SYSTEM 21 ANALOG INPUT

PM2140

1. GENERAL

The PM2140 is an analog input unit for System 21. It provides the following features:
- A three range voltage input.
- Separate single range current input.
- Programmable High- and Low limit relais.
- Two measuring modes: slow and fast.
- Programmable hardware filter for extra SMR.

2. TECHNICAL DATA

2.1 Unit Characteristics

Supply voltage 7.5 to 16 Vdc
Supply current <100 mA
User I/O terminal Type F161 female, 37 contacts, dimensions according to
MIL-C-24308.

PHILIPS

2.2 INPUTS

2.2.1 *Voltage input*

Ranges	200 mVdc, 2 Vdc, 20 Vdc
Max. measuring voltage	25 V in 20 V range
Overload indication at	25000 digits (mode 0) and
	2500 digits (mode 1)
Resolution	mode 0 : $10 \mu V$ in 200 mV range
	mode 1 : $100 \mu V$ in 200 mV range
Number of representation	mode 0 : 25000
units	mode 1 : 2500
Accuracy	$\pm 0.1\%$ of reading
	$\pm 0.02\%$ of range
Temperature coefficient	2 V, 20 V ranges : $\pm 0.005\%/°C$
	200 mV range : $\pm 0.01\%/°C$
Input impedance	200 mV range : 1 Mohm $\pm 1\%$
	2 V, 20 V ranges : 10 Mohm $\pm 1\%$
Series mode rejection	mode 0, filter off :
ratio at 50/60Hz 1%	200 mV range : > 40 dB
	2 V, 20 V ranges : > 50 dB
	mode 1, filter off:
	200 mV range : > 30 dB
	2 V, 20 V ranges : > 40 dB
Extra SMRR with filter on	$+ 20$ dB
Common mode rejection	100 dB for dc signals
ratio	80 dB for ac signals 50/60 Hz
Maximum common mode voltage	40 Vdc or peak ac
Integration time	mode 0 : 580 ms
	mode 1 : 60 ms
Input settling time	filter off : < 75 ms within 0.04%
	< 150 ms within 0.004%
	filter on : < 550 ms within 0.04%
	< 700 ms within 0.004%
Zeroing	automatic
Maximum voltage between	High and Low : 30 Vac or 42 Vdc
	(testvoltage 250 Vrms)
	High and Earth : 30 Vac or 42 Vdc
	Low and Earth : 30 Vac or 42 Vdc

2.2.2 Current Input

Range	200 mAdc
Maximum measuring current	250 mAdc
Resolution	mode 0 : 10 μA
	mode 1 : 100 μA
Number of representation	mode 0 : 25000
units	mode 1 : 2500
Accuracy	$\pm$0.25% of reading
	$\pm$0.05% of range
Temperature coefficient	$\pm$0.05%/°C
Voltage drop across shunt	200 mV for 200 mA
Integration time	mode 0 : 580 ms
	mode 1 : 60 ms
Input settling time	filter off: < 75 ms within 0.04%
	< 100 ms within 0.004%
	filter on: < 350 ms within 0.04%
	< 450 ms within 0.004%
Maximum overload current	1.5 A continuously
	10 A repetitive peak
	35 A surge (t < 10 ms)

2.3 LIMIT RELAYS

|	
Limit relays	1 Low limit relay, 1 high limit relay
Setting range	−25000 ... +25000 digits in mode 0
	−2500...+2500 digits in mode 1
Maximum switch power	10 W
Maximum switch voltage	30 Vac or 42 Vdc
Maximum switch current	500 mAdc or 500 mAac rms
Contact resistance	<100 mΩ

2.4 TIMING

Reaction time from trigger to data available	mode 0 : < 600 ms
	mode 1 : < 100 ms
Number of measurements per second internally (without read-out)	mode 0 : 1,6
	mode 1 : 10

2.5 GENERAL

Storage temperature	−40...+75°C
Operating temperature	−10...+55°C
Reference temperature	23°C $\pm$2°C

3. ADDRESS SETTING
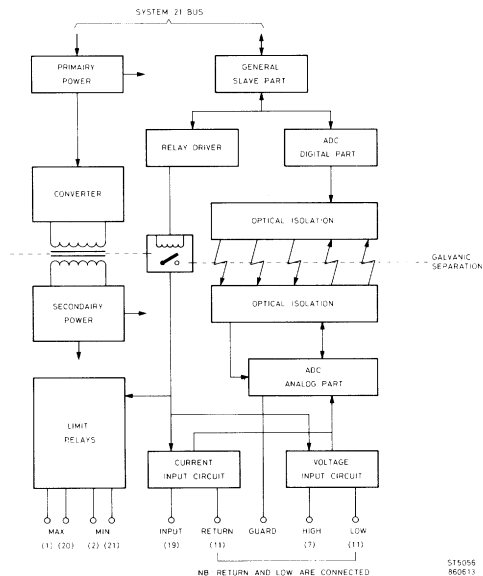

ADDRESS

40

FLAT BLADE 3x1mm
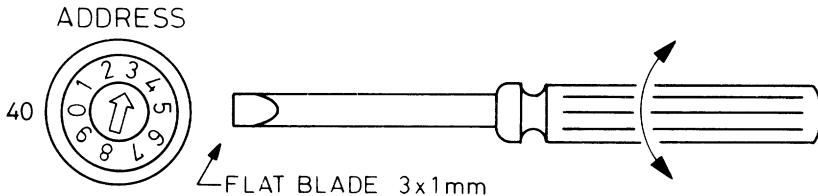
EXAMPLE : THE SELECTED ADDRESS IS 403.

ST5055

4. FUNCTIONAL DESCRIPTION

A voltage or current to be measured is supplied to the corresponding input circuit (see the functional diagram below). Via the analog ADC, the galvanic separation and the digital ADC, the signal is supplied via the general slave part to the System 21 bus. It is possible to set limit values. If the high limit value for input voltage or current is exceeded, the high limit relay is closed. If the input decreases below the low limit, the low limit relay is closed. The supply voltages for the secondary part are made by a converter. This convertor is supplied by the System 21 internal power line.

SYSTEM 21 BUS

PRIMAIRY POWER

GENERAL SLAVE PART

RELAY DRIVER

ADC DIGITAL PART

CONVERTER

OPTICAL ISOLATION

GALVANIC SEPARATION

SECONDAIRY POWER

OPTICAL ISOLATION

ADC ANALOG PART

LIMIT RELAYS

CURRENT INPUT CIRCUIT

VOLTAGE INPUT CIRCUIT

MAX   MIN   INPUT   RETURN   GUARD   HIGH   LOW
(1) (20) (2) (21)   (19)   (11)   (7)   (11)

NB RETURN AND LOW ARE CONNECTED

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5. PROGRAMMING

5.1 Mode programming

MODE 0: Slow measuring mode

> 600 ms measurement time

> 25000 points resolution

Syntax: [M0,] <commands>

> Output formats: (Full format)

FNC 0 : VDC $\pm$ 250.00E-3   FNC 2 : VDC $\pm$ 25.000E+0

FNC 1 : VDC $\pm$ 2.5000E+0   FNC 3 : IDC $\pm$ 250.00E-3

At overload the numeric field shows 99999E+9, however function, sign and decimal point indication remain.

MODE 1: Fast measuring mode

> 100 ms measurement time

> 2500 points resolution

Syntax: [M1,] <commands>

> Output formats: (full format)

FNC 0 : VDC $\pm$ 250.0E-3   FNC 2 : VDC $\pm$ 25.00E+0

FNC 1 : VDC $\pm$ 2.500E+0   FNC 3 : IDC $\pm$ 250.0E-3

At overload the numeric field shows 9999E+9, however function, sign and decimal point indication remain.

After mode setting the following defaults are valid:

M0: Filter on   M1: Filter off
    Limits off   Limits off

5.2 COMMANDS (for both modes)

Function selection

Code	Description	Output
FNC 0 FNC 1 FNC 2 FNC 3 FNC ?	Vdc 200 mV Vdc 2 V Vdc 20 V Idc 200 mA Request for the current function setting	* * * * FNC 0 or 1 or 2 or 3 depending on the above selection

Limit setting

Code	Description	Output
LMH <value> LML <value> LIM ON LIM OFF LMH ? LML ? LIM ?	Setting of high limit Setting of low limit Limit function on Limit function off Request for high limit value Request for low limit value Request for limit status	* * * * LMH ± <value> LML ± <value> LIM ON or LIM OFF

Filter setting

Code	Description	Output
FIL ON FIL OFF FIL ?	Filter is switched on Filter is switched off Request for filter status	* * FIL ON or FIL OFF

Measurement command

Code	Description	Output
MEAS	Starts a new ADC cycle and sets the DAV flag when measurement ready. See also section 5.5	*

* Output is measurement data
Format of output data depends on selected mode, function and range (see section 5.1).

5.3   USING THE LIMIT RELAYS

The limit relays, are used to switch (the relay closes) sources, warning indicators etc, when the limits are exceeded.

Conditions to set limits: LML <value>
                                   LMH <value>

The limits can be set from −25000 points to +25000 points in mode M0; in mode M1 from −2500 points to +2500 points. When the limit function is switched off, the limit values are saved.

5.4   BLOCK OPERATION (command I__B, n)

Block operation only operates in conditional execution modes (see 5.5). During block-operation, the next block-position is only executed after the data which becomes available by the command of the present block-position, has been read from the PM2140. When data is available the "data available flag" of the slave status is set; this flag is cleared after reading the data.

5.5   EXECUTION MODES

Conditional execution (E__T or E__X)

After receipt of a trigger- or an execute command (X), a new ADC measurement is started. During the measurement period (580 ms for mode M0 and 60 ms for mode M1) the requests for data are delayed (DAV=0) until the measurement is ready. Then DAV=1 and the data is released. After reading the data DAV=0 and remains that way, however the same data can be read repetitively. To get new data the MEAS command must be executed, or a function must be changed. Then DAV=1 and the new data is released.

Unconditional execution

The unconditional execution operates the same way as the conditional execution but after each ADC measurement a new one is started automatically and new data is available. Once data of a measurement is read, new requests for data are delayed until completion of the present measurement. The MEAS command can also be used in the unconditional execution mode. After MEAS the previous ADC cycle is interrupted immediately and a new ADC cycle is started. This can be used to synchronise measurements.

5.6 DEFAULTS

After a power on reset:
- Mode 0 (M 0)
- Function 0 (FNC 0)
- Filter on (FIL ON)
- Limits off (LIM OFF)
- High limit 0 (LMH +00000)
- Low limit 0 (LML +00000)

6. GENERAL SLAVE COMMANDS S_? AND D_?

The response after these commands give partly PM2140 data.

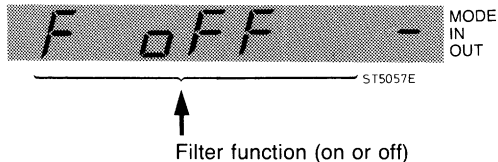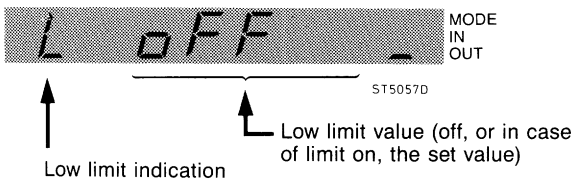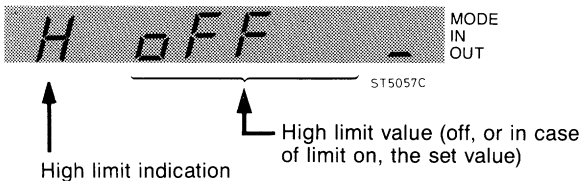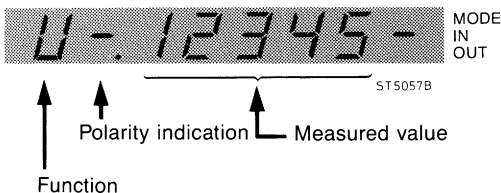Response after S_? (request slave status): S <9 digits>

Digit	Meaning
1	*
2	Not used
3	*
4	DAV (data available, PM2140 should be read)
5	*
6	*
7	Warning 1: input below low limit value. Cleared after reading the status.
8	Warning 2: input above high limit value. Cleared after reading the status.
9	Not used

* General slave data; see system 21 manual.

Response after D_? (request dump data):

<operating mode>	M_0 or M_1
<execution mode>	E_U, E_T or E_X
<ready-line control mode>	R_E or R_D
<function>	FNC 0,1,2 or 3
<high limit>	LMH <value>
<low limit>	LML <value>
<limit on/off>	LIM_ON or LIM_OFF
<filter on/off>	FIL_ON or FIL_OFF

7. DISPLAY ON PM2190

MODE
IN
OUT

ST5057A

Execution mode

Operating mode

Ready-line control mode

MODE
IN
OUT

ST5057B

Polarity indication — Measured value

Function

MODE
IN
OUT

ST5057C

High limit value (off, or in case of limit on, the set value)

High limit indication

MODE
IN
OUT

ST5057D

Low limit value (off, or in case of limit on, the set value)

Low limit indication

MODE
IN
OUT

ST5057E

Filter function (on or off)

8. GENERAL SLAVE FUNCTIONS

Commands

Code	Description
E ?	Send execution mode
D ?	Send dump data
I ?	Send identification of module
M ?	Send operating mode
Pn; <funct. cmd>	Store functional commands on
(n=0.....19)	block-memory position n
R ?	Send ready-line control mode
R0	Reset as after power on
R1	Reset as after mode change
R2	Clear block-memory
S ?	Send status
T n (n=0,1)	Functional test n
X	Execute
I_B [,n]	Initiate block-operation up to and including block-memory position n
I n (n=0.....19)	Initiate block position n

Synchronization modes

Code	Description
E_T	Execute on trigger
E_U	Execute unconditional
E_X	Execute on X
R_D	Ready-line control disable
R_E	Ready-line control enable

Notes: - Where "_" is given , a space-character is necessary for command recognition.
- For full details of these commands see the System 21 manual.