Nokeval

Manual

Models 2051 and 2251
Scalable frequency indicators

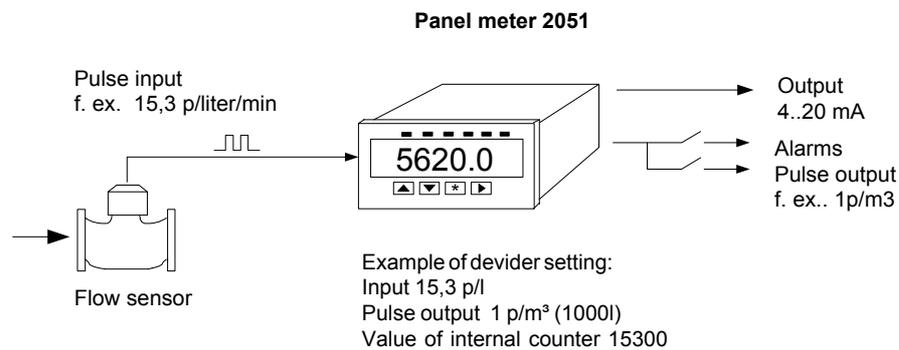# Panel meter 2051

Display:
3600

Power supply

Configuration
▲ ▼

Pulse devider

DAC

Sensor

24V power supply to sensor

Pulse sensors:
NPN-, PNP-transistor
Namur (1..3 mA)
Closing contact or
Pick-up sensor

Input freguency:
Min. 0,0001
Max. 5 kHz

Display:
6 digits, scalable range -99999 ..999999.
Desicimal point freely selectable.

Power supply
85..240 VAC or
12..32 VDC or 24 VAC

Pulse output,
relay contact
Pulse devider setting
via front panel keys

Alarm card, 230V, 2A

Output 0..10 V
or 0/4..20 mA

Serial output
RS232 or RS485

Typical solution

Panel meter 2051

Pulse input
f. ex. 15,3 p/liter/min

Flow sensor

5620.0

Output
4..20 mA

Alarms
Pulse output
f. ex.. 1p/m3

Example of devider setting:
Input 15,3 p/l
Pulse output 1 p/m³ (1000l)
Value of internal counter 15300

General description

Panel meter 2051 is designed for pulse sensors like NPN, PNP, namur , relay contact or pick-up sensors. Input freguency range is 0.0001 Hz..5 kHz. 6-digit digital display is scalable on whole range -99999..999999. Measuring method is counting of time interval between two incoming pulses. Display is updated after each incoming pulse. Input freguency is counted from rising or falling edge of input pulse and is programmable. Meter provides excitation voltage 24 VDC (max. 150 mA) for sensor.

Mother card has two additional slots, one for output signal and one for relay card. Outputs, 0/4..20 mA or 0..10V are isolated from input and power supply. Also serial output cards RS232 and RS485 is available. You may add output afterwards and no calibration is needed. Two alarms, both to set either HI or LO alarm steer optional alarm card with potential free contacts or transistor relays. One alarm relay may be set-up for pulse output f.ex. sending pulse for totalizer when internal counter set value is reached (maximum value 65 534). Meter front cover features rating IP65.

Specifications:

Input freguency:
0.00001..5 kHz
Scalable   range:
-99999..999999
Decimal selection:
0.0001..1
Response time:
1-2 incoming pulses
Measuring method:
Periode of incoming pulses
Accuracy:
0.01 % of span
Sensor:
NPN-, PNP-transistor, Namur, Closing contact
or Pick-up
Pulse voltage level. min 3 V and max. 32V
Pickup: >0,5V
Power supply to sensor:
24 VDC ± 5 %, max. 150 mA
Output(optional):
0..20 mA or 4..20 mA Max. load 1000 ohm.
Galvanic isolation (2500 V, 1min.)
Scaling by front panel keys.
Output card may be added later without calibration.
Alarms:
Into slot B or C.
Two alarm levels selectable by front panel keys
Relay contacts max. 230 VAC, 2A or
semiconductor relays for output pulse >1 hz ,
max. 60V, 0,5 A
Pulse output:
Devider setting range 1..64000
Output pulse periode selectable 1..100 ms
Relay contact max.230V VAC, 2A or semiconductor
relay for output >1 Hz, max 60 V, 05 A.
Serial output:
RS-232 or RS485,

Functions: Only for reading measured values
Addresses: 0-127
Baud rate: 300, 600, 1200, 4800, 9600, 19200
Protocol: Nokeval SCL
General:
6 digits (-99999..+999999)
Digit size 14.5 mm
Red bright LED, brightness selectable
Power supply 85..240 VAC
or 12..32 VDC, 24 VAC
Front panel rating IP65

Optional :
Field enclosure   2000IP65-1   one 2051
                       2000IP65-2   two 2051
                       2000IP65-3   three 2051

How to order:

2051-NPN-OUT1-REL2-24VDC
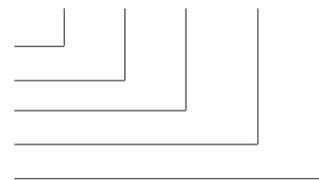Models:
2051 or 2251
Sensor
Output
Relay card
Power supply
12..32 VDC, 24VAC

Optional cards:
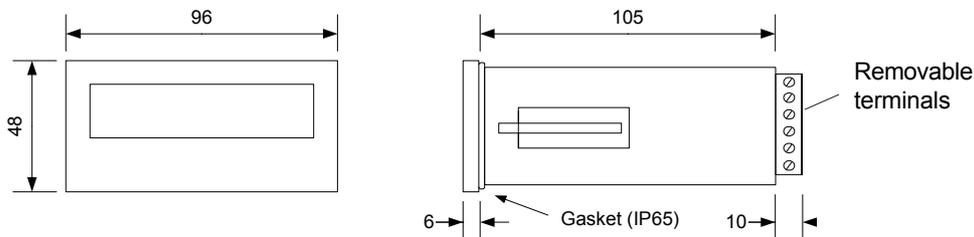Output card   2000-OUT1
Serial output card   2000-RS232/RS485
Relay card (<1Hz)   2000-REL2

Two optional card available on the mother board for
2051 and one for 2251.

The label of meter shows combination of optional
cards, if disparity occurs between label and
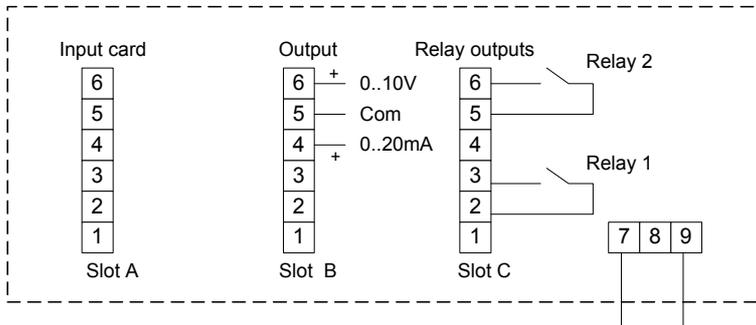manual.

Dimensions:

96

48

Cut out
43,5 x 90.5 mm

Centering taps in corners, R 1.5 mm

105

Removable
terminals

6→

Gasket (IP65)

10→

Meter front cover features
rating IP65 when O-ring
installed between front
cover and panel

Connections:

Slots A-C

Input card		Output		Relay outputs	
6		6	+ 0..10V	6	Relay 2
5		5	Com	5	
4		4	+ 0..20mA	4	
3		3		3	Relay 1
2		2		2	
1		1		1	
Slot A		Slot B		Slot C	

7 8 9

Slot A is always for input cards and slots B and C for optional cards.

Power supply 85..240 VAC or 12..32 VDC, 24 VAC (no polarity)

Factory settings:
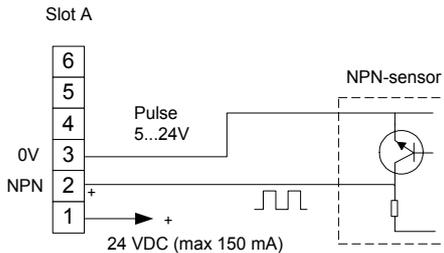Analog output is installed into slot B and relay outputs into slot C.

Relay card ratings:
potential free change-over contacts, max. 230 VAC, 2A (grey connector) or SSR-relay max. 60V, 0,5 A (green connector)
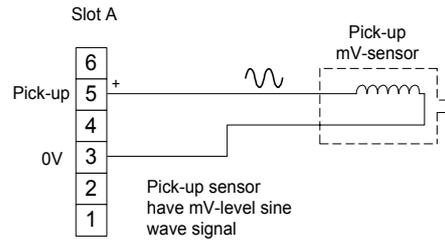
Note:
Check always the type of relay card and power supply before you apply power. If removable connector colour is different from indicated on this manual, the body colour of connector rules the type of card.
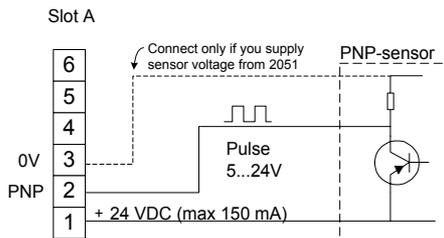

NPN-sensor

Slot A

6	
5	
4	Pulse 5...24V
3	0V
2	NPN +
1	

NPN-sensor

24 VDC (max 150 mA)

Pick-up sensor

Slot A

6	
5	Pick-up +
4	
3	0V
2	
1	

Pick-up mV-sensor

Pick-up sensor have mV-level sine wave signal

PNP-sensor

Slot A

Connect only if you supply sensor voltage from 2051

6	
5	
4	Pulse 5...24V
3	0V
2	PNP
1	+ 24 VDC (max 150 mA)

PNP-sensor

Closing contact

Slot A

Note: In the programming selection will select NPN

6	
5	
4	Pulse 5...24V
3	0
2	Input
1	

Closing Contact

Namur-sensor

Slot A

6	
5	
4	Namur +
3	0V
2	
1	

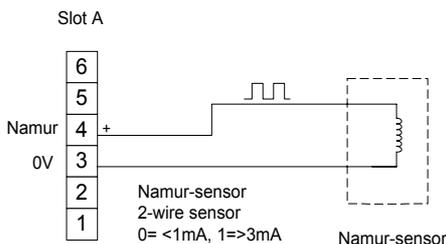Namur-sensor 2-wire sensor
0= <1mA, 1=>3mA
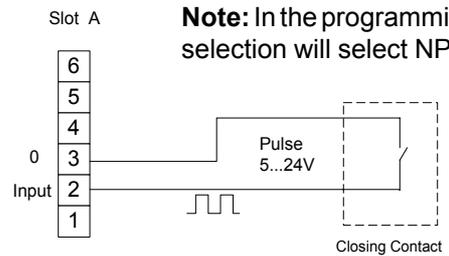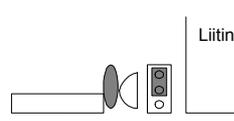
Namur-sensor

Sensor supply voltage selection from input card 2051

Liitin

Sensor supply 24 V Factory default

Sensor supply 12 V max 50 mA

Conf-LED indicates that display is in configuration stage.

LED's A..A4 indicate alarm function. when alarm relays are placed in slot C, LED's A3 ja A4 are in use (default setting). When alarm relays are placed in slot B, LED's A1 and A2.

5620.0

▲ ▼ * ▶

By up- and down-keys you can change display value or move up- and downwards in menu.

.
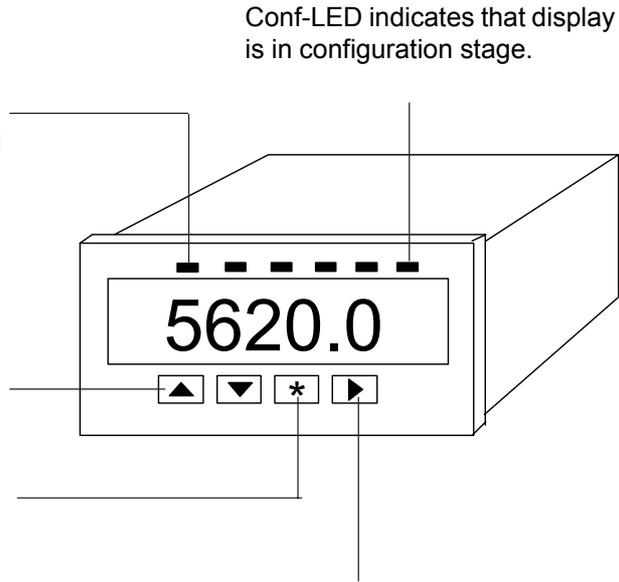
Opening configuration stage:

You can open config. stage by pressing 2 seconds x-key and down-key at the same time. In config.satge you can scale display and output signal and set pulse devider and alarms.

Move numbers from left to right when you change alarms or settings.

Setting of number values:
You set number by arrow-keys up- or downwards number by number. Setting starts from largest number from left to right. Move to next number by right-key. Set decimal point by down-key when display shows zero (0). Acceptance by x-key after selection of last number.

Number setting:

▲
400.00
↳

▲ ▼ | * |
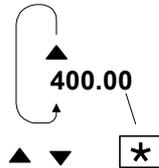
Numbers   You accept setting by
0...9   x-key after selection
          of last number

→ ▶   Move to next
           number
400.00

▼
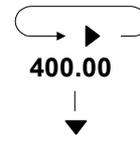
You select comma by
down-key when zero is
selected in display

Display Filter (damping)
This function stabilies display value when wide measuring range is used. It is recommended if range is over 5000. Some times when working in sensors maximum limits, it may become unstabile, this feature helps to stabilize it again. Filter is mathematical and therefore it doesn't affect to measuring accuracy.

Filter value can be set between 1 (min) ..0.010 (max).

1.000 = no filter
0.200 = normal filter
e.g. 0.2 =1/5 of one new measure
ment and 4/5 of old measurement or
0,1 = (1/10) of new + 9/10 of old
value (slower).

Configuration

In configuration stage you can select sensors, outputs, alarms and set scalings. You enter config.stage by pressing 2 seconds ★-key and ▲-key at the same time. Display shows text Fin. Move by arrow keys ▲ and ▼ in main manu. By I-key you move to setting stage and also return to main menu. When you have done all settings mov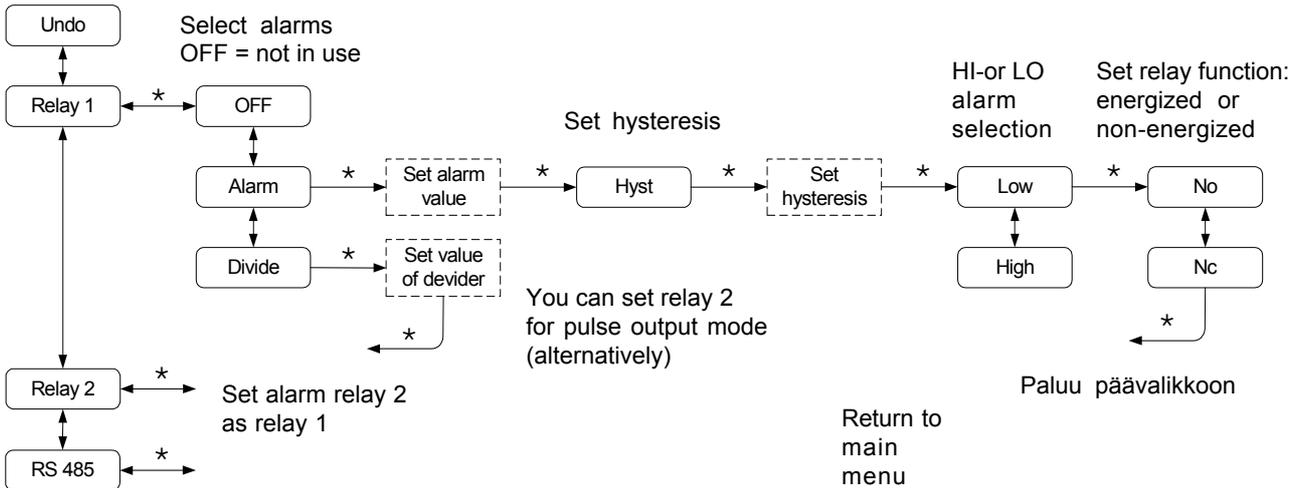e foward by down-key until display shows text Save and accept by ★-key. If you like to cancel settings move forward until display shows Undo and accept by ★-key.

Main menu

Menu		Description
F in ←★→		Maximum input frequency that is coming in (Hz) , *(f.ex. 200 Hz)*
Disp ←★→		Setting for display that is shown when maximum input frequensy is reached. *(Same input scaling works with the input channel 2 on meter 2800-2051)*
Zero ←★→		Offset setting for zero point.
F in2 ←★→		**Setting only in model 2251**. Maximum input frequency (Hz) on channel 2 (B).
Dif OP ←★→	Sub Div	**Setting only in model 2251.** Is display showing difference or ratio. **Sub** = channel A-B difference **Div** = channel A/B ratio
Filter ←★→		Digital filter settings (damping). Look specifically: Display digital filtering
Dec ←★→		Desimal number selection.
Sensor ←★→	NPN (=contact) PNP Namur Pickup	Selection of the sensor type: NPN, PNP, Namur ja Pickup (Select NPN if used colsing contact and include jumpper for removing the contact vibration: see connections page)
Sens 2 ←★→		**Setting only in model 2251.** Sensor type selection on channel 2 (B): NPN, PNP, Namur ja Pickup. (Closing contact select NPN)
Edge ←★→	Rising Fallin	Input pulse counting: **Rising** = rising edge of the pulse (default) **Fallin** = falling edge of the pulse
Baudr ←★→	300...19200	Baudrate selection for serial connection: 300, 600, 1200, 2400, 4800, 9600 tai 19200
Addres ←★→	0...127	Serial address selection: 0...127
Slot B ←★→		External slots **Slot B** and **Slot C** is meant for optional- cards. (alarmrelay-, analog output- or serial output -cards). On meter 2251 input card 2 is attached on **Slot B** and optional- cards to the **slot C**: Optinal card settings are displayed on the next page.
Slot C ←★→		
Save ←★→		Saves the settings and leaves from programming state with ★- button.
Undo ←★→		Chancels settings and leaves from programming state with ★- button.

Setting of alarms and pulse output

Two alarms, both to be set either Hi or Lo alarm steer relays 1 and 2. Indicating LED's on front panel. Alternatively one relay may be set-up for pulse output where incoming pulses are devided with wished number (Devider=dMdE).

If devider value is one max. frequency of incoming pulses is 2 Hz (devider should be always >1) Largest devider value is 64000.
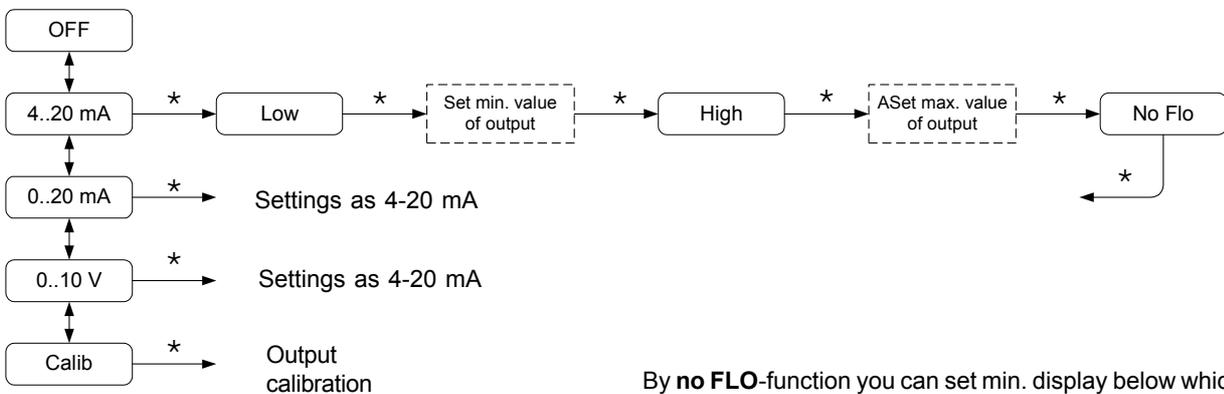
Slot B or C from main menu

Select alarms
OFF = not in use

Set hysteresis

HI-or LO alarm selection

Set relay function: energized or non-energized

```
Undo

Relay 1  ──*──►  OFF
                  ↕
                 Alarm  ──*──►  Set alarm     ──*──►  Hyst  ──*──►  Set        ──*──►  Low   ──*──►  No
                                value                                hysteresis          ↕              ↕
                  ↕                                                                       High          Nc
                 Divide ──*──►  Set value                                                               ↑
                                of devider                                                             └─*
                                  ↑
                                  └─────────*

Relay 2  ──*──►  Set alarm relay 2
                 as relay 1

RS 485   ──*──►
```

You can set relay 2 for pulse output mode (alternatively)

Return to main menu

Paluu päävalikkoon

Choose and scaling of output

Select first display corresponding min. value f.ex. 0.0=4 mA and then display corresponding max. value, f.ex. 100.0=20 mA. Calibration of output can be done in stage Calib. Output card is always delivered calibrated and no recalibrating is needed when installed to meter.

Slot B or C from main menu

```
OFF
 ↕
4..20 mA ──*──►  Low  ──*──►  Set min. value  ──*──►  High  ──*──►  ASet max. value  ──*──►  No Flo
 ↕                            of output                             of output                  ↑
0..20 mA ──*──►  Settings as 4-20 mA                                                          └─*
 ↕
0..10 V  ──*──►  Settings as 4-20 mA
 ↕
Calib    ──*──►  Output
                 calibration
```

By **no FLO**-function you can set min. display below which output drops to zero (or to 4 mA). This method fastens updating of output when incoming pulses have stopped.
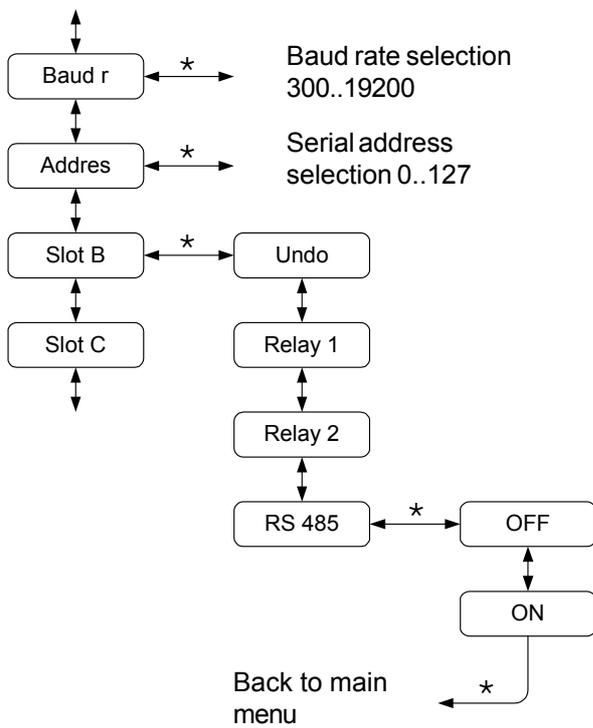
Serial output RS-485/RS-232 (option)

Meter may be provided with optional serial output and you can read measurements by e.g. PC. Display programming can not be made via serial port. Additional card provides serial signal RS-232 and RS-485, only one of those can be selected.

Serial signal is isolated from both input signal and power supply. Meters with RS-485 can be max. 31 in same loop and longest distance 1000m. RS-232 enables only connection of two devices and max. distance 10..20 m.

In programming stage you can first select card type (serial) mounted to slot B or C and then address and Baud rate. Baud rates are: 300, 1200, 2400, 4800, 9600, 19200 and addresses 0-127.

Accept selection and move forward by ★-key. You come back to previous level always by ★-key.

Program remembers card type mounted, if it has been saved by save command when leaving program. In case you can not choose serial card, slot has automatically recognized card (plug and play).

Main menu

Baud r	★	Baud rate selection 300..19200
Addres	★	Serial address selection 0..127
Slot B	★	Undo
Slot C		Relay 1
		Relay 2
		RS 485 ★ OFF — Serial signal not used
		ON — Serial signal card installed slot B

Back to main menu ★

Terminal connections:

Input	Serial output	
6	6	A RS-485
5	5	B
4	4	
3	3	TxD
2	2	Com
1	1	RxD
Card slot A	Card slot B or C	
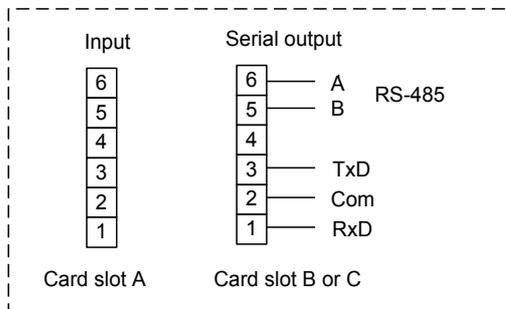
By serial signal RS-485 last unit must be terminated by 110 ohm resistor. you can make termination at terminal connectors or by connecting jumper J1 to ON-position.

Serial card

2000-RS

on off
Term Fs
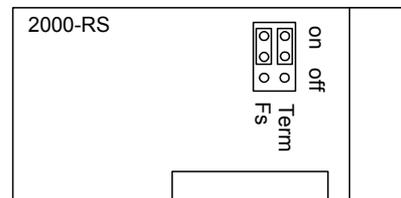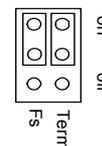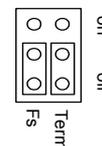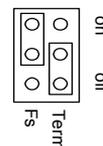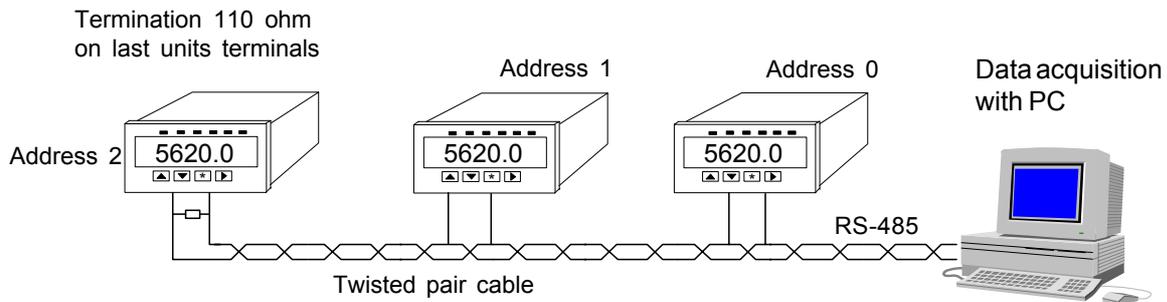
RS232   RS485
               channel's middle unit
               (Factory settings)   RS485
                                            channel's last unit

on off   on off   on off
Fs Term   Fs Term   Fs Term

Termination 110 ohm on last units terminals — Address 2 — 5620.0 — Address 1 — 5620.0 — Address 0 — 5620.0 — Data acquisition with PC — RS-485 — Twisted pair cable

Serial communication

Baudrate: 300, 1200, 2400, 4800, 9600 and 19200
1 Start, 8 Data and 1 Stop bit, no parity.

Serial protocol (SCL):

MESSAGES: When asking the measurement data from the panelmeter 2051 through the serial port, a command sequence which is in accordance with the SCL protocol is used for the inquiry:
(Only the measurement results can be asked from the panelmeter 2051)

<ADDR+80h>COMMAND STRING<ETX><BCC>

<ADDR>
The first byte character to be sent contains the ADDR (0..127) of the address of the destination device and at the same time functions as the start bit of the command. 80H (in a decimal 128) with which an uppermost bit is set as the number one is added to the address.

COMMAND STRING: When measurement data is requested, the actual command is: MEA CH 1 ? , in which 1 means the channel number. (there is only one channel in the panelmeter 2051 so the number is always 1).

<ETX>
<ETX> mean the end mark of the command, ASCII character 03h.

<BCC>
Finally the checksum is calculated using the XOR operation on the byte characters of the actual command including the ETX. In the example the ASCII codes have been presented in hexadecimal.

e.g.
One wants the measurement result from the display unit address 1. To the channel an inquiry is sent: MEA CH 1 ? (ASCII codes shown for <BCC> calculation)

M E A   C H   1   ?<ETX> <BCC>
4Dx45x41x20x43x48x20x31x20x3F x03   = 6F

(Presented the XOR operation with a character x)
(ASCII code 20h corresponds to space character)

So the following bytes are sent to 2051:
81 4D 45 41 20 43 48 20 31 20 3F 03 6F

RETURN MESSAGE: The answer from the panelmeter 2051 is obtained in the following format:

<ACK>RETURN MESSAGE<ETX><BCC>

<ACK>
The first byte of the answer contains the start of the answer <ACK> (ASCII-code 06h) and the answer itself, endmark <ETX> (ASCII- 03h) and the checksum of the answer which is calculated from all the byte characters of the answer including <ACK> and <ETX>. 2051 counts the checksum in which case the receiver does not need necessarily to care about it,
e.g.
e.g. When a measurement result is for example 21.3, it will be obtained from the panelmeter in the following form

      <ACK> 2   1   .   3 <ETX> <BCC>
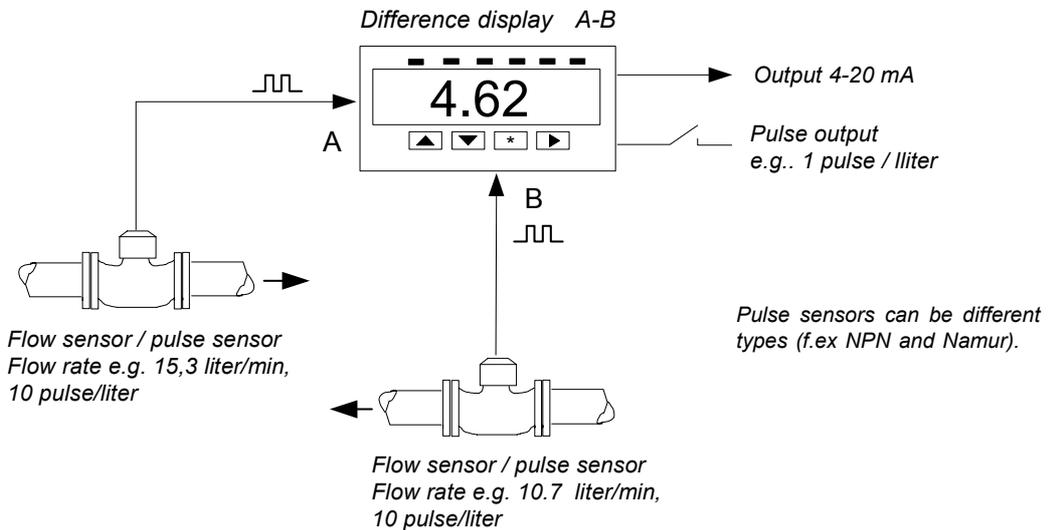Answer: 06   32   31 2E   33   03   1B

Frequency differrence- or ratio display 2251

Panelmeter 2051 can be change to frequency differ-ence display including second input card in to the meter on slot B (card 2251-PU). Inputchannel differ-ence is shown in the display (A-B). Boht channels can be scaled differently (Fin ja Fin2). Only one outputcard is possible to attach on this model: alarm-, analog output- or serial outputcard. One channel model can obtain two optional cards.
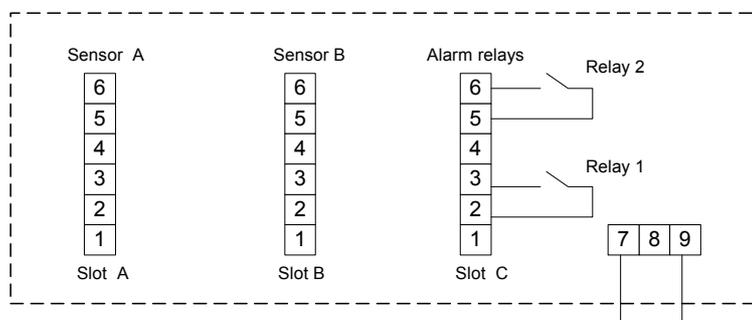
Settings for difference display, look at the main menu on page 6

F in	**Channel A** inputfrequency / Hz *f.ex 200 Hz*
F in2	**Channel B** inputfrequency / Hz *f.ex 100 Hz*
Dif OP	Selection wich is shown in display, channel A and B difference or ratio (A/B).
Disp	Scaling for input frequencies that are shown in the display *f.ex channel A 200 Hz correspond in dis-play 5000, and the same time channel B 100 Hz correspond 5000 in the display.*
Sensor	Channel A sensor type selection
Sens 2	Channel B sensor type selection

Typical application for flow measurement

Difference display   A-B

4.62

A

B

Output 4-20 mA

Pulse output
e.g.. 1 pulse / lliter

*Flow sensor / pulse sensor
Flow rate e.g. 15,3 liter/min,
10 pulse/liter*

*Flow sensor / pulse sensor
Flow rate e.g. 10.7 liter/min,
10 pulse/liter*

*Pulse sensors can be different
types (f.ex NPN and Namur).*

Card slots in model 2251:

Sensor A   Sensor B   Alarm relays

6	6	6
5	5	5
4	4	4
3	3	3
2	2	2
1	1	1

Slot A   Slot B   Slot C

Relay 2

Relay 1

7 8 9

Outputcard or relaycard is installed on slot C.

Alarm card can be used relay card 2000-REL2 (contacts) below 1 Hz frequencies or 2000-I/O card when output frequency must exceed over 1 Hz.

Inspect from the sticker on top of the electronichs what combination your model is compiled.

Card slot A and B is meaned for sensor input cardsand card slot C is for optional cards (model 2251)
Input card type symbols:
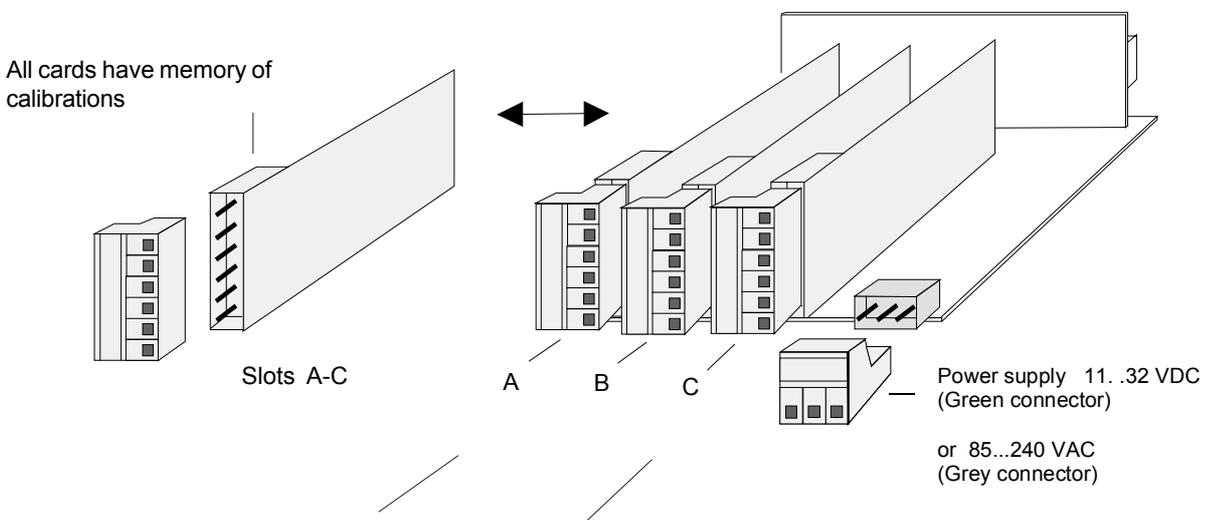Slot A = 2051-PU, input on channel A
Slot B = 2251-PU, input on channel B

Käyttöjännite
85..240 VAC tai
12..32 VDC, 24 VAC
(Ei napaisuutta)

Boht channels are wired exactly the same as channel A, see more information on page 5.

Construction of panelmeter 2000

The 2000 series panelmeters are modular and easy to be assembled. According to customers wishes. The basic construction consists of mother board wth tree slots, A, B and C. Slot A determs meter type and prodides always input signal. Slot B and C are interchangeable. As factory delivery input signal is always installed into slot A , mA output into slot B and alarms into slot C. In case of f.ex 4 alarms and relay card with 2 change-over contact (2 + 2 relays) are used, you must place second relay card into slot B. If you accept only closing or opening relay contacts, you need only one relay card with 4 relays placed into slot C. The slot B is now usable for other optional outputs. You can have different types of meters by only changing the input card in slot A. Data sheet of each type of meter dictates the possible combinations. Recalibration of card is not needed; only scaling and other settings must be set by front panel keys.

All cards have memory of calibrations

Slots A-C

A   B   C

Power supply   11. .32 VDC
(Green connector)

or 85...240 VAC
(Grey connector)

Change of meter type:
Input card is placed always to slot A. By changing input card you can get an other type of meter. You can change meter with pulse input to meter with current input, thermocouple, strain gage etc.

Additional slots:
Additional cards provide output 4..20 mA, alarms, serial interface, BCD output etc. Meter data sheet dictates possible combinations. grey connectors allow line voltage 110...230 VAC (relay contacts).

Power supply:
There are two different mother boards power supply 85..230VAC and 12...32 VDC. VDC-mother board accepts 24 VAC. Connectors are colour coded.

Removal of meter from case:

Loose connectors and fastening screw beside power connector. Loose front panel and draw meter out from front. You may remove mother board from rear by opening four screws in corners of case
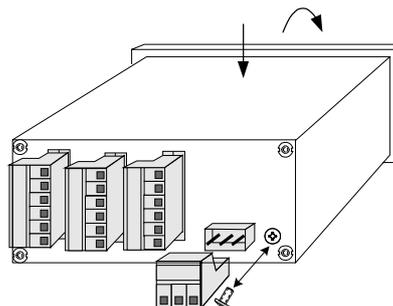
Press gently case behind front panel and draw frame outwards gripping upper part of frame.