3B SCIENTIFIC® PHYSICS

Digital Counter with Interface (115 V, 50/60 Hz)   1003122
Digital Counter with Interface (230 V, 50/60 Hz)   1003123

Instruction sheet

09/12 ALF

1. Safety instructions

The counter conforms to safety regulations for electrical measuring instruments and control and laboratory equipment as per DIN EN 61010, part 1. It is intended for operation in a dry environment, suitable for the operation of electrical equipment and systems.

Safe operation of the counter is guaranteed, provided it is used correctly. However, there is no guarantee of safety if the counter is used in an improper or careless manner.

If it may be assumed for any reason that non-hazardous operation will not be possible (e.g. visible damage), the counter should be switched off immediately and secured against any unintended use.

- Before using the counter for the first time, confirm that the specifications printed on the rear side of the housing are compatible with the local mains voltage.
- Replace a faulty fuse only with one matching the specifications stated at the rear of the housing.
- Disconnect the counter from the mains before replacing a fuse.
- Never short the fuse or the fuse holder.

2. Description

The digital counter with interface is a microprocessor based counter. It was specially designed for the education in Physics.

The instrument has the following functions and measuring modes:

Frequency counting

Period measurement

Impulse counting

Start A - Stop B

Pass times

Run + Pass times

The digital counter with interface can be used as a stand-alone instrument or together with a Personal Computer. A Windows programme for operation and data logging from the instrument is supplied with the instrument. Also a cable for connecting the counter and the PC serial port (COM-1 or COM-2) is supplied.

The Geiger-Müller amplifier module is as standard supplied with the counter.

The counter with the order number 1003123 is for mains supplies of 230 V (±10%) while the one with order no. 1003122 is for 115 V (±10%) systems.

3. Operating controls and connections

Front panel

POWER
On / Off contact

FUNCTION
Push button for selection of function. Push to select next.

SELECT
Push button for selection of measuring method, and for use with display of results

START/STOP
Push button to start and stop of measurement

Hz LED for indication of measurement in Hz

kHz LED for indication of measurement in kHz

s LED for indication of measurement in seconds

ms LED for indication of measurement in milli seconds

4-digit LED-display for results

2x16-character LCD-display for function, selection, setup etc.

A LED
indicator for input A

B LED
indicator for input B

IMPULSE   Electrical impulse input A

IMPULSE   Electrical impulse input B

SWITCH
Electro/mechanical switch input A

SWITCH
Electro/mechanical switch input B

PHOTO/MIC
mini-DIN8 socket for connection of photo gates or microphone

PHOTO/MIC
mini-DIN8 socket for connection of photo gates or microphone

Rear panel

Mains connection 230 V or 115 V AC 50/60 Hz
Mains fuse (0.5 AT)

RS232 interface to PC für PC

GM
BNC-connector for Geiger-Müller tube

GM VOLTAGE
Voltage regulation potmeter for the Geiger-Müller tube.

4. Technical data

Input A and B

Input impedance:	500 kΩ
Sensitivity:	200 mV
Trigger polarity:	positive going or negative going, individually selectable in each function if relevant

Frequency

Range:	0.01 Hz – 99,9 kHz
Resolution:	0.01 Hz - 10 Hz
Method:	continuous / single measurement

Period

Range:	0.01 Hz – 99.9 kHz
Resolution:	0.01 ms - 10 ms
Method:	continuous / single measurement

Impulse count

Range:	0 - 9999 impulses per s
Resolution:	1 impulse
Method:	continuous; counting for 1 s; 6 s; 10 s and 60 s; counting for 10 s followed by 5 s pause; counting for 10 s continuous

Start A - Stop B

Range:	0.01 ms - 100 s
Resolution:	0.01 ms

Pass time

Range:	0.01 m - 100 s
Resolution:	0.01 ms
Method:	simultaneous on both channels
Memory:	up to 9 times per channel

Pass / Run time

Range:	0.01 ms - 100 s
Resolution:	0.01 ms
Method:	first pass time on A, then pass time on B
Memory:	one set of measurements (run time A to B, pass time A and pass time B)

Geiger-Müller amplifi er module

Anode resistor:	10 MΩ (Ri)
GM voltage range:	325 – 650 V DC continuously adjustable

Hint: Voltage can be measured with a 10 MΩ multimeter, and multiplied by 2.

General data

Mains connection:	
1003122:	115 V (±10 %), 50/60 Hz
1003123:	230 V (±10 %), 50/60 Hz
Power consumption:	20 VA approx.
Dimensions:	95x245x185 mm approx.
Weight:	5 kg approx.

5. Operation

The instrument is powered by activating the switch marked **'POWER'**.

Immediately on power-on the instrument displays the version number (i.e. 'r 1 1.00 .00 .00' for approx. 2 secs.).

The counter is now ready for use.

The selected function and method of measurement are shown in the LCD-display.

To change language turn off the power, hold the **'SELECT'** and simultaneous switch on the power.

Use the **'SELECT'** button to change the language, press **'FUNCTION'** to store the selection in memory.

Select a function with the push-button **'FUNCTION'** and then the measuring method with the pushbutton **'SELECT'**.

If the selected function has the option to select the trigger polarity, then a simultaneous push on **'FUNCTION'** and **'SELECT'** displays the trigger polarity in the LCD-display for each input.

Pushing the **'SELECT'** changes the trigger polarity. Push the **'START/STOP'** to store the selection in memory.

List of the functions and measurement methods:

Function	Select	Description
FRE-QUENCY	Continuous	When button **'START/STOP'** is pressed, frequency is continuously measured
	Single measurement	When button **'START/STOP'** is pressed, a single measurement is started
	Pendulum continuous	When button **'START/STOP'** is pressed, a pendulum's freq. is continuously measured

	Pendulum single measurement	When button 'START/STOP' is pressed, a single measurement is started
PERIODES	Continuous	When button 'START/STOP' is pressed, the period time is measured continuously
	Single measurement	When button 'START/STOP' is pressed, a single measurement is started
	Pendulum continuous	When button 'START/STOP' is pressed, a pendulum's period time is cont. measured.
	Pendulum single measurement	When button 'START/STOP' is pressed, a single measurement is started
IMPULSE COUNT	Continuous	When button 'START/STOP' is pressed, the impulse counting is started, and runs until 'START/STOP' is pressed again
	1 s 6 s 10 s 60 s	When button 'START/STOP' is pressed, counting for 1 / 6 / 10 or 60 s is started
	Count 10 s Hold 5 s	When button 'START/STOP' is pressed, counting for 10 s is started followed by 5 s pause
	10 s Continuous	When button 'START/STOP' is pressed, sequential counting for 10 sec is started
At frequency, period and impulse measurements, only input A is used.		
START A - STOP B [START]		When button 'START/STOP' is pressed, the time from A to B is measured
PASS TIME [START]		When button 'START/STOP' is pressed, pass times on A and B are measured (up to 9 measurements per channel)

RUN & PASS TIME [START]		When button 'START/STOP' is pressed, the run time from A to B, and the pass time for A and B are measured.

On each of the above three functions (and the pendulum selection in frequency and period), the following applies:

When 'FUNCTION' and 'SELECT' are pressed simultaneously, the start-/stop-polarity triggering is shown on the display.

Pressing 'SELECT' shifts through the four (two) different combinations possible.

Press 'START/STOP' to store the selection in memory for each individual function. The setup is memorized, even when the power is off.

Geiger-Müller amplifi er module

Function	Select	Description
IMPULSE COUNT GM	Continuous	When button 'START/STOP' is pressed, GM input counting is started, and runs until 'START/STOP' is pressed again
	1 s 6 s 10 s 60 s	When button 'START/STOP' is pressed, GM input counting for 1 / 6 / 10 or 60 s is started
	Count 10 s Hold 5 s	When button 'START/STOP' is pressed, GM input counting for 10 s is started followed by 5 s pause
	10 s Continuous	When button 'START/STOP' is pressed, sequential GM input counting for 10 sec is started

5.1 Frequency measurement

- Select frequency measuring with the push-button 'FUNCTION' and hereafter the wanted measuring function with the push-button 'SELECT'.

- Press the button 'START/STOP' to start the frequency measurement.

If the measuring function 'Single measuring' or 'Pendulum Single' (pendulum), has been selected, a new frequency measurement is made

every time the push-button 'START/STOP' is pressed.

LED 'Input A' is lit when the input (the gate) is open.

Selection of trigger polarity is possible, if pendulum is selected.

The frequency is displayed in Hz or kHz.

5.2 Period measurement

- Select frequency measuring with the push-button 'FUNCTION' and hereafter the wanted measuring function with the push-button 'SELECT'.

- Press the button 'START/STOP' to start the frequency measurement.

If the measuring function 'Single measuring' or 'Pendulum Single ' (pendulum), has been selected, a new period measurement is made, every time the push-button 'START/STOP' is pressed.

Selection of trigger polarity is possible, if pendulum is selected.

LED 'Input A' is lit when the input (the gate) is open.

The period time is displayed in s or ms.

5.3 Impulse counting

- Select frequency measuring with the push-button 'FUNCTION' and hereafter the wanted measuring function with the push-button 'SELECT'.

At all counting functions, the 'Input A'-LED is lit when counting.

If 'Continuous' has been selected, the counter is started when 'START/STOP' is pressed. The counter can be stopped and restarted (without resetting the counter) by pressing the 'START/STOP'.

If the counter has to be reset (count set to zero): push 'START/STOP' to stop the counting, and thereafter push 'FUNCTION' to reset and prepare the counter for a new counting.

If count time has been selected to 1, 6, 10 or 60 seconds, a new counting time is started by pressing 'START/STOP'. The counter can not be restarted if a count is in progress.

If 'Count. 10s-Hold 5s' has been selected, the counter is started when 'START/STOP' is pressed. Counting is done in segments of 10 seconds with a 5 seconds' interval pause. The counter is reset before each 10 seconds' counting. The function is stopped when 'FUNCTION' is pressed, and the counter is then reset and prepared for a new measurement.

If '10s Continuous' has been selected, the counter is started when 'START/STOP' is pres-

sed. The counting sequence is continuous, with 10 seconds' counting followed by a 5 seconds' displaylock (for reading the result). The counter is reset (and restarted) every 10 seconds, even if the display is locked (the counter is still counting). The function is stopped when 'FUNCTION' is pressed, and the counter is reset and prepared for a new measurement.

5.4 Start A - Stop B

- The function is selected with the push-button 'FUNCTION', and started when 'START/STOP' is pressed.

The time measurement starts when an impulse occurs at input A, and stops when an impulse occurs at input B. The time is displayed in s or ms.

The positive- or negative-going triggering is setup by pressing 'SELECT' and 'FUNCTION'

simultaneously. The current state of the setup is shown in the display i.e.
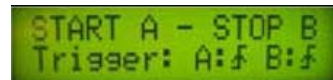
Pressing 'SELECT' shifts through the four different combinations. When satisfied, press 'START/STOP' and the setup is stored in the internal Lithium Battery backup-memory.
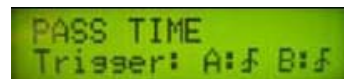
The LEDs 'Input A' and 'Input B' are lit until an impulse has occurred at each input. When the measurement is stopped, a new measurement is prepared when 'START/STOP' is pressed.

The function is aborted if 'FUNCTION' is pressed again, and the counter is reset and prepared for a new measurement.

5.5 Pass times A and B

- The function is selected with the push-button 'FUNCTION', and started when 'START/STOP' is pressed.

The positive- or negative-going triggering is setup by pressing 'SELECT' and 'FUNCTION' simultaneously. The current state of the setup is shown in the display i.e.

Pressing 'SELECT' shifts through the four different combinations. When satisfied, press 'START/STOP' and the setup is stored in the internal Lithium Battery backup-memory.

The LEDs 'Input A' and 'Input B' are lit.

The pass times on 'Input A' and 'Input B' are measured independent from each other. During passage of A and B, the light emitting diode at 'Input A' or 'Input B' is turned off.

The number of pass times on each input is constantly shown in the display: '2 4' indicates 2 pass times on A and 4 on B.

The counter's memory holds up to 9 pass times per input.

When no more measurements are needed, press **'START/STOP'** once and the light emitting diodes **'Input A'** and **'Input B'** are turned off. Each time the push-button **'SELECT'** is pressed, the measurements are read out one by one. The measurements are numbered A1-9 or B1-9.

The readings are in s or ms.

All measurements must be read at least once, before new measurements can be started by pressing the **'START/STOP'** push-button.

Note: When **'FUNCTION'** is pressed, all measurements are deleted, and the counter is prepared for new measurements.

5.6 Run and Pass times

- The function is selected with the push-button **'FUNCTION'**, and started when **'START/STOP'** is pressed.

The positive- or negative-going triggering is setup by pressing **'SELECT'** and **'FUNCTION'** simultaneously. The current state of the setup is shown in the display i.e
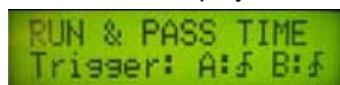
Pressing **'SELECT'** shifts through the four different combinations. When satisfied, press **'START/STOP'** and the setup is stored in the internal Lithium Battery backup-memory.

The LEDs **'Input A'** and **'Input B'** are lit.

The pass times on **'Input A'** and **'Input B'** are measured together with the run time (the time from **A** to **B**). During passage of **A** and **B**, the light emitting diode at **'Input A'** and **'Input B'** are turned off.

A *must* be passed before **B**.

If **A** is passed several times before **B**, the time in memory is the first passage of **A**.

The light emitting diodes **'Input A'** and **'Input B'** are turned off, and the run time is displayed.

When the push-button **'SELECT'** is pressed, the pass time A is displayed, and another push on **'SELECT'** displays the pass time B.

If **'SELECT'** is pressed again, the display sequence is repeated.

Display time unit is s or ms.

All three measurements must have been read at least once, before a new measurement can be started by pressing **'START/STOP'**.

Note: When **'FUNCTION'** is pressed, all measurements are deleted, and the counter is prepared for new measurements.

5.7 Geiger-Müller amplifi er module

Geiger-Müller tube is connected to the BNC plug marked 'GM' at the rear panel of the counter.

The GM Voltage is adjusted with the knob **'GM Voltage'**, at the rear panel of the counter.

Selecting the function 'IMPULSE COUNT GM', the GM input at the rear panel of the counter is used as the only signal input source.

Description of the methods and how to use the function, please consult the section 5.3 'Impulse Count' as the methods are the same.

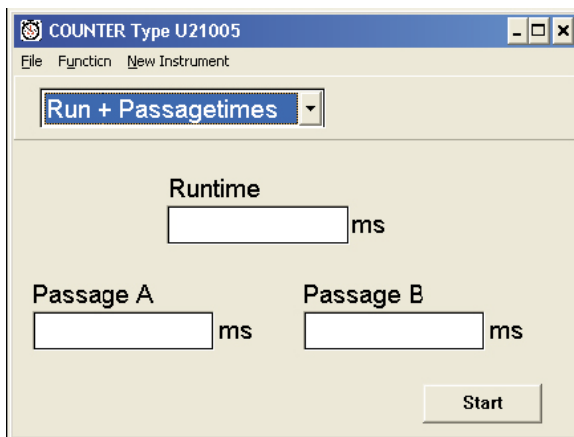## 6. PC Programme CNT

Installation

- Insert the CDROM in drive.
- From Windows, run the programme <D:\3B Scientific\CNT PC-Software/SETUP.EXE>.
- Click the „Target"-button to select where you want to install the programme (e.g.: C:\CNT\).
- Start the installation with the „Start"-button. The programme is then installed on your hard disk and the „CNT" is added.

Information ×

ℹ Setup Complete! Select "Ok" to create Program Manager group
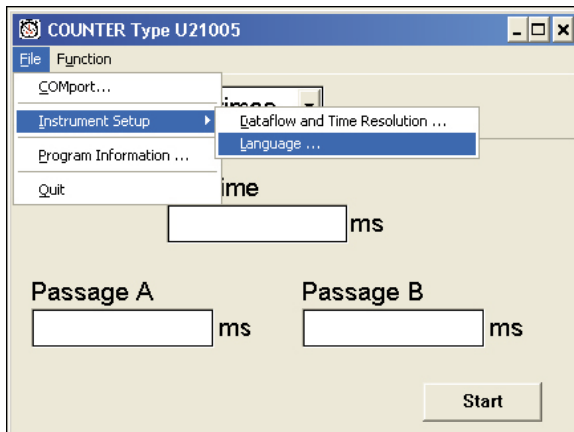
✓ OK
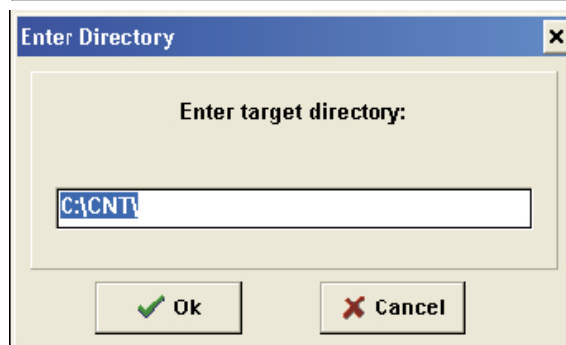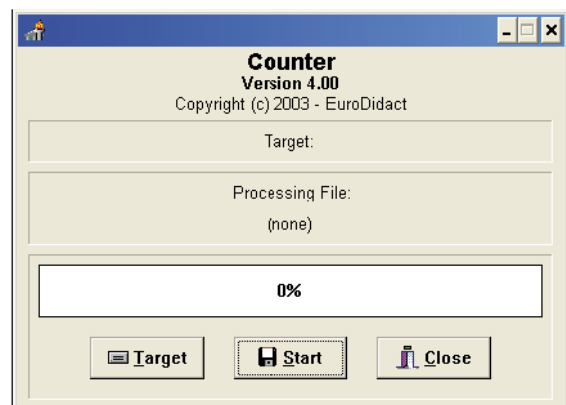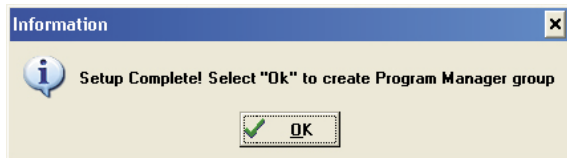
- Start the programme „CNT" in the folder „CNT", and select the ComPort from the File pull down menu, used to connect to the Counter

When the counter has been correctly connected with the supplied cable, the programme automatically displays the current function set on the counter. See the example below.

COUNTER Type U21005 _ □ ×

File Function New Instrument

Run + Passagetimes ▼

Runtime
[   ] ms

Passage A   Passage B
[   ] ms   [   ] ms

Start

- To change language, use this sub-menu <File>, <Instrument Setup>, <Language>:

COUNTER Type U21005 _ □ ×

File Function

COMport...
Instrument Setup ▶ Dataflow and Time Resolution ...
Program Information ...   Language ...
Quit

ime
[   ] ms

Passage A   Passage B
[   ] ms   [   ] ms

Start

In the pull-down menu **"File"** the following is available:

ComPort: Selection of the PC's Serial port (COM-1 or COM-2).

U21005 setup Data flow: Selection of Start/Stop or Continuous data fl ow from the counter to the PC. Only active during IMPULSE COUNT and START A - STOP B.

Language: Select the language.

Programme Information: Displays the version of the programme etc. If a counter is connected, the version of the instrument is also displayed.

Exit: Exit programme.

In the menu **"Function"** all of the above described measurement methods are available.

The following keys can be used when IMPULSE COUNT or IMPULSE COUNT GM were chosen:

Measurement method	IMPULSE COUNT	IMPULSE COUNT GM
Impulse count cont.	F1	Shift F1
Impulse count 1 s	F2	Shift F2
Impulse count 6 s	F3	Shift F3
Impulse count 10 s	F4	Shift F4
Impulse count 60 s	F5	Shift F5
Impulse count 10 s, 5 s pause	F6	Shift F6
Impulse count 10 s continuous	F7	Shift F7

7. Care and maintenance

- Before cleaning the counter, disconnect it from the mains.
- Use a soft, damp cloth to clean it.

8. Disposal

- The packaging should be disposed of at local recycling points.
- Should you need to dispose of the counter itself, never throw it away in normal domestic waste. Local regulations for the disposal of electrical equipment will apply.