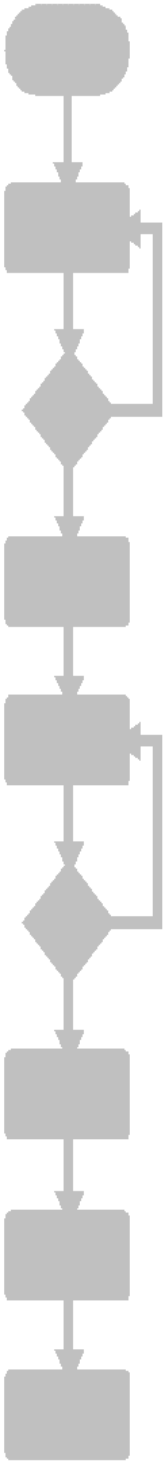

JetMove 2xx
Version Update
from V2.09 to V2.10

Jetter

Revision 1.00

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1 Introduction

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V 2.07	Operation of stepper motors	✓	
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	Motor temperature monitoring		✓
V 2.09	Incremental encoder simulation	✓	
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	Switching digital outputs to position X	✓	
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	Hiperface reinitialization with MC		✓
	Precision of speed scaling		✓
	Machine referencing to the reference switch, one-phase		✓
	Referencing towards zero pulse		✓
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	"Stopped" flag		✓

2 Expansions

2.1 Osci: Triggering to float registers

Until now, it has not been possible to trigger the osci function where the signal to be used for triggering is a float value.

As of version V2.09.0.02, the trigger function is also available for float registers.

2.2 Dead time compensation for trigger input

Until now, the capture function involving the interrupt input ignored the dead time for the hardware circuit.

As of version V2.09.0.07, this dead time can be compensated. The following register is used for this purpose.

Register 527: Dead time correction	
Function	**Description**
Read/Write	Dead time correction
Type/Unit	Float/[ms]
Value range	0.0 ms – 5.0 ms
Value after reset	0.4 ms

2.3 Trailing indicator for tracking error

As of version 2.09.0.16, the following registers can be used to read out the maximum and minimum value for the position controller tracking error.

Register 538: Trailing indicator for pos. tracking error	
Function	**Description**
Read/Write	Read access: Return value is the maximum value Write access: Reset the trailing indicator to 0.0.
Type/Unit	Float/[mm, °]
Value range	0.0 – MaxFloat
Value after reset	0.0

Register 539: Trailing indicator for neg. tracking error	
Function	**Description**
Read/Write	Read access: Return value is the minimum value Write access: Reset the trailing indicator to 0.0.
Type/Unit	Float/[mm, °]
Value range	0.0 – MinFloat
Value after reset	0.0

2.4 New command 14

As of version 2.09.0.19, command 14 on register 100 can be used to delete the R101.0 = *Home position set* flag.

2.5 New R432 CamChange type

Until now, the master and slave axes have been subject to modulo treatment when switching from the currently used table to a new table. This, however, is not always desirable. The R432 CamChange type register enables the user to make the right selection for any given application.

Register 432: CamChange type	
Function	**Description**
Read/Write	Current/new value for CamChange type
Type/Unit	Int/[-]
Value range	0 - 3
Value after reset	0

0	Modulo treatment for master and slave (default)
1	Modulo treatment for master only
2	Modulo treatment for slave only
3	No modulo treatment

2.6 Digital outputs as a function of the actual position

As of version 2.09.0.22, it is possible to switch digital outputs depending on the actual position value. This function can only be used, of course, with those JetMove models which have digital outputs.

2.6.1 General information

- This function is implemented with two identical channels working independently of each other.
- Both channels process the R109 actual position value.
- Both channels work on the shared R515 status register.
- Both channels work on the shared digital outputs on the X31 connector.
- Digital outputs can also be controlled by both channels at the same time. Depending on parameter settings, it is also possible for individual signal patterns to overlap.
- A sampling rate of 16 kHz is used for comparison with the actual position value.

2.6.2 Shared registers

The following registers are shared by both channels.

The R109 current position register [°,mm] is the input variable for the function.

Register 515: DigOut status word	
Function	**Description**
Read/Write	Current switching state/Setting the new state
Type/Unit	Integer/[-]
Value range	0x0000 – 0x000F
Value after reset	0

- The register shows the current state of the digital outputs and contains the assignments:
  - Bit0 = DigOut1 on X31
  - Bit1 = DigOut2 on X31
  - Bit2 = DigOut3 on X31
  - Bit3 = DigOut4 on X31
- Values can be written to the register at any time with immediate effect.
- The initial write access switches the hardware driver to the active state.

2.6.3 Register set for channel 1

Register 525: DigOut type	
Function	**Description**
Read/Write	Operating mode for the digital outputs
Type/Unit	Integer/[]
Value range	0 – 4
Value after reset	0

The operating mode for channel 1 is set via the register.

0	R516 DigOut-Set and R517 DigOut-Clr are completely transparent in terms of their effectiveness, no automatic processes are active (default).
1	If R109 PosAct >= R526 PosX, the JetMove performs the following program sequence internally: • The R516 Set register becomes effective immediately. • The R517 Clear register becomes effective after the R529 delay time. • R525 is set to 0 again.
2	If R109 PosAct <= R526 PosX, the JetMove performs the following program sequence internally: • The R516 Set register becomes effective immediately. • The R517 Clear register becomes effective after the R529 delay time. • R525 is set to 0 again.
3	If R109 PosAct >= R526 PosX, the JetMove performs the following program sequence internally: • The R517 Clear register becomes effective immediately. • The R516 Set register becomes effective after the R529 delay time. • R525 is set to 0 again.
4	If R109 PosAct <= R526 PosX, the JetMove performs the following program sequence internally: • The R517 Clear register becomes effective immediately. • The R516 Set register becomes effective after the R529 delay time. • R525 is set to 0 again.

Modes 1 and 2 can be used to generate the following signal patterns:
- Active high pulses of a defined length
- Immediate rising edges
- Delayed falling edges

Modes 3 and 4 can be used to generate the following signal patterns:
- Active low pulses of a defined length
- Delayed rising edges
- Immediate falling edges

Register 516: DigOut-Set	
Function	**Description**
Read/Write	Register for setting digital outputs
Type/Unit	Integer/[-]
Value range	0x0000 – 0x000F
Value after reset	0x0000

- The bit assignment corresponds to R515.
- =1: The set bits activate the relevant output (= 24 V).
- If DigOut type R525 = 0, this occurs as soon as the register is written to.
- For further information, please refer to the description of DigOut type R525.

Register 517: DigOut-Clear	
Function	**Description**
Read/Write	Register for resetting digital outputs
Type/Unit	Integer/[-]
Value range	0x0000 – 0x000F
Value after reset	0.4 ms

- The bit-assignment corresponds to R515
- =1: The set bits deactivate the relevant output (= 0 V).
- If DigOut type R525 = 0, this occurs as soon as the register is written to.
- For further information, please refer to the description of DigOut type R525.

Register 526: Position X	
Function	**Description**
Read/Write	Comparison value for the actual position
Type/Unit	Float/[mm, °]
Value range	Same as the travel range for the axis
Value after reset	0.4 ms

The register defines the position where part 1 of the switching process will occur.

Register 529: DigOut-Delay

Function	Description
Read/Write	Delay time for pulse generation
Type/Unit	Float/[ms]
Value range	0.0 ms – 2000.0 ms
Value after reset	0.0 ms

The delay defines the period between part 1 and part 2 of the switching process.

2.6.4 Register set for channel 2

Ax.DO_nm_Type2	R623		Default value = 0
Ax.DO_nm_Set2	R624	[..]	Default value = 0
Ax.DO_nm_Clr2	R625	[..]	Default value = 0
Ax.DO_fm_PosX2	R626	[°, mm]	Default value = 0.0
Ax.DO_fm_Delay2	R627	[ms]	Default value = 0.0

The registers behave in the same way as the registers for channel 1.

2.7 JM_CNT with incremental encoder

As of version 2.09.0.15, the JM_CNT option card can be used (in Anybus socket # 2, see the additional documentation) to evaluate incremental encoders with input frequencies of up to 10 MHz. In view of this, the type 12 encoder has been redefined for register 577. Inputting the encoder resolution (= PPR count * 4) on register 117 starts the initialization process for encoder evaluation.

2.8 JM_CNT with EnDat 2.2 encoder

As of version 2.09.0.15, the JM_CNT option card can be used (in Anybus socket # 2, see the additional documentation) to evaluate EnDat 2.2 encoders. In view of this, type 13 and 14 encoders (single-turn and multi-turn encoders) have been redefined for encoder type register 577. Inputting the encoder type on register 577 starts the initialization process for encoder evaluation.

2.9 JM_CNT as a second encoder system

As of version 2.09.0.23, the JM_CNT option card (in Anybus socket # 2, see the additional documentation) enables incremental or EnDat 2.2 encoders to be used as second encoder systems. This additional position detection capability can be used in two different ways:

- As a load-side encoder for position control
- As an independent encoder system which can be used as a real leading axis. The actual position is output cyclically on the system bus for this purpose.

2.9.1 Register for position control

Register 190: Actual value selection for position controller	
Function	**Description**
Read/Write	Current/new source of the actual value for the position controller
Type/Unit	INT/[-]
Value range	1 – 2
Value after reset	1

1	Actual position value comes from encoder 1
2	Actual position value comes from encoder 2. Switching is only possible if the JM_CNT option is available and the controller is inhibited.

During switching, register 109 *Actual position value* is NOT reinitialized!

Register 239: Motor/encoder - ratio	
Function	**Description**
Read/Write	Current/new value for the factor relating the motor to the position encoder
Type/Unit	Float/[ms]
Value range	0.0 – 100.0
Value after reset	1.0

This factor describes the resulting ratio between the motor and the source of the actual value for the position controller.

For R190 = 1 (=encoder 1 as actual value for position controller), this value is always 1.0 as the encoder is usually mounted directly on the motor.
For R191 = 2 (=encoder 2 as actual value for position controller), the value can be calculated using the following formula:
R239 = (R194/R195 * R246)/(R244/R245 * R196)

2.9.2 Register for encoder 2

Register 240: Status word	
Function	**Description**
Read	Current status information for encoder 2
Type/Unit	Int/[...]
Value range	0 – 3
Value after reset	0

Bit #0	=1: Encoder 2 is initialized. Flag is deleted when error F42 occurs.
Bit #1	=1: Actual value detection active for real leading axis (R249, 250, 251). Only possible if encoder 2 is not used for position control

Register 241: Encoder type	
Function	**Description**
Read/Write	Current/new encoder type
Type/Unit	Integer/[-]
Value range	0 – 14
Value after reset	0

0	Encoder evaluation disabled
12	Incremental encoder
13	EnDat single-turn encoder
14	EnDat multi-turn encoder

Register 242: Resolution	
Function	**Description**
Read/Write	Current/new resolution
Type/Unit	Integer/[Inc/360°]
Value range	0 - MaxInt32
Value after reset	0

Register 243: Mechanical angle	
Function	**Description**
Read	Angle measuring value for the encoder
Type/Unit	Float/[°]
Value range	-180.0 – +180.0
Value after reset	0.0

Register 244: Encoder ratio	
Function	**Description**
Read/Write	Current/new ratio
Type/Unit	Float/[1]
Value range	> 0.0 – MaxFloat
Value after reset	1.0

In the case of a rotatory axis, this parameter will be used for calculating the gear ratio: If, for example, the mechanics rotate once, while the encoder rotates ten times, the number of encoder rotations must be set to 10, while the number of load rotations is set to 1.

i = encoder rotations (R244)/mechanics rotations (R245)

Register 245: Gear ratio mechanism	
Function	**Description**
Read/Write	Current/new ratio
Type/Unit	Float/[1]
Value range	> 0.0 – MaxFloat
Value after reset	1.0

Register 246: Linear/rotatory ratio	
Function	**Description**
Read/Write	Current/new ratio
Type/Unit	Float/[mm/360°]
Value range	> 0.0 – MaxFloat
Value after reset	360.0

The linear/rotation ratio is only used when there is a linear axis.
It describes the linear motion of the axis in relation to one rotation
of the last rotatory gear unit, the 245 *Gear Ratio Mechanism* register.

Where R191=2 (axis type = rotatory), the linear/rotatory ratio register R246 = 360.0 mm/° is set for the actual value selection for position controller R190 = 1 or 2. The register is then write protected.

Register 247: Travel limit, positive	
Function	**Description**
Read/Write	Current/new positive travel limit
Type/Unit	Float/[mm] or [°]
Value range	Float limits
Value after reset	360.0

The positive modulo travel range limit of a modulo axis is specified here. The modulo travel range defined in register 193 *Modulo travel range* is automatically calculated as the difference between the positive and the negative travel limit.
If your axis is not a modulo axis, this parameter will limit the absolute axis motion in the positive direction. This means that, on a positioning run, the target position will always be limited to this value, even if a higher value is entered. The axis is set to a modulo axis via register 192 *Modulo axis*.

Register 248: Travel limit, negative	
Function	**Description**
Read/Write	Current/new negative travel limit
Type/Unit	Float/[mm] or [°]
Value range	Float limits
Value after reset	0.0

The negative modulo travel range limit for a modulo axis is specified here. The modulo travel range defined in register 193 *Modulo travel range* is automatically calculated as the difference between the positive and the negative travel limit.
If your axis is not a modulo axis, this parameter will limit the absolute axis motion in the negative direction. This means that, on a positioning run, the target position will always be limited to this value, even if a higher value is entered. The axis is set to a modulo axis via register 192 *Modulo axis*.

Register 249: Position actual value	
Function	**Description**
Read/Write	Read the current/Set the new actual position value
Type/Unit	Float/[mm] or [°]
Value range	R248 – R247
Value after reset	0.0

The actual position value is only updated if encoder 2 is not being used for position control. (R190 actual value selection for position controller = 1)

Register 250: Counter for modulo turns	
Function	**Description**
Read	Current number of modulo turns
Type/Unit	Integer/[1]
Value range	0x80000000 - 0x7FFFFFFF
Value after reset	0

This register shows the number of completed modulo cycles.

Register 251: Present speed	
Function	**Description**
Read	Current load speed
Type/Unit	Float/[mm/s] or [°/s]
Value range	Float limits
Value after reset	0.0

The actual speed value is only updated if encoder 2 is not being used for position control. (R190 actual value selection for position controller = 1)

Register 252: Reversal of direction	
Function	**Description**
Read/Write	Current/new value
Type/Unit	Integer/[-]
Value range	0, 1
Value after reset	0

0	Reversal of direction deactivated, **clockwise** rotating encoder provides increasing position values
1	Reversal of direction active, **counterclockwise** rotating encoder provides increasing position values

2.9.3 JM_CNT as actual position value for position controller

Using the JM_CNT option card as a load-related method of detecting the actual value for the position controller has a significant impact on the axis configuration for the motion control application within the JetMove. Like the motor with its first mounted encoder, the second encoder is linked to the load via a defined mechanical link. The mechanical gear ratios between encoder 1 and the load are very rarely the same as those between encoder 2 and the load. However, it is absolutely essential for the motion control facility to have access to the mechanical ratios as applicable from the relevant encoder system's perspective in order to ensure correct operation.
Register R190 *Actual value selection for position controller* is used to specify which mechanical geometry will apply. After the two geometries have been defined in different registers, one or other of the register sets will take effect, depending on R190. In each case, the other register set will not be taken into account.
The following table puts this into context:

Actual value selection for position controller	**R190 = 1 (encoder 1)**	**R190 = 2 (encoder 2)**
Encoder ratio	R194	R244
Gear ratio mechanism	R195	R245
Linear/rotatory ratio	R196	R246
Travel limit, positive	R182	R247
Travel limit, negative	R183	R248

Initialization
Proceed as follows when initializing position control on a single-turn EnDat encoder as encoder 2:

1. R190 Actual value selection for position controller = 2
2. R244 = Number of encoder rotations
3. R245 = Number of load rotations
4. R246 = Linear/rotatory ratio
5. R247 = Travel limit, positive
6. R248 = Travel limit, negative
7. R252 = 0/1 Reversal of direction
8. R241 = 13 encoder type 2 = single-turn EnDat
9. If Bit #0 = 1 is set in status register R240 *Encoder 2*, this means the initialization process for the EnDat encoder was successful.

Important
Please note the following:

- Error F42 is generated by an encoder failure where JM_CNT is being used as a second encoder.
- R100.0 *Home position set* (=1), behaves as follows:
  - R190 = 1 *Encoder failure on encoder 1*: R100.0 = 0 (error F09)
  - R190 = 1 *Encoder failure on encoder 2*: R100.0 = 1 (error F42)
  - R190 = 2 *Encoder failure on encoder 1*: R100.0 = 1 (error F09)
  - R190 = 2 *Encoder failure on encoder 2*: R100.0 = 0 (error F42)

2.9.4 JM_CNT as a real leading axis

The encoders connected to the JM_CNT module can also be operated as a real leading axis. Its actual position value can be transmitted cyclically by the evaluating JetMove on the system bus, thereby making this information available to all the other JetMoves.
In view of this, the registers R151 *Transmit mode* and R152 *Receive mode* have been expanded to include data type 105.

The following steps must be performed when commissioning a single-turn EnDat encoder as encoder 2:

1. R190 = 1. Set the actual value selection for the position controller on encoder 1.
2. R245 = number of load rotations
3. R246 = linear/rotatory ratio
4. R247 = travel limit, positive
5. R248 = travel limit, negative
6. R252 = 0/1 reversal of direction
7. R241 = 13 encoder type 2 = single-turn EnDat If Bit #0 = 1 is set in status register R240 *Encoder 2*, this means the initialization process for the EnDat encoder was successful.
8. R151 transmit mode = 105. This makes the actual position value of register R249 available on the system bus for the other JetMoves.
9. On the following axes, the R152 receive mode register must also = 105 to ensure the position data can be received from the system bus. This also applies to the JetMove evaluating the leading axis encoder.

3 Corrections

3.1 Torque deactivation

Command 29 was not always effective when used to end torque deactivation. In the event of an error, it was no longer possible to position the axis.

As of version 2.09.0.03, torque deactivation can be ended without any problems.

3.2 Negative leading axis difference in the table

Until now, a table starting with a negative leading axis difference was capable of crashing JetMove communication. A negative leading axis difference always occurs if the leading axis position of the final point in a table is less than or equal to the leading axis position of the initial point in a table.

As of version 2.09.0.04, this problem has been resolved.

3.3 Referencing with MC gantry axis

Since version 2.06.0.01, reference runs for MC gantry axes have been interrupted with the 5800 or 6800 error message "Gantry: synchronization window exceeded".

As of version 2.09.0.05, this problem has been resolved.

3.4 Reference positions with decimal places

Until now, it has not been possible to set reference positions with decimal places for modulo axes. For example, the system would set the reference position to 10.0° if anyone attempted to set a value of 10.5°.

As of version 2.09.0.05, this problem has been resolved.

3.5 Hiperface reinitialization with MC

In the case of a JM2xx with external MC, if reinitialization of a Hiperface encoder is triggered by writing to the R577 EncType register, the
busy flag is set. This state will remain unchanged.

As of version 2.09.0.07, this problem has been resolved.

3.6 Precision of speed scaling

Until now, the precision of speed scaling could only be guaranteed if the value 120000 was an exact multiple of the required maximum speed in R118.
Where this was not the case, a tracking error proportional to the speed could be observed on the drive.

As of version 2.09.0.09, this problem has been resolved.

3.7 Machine referencing to the reference switch, one-phase

The JM-2xx uses register R164 *Max. distance - switch search* to monitor the maximum distance, even though, as is also the case with the MC, the R167 *Max. distance - reference search* register should be used.
As of version 2.09.0.09, this problem has been resolved.

3.8 Referencing towards zero pulse

As of version 2.03.0.1, referencing towards zero pulse without a reference switch can only be completed when a reference switch is actually activated. It will then behave as if referencing to K0 with a reference switch had been selected.

As of version 2.09.0.09, this problem has been resolved.

3.9 Current reduction

As of version 2.06.0.09, current reduction for stepper motors has not been functioning correctly.
When an attempt is made to switch back to normal operating current after the motor current has been reduced, the reduced setpoint value for the current continues to apply.

As of version 2.09.0.12, this problem has been resolved.

3.10 Hold flag

Up to version 2.09.0.15, it had been possible for relative positions with a distance differential of 0 in relation to the actual position value to remain locked in the "Maximum speed" state. The "Hold" flag was not set in such situations.

As of version 2.09.0.17, this problem has been resolved.