

LabVIEW[®]-VI *phy*MOTION[™]

Virtual Instruments for the *phy*MOTION[™] Controller



LabVIEW® Virtual Instruments

for the *phy*MOTION™

Controller

TRANSLATION OF THE GERMAN ORIGINAL MANUAL

Version	Content
1	new
2	Status-MCM.vi corrected

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Every possible care has been taken to ensure the accuracy of this technical manual. All information contained in this manual is correct to the best of our knowledge and belief but cannot be guaranteed. Furthermore, we reserve the right to make improvements and enhancements to the manual and / or the devices described herein without prior notification.

We appreciate suggestions and criticisms for further improvement. Please send your comments to the following email address: doku@phytron.de

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1 Information



This manual:

Read this manual very carefully before mounting, installing and operating the device and if necessary further manuals related to this manual.

- Please pay special attention to instructions that are marked as follows:

	DANGER – Serious injury!	<i>Indicates a high risk of serious injury or death!</i>
	DANGER – Serious injury from electric shock!	<i>Indicates a high risk of serious injury or death from electric shock!</i>
	WARNING – Serious injury possible!	<i>Indicates a possible risk of serious injury or death!</i>
	WARNING – Serious injury from electric shock!	<i>Indicates a possible risk of serious injury or death from electric shock!</i>
	CAUTION – Possible injury!	<i>Indicates a possible risk of personal injury.</i>
	CAUTION – Possible damage!	<i>Indicates a possible risk of damage to equipment.</i>
	CAUTION – Possible damage due to ESD!	<i>Refers to a possible risk of equipment damage from electrostatic discharge.</i>
	”Any heading“	<i>Refers to an important paragraph in the manual.</i>

Observe the following safety instructions!

Qualified personnel



WARNING – Serious injury possible!

Serious personal injury or serious damage to the machine and drives could be caused by insufficiently trained personnel!

Without proper training and qualifications damage to devices and injury might result!

- Design, installation and operation of systems may only be performed by qualified and trained personnel.
- These persons should be able to recognize and handle risks emerging from electrical, mechanical or electronic system parts.
- The qualified personnel must know the content of this manual and be able to understand all documents belonging to the product. Safety instructions are to be provided.
- The trained personnel must know all valid standards, regulations and rules for the prevention of accidents, which are necessary for working with the product.

Safety Instructions



CAUTION – Possible damage!

Malfunctions are possible while programming the instruction codes – e.g. sudden running of a connected motor, braking etc.

- Please test the program flow step by step.



CAUTION – Possible damage!

For each application, the functional reliability of software products by external factors such as voltage differences or hardware failure, etc. is affected.

- To prevent damage due to system error, the user should take appropriate safety measures. These include back-up and shut-down mechanisms.



CAUTION – Possible damage!

Each end user system is customised and differs from the testing platform. Therefore the user or application designer is responsible for verifying and validating the suitability of the application.

- The suitability of the device's use must be tested and validated.



CAUTION – Possible damage!

Some modules are set to a default value on delivery. So, e.g., the motor current must be set to the corresponding value (see the motor data from the motor manufacturer). Connected components like motors can be damaged by incorrectly set values.

- Please check before starting, if the parameters are correct.

2 What is LabVIEW®?

This manual describes the LabVIEW graphical programming language from National Instruments. It uses icons to create the application.

LabVIEW stands for „Laboratory Virtual Instrument Engineering Workbench“.

LabVIEW programs are called Virtual Instruments or VIs. These VIs contains the front panel, the user interface and the block diagram, the graphical program code, which is compiled like other high level programming languages.

This manual describes the LabVIEW use for the Phytron controller *phyMOTION*™.

LabVIEW is a Trade Mark of National Instruments Corporation.

2.1 Requirements

For using the Phytron *phyMOTION*™ controller VIs it is expected that the user is well-trained in LabVIEW and knows the programming environment. Basic knowledge in programming like data types, loops etc. are required.

The *phyMOTION*™ VIs are built for LabVIEW 8.0 or higher.

2.2 Extent of Supply

The LabVIEW libraries are saved as Labview_phymotion.zip.

3 General VI Description

LabVIEW programs are called virtual instruments or VIs.

Every VI can be used as a stand-alone program or as a subroutine called sub VI.

The user transfers data among block diagram objects through wires.

The VI starts to run when all input data are available.

If the complete VI is finished, the results are on the outputs. The sequence of the execution is defined by the dependency of the data. There is no predefined sequence (e. g. from right to left).

4 Description of the *phy*MOTION™ VIs

4.1 General

Inputs and outputs which are the same for all libraries:

Name	I/O	Meaning
VISA resource name in	Input	Transfer of the interface parameters
Error in	Input	Input of the error clusters
VISA resource name out	Output	Display of the interface parameters
Error out	Output	Output of the error cluster

Inputs and outputs have the same function. They are only described once.

Cluster is the bundling of different data types in LabVIEW. It can be used as an input or output.

4.2 AD MCM.VI

The A/D value of the *phy*MOTION™ is read.

This VI provides the current A/D converter value as a 14-bit unit to the output while executing.

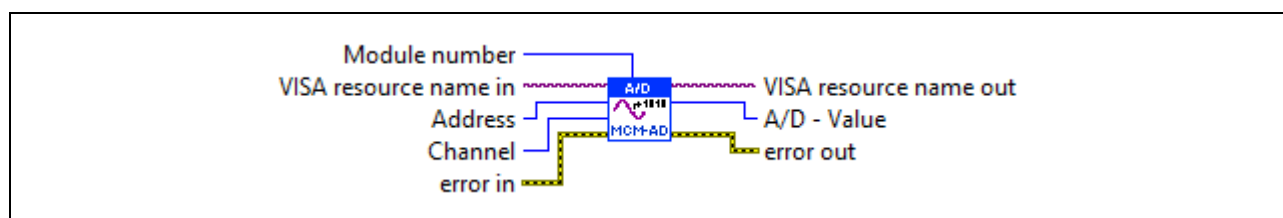


Fig. 1: AD MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Module number	Number of the addressed board	Input
Channel	Channel of the A/D converter, which should be read (1,2,3 or 4; 8-bit unit)	Input
A/D Value	A/D value in increments (0 – 16384, 14 bit)	Output

4.3 COMM MCM.vi

This VI is internal used by other VIs. It should not be applied for programming user specific applications.

4.4 Counter MCM.vi

This VI reads the selected axis counter.

It displays the counter value of the selected axis by reading the parameter 20 (P20). You'll find the parameter description in chapter 6.

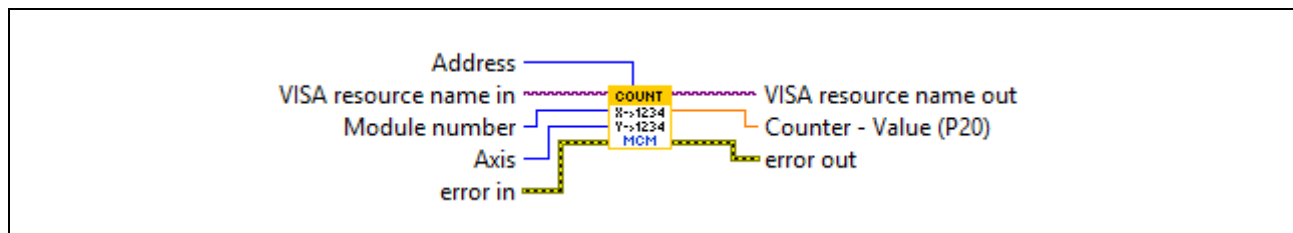


Fig. 2: Counter MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Axis	Axis, the counter should be read (1,2,3 or 4; 8-bit unit)	Input
Module number	Number of the addressed board	Input
Counter Value	Counter value of the axis (Double)	Output

4.5 DA MCM.vi

The D/A value of the *phyMOTION*™ is read.

This functional module reads the values adjusted in the cluster and acknowledges with transmission OK.



Fig. 3: DA MCM.vi

Name	Meaning	I/O
Cluster:	consists of the following file types:	Input
Address	<ul style="list-style-type: none"> Controller address (0 -15; 8-bit unit) 	
Module number	<ul style="list-style-type: none"> Number of the addressed board 	
Channel	<ul style="list-style-type: none"> D/A converter channel, which should be read (1,2, 3 or 4; 8-bit unit) 	
Value	<ul style="list-style-type: none"> Increments (0....65535, 16 bit) are read 	
Transmission OK	True, if the controller acknowledged the command (ACK) False, if the command was invalid (NAK)	Output

4.6 Direct Mode MCM.vi

An instruction is transmitted to the controller.

The VI transmits the string at the input Send String to the controller and picks the answer from the controller.

For detailed description of the controller parameters see chap.6.

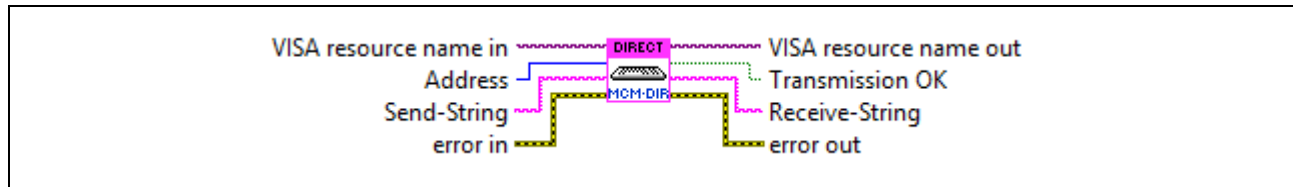


Fig. 4: Direct mode MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Send String	Command, which is transmitted to the controller (e. g. 1.1+1000 corresponds to drive 1000 steps)	Input
Transmission OK	True, if the controller acknowledged the command (ACK) False, if the command was invalid (NAK)	Output
Receive String	Response String of the controller (without control character and ACK) It's empty in commands without response	Output

4.7 Drive MCM.vi

This VI sends drive instructions to the *phyMOTION*™.

This functional module reads the value adjusted in the cluster and generates a drive instruction for the *phyMOTION*™.

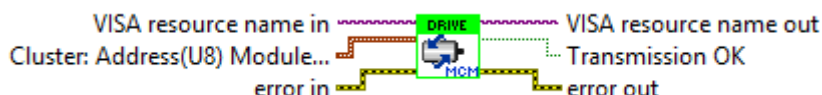


Fig. 5: Drive MCM.vi

Name	Meaning	I/O
Cluster:	consists of the following file types:	Input
Axis	<ul style="list-style-type: none"> Axis (8-bit unit): axis, where the drive instruction is written (1 to 18) 	
Address	<ul style="list-style-type: none"> Address (8-bit unit): Controller address (0-15) 	
Module number	<ul style="list-style-type: none"> Number of the addressed board 	
Position Mode (ENUM)	<ul style="list-style-type: none"> Position Mode (ENUM): the following adjustments are available¹⁾: <ul style="list-style-type: none"> Relative, generates and transmits a relative drive instruction Absolute, generates and transmits an absolute drive instruction Initialisation Plus, generates and transmits an initialisation in the positive direction Initialisation Minus, generates and transmits an initialisation in the negative direction Initialisation Center Plus, generates and transmits an initialisation to the Center Switch in the positive direction Initialisation Center Minus, generates and transmits an initialisation to the Center Switch in the negative direction Free Run Plus, starts a free run in the positive direction Free Run Minus, starts a free run in the negative direction 	

Distance	<ul style="list-style-type: none">Distance (DBL): this input is used as a distance for relative and absolute drive instructions	
Transmission OK	True: the controller accepts the instruction False: invalid command	Output

¹⁾More information:



Further Manual

An overview of axis commands and associated parameters, as well as schematic representations of the driving parameters can be found in the following manual:

„Principles of Positioning for Stepper Motor Controllers“

4.8 Encoder MCM.vi

The encoder counter reads the selected axis.

Parameter 22 (P22) is read out for the respective axis.

You'll find the description of the parameters in chapter 6 parameters.

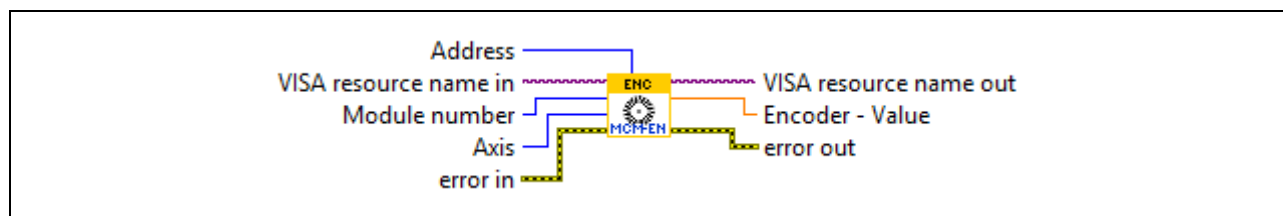


Fig. 6: Encoder MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Module number	Number of the addressed board	Input
Axis	Axis, whose counter is to be read (1 to 18; 8-bit unit)	Input
Encoder Value	Read encoder value of the axis (double)	Output

4.9 Init MCM.vi

This VI displays the initiator status.

The *phyMOTION*™ initiator status is imported and displayed as Boolean Cluster.

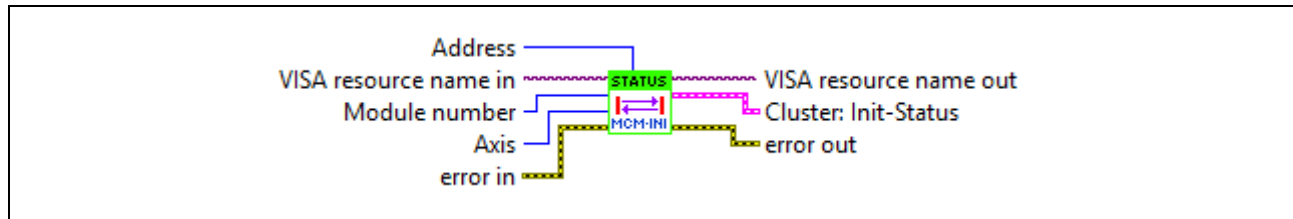


Fig. 7: Init MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Module number	Number of the addressed board	Input
Axis	The count of the axis is to be read (1 to 18, 8-bit unit)	Input
Cluster: Initiator Status	<p>The Initiator Status consists of five elements (BOOL)</p> <ul style="list-style-type: none"> • Axis +, activated = TRUE, free = FALSE • Axis –, activated = TRUE, free = FALSE • Axis Center, activated = TRUE, free = FALSE • Axis SW+, activated = TRUE, free = FALSE • Axis SW–, activated = TRUE, free = FALSE 	Output

4.10 Input MCM.vi

Reads the *phyMOTION*TM input status.

The status of the *phyMOTION*TM is displayed as a Boolean Cluster.

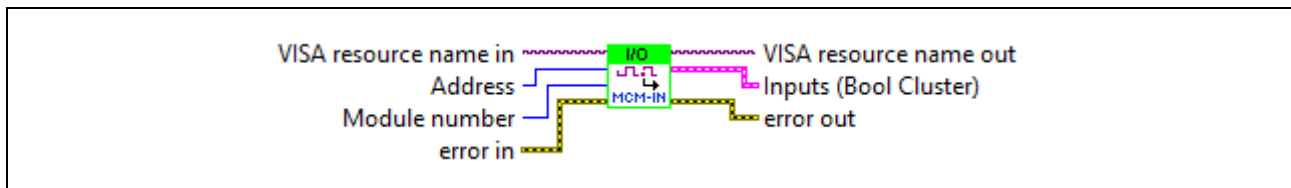


Fig. 8: Input MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15 8-bit unit)	Input
Module number	Number of the addressed board	Input
Cluster: Inputs	consists of eight elements (Boolean) TRUE = Input High FALSE = Input Low	Output

4.11 Output MCM.vi

This VI sets the outputs at the *phyMOTION*™.
Executing this routine the status at the input is set as output status.

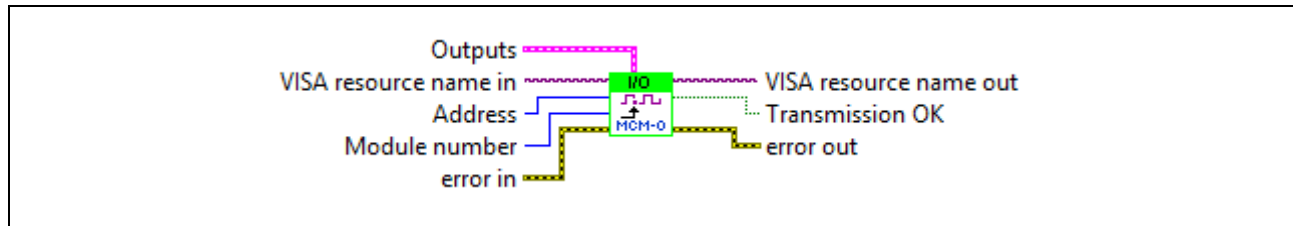


Fig. 9: Output MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Module number	Number of the addressed board	Input
Cluster: Outputs	consists of eight elements (Boolean) TRUE = Output High FALSE = Output Low	Input
Transmission OK	True: the controller accepts the instruction False: invalid command	Output

4.12 Parameter MCM.vi

This VI reads or sets the *phyMOTION*TM parameters.

The *phyMOTION*TM reads or transmits the parameter which is adjusted in the Parameter Number.

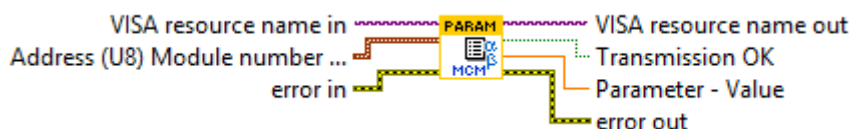


Fig. 10: Parameter MCM.vi

Name	Meaning	I/O
Cluster:	consists of the following data types:	Input
Address	<ul style="list-style-type: none"> 8-bit unit, controller address (0-15) 	
Module number	<ul style="list-style-type: none"> Number of the addressed board 	
Axis	<ul style="list-style-type: none"> 8-bit unit: axis, the parameter is read/written (1 to 18) 	
ParameterNumber	<ul style="list-style-type: none"> 8-bit unit: parameter number, to be read or written 	
Parameter Value	<ul style="list-style-type: none"> Parameter Value (Double): Parameter value to be written. Only with the choice "write"! 	
Read / Write	<ul style="list-style-type: none"> Read / Write (ENUM): Contains the entry Read and Write. Read: Parameter is read and the Parameter Value is displayed at the output. Write: Parameter is written with the value from the input Parameter Value. 	
Transmission OK	True: the controller accepts the instruction False: invalid command (Boolean)	Output
Parameter Value	The Read function displays the parameter value of the selected parameter (Double).	Output



Further Manual

An overview of the parameters can be found in the following manual:

"phyLOGICTM Command Reference for the phyMOTIONTM Controller"

4.13 Register MCM.vi

The register of the *phyMOTION*™ register is read or set..

The register set in Register Number is read by the *phyMOTION*™ or transmitted to the *phyMOTION*™.

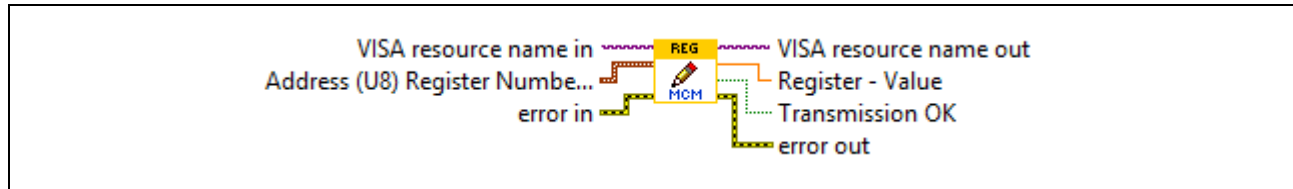


Fig. 11: Register MCM.vi

Name	Meaning	I/O
Cluster: Address Register Number Register Value Read / Write	It has the following data types: <ul style="list-style-type: none"> Address (8-bit unit): controller address (0-15) Register Number (16-bit unit): register number, to be read or written. Register Value (Double): register value to be written. Only with the choice "write"! Read / Write (ENUM): contains the entry Read and Write. Read: Parameter is read and the Register Value is displayed at the output. Write: Parameter is written with the value from the input Register Value. 	Input
Transmission OK	True: the controller accepts the instruction False: invalid command (Boolean)	Output
Register Value	The Read function displays the Register Value of the selected parameter (Double).	Output

4.14 Status MCM.vi

The *phyMOTION*TM status is read and the result is displayed as Boolean Cluster.

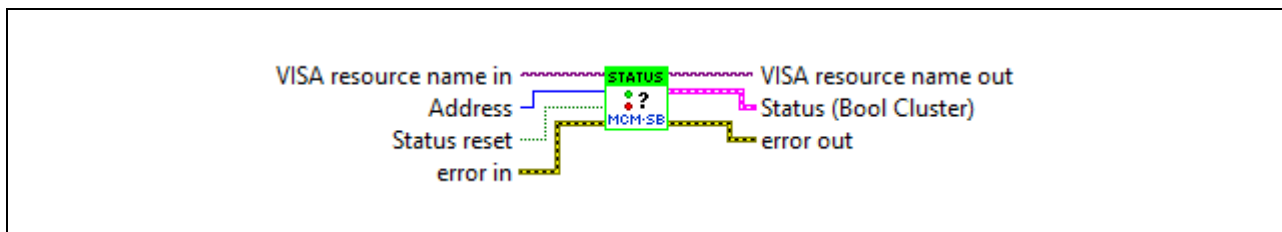


Fig. 12: Status MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Status Reset	Resets any pending status (error)	Input
Cluster: Status	Displays the <i>phyMOTION</i> TM status as Boolean cluster. The status is read binary. You'll find further information in the <i>phyLOGIC</i> TM . Programming Manual for <i>phyMOTION</i> TM available under the instruction ST.	Output

4.15 Extended Status MCM.vi

The extended status of the *phyMOTION*™ is read and displayed as Boolean Cluster.

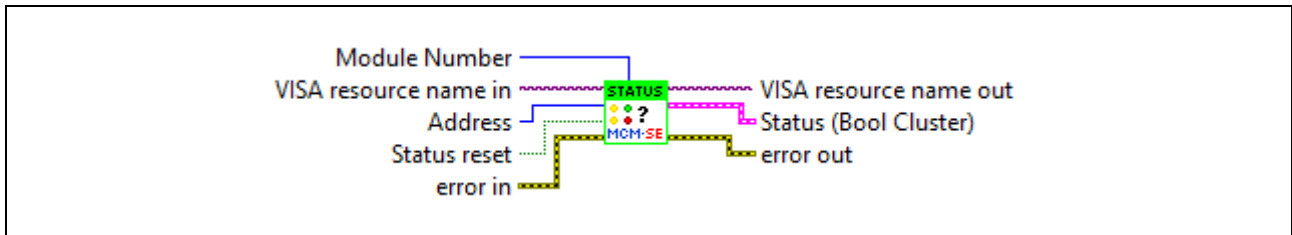


Fig. 13: Extended Status MCM.vi

Name	Meaning	I/O
Address	Configured address at the controller (0 -15; 8-bit unit)	Input
Module number	Number of the addressed board	Input
Status Reset	Resets any pending status (error)	Input
Cluster: Status	Displays the <i>phyMOTION</i> ™ status as Boolean cluster. The status is read binary. You'll find further information in the <i>phyLOGIC</i> ™ Programming Manual for <i>phyMOTION</i> ™ available under the instruction 1.1SE.	Output

5 Demo MCM.vi

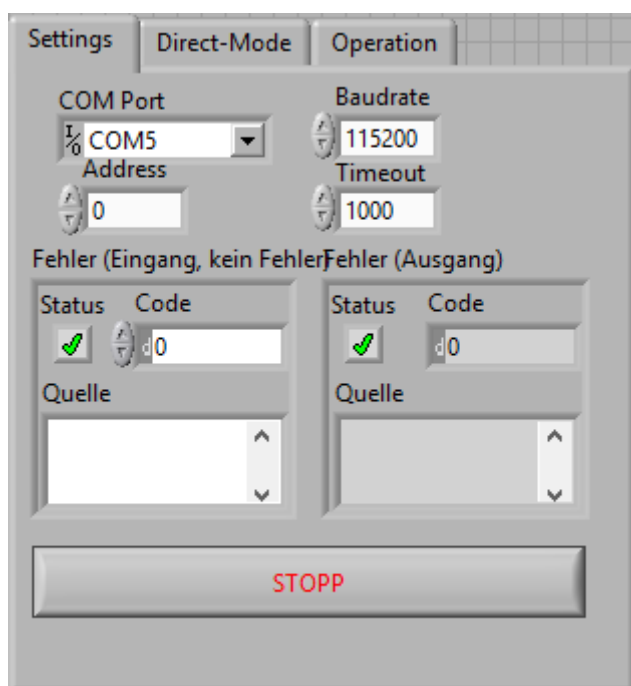
5.1 General Description

The VI demos use the VIs from the phymotion.llb. These are demos of register cards with different tabs.

The first register card (Settings) is equal in all demos and only described once.

Settings register card:

Here are the general settings for the interface:



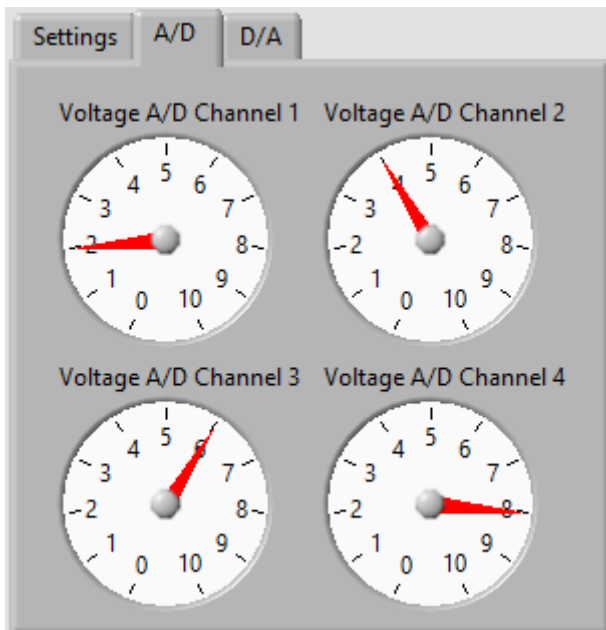
COM Port	Configures the interface used. In this case the serial interface COM5.
Address	The Address adjusted at the controller
Baud Rate	Configuration of the controller's baud rate, e. g. 115 200.
Timeout	The time waiting for an answer. If there is no answer in the denoted time, VISA-VI displays an error.
Error	This output displays an error message, which occurs during communication.
Stop	Stops the program.



5.2 Reading the A/D and D/A Inputs

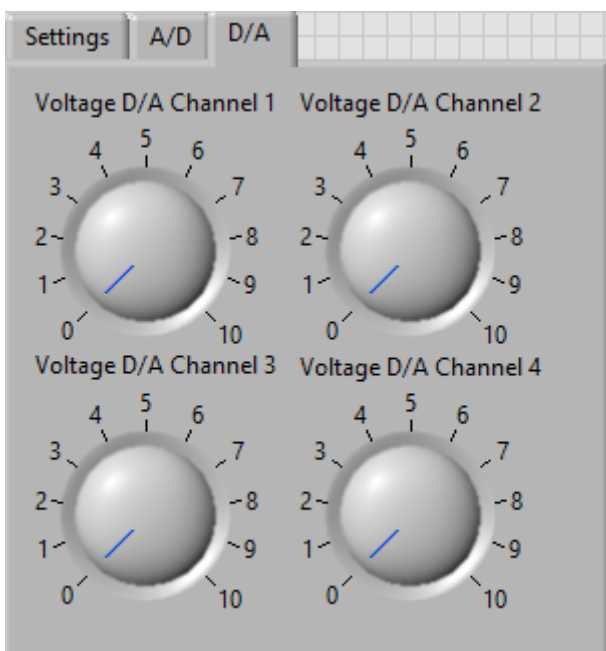
This demo has one register card with three tabs: Settings, A/D and D/A.
(For the description of Settings register card please see above.)

A/D register card:



This register card shows the present voltage at channel 1 to 4 of the A/D inputs of the *phyMOTION*™. These are both graphically displayed.

D/A register card:



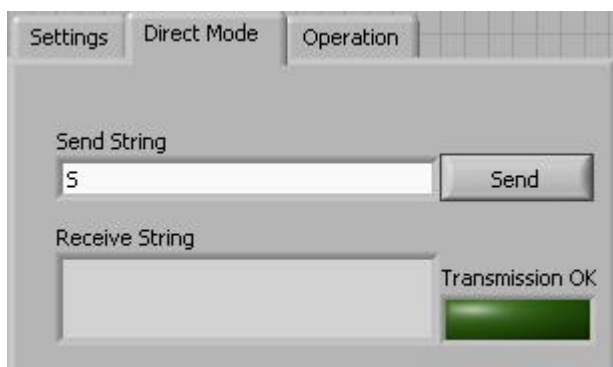
Here, the voltage value for the analogue output is set at the channel 1 to 4 of the *phyMOTION*™.

5.3 Drive Application for Direct Mode and Motor

This demo is a small application to demonstrate

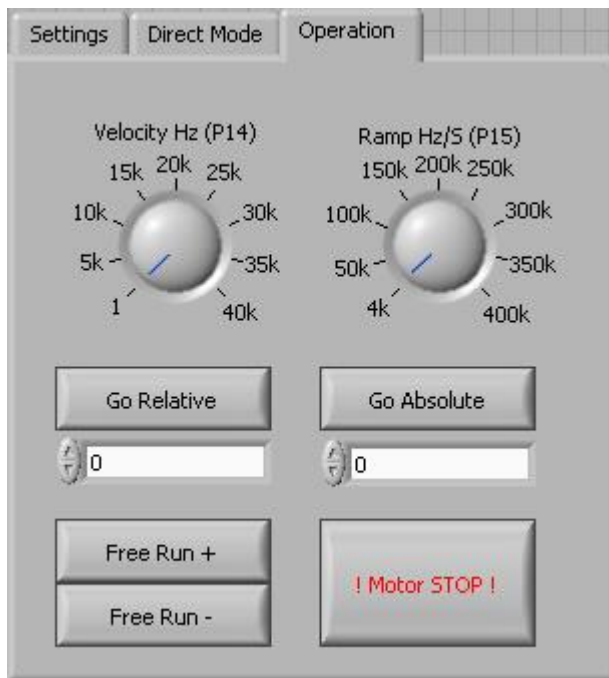
- **Direct Mode MCM.vi**
- **Parameter MCM.vi** and
- **Drive MCM.vi** files.

Direct Mode register card:



Send String	Entry of the transmitted command
Send	Transfer of the command
Receive String	Display of the <i>phyMOTION</i> TM answer
Transmission OK	Command recognized: LED on (ACK) command not recognized: LED off (NAK)

Operation register card:



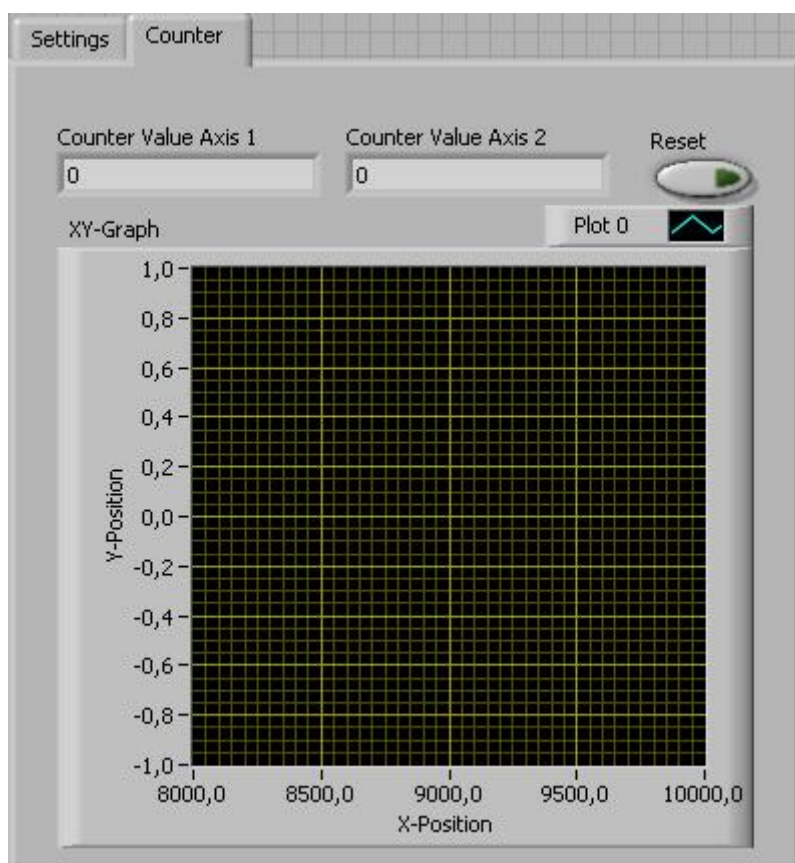
Velocity Hz (P14)	Sets the driving speed of the <i>phyMOTION</i> ™. Free Run + or – enables to change the velocity also during the run.
Ramp Hz/S (P15)	Sets the acceleration- and deceleration of the ramp. The value can only be adopted when the motor is at a standstill.
Go Relative	Moves from the actual position by the entered value (box beneath).
Go Absolute	The entered value (box beneath) is referred to the zero point.
Free Run +	Starts a free run in positive direction
Free Run -	Starts a free run in negative direction
! Motor STOP !	Cancels each running positioning and stops the motor.



5.4 Reading and Output of the Internal Distance Counter

This demo reads the internal *phyMOTION*TM distance counter (P20) and displays both as a counter value as a diagram.

Counter register card:



Counter Value Axis 1 Counter value display of axis 1.1

Counter Value Axis 2 Counter value display of axis 2.1

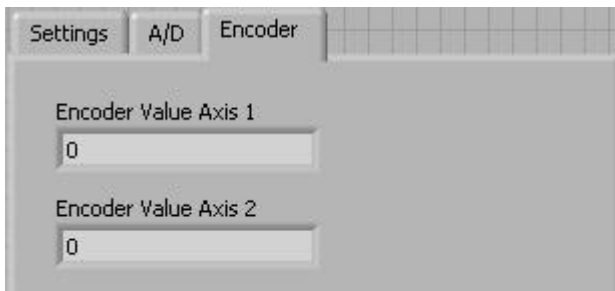
Reset Deletes the graph

XY Graph Diagram of the varying counter value at axis X and Y and in the system of coordinates.

5.5 Reading and Display of the Encoder Counter

This register card imports the *phyMOTION*™ Encoder Counter (P22) and the counter value is displayed in the text box.

Encoder register card:



Encoder Value Axis1 The encoder counter value of the axis 1.1

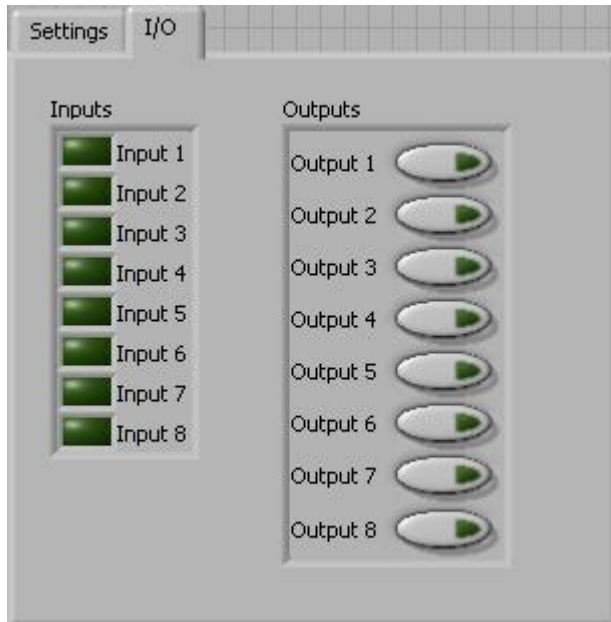
Encoder Value Axis2 The encoder counter value of the axis 2.1



5.6 Reading and Setting of the Inputs / Outputs

This demo reads and displays the *phyMOTION*TM inputs and activates the outputs.

I/O register card:



Inputs

Display of the MCM input status:

LED on = Status High

LED off = Status Low

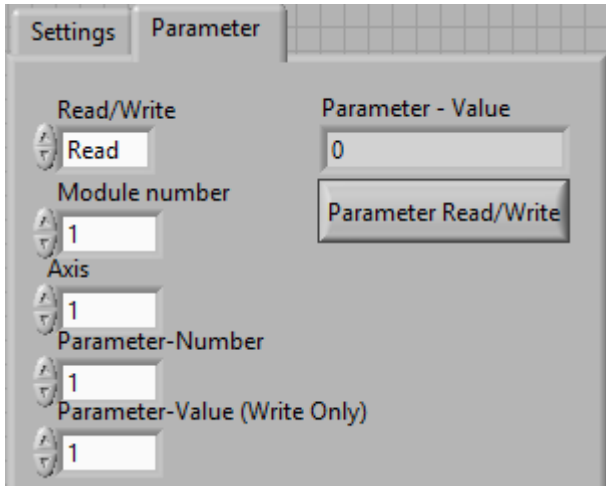
Outputs

The respective MCM outputs can be switched.

5.7 Reading / Writing the Parameters

This demo reads and writes the *phyMOTION*™ parameters.

Parameter register card:



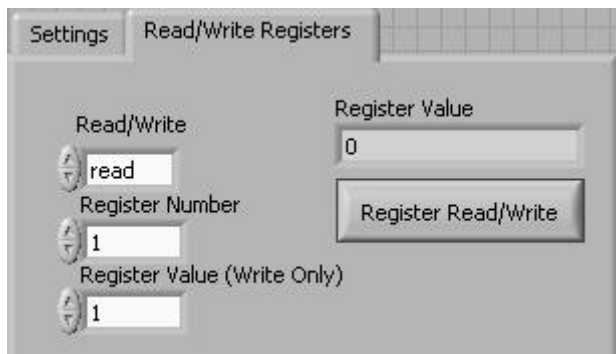
Read/Write	Reading or writing the parameters
Module number	Number of the addressed board
Axis	Axis, whose parameters are changed
Parameter Number	Parameter number, which is modified
Parameter Value (Write Only)	Value to which the parameter is changed (write only)
Parameter Value	Read parameter of the controller (read only)



5.8 Reading and Writing the Registers

This demo reads and writes the *phyMOTION*™ Register.

Read/Write Registers Register card:



Read/Write	Reads or writes the registers
Register Number	Register number which is read or written
Register Value (Write Only)	Value that is written in the register. (write only)
Register Value	Value that is written out of the register. (read only)

5.9 Reading the Status

This demo reads and displays the initiator status and the general and extended *phy*MOTION™ status.

Status register card:



Initiator Status Initiator status of the controller.
The LED is on, when the initiator is activated.

Status General status of the controller.
The LEDs display the status.
The ST command is used.
Extended status: 1.1SE

The LED colors are described in the *phy*LOGIC™ ToolBox communication software for PC Manual.

6 Copyright and Disclaimer of Warranty

The communication software Lab VIEW and any documentation delivered with it are protected by copyright law. The manual must not be copied, reproduced, put into machine readable form, neither complete nor in parts, without the prior written permission of National Instruments Corporation. It is permitted to create backups of the Phytron Freeware VIs for personal use. However, the program must not be modified or sold.

Limitation of warranty

The Lab VIEW-VI software and its documentation have been made with great carefulness and have been reproduced under effective controlling measures. Nevertheless, there might be mistakes.

We refer to our terms of delivery and payment, in particular to item VII liability and item IX software utilization.

You'll agree to our delivery and payment conditions, if you install, copy or use otherwise the software. If you disagree to these condition you aren't authorized to install or use the software.

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Phytron does not warrant that the software is free of errors.

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