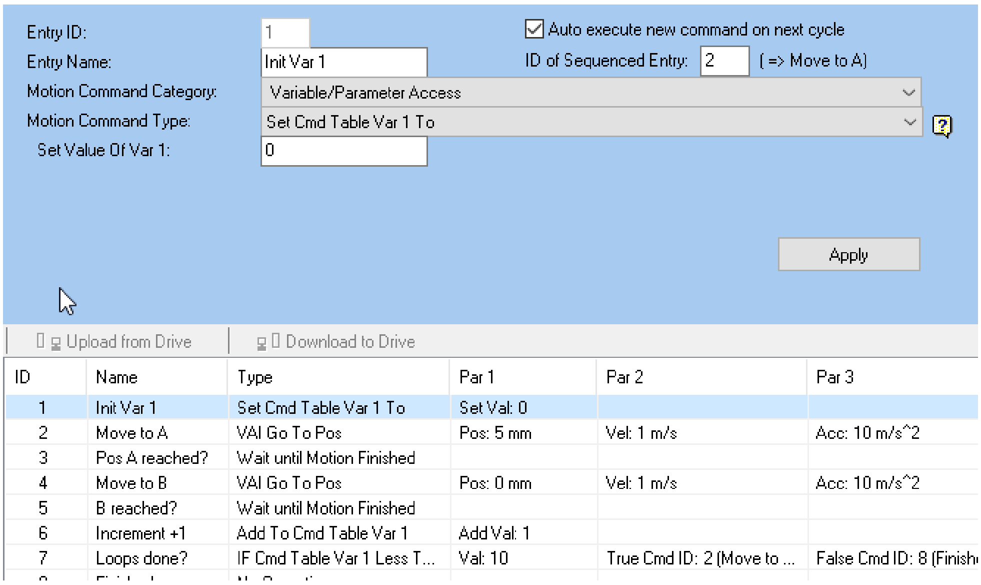
LinMot®

How To

Using the Command Table



Entry ID: 1

Entry Name: Init Var 1

Motion Command Category: Variable/Parameter Access

Motion Command Type: Set Cmd Table Var 1 To

Set Value Of Var 1: 0

☑ Auto execute new command on next cycle

ID of Sequenced Entry: 2 (=> Move to A)

ID	Name	Type	Par 1	Par 2	Par 3
1	Init Var 1	Set Cmd Table Var 1 To	Set Val: 0		
2	Move to A	VAI Go To Pos	Pos: 5 mm	Vel: 1 m/s	Acc: 10 m/s^2
3	Pos A reached?	Wait until Motion Finished			
4	Move to B	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2
5	B reached?	Wait until Motion Finished			
6	Increment +1	Add To Cmd Table Var 1	Add Val: 1		
7	Loops done?	IF Cmd Table Var 1 Less T...	Val: 10	True Cmd ID: 2 (Move to ...	False Cmd ID: 8 (Finish

Classification: [x] Public
[ ] LinMot internally

May 2018

0185-0012_E_1V0_AN_HT_CommandTable

Command Table

LinMot drives provide a feature which is called the **Command Table**.
This feature allows the user to define simple command sequences, similar to a simple PLC program.
The Command Table feature is no substitution for a PLC. Functions are limited compared to a PLC.
Typical use examples are simple motion sequences for standalone applications like test rigs, where some movements must be repeated over long time.
The Command Table acts as a simulated interface. The interface on LinMot drives is typically a fieldbus, which controls the drive. Instead of using a fieldbus, the command table can simulate interface commands.

⚠ **Attention:** The Command Table can be started over a fieldbus by a motion command! When the command table is running, ensure, no motion commands are sent over the fieldbus to prevent any unexpected behavior!
A running command table is signaled in “Status Word Bit 8: Event Handler Active”. This bit can be observed by a PLC to check when the command table has finished!

⚠ **Attention:** LinMot firmware allows use of input lines in several sections of the firmware. If you use an input in the drive I/O definitions at the same time as EasySteps or the Command Table, unexpected behavior may occur!
Use each input only for one task, or ask Support if multiple use may be possible or not!

General information about Command Table

Overview about timing, capacity and I/O capabilities:

Drive	Execution Time [us]	Capacity [lines]	I/O lines
A1100	500	255	6 In / 2 Out
B1100	400	31	6 In / 6 Out
C1100	500	255	4 In / 2 Out
C1200	250	255	4 In / 2 Out
E1100	625	255	8 I/O (GP + 16 In / 8 Out)
E1200	200	255	8 I/O
C1400	250	255	4 In / 2 Out
E1400	250	255	8 I/O

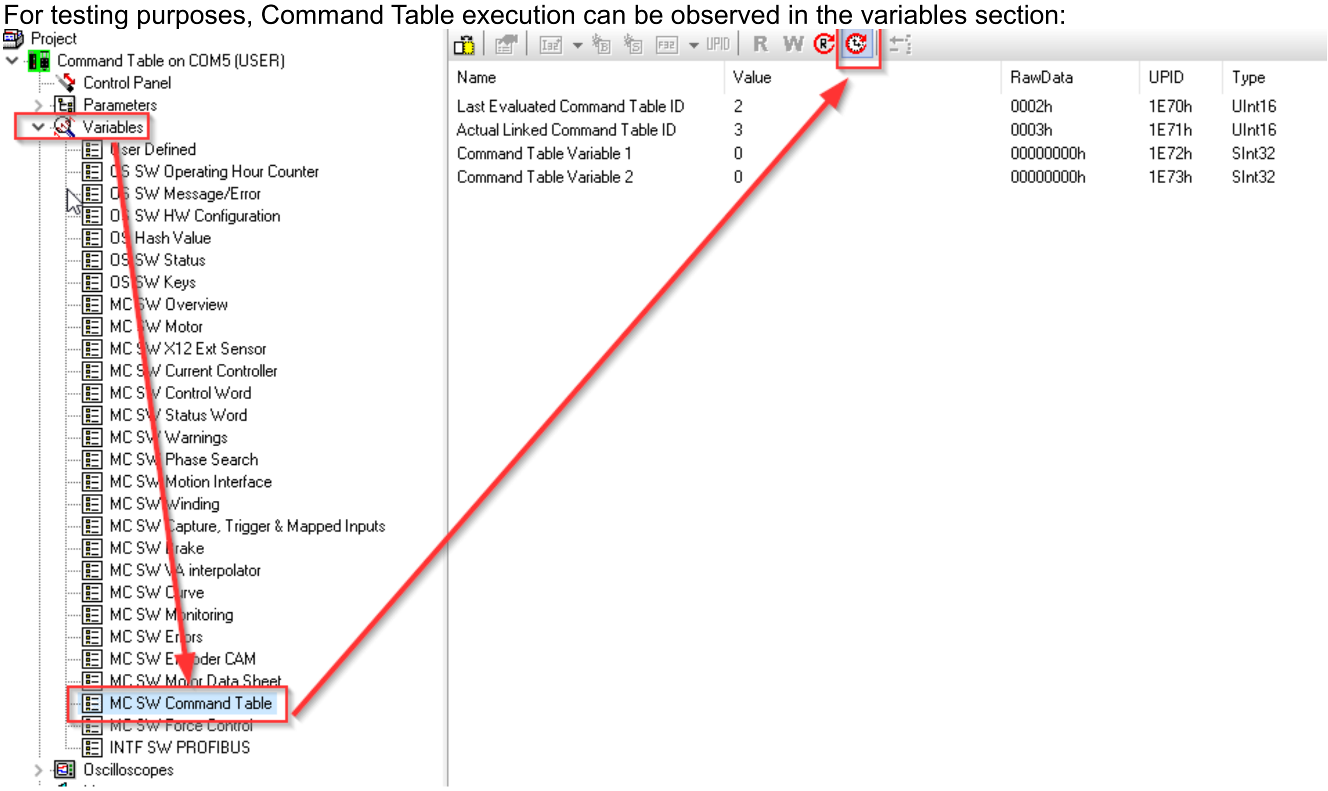
Execution time means the cycle time to execute one Command Table line.
The EasySteps application runs in the same cycle time as the command table.
Detailed information about I/O and wiring can be found in the corresponding drive installation guide!
I/O sample rate is independent of execution cycle time and can be found in the corresponding drive installation guide!

1 Execution sources of Command Table

Command Table execution can be started several ways.
For starting the command table, a unique command table ID is used to address the command line, which should be started as an entry point.
Depending on the selected run mode or command table execution, command table sequences must be handled as infinite loops or with an end point.
The Command table will stop when no new Link ID is entered. If the next link ID points to any valid ID the command table will continue. If a Link ID goes back to a previously executed command then the Command Table is proceeding in a loop.
A running command table cannot be stopped directly!
If the motor is switched off by Control Word bit 0, remember that the Command Table is still running. If a motion command is used in this phase, the drive goes into an error- "User Err: Motion Cmd In Wrong St".
Switching off the motor by Control Word bit 0 or any other sources (STO, Quickstop) should be handled in the Command Table to prevent sending new motion commands. The Command Table should be stopped by calling motion command "Clear Event Evaluation".
The following chapters will show the different options of Command Table features and samples to develop your own applications.

1.1 Debugging Command Table

For testing purposes, Command Table execution can be observed in the variables section:



Name	Value	RawData	UPID	Type
Last Evaluated Command Table ID	2	0002h	1E70h	UInt16
Actual Linked Command Table ID	3	0003h	1E71h	UInt16
Command Table Variable 1	0	00000000h	1E72h	SInt32
Command Table Variable 2	0	00000000h	1E73h	SInt32

When the Command Table is running, you can observe both variables 1 & 2 and the actual linked line and the last linked line. This may be helpful to figure out which line sequence is working. This is especially helpful when "IF" conditions are used.
These variables may be recorded by the Oscilloscope as well. This is helpful if the detailed debugging of conditions are too fast in the variable view.

1.2 Run mode: Triggered Command Table

The Command table can be executed by a hardware trigger signal.
For this use, the run mode of the drive must be set as follows in the parameter tree:

Function	Value	UPID (B1100)	UPID (all other)	Description
Set run mode	\Parameters\Motion Control SW\Motion Interface\Run Mode Settings\Run Mode Selection			
Triggered Command Table	On	62A8h	1450h	Run mode Triggered Command Table

Function	Value	UPID (B1100)	UPID (all other)	Description
Set ID rising trigger	\Parameters\ Motion Control SW\Motion Interface\Run Mode Settings\Triggered Command Table Settings			
Rise Command Table Entry ID	ID number	6302h	1486h	ID number for execution

Function	Value	UPID (B1100)	UPID (all other)	Description
Set ID falling trigger	\Parameters\ Motion Control SW\Motion Interface\Run Mode Settings\Triggered Command Table Settings			
Fall Command Table Entry ID	ID number	6303h	1487h	ID number for execution

In the trigger settings, at least one of the two available parameters, must be set to a valid command table ID. Depending on the application, both rise and fall conditions can be used.

Note: B1100 differs from UPID addresses to other drive series!
Trigger input is fixed to a specific input, which is sampled faster compared to other inputs.
Trigger input cannot be changed to different input lines!

For using this run mode, the trigger input must be configured as follows:

Function	Value	UPID (B1100)	UPID (all other)	Description
Define Trigger Input	\Parameters\Motion Control SW\Drive Configuration\X4/X14 IO Definitions\			
IO X4.6 (not B1100)	01 - Trigger	-	1039h	Set hardware trigger
IO X14.15 (B1100)	01 - Trigger	62EAh	-	Set hardware trigger

Function	Value	UPID (B1100)	UPID (all other)	Description
Define trigger mode	\Parameters\Motion Control SW\Drive Configuration\X4/X14 IO Definitions\Trigger\			
Trigger Mode	01 - Direct	62D8h	170Ch	Trigger evaluation mode

Depending on selected Trigger Mode, inhibit and delay times can be defined in “Trigger Settings”

Attention: Using triggered command table requires short, non-blocking command table sequences!

Attention: Command Table sequences must end! Do not build infinite loops!

Attention: Ensure sequences are finished before a new trigger occurs to prevent any unsuspected behavior!

1.3 Run mode: Command Table

The Command Table can be directly executed. Command Table execution starts immediately after first switch on when the drive is homed.
For use of this feature, the run mode of the drive must be set as follows in the parameter tree:

Function	Value	UPID (B1100)	UPID (all other)	Description
Set run mode	\Parameters\Motion Control SW\Motion Interface\Run Mode Settings\Run Mode Selection			
Command Table Mode	On	62A8h	1450h	Run mode Command Table Mode

Function	Value	UPID (B1100)	UPID (all other)	Description
Set Entry ID	\Parameters\ Motion Control SW\Motion Interface\Run Mode Settings\Command Table Settings			
Command Table Entry ID	ID number	6301h	1485h	ID number for execution

In this mode if the Command Table ends with no link ID then the Command Table execution stops when the last line is reached and will restart when the drive is switched off then back on with Control Word bit 0.

If in this mode and the Command Table is internally linked back to the entry point, the Command Table execution will never stop until the drive is switched off with **Control Word** bit 0. Switching Control Word bit 0 back on will proceed with the Command Table execution. Command Table execution will continue from the last evaluated command table ID. Depending on the application, this behavior must be considered to prevent any unexpected behavior!

1.4 Starting by PLC command

The Command Table may be started by the PLC over a fieldbus, which works in parallel to the Command Table.
The User must ensure that only one sequence source is active!
If the Command Table is started then the PLC must never send any motion commands until the command table has finished!
For starting the Command Table, the PLC sends motion command “Start Command Table Command (200xh)” with parameter word 1 containing the entry ID of the Command Table.
If LinMot PLC libraries are used, there is a predefined function block for starting the command table included.

To observe a running Command table, the PLC must check bit 8 “Event Handler Active” in the Status Word. As long as this bit is set the Command Table is running.
To skip the Command Table execution, it is possible to send motion command “Clear Event Evaluation (008xh)”, which is available in most function block libraries as well.

1.5 Starting with EasySteps

If the optional application software “EasySteps” is installed on the drive, the Command Table may be executed by EasySteps.
Details about this application can be found in the corresponding manual
http://shop.linmot.com/E/product/0185-1037-E

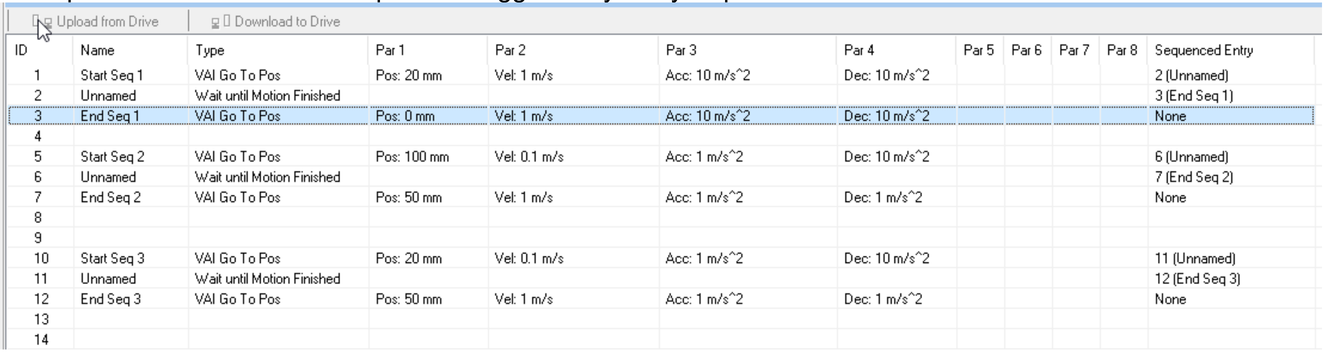
With EasySteps some inputs can be configured to evaluate a Command Table line (depends on the drive).
This can be used instead of “Triggered Command Table”.

It must be ensured, that the Command Table sections are finished, before the next input is triggered!

Attention: Using EasySteps to evaluate Command Table lines, short, non-blocking command table sequences are required!
Ensure sequences are finished, before a new trigger occurs to prevent any undesirable behavior!

Attention: Command Table sequences must end! Do not build infinite loops!

Example: three short motion sequences triggered by EasySteps



ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Start Seq 1	VAI Go To Pos	Pos: 20 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					2 (Unnamed)
2	Unnamed	Wait until Motion Finished									3 (End Seq 1)
3	End Seq 1	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					None
4											
5	Start Seq 2	VAI Go To Pos	Pos: 100 mm	Vel: 0.1 m/s	Acc: 1 m/s^2	Dec: 10 m/s^2					6 (Unnamed)
6	Unnamed	Wait until Motion Finished									7 (End Seq 2)
7	End Seq 2	VAI Go To Pos	Pos: 50 mm	Vel: 1 m/s	Acc: 1 m/s^2	Dec: 1 m/s^2					None
8											
9											
10	Start Seq 3	VAI Go To Pos	Pos: 20 mm	Vel: 0.1 m/s	Acc: 1 m/s^2	Dec: 10 m/s^2					11 (Unnamed)
11	Unnamed	Wait until Motion Finished									12 (End Seq 3)
12	End Seq 3	VAI Go To Pos	Pos: 50 mm	Vel: 1 m/s	Acc: 1 m/s^2	Dec: 1 m/s^2					None
13											
14											

Configuring EasySteps I/O Motion (several inputs support this feature, depending on drive type):

Function	Value	UPID (B1100)	UPID (all other)	Description
Input Xxx Function	\Parameters\EasySteps\IO Motion\Input X4/X14 Config\			
X4.5 Rising Edge Function (not B1100)	0Ch – Eval Command Table Command	-	3600h	Eval Command Table Command
X14.2 Rising Edge Function (B1100)	0Ch – Eval Command Table Command	6418h	-	Eval Command Table Command

Function	Value	UPID (B1100)	UPID (all other)	Description
Xxx IO Motion Config	\Parameters\EasySteps\IO Motion\Input X4/X14 Config\ IO Motion Config			
Curve/CmdID	Entry ID	6419h	3620h	Entry ID for Command Table execution

This setting shows only one input however, depending on the drive hardware, several inputs can be configured in the same way to execute Command Table sequences.
For each motion sequence in the above shown command table, an input definition in EasySteps must be done. These inputs can trigger the motion sequences.

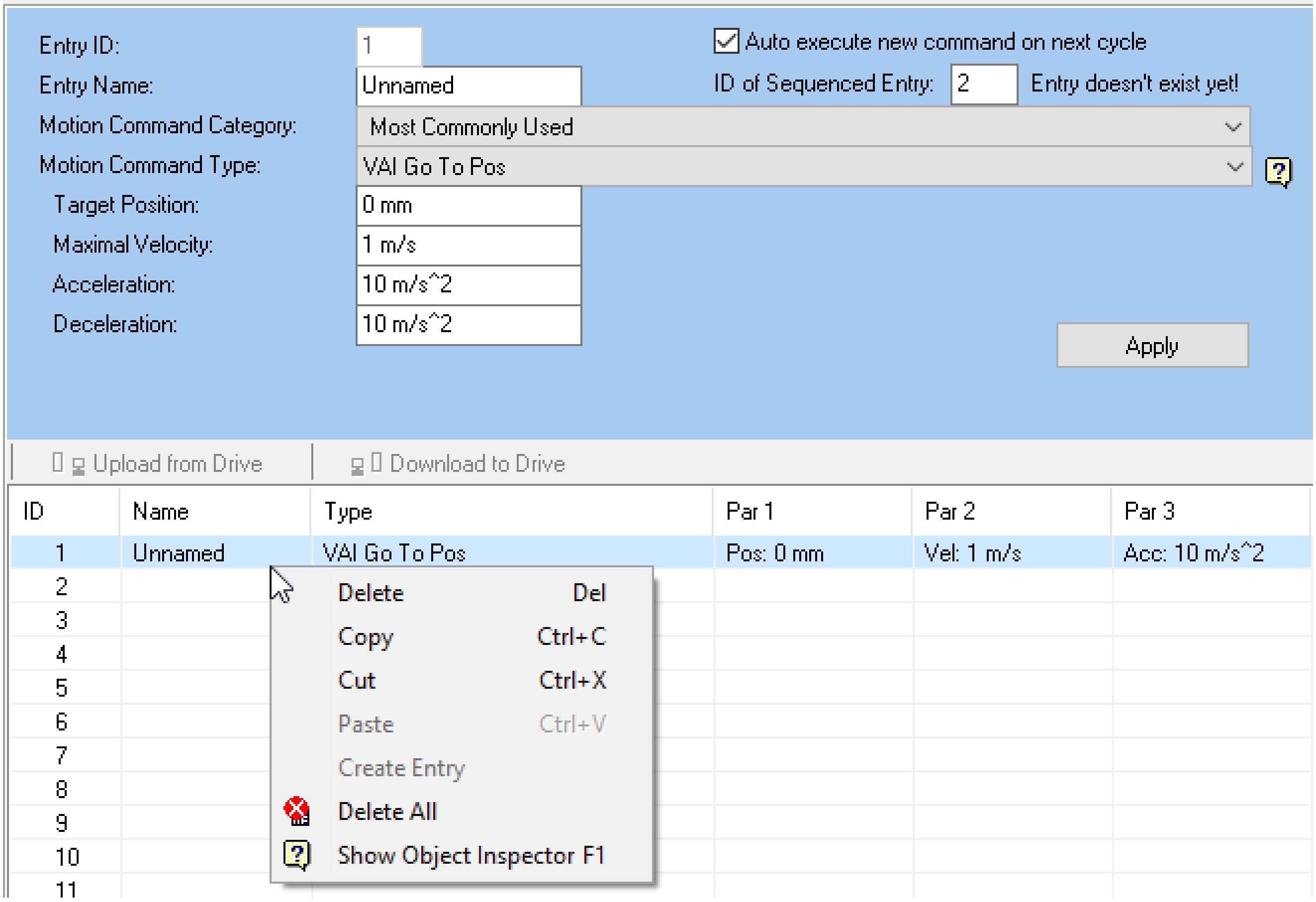
1.6 Using Command Table I/O Interface (only E1100-GP series)

Command Table I/O Interface is a special feature on E1100-GP drives, which allows selection of each command table line by a binary coded bit structure over the X6 I/O connector.
Details can be found in the user manual
http://shop.linmot.com/E/product/0185-1077-E

2 Editing Command Table

The Command Table editor is based on a table.
The command table section is located in the parameter tree of the selected drive configuration.
Each table line corresponds to one command table command.
Each row starts with its unique ID, which corresponds to the line number.
For jumps or conditions, this line ID is used to address the next command.

Right click on a command table line will show a popup window with additional functions for editing.



Entry ID:	1
Entry Name:	Unnamed
Motion Command Category:	Most Commonly Used
Motion Command Type:	VAI Go To Pos
Target Position:	0 mm
Maximal Velocity:	1 m/s
Acceleration:	10 m/s^2
Deceleration:	10 m/s^2

☑ Auto execute new command on next cycle

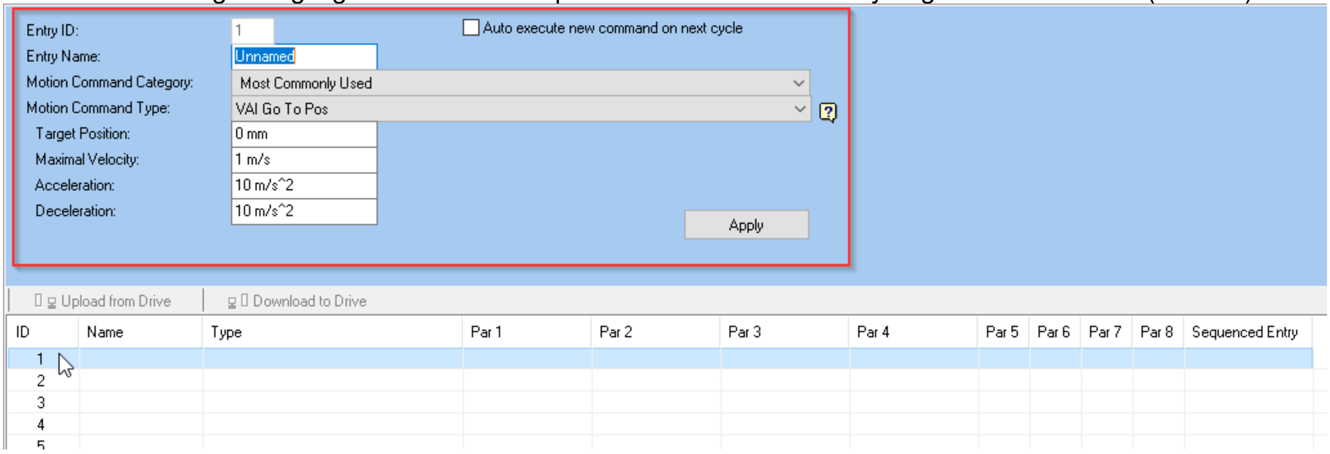
ID of Sequenced Entry: 2 Entry doesn't exist yet!

ID	Name	Type	Par 1	Par 2	Par 3
1	Unnamed	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					

Single or multiple lines can be cut, copied, or pasted in the Command Table.

2.1 Enter a command

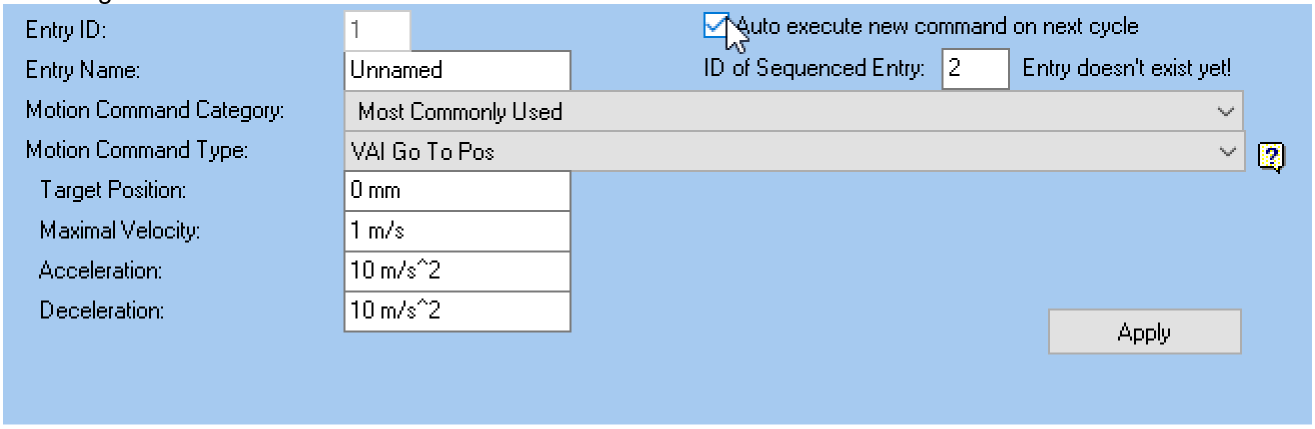
Select one command table line by double click.
The selected line gets highlighted and at the top of command table editor you get an editor block (red box).



Entry ID: 1
□ Auto execute new command on next cycle
Entry Name: Unnamed
Motion Command Category: Most Commonly Used
Motion Command Type: VAI Go To Pos
Target Position: 0 mm
Maximal Velocity: 1 m/s
Acceleration: 10 m/s^2
Deceleration: 10 m/s^2

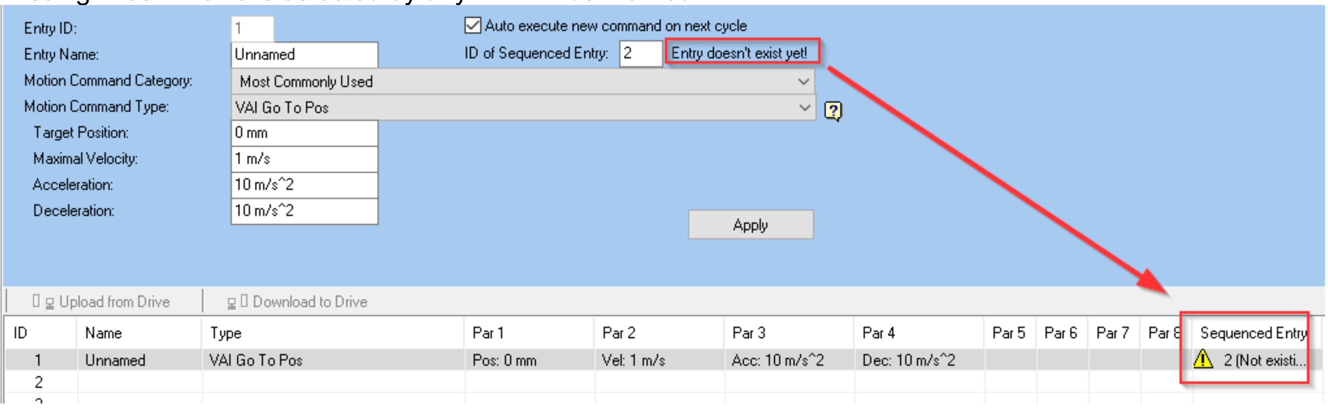
ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1											
2											
3											
4											
5											

The entry ID is fixed by the selected line.
You can enter a name or info text in the field “Entry Name” to get the command table structure.
In the section “Motion Command Category” you can preselect the available commands to reduce the list in “Motion Command Type”.
Depending on the preselection, you can select available commands in “Motion Command Type”.
According to the selected “Motion Command”, entry fields for parameters will change.
If the actual command table line is the last line (means table will end after this line), do not select “Auto execute new command on next cycle”.
If you want to execute new/next command, select “Auto execute new command on next cycle” and enter in the occurring filed the next ID to execute.



Entry ID: 1
☑ Auto execute new command on next cycle
Entry Name: Unnamed
ID of Sequenced Entry: 2 Entry doesn't exist yet!
Motion Command Category: Most Commonly Used
Motion Command Type: VAI Go To Pos
Target Position: 0 mm
Maximal Velocity: 1 m/s
Acceleration: 10 m/s^2
Deceleration: 10 m/s^2

Missing lines which are selected by any link will be marked!



Entry ID: 1
☑ Auto execute new command on next cycle
Entry Name: Unnamed
ID of Sequenced Entry: 2 Entry doesn't exist yet!
Motion Command Category: Most Commonly Used
Motion Command Type: VAI Go To Pos
Target Position: 0 mm
Maximal Velocity: 1 m/s
Acceleration: 10 m/s^2
Deceleration: 10 m/s^2

ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Unnamed	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					⚠ 2 (Not existi...
2											

2.2 Delete commands

Select the line or lines to be deleted and perform right mouse click to show popup window.

Select Delete (or press del key).

Attention: Clicking on "Delete All" will clear the complete command table!

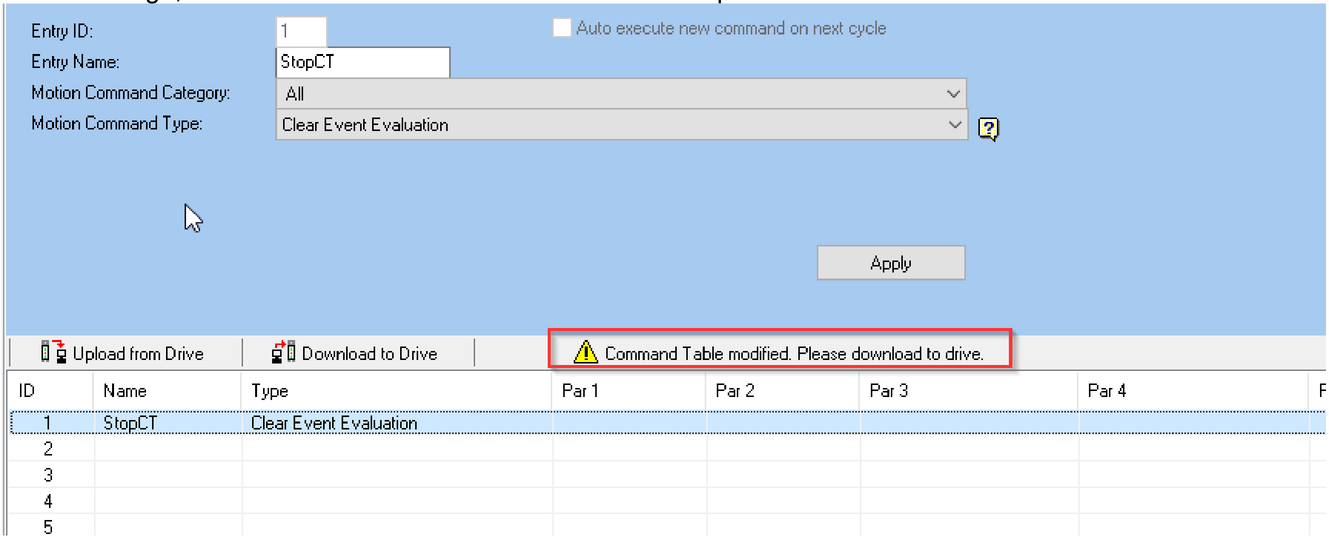
2.3 Move / add a new line

Moving command table lines may be necessary to get space for new additional lines.
It's not possible to insert a new line directly.
To get space for additional lines, you need to select lines, cut them out and paste them in at the new location.
Multiple lines in one block can be cut and pasted.
For pasting the lines all needed target lines must be empty or they will be overwritten!
Linked ID's especially ID's in conditions will not automatically renumbered! This must be done manually!

Attention: Pasted lines (after copy or cut) will not be automatically renumbered in the linked ID or in conditions!
This must be done manually!

2.4 Download the Command Table

If the Command Table is modified, changes must be downloaded to the drive to get stored and activated.
After a change, the Command Table shows the download request:



Entry ID: 1
Entry Name: StopCT
Motion Command Category: All
Motion Command Type: Clear Event Evaluation

□ Auto execute new command on next cycle

Command Table modified. Please download to drive.

ID	Name	Type	Par 1	Par 2	Par 3	Par 4
1	StopCT	Clear Event Evaluation				
2						
3						
4						
5						

During download firmware must be stopped. When the download is complete, restart the drive.

2.5 Upload the Command Table

During drive login the existing Command Table will be uploaded automatically.
In some cases, it's helpful to upload a Command Table.
The PLC can be programmed to modify the Command Table for special use. For debugging purposes, uploading the Command Table will show the changes from PLC.

3 Command sequences

Depending on the particular drive, you have several available commands.
You can use each motion command, which is supported on the particular drive.
A list of the commands can be found in the user manual motion control:
For B1100/E1100 series http://shop.linmot.com/E/product/0185-1092-E

For all other series http://shop.linmot.com/E/product/0185-1093-E

The drives provide additional commands, which are only foreseen for use in the Command Table like: conditions, parameter access, and I/O access for example.

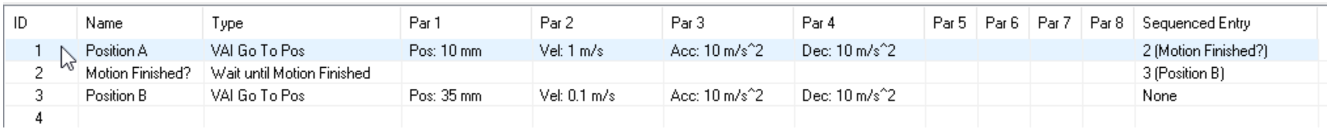
3.1 Conditions

The Command Table provide several conditions to control command table execution.
There are two main groups of conditions:

- Waiting conditions (wait until the condition becomes true, before executing the linked ID)
- If conditions (link to ID depending on if condition, no wait)

3.1.1 Wait conditions

For simple motion sequences, its sufficient to use “Wait” conditions. These conditions will execute next ID, when a condition is true.
For example:
Move to position A, when motion finished, move to position B:



ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Position A	VAI Go To Pos	Pos: 10 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					2 (Motion Finished?)
2	Motion Finished?	Wait until Motion Finished									3 (Position B)
3	Position B	VAI Go To Pos	Pos: 35 mm	Vel: 0.1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					None
4											

Execution starts in line 1 by moving the motor to a position of 10mm, link to line 2.
While the motor moves to position A, condition in line 2 waits until VA interpolator is finished (motion curve is done). Then line 3 will executed and command table ends directly, while motor still moves until position is reached.

Note: For simple movements as a sequence, use wait conditions! Without conditions, running command will be overwritten with next linked command!
If the wait condition is removed in the above sequence the motor starts with position A and the command will be overwritten with position B, so only movement to position B will be observed!

Note: Difference: Wait until motion finished – Wait until in target position
First command waits until VA interpolator is finished, while second command waits until position is in the check window of “Status In Target Position”.

List of wait-conditions:

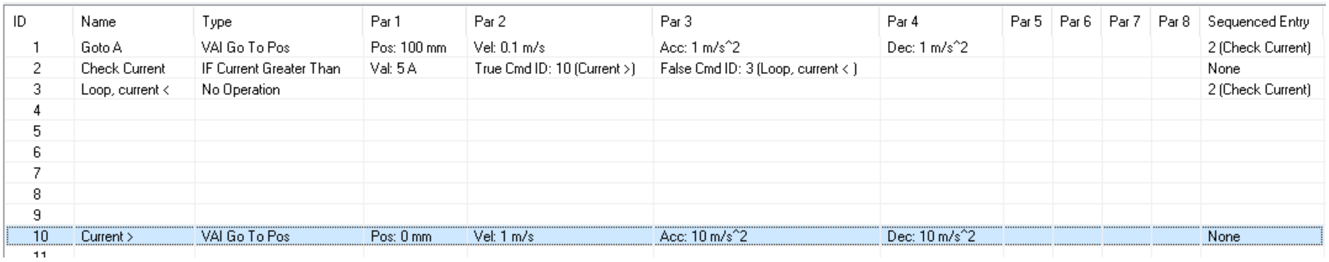
- Wait Time (210xh)
- Wait Until Motion Finished (211xh)
- Wait Until In Target Position (212xh)
- Wait Until Rising Trigger Event (213xh)
- Wait Until Falling Trigger Event (214xh)
- Wait Until Demand Position Greater Than (220xh)
- Wait Until Demand Position Less Than (221xh)
- Wait Until Actual Position Greater Than (222xh)
- Wait Until Actual Position Less Than (223xh)
- Wait Until Difference Position Greater Than (224xh)
- Wait Until Difference Position Less Than (225xh)
- Wait Until Difference Position Unsigned Greater Than (226xh)
- Wait Until Difference Position Unsigned Less Than (227xh)
- Wait Until Demand Velocity Greater Than (228xh)
- Wait Until Demand Velocity Less Than (229xh)
- Wait Until Actual Velocity Greater Than (22Axh)
- Wait Until Actual Velocity Less Than (22Bxh)
- Wait Until Current Greater Than (22Exh)
- Wait Until Current Less Than (22Fxh)

Attention: Check the corresponding motion control software manual to verify if the listed command is supported on your particular drive!

3.1.2 If conditions

Note: While using IF conditions, never set one of the both link ID’s to its own entry ID! This will cause a Trap Class A error!
All command table lines will be executed in one interface software cycle of the firmware. This ensures constant execution timing, but this does not allow direct loop back!
It is recommended never call an IF condition from an IF condition!

For some applications handled by command table, its useful to have an if condition.
For example, during movement to a position, the IF condition should check that specific motor current is reached to detect a target by current increase.



ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Goto A	VAI Go To Pos	Pos: 100 mm	Vel: 0.1 m/s	Acc: 1 m/s^2	Dec: 1 m/s^2					2 (Check Current)
2	Check Current	IF Current Greater Than	Val: 5 A	True Cmd ID: 10 (Current >)	False Cmd ID: 3 (Loop, current <)						None
3	Loop, current <	No Operation									2 (Check Current)
4											
5											
6											
7											
8											
9											
10	Current >	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					None
11											

Line 1 will start a movement to 100mm and jump into line 2.
Line 2 check, if motor current is greater than 5A, like when hitting an obstruction, then jump to line 10, or less than 5A to jump to line 3.
Line 3 will loop back IF condition into line 2, because no direct loop backs from IF condition itself are allowed!
Line 3 is needed to decouple the IF condition loop back.
Line 10 will execute, here it’s just moving back to 0 and ending command table execution.

List of IF conditions:

- IF Cmd Table Var 1 Less Than (250xh)
- IF Cmd Table Var 1 Greater Than (251xh)
- IF Cmd Table Var 2 Less Than (252xh)
- IF Cmd Table Var 2 Greater Than (253xh)
- IF Cmd Table Var 1 Less Than UPID Value (256xh)
- IF Cmd Table Var 2 Less Than UPID Value (257xh)
- IF Demand Position Less Than (258xh)
- IF Demand Position Greater Than (259xh)
- IF Actual Position Less Than (25Axh)
- IF Actual Position Greater Than (25Bxh)
- IF Difference Position Less Than (25Cxh)
- IF Difference Position Greater Than (25Dxh)
- IF Current Less Than (25Exh)
- IF Current Greater Than (25Fxh)
- IF Analog Val On X4.4 Less Than (260xh)
- IF Masked X4 Input Value Equal Than (262xh) (E1100, E1200, C1100, C1200, C1400, E1400)
- IF Masked X14 Input Value Equal Than (262xh) (B1100)
- IF Masked X6 Input Value Equal Than (263xh) (only E1100-GP)
- IF Masked Status Word Equal Than (264xh)
- IF Masked Warn Word Equal Than (265xh)
- IF CAM Counts Less Than (266xh)

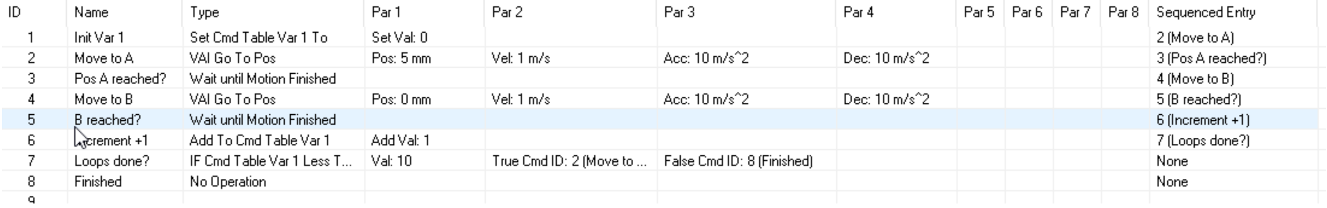
Attention: Check the corresponding motion control software manual to verify if the listed command is supported on your particular drive!

3.2 Variable / Parameter access

Command Table feature provide two variables to store temporary data. Data type is adopted automatically from the data source data type.
These variables can both be set to a specific value and can be incremented and used in IF conditions as well.
If a loop counter is needed, this can be done with a variable.
Variables can be loaded with a value from the drive RAM by its UPID address as well as writing variable content to a UPID address.

Variables can be observed with LinMot Talk variable section – Command Table or read by PLC.

For example, a loop counter is needed to repeat a specific amount of motion cycles:



ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Init Var 1	Set Cmd Table Var 1 To	Set Val: 0								2 (Move to A)
2	Move to A	VAI Go To Pos	Pos: 5 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					3 (Pos A reached?)
3	Pos A reached?	Wait until Motion Finished									4 (Move to B)
4	Move to B	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					5 (B reached?)
5	B reached?	Wait until Motion Finished									6 (Increment +1)
6	Increment +1	Add To Cmd Table Var 1	Add Val: 1								7 (Loops done?)
7	Loops done?	IF Cmd Table Var 1 Less T...	Val: 10	True Cmd ID: 2 (Move to ...	False Cmd ID: 8 (Finished)						None
8	Finished	No Operation									None
9											

In this example, command table execution starts in line 1, where counter is preset to “0”.
Then, motion is performed in lines 2 to 5.
In line 6, variable 1 gets incremented with +1.
Line 7 checks, if variable 1 is less than 10 loops to repeat at line 2 or jump to line 8 and finish command table.
This sample will repeat the both movements 10 times.

List of Variable / Parameter access

- Set Cmd Table Var 1 To (240xh)
- Add To Cmd Table Var 1 (241xh)
- Set Cmd Table Var 2 To (242xh)
- Add To Cmd Table Var 2 (243xh)
- Write Cmd Table Var 1 To UPID RAM value (248xh)
- Write Cmd Table Var 2 To UPID RAM value (249xh)
- Write UPID RAM Value To Cmd Table Var 1 (24Cxh)
- Write UPID RAM Value To Cmd Table Var 2 (24Dxh)
- Write UPID RAM value To UPID ROM value (24Exh)

Note: If you need to do something like a count down, increment variable with “-“ sign.
E.g. increment value “-1” instead of “1” will count down the used variable.

Attention: Check the corresponding motion control software manual to verify if the listed command is supported on your particular drive!

3.3 Access to I/O

With a command table sequence, you can access the drive I/O.
For reading an input, no additional settings according I/O must be done.
If you want to set an output, this I/O line must be configured as “Interface Output” as follows:

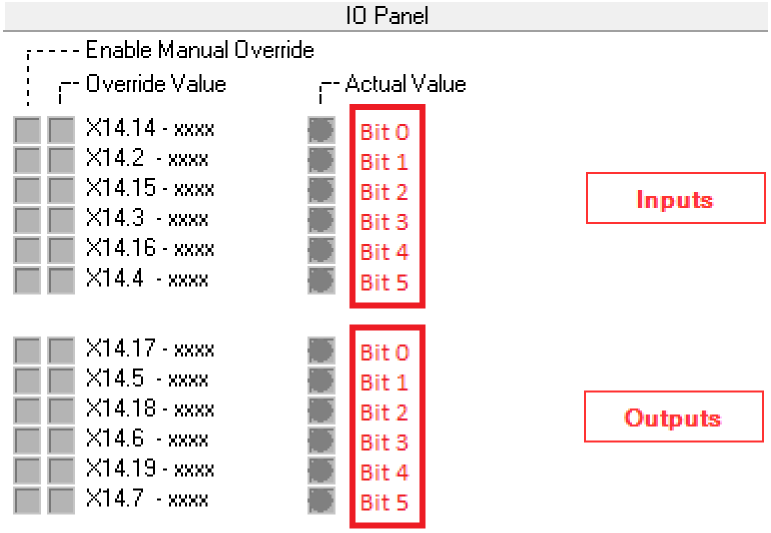
Configuring of an output for use with Command Table:

Function	Value	UPID (B1100)	UPID (all other)	Description
Define Output	\Parameters\Motion Control SW\Drive Configuration\X4/X14 IO Definitions\			
IO X4.3 (not B1100)	0Eh – Interface Output	-	1036h	Set X4.3 as output
IO X14.17 (B1100)	0Eh – Interface Output	62EEh	-	Set X14.17 as output

For checking an input state with an IF condition or to set one or several outputs a bit mask is required to define the input/output line.
The bit mask selects the needed bits from the input or output register.

The B1100 and C series drives define input and output lines separately, while all E1XX0 drives provide I/O lines. This means that the lines can be configured as input or output. Without any configuration, each I/O line is always an input.

The following inputs and outputs on the B1100 series drives are available:



IO Panel

Enable Manual Override

Override Value

Actual Value

X14.14 - xxxx Bit 0
X14.2 - xxxx Bit 1
X14.15 - xxxx Bit 2
X14.3 - xxxx Bit 3
X14.16 - xxxx Bit 4
X14.4 - xxxx Bit 5

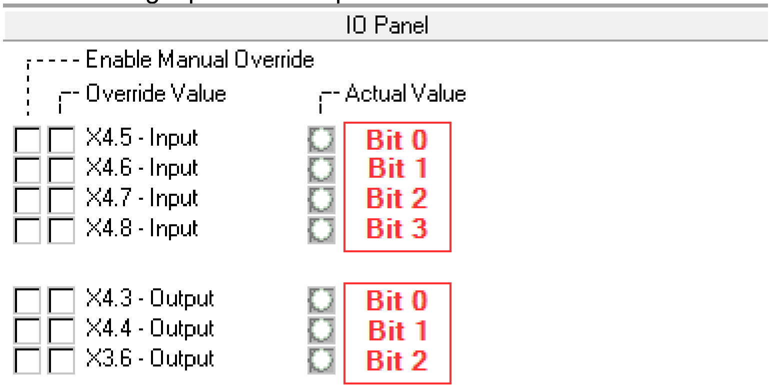
Inputs

X14.17 - xxxx Bit 0
X14.5 - xxxx Bit 1
X14.18 - xxxx Bit 2
X14.6 - xxxx Bit 3
X14.19 - xxxx Bit 4
X14.7 - xxxx Bit 5

Outputs

Bit counting direction from top to bottom.

The following inputs and outputs on the C1X00 series drives are available:



IO Panel

Enable Manual Override

Override Value

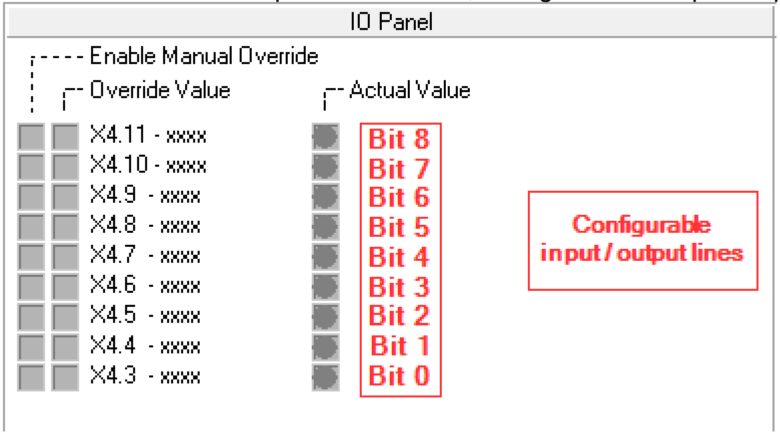
Actual Value

X4.5 - Input Bit 0
X4.6 - Input Bit 1
X4.7 - Input Bit 2
X4.8 - Input Bit 3

X4.3 - Output Bit 0
X4.4 - Output Bit 1
X3.6 - Output Bit 2

Bit counting direction from top to bottom.

All E1XX0 drive series provide I/O lines, configurable as input/output lines:



Bit counting from bottom to top. Depending on drive, I/O count varies up to X4.12 (bit 9).

3.3.1 Creating bit mask

Creating a bit mask means, you set a bit, which should be used in the mask byte.
This can simply be done by mathematical equation: $mask\ value = 2^{Bitnumber}$

Example on B1100 inputs:
Bit mask for X14.3, bit number 3 -> $2^3 = 8 = 8h = 0000\ 1000$

Example for B1100 outputs:
Bit mask for X14.17, bit number 0 -> $2^0 = 1 = 1h = 0000\ 0001$
Bit mask for X14.6, bit number 3 ->$2^3 = 8 = 8h = 0000\ 1000$

A bit mask allows to select several bits at same time. To do so, you need to add each calculated bit value.
Example on E1100:
Bit mask for X4.4, bit number 1 -> $2^1 = 2 = 2h = 0000\ 0010$
Bit mask for X4.9, bit number 6 -> $2^6 = 64 = 40h = 0100\ 0000$

Sum: $Bit\ mask = 2^1 + 2^6 = 2 + 64 = 66 = 42h = 0100\ 0010$

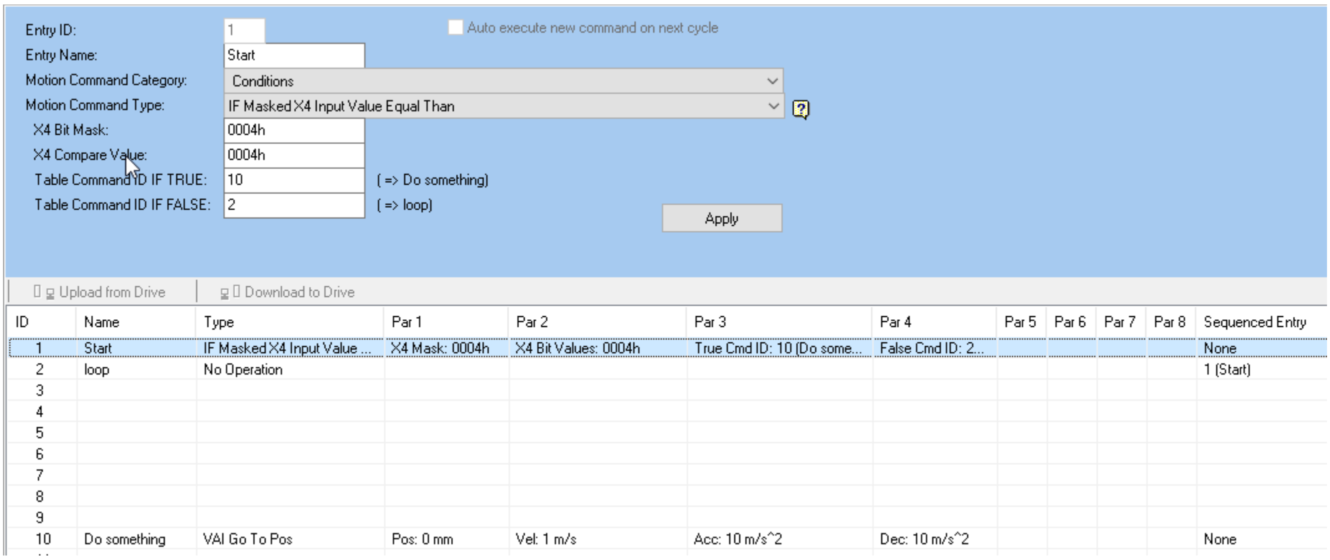
This bit mask will observe X4.4 and X4.9. A bit mask is a logical AND equation.

All bit numbers for I/O lines starts with count 0 for X4.3 and increase up to last I/O, except B1100.
B1100 starts bit counting in the I/O panel from top to down (see screenshot).
Inputs and outputs are separate blocks, while other drive I/O lines are in same block.

3.3.2 Check input value

Checking input values can be done by using IF command “IF Masked X4 Input Value Equal Than (262xh)”. Here, a bit mask and compare value is required to check if the input line is set.

Example: checking, if X4.5 is set on E1100 drive:
X4.5 bit value = 2 -> $2^2 = 4 = 04h = 0000\ 0100$

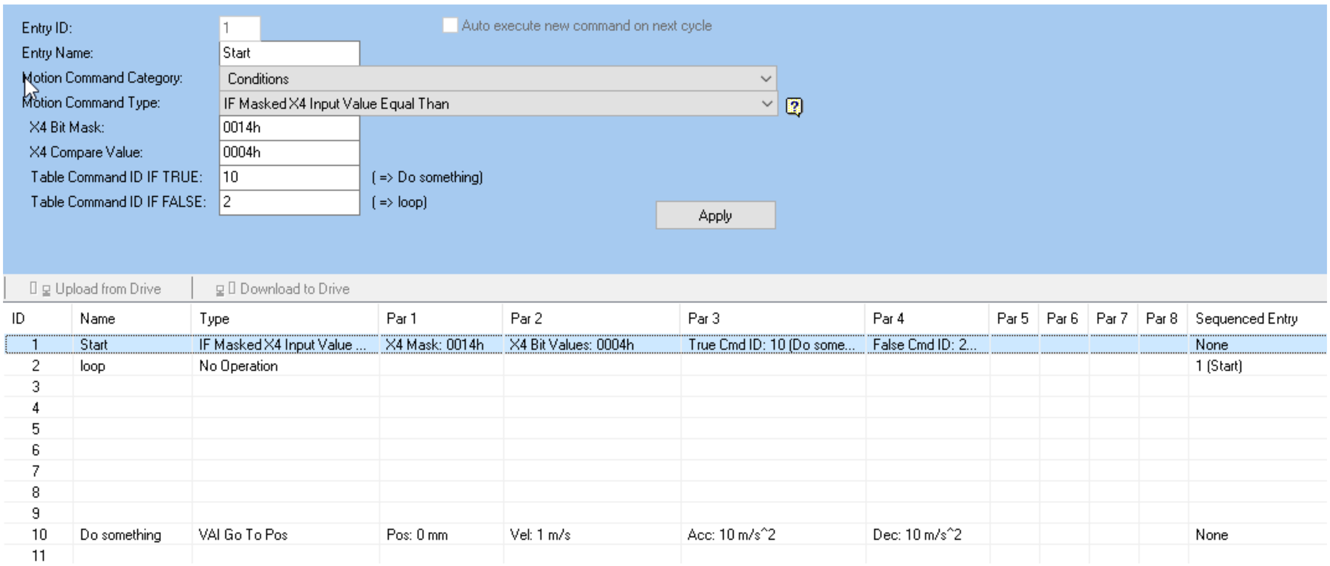


Entry ID: 1
□ Auto execute new command on next cycle
Entry Name: Start
Motion Command Category: Conditions
Motion Command Type: IF Masked X4 Input Value Equal Than
X4 Bit Mask: 0004h
X4 Compare Value: 0004h
Table Command ID IF TRUE: 10 (=> Do something)
Table Command ID IF FALSE: 2 (=> loop)

ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Start	IF Masked X4 Input Value ...	X4 Mask: 0004h	X4 Bit Values: 0004h	True Cmd ID: 10 (Do some...	False Cmd ID: 2...					None
2	loop	No Operation									1 (Start)
3											
4											
5											
6											
7											
8											
9											
10	Do something	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					None

Line 1 is checking if the masked input corresponds with its bit value (same as bit mask) for proceeding in line 10, otherwise it loops via line 2 back into line 1.

Example: checking, if X4.5 is set and X4.7 is not set on E1100 drive:
Bit mask: $= Bitmask = 2^2 + 2^4 = 20 = 14h = 0001\ 0100$
Compare value: $CompareValue = 1 * 2^2 + 0 * 2^4 = 4 = 04h = 0000\ 0100$



Entry ID: 1
□ Auto execute new command on next cycle
Entry Name: Start
Motion Command Category: Conditions
Motion Command Type: IF Masked X4 Input Value Equal Than
X4 Bit Mask: 0014h
X4 Compare Value: 0004h
Table Command ID IF TRUE: 10 (=> Do something)
Table Command ID IF FALSE: 2 (=> loop)

ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Start	IF Masked X4 Input Value ...	X4 Mask: 0014h	X4 Bit Values: 0004h	True Cmd ID: 10 (Do some...	False Cmd ID: 2...					None
2	loop	No Operation									1 (Start)
3											
4											
5											
6											
7											
8											
9											
10	Do something	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					None
11											

This IF condition will link to line 10, if X4.5 is set and X4.7 is not set.

3.3.3 Set output

The following commands to set the outputs are:

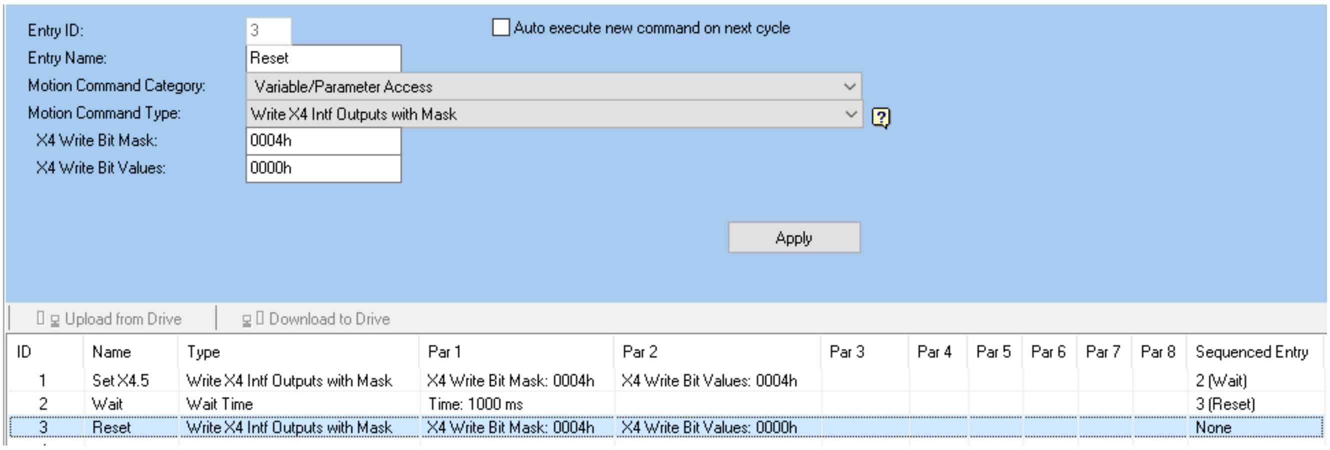
- Write X4 Intf Outputs with Mask (003xh) (E1100, E1200, C1100, C1200, C1400, E1400)
- Write X14 Intf Outputs with Mask (003xh) (B1100)
- Write X6 Intf Outputs with Mask (004xh) (only available on E1100-GP drives)

Attention: Make sure, planned I/O line is configured as “Interface Output”!

To write a bit to an output line you need to build a bit mask and a value. This is similar to reading inputs previously.

Example: Set X4.5 as output on E1100 drive:

X4.5 bit mask = 2 -> $2^2 = 4 = 04h = 0000\ 0100$
X4.5 bit value = 2 -> $2^2 = 4 = 04h = 0000\ 0100$



□ Auto execute new command on next cycle

Entry ID:	3
Entry Name:	Reset
Motion Command Category:	Variable/Parameter Access
Motion Command Type:	Write X4 Intf Outputs with Mask
X4 Write Bit Mask:	0004h
X4 Write Bit Values:	0000h

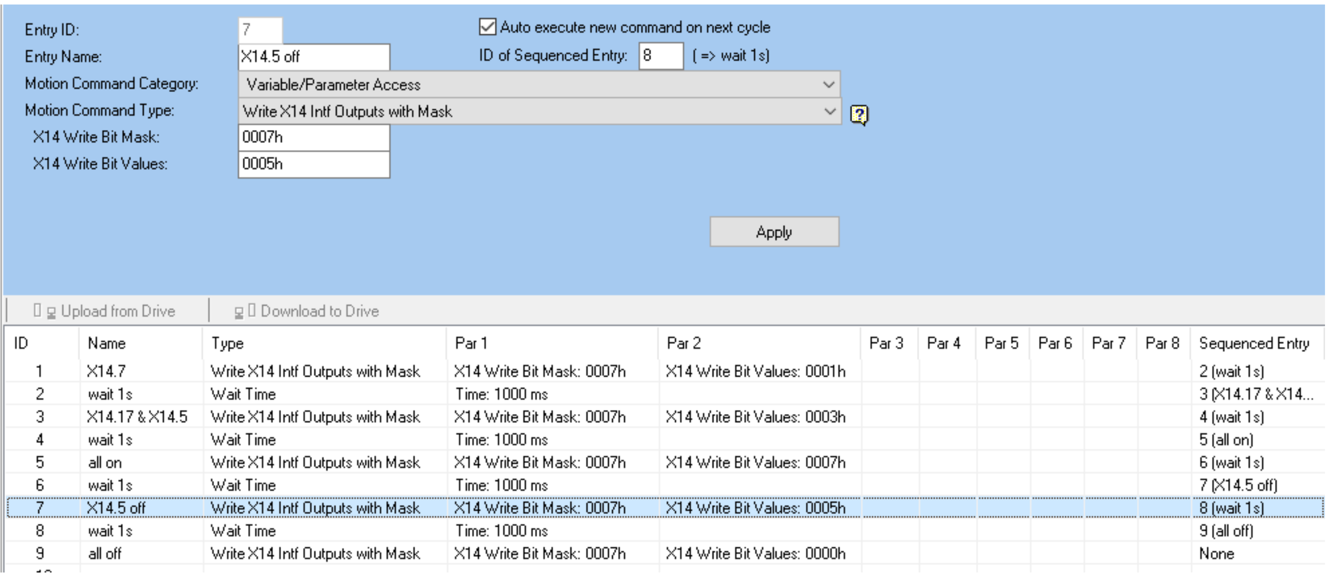
ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	Set X4.5	Write X4 Intf Outputs with Mask	X4 Write Bit Mask: 0004h	X4 Write Bit Values: 0004h							2 (Wait)
2	Wait	Wait Time	Time: 1000 ms								3 (Reset)
3	Reset	Write X4 Intf Outputs with Mask	X4 Write Bit Mask: 0004h	X4 Write Bit Values: 0000h							None

This example sets X4.5 to a high signal (on), wait 1s and reset X4.5 back to a low signal (off) and finish the command table.

Example: Setting X14.17, X14.5 and X14.18 on B1100 to outputs:

Bit mask: $Bitmask = 2^0 + 2^1 + 2^2 = 1 + 2 + 4 = 7 = 07h = 0000\ 0111$
This command table sequence is setting a sequence on the outputs.
First, X14.17 is set, after 1s X14.5 is set, and after 1s X14.18 is set. Then after 1s X14.5 is reset. After another 1s all outputs are reset.
For this sequence, several bit values are required to get this sequence to the outputs.

Bit value for X14.17: $Bitvalue = 2^0$ = 1 = 01h = 0000 0001
Bit value for X14.17 and X14.5: $Bitvalue = 2^0 + 2^1 = 1 + 2 = 3 = 03h = 0000\ 0011$
Bit value for X14.17 and X14.5 and X14.18: $Bitvalue = 2^0 + 2^1 + 2^2 = 1 + 2 + 4 = 7 = 07h = 0000\ 0111$
Bit value for X14.17 and not X14.5 and X14.18: $Bitvalue = 1 * 2^0 + 0 * 2^1 + 1 * 2^2 = 1 + 0 + 4 = 5 = 05h = 0000\ 0101$
Bit value all off: 0



Entry ID:	7	☑ Auto execute new command on next cycle	
Entry Name:	X14.5 off	ID of Sequenced Entry:	8 (=> wait 1s)
Motion Command Category:	Variable/Parameter Access		
Motion Command Type:	Write X14 Intf Outputs with Mask		
X14 Write Bit Mask:	0007h		
X14 Write Bit Values:	0005h		

ID	Name	Type	Par 1	Par 2	Par 3	Par 4	Par 5	Par 6	Par 7	Par 8	Sequenced Entry
1	X14.7	Write X14 Intf Outputs with Mask	X14 Write Bit Mask: 0007h	X14 Write Bit Values: 0001h							2 (wait 1s)
2	wait 1s	Wait Time	Time: 1000 ms								3 (X14.17 & X14...
3	X14.17 & X14.5	Write X14 Intf Outputs with Mask	X14 Write Bit Mask: 0007h	X14 Write Bit Values: 0003h							4 (wait 1s)
4	wait 1s	Wait Time	Time: 1000 ms								5 (all on)
5	all on	Write X14 Intf Outputs with Mask	X14 Write Bit Mask: 0007h	X14 Write Bit Values: 0007h							6 (wait 1s)
6	wait 1s	Wait Time	Time: 1000 ms								7 (X14.5 off)
7	X14.5 off	Write X14 Intf Outputs with Mask	X14 Write Bit Mask: 0007h	X14 Write Bit Values: 0005h							8 (wait 1s)
8	wait 1s	Wait Time	Time: 1000 ms								9 (all off)
9	all off	Write X14 Intf Outputs with Mask	X14 Write Bit Mask: 0007h	X14 Write Bit Values: 0000h							None

4 Examples

This chapter shows some simple sample command tables to see, how to solve simple tasks.
All samples are done on E1100-GP drives with installed EasySteps application software!
For each example it's assumed drive is defaulted and motor is configured by motor wizard.

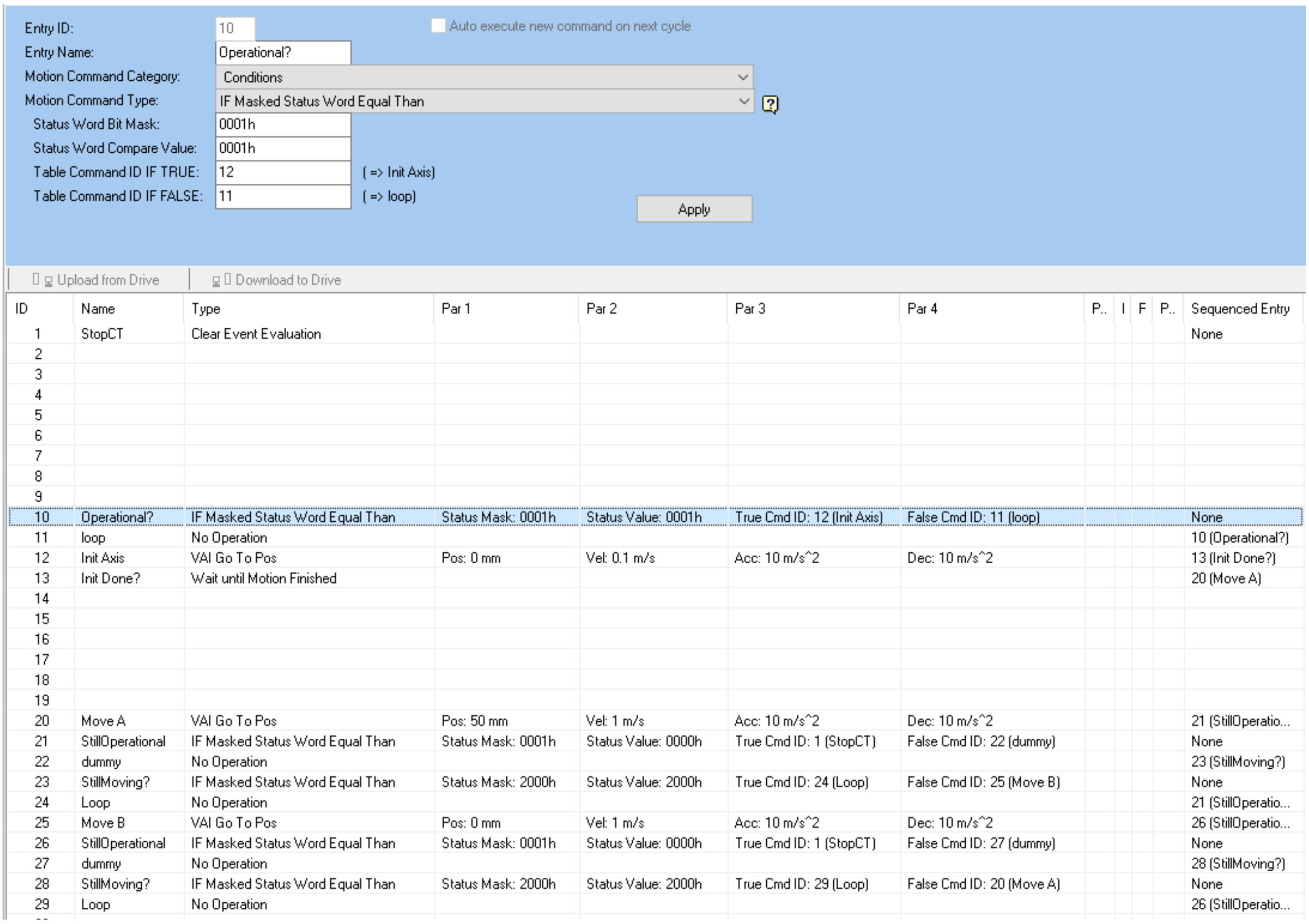
4.1 Example 1: Controlled switch off

This example uses EasySteps X4.4 to evaluate Command Table line 10 to start the sequence.
(Using EasySteps is described in the manual
http://shop.linmot.com/E/product/0185-1037-E

Motor switching on and off is done by Control Word bit 0 (handled by control panel, and can be mapped to I/O).

In this example, the motor will be moved to start position when X4.4 is triggered and the drive is operational.
Line 10 checks if Status Word bit 0 is set, which means the drive is operational.
During the movement to initial position there is no check for power off!
After initialization, line 20 is executed.
Then, there is a check if the drive is still operational. If not, line 1 will be executed to stop the command table.
Otherwise, in line 23 Status Word bit 13, "Motion Active" is checked. If motion is still active, condition loop back to line 21, otherwise it starts line 25 for the next movement.
For the next position, the same checks are done and then loop back to line 20.
As long as Control Word bit 0 "Switch On" is active the motor will move between two positions.
If Control Word bit 0 is off, the Command Table will stop.
After Control Word bit 0 is set again, Command Table execution can be triggered again by X4.4.

This sequence prevents sending motion commands when drive is not ready to move

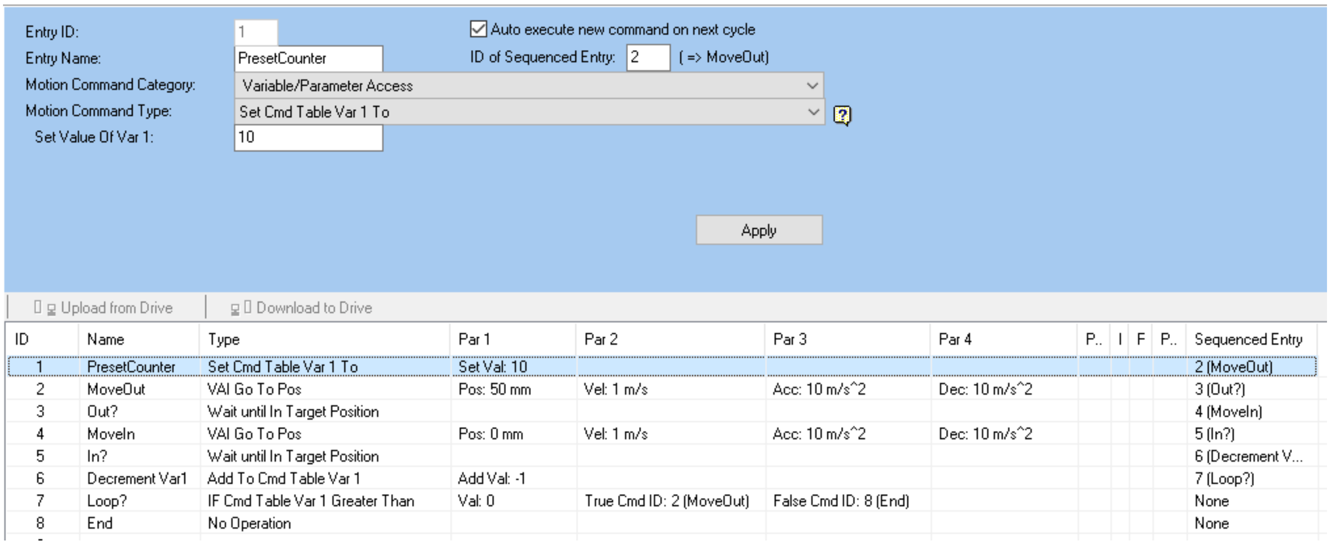


Entry ID:	10	□ Auto execute new command on next cycle
Entry Name:	Operational?	
Motion Command Category:	Conditions	
Motion Command Type:	IF Masked Status Word Equal Than	
Status Word Bit Mask:	0001h	
Status Word Compare Value:	0001h	
Table Command ID IF TRUE:	12	(=> Init Axis)
Table Command ID IF FALSE:	11	(=> loop)

ID	Name	Type	Par 1	Par 2	Par 3	Par 4	P..	I	F	P..	Sequenced Entry
1	StopCT	Clear Event Evaluation									None
2											
3											
4											
5											
6											
7											
8											
9											
10	Operational?	IF Masked Status Word Equal Than	Status Mask: 0001h	Status Value: 0001h	True Cmd ID: 12 (Init Axis)	False Cmd ID: 11 (loop)					None
11	loop	No Operation									10 (Operational?)
12	Init Axis	VAI Go To Pos	Pos: 0 mm	Vel: 0.1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					13 (Init Done?)
13	Init Done?	Wait until Motion Finished									20 (Move A)
14											
15											
16											
17											
18											
19											
20	Move A	VAI Go To Pos	Pos: 50 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					21 (StillOperatio...
21	StillOperational	IF Masked Status Word Equal Than	Status Mask: 0001h	Status Value: 0000h	True Cmd ID: 1 (StopCT)	False Cmd ID: 22 (dummy)					None
22	dummy	No Operation									23 (StillMoving?)
23	StillMoving?	IF Masked Status Word Equal Than	Status Mask: 2000h	Status Value: 2000h	True Cmd ID: 24 (Loop)	False Cmd ID: 25 (Move B)					None
24	Loop	No Operation									21 (StillOperatio...
25	Move B	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					26 (StillOperatio...
26	StillOperational	IF Masked Status Word Equal Than	Status Mask: 0001h	Status Value: 0000h	True Cmd ID: 1 (StopCT)	False Cmd ID: 27 (dummy)					None
27	dummy	No Operation									28 (StillMoving?)
28	StillMoving?	IF Masked Status Word Equal Than	Status Mask: 2000h	Status Value: 2000h	True Cmd ID: 29 (Loop)	False Cmd ID: 20 (Move A)					None
29	Loop	No Operation									26 (StillOperatio...

4.2 Simple loop counter

The following Command Table sequence performs a push/pull motion 10 times.
The sample shows how you can decrement the Command Table variables.
In line 1 Var1 is initialized with a value of 10 to use with this loop counter.
Next the motor will move out and in between the lines 2 – 5.
At line 6, Command Table Var1 is decremented by 1, that means add -1 to Var1, which will decrement the value.
Line 7 uses If condition to check, if Var1 is still greater than 0 to jump into line 2, or finish the Command Table in line 8.
This sample will loop 10 times through the both motions.



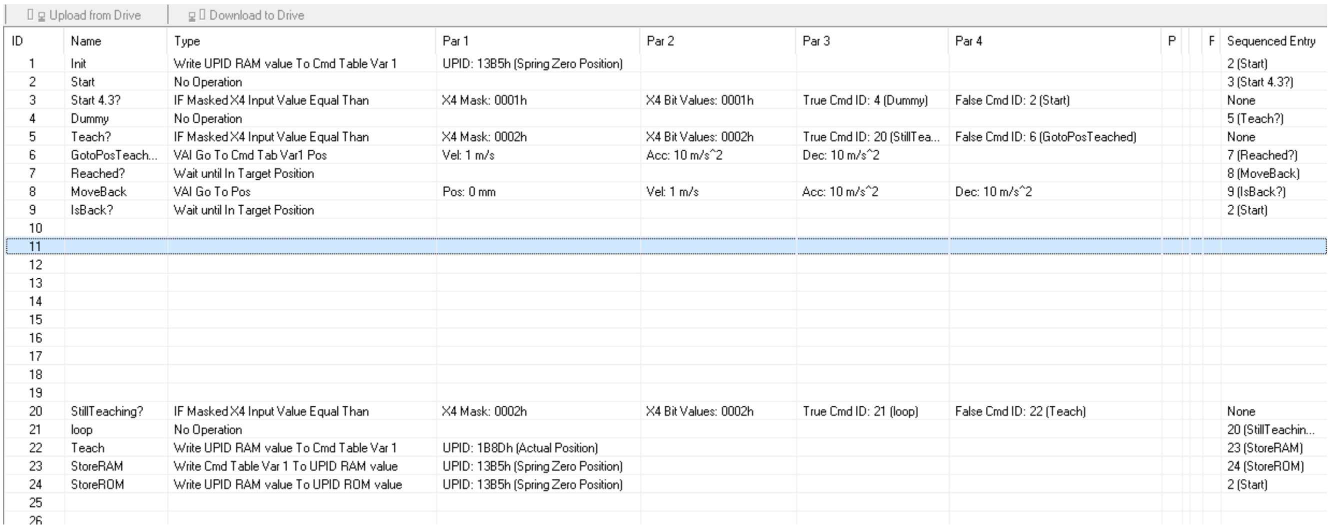
Entry ID: 1
Entry Name: PresetCounter
Motion Command Category: Variable/Parameter Access
Motion Command Type: Set Cmd Table Var 1 To
Set Value Of Var 1: 10
☑ Auto execute new command on next cycle
ID of Sequenced Entry: 2 (=> MoveOut)

ID	Name	Type	Par 1	Par 2	Par 3	Par 4	P..	I	F	P..	Sequenced Entry
1	PresetCounter	Set Cmd Table Var 1 To	Set Val: 10								2 (MoveOut)
2	MoveOut	VAI Go To Pos	Pos: 50 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					3 (Out?)
3	Out?	Wait until In Target Position									4 (MoveIn)
4	MoveIn	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					5 (In?)
5	In?	Wait until In Target Position									6 (Decrement V...
6	Decrement Var1	Add To Cmd Table Var 1	Add Val: -1								7 (Loop?)
7	Loop?	IF Cmd Table Var 1 Greater Than	Val: 0	True Cmd ID: 2 (MoveOut)	False Cmd ID: 8 (End)						None
8	End	No Operation									None

General configurations:
No specific configuration. The Command Table may be executed as a “Triggered Command Table” (see chapter 1.2)

4.3 Storing a Command Table variable value permanently on the drive

This example shows how to store a value permanently on the drive.
The sample use two digital inputs in Command Table mode.
Input X4.3 is used to start a two-point motion, and X4.4 is used to teach the motion.
In teaching mode, position change is done by using jog+ / jog- function of the drive.
Teaching mode is only available when motion is running.



ID	Name	Type	Par 1	Par 2	Par 3	Par 4	P		F	Sequenced Entry
1	Init	Write UPID RAM value To Cmd Table Var 1	UPID: 13B5h (Spring Zero Position)							2 (Start)
2	Start	No Operation								3 (Start 4.3?)
3	Start 4.3?	IF Masked X4 Input Value Equal Than	X4 Mask: 0001h	X4 Bit Values: 0001h	True Cmd ID: 4 (Dummy)	False Cmd ID: 2 (Start)				None
4	Dummy	No Operation								5 (Teach?)
5	Teach?	IF Masked X4 Input Value Equal Than	X4 Mask: 0002h	X4 Bit Values: 0002h	True Cmd ID: 20 (StillTea...	False Cmd ID: 6 (GotoPosTeached)				None
6	GotoPosTeach...	VAI Go To Cmd Tab Var1 Pos	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					7 (Reached?)
7	Reached?	Wait until In Target Position								8 (MoveBack)
8	MoveBack	VAI Go To Pos	Pos: 0 mm	Vel: 1 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2				9 (IsBack?)
9	IsBack?	Wait until In Target Position								2 (Start)
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20	StillTeaching?	IF Masked X4 Input Value Equal Than	X4 Mask: 0002h	X4 Bit Values: 0002h	True Cmd ID: 21 (loop)	False Cmd ID: 22 (Teach)				None
21	loop	No Operation								20 (StillTeachin...
22	Teach	Write UPID RAM value To Cmd Table Var 1	UPID: 1B8Dh (Actual Position)							23 (StoreRAM)
23	StoreRAM	Write Cmd Table Var 1 To UPID RAM value	UPID: 13B5h (Spring Zero Position)							24 (StoreROM)
24	StoreROM	Write UPID RAM value To UPID ROM value	UPID: 13B5h (Spring Zero Position)							2 (Start)
25										
26										

Line 1 will load the last stored position value into Var1 of the Command Table and proceed to line 2 and then line 3.
Here, IF condition checks X4.3 to determine if motion should run or not.
If X4.3 is a true condition we then proceed to line 4 and then line 5, where the teach mode is checked.
If no teach is requested in line 5 we then move to line 6. The target position for this motion command is derived from Command Table Var1. When this position is reached, the motor moves back to 0mm then starts over again on line 2. If teach mode is requested in line 5 then we will loop to line 20.
At line 20, an additional IF condition will loop in line 20 until the teaching mode with X4.4 is deactivated. Before this line get deactivated, the user must adjust position by the jog+/- bits.
When X4.4 gets deactivated, the actual position value is stored in Command Table Var1 at line 22. This variable will be stored into RAM memory of the normally not used position controller set B variable “Spring Zero Position”. This Variable will be used as “storage”. Line 24 will finally save the RAM value of this variable into ROM memory.
On each power up, the stored value gets copied into RAM and will be read out in line 1 at first start.

General configurations:

Function	Value	UPID	Description
Define Input “Move”	\Parameters\Motion Control SW\Drive Configuration\X4/ IO Definitions\		
IO X4.3	00h – None	1036h	Use X4.3 as input

Function	Value	UPID	Description
Define Input “Teach”	\Parameters\Motion Control SW\Drive Configuration\X4/ IO Definitions\		
IO X4.4	01h – Trigger (Input)	1039h	Use X4.4 as input

Configuring JOG mode as needed: \Parameters\Motion Control SW\State Machine Setup\Jogging\

Command Table execution is done in “Command Table” mode, see chapter 1.3.

Attention: Make sure, “Control Parameter Set B” is not used in this application!
(\Parameters\Motion Control SW\Position Controller\Ctrl Par Set Selection is set to Set A)

4.4 Application: Foam rubber testing

Foam rubber squares are tested in a machine. A linear motor is to compress the square with a force of 40 N. After 2 seconds of press time, the square is measured to see if it is within tolerance.

The entire sequence is to be started by a trigger signal. If the square is in spec, this is to be indicated at a digital output.
The same applies if it is defective.

Sequence description:	
1.	Move linear motor to 40 mm position, with v = 3 m/s and a = 5 m/s^2
2.	Reduce force to 40 N and press squares together at a speed of 0.05 m/s
3.	Press for 2 seconds
4.	Check the tolerances: If the linear motor is at a position that is greater than 65 mm and less than 75mm, then the square is in spec; otherwise, it is defective.
5.	Return to start position at 0mm mm, with v = 0.5 m/s and a = 5 m/s^2

As motor a PS01-37x240 is used in this example.

The trigger signal is wired to X4.6. If the square is in tolerance, then this is indicated at X4.8 (OK); if it is outside the tolerance, this is indicated at X4.7 (Defect).

In order to limit the linear motor force to 40 N, the maximum current has to be limited. The model PS01-37x240 motor has a force constant of 23.8 N/A, which leads to a current of 1.68 A for 40 N (40N / 23.8N/A).

The drive’s following error monitor must be deactivated, since the motor will not reach the target position when pressing. This is deliberate in this application.

General configurations:

Function	Value	UPID	Description
Define Trigger Input	\Parameters\Motion Control SW\Drive Configuration\X4/ IO Definitions\		
IO X4.6	01h – Trigger (Input)	1039h	Set X4.6 as trigger
Trigger Mode*	01h – Direct	170Ch	Trigger Mode “Direct”

* The trigger mode (Direct, inhibited and/or delayed) and the according parameters can be found here:
\Parameters\Motion Control SW\Drive Configuration\X4 I/O Definitions\Trigger

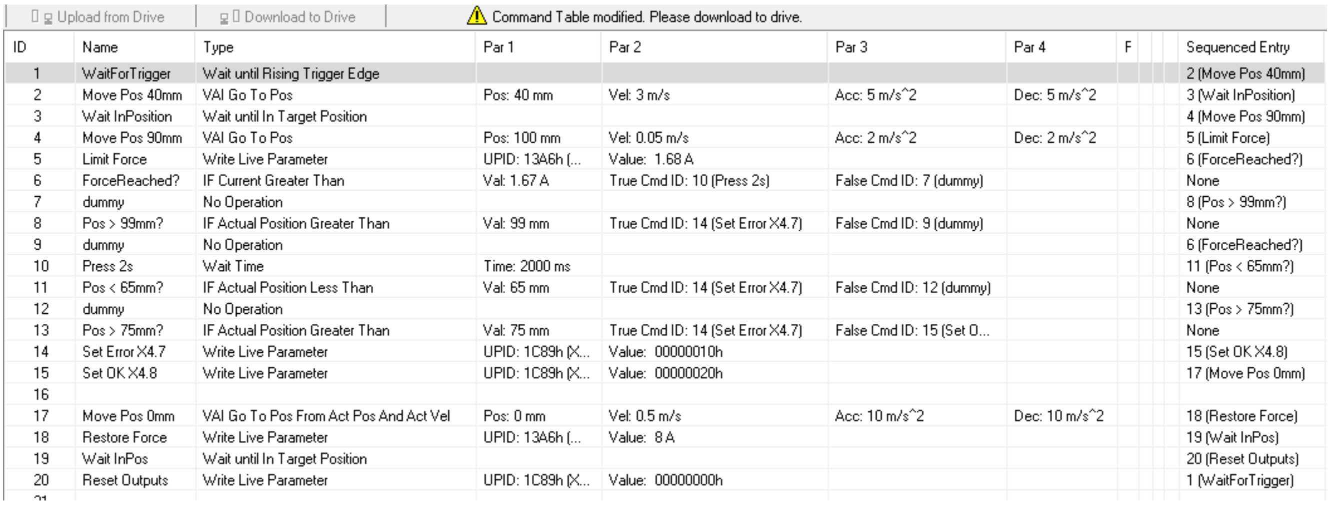
Function	Value	UPID	Description
Run mode configuration	\Parameters\Motion Control SW\Motion Interface\RunMode Settings\Run Mode Selection		
Triggered command table	0Ch – Triggered Command Table	1450h	Run Mode: Triggered Command Table

Function	Value	UPID	Description
Command Table entry ID	\Parameters\Motion Control SW\Motion Interface\RunMode Settings\Command Table Settings		
Rise Command Table entry ID	1	1486h	Set Command Table start line

Function	Value	UPID	Description
Error Output	\Parameters\Motion Control SW\Drive Configuration\X4 I/O Definitions		
Interface Output	0Eh – Interface Output	103Ah	X4.7 as Interface Output

Function	Value	UPID	Description
OK Output	\Parameters\Motion Control SW\Drive Configuration\X4 I/O Definitions		
Interface Output	0Eh – Interface Output	103Bh	X4.8 as Interface Output

Function	Value	UPID	Description
Deactivating following error	\Parameters\Motion Control SW\Errors & Warnings\Error Detection Mask		
Position Lag Always	false	1587h	Turn off general following error



⚠ Command Table modified. Please download to drive.

ID	Name	Type	Par 1	Par 2	Par 3	Par 4	F				Sequenced Entry
1	WaitForTrigger	Wait until Rising Trigger Edge									2 (Move Pos 40mm)
2	Move Pos 40mm	VAI Go To Pos	Pos: 40 mm	Vel: 3 m/s	Acc: 5 m/s^2	Dec: 5 m/s^2					3 (Wait InPosition)
3	Wait InPosition	Wait until In Target Position									4 (Move Pos 90mm)
4	Move Pos 90mm	VAI Go To Pos	Pos: 100 mm	Vel: 0.05 m/s	Acc: 2 m/s^2	Dec: 2 m/s^2					5 (Limit Force)
5	Limit Force	Write Live Parameter	UPID: 13A6h (...	Value: 1.68 A							6 (ForceReached?)
6	ForceReached?	IF Current Greater Than	Val: 1.67 A	True Cmd ID: 10 (Press 2s)	False Cmd ID: 7 (dummy)						None
7	dummy	No Operation									8 (Pos > 99mm?)
8	Pos > 99mm?	IF Actual Position Greater Than	Val: 99 mm	True Cmd ID: 14 (Set Error X4.7)	False Cmd ID: 9 (dummy)						None
9	dummy	No Operation									6 (ForceReached?)
10	Press 2s	Wait Time	Time: 2000 ms								11 (Pos < 65mm?)
11	Pos < 65mm?	IF Actual Position Less Than	Val: 65 mm	True Cmd ID: 14 (Set Error X4.7)	False Cmd ID: 12 (dummy)						None
12	dummy	No Operation									13 (Pos > 75mm?)
13	Pos > 75mm?	IF Actual Position Greater Than	Val: 75 mm	True Cmd ID: 14 (Set Error X4.7)	False Cmd ID: 15 (Set O...						None
14	Set Error X4.7	Write Live Parameter	UPID: 1C89h (X...	Value: 00000010h							15 (Set OK X4.8)
15	Set OK X4.8	Write Live Parameter	UPID: 1C89h (X...	Value: 00000020h							17 (Move Pos 0mm)
16											
17	Move Pos 0mm	VAI Go To Pos From Act Pos And Act Vel	Pos: 0 mm	Vel: 0.5 m/s	Acc: 10 m/s^2	Dec: 10 m/s^2					18 (Restore Force)
18	Restore Force	Write Live Parameter	UPID: 13A6h (...	Value: 8 A							19 (Wait InPos)
19	Wait InPos	Wait until In Target Position									20 (Reset Outputs)
20	Reset Outputs	Write Live Parameter	UPID: 1C89h (X...	Value: 00000000h							1 (WaitForTrigger)

5 Version History

Version	Date	Author	Description
1V0	16.05.2018	mr	Initial version

Note
The information in this documentation reflects the stage of development at the time of press and is therefore without obligation. NTI AG reserves itself the right to make changes at any time and without notice to reflect further technical advance or product improvement.

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