

SYSTEM 21 ANALOG OUTPUT

PM2141

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1. GENERAL

The PM2141 is a programmable four quadrant analog output unit. The outputs can supply positive as well as negative voltages at both positive and negative currents. It has two outputs: one for a programmable voltage and one for a programmable current. Only one output can be selected at a time.

The voltage output has two programmable ranges: $-2 \dots +2$ V and $-20 \dots +20$ V. Within both ranges it can supply a load of -10 to $+10$ mA. Two sense outputs are available to eliminate voltage loss across leads (remote sensing), or to control an additional power stage, when more current is needed but the same voltage accuracy is required.

The current output has one fixed range: -20 mA \dots $+20$ mA. The open circuit voltage is limited from -9 to $+9$ V.

Both outputs are floating with respect to the System 21 ground and have a common return.

2. TECHNICAL DATA

2.1 Unit characteristics

Supply voltage	7.5 V \dots 16 VDC
Supply current	<200 mA typical, <250 mA at 20 mA output current and 12 V supply from the System 21 bus.
User I/O terminal	Type F161 female, 37 contacts, dimensions according to MIL-C-24308.



PHILIPS

2.2 Outputs

2.2.1 Voltage output

Ranges	mode 1: -2.000 ... +2.000 V mode 2: -20.00 ... +20.00 V
Accuracy *)	mode 1: $\pm(0.1\%$ of value +0.1% of range) mode 2: $\pm(0.1\%$ of value +0.05% of range)
Temp. coefficient	mode 1: $\pm(0.01\%$ of value +0.01% of range)/K mode 2: $\pm(0.01\%$ of value +0.005% of range)/K
Resolution	mode 1: 1 mV mode 2: 10 mV
Output impedance	mode 1 and mode 2: $<0.1 \Omega$
Output current	-10 ... +10 mA (short-circuit current $<20\text{mA}$)
Max. output voltage	$\pm 20.5 \text{ V}$ (is possible when using the sense outputs).

* Only valid if the sense outputs are connected to the output terminals, if not, the output voltage increases by 0.5% of the programmed value (see section 4.2).

2.2.2 Current output

Range	-20.00 ... +20.00 mA
Accuracy	$\pm(0.1\%$ of value +0.05% of range)
Temp. coefficient	$\pm(0.01\%$ of value +0.005% of range)/K
Resolution	10 μA
Output admittance	1 $\mu\text{A/V}$
Temp. coefficient on output impedance	$\pm 0.1 \mu\text{A/V/K}$
Max. output voltage	$\pm 9 \text{ V}$ (is also the open circuit voltage)

2.2.3 Isolation

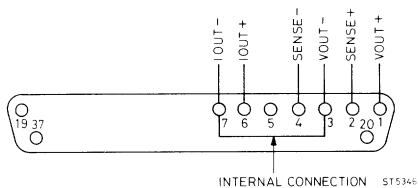
Between output and safety ground: 10 nF
Between output and system ground: 10 nF in parallel with 1.1 M Ω

2.2.4 Timing

After receipt of the GPIB command, the output value of the voltage or the current will be reached within:

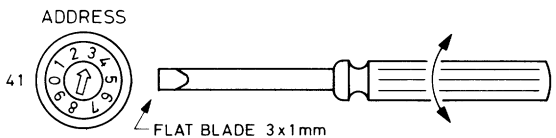
approximately 60 ms	for the maximum programmable change in output value or,
approximately 50 ms	if the programmed change in output value is approximately zero.

2.3 Output connector



Connector at the rear of the PM2141

3. ADDRESS SETTING



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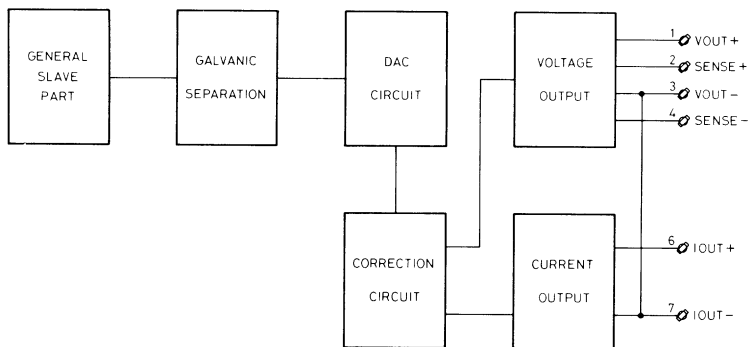
Example: the selected address is 413

4. FUNCTIONAL DESCRIPTION

4.1 General

Conversion of the programmed digital value to an analog value, at one of the outputs of the PM2141, is performed by means of a DAC. The DAC uses a low drift zener diode as a reference. The voltage from the DAC controls the current or voltage output, via a correction circuit. Mode change and polarity switching also takes place in the correction circuit. The voltage output circuit has sense outputs, that can be used to eliminate voltage loss across leads (connect sense + to the positive terminal, sense - to the negative terminal of the load circuit). You can also use the sense outputs to control an additional power stage following the voltage output and still maintain the same accuracy.

Only one output can be selected at a time. When an output is selected, the other is set to zero output but keeps its characteristics as an output. For example, when the current output is selected, the voltage output is set to 0 V but can still supply current as specified in section 2.2.1.



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Functional block diagram of the PM2141

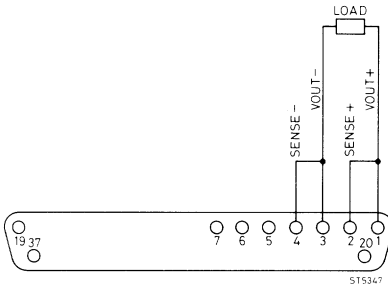
Notes:

1. The current and the voltage outputs are floating with respect to system ground and safety earth. The maximum voltage allowed between safety earth and any output is ± 42 V, including the voltage at the output.
2. Mind that the return terminals of the voltage and current output (Vout - and Iout -) are connected to one another (internally fixed connection).

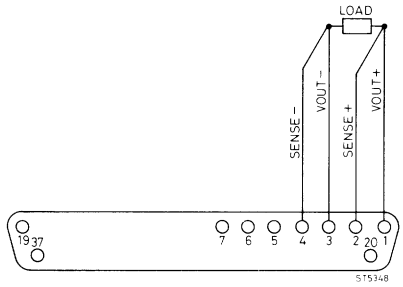
4.2 Connection diagrams

4.2.1 Mode 1,2

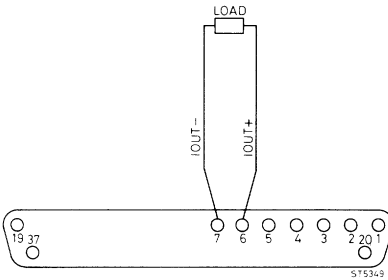
Local sensing:



Remote sensing:



4.2.2 Mode 3



5. PROGRAMMING

5.1 Mode programming

Program code	Mode	Output	Range
M1	1	Voltage	-2.000 ... +2.000 V
M2	2	Voltage	-20.00 ... +20.00 V
M3	3	Current	-20.00 ... +20.00 mA

5.2 Output programming

Program code	Mode	<value>
VDC <value>	1	-2.000 ... +2.000
VDC <value>	2	-20.00 ... +20.00
IDC <value>	3	-20.00 ... +20.00

Notes:

1. <value> is truncated to 4 digits.

Examples: 1.3429 is truncated to 1.342 in mode 1.

2.0009 is not out of range !!

2. Scientific notation of <value> is allowed, but mind the maximum resolution given under note 1.

Examples: 0.015 may be written as 15.00E-3.

15.25E-3 will be truncated to 15E-3.

5.3 Block programming

Mode programming codes and output programming codes as stated in sections 5.1 and 5.2 can be used for programming the block memory.

5.4 Defaults

After a power-on reset, the following settings are active:

- Mode 1
- Voltage output set to 0 V
- Current output set to 0 mA
- Execute unconditional mode

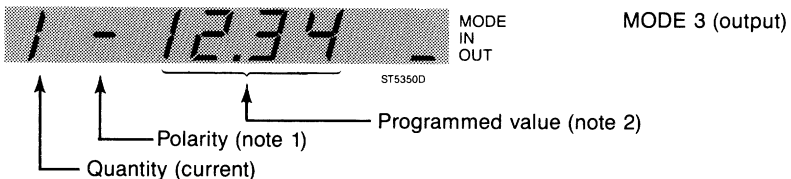
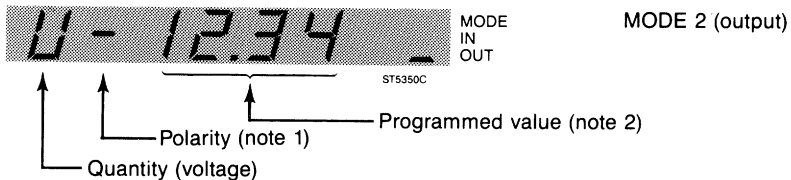
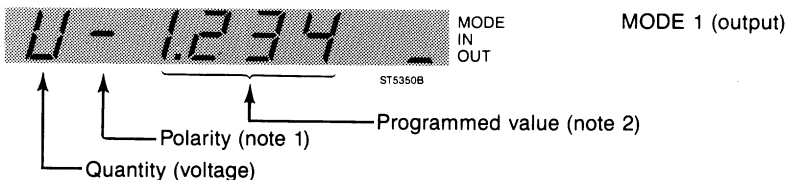
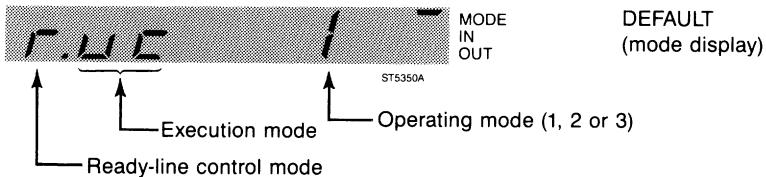
After a mode change, the voltage and current outputs are set to 0 V and 0 mA respectively.

6. GENERAL SLAVE COMMANDS

The following general slave commands give partial unit specific data:

Program code	Description	Response from unit
S ?	Ask general slave status	Digit 3 is set if an illegal program code is received or when the programmed value is out of range (see System 21 manual). Example of response: AID 410;S 003400000
D ?	Ask dump data	<i><operating mode></i> , <i><execution mode></i> , <i><ready line control mode></i> , <i><functional setting></i> Example of response: AID 410;M 1,E T,R E,VDC +12.25E+0

7. DISPLAY ON PM2190



Notes:

1. Positive polarity is not shown (blank space).
2. The display shows the programmed output value, not the actual value at the output. The actual value will be within specification (see section 2.2) if the output is not overloaded.

3. 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> (n=0.....19)	Store functional commands on 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
X	Execute
I__B [..n] (n=0.....19)	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 (Trg)
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.

