

MSD Servo Drive

Specification

Option 2 - Technology

TTL Encoder / TTL Encoder simulation



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TTL encoder / TTL encoder simulation

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Applicable as from firmware version: V2.15-00



NOTE: This document does not replace the MSD Servo Drive Operation Manual. Please be sure to observe the information contained in the "For your safety", "Intended use" and "Responsibility" sections of the Operation Manual (ID no.: CA65642-001). For information on installation, setup and commissioning, and details of the warranted technical characteristics of the MSD Servo Drive series, refer to the additional documentation (Operation Manual, User Manual, etc.).

This documentation applies to:

Series	Model	Firmware version
MSD Servo Drive Single-Axis System	G392-xxxxx6xxxxx G395-xxx-x6xxxxx	from V2.15
MSD Servo Drive Multi-Axis System	G393-xxx-x6xxxxx G397-xxx-x6xxxxx	from V2.15
MSD Servo Drive Compact	not available	--

Table 1.1 Applicability

Technical alterations reserved.

The contents of our documentation have been compiled with greatest care and in compliance with our present status of information.

Nevertheless we would like to point out that this document cannot always be updated parallel to the technical further development of our products.

Information and specifications may be changed at any time. For information on the latest version please refer to drives-support@moog.com.

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1. TTL Module

With the TTL module the following operation modes are possible:

- Evaluation of a TTL encoder
- Simulation of a TTL encoder (signals from other encoders are converted into TTL signals and made available as output signals [for a slave axis])
- TTL repeater (evaluation and transmission of incoming TTL signals for additional axes)

1.1 Technical data and pin assignment

1.1.1 TTL encoder

Interface	EIA422 (not EIA485 conformant, see technical data below) Recommended cable cross-section: > 0.14 mm ² , (e.g. 3 x 2 x 0.14 mm ² + 1 x 2 x 0.25 mm ²) Maximum cable length: 10 m Connector: 15-pin D-SUB, High-Density, female		
	Minimum	Maximum	Typ.
Input frequency	0 Hz	500 kHz	
Input voltage <ul style="list-style-type: none"> • High level • Low level • Differential 	0.1 V	-0.1 V ± 5 V	
Wave terminating resistance			120 Ω
Voltage supply to external encoder	4.5 V	5.25 V	5 V / 100 mA

Table 1.2 Electrical specification of the TTL encoder input on X8

1.1.2 TTL encoder simulation

Interface	EIA422 Electrically isolated from the drive controller Rec. cable cross-section: > 0.14 mm ² , (e.g. 4 x 2 x 0.14 mm ²) Maximum cable length: 10 m Connector: 15-pin D-SUB, High-Density, female		
	Minimum	Maximum	Comments
Output frequency	0 Hz	1000 kHz	
Output voltage <ul style="list-style-type: none"> • High level • Low level • Differential 	2.5 V 2.0 V	0.5 V	I _{OH} = -20 mA I _{OL} = 48 mA
Wave terminating resistance	120 Ω		

Table 1.3 Electrical specification of the TTL encoder simulation on X8

1.1.3 Pin assignment

The assignment of the 15-pin D-Sub female connector on slot X8 is set out in the following table.

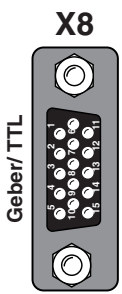
Connection	TTL encoder			TTL encoder simulation		
	Pin	Signal	Comments	Pin	Signal	Comments
	1	A-	Track A-	1		
	2	A+	Track A+	2		
	3	+5V	Encoder supply	3		
	4			4	A+	Track A+
	5			5	A-	Track A-
	6	B-	Track B-	6		
	7			7	R+	Zero pulse +
	8	GND	+ 5 V reference potential	8		
	9	R-	Zero pulse -	9		
	10	R+	Zero pulse +	10		
	11	B+	Track B+	11		
	12			12	R-	Zero pulse -
	13			13	GND	Ground, required for potential equalization
	14			14	B+	Track B+
	15			15	B-	Track B-

Table 1.4 Pin assignment of the TTL module on X8

1.2 Configuration

1.2.1 Configuration of TTL encoder simulation and TTL repeater function

In the "encoder simulation" function the expansion module can simulate a TTL encoder. Two 90° offset signals are generated on tracks A and B as well as a zero pulse. In "Repeater" mode the TTL signal connected to X8 is outputted isolated by way of the encoder simulation.

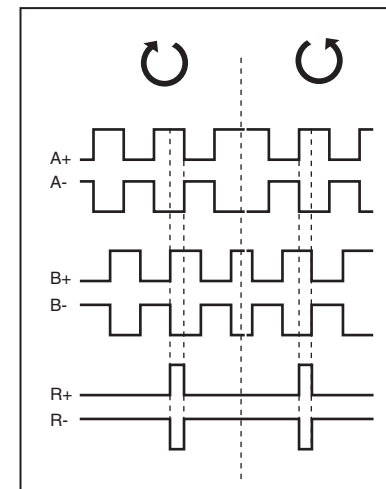


Figure 1.1 Encoder simulation signals looking onto the motor shaft (at left when motor rotating clockwise)

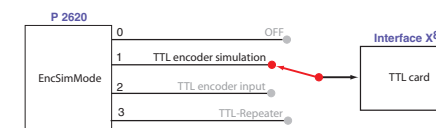


Figure 1.2 Configuration of TTL encoder simulation mode enabled

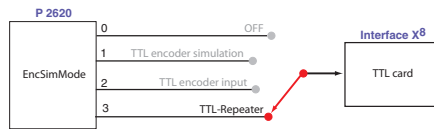


Figure 1.3 Configuration of TTL repeater function enabled

Parameter No.	Setting	Designation in MDA 5	Function
P 2620		InOutMode	Configuration of mode
	OFF (0)		Expansion module disabled
	TTL_OUT (1)		TTL encoder simulation enabled
	TTL_IN (2)		TTL encoder input enabled
	TTL_REPEAT (3)		TTL repeater enabled, TTL encoder input and transmission of counter reading to output for connected slave axes
P 2621		EncSimLines	Configuration of lines per revolution for encoder simulation:
	64 Inc (0)		
	128 Inc (1)		
	256 Inc (2)		
	512 Inc (3)		
	1024 Inc (4)		
	2048 Inc (5)		
	4096 Inc (6)		
	8192 Inc (7)		
	16348 Inc (8)		
	32768 Inc (9)		
65536 Inc (10)			
P 2622	0...65535	EncSimIndexPulse	Position of the zero pulse scaled to 2^{16} per revolution (360°)
P 2624	0...65535	EncActPos	Current counter reading, for encoder simulation and encoder input

Table 1.5 Parameters for TTL encoder simulation and TTL repeater function

Parameter No.	Setting	Designation in MDA 5	Function
P 2656	0...5000 μ s	EncSimDlyComp	Dead time compensation for encoder simulation
P 2811		InOut_Enc_Sim_Source	Selection of source for encoder simulation
	ACT_POS (0)		Actual position value
	REF_POS (1)		Target position value
	RESERVED (2)		reserved
	RESERVED (3)		reserved
	VIRTUAL_MASTER (4)		Virtual master

Table 1.5 Parameters for TTL encoder simulation and TTL repeater function

Lines per revolution	Encoder simulation rpm	Master encoder input rpm
8192	6000	3000
16384	3660	1830
32768	1830	915
65536	915	460

Table 1.6 Maximum mappable rotation speeds for high lines per revolution (max. signal frequency)

1.2.2 Configuration of TTL encoder channel 3

By way of TTL encoder channel 3 the following signal sources can be connected:

- TTL encoder with zero pulse
- Master frequency signal with two 90° offset track signals A/B
- Pulse/direction signal e.g from a stepper motor control

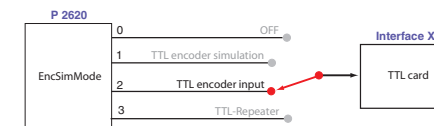


Figure 1.4 Configuration of TTL encoder input mode enabled

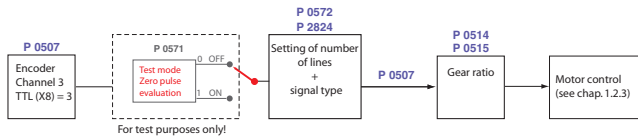


Figure 1.5 Configuration of encoder channel 3

Parameter No.	Field index	Setting	Designation in MDA 5	Function
P 0502		Actual value parameter	Actual Value ST, MT	Raw data of single-turn and multi-turn information to test encoder evaluation.
	(0)	00...00hex	Single-turn	The raw data are displayed after the electronic gearing and before the factor group (see drawing).
	(1)	00...00hex	Multi-turn	
P 0507			Encoder Channel 3 Select	Selection of encoder
		OFF (0)	No function	No function
		Sin/Cos encoder (1)	SinCos encoder ¹⁾	Sin/Cos encoder without absolute information and zero pulse ¹⁾ Sin/Cos encoder with absolute information and without zero pulse ¹⁾
	-	-	-	Reserved

^{1)Only with Sin/Cos option}

Table 1.7 Basic setting of encoder channel

Parameter No.	Field index	Setting	Designation in MDA 5	Function
		TTL encoder (3)	TTL encoder	TTL encoder with zero pulse (to be set for this function)
P 0514		$\pm (2^{31}-1)$	Gear Numerator	Numerator of encoder gearing
P 0515		$1 \dots (2^{32}-1)$	Gear Denominator	Denominator of encoder gearing
P 0571			Index Pulse Test Mode	Zero pulse wiring test (more details following)
		OFF (0)	No function	No function
		ON (1)	Function active	Zero pulse evaluation active
P 0572				Setting of number of lines (maximum 65535) of TTL encoder per motor revolution
		Input of number of lines per revolution 1 - 65535	Number of lines (Sin/Cos encoders/ TTL encoders)	
P 2620			InOutMode	Configuration of mode
		OFF (0)		Expansion module disabled
		TTL_OUT (1)		TTL encoder simulation enabled
		TTL_IN (2)		TTL encoder input enabled
		TTL_REPEAT (3)		TTL repeater enabled, TTL encoder input and transmission of counter reading to output for connected slave axes
P 2624			EncActPos	Current counter reading, for encoder simulation and encoder input
P 2824		See table 1.7	SignalType	TTL signal type

^{1)Only with Sin/Cos option}

Table 1.7 Basic setting of encoder channel

Setting	Function	Example
AF_B (0)	<ul style="list-style-type: none"> TTL signals (track A, track B) Direction of rotation of "slave axis" equal to "master axis" 	
AR_B (1)	<ul style="list-style-type: none"> TTL signals (track A, track B) Direction of rotation of "slave axis" in inverse proportion to "master axis" 	
ABDFN (2)	<ul style="list-style-type: none"> Pulse-direction signals (track A: puls; track B: direction) With a rising edge of track B positive direction Only falling edges of track A are evaluated. 	
ABDRP (3)	<ul style="list-style-type: none"> Pulse-direction signals (track A: puls; track B: direction) With a falling edge of track B negative direction Only rising edges of track A are evaluated. 	

Table 1.8 Function description – parameter P 2824 (SignalType)

Zero pulse wiring test

Zero pulse evaluation is only active during homing with evaluation of a zero pulse. To check the wiring, a zero pulse can be recorded via test mode on the digital oscilloscope of the Moog DRIVEADMINISTRATOR.

Parameter **P 0571 = ON (1)** must be set for this. On the oscilloscope it can then be represented with the measurement variables CH3-Np1 (High level for 1 s) or CH3-Np2 (High level for 1 ms). In this, the pulse width of the scope signal does not match the pulse width of the actual zero pulse. The representation on the oscilloscope appears wider, permitting better detection of the zero pulse. The decisive factor here is the rising edge of the scope signal.

1.2.3 Interface configuration of encoder for loop control

TTL encoder as actual value encoder (e.g. motor feedback)

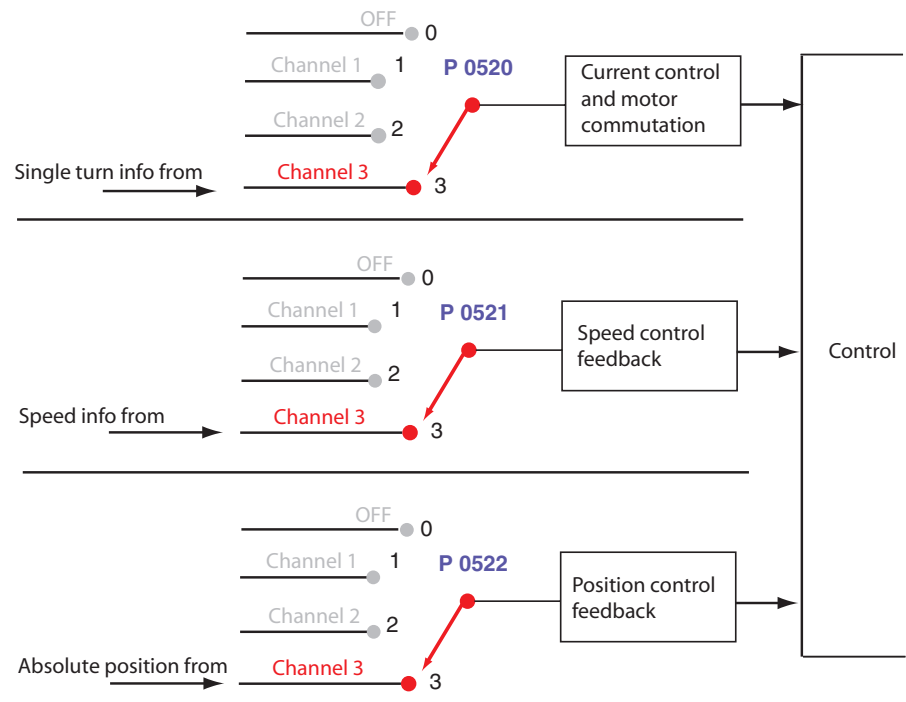


Figure 1.6 Display of encoder configuration for encoder channel 3



ATTENTION: A parameter can only be written or read with the appropriate access rights (e.g. "Local administrator"). A changed parameter must always be saved on the device.

When editable online, a parameter executes a reaction on the device immediately, so inputs must always be carefully checked.

Parameter no.	Designation	MDA 5 designation	Function
P 0520	ENC_MCon	Encoder: Channel Select for Motor Commutation and Current control	Selection of encoder channel for commutation angle and current control. Feedback signal for field-oriented regulation.
P 0521	ENC_SCon	Encoder: Channel select for Speed Control	Selection of encoder channel for speed configuration. Feedback signal for speed controller
P 0522	ENC_PCon	Encoder: Channel select for Position Control	Selection of encoder channel for position information. Feedback signal for position controller
P 0523	ENC_RefCon	Encoder: Channel select for Master "IN"	Selection of channel to act as master encoder

Table 1.9 Encoder configuration

TTL encoder as master frequency input (setpoint)

The TTL input on X8 can also be used as a master frequency input for an electronic gear. For this parameter **P 1319 CamMaster_AxisType = 8** must be set. More details on the function can be found in the MSD Servo Drive Device Help.

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