

5.5.1 How to switch on the cold calibration mode by manual control.

Cold calibration has to be made at a room temperature of +20 to +26°C +/-1°C. Before calibrating the instrument check if the instrument mains frequency is set correct.

How to select the calibration enable mode.

To make it possible to calibrate the instrument it has to be set in the calibration enable mode. This may be done by pressing the switch "CAL" and "RESET"(pencil-point operation) simultaneously and then release the "RESET" switch before releasing the "CAL" switch. Now the instrument is set in the calibration enable mode. In the display CAL appears. Press "SHIFT CHECK 0 ENTER".

Now the instrument is set in the mode "CAL_0" which means calibration cold.

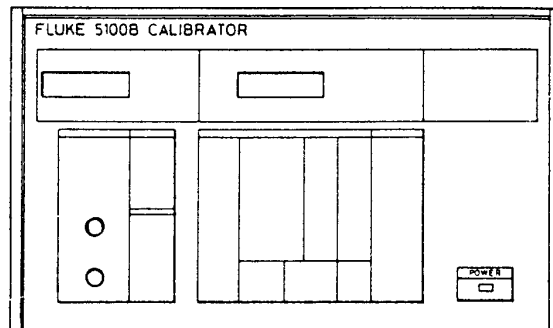
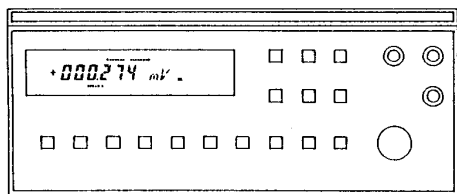
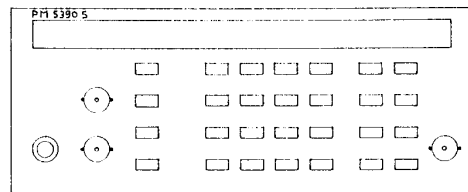
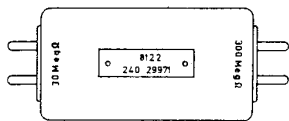
Select the range and function which need to be calibrated.

When the display shows a value followed by "nA" this means, this range cannot be calibrated (not applicable).

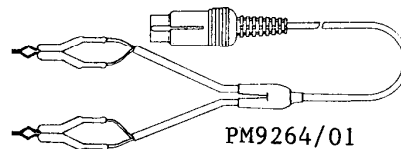
After supplying the signal to the input terminals, start calibration by pressing the "ZERO" key. In a few seconds appears on the display the calibrated value followed by "r", this means, calibration ready. If "FAIL" is shown, the calibration has failed and has to be repeated. Pressing the "RESET" switch or POWER ON/OFF will return to normal measuring.

See also next page: Flowchart for electronic calibration by manual control.

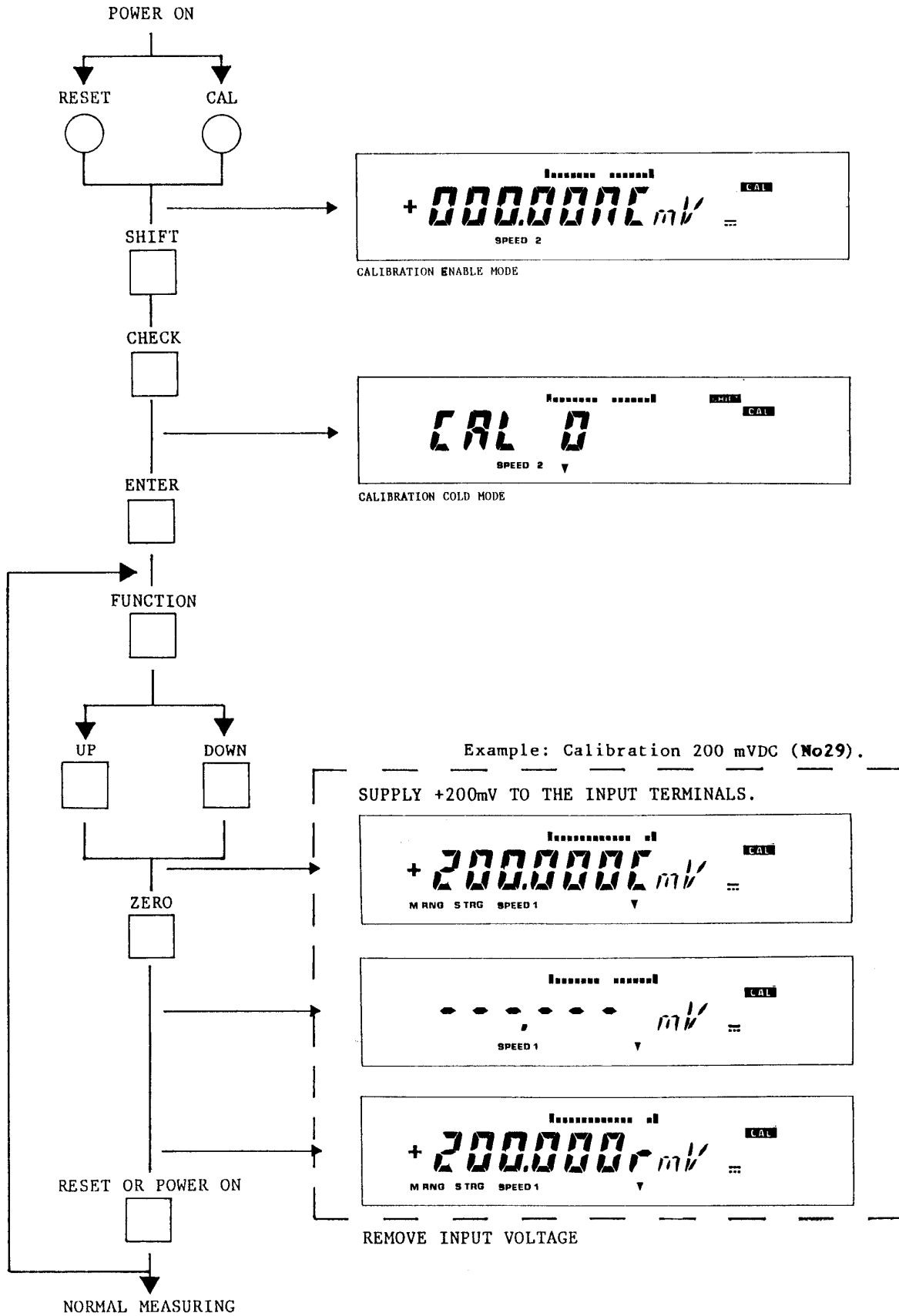
Resistorbox for 30 Mohm calibration.



Resistor for 1µA and 10µA calibration.



Example of instruments and accessories for cold calibration by manual control.



Flow-chart for electronic calibration by manual control

5.5.2 How to switch on the cold calibration mode by computer control

Cold calibration must be made at a temperature of +20 to +26°C
+/- 1°C.

Selecting of range and function must be done by a controller with IEEE-488 interface (IBM compatible e.g. P3100)

When using an PM9181 as IEEE-488 interface for the PM2525, make a help set (see page 5-28) to connect the interface plug and the four wire ohm cable at the same time to the instrument.

Before calibrating the instrument check if the instrument mains frequency is set correct.

To make it possible to calibrate the instrument, it has to be set in the calibration enable mode.

This may be done by pressing the switch "CAL" and "RESET" (pencil-point operation) simultaneously and then release the "RESET" switch before releasing the "CAL" switch.

Now the instrument is set to the calibration enable mode. In the display "CAL" appears.

COMMANDS

CAL_ON,0	select calibration cold
CAL_OFF	switch off the cal mode,back to cal enable *
CAL_OFF (second)	switch off cal enable mode, back to normal measuring.
CAL_?	gives the actual cal mode (eg CAL ON,0 or CAL OFF)

After sending the command "CAL_ON ,0" the instrument is set in the mode calibration cold.

Now select the range and function which need to be calibrated by sending the corresponding commands.

If the display shows a value followed by "nA " this means this range cannot be calibrated (not applicable).

After supplying the signal to the input terminals, send the command "TRC_B,x". This command will start the calibration.

In a few seconds on the display appears the calibrated value followed by "r ", which means calibration ready.

If "FAIL" is shown the calibration has failed and has to be repeated.

Sending the command "CAL_OFF" once, will set the instrument in the calibration enable mode. Sending the command "CAL OFF" the second time, the instrument will disable the calibration enable mode and return to normal measuring.

Page 5-20 shows an example of an calibration set-up.

See also page 5-19: Flow-chart calibration by computer control.

* In the calibration enable mode the display shows processed zero point calibration values for test purposes. Refer to chapter 6.3 Trouble shooting.

5.5.3 How to switch on the hot calibration by manual control

Hot calibration have to be made at a temperature of +33 to +40°C
+/-5°C. The best way is to do this in an oven.

The warming-up time for hot calibration is one hour (instrument in the oven at the correct temperature, power on).

During calibration,keep the door of the oven closed as much as possible, otherwise there is a lot of temperature loss every time the oven will be opened.

Before calibrating the instrument check if the instrument mains frequency is set correct.

To make it possible to calibrate the instrument, it has to be set in the calibration enable mode.
 This may be done by pressing the switch "CAL" and "RESET"(pencil-point operation) simultaneously and then release the "RESET" switch before releasing the "CAL" switch.
 Now the instrument is set in the calibration enable mode. In the display "CAL" appears.

Press "SHIFT CHECK 1 ENTER" and the instrument is set in the mode "CAL 1" which means calibration hot.

Select range and function which need to calibrate, when the display will show a value followed by "nA "this means not applicable.

After supplying the signal to the input terminals press the ZERO key, and calibration is started.

In a few seconds on the display appears the calibrated value followed by "r ", which means calibration ready.

If "FAIL" is shown the calibration has failed and has to be repeated.

Select next function and range and calibrate as above described.

5.5.4 How to switch on the hot calibration by computer control

Hot calibration has to be made at a temperature of +33 to +40°C +/-5°C. The best way is to do this in an oven.

The warming-up time for hot calibration is one hour (instrument in the oven at the correct temperature, power on).

During calibration, keep the door of the oven closed as much as possible, otherwise there is a temperature loss every time the oven will be opened.

Selecting of range and function may be done by controller with a IEEE-488 interface (IBM compatible eg P3100).

When using an PM 9181as IEEE-488 interface for the PM2525, make a help set (see page 5-28) to connect the interfase plug and the 4 wire ohm cable at the same time to the instrument.

Before calibrating the instrument check if the instrument mains frequency is set correct.

To make it possible to calibrate the instrument, it has to be set in the calibration enable mode.

This may be done by pressing the switch "CAL" and "RESET" (pencil-point operation) simultaneously and then release the "RESET" switch before releasing the "CAL" switch.

Now the instrument is set to the calibration enable mode. In the display "CAL" appears.

COMMANDS

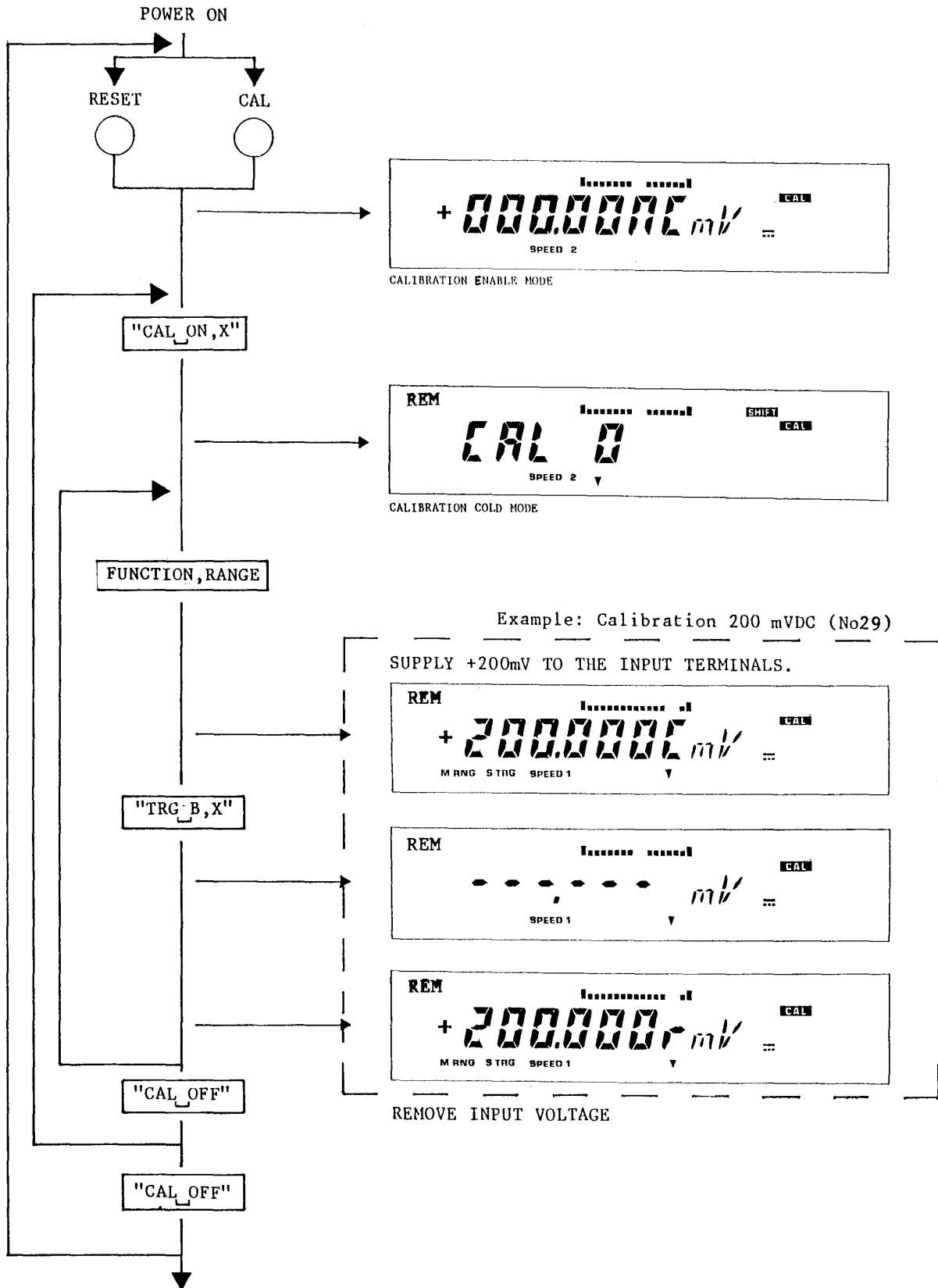
CAL_ON,1	select calibration hot
CAL_OFF	switch off the cal mode,back to cal enable *
CAL_OFF (second)	switch off cal enable mode, back to normal measuring.
CAL_?	gives the actual cal mode (e.g. CAL_0 or CAL_OFF)

After sending the command "CAL_ON,1" the instrument is set in the mode calibration hot.
Now select the range and function which need to be calibrated by sending the corresponding commands.
If the display shows a value followed by "nA " this means this range cannot be calibrated (not applicable).

After supplying the signal to the input terminals, send the command "TRG B,X". This command will start calibration.
In a few seconds appears on the display the calibrated value followed by "r ", which means calibration is OK.
If "FAIL" is shown the calibration has failed and has to be done again.

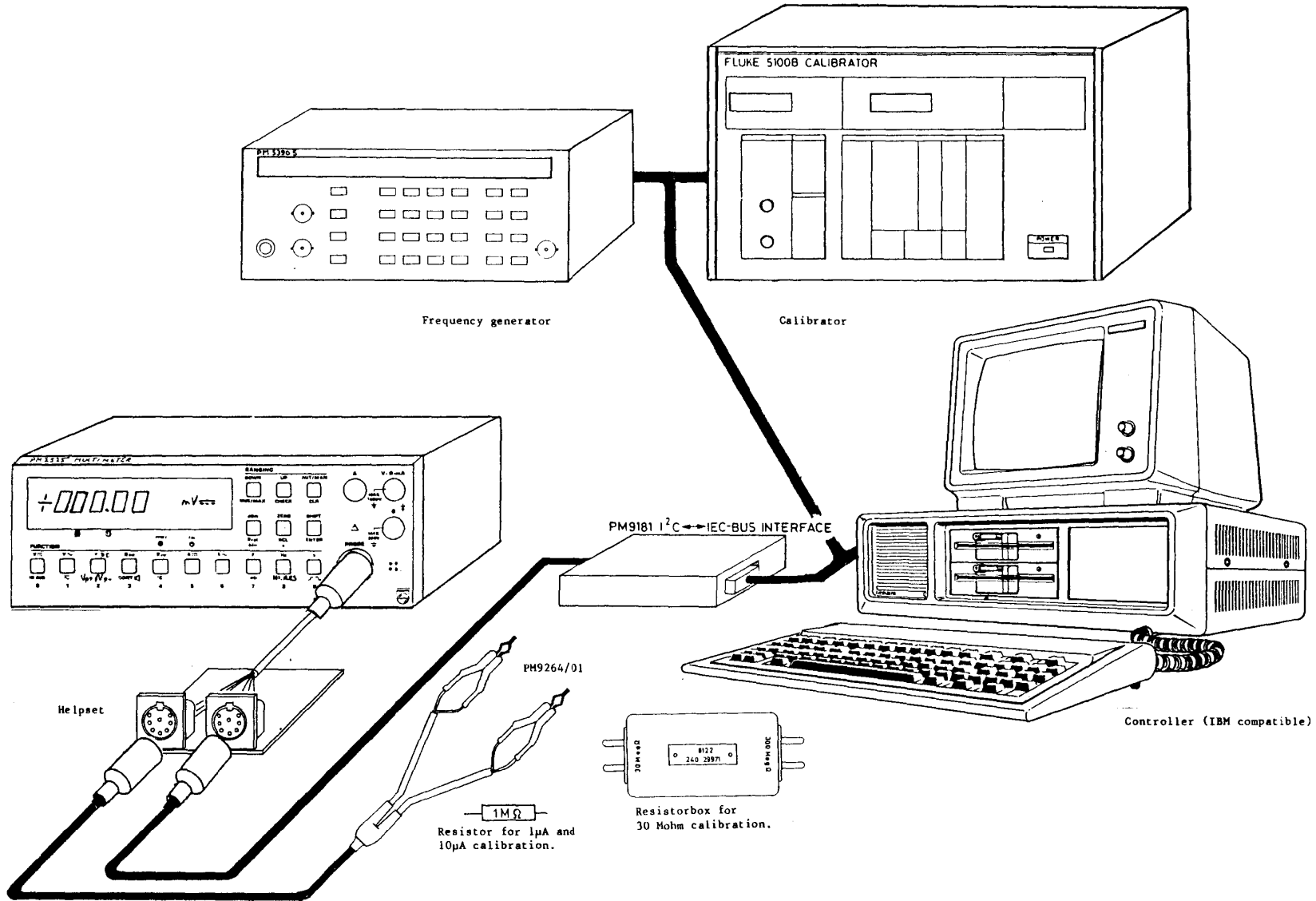
Sending the command "CAL OFF" once, the instrument is set in the calibration enable mode. Sending the command "CAL OFF" the second time, the instrument will disable the calibration enable mode and returns to normal measuring.
See also page 5-19: Flow-chart calibration by computer control.

* In the calibration enable mode the display shows processed zero point calibration values for test purposes. Refer to chapter 6.3 Trouble shooting.



Flow-chart for electronic calibration by computer control

Example of instruments and accesories for cold calibration by computer control



5.5.5 Calibration of the 1 uA and 10 uA ranges

The DC current ranges 1 uA and 10 uA of the FLUKE 5100 B calibrator are not accurate enough to calibrate the PM2525

To calibrate these two uA ranges connect a resistor of 1 M between the HI output of the FLUKE 5100 B en the HI input of the PM2525.

Connect the low output of the FLUKE 5100 B to the LO input of the PM2525.

Use undermentioned table for correct input signals.

No	PREPARATION	CALIBRATING RANGE	OUTPUT SIGNAL 5100 B	INPUT SIGNAL PM2525	DISPLAY AFTER CALIBRATION
11		1 uA		open input	0.000 ruA
20	1 MΩ	1 uA	+ 1 V	1 uA	1.0000 ruA
21	1 MΩ	10 uA	+10 V	10 uA	10.000 ruA

Calibration table for DC uA ranges.

5.5.6 Calibration overviews

5.5.6.1 Cold/Hot calibrations

Adj.No	Adj	Cold	Hot
10	1 MHz f.s.	x	-
11	1 uA DC zero (open)	x	x
12	100 uA DC zero (open)	x	x
13	20 nF zero (open)	x	-
14	200 Ω FW zero	x	x
15	2 k Ω FW 1 k Ω	x	x
16	20 k Ω FW 10 k Ω	x	x
17	TDC 0 Ω	x	x
18	TDC 100 Ω	x	x
19	200 M Ω TW 30 M Ω	x	x
20	1 uADC 1 uA	x	x
21	10 uADC 10 uA	x	x
22	1 ADC 1 A	x	x
23	200 m VDC zero	x	x
24	2 VDC zero	x	x
25	20 VDC zero	x	x
26	200 VDC zero	x	x
27	2 VPU zero	x	x
28	2 VPL zero	x	x
29	200 mVDC 200 mV	x	x
30	2 VDC 2 V	x	x
31	20 VDC 20 V	x	x
32	20 VDC -20 V	x	-
33	2 VPU 2 V	x	x
34	2 VPL -2 V	x	x
35	200 mVAC 200 mV	x	-
36	2-VAC 2 V	x	x
37	20 VAC 20 V	x	-
38	200 k Ω 100 k Ω	x	x
39	2 M Ω 1 M Ω	x	x
40	20 M Ω 10 M Ω	x	x
41	1 mADC 1 mA	x	x
42	100 mADC 100 mA	x	x
43	1 mAAC 1 mA	x	x
44	200 VAC 200 V	x	-
45	2000 VAC 600 V	x	-
46	200 VDC 200 V	x	-
47	2000 VDC 1000 V	x	-

5.5.6.2 Calibration cross-reference of related ranges

Nr.	Function	Range	Cold		Hot	
			Zero scale	Full scale	Zero scale	Full scale
23/29	VDC	200 mV	x	x	x	x
24/30	VDC	2 V	x	x	x	x
25/31	VDC	20 V	x	x	x	x
32	VDC	-20 V	.	x	.	.
26/46	VDC	200 V	x	x	x	.
47	VDC	2000 V	.	x!	.	.
35	VAC	200 mV	.	x	.	.
36	VAC	2 V	.	x	.	x
37	VAC	20 V	.	x	.	.
38	VAC	200 V	.	x	.	.
45	VAC	2000 V	.	x!	.	.
28/34	VPL	2 V	x	x	x	x
2733	VPU	2 V	x	x	x	x

! Input value is not full scale.

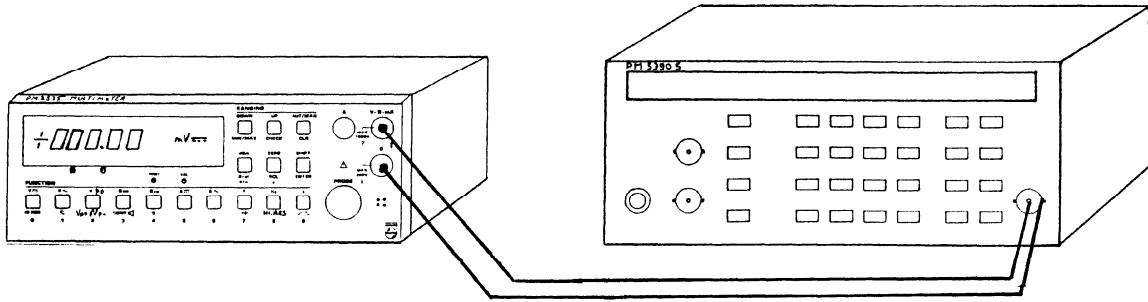
Nr.	Function	Range	Cold		Hot	
			Zero scale	Full scale	Zero scale	Full scale
14	RFW	200 Ω	x	.	x	.
15	RFW	2 k Ω	.	x!	.	x!
16	RFW	20 k Ω	.	x!	.	x!
38	RTW	200 k Ω	.	x!	.	x!
39	RTW	2 M Ω	.	x!	.	x!
40	RTW	20 M Ω	.	x!	.	x!
19	RTW	200 M Ω	.	x!	.	x!
17/18	TDC	-100. +850 $^{\circ}$ C	x	x!	x	x
11/20	IDC	1 uA	x	x	x	x
21	IDC	10 uA	.	x	.	x
12	IDC	100 uA	x	.	x	.
41	IDC	1 mA	.	x	.	x
42	IDC	100 mA	.	x	.	x
22	IDC	1 A	.	x	.	x
43	IAC	1 mA	.	x	.	x
13	CAP	20 nF	x	.	.	.

! Input value is not full scale.

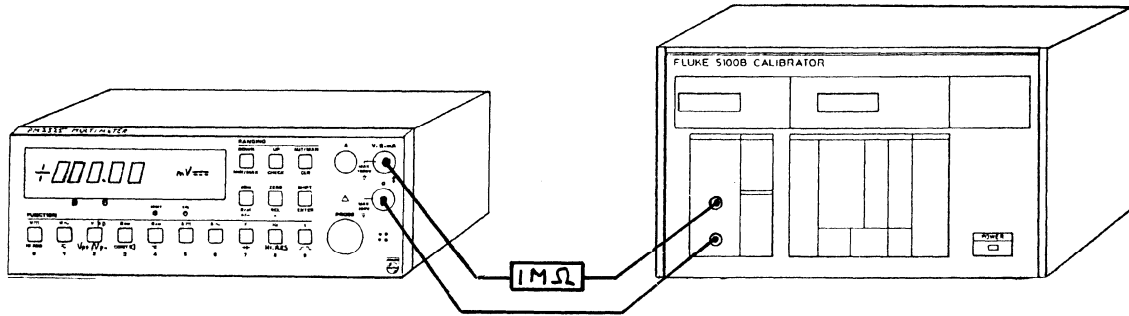
5.5.7 Calibrationtable

Nr.	Function	Range	Input signal	Display before calibration	Display before calibration	Remarks
10*	Hz (only cold)	1 MHz	1 MHz 2 Vpp +/- 2 Hz	1.00000 CMHz	1.00000 rMHz	
11	IDC	1 uA	open input	1.0000 CuA	0.0000 ruA	
12	IDC	100 uA	open input	100.00 CuA	000.00 ruA	
13*	F (only cold)	20 nF	open input	20.000 CnF	00.000 rnF	
14	RFW	200Ω	0Ω	200.00 CΩ	000.00 rΩ	Use 4 wire cable
15	RFW	2 kΩ	1 kΩ +/- 0.04 %	1.0000 CkΩ	1.0000 rkΩ	Use 4 wire cable
16	RFW	20 kΩ	10 kΩ +/- 0.04 %	10.000 CkΩ	10.000 rkΩ	Use 4 wire cable
17	TDCΩ	0	0Ω	000.0 C°C	-246.8 r°C	Use 4 wire cable
18	TDCΩ	100	100Ω +/- 0.1 %	000.0 C°C	000.0 r°C	Use 4 wire cable
19	RTW	200 MΩ	30 MΩ +/- 1.66 %	30.0 CMΩ	30.0 rMΩ	See section 5.5.7
20	IDC	1 uA	1 uA $\overline{\overline{\cdot}}$ +/- 0.03 %	1.0000 CuA	1.0000 ruA	See section 5.5.4
21	IDC	10 uA	10 uA $\overline{\overline{\cdot}}$ +/- 0.03 %	10.000 CuA	10.000 ruA	See section 5.5.4
22	IDC	1 A	1 A $\overline{\overline{\cdot}}$ +/- 0.03 %	1.0000 C A	1.0000 rA	
23	VDC	200 mV	0	200.000 CmV	000.000 rmV	
24	VDC	2 V	0	2.00000 CV	0.00000 rV	
25	VDC	20 V	0	20.0000 CV	00.0000 rV	
26	VDC	200 V	0	200.000 CV	000.000 rV	
27	VPU	2 V	0	2.000 CVP \wedge	0.000 rVP \wedge	
28	VPL	2 V	0	2.000 CVP \sim	0.000 rVP \sim	
29	VDC	200 mV	200 mV $\overline{\overline{\cdot}}$ +/- 0.006 %	200.000 CmV	+200.000 rmV	
30	VDC	2 V	2 V $\overline{\overline{\cdot}}$ +/- 0.006 %	2.00000 CV	+2.00000 rV	
31	VDC	20 V	20 V $\overline{\overline{\cdot}}$	20.0000 CV	+20.0000 rV	

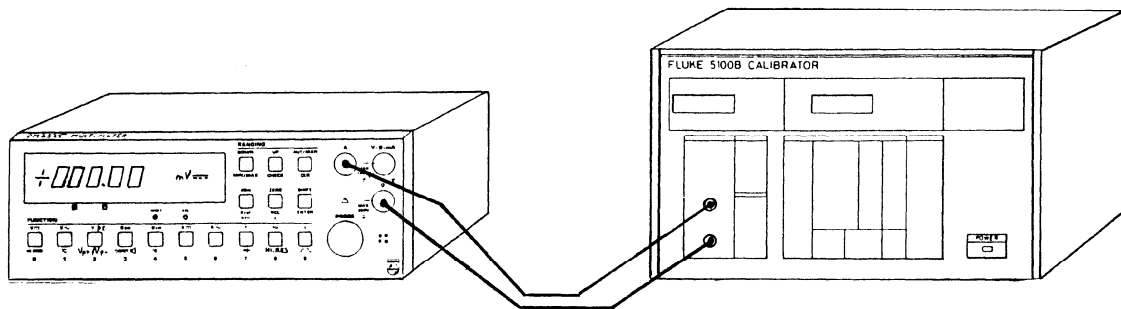
Nr.	Function	Range	Input signal	Display before calibration	Display before calibration	Remarks
32*	VDC (only cold)	20 V	-20 V $\overline{\dots}$ +/- 0.006 %	20.0000 CV	-20.0000 rV	
33	VPU	2 V	2 V $\overline{\dots}$ +/- 0.3 %	2.000 CVP	2.000 rVP	
34	VPL	2 V	-2 V $\overline{\dots}$ +/- 0.3 %	2.000 CVP [~]	2.000 rVP [~]	
35*	VAC (only cold)	200 mV	200 mV 60 Hz +/- 0.08 %	200.00 CmV [~]	200.00 rmV [~]	
36	VAC	2 V	2 V 60 Hz +/- 0.08 %	2.0000 CV [~]	2.0000 rV [~]	
37*	VAC (only cold)	20 V	20 V 60 Hz +/- 0.08 %	20.000 CV [~]	20.000 rV [~]	
38	RTW	200 k Ω	100 k Ω +/- 0.04 %	100.00 Ck Ω	100.00 rk Ω	
39	RTW	2 M Ω	1 M Ω +/- 0.14 %	1.0000 CM Ω	1.0000 rM Ω	
40	RTW	20 M Ω	10 M Ω +/- 0.14 %	10.000 CM Ω	10.000 rM Ω	
41	IDC	1 mA	1 mA $\overline{\dots}$ +/- 0.03 %	1.0000 CmA	1.0000 rmA	
42	IDC	100 mA	100 mA +/- 0.03 %	100.00 CmA	100.00 rmA	
43	IAC	1 mA	1 mA 60 Hz +/- 0.11 %	1.0000 CmA	1.0000 rmA	
44	VAC	200 V	200 V 60 Hz +/- 0.08 %	200.00 CV	200.00 rV	
45*	VAC (only cold)	2000 V	600 V 60 Hz +/- 0.1266	0600.0 CV	0600.0 rV	
46*	VDC (only cold)	200 V	200 V $\overline{\dots}$ +/- 0.006 %	200.000 CV	200.000 rV	
47*	VDC (only cold)	2000 V	1000 V $\overline{\dots}$ +/- 0.008 %	1000.00 CV	1000.00 rV	



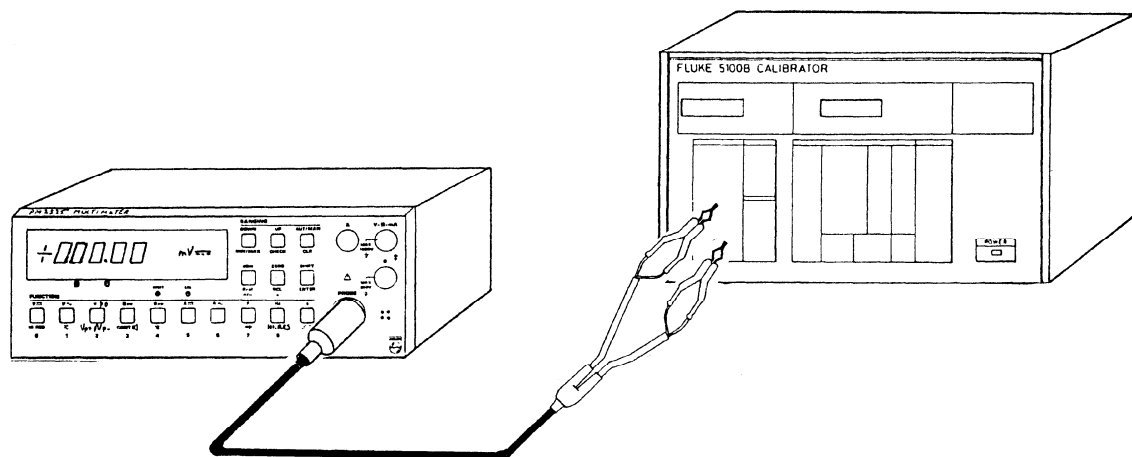
Example of calibration set up for Hz



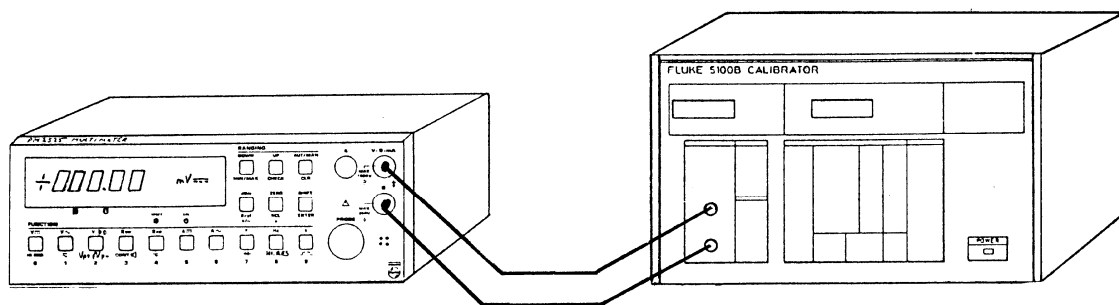
Example of calibration set up for 1 uA DC and 10 uA DC



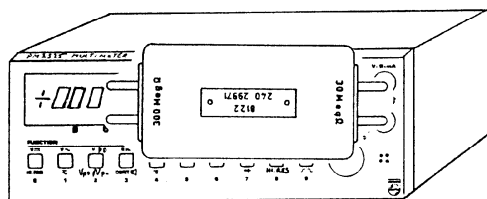
Example of calibration set up for 1 A DC



Example of calibration set up for RFW and TDC



Example of calibration set up for VDC,VP+,VP-,VAC,RTW,IAC and some ranges of IDC



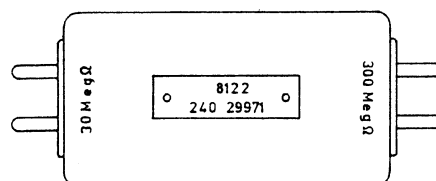
Example of calibration set up for RTW 30 M

5.5.8 Calibration accessories

A resistor box* is available for calibrating the 30 M range of the PM2525.

Characteristics

Accuracy 30 MΩ	:0.04%
Accuracy 300 MΩ	:0.16%
Reference temperature	:+23 +/-1°C
Relative humidity	:20 - 80 %
Recalibration interval	:6 months



Resistorbox for
30 Mohm calibration.

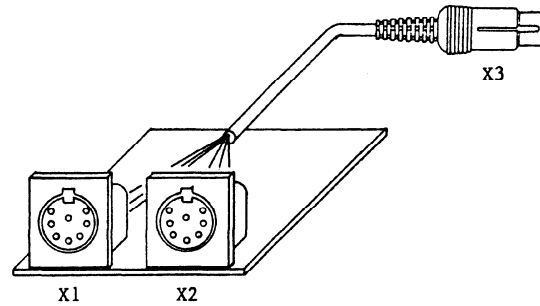
The adjusting resistors to calibrate the resistors box can be attained by removing the cover of it.

NOTE: Connect the resistor box in the correct way (V-Ω pin in the V-Ω terminal). this will eliminate the influence of hancontact etc. on the calibration measurements.

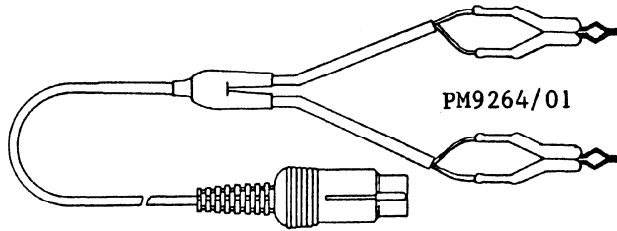
* Available at service T&M, I&E Almelo Holland
ordering number 8122 240 29971

Connections of the help set

pin 1 of X3 to pin 1 of X1 and X2
 pin 2 of X3 to pin 2 of X1 and X2
 pin 3 of X3 to pin 3 of X1 and X2
 pin 4 of X3 to pin 4 of X1 and X2
 pin 5 of X3 to pin 5 of X1 and X2
 pin 6 of X3 to pin 6 of X1 and X2
 pin 7 of X3 to pin 7 of X1 and X2
 pin 8 of X3 to pin 8 of X1 and X2



Helpset



Measuring cable for RFW (Resistance Four Wire) and TDC (Temperature Degree Celcius).

5.6 ADJUSTING THE LIQUID CRYSTAL DISPLAY

The PCF 8576 is a circuit designed to drive a Liquid Crystal Display with up to 160 segments. A 2-line IIC bus structure enables serial data transfer with the microcomputer.

A LCD is a AC device. Therefore, for multiplexing, the information of the segment line is important for each segment that will be driven by thet line.

The reference voltage for the driver is obtained from transistor V 2102 and zener diode V 1201.

To change the viewing angle the reference voltage can be adjusted with potentiometer R 5102.