (name).AND.20hex =	0	= IN
	20hex	= OUT
lin (name)	0	= Tc J
	1	= Tc K
	2	= Tc T
	3	= Tc U
	4	= Tc L
	5	= Tc N
	6	= Tc E
	7	= Tc R
	8	= Tc S
	9	= Tc B
	10	= Tc C
	11	= Tc F
	12	= Tc G
	13	= Tc D
	14	= Pt100 (.385)
	15	= Pt100 (.3916 JIS)
	16	= Pt100 (.3910 OIML)
	17	= Ni100
	18	= Ni120
	19	= OHM
	20	= 22 mV
	21	= 100 mV
	22	= 1000 mV



	23	= 10 V
	24	= 20 mA
	25	= X scaling
Lin (name).AND.80hex =	0	= value OK
	80hex	= error
if line (name).AND.80hex = 80hex corresponding "Value Lo"	0	= under
	1	= over
	2	= error 7
	3	= error 2
	4	= error 6
	6	= error 0
if line (name).AND.80hex = 0 value (name) = 2nd complement (16 bit) Value Hi (name).256 + Value Lo (name)		
Mode =	0	= one ramp dual slope
	1	= multi ramp dual slope
	2	= one step one slope
	3	= multi ramp one slope
Type X	0	= 0 - 100 mV
	1	= 0 - 1000 mV
	3	= 4 - 20 mA
	4	= 0 - 400 _
	5	= 1 - 5 V _
	6	= 0 - 10 V
Mode X	0	= linear
	1	= square
STO Group selected	0	= A
	1	= B
	2	= C
	...	= ...
	n (max. 19)	= n (max. T)
Program	0	= Program 1
	1	= Program 2
	...	= ...
	n (max. 7)	= n (max. Program 7)
Ramp	0	= Autoramp 1
	1	= Autoramp 2
	2	= Program
From.....To.....	0	= STO 0 Group A
	1	= STO 1 Group A
	2	= STO 2 Group A
	3	= STO 0 Group B
	...	= ...
	n (max. 59)	= STO n Group n (max. STO 2 Group T)
Volt Vbat		= (Vbat x 2) / 51

CHKSUM (checksum) = DATA1 + DATA2 + DATA3 + DATA4).AND. FF

The above is useful to verify the integrity of transmitted and received data
The minimum time-out of the **MicroCal 10** is 5 seconds.

10.5 Computer request for MicroCal settings

<u>Computer</u>		<u>MicroCal 10</u>	
Tx IDNAME	—	Rx IDNAME	Proceed if name acknowledged If not, do not answer
Rx IDNAME	↔	Tx IDNAME	
Tx Instruction	—	Rx Instruction	
Rx Instruction	↔	Tx Instruction	
Tx DATA 1	—	Rx DATA 1	



Rx char	↔	Tx char
Tx DATA 2	—	Rx DATA 2
Rx char	↔	Tx char
Tx DATA 3	—	Rx DATA 3
Rx char	↔	Tx char
Tx DATA 4	—	Rx DATA 4
Rx char	↔	Tx char
Tx CHKSUM	—	Rx CHKSUM
Rx char	↔	Tx char

The MicroCal 1 receives and verifies CHKSUM; when not valid, it does not accept the transmitted data

Each PC instruction for operative mode request must be followed by the CHECSUM recalculation Instruction 47 (with the pertinent A and B values) as per the table below

<u>Notes</u>	<u>Instr</u>	<u>DATA 1</u>	<u>DATA 2</u>	<u>DATA 3</u>	<u>DATA 4</u>	<u>A</u>	<u>B</u>
Set In	25	Lin (actual)	x	x	x	-----	
Set display	26	Display (actual)	x	x	x	-----	
Set value	27	Value Hi (Out)	Value Lo (Out)	x	x	-----	
Start ramp	28	x	x	x	x	-----	
Start ramp	33	x	x	x	x	-----	
TIME RAMP 1	127	0	2	Time Hi	Time Lo	0	0
START RAMP 1	127	0	4	Start Hi	Start Lo	0	0
STOP RAMP 1	127	0	6	Stop Hi	Stop Lo	0	0
STEP RAMP 1	127	0	8	Step Hi	Step Lo	0	0
Lin/Dis RAMP 1	127	0	10	Lin	Display	0	0
SOAK RAMP 1	127	0	12	Soak Hi	Soak Lo	0	0
MODE RAMP 1	127	0	14	0	Mode	0	0
TIME RAMP 2	127	0	18	Time Hi	Time Lo	0	16
START RAMP 2	127	0	20	Start Hi	Start Lo	0	16
STOP RAMP 2	127	0	22	Stop Hi	Stop Lo	0	16
STEP RAMP 2	127	0	24	Step Hi	Step Lo	0	16
Lin/Dis RAMP 2	127	0	26	Lin	Display	0	16
SOAK RAMP 2	127	0	28	Soak Hi	Soak Lo	0	16
MODE RAMP 2	127	0	30	0	Mode	0	16
LoX	127	0	34	LoX Hi	LoX Hi	0	32
HiX	127	0	36	HiX Lo	HiX Lo	0	32
DP/TYPE	127	0	38	DP	TYPE	0	32
MODE/Char 1	127	0	40	MODE	Char 1	0	32
Char 1/Char 2	127	0	41	Char 1	Char 2	0	32
Char 3/Char 4	127	0	43	Char 3	Char 4	0	32
Dis/Lin STO 0 #A	127	0	146	Display (0)	Lin	0	144
Value STO 0 #A	127	0	148	Value Hi (0)	Value Lo (0)	0	144
Dis/Lin STO1 #A	127	0	150	Display (1)	Lin	0	144
Value STO 1 #A	127	0	152	Value Hi (1)	Value Lo (1)	0	144
Dis/Lin STO 2 #A	127	0	154	Display (2)	Lin	0	144
Value STO 2 #A	127	0	156	Value Hi (2)	Value Lo (2)	0	144
Dis/Lin STO 0 #B	127	0	162	Display (0)	Lin	0	160
Value STO 0 #B	127	0	164	Value Hi (0)	Value Lo (0)	0	160
Dis/Lin STO1 #B	127	0	166	Display (1)	Lin	0	160
Value STO 1 #B	127	0	168	Value Hi (1)	Value Lo (1)	0	160
Dis/Lin STO 2 #B	127	0	170	Display (2)	Lin	0	160



Value	STO 2 #B	127	0	172	Value Hi (2)	Value Lo (2)	0	160
Dis/Lin	STO 0 #C	127	0	178	Display (0)	Lin	0	176
Value	STO 0 #C	127	0	180	Value Hi (0)	Value Lo (0)	0	176
Dis/Lin	STO 1 #C	127	0	182	Display (1)	Lin	0	176
Value	STO 1 #C	127	0	184	Value Hi (1)	Value Lo (1)	0	176
Dis/Lin	STO 2 #C	127	0	186	Display (2)	Lin	0	176
Value	STO 2 #C	127	0	188	Value Hi (2)	Value Lo (2)	0	176
Dis/Lin	STO 0 #D	127	0	194	Display (0)	Lin	0	192
Value	STO 0 #D	127	0	196	Value Hi (0)	Value Lo (0)	0	192
Dis/Lin	STO 1 #D	127	0	198	Display (1)	Lin	0	192
Value	STO 1 #D	127	0	200	Value Hi (1)	Value Lo (1)	0	192
Dis/Lin	STO 2 #D	127	0	202	Display (2)	Lin	0	192
Value	STO 2 #D	127	0	204	Value Hi (2)	Value Lo (2)	0	192
Dis/Lin	STO 0 #E	127	0	210	Display (0)	Lin	0	208
Value	STO 0 #E	127	0	212	Value Hi (0)	Value Lo (0)	0	208
Dis/Lin	STO 1 #E	127	0	214	Display (1)	Lin	0	208
Value	STO 1 #E	127	0	216	Value Hi (1)	Value Lo (1)	0	208
Dis/Lin	STO 2 #E	127	0	218	Display (2)	Lin	0	208
Value	STO 2 #E	127	0	220	Value Hi (2)	Value Lo (2)	0	208
Dis/Lin	STO 0 #F	127	0	226	Display (0)	Lin	0	224
Value	STO 0 #F	127	0	228	Value Hi (0)	Value Lo (0)	0	224
Dis/Lin	STO 1 #F	127	0	230	Display (1)	Lin	0	224
Value	STO 1 #F	127	0	232	Value Hi (1)	Value Lo (1)	0	224
Dis/Lin	STO 2 #F	127	0	234	Display (2)	Lin	0	224
Value	STO 2 #F	127	0	236	Value Hi (2)	Value Lo (2)	0	224
Dis/Lin	STO 0 ##	127	0	242	Display (0)	Lin	0	240
Value	STO 0 ##	127	0	244	Value Hi (0)	Value Lo (0)	0	240
Dis/Lin	STO 1 ##	127	0	246	Display (1)	Lin	0	240
Value	STO 1 ##	127	0	248	Value Hi (1)	Value Lo (1)	0	240
Dis/Lin	STO 2 ##	127	0	250	Display (2)	Lin	0	240
Value	STO 2 ##	127	0	252	Value Hi (2)	Value Lo (2)	0	240
Dis/Lin	STO 0 #H	127	1	2	Display (0)	Lin	1	0
Value	STO 0 #H	127	1	4	Value Hi (0)	Value Lo (0)	1	0
Dis/Lin	STO 1 #H	127	1	6	Display (1)	Lin	1	0
Value	STO 1 #H	127	1	8	Value Hi (1)	Value Lo (1)	1	0
Dis/Lin	STO 2 #H	127	1	10	Display (2)	Lin	1	0
Value	STO 2 #H	127	1	12	Value Hi (2)	Value Lo (2)	1	0
Dis/Lin	STO 0 #I	127	1	18	Display (0)	Lin	1	16
Value	STO 0 #I	127	1	20	Value Hi (0)	Value Lo (0)	1	16
Dis/Lin	STO 1 #I	127	1	22	Display (1)	Lin	1	16
Value	STO 1 #I	127	1	24	Value Hi (1)	Value Lo (1)	1	16
Dis/Lin	STO 2 #I	127	1	26	Display (2)	Lin	1	16
Value	STO 2 #I	127	1	28	Value Hi (2)	Value Lo (2)	1	16
Dis/Lin	STO 0 #J	127	1	34	Display (0)	Lin	1	32
Value	STO 0 #J	127	1	36	Value Hi (0)	Value Lo (0)	1	32
Dis/Lin	STO 1 #J	127	1	38	Display (1)	Lin	1	32
Value	STO 1 #J	127	1	40	Value Hi (1)	Value Lo (1)	1	32
Dis/Lin	STO 2 #J	127	1	42	Display (2)	Lin	1	32
Value	STO 2 #J	127	1	44	Value Hi (2)	Value Lo (2)	1	32
Dis/Lin	STO 0 #K	127	1	50	Display (0)	Lin	1	48
Value	STO 0 #K	127	1	52	Value Hi (0)	Value Lo (0)	1	48
Dis/Lin	STO 1 #K	127	1	54	Display (1)	Lin	1	48
Value	STO 1 #K	127	1	56	Value Hi (1)	Value Lo (1)	1	48
Dis/Lin	STO 2 #K	127	1	58	Display (2)	Lin	1	48
Value	STO 2 #K	127	1	60	Value Hi (2)	Value Lo (2)	1	48



Dis/Lin STO 0 #L	127	1	66	Display (0)	Lin	1	64
Value STO 0 #L	127	1	68	Value Hi (0)	Value Lo (0)	1	64
Dis/Lin STO 1 #L	127	1	70	Display (1)	Lin	1	64
Value STO 1 #L	127	1	72	Value Hi (1)	Value Lo (1)	1	64
Dis/Lin STO 2 #L	127	1	74	Display (2)	Lin	1	64
Value STO 2 #L	127	1	76	Value Hi (2)	Value Lo (2)	1	64
Dis/Lin STO 0 #M	127	1	82	Display (0)	Lin	1	80
Value STO 0 #M	127	1	84	Value Hi (0)	Value Lo (0)	1	80
Dis/Lin STO 1 #M	127	1	86	Display (1)	Lin	1	80
Value STO 1 #M	127	1	88	Value Hi (1)	Value Lo (1)	1	80
Dis/Lin STO 2 #M	127	1	90	Display (2)	Lin	1	80
Value STO 2 #M	127	1	92	Value Hi (2)	Value Lo (2)	1	80
Dis/Lin STO 0 #N	127	1	98	Display (0)	Lin	1	96
Value STO 0 #N	127	1	100	Value Hi (0)	Value Lo (0)	1	96
Dis/Lin STO 1 #N	127	1	102	Display (1)	Lin	1	96
Value STO 1 #N	127	1	104	Value Hi (1)	Value Lo (1)	1	96
Dis/Lin STO 2 #N	127	1	106	Display (2)	Lin	1	96
Value STO 2 #N	127	1	108	Value Hi (2)	Value Lo (2)	1	96
Dis/Lin STO 0 #O	127	1	114	Display (0)	Lin	1	112
Value STO 0 #O	127	1	116	Value Hi (0)	Value Lo (0)	1	112
Dis/Lin STO 1 #O	127	1	118	Display (1)	Lin	1	112
Value STO 1 #O	127	1	120	Value Hi (1)	Value Lo (1)	1	112
Dis/Lin STO 2 #O	127	1	122	Display (2)	Lin	1	112
Value STO 2 #O	127	1	124	Value Hi (2)	Value Lo (2)	1	112
Dis/Lin STO 0 #P	127	1	130	Display (0)	Lin	1	128
Value STO 0 #P	127	1	132	Value Hi (0)	Value Lo (0)	1	128
Dis/Lin STO 1 #P	127	1	134	Display (1)	Lin	1	128
Value STO 1 #P	127	1	136	Value Hi (1)	Value Lo (1)	1	128
Dis/Lin STO 2 #P	127	1	138	Display (2)	Lin	1	128
Value STO 2 #P	127	1	140	Value Hi (2)	Value Lo (2)	1	128
Dis/Lin STO 0 #Q	127	1	146	Display (0)	Lin	1	144
Value STO 0 #Q	127	1	148	Value Hi (0)	Value Lo (0)	1	144
Dis/Lin STO 1 #Q	127	1	150	Display (1)	Lin	1	144
Value STO 1 #Q	127	1	152	Value Hi (1)	Value Lo (1)	1	144
Dis/Lin STO 2 #Q	127	1	154	Display (2)	Lin	1	144
Value STO 2 #Q	127	1	156	Value Hi (2)	Value Lo (2)	1	144
Dis/Lin STO 0 #R	127	1	162	Display (0)	Lin	1	160
Value STO 0 #R	127	1	164	Value Hi (0)	Value Lo (0)	1	160
Dis/Lin STO 1 #R	127	1	166	Display (1)	Lin	1	160
Value STO 1 #R	127	1	168	Value Hi (1)	Value Lo (1)	1	160
Dis/Lin STO 2 #R	127	1	170	Display (2)	Lin	1	160
Value STO 2 #R	127	1	172	Value Hi (2)	Value Lo (2)	1	160
Dis/Lin STO 0 #S	127	1	178	Display (0)	Lin	1	176
Value STO 0 #S	127	1	180	Value Hi (0)	Value Lo (0)	1	176
Dis/Lin STO 1 #S	127	1	182	Display (1)	Lin	1	176
Value STO 1 #S	127	1	184	Value Hi (1)	Value Lo (1)	1	176
Dis/Lin STO 2 #S	127	1	186	Display (2)	Lin	1	176
Value STO 2 #S	127	1	188	Value Hi (2)	Value Lo (2)	1	176
Dis/Lin STO 0 #T	127	1	194	Display (0)	Lin	1	192
Value STO 0 #T	127	1	196	Value Hi (0)	Value Lo (0)	1	192
Dis/Lin STO 1 #T	127	1	198	Display (1)	Lin	1	192
Value STO 1 #T	127	1	200	Value Hi (1)	Value Lo (1)	1	192
Dis/Lin STO 2 #T	127	1	202	Display (2)	Lin	1	192
Value STO 2 #T	127	1	204	Value Hi (2)	Value Lo (2)	1	192



Notes	Instr	DATA 1	DATA 2	DATA 3	DATA 4	A	B
CHKSUM recal.	47	A	B	0	0	-----	
From/To PROG 1	127	1	210	From	To	1	208
From/To PROG 2	127	1	212	From	To	1	208
From/To PROG 3	127	1	214	From	To	1	208
From/To PROG 4	127	1	216	From	To	1	208
From/To PROG 5	127	1	218	From	To	1	208
From/To PROG 6	127	1	220	From	To	1	208
From/To PROG 7	127	1	222	From	To	1	208
PROGRAM	72	PROGRAM	0	0	0	-----	
RAMP	71	RAMP	0	0	0	-----	
SELECT GROUP	74	Group	0	0	0	-----	

The computer must split a 16 bit word into 2 words of 8 bit as follows

Value Hi (....)	Value Lo (....)
Higher 8 bit	Lower 8 bit

CHKSUM = (DATA1 + DATA2 + DATA 3 + DATA 4) .AND.7F

10.6 Communication programs

In this paragraph are illustrated two examples of communication programs between the **MicroCal 10** and an IBM or IBM compatible PC.

Example A: (data transfer from MicroCal 10 to PC)

Set IDNAME=1 and BAUD RATE=9600 on **MicroCal 10** (see 8.8.1). Connect MicroCal 10 through adapter BB530001 (TTL-RS232 converter), to personal computer communication port COM1.

Set MicroCal 10 in mA measurement (IN). Run the program and you will see on the computer screen the actual reading value (once).

Example B: (PC instructions to MicroCal 10)

Set IDNAME=1 and BAUD RATE=9600 on MicroCal 10 (see 8.8.1). Connect **MicroCal 10** through adapter BB530001 (TTL-RS232 converter), to personal computer communication port COM1.

Set the MicroCal 10 for current OUT mode; run the program and MicroCal 10 will be set automatically to 20mA.

Example A:

```

10 CHAR = 0
20 IDNAME = 1
30 INSTRUCTION = 24
35 OPEN "COM1: 9600, N,8,1,CD,CS,DS,RS" FOR RANDOM AS # 1
40 PRINT #1, CHR$(IDNAME); REM TRANSMIT IDNAME TO MICROCAL 10
50 WHILE LOC(1) = 0: WEND: REM WAIT RECEIVING IDNAME FROM MICROCAL 10
60 IDNAME = ASC(INPUT$(1, 1)): REM READ RECEIVED IDNAME FROM MICROCAL 10
70 PRINT #1, CHR$(INSTRUCTION);
80 WHILE LOC(1) = 0: WEND
90 INSTRUCTION = ASC(INPUT$(1, 1))
100 PRINT #1, CHR$(CHAR);
110 WHILE LOC(1) = 0: WEND
120 DATA 1 = ASC(INPUT$(1, 1))
130 PRINT #1, CHR$(CHAR);
140 WHILE LOC(1) = 0: WEND
150 DATA 2 = ASC(INPUT$(1, 1))
160 PRINT #1, CHR$(CHAR);
170 WHILE LOC(1) = 0: WEND
180 DATA 3 = ASC(INPUT$(1, 1))
190 PRINT #1, CHR$(CHAR);
200 WHILE LOC(1) = 0: WEND
210 DATA 4 = ASC(INPUT$(1, 1))
220 PRINT #1, CHR$(CHAR);
2310 WHILE LOC(1) = 0: WEND

```



```
240 CHKSUM = ASC (INPUT$ (1, 1))
250 IF CHKSUM <> ((DATA1 + DATA2 + DATA3 + DATA4) AND &HFF) THEN PRINT "Error": END
260 VALUE = DATA3 * 256 + DATA4
270 IF VALUE > 32767 THEN VALUE =VALUE - 65536: REM 2'S COMPLEMENT
280 PRINT "VALUE: " ; VALUE / 100
290 END
```

Example B:

```
10 CHAR = 0
20 IDNAME = 1
30 INSTRUCTION = 27
40 VALUE = 2000
50 VALUE$ = HEX$ (VALUE)
55 WHILE LEN (VALUE$)<4: VALUE$ ="0"+VALUE$: WEND
60 IF LEN (VALUE$) > 4 THEN VALUE$ =RIGHT$ (VALUE$,4)
65 DATA1 = VAL ("&H" + LEFT$ (VALUE$, 2))
70 DATA2 = VAL ("&H" +RIGHT$ (VALUE$, 2))
75 DATA3 = 0
80 DATA4 = 0
90 CHKSUM = (DATA1 + DATA2 + DATA3 + DATA4) AND &H7F
100 REM MEMORY RELEASE PREVIOUS 4.xx1 (Example 4.000, 4.200) MUST USE
110 REM NEXT LINE INSTEAD LINE 90 OR PROGRAM DOES'NT WORK
120 REM CHKSUM =(DATA1 + DATA2 + DATA3 + DATA4) AND &HFF
130 OPEN "COM1: 9600,N,8,1,CD,CS,DS,RS" FOR RANDOM AS #1
140 PRINT #1, CHR$ (IDNAME) ; : REM TRANSMIT IDNAME TO MICROCAL 10
150 WHILE LOC (1) = 0: WEND: REM WAIT RECEIVING IDNAME FROM MICROCAL 10
160 IDNAME = ASC (INPUT$ (1, 1)): REM READ RECEIVED IDNAME FROM MICROCAL 10
170 PRINT #1, CHR$ (INSTRUCTION) ;
180 WHILE LOC (1) = 0: WEND
190 INSTRUCTION = ASC (INPUT$ (1, 1))
200 PRINT #1, CHR$ (DATA1) ;
210 WHILE LOC (1) = 0: WEND
220 CHAR = ASC (INPUT$ (1, 1))
230 PRINT #1, CHR$ (DATA2) ;
240 WHILE LOC (1) = 0: WEND
250 CHAR = ASC (INPUT$ (1, 1))
260 PRINT #1, CHR$ (DATA3) ;
270 WHILE LOC (1) = 0: WEND
280 CHAR = ASC (INPUT$ (1, 1))
290 PRINT #1, CHR$ (DATA4) ;
300 WHILE LOC (1) = 0: WEND
310 CHAR = ASC (INPUT$ (1, 1))
320 PRINT #1, CHR$ (CHKSUM) ;
330 WHILE LOC (1) = 0: WEND
340 CHAR = ASC (INPUT$ (1, 1))
350 PRINT "Trasmitted."
390 END
```