LEXIUM
Communication via Modbus Plus

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Document Set

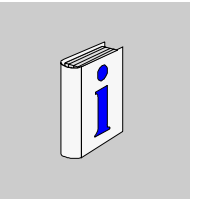
At a Glance

Document set:

- Modbus Plus Network:
  Modicon Installation manual 890 USE 100 00
  Modicon reference manual for Modbus Plus protocol PI-MBUS-300
- Quantum PLC
  Modicon Modsoft Programmer User Manual 890 USE 115 00
  Modicon Ladder Logic Block Library User Guide - 840 USE 101 00
- Premium PLC:
- PL7 Micro/Junior/Pro communication applications TLX DS COM PL7 43F
- Lexium drive:
  Lexium user manual
  Unilink software user manual
  List of ASCII commands
  These documents are available on the Lexium Motion Tools CD-ROM (ref. AM0 CSW 001V350).

Table of Contents

About the Book



At a Glance

Document Scope This document is a description of the Modbus Plus environment, as well as the Lexium command station principles and drive function. This description is not exhaustive.

User Comments We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com.

The Modbus Plus Package on LEXIUM

1

At a Glance

Aim of this Chapter

This Chapter details the implementation of Modbus Plus on LEXIUM.

What's in this Chapter?

This chapter contains the following topics:

Implementation: General

At a Glance

The Modbus Plus communication option card enables you to connect a Lexium drive on a Modbus Plus network.

The Modbus Plus option card package consists of:
- An option card reference AM0 MBP 001 V000.
- A CD-ROM containing the present manual.

The Modbus Plus cables and accessories are not supplied. References for the necessary elements are detailed in the Hardware implementation chapter.

Compatibility

This card can be used on Lexium digital MHDA drives with analogue setpoints:

Reference	Permanent output current
MHDA 1004.00	1.5 A rms
MHDA 1008.00	3 A rms
MHDA 1017.00	6 A rms
MHDA 1028.00	10 A rms
MHDA1056.00	20 A rms
MHDA 1112.00	40 A rms
MHDA 1198.00	70 A rms

Note: Compatibility rules:
- The drive serial number should be greater than or equal to 0770 220 200 (*) or RL (Revision Level) $\geq$8.
- The software version of the drive must be higher than or equal to version V4.20.
- The PL7 version must be higher than or equal to version V3.0
- The Unilink version must be higher than or equal to V2.0

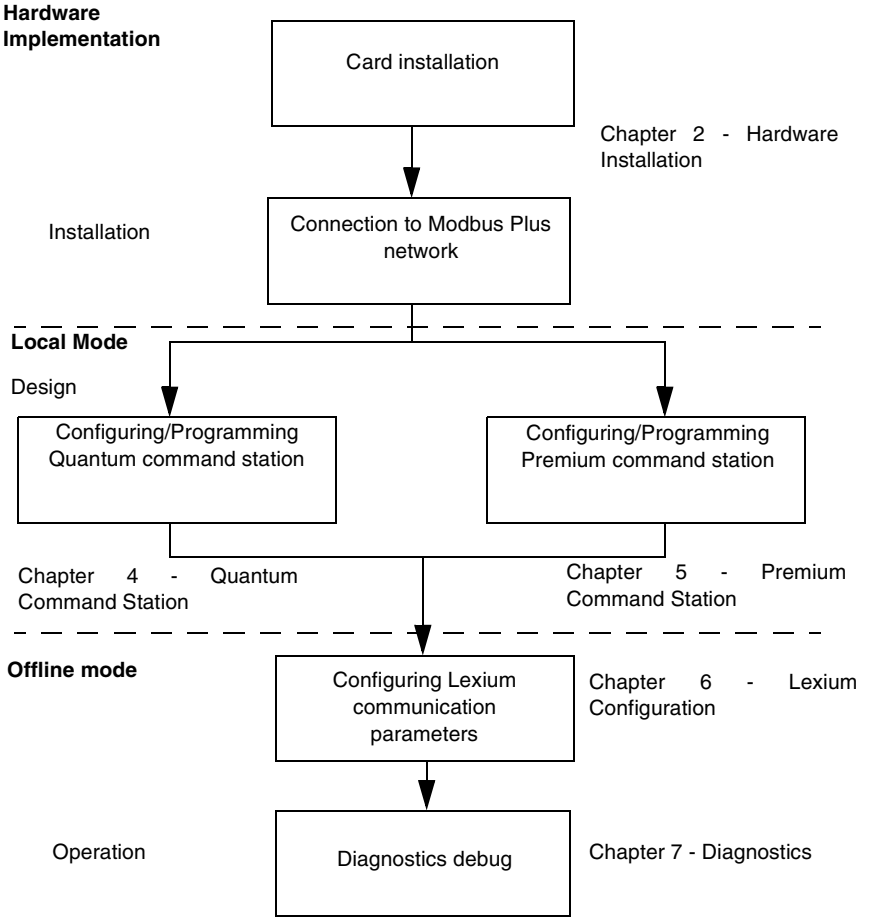
(*) Modbus Plus connection is not possible for a serial number below 770 220 000. For a serial number between 770 220 000 and 770 220 200 please contact us.

Compatibility with Option Card Standards	• EN61131-2 • IEC 1000-4-2 • IEC 1000-4-3 • IEC 1000-4-5 • IEC 1000-4-6 • EN55022/55011 • UL508 • CSA 22-2
Operational Temperature	• In operation: 0 to 60°C • In storage: -25°C to 70°C

Methodology

Presentation Flow Chart

The following flow chart summarizes the different phases of the implementation of a Lexium drive equipped with a Modbus Plus card option in a Modbus Plus architecture network.



Hardware Implementation

2

At a Glance

Aim of this Chapter

This chapter details the hardware implementation of Modbus Plus on LEXIUM

What's in this Chapter?

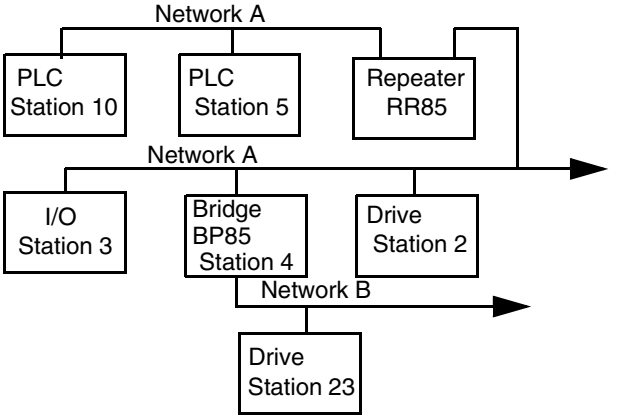
This chapter contains the following topics:

Installation: General

At a Glance

Modbus Plus is a local network designed for industry controlled applications.
It is possible to connect up to 32 stations on a cable network, the length of which can be up to 450m. Repeaters can increase the length of the cable up to 1800m and the number of stations to 64. Bridges and bridge multiplexers enable you to interconnect the Modbus Plus networks.

Example of Modbus Plus architecture

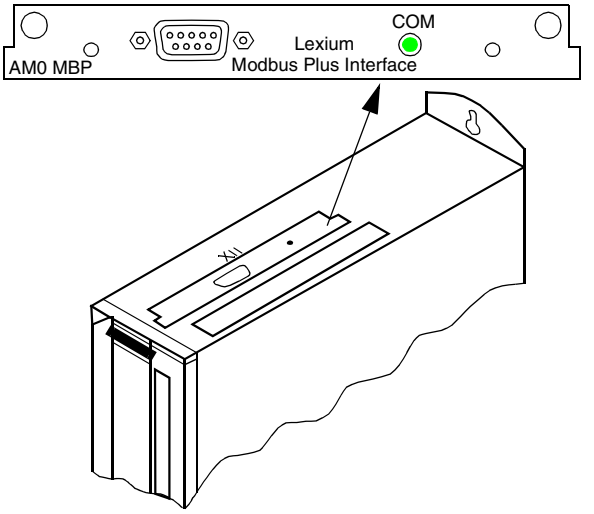


Networks A and B are interconnected via a bridge called "Bridge Plus 85". For more detailed information about the various elements, consult the Modbus Plus Modicon network installation guide.

Network stations are identified by an address configured by the user.
Each of these addresses is independent of its physical location on the site.
They should be between 1 and 64 and do not have to be sequential. There can be no duplicate addresses. Any piece of equipment with a duplicate address will not be able to be connected and a fault will be shown by means of the diagnostic LED. See *Diagnostics: Indication, p. 69*

Installation

The Modbus Plus option card is not mounted on the drive when it is supplied. The card slot for this card (reference X11 on the drive) is protected by a secure cover.



The Modbus Plus card option has a Sub-D 9 female connector as well as a green diagnostics LED
The power supply for this card is provided by Lexium.

Assembly Instructions

Procedure

Warning: Before starting, make sure that the drive is not switched on.

Step	Action
1	Detach the cover from the port intended for the option cards.
2	Take care not to let any components (for example the screws) fall into the open slot.
3	Carefully place the card into the slot, following the guidance rail.
4	Press down firmly on the card until the card's contact is in contact with the edge of the drive. This enables you to make sure that the card is well connected to the drive.
5	Fix the card with the 2 screws provided.

Modbus Plus Accessory References

Table of References

References for the different accessories

Accessory	Reference
Bridge muliplexer	BM85
Bridge BP85	NWBP 85 002
Repeater RR85	NWRR 85 001
2.4 m tap-off cable	990 NAD 219 10
6 m tap-off cable	990 NAD 219 30
30.5 m main network cable	490 NAA 271 01
152.5 m main network cable	490 NAA 271 02
305 m main network cable	490 NAA 271 03
457 m main network cable	490 NAA 271 04
1525 m main network cable	490 NAA 271 05
Junction box IP 20	990 NAD 230 00
Junction box IP 65	990 NAD 230 10
Termination of line for box IP20	AS MBKT 185
Line termination for box IP65	990 NAD 230 11
Modbus Plus card PCMCIA for Premium	TSX MBP 100
- Cable for PCMCIA_3m card	TSX MBP CE 030
- Cable for PCMCIA MBP_6m card	TSX MBP CE 060

Note: For more extensive details, please consult the Schneider catalogues.

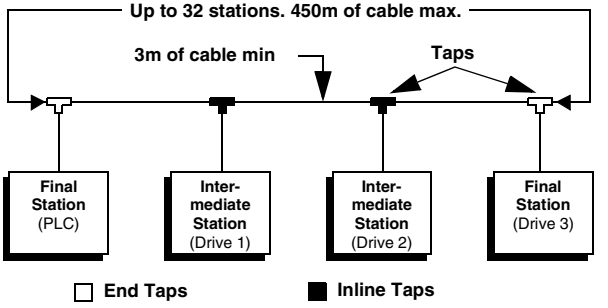
Connection to Modbus Plus Bus

Introduction

The bus is made up of a shielded twisted pair cable, transported on a direct route between one station and the next. The two data lines inside the cable are not sensitive to polarity.

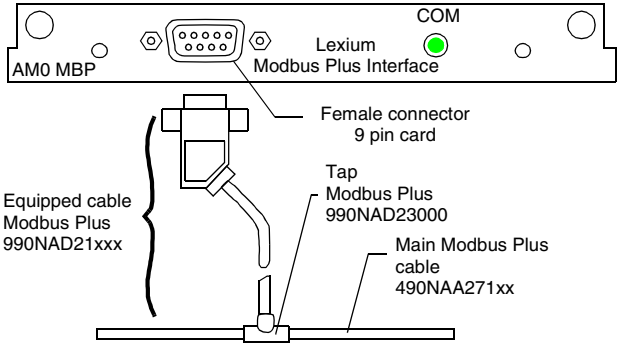
Diagram Showing Station Connections

Station connections on the cable network are carried out by means of taps. These consist of "crossings" for the main cable and a "Tap" for the cable leading to the station.

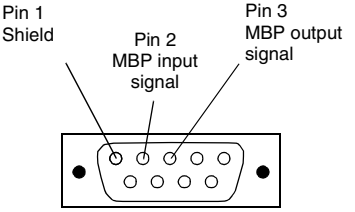


Connection of the Option Card on the Trunk Cable

A Trunk cable is used at each intermediate point between the box and the corresponding station. The cable is pre-equipped at one end with a 9 pin Sub-D connector for connection to the station.

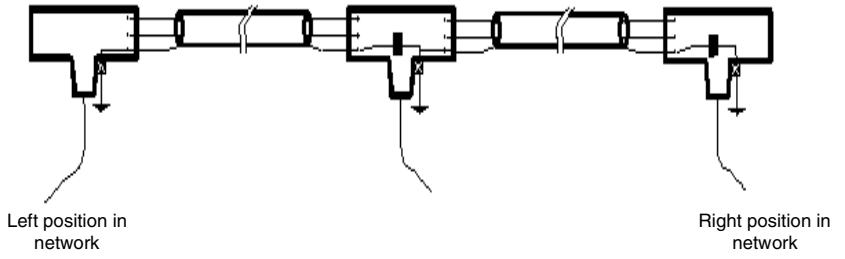


The option card connects with the main network cable by its Sub-D 9 connector whose pin configuration is shown below.



Main Bus Connection

The left input to the junction box is different from the right input:
the grounding of the trunk cable is not symmetrical. The junction boxes must be aligned in the same way throughout the network.



Tap Layout

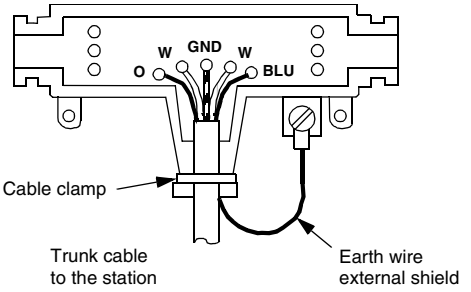
Principles and diagrams

One end of the trunk cable is free so that it can be connected to the tap.

Connection to the tap :

- Insert the cable into the tap and hold in place using a cable clamp
- Connect the wires following the directions shown on the diagram below.

The terminals are located as follows:

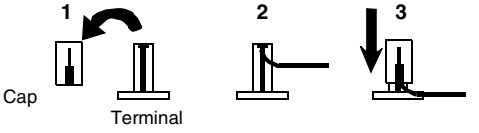


Color of the different terminals

Terminal	Wire Color
O	Orange
W	White
GND	Shield
W	White
BLU	Blue

Connection principle

The figures underneath show the connection sequence.



Procedure

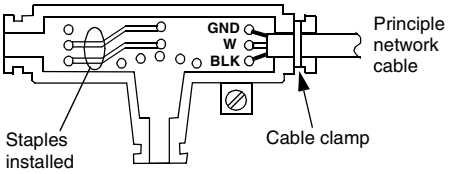
Procedures to follow:

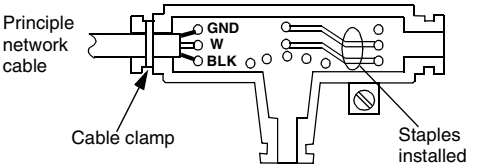
Step	Action
1	In order to connect each wire remove the plastic cap from the terminal.
2	Place the wire in the terminal slot.
3	Replace the cap using a screwdriver, then press down on the cap to push the wire well into the slot. There is a tool especially designed to do this. (Reference number AMP 552714-3).

Connecting the wire of the external shield:
Install an open terminal spade tag on the wire of the external shield, either by soldering or by setting, and connect it to the earth screw of the case as shown on the diagram below.

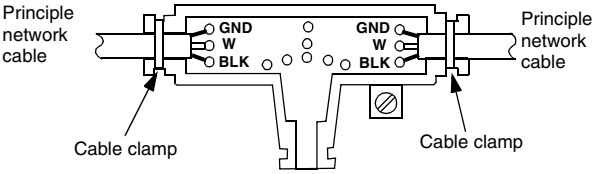
Wiring of the cable network:
The tap can be wired in two different ways depending on its position in the cable network.

Modbus Plus End Taps:
The tap is made up of a resistant line termination joined together by two internal staples At each end of the cable network the two staples must be joined to the inside of the tap so as to avoid signal reflections.



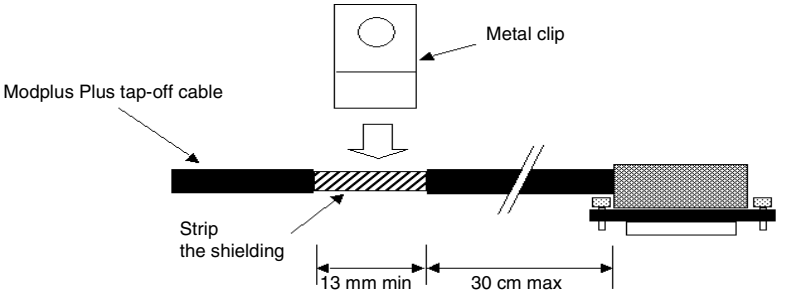


Modbus Plus Inline Taps :
For Inline Taps the two staples are not connected.



Ground Connection of Tap-off Cables

The Modbus Plus tap-off cable must be connected to ground via the backplane or an equivalent point in the network.
The backplane is grounded by means of a metal clip which connects the cable shield to the backplane.
The clip is supplied together with the junction box.



Software Implementation

3

At a Glance

Aim of this Chapter

This Chapter describes the general communication function of the Modbus Plus

What's in this Chapter?

This chapter contains the following topics:

Software Part: General

General

Communication using Modbus Plus enables the exchange of data between all stations connected on the bus.
Modbus Plus protocol is based on the principal of a logic token bus (Logic token passing). The token is a database circulating between stations. When one station has the token, it is possible to read all data coming from other stations or to write the data to other stations.

There are three communication functions:

Messaging

Point to point communication method between the network equipment. The message transmitter sends a request to the destination station. The station concerned must transmit an acknowledgement of receipt of the message, then send the reply when the token is next passing. The message can contain up to 100 registers in 16 bit format. The messaging range is not limited to the network segment but can come through the network routers.

Peer Cop

Peer cop (also known as specific output) is a method of mapping a block of registers from one specific node to the drive controller's Command and Adjustment registers. The transmitting node sends the peer cop data once per token pass. Each command node can send up to 32 words of peer cop data to specific nodes on the network as long as the total does not exceeded 500 words. Peer cop is a fast, efficient way to send data from the command node to the drive controller. It does not require ladder logic to be written.
Note : Peer cop data cannot be passed through bridges. Also, the drive controller can receive peer cop data but cannot transmit it.

Global Data

When a networked node holds the token, it may communicate with other nodes on the link and gather network statistics. When a node releases the token, it appends up to 32 sixteen-bit words of global data to the token frame. All nodes present on the network detect this data packet, and any appropriately programmed node can extract the data and record it in its global database. For a Modbus Plus network with a maximum 64 nodes, the global database can contain up to 2048 sixteen-bit words (32 words per node). Different networks cannot share global data since the token cannot pass through a bridge.

Drive Functioning on the Network

Introduction

The Lexium drive appears on the Modbus Plus network as a "slave" station.
The drive:

- Receives the Peer Cop data (Limited to 9 words max),
- Transmits global data (Limited to 18 words max),
- Responds to messaging requests (Read/Write).

The following chapters briefly describe the Lexium parameters accessible via Modbus Plus. For more details about these parameters, please consult the ASCII command list available on CD-ROM Lexium Motion Tools (reference number AM0 CSW 001V350).

Peer Cop: Lexium Command Data from PLC

At a Glance

The structure of the Peer Cop data received by the drive is predifined. The user can specify the number of registers to be transmitted. This is configured via Unilink using Peer Cop ASCII parameter. Setting this parameter to 0 will disable Peer Cop transactions.
The table below lists the command registers transmitted from the PLC to the Lexium as Peer Cop data and the order in which the registers are sent. For example, if you configure 4x register 40400 as specific output source register then the OPMODE object would be found in register 40405.

Peer Cop Data Order Number	Object	Description
1	STW	DRIVECOM command word Description: (See *Drive Operating Modes, p. 73*)
2	VCMD	Speed setpoint. Only in mode 0. (OPMODE=0, controlled by bit 6 of the STW) Units in (3000*rpm)/10000
3	ICMD	Current setpoint. (OPMODE=2, controlled by bit 6 of the STW) Unit = (2 x nominal current of the drive in amperes) / 10 [unit in mA]
4	S_SETH (least significant)	Absolute position setpoint in increments. (OPMODE=5, controlled by bit 6 of the STW) (*)
5	S_SETH (most significant)	
6	OPMODE	Basic function of the drive: ● 0 : Digital speed setpoint ● 1 : Analog speed setpoint ● 2 : Digital torque setpoint ● 3 : Analog torque setpoint ● 4 : Position control by external encoder ● 5 : Position control by external network (ex:Modbus Plus) ● 8 : Position control order
7	MOVE	Start of Parameterized position control Task (0 - 255). This data is only valid in mode 8 (OPMODE=8, controlled by bit 6 of the STW)
8	VJOG (least significant)	JOG mode is an infinite movement task. This value defines the speed of transfer in increments/sec. It is only valid in mode 8. (controlled by bit 8 of the STW)
9	VJOG (most significant)	

(*) This "trajectory" mode consists of two parameters:

- PTBASE (address: 213) : Time base expressed in N*250 µs
  For example: N=4 implies an interpolation time of 1ms
- PRBASE (address: 209): Defines the number of increments by revolution
  For example: N=20 or 2^{20}=1048576 increments/revolution

Global Data Sent from Lexium

List of Transmitted Variables

The list of variables transmitted in Global Data is also predefined. The user can specify the number of registers to be sent.
If the global data transmission is enabled for the Lexium drive controller, up to 18 display registers of the drive controller can be broadcast to the network as global data with each token rotation. To enable global data transmission, enter the number of display registers to be transmitted in the GDTX parameter via Unilink (See *Configuration of Lexium: Parameters, p. 61*). Entering "0" for this parameter disables gobal data transmission.
The table below lists the display registers transmitted as global data from the Lexium and the order in which the register are sent during global data transfers. For example, if you configured 4x register 40500 as the global input destination register then the ERRCODE (most significant) object would be found in register 40504.

Global Data Order Number	Designation	Description
1	ZSW	DriveCom status word *Drive Operating Modes, p. 73*
2	STATCODE (least significant)	Alarm in progress #bit 0 : IT threshold exceeded 1 : Ballast power reached 2 : Following error window exceeded 3 : Node guarding active 4 : Missing network phase 5 : Software limit 1 exceeded 6 : Software limit 2 exceeded 7 : Erroneous start command 8 : Lack of reference point 9 : PSTOP limit operated 10 : NSTOP limit operated 11 : Implicit data HIPERFACE 12 : Expansion card malfunction 13 : HIPERFACE reference mode reset to 0 14 : Error speed/current table 15-30 : Reserved 31 : Beta software version not allowed -
3	STATCODE (most significant)	

Global Data Order Number	Designation	Description
4	ERRCODE (least significant)	Error in progress: #bit 0 : Heatsink temperature too high 1 : Overvoltage 2 : Following error 3 : Feedback fault 4 : Undervoltage 5 : Motor temperature too high 6 : Faulty auxiliary voltage 7 : Overspeed 8 : EEPROM fault 9 : Flash EPROM fault 10 : Brake fault 11 : Motor phase fault 12 : Internal temperature too high 13 : Final power stage fault 14 : Maximum IT value exceeded 15 : 2 or 3 phases missing 16 : Analog/numeric conversion error 17 : Ballast error 18 : Network phase fault 19 : Expansion card hardware error 20 : Expansion card software error 21 : Ground short circuit 22 : CAN fault BusOff 23 : Alarm defined in error by WMASK 24 : Commutation error (overspeed) 25 : Hardware limit error 26 : Reserved 27 : Reserved 28 : Sercos error 29 : TimeOut Sercos 30 : Reserved 31 : System error
5	ERRCODE (most significant)	

Global Data Order Number	Designation	Description
4	ERRCODE (least significant)	Error in progress: #bit 0 : Heatsink temperature too high 1 : Overvoltage 2 : Following error 3 : Feedback fault 4 : Undervoltage 5 : Motor temperature too high 6 : Faulty auxiliary voltage 7 : Overspeed 8 : EEPROM fault 9 : Flash EPROM fault 10 : Brake fault 11 : Motor phase fault 12 : Internal temperature too high 13 : Final power stage fault 14 : Maximum IT value exceeded 15 : 2 or 3 phases missing 16 : Analog/numeric conversion error 17 : Ballast error 18 : Network phase fault 19 : Expansion card hardware error 20 : Expansion card software error 21 : Ground short circuit 22 : CAN fault BusOff 23 : Alarm defined in error by WMASK 24 : Commutation error (overspeed) 25 : Hardware limit error 26 : Reserved 27 : Reserved 28 : Sercos error 29 : TimeOut Sercos 30 : Reserved 31 : System error
5	ERRCODE (most significant)	

Global Data Order Number	Designation	Description
6	TJRSTAT (least significant)	Internal status: #bit 0 : INPOS2 output update 1 : End of current movement task 2 : Movement task completed 3-15 : Reserved 16 : Movement task active 17 : Reference point reached 18 : Position = source 19 : In position 20 : Rising edge detection on input latch 2 21 : Reference point active 22 : JOG move active 23 : Falling edge detection on input latch 2 24 : Emergency stop active 25-31 : Reserved
7	TJRSTAT (most significant)	
8	PFB (least significant)	Current position in increments.
9	PFB (most significant)	
10	V	Current speed. Unit = (3000 x rpm)/10000 [*unit in rpm]
11	I	Actual value of current. Unit* = (DICONT** x 2) / 10 [*unit in mA] [**DICONT in A]
12	MONITOR 1	Value of analog output Monitor 1 in mV
13	MONITOR 2	Value of analog output Monitor 2 in mV
14	ANIN 1	Value of analog input SW1 in mV
15	ANIN 2	Value of analog input SW2 in mV

Global Data Order Number	Designation	Description
16	STAT IO	Status of logical inputs/outputs of the drive according to the following sequence: #bit 0 : OUT 2 1 : OUT 1 2 : ENABLE 3 : IN4 4 : IN3 5 : IN2 6 : IN1
17	PE (least significant)	Current following error in increments.
18	PE (most significant)	

Messaging

Types of variables

Messaging allows the command station read or write access to internal drive data. This data is:

- Command variables
- Monitoring variables
- Configuration and adjustment variables.

Note: List of available variables (See *List of Lexium Variables: General, p. 91*). Variables that are contained in the 9 Peer cop command registers can not be overwritten via messaging when Peer cop is enabled. Write access to these registers is permitted when Peer cop is disabled.

The drive can be controlled by another station using this device when Peer Cop is disabled.

Quantum Command Station

4

At a Glance

Aim of this Chapter

This Chapter shows how to place the different modes of communication enabling access to the drive.

What's in this Chapter?

This chapter contains the following topics:

Quantum Command Station: General

General

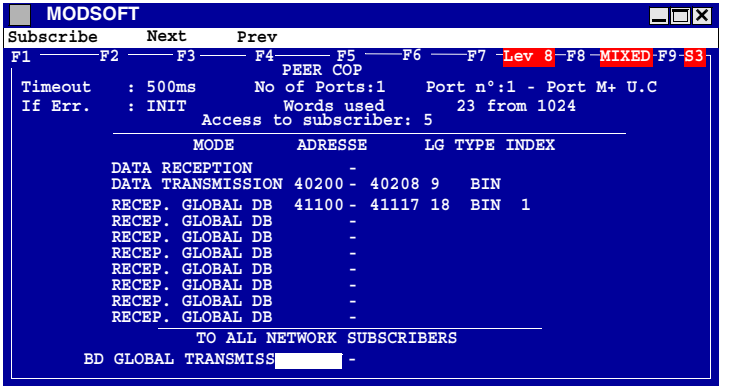
An application can be installed on a Quantum PLC in various ways via Modsoft, Concept or ProWORX. This chapter will demonstrate how to configure Modbus Plus exchanges via Modsoft and Concept. Also, programming examples of reading, writing and controlling the Lexium drive will be covered.

Quantum Command Station

Configuration of Peer Cop and Global Data via Modsoft

The Modsoft Peer Cop screen enables the configuration of the Quantum registers exchanged between Peer Cop and Global Data with the other stations on the network.

Configuration Example

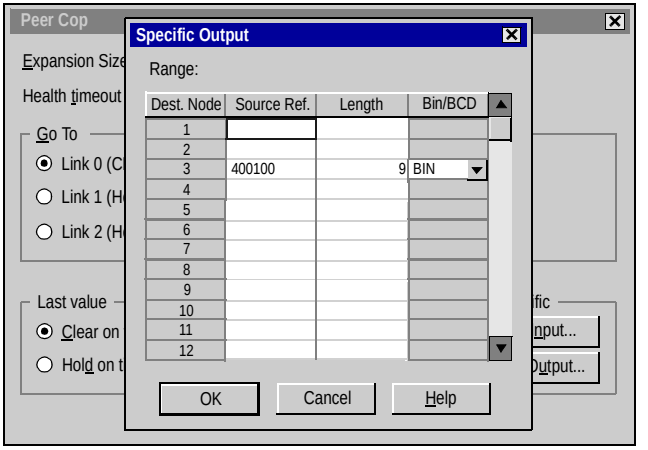


The configuration above shows the registers exchanged with address station no. 5.

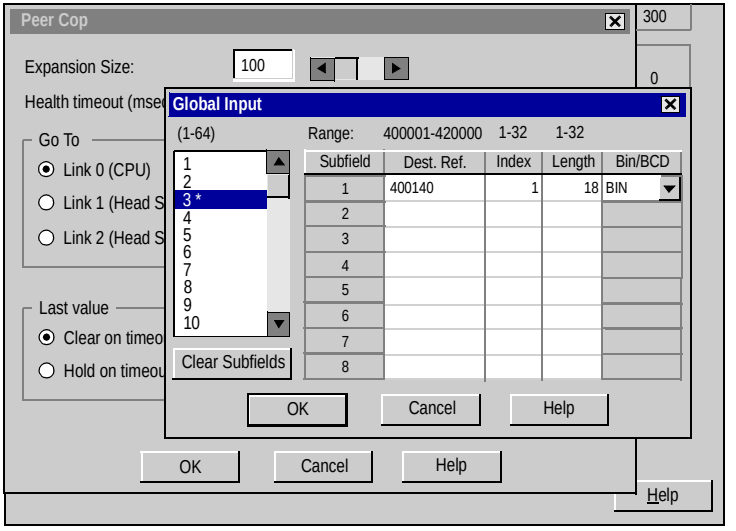
- 9 registers 16 bits (Modsoft registers 40200 to 40208) are transmitted in Peer Cop to station 5.
- 18 registers 16 bits (Modsoft registers 41100 to 41117) receive the Global data transmitted by station 5.

Configuration of Peer Cop and Global Data via Concept

Configuration of PeerCop and Global Data via Concept :



The configuration above shows the registers exchanged with address station no.3.9 registers (PLC registers 40100 to 40108) are transmitted in PeerCop to station 3.



The configuration above shows the registers exchanged with address station no.3.18 registers (PLC registers 40140 to 40157) are transmitted via Global Data to station 3.

MSTR Block

Overview of MSTR Block

PLCs that support MODBUS PLUS communications have a special MSTR (master) instruction with which nodes of the network can initiate message transactions. The MSTR function allows you to initiate one of nine possible network communications operations. Each operation is designated by a code (see Table below):

MSTR Operation	Operation code
Write data	1
Read data	2
Local statistics	3
Write in the Global data base	5
Read the Global data base	6
Remote statistics	7
Clear remote statistics	8
Peer Cop status	9

This section discusses read and write MSTR instruction blocks. For additional information on Modbus instructions, refer to the Ladder Logic Block Library User Guide, 840 USE 10 100.

MSTR Block Structure

Inputs:

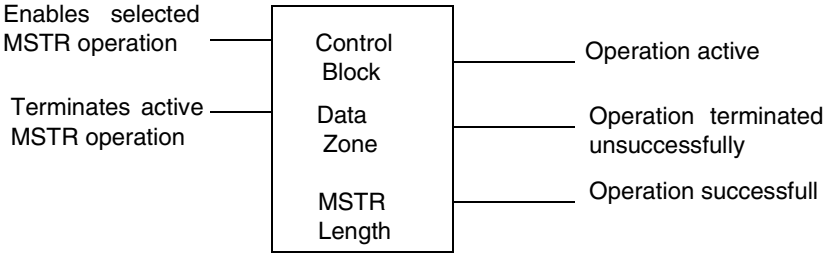
MSTR has two control points (see Figure below):

- Top node input - enables the instruction when top node input is ON.
- Middle node input - terminates the active operation when middlenode input is ON.

Outputs:

MSTR can produce three possible outputs (see Figure below):

- Top node output — echoes the state of the top node input (goes ONwhile the instruction is active).
- Middle node output — echoes the state of the middle node input andgoes ON if the MSTR operation is terminated prior to completion.
- Bottom node output — goes ON when MSTR operation is completedsuccessfully.



Top Node content

The 4x register entered in the top node is the first of nine contiguous holding registers that comprise the control block (see Table 11).

Note: You must understand MODBUS PLUS routing path procedures before programming an MSTR instruction. For a complete overview, refer to the MODBUS PLUS Network Planning and Installation Guide, 890 USE 100 00 .

Table Control Block Holding Registers

Register	Contents
1	MSTR Operation Code
2	Error in progress for the MSTR
3	Write : Number of variables to send Read : Number of variables to read
4	Read / write concerns the base variable address. **Warning : there is a shift of 1 for this register.** **For example, in order to access address 180, you have to enter 181.**
5	Station address destination
6	Station address destination routing 2
7	Station address destination routing 3
8	Station address destination routing 4
9	Station address destination routing 5

Middle Node Content

The 4x register entered in the middle node is the first in a group of contiguous holding registers that comprise the data area. For operations that provide the communication processor with data such as a write operation the data area is the source of the data. For operations that acquire data from the communication processor such as a read operation the data area is the destination for the data.

Bottom Node Content

The integer value entered in the bottom node specifies the length the maximum number of registers in the data area. Although the typical MODBUS PLUS length may range from 1 to 100 registers, the Lexium drive controller range is 1 to 60 registers.

Read and Write MSTR Operations

An MSTR write operation transfers data from a controlling device to the drive controller. An MSTR read operation transfers data from the drive controller to a controlling device on the network.

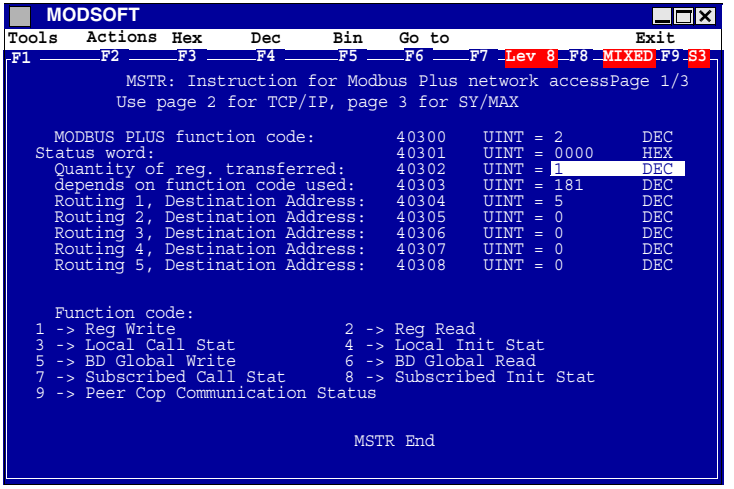
Control Block

Table below shows the information contained in the top node of the MSTR control block in a read or write operation.
Control Block Register - Read and Write Operations

Register	Function	Content
Displayed	Operation type	1 = Write; 2 = Read
1st implied	Error status	Displays a hex value indicating MSTR error, when relevant
2nd implied	Length	Write = # of registers to be sent to drive controller. Read = # of registers to be read to drive controller.
3rd implied	Drive controller data area	Specifies starting register in the drive controller to be read from or written to
4th...8th implied	Routing 1...5	Designates 1st...5th routing path addresses, respectively; last non-zero byte in routing path is the transaction device.

Example 1

Example



The example above shows how an MSTR block is used to read a register beginning at address 180 (OPMODE) on address station 5.
The registers 40001 to 40009 are assigned at configuration of the MSTR block

- 40001 : Read data operation
- 40002 : Current error (0 no error)
- 40003 : Number of read registers
- 40004 : Base address for read 180 (181-1)
- 40005 - 40009 : Address of the destination station for the message (5). No defined route. Station 10 is on the same network as the PLC.

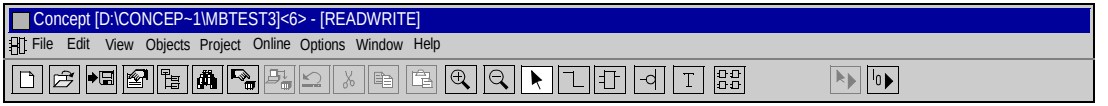
Programming Example

Purpose

To power up, initialize and enable the drive. Download a motion task via messaging. Start a motion task from the PLC by Peer Cop using Concept programming software.

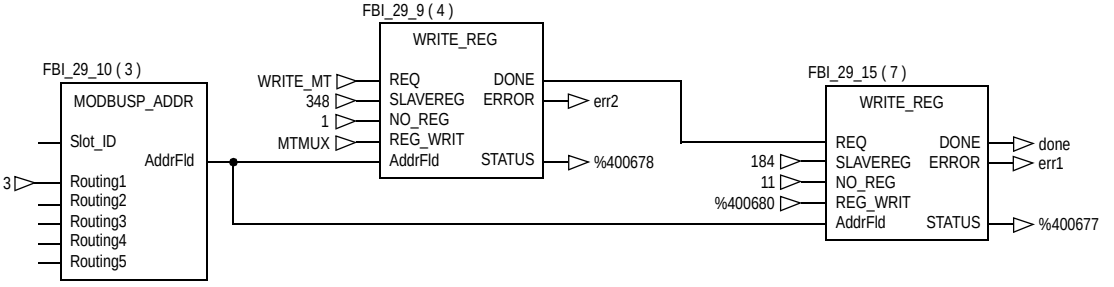
1. Configure the PLC Peer Cop/Global Data exchanges as outlined in the section, Quantum Command Station – Configuration of Peer Cop and Global Data via Concept.
2. Configure the Lexium as described in Chapter 6, Configuration of Lexium.

3. Define motion task #192 parameters by writing from PLC. In addition to the MSTR block described earlier, this example makes use of another method of writing to the Lexium, the WRITE_REG block for use in Concept. The example below makes use of two WRITE_REG blocks setup to write to modbus plus address 3 in this case the Lexium Drive. The first block is triggered by the boolean variable WRITE_MT which will send the value stored in the PLC varaiable MTMUX, 192 for this example, to address 348 (347 + 1) in the Lexium drive. This is the address in the drive where the motion task you wish to write is stored. Refer to the ASCII command MTMUX in Chapter 10. It has a length of 1 word. When the done bit is set on the first block it triggers the second WRITE_REG block which passes the Motion task parameters stored in the PLC starting at address 400680 to the Lexium address 184 (183 + 1). The parameters are 11 words long.



WRITE_MT triggers a write of a motion task to the Lexium. MTMUX is the number of the motion task you wish to write. Valid values are 0 and 192-255. 348 is the address in the Lexium where MTMUX is stored. (347 + 1). It's length is 1 word. When done bit is set a second write is triggered which passes the Motion task parameters to Lexium address 184(183+1). They are 11 words long. The data to be written is stored in 400680.

Variable	Address
O_ACC1	400680
O_ACC2	400681
O_C	400682
O_DEC1	400683
O_DEC2	400684
O_FN	400685
O_FT	400686
O_P	400687
O_V	400689



4. To enable the drive to move the motor the state machine must be programmed in accordance with the DRIVECOM standard as it applies to the Lexium drive. Refer to Chapter 8 for detailed information on the DRIVECOM standard. The figure below depicts a Concept Structured Text section that tests to see which state the Lexium is in. In order to be able to start a motion task, the Lexium must be in the state "Lexium Running". This is equivalent to a value of 16#27 in the STATUS variable. Please note that STATUS is equal to the boolean AND of ZSW and 16#006F. ZSW is the status of the drive which is sent in the 1st register of the Global Data transaction.

```
»»»»»»»»»»»»»»»» Structured Text Start ««««««««««««««««
STATUS :=  AND_WORD (IN1 := ZSW, IN2 := 16#006F);
FaultMask :=  AND_BYTE (IN1 := STATUS_L, IN2 := 16#0F);
(*_____________________________________________________________________________*)
(*State Tests*)


(*Faulty Lexium*)
StateMalfunction_Case1 := EQ_BYTE (IN1 := FaultMask, IN2 := 16#08);
StateMalfunction_Case2 := EQ_BYTE (IN1 := FaultMask, IN2 := 16#0F);
StateMalfunction := OR_BOOL (IN1 := StateMalfunction_Case1, IN2 := StateMalfunction_Case2);

(*Inoperative Lexium*)
StateNotReadyToSwitchOn_Case1 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#00);
StateNotReadyToSwitchOn_Case2 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#20);
StateNotReadyToSwitchOn := OR_BOOL (IN1 := StateNotReadyToSwitchOn_Case1, IN2 := StateNotReadyToSwitchOn_Case2);

(*Lexium Powered and Locked*)
StateSwitchOnDisabled_Case1 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#40);
StateSwitchOnDisabled_Case2 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#60);
StateSwitchOnDisabled := OR_BOOL (IN1 :=StateSwitchOnDisabled_Case1, IN2 := StateSwitchOnDisabled_Case2);

(*Waiting State*)
StateReadyToSwitchOn_Case1 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#21);
StateReadyToSwitchOn_Case2 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#01);
StateReadyToSwitchOn := OR_BOOL (IN1 := StateReadyToSwitchOn_Case1, IN2 := StateReadyToSwitchOn_Case2);

(*Lexium Ready*)
StateSwitchedOn := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#23);

(*Lexium Running*)
StateOperationEnabled := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#27);

(*Lexium in fast stop*)
StateQuickStopActive_Case1 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#07);
StateQuickStopActive_Case2 := EQ_BYTE (IN1 := STATUS_L, IN2 := 16#03);
StateQuickStopActive := OR_BOOL (IN1 := StateQuickStopActive_Case1, IN2 := StateQuickStopActive_Case2);
(*_____________________________________________________________________________*)
```

5. The following structured text programming was implemented to transition the drive to the "Lexium Running" state. This involves 3 drive transitions, 2,3 and 4 as described in the Status Diagram in Chapter 8. Transition 2 tests for the drive to be in the "Lexium Powered and Locked" state (StateSwitchOnDisabled) and that the PLC boolean variables Enable is high and ESTOP is low. When these conditions are satisfied the PLC sends a value of 16#0006 in the command word STW. STW is the first word in the Peer Cop data exchange. As a result of this command the drive should transition to the "Waiting State". Transition 3 tests to make sure that it did. (StateReadyToSwitchOn). If it did then the PLC sends a value of 16#0007 in the command word STW. As a result of this command the drive should transition to the "Lexium Ready" state. In this state the drive is enabled with torque but not ready to accept motion commands. Transition 4 tests for this "Lexium Ready" state (StateSwitchedOn) and for the PLC boolean variable, Run_Mode, to be set. If both these conditions are satisfied then the PLC sends the command 16#001F in the command word STW. Upon acceptance of this command the drive will transition to the "Lexium Running" state. The drive can now execute motion commands.

```
(* Disable -> Ready Transition - 2*)
IF Enable AND NOT(ESTOP) AND StateSwitchOnDisabled THEN STW_Word := 16#0006;
END_IF;

(* Ready -> Switched On Transition - 3*)
IF Enable AND NOT(ESTOP) AND StateReadyToSwitchOn THEN STW_Word := 16#0007;
END_IF;

(* Ready Drive for Motion - Transition 4*)
IF Run_Mode AND (StateSwitchedOn) THEN STW_Word := 16#001F;
END_IF;
```

6. In order to start a motion task the drive must be in Opmode 8 and have its reference point set. Toggling bit 6 of the command word STW will start the motion task. The following structured text programming was used to start the motion task. The code checks for the drive to be in the "Lexium Running" state (StateOperationEnabled) and that it is in Opmode 8. If these conditions are true then the code checks for the start signal, PLC boolean variable, Start_Out, to be set. When set, bit 6 of the STW command word is toggled causing the drive to execute the motion task number stored in the MOVE object (7th register in the Peer Cop data exchange).

```
IF  StateOperationEnabled  THEN
    IF  (Opmode  =  8)  THEN
        (*  Jog  Drive  *
        Jog is done by toggling bit 8 of the STW command word, 0 to 1 starts jog, 1 to 0 stops jog *)
        IF  Jog  AND NOT  (Home)  AND NOT  (startMotionTask)  THEN
        STW_Word  :=  OR_WORD  (IN1  :=STW_Word,  IN2  :=  16#0120);
        JogFlag  :=1;
        END_IF;
        IF NOT  (Jog)  AND  JogFlag  =  1  THEN
        STW_Word  :=  XOR_WORD  (IN1  :=STW_Word,  IN2  :=  16#0120);
        JogFlag  :=0;
        END_IF;

        (*  Home  Drive  *
        Home is done by toggling bit 11 of the STW word from 0 to 1 *)
        IF  Home  AND NOT  (Jog)  AND NOT  (startMotionTask)  THEN
        STW_Word  :=  XOR_WORD  (IN1  :=STW_Word,  IN2  :=  16#0800);
        END_IF;

        (*  Start  Motion  Task  *
        A motion task is started with EACH transition of bit 6 in the STW word, it is a toggle style bit *)
        IF  (startMotionTask  OR executeNewSpeed OR executeNewPosition) AND NOT  (Home)  AND
        NOT  (Jog)  THEN
        STW_Word  :=  XOR_WORD  (IN1  :=  STW_Word,  IN2  :=16#0040);
        END_IF;

    END_IF;
END_IF;
```

Premium Command Station

5

At a Glance

Aim of this Chapter

This chapter shows how to place the different modes of communication enabling access to the drive.

What's in this Chapter?

This chapter contains the following topics:

Premium Command Station

General

An application is installed on a Premium PLC by means of the PL7 software factory. This factory contains a specific screen, which enables you to configure the Modbus Plus exchanges. This chapter shows how to implement the different modes of communication allowing access to the drive.

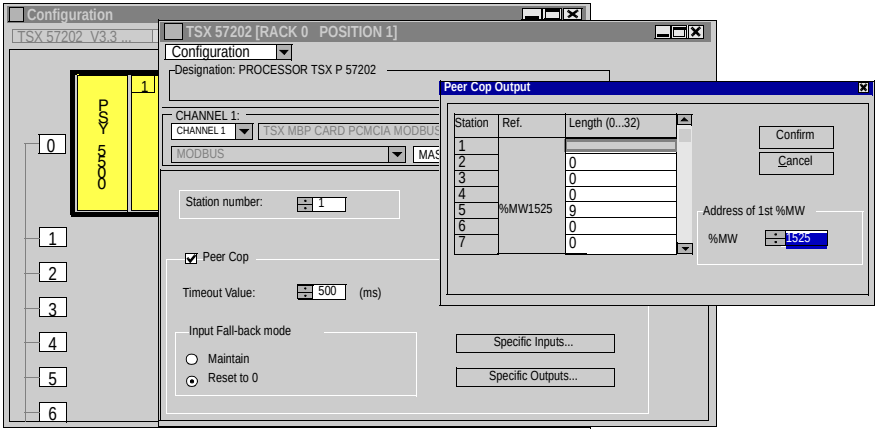
The installation is carried out in two parts:

- Station configuration : Station address, Peer Cop
- Write PLC tasks. Use of messaging and global data

Peer Cop Configuration

Peer Cop configuration occurs once the Premium station is configured. When these are defined, Premium manages their updating in a manner that is clear to the user. There is no function to execute.

The example below shows Peer Cop configuration. A Premium register zone serves as a storage buffer between the application and the Modbus Plus network.



The Premium station address is 1. The station wants to receive 9 words of Peer Cop data from station address 5.
Data sent out in Peer Cop will be issued from the 16 bit registers %MW1525 to %MW1533. These registers will be updated using the application defined by the user. Premium automatically and periodically transfers these registers onto the Modbus Plus network.

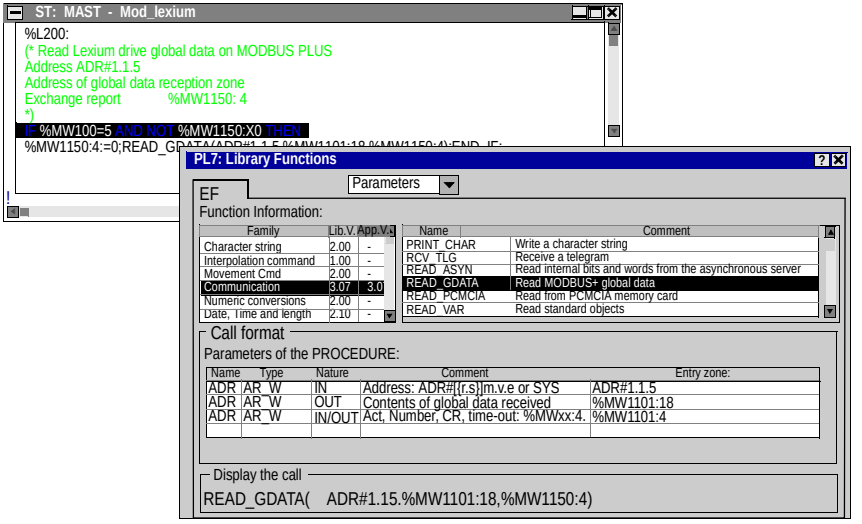
Note: For more detailed information, please consult the TLX DS COM PL7 manual.

Use of Global Data

The "READ_GDATA" function

Unlike a Quantum station, Global data is not managed directly by the PLC. The "READ_GDATA" function must be used to take these values into account.

The example below shows the use of the READ_GDATA function in the Premium environment. The top screen represents a defined task in ST language (structured literal language) which will be executed on each PLC cycle. The bottom screen is an on-line help which makes the implementation of the function easier.



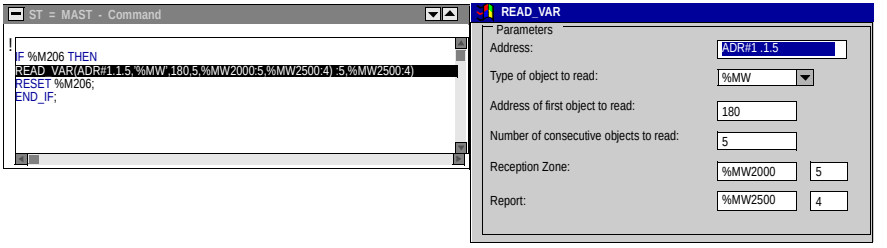
In the example above, when the condition is verified (%MW1150:X0=0), the application reads 18 items of global data produced by address station 5 (1.15). The read data will be stored in the Premium registers %MW1101 to %MW1118. An exchange report will be stored in the Premium registers %MW1150 to %MW1153.

Using Messaging

Read Command

The "READ_VAR" function allows a read request to be carried out by messaging using Modbus Plus.

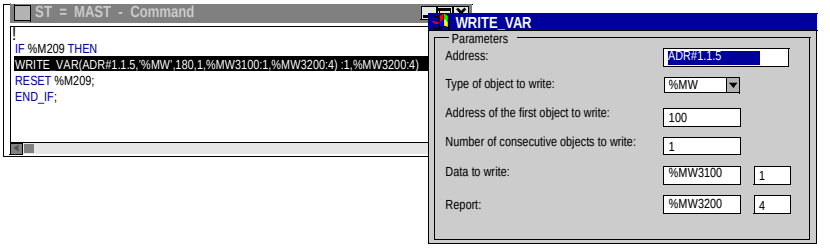
The example below shows the use of the READ_VAR function in the Premium environment. The screen on the left represents a defined task in ST language (structured literal language) which will be executed on each PLC cycle. The screen on the right is an on-line help which makes the implementation of the function easier.



In the example, the application reads 5 registers 16 bits (%MW) beginning at address 180 on station address 5 (1.1.5) when the %M206 condition is verified. (takes account of %MW2500:X0 = 0)
The read data will be stored in the Premium registers %MW2000 to %MW2004. An exchange report will be stored in the Premium registers %MW2500 to %MW2503.

Write Command

The "WRITE_VAR" function allows a write request to be carried out by messaging using Modbus Plus.
The example below shows the use of the WRITE_VAR function in the Premium environment. The screen on the left represents a defined task in ST language (structured literal language) which will be executed on each PLC cycle. The screen on the right is an on-line help which makes the implementation of the function easier.



In the example, the application writes a 16-bit register (%MW) beginning at address 180 on station address 5 (1.1.5) when the %M209 condition is verified. (takes account of %MW3200:X0=0)

The data to be written is stored in the Premium register %MW3100.

An exchange report will be stored in the Premium registers %MW3200 to %MW3203.

Programming Example 1

Purpose

To achieve control of the "movement task program by Peer_cop and Global Data.

Configure the Premium/Lexium:

- At the PLC, this is done using the PL7 software:
  - define the master PLC address: 1
  - activate the Peer_cop and specify the outputs:

    Address of 1^{er} word of the Peer_cop table: %MW1525.

    Assign a number of words for each slave in the network on the basis of current or future needs.

In the PL7 screen used for Peer_cop configuration:

Station	Ref.	Length (0...32)
1		
2	%MW1525	32
3	%MW1557	9
4		0
5	%MW1566	9
6		0

In this example, there are 3 slaves at the addresses 2, 3 and 5. The station is declared to be set up in readiness for a product which accepts 32 Peer_cop words. Note that continuity of the table of words is maintained despite the absence of station 4.

- At Lexium address 3, this is done using the Unilink software:
  - define the address: 3
  - define the Peer_cop
  - define the global data

Literal programming:

The movement task parameters are loaded using the Unilink tool.

- Write the application in literal language in order to read the Global Data:

```
(* drive address *)
! %MW10:6 := ADR#0.1.3;
```

(* %MW10:6 => optional definition of an indirect address *)
(* ADR#0.1.3 => Lexium @3 *)

- Read the global data:

Note:
Hypothesis: the DriveCom must have the status "Lexium running (See *Status Diagram for the Standard DriveCom, p. 74*)"

```
! %L200:
(* read global data from Lexium @3 drive to Modbus Plus *)
(* address of global data reception zone: %MW1101:18 *)
(* address ADR#0.1.3 = %MW10:6 *)
(* %M24 = read command *)
(* exchange report: %MW1150:4 *)
(* Zsw:18 status, first word of Zsw table=%MW1101 *)

IF %M24 AND NOT %MW1150:X0 THEN RESET %M24;
%MW1150:4 = 0;
READ_GDATA (%MW10:6 , Zsw:18 , %MW1150:4);
END_IF;
```

Operation:
Start and confirm the drive using the Drivecom diagram:
- PLC started
- Confirm reading of Global Data %MW24 := 1
- Set command word STW to 0 to set the Lexium to the status "powered-up and locked": %MW1557 := 0
- To switch the Lexium to the Drivecom "started" status, specify the following in sequence:
  %MW1557 := 6
  %MW1557 := 7
  %MW1557 := 16#001F

On each command, the status changes in accordance with the diagram described in the chapter Drivecom. (See *Status Diagram for the Standard DriveCom, p. 74*)

When the status is equal to 16#0027, the drive is ready to receive the movement start command via a dedicated operating screen or via an animation table.

The sequence is as follows:
- The referenced axis is tested by reading bit 1 of %MW1107.
- Test of the global data, bit 9 of word %MW1102 (absence of reference point).
- Select Opmode 8 (%MW1562 = 8).
- If the axis is not referenced, activate bit 11 of the command word STW (%MW1557).
- Select the step for the movement task (No. of task to be started MW1563 = 3)
- Start the movement via bit 6 of the command word STW.

Programming Example 2

At a Glance

PL7 Programming Example:
Example of message mode, to read and modify the parameters of steps 0 and 192 to 255 in the movement task.
The 9 parameters that are simultaneously modified are:

- O_ACC1
- O_ACC2
- O_C
- O_DEC1
- O_DEC2
- O_FN
- O_FT
- O_P
- O_V

The network consists of a master PLC and a Lexium slave:

- Address of the master PLC station: 1
- Address of the slave Lexium station: 3

Configure the Premium/Lexium:

- At the PLC, this is done using the PL7 software:
  - define the master PLC address: 1
  - activate the Peer_cop and specify the outputs:

    Address of 1^{er} word of the Peer_cop table: %MW1525.

    Assign a number of words for each slave in the network on the basis of current or future needs.

In the PL7 screen used for Peer_cop configuration:

Station	Ref.	Length (0...32)
1		
2	%MW1525	32
3	%MW1557	9
4		0
5	%MW1566	9
6		0

In this example, there are 3 slaves at the addresses 2, 3 and 5. The station is declared to be set up in readiness for a product which accepts 32 Peer_cop words. Note that continuity of the table of words is maintained despite the absence of station 4.

- At Lexium address 3, this is done using the Unilink software:

- define the address: 3
- define the Peer_cop
- define the global data

Write the application in literal language, Lexium drive slave @3:

```
(* drive address *)
! %MW10:6 := ADR#0.1.3;
```

(* %MW10:6 => optional definition of an indirect address *)
(* ADR#0.1.3 => Lexium @3 *)

```
! %L200:

(* read global data from Lexium @3 drive to Modbus Plus *)
(* address of global data reception zone: %MW1101:18 *)
(* address ADR#0.1.3 = %MW10:6 *)
(* %M24 = read command *)
(* exchange report: %MW1150:4 *)
(* Zsw:18 status, first word of Zsw table=%MW1101 *)

IF %M24 AND NOT %MW1150:X0 THEN RESET %M24;
%MW1150:4 = 0;
READ_GDATA (%MW10:6 , Zsw:18 , %MW1150:4);
END_IF;

! (* filtering of status word *)
%MW750:=%MW1101 AND 16#006F;
%L300:
(* WRITE Lg1 MTMUX Lexium @3 on Modbus Plus *)
(* address: %MW10:6 *)
(* type of variable: %MW *)
(* MTMUX register: 347 *)
(* length of MTMUX register: 1 *)
(* register number for MTASK step: %MW60:1 *)
(* exchange report:  %MW80:4 *)

IF %M50 AND NOT %MW80:X0
THEN RESET %M50; %MW80:4:=0;
WRITE_VAR(%MW10:6,'%MW',347,1,%MW60:1,%MW80:4);
END_IF;

!
%L320:
(* WRITE Lg11 table MTMAX Lexium @3 on Modbus Plus *)
(* address: %MW10:6 *)
```

```
(* type of variable: %MW *)
(* 1st MTMAX register to be written: 183 *)
(* number of registers to be written: 11 *)
(* value to be output: %MW61:11 *)
(* exchange report:  %MW84:4 *)

IF %M51 AND NOT %MW84:X0
THEN RESET %M51; %MW84:4:=0;
WRITE_VAR(%MW10:6,'%MW',183,11,%MW61:11,%MW84:4);
END_IF;

!
%L340:
(* read MTMUX Lexium @3 on Modbus Plus *)
(* address: %MW10:6 *)
(* type of variable: %MW *)
(* MTMUX register: 347 *)
(* length of MTMUX register: 1 *)
(* register number for MTASK step: %MW60:1 *)
(* exchange report:  %MW80:4 *)

IF %M52 AND NOT %MW80:X0
THEN RESET %M52; %MW80:4:=0, %MW60:=0;
READ_VAR(%MW10:6,'%MW',347,1,%MW60:1,%MW80:4);
END_IF;

!
%L360:
(* read MTMUX Lexium @3 on Modbus Plus *)
(* address: %MW10:6 *)
(* type of variable: %MW *)
(* 1st MTMAX register to be read: 183 *)
(* number of registers to be read: 11 *)
(* receive register: %MW61:11 *)
(* exchange report:  %MW80:4 *)

IF %M53 AND NOT %MW80:X0
THEN RESET %M53; %MW80:4:=0, %MW61:=0;
READ_VAR(%MW10:6,'%MW',183,11,%MW61:11,%MW80:4);
END_IF;
```

Program Operation

Start and confirm the drive using the Drivecom diagram:

- PLC started
- Confirm reading of Global Data %MW24 := 1

- Set command word STW to 0 to set the Lexium to the status "powered-up and locked": %MW1557 := 0
- To switch the Lexium to the Drivecom "started" status, specify the following in sequence:
  %MW1557 := 6
  %MW1557 := 7
  %MW1557 := 16#001F

The status (remember: STATUS = ZSW AND 16#006F) changes on each command in accordance with the diagram in the chapter Drivecom. (See *Drive Operating Modes, p. 73*)

When the status is equal to 16#0027, the drive is ready to receive the movement start command.

- **Select the step for the movement task to be read or modified:**
  Write the number of the step to be read or modified to the register %MW60.
  This register will be loaded into the MTMUX register when bit %M50 is activated.
  The MTMUX register can be read by loading its value into the register %MW60.
  Activate bit %M52 to perform this load operation.
- **Read the step parameters for the selected movement task:**
  Activate bit %M53
  Parameters 183 to 191 (O_ACC1 ....O_V (See *General table of read/write variables, p. 92*)) of the Lexium drive are then loaded into registers %MW61 to %MW71.
  Special case: Parameters 190 and 191 use 2 words each. Consequently, we have %MD68 for register 190 and %MD70 for register 191.
- **Write the step parameters for the selected movement task:**
  Activate bit %M51 after you have changed one or more of the parameters in the registers %M61 to %M71.
  The parameters of all the internal words %MW61 to %MW71 are then loaded into the registers 183 to 191 of the Lexium drive.
  Pay attention to the special case of the double parameters 190 (0_P) and 191 (O_V).
  The new parameters will not be used until the step is started (specified in the MOVE parameters) via command bit 6 of the STW.
- **Meaning of the bits for the movement task:**
  bits %M50 = write confirmation for the MTMUX register
  bits %M51 = write confirmation for the parameters of the movement task
  bits %M52 = read confirmation for the MTMUX register
  bits %M53 = read confirmation for the parameters of the movement task

Configuration of Lexium: Parameters

6

At a Glance

Aim of this Chapter

This chapter describes the configuration of different communication parameters.

What's in this Chapter?

This chapter contains the following topics:

Communication Parameters

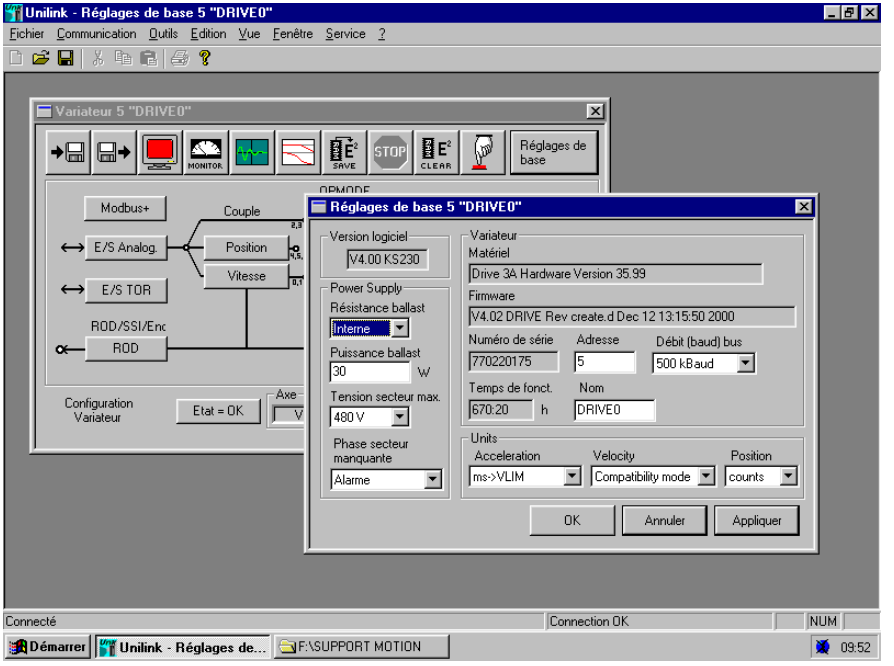
At a Glance

Communication parameters are configured in 2 ways:

- either via the Unilink software terminal mode or via a hyperterminal mode under Windows.
  Some ASCII commands are defined to make it possible to read or modify these parameters.
- Via the Modbus Plus screen in the Unilink software

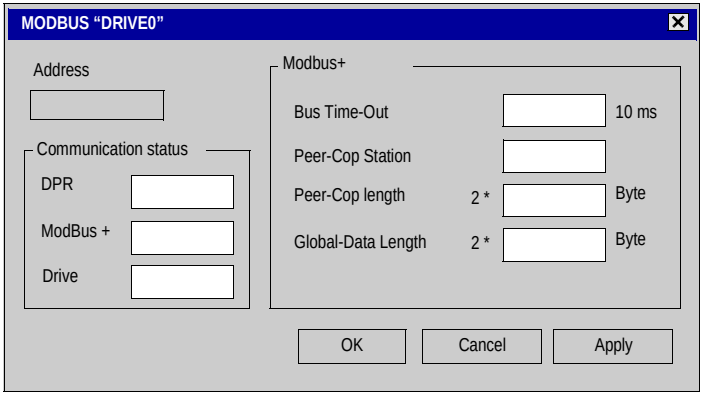
Addressing

"DRIVE 0" basic configuration screen



Modbus Plus Parameters:

The Modbus Plus screen in the Unilink software:



The following table describes different parameters in the "Modbus Plus Settings" zone:

Parameter	Command ASCII	Range	Default value	Note
Address (*)	ADDR	1-63	1	Modbus+ node address (read only)
Bus TimeOut (**)	TIMEMBP	0.01-60	1	In seconds. Increments of 10ms
Command station Peer-Cop Station Master address	PEERCOPS	1-64	1	Must be different from the drive address. 0= no PeerCop registers received
PEERCOP register Peer-Cop length	PEERCOP	0-9	0	Number of PeerCop registers received. 0= PeerCop registers received
Global data Tx	GDTX	0-18	0	Number of Global data registers transmitted. 0: Global data not transmitted

(*) The station address is entered in the Unilink base adjustment screen.
(**) Timeout represents:

- the longest time span during which no token has been received;
- the longest time span between the reception of two PeerCop transmissions.

The following table describes the different values in the communication status zone:

Parameters	ASCII command	Range	Default value	Note
DPR	DPRSTATE (status during initialization phase) DPRSTATE = 80: Message ready			16-bit length
Modbus +	MBPSTATE (status read by Unilink) Updated by MBP card, it makes the drive aware of the MBP card status		0	16-bit length
Drive	MBPSTATE (status read by Unilink) Updated by the drive, it makes the MBP card aware of the drive status	1-100	0	16-bit length

Descriptions of the different MBPSTATE statuses:

Value of MBPSTATE	Description
0	Card not configured
1	Card in Run
2	No communication from card
3	Network communication fault
4	DPRAM communication fault

Descriptions of the different MBPDRVSTAT status:

Value of MBPDRVSTAT	Description
1	Drive ready
2	Network communication fault
4	DPRAM communication fault
8	Communication fault: network ignored (MBTNTO* bit)

(*) MBPNTO = 0 communication fault reported to the drive.
MBPNTO = 1 communication fault ignored by the drive, it is accessible in write mode via the ASCII MBPDRVSTAT command.
Thus if MBPDRVSTAT = 8h for MBPNTO = 1 then the read value is 9
If MBPDRVSTAT = 0h for MBPNTO = 0 then the read value is 1

Procédure

The Modbus Plus Lexium communication is configured as follows:

Step	Action
1	Power up the drive. The network cable does not have to be connected.
2	Check that the Modbus Plus card option is in good working order: The green diagnostics LED should flash regularly (6 flashes per second).
3	Run the Unilink software or a terminal

Configuration of Address and TimeOut via Unilink or via a Terminal

Address Configuration

Note: An address should not be duplicated on the network and should be between 1 and 63.

Configuration via Unilink

- Configure the "Address" field using the station address in the Unilink basic setup screen.

Configuration via a terminal

- Enter the terminal screen,
- Enter the ADDR command <Address>. For example, to set the drive address to 3, type ADDR 3.
- Enter the ADDR command without parameters to check that the configuration has been correctly implemented.

Note: The address is stored in the drive. Replacing the Modbus Plus card has no effect on the drive address. It continues to have the previously configured address.

TimeOut Configuration

Configuration via Unilink

- Configure the " Bus Time-Out" field with the selected value.

Configuration via a terminal

- Enter the terminal screen,
- Enter the TIMEMBP command <Value in 0.01 sec.> For example, type TIMEMBP 200, to set a time out value of 2 seconds.
- Enter the TIMEMBP command without parameters to check that the configuration has been correctly implemented.

TimeOut represents:

- The maximum period of time during which a token is not received,
- The maximum period of time between 2 Peer Cop transmissions being received.

When a TimeOut is detected, the drive faults.

Peer Cop Data

Peer Cop Configuration

Peer Cop data are the registers transmitted by the command station. The number of registers received by the drive can be configured by the user.

The number of Peer Cop registers transferred can be configured in either of two ways:

Configuration via Unilink
- Configure the "Peer-Cop Station" field with the command station address,
- Configure the "Peer-Cop Length" field with the number of received Peer Cop registers.

Configuration via a terminal

Selecting the number of a Peer Cop registers
- Enter the terminal screen,
- Enter the Peer Cop command <Number of Peer Cop registers>. For example, type Peer Cop 9 to configure the Lexium to receive 9 registers.
- Enter the Peer Cop command without parameters to check that the configuration has been correctly implemented.

Command station configuration
- Enter the Peer Cop command <Command Station Address>. For example, type Peer Cop 6 to configure the PLC in command whose node address is 6.

Enter the Peer Cop command without parameters to check that the configuration has been correctly implemented.

For example:
- If the number 2 is entered in the "Number of Peer Cop Registers" parameter of the drive and the PLC, only the first two registers of the Peer Cop data, STW and VCMD variables will be received by the drive.
- The configured number of Peer Cop registers should be adjusted in relation to the application requirements. The smallest possible number of Peer Cops should be used to optimize the network bandwidth and feed-through time of the Modbus Plus card. However, you are strongly advised to always use the STW command word.

If no Peer Cop data is received from the command station before the end of the specified wait time, the drive faults. It can still be accessed via messaging.

Common Parameter Management with Messaging

Variables that are configured in the 9 Peer Cop command registers can not be overwritten via messaging when Peer Cop exchanges are enabled. Write access to these registers is permitted when they are not configured in the Peer Cop exchange.

Global data configuration via Unilink or via a terminal

Global data configuration

Updating global data is confirmed by selecting a number of Global data registers greater than 0.

Configuration via Unilink:

- configure the "Global-Data length" field with the number of registers.

Configuration via a terminal:

Selecting the number of Global data registers

- enter the terminal screen,
- Enter the GDTX command <Number of Global Data registers>. For example, type GDTX 18 to configure the Lexium to send 18 registers
- enter the GDTX command without parameters to check that the configuration has been correctly implemented.

Example:

- if the number 2 is entered in the "Number of Global data registers" drive and PLC parameters, only the first two registers of the Global data, ZSW and STATCODE variables will be updated by the drive,
- the number of configured Global data registers should be adjusted in relation to the application requirements. The smallest possible amount of global data must be used in order to optimize the network bandwidth and feed-through time of the Modbus Plus card.

Diagnostics: Indication

7

At a Glance

Aim of this Chapter

This Chapter explains the meaning of the different green LEDs, which can be found on the Modbus Plus card.

What's in this Chapter?

This chapter contains the following topics:

Diagnostics: Different Statuses

Diagnostics

The Modbus+ card is provided with a green indicator LED, which indicates the communication status. The following table indicates the meaning of the different statuses.

LED status	Meaning
Off	The options card has faulted, the Modbus Plus address is not configured. Causes for this fault: • An error in communicating with the drive. • An option card hardware fault.
1 flash/second	MONITOR LINK. From powering up or following a DUPLICATE STATION status, the card examines the network and constructs a table of active nodes. After 5 seconds, the card tries to resume normal mode (TOKEN OK).
6 flashes/second	TOKEN OK. The token circulates normally and the card receives it once per rotation.
2 flashes/second followed by a 2 second pause	NEVER GETTING TOKEN. The token circulates on the network but the card never receives it.
3 flashes/second followed by a 1.7 second pause	SOLE STATION. The network comprises one station only or the link was lost.
4 flashes/second followed by a 1.4 second pause	DUPLICATE STATION. Another network node has the address of the options card. This requires reconfiguration or the other node to be disconnected from the network.

Lexium Drive Parameters

Drive status

The Lexium drive uses three parameters (See *Modbus Plus Parameters:, p. 63*) which allow the drive and Modbus Plus option card status to be seen.

- (DPR, ASCII equivalent DPRSTATE)
- (Modbus Plus, ASCII equivalent MBPSTATE)
- (Drive, ASCII equivalent MBPDPRVSTATE)

These parameters can be accessed:

- Via the Unilink software terminal or any terminal. Some ASCII commands are defined to allow parameter reading.
- Via the Modbus Plus screen in the Unilink software

Drive Operating Modes

8

At a Glance

Aim of this Chapter

This chapter shows the status chart of the standard DRIVECOM as well as the forced local mode via Unilink.

What's in this Chapter?

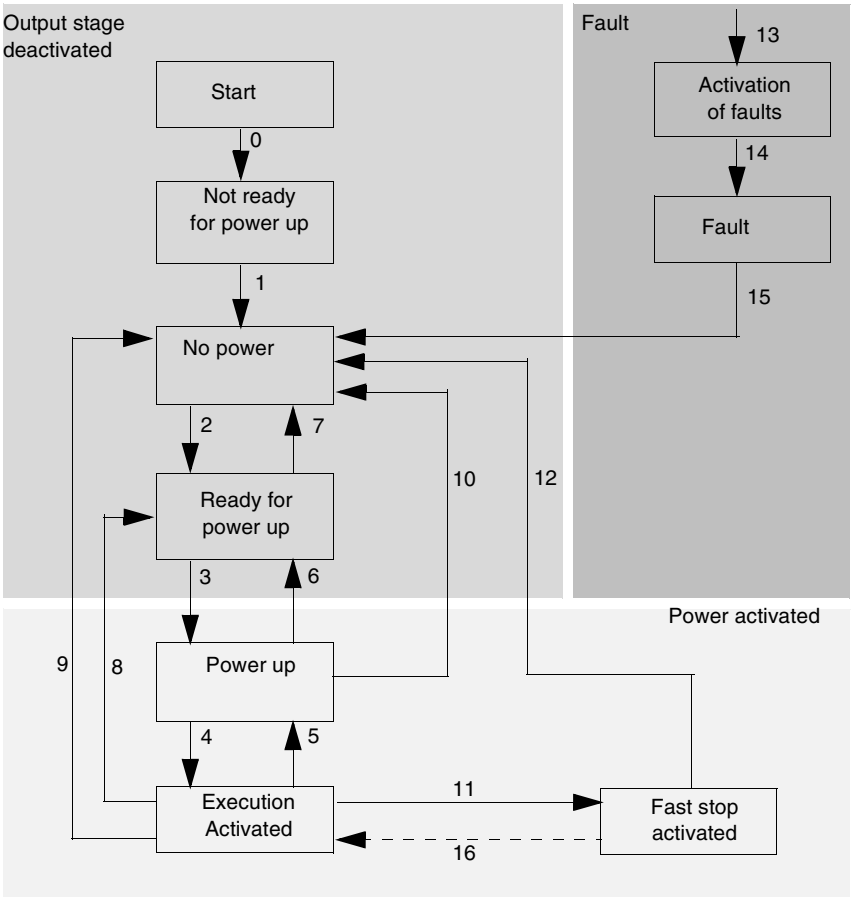
This chapter contains the following topics:

Status Diagram for the standard DRIVECOM

Status Diagram for the Standard DriveCom

The Lexium drive can be commanded via Modbus Plus according to the status diagram for the DRIVECOM standard:

Diagram:



This standard includes the key functions for drives produced by a number of different manufacturers.
Each status corresponds to an internal drive behavior. The status of the drive can be accessed via its status word. The status is changed using the command word. The value of any bits marked with an X is irrelevant.

DRIVECOM Standard

DRIVECOM Standard

The Lexium control process conforms to the DRIVECOM standard state chart. Each state represents an aspect of the internal behavior of the drive controller. The drive controller state changes when:

- The command word, STW (Peercop word 1), sends a command.
- An event other than a command, such as an external fault, occurs.

The drive controller status is given by the status word, ZSW (Global Data word 1).
The drive controller states are described below.

Not Ready to Switch On (Initialization of communications)
The communication card is initializing, but the drive controller is not yet powered or is in the process of powering up. Drive funstion is disabled.

Switch On Disabled (Configuration of the drive controller)
The driver controller is powered up and has completed its initialization routine. Configuration and adjustment parameters can be modified at this time. Operation of the output voltage circuitry is locked out during this time.

Ready to Switch On and Switched On (Initialization and configuration of the drive controller is complete)
The drive controller is not delivering voltage to the output but is ready and waiting. Switching on enabled.

Operation Enabled (Ability to output voltage to the motor terminals)
The drive controller output voltage circuitry is functional. All run, stop, and auto-tuning functions are acknowledged. Adjustment parameters can be modified at any time. Configuration parameters can be changed only when the motor is stopped; and if a configuration parameter is changed, the drive controller returns to the Switch On disabled state.

Quick Stop Active (E-stop/rapid deceleration)
Activation of this stop mode causes the drive controller to decelerate the motor using the minimum deceleration ramp time. To restart the drive controller output, the controller must be returned to the Switch On disabled state. From this point, sequential transition commands can return the controller to the Operation enabled state.

Malfunction Reaction Active (Ability to determine what action to take when a fault occurs)
The drive controller detects a fault and reacts by performing an action that is appropriate (and perhaps pre-programmed, in certain cases) to the type of fault. Other drive functions are disabled during this time.

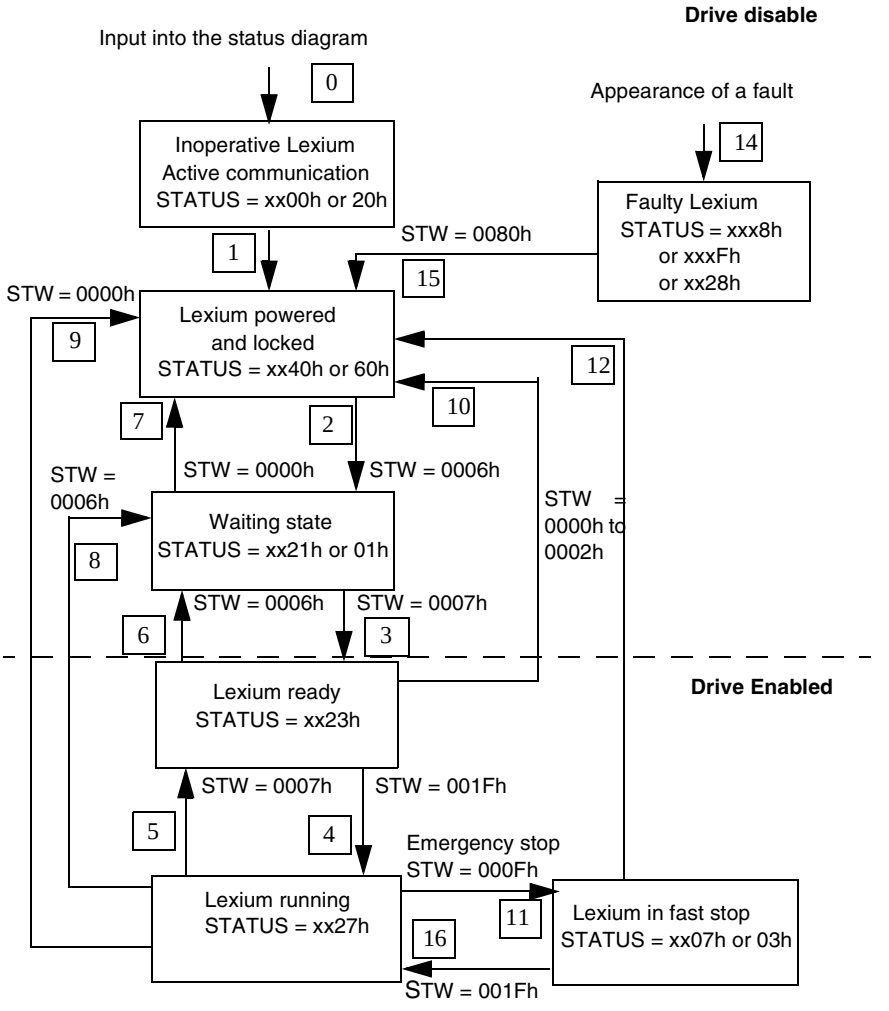
Malfunction (Drive controller in faulted state)
The drive controller has detected the occurrence of a fault that warrants disabling the drive functions. A fault reset command or the cycling of the main power is required to return the controller to the Switch On disabled state. From this point, sequential transition commands can return the controller to the Operation enabled state. For more information, refer to "Switch On Disabled (Configuration of the drive controller)".

Status Diagram/Instrument control for Lexium

Instrument control

The control of the instrument is described with the aid of a state machine. The state machine isdefined in the drive profile by a flow diagram for all operating modes. The following diagram shows the possible instrument states for the Lexium Drive (See *Status Diagram for the standard DRIVECOM, p. 74*).

Note: STATUS is the logical boolean AND of ZSW (Word 1 of Global Data) and 6F (hex). All STATUS and STW (Command word 1 of Peercop data) values are given in hexadecimal.



Note: STATUS = ZSW AND 16#006Fh

Instrument states

The following table describes the instruments states and the transitions :

Not ready for switch-on "**Inoperative Lexium**"	Lexium drive is not ready for switch-on. No operation readiness (Fault RA/RB) is signaled from the amplifier software.
Switch-on inhibited"**Lexium powered and locked**"	LEXIUM DRIVE is ready for switch-on. Parameters can be transferred, DC-link (DC-bus) can be switched on, motion functions cannot be carried out yet.
Ready for switch-on"**Waiting State**"	DC-link voltage must be applied. Parameters can be transferred, motion functions cannot be carried out yet.
Ready for operation"**Lexium Ready**"	DC-link voltage must be switched on. Parameters can be transferred, motion functions cannot be carried out yet. Output stage is switched on (enabled).
Operation enabled"**Lexium Running**"	No error present. Output stage is switched on, motion functions are enabled.
Fast stop activated"**Lexium in Fast Stop**"	Drive has been stopped, using the emergency stop ramp. Output stage is switched on (enabled), motion functions are enabled.
Error response active/ error"**Faulty Lexium**"	If an instrument error occurs, the LEXIUM DRIVE changes to the instrument state "Error response active". In this state, the power stage is switched off immediately. After this error response has taken place, it changes to the state "Error". This state can only be terminated by the bit-command "Error-reset".To do this, the cause of the error must have been removed (see ASCII command ERRCODE).

Transitions of the state machine

This table gives equivalent bit manipulation to the hexadecimal values listed in the state flow diagram above.

Transition 0	Event	Reset / 24V supply is switched on
	Action	Initialization started
Transition 1	Event	Initialization successfully completed, LEXIUM DRIVE switch-on inhibit
	Action	None
Transition 2	Event	Bit 1 (inhibit voltage) and Bit 2 (fast stop) are set in the control word(command: shutdown). DC-link voltage is present.
	Action	None
Transition 3	Event	Bit 0 (switch-on) is also set (command: switch-on)
	Action	Output stage is switched on (enabled). Drive has torque
Transition 4	Event	Bit 3 (operation enabled) is also set (command: operation enable)

	Action	Motion functions are enabled, depending on the operating mode that is set.
Transition 5	Event	Bit 3 is canceled (command: inhibit)
	Action	Motion functions are disabled.Drive is braked, using the relevant ramp (depends on operating mode).
Transition 6	Event	Bit 0 is canceled (ready for switch-on).
	Action	Output stage is switched off (disabled). Drive has no torque.
Transition 7	Event	Bit 1 or Bit 2 is canceled.
	Action	(Command: "Fast stop" or "Inhibit voltage")
Transition 8	Event	Bit 0 is canceled (operation enabled -> ready for switch-on)
	Action	Output stage is switched off (disabled) - motor loses torque.
Transition 9	Event	Bit 1 is canceled (operation enabled -> switch-on inhibited)
	Action	Output stage is switched off (disabled) - motor loses torque.
Transition 10	Event	Bit 1 or 2 are canceled (ready for operation -> switch-on inhibited)
	Action	Output stage is switched off (disabled) - motor loses torque.
Transition 11	Event	Bit 2 is canceled (operation enabled -> fast stop)
	Action	Drive is stopped, using the emergency ramp. The output stage remains enabled.Setpoints are canceled (e.g motion block number, digital setpoint).
Transition 12	Event	Bit 1 is canceled (fast stop -> switch-on inhibited)
	Action	Output stage is switched off (disabled) - motor loses torque.
Transition 13	Event	Error response active
	Action	Output stage is switched off (disabled) - motor loses torque.
Transition 14	Event	Error
	Action	None
Transition 15	Event	Bit 7 is set (error -> switch-on inhibited)
	Action	Acknowledge error (depending on error – with/without reset)
Transition 16	Event	Bit 2 is set (fast stop -> operation enabled)
	Action	Motion function is enabled again.

The state transitions are affected by internal events (e.g. switching off the DC-link voltage) and by flags in the control word (Bits 0, 1, 2, 3, 7).

DRIVECOM Command Word

Control word (STW)

With the aid of the control word, you can switch from one instrument state to another. In the diagram for the state machine you can see which instrument states can be reached by which transitions. The momentary instrument state can be taken from the STATUS word.
Several states may be passed through during a telegram cycle (e.g. Ready for switch on -> Ready for operation -> Operation enabled). The bits in the control word can be (operating-) **mode-dependent** or **mode-independent**.
The following table describes the bit definitions of the control word (STW).

Bit	DRIVECOM Standard Name	Application of the Lexium to the DRIVECOM standard
0	Switch on	Ready Status 0= not ready, 1 = ready
1	Inhibit voltage	-
2	Fast stop, switch-on inhibited	1 -> 0 drive brakes using emergency ramp(ASCII parameter DECSTOP), axis is disabled.
3	Operation enabled	Drive can be issued motion commands
4	Fast stop	1 -> 0 drive brakes using emergency ramp (ASCII parameter DECSTOP), axis remains enabled.
5	Depends on operating mode	Mode-dependent
6	Depends on operating mode	Mode-dependent
7	Reset Fault	Fault reset control
8	Start Jogging	mode-dependent
9	Reserved	-
10	Reserved	-
11	Start homing (edge)	mode-dependent
12	Manufacturer-specific	reset the position
13	Alarm acknowledgment Manufacturer-specific	acknowledge warnings, must set ASCII parameter CLRWARN = 1 to enable this feature
14	Manufacturer-specific	reserved
15	Manufacturer-specific	reserved

Depending on the bit combination in the control word, a corresponding control command is defined.
The following table shows the bit combinations and also determines the priorities of the individual bits, in case several bits are altered in one telegram cycle.

State after command is Given and typical Hex value for status word	Command in DRIVECOM	Bit 13	Bit 7	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Transition (see Status diagram)	Typical values of the command word
Waiting State STATUS = xx21 or xx01	Shutdown	X	X	X	X	1	1	0	2,6,8	16#0006
Lexium Ready STATUS = xx23	Switch-on	X	X	X	X	1	1	1	3	16#0007
Lexium powered and locked STATUS = xx40 or xx60	Inhibit voltage	X	X	X	X	X	0	X	7,9,10,12	16#0000
Lexium powered and locked STATUS = xx40 or xx60	Fast stop (disable)ESTOP	X	X	X	X	0	1	X	7,10,11, >12	16#0000
Lexium in Fast Stop STATUS = xx07 or xx03	Fast stop (enable)QUICK STOP	X	X	0	1	1	1	1	11	16#000F
Lexium Ready STATUS = xx23	Inhibit operation	X	X	X	0	1	1	1	5	16#0007
Lexium Running STATUS = xx27	Enable operation	X	X	1	1	1	1	1	4,16	16#001F
Lexium powered and locked STATUS = xx40 or xx60	Reset Fault	X	1	X	X	X	X	X	15	16#0080

Bits labeled with X are irrelevant.

Mode-dependent bits in the control word:

Mode	Bit 5	Bit 6	Bit 8	Bit 11
8: Position	1 > 0 - Pauses motion 0 > 1 – Resumes motion **For Motion Task**: Acc. and dec. ramps are defined by ASCII parameters O_ACC1 and O_DEC1. **For Homing/Jogging**: Acc. and dec. ramps are defined by ASCII parameters ACCR and DECR.	Start a motion task with every transition edge (toggle bit).	Start / stop jogging	Start homing
0: Digital speed	1 > 0 – Stop motion. Drive brakes, using the preset speed ramps. ASCII parameters ACC and DEC.	Set to 1 -Authorizes motion to preset speed in VCMD	Reserved	Reserved
2: Digital current	Reserved	Set to 1 -Authorizes motion to preset current in ICMD	Reserved	Reserved
1: Analog speed	Reserved	Reserved	Reserved	Reserved
3: Analog current	Reserved	Reserved	Reserved	Reserved
5: Position control via external network	Reserved	Start S_SETH	Reserved	Reserved

Priority of the Bits 6, 8, 11 in position-control mode: 6 (high), 11, 8 (low).

DRIVECOM Status word

Status word (ZSW)

With the aid of the status word, the instrument state can be represented and the transmitted control word can be verified. If an unexpected condition is reported, as the result of a transmitted control word, then first of all the boundary conditions for the expected instrument state must be clarified (e.g. enable of the output stage – hardware + software, application of the DC-link voltage).The bits in the status word can be **mode-dependent** or **mode-independent**.

The following table describes the bit definitions of the status word (ZSW).

Bit	DRIVECOM Standard Name	Applicatioon of the Lexium to the DRIVECOM standard
0	Ready to Switch on	Waiting state
1	Switched-on	Lexium ready
2	Operation enabled	Lexium running
3	Fault present	Faulty Lexium, see ASCII command ERRCODE
4	Voltage inhibited	-
5	Fast stop	-
6	Switch-on inhibit	-
7	Warning active	see ASCII command STATCODE
8	Following error	only in position-control mode Opmode 5
9	Remote/Local	not supported, fixed to 1
10	Setpoint reached	only in position modes 4 and 5:
11	Threshold reached	not supported at present
12	Reserved	Reserved
13	Mode-dependent	Reserved
14	Manufacturer-specific	Reserved
15	Manufacturer-specific	Reserved

Status word (ZSW) states:

State	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not ready for switch-on "Inoperative Lexium"	0	X	X	0	0	0	0
Switch-on inhibit "Lexium Powered and Locked"	1	X	X	0	0	0	0
Ready for switch-on "Waiting State"	0	1	X	0	0	0	1
Ready for operation "Lexium Ready"	0	1	X	0	1	1	1
Operation enabled "Lexium Running"	0	1	X	0	1	1	1
Error "Faulty Lexium"	0	X	X	1	0	0	0
Fast stop active "Lexium in Fast Stop"	0	0	X	0	1	1	1

Example of the Sequence of Transition Commands to recover from a Fault Condition

When a fault occurs, the status word is set to xxx8h or xxxFh. The fault must be cleared by setting the command word to a value of 0080h (toggle bit 7 0>1). The Lexium responds by clearing the fault (if possible) and setting the status to "Lexium Powered and Locked" with a status word value of xx40h or xx60h. To enter the "Waiting State" status, write 0006h to the command word. The status word now has a value of xx21h or xx01h. Next, enter the "Lexium Ready" state by writing 0007h to the command word. The status word now has a value of xx23h. The output stage is now enabled. Next, in order to command motion, write 001Fh to the command word. The drive will transition to the "Lexium Running" state with a status word value of xx27h. Motion functions are now enabled and depending on the operating mode that is set, the motor can be commanded to move.

Unilink Forced Local Mode

Unilink Forced Local Mode

When the axis is debugged, it is possible to switch to forced local mode in Unilink. Switching to local mode is done via the "Enable" command from Unilink. If this is done, Peer Cop data exchanges are stopped and all the commands in Unilink are accessible in the same way as they are in standalone operation.
Peer Cop exchanges are reestablished by issuing the "disable" command from Unilink.

Theoretical Performance

9

Theoretical Performance

Average Time Between 2 Updates of Data by a Network Station (Token Rotation Time)

Reference documents: Modicon Installation manual 890 USE 100 00.

Token Rotation Time:
TRT (in ms) = (2.08+0.016 * DMW) * DMP+(0.19+0.016 * GDW) * GDN+0.53 * N.

N = Number of network station,
DMP = Number of master using MSTR,
DMW = Average number of MSTR register word,
GDN = Number of station transmitting Global Data (and Peer Cop),
GDW = Average number of register word transmitted in Global Data.

Example in a configuration using a Premium station, a Quantum station and a Lexium drive:
Premium (9 Peer Cop) + Quantum (9 Peer Cop + MSTR (Get Network statistic)) + Lexium (18 Global Data).

TRT = (2.08 + negligible) * 1 + (0.19 + 0.016 * 18) * 3 + 0.53 * 3 = 5 ms approx. This corresponds to the value read by the MSTR request on the Quantum.

Lexium Scan Time

Peer Cop and Global Data Lexium scan time = 10 ms typically

Lexium response time for accessing messaging, drive parameters and drive commands varies in the order of a few ms to 500ms.
It depends on the parameter types (loop adjustment, configuration adjustment, motion task adjustment, etc.) and on the drive status (valid or locked).

Examples:

- Locked drive
  Reading proportional gain (PG) from position loop t = 4ms
  Writing proportional gain (PG) from position loop t = 326ms
- Confirmed drive
  Writing proportional gain (PG) from position loop t = 392ms
  Acceleration (ACC) in reading t = 4ms
  Acceleration (ACC) in reading t = 6ms
- Enable drive command t = 2ms

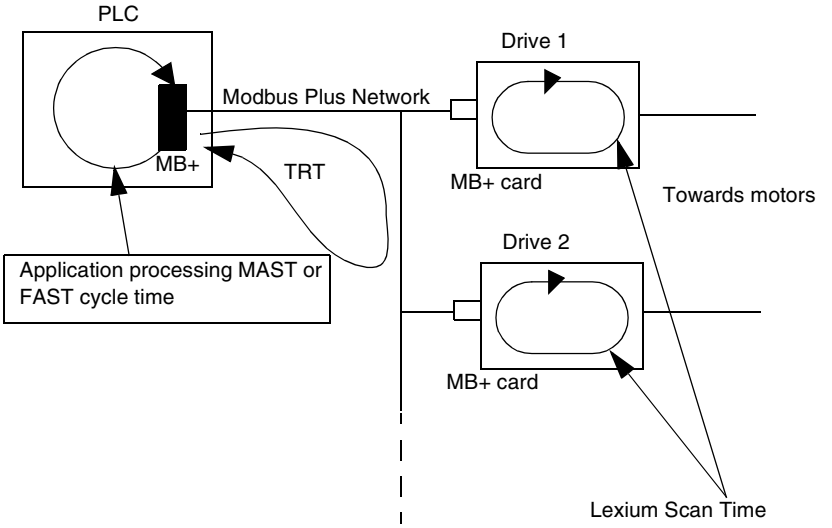
Average response time

Average RT for Global Data and Peer Cop = 1 * TRT + 1/2 equipment receptor scan time.

Average RT for Messaging = 1 * TRT + 1 caller equipment scan time + 1/2 target equipment scan.

Average Application Response Time

general diagram



Average application response time:
$RT_{Appavge} = 1.5T_{cyclePLC} + TRavge$

List of Lexium Variables: General

10

At a Glance

Aim of this Chapter

This chapter contains tables showing the variables, which can be accessed by the user via messaging.
This list is not exhaustive, see the ASCII Command on the Lexium motion tools CD.

What's in this Chapter?

This chapter contains the following topics:

General variables for Lexium: General

General

The following tables show the variables that can be accessed by the user via messaging.
The list is not exhaustive. For a complete list, consult the list of ASCII commands available on the Lexium Motion Tool CD-ROM (ref. AM0 CSW 001V350).
Formats:

- W: 16 bits word
- DW: Double Word (32 bits, least significant first)
- F: Float (32 bits with the value * 1000)
  Example: ASCII GP=0.15, the returned value will read 150.

General table of read/write variables

Variables accessible to the user

Drive memory address *	ASCII command	Description	Range	Default value	Format
001	ACC	Acceleration rate	1 to 32767.	10	DW
002	ACCR	Acceleration ramp (reference point, Jog)	1 to 32767.	10	DW
008	ANDB	Analog input signal dead band	0 to 10000.	0	DW (F)
017	AVZ1	Input 1 filter time constant	0.2 to 100.	1	DW (F)
034	DEC	Deceleration rate	1 to 32767.	10	DW
035	DECDIS	Deceleration in case of power outage	1 to 32767.	10	DW
036	DECR	Deceleration ramp (reference point, Jog)	1 to 32767.	10	DW
037	DECSTOP	Fast stop ramp	1 to 32767.	10	DW
050	ENCIN	Encoder input resolution	256, 512, 1024, 2048, ...65536	4096	DW
055	ENCZERO	Top zero offset	0 to 1023.	0	W
056	EXTMUL	External incremental return scale factor	0 to 32767.	256	W
062	GEARI	Number of teeth on gearing input	1 to 32767.	8192	W
064	GEARO	Number of teeth on gearing output	-32768 to 32767.	8192	W

Drive memory address *	ASCII command	Description	Range	Default value	Format
066	GP	Position loop: Proportional gain	0.01 to 25.	0.15	DW (F)
067	GPFBT	Position loop: control current for anticipation speed	0 to 2.0.	1	DW (F)
068	GPFFT	Position loop: Setpoint current or speed.	0 to 2.0.	1	DW (F)
069	GPFFV	Position loop: Anticipation speed.	0 to 2.0.	1	DW (F)
070	GPTN	Position loop: Integration action time	1 to 200.0.	50	DW (F)
071	GPV	Position loop: Control speed for Feed Forward	0.1 to 60.	3	DW (F)
072	GV	Speed loop: Proportional gain	0 to 200.0.	1	DW (F)
073	GVFBT	Speed loop: First integration return filter time constant	0 to 100.	0.4	DW (F)
074	GVFILT	Speed loop: proportion of filtering in [%] for GVT2	0 to 100.	85	W
075	GVFR	Speed loop: PI-Plus term	0 to 1	1	DW (F)
076	GVT2	Speed loop: 2nd time constant	0 to 1000	1	DW (F)
077	GVTN	Speed loop: I integration time	0.2 to 1000	10	DW (F)
090	I2TLIM	I2T message	0 to 100	80	W
092	ICONT	Nominal current	10% of DICONT to max (DICONT, IPEAK)	Min of DICONT and MICONT	DW (F)
099	IN1TRIG	Auxiliary trigger variable for IN1MODE	Long integer	0	DW
102	IN2TRIG	Auxiliary trigger variable for IN2MODE	Long integer	0	DW
105	IN3TRIG	Auxiliary trigger variable for IN3MODE	Long integer	0	DW

Drive memory address *	ASCII command	Description	Range	Default value	Format
108	IN4TRIG	Auxiliary trigger variable for In4MODE	Long integer	0	DW
110	IPEAK	Max application current	20% of DICONT to 2*DICONT	IMAX	DW (F)
111	IPEAKN	Max application current negative direction	20% of DICONT to 2*DICONT	IMAX	DW (F)
113	ISCALE1	Scale factor for analog current command 1	0 to 100	DIPEAK	DW (F)
114	ISCALE2	Scale factor for analog current command 2	0 to 100	DIPEAK	DW (F)
303	KTN	Integral action time for the current regulator	0.2 to 10	0.6	DW (F)
132	MAXTEMPE	Max. drive internal temperature	10 to 80	70	W
133	MAXTEMPH	Cut-out value of the radiator temperature	20 to 85	80	W
134	MAXTEMPM	Max. motor temperature.	0 to 6000	1000	DW (F)
142	MICONT	Nominal direct current	10% of DICONT,	DICONT	DW (F)
143	MIPEAK	Peak current limit for motor	20% of DICONT,	DIPEAK	DW (F)
149	MLGC	Adaptive gain of the current regulator (direct current)	0.2 to 1	0.7	DW (F)
150	MLGD	Gain of the axis D current regulator for the motor current	0.1 to 1	0.3	DW (F)
151	MLGP	Adaptive gain of the peak motor current	0.1 to 1	0.4	DW (F)
152	MLGQ	Gain of the axis Q current regulator for the motor current	0.01 to 30	1	DW (F)
156	MPHASE	Motor phase, Electrical offset (resolver adjustment)	0 to 360	0	W

Drive memory address *	ASCII command	Description	Range	Default value	Format
160	MRESBW	Resolver bandwidth	200 to 800	600	W
163	MSPEED	Max. speed limit for motor	0 to 12000	3000	DW (F)
165	MTANGLP	Current advance	0 to 45	0	W
347	MTMUX	Motion task loading	0,192.....255	0	W
167	MVANGLB	Advance depending on the rotation speed (Phi initial)	0 to 15000	2400	DW
168	MVANGLF	Advance depending on the rotation speed (Phi final)	0 to 45	20	W
146	MVANGLP	Velocity-related commutation angle	0 to 45	0	W
183	O_ACC1	Acceleration time 1 for MT 0	1 to 32000	0	W
184	O_ACC2	Acceleration time 2 for MT 0	1 to 32000	0	W
185	O_C	Command variable for MT 0	int (=word)	-	W
186	O_DEC1	Deceleration time 1 for MT 0	1 to 32000	0	W
187	O_DEC2	Deceleration time 2 for MT 0	1 to 32000	0	W
188	O_FN	Next order number for MT 0	0,1...180,192...255	0	W
189	O_FT	Next order delay for MT 0	1 to 32767	0	W
190	O_P	Target position for MT 0	Long integer	0	DW
191	O_V	Target speed for MT 0	Long integer	0	DW
176	O1TRIG	Auxiliary trigger variable for O1MODE	Long integer	0	DW
179	O2TRIG	Auxiliary trigger variable for O2MODE	Long integer	0	DW

Drive memory address *	ASCII command	Description	Range	Default value	Format
193	PBALMAX	Maximum ballast power	0-80 (3A); 0-200 (>3A); external 1500	80/200	DW
198	PEINPOS	Position error threshold for the in-position band (INPOS)	Long integer	4000	DW
199	PEMAX	Max. following error	Long integer	262144	DW
202	PGEARI	Numerator for the Motion Task resolution factor	Long integer	1	DW
203	PGEARO	Denominator for the Motion Task resolution factor	Long integer	1	DW
213	PTBASE	External trajectory time base	1 to 100	4	W
214	PTMIN	Minimum acceleration time for MT	1 to 32767	1	DW
216	PVMAX	Max. speed for the MT	0 to Long integer	100	DW
217	PVMAX	Max. speed for the MT (negative direction)	0 to Long integer	100	DW
226	REFIP	Application current in reference point on the mechanical limit	0 to IPEAK	IPEAK	DW (F)
231	ROFFS	Source offset	Long integer	0	DW
260	SWE1	Position value for Pos.Reg.1	Long integer	0	DW
262	SWE2	Position value for Pos.Reg.2	Long integer	0	DW
264	SWE3	Position value for Pos.Reg.3	Long integer	0	DW
266	SWE4	Position value for Pos.Reg.4	Long integer	0	DW

Drive memory address *	ASCII command	Description	Range	Default value	Format
278	UID	User ID	-32768 to 32767	0	W
305	UCOMP	No-return compensation	-231 to 231.	0	DW
284	VBUSMAX	Max. bus voltage	30 to 950	900	DW
285	VBUSMIN	Min. bus voltage	30 to 800	100	W
289	VJOG	Speed in Jog	0 to Long integer	0	DW
290	VLIM	System speed limit	0 to MSPEED	3000	DW (F)
291	VLIMN	System speed limit (negative direction)	0 to MSPEED	3000	DW (F)
295	VOSPD	Max. speed exceeded	0 to 1.2*MSPEED	3600	DW (F)
296	VREF	Homing speed	0 to Long integer	0	DW
297	VSCALE1	Scale factor on speed 1 input	0 to 12000	3000	W
298	VSCALE 2	Scale factor on speed 2 input	0 to 12000	3000	W

* See the ASCII command manual for the full list. The drive memory address is listed in the table under "object number" for the specific ASCII command. Remember to add 1 to the address when you use Modicon PLCs.

Read/Write logical Variables

Table of read/ write logical variables

Table of variables

Address	ASCII command	Description	Range	Default value	Format
003	ACTFAULT	Active fault mode	0=var. cut 1=deceleration	0	W
162	MSG	Messages acceptance/refusal	0=refusal 1=acceptance of error messages only 2=acceptance of all messages	0	W
180	OPMODE	Operation mode	0-5, 8	1	W
209	PRBASE	Bits by rev	16,20	20	W
211	PROMPT	RS232 protocol pre-selection	0=no prompt 1=prompt activated 2=echo char. and prompt activated 3=prompt and checksum activated	1	-
245	SPSET	Ramp authorization in Sine	0=not authorized 1=authorized	0	W
255	STOPMODE	Dynamic brake management mode	0=no braking 1=braking upon fault and/or var. cut	0	W

List of General Lexium Variables

Table of General Read Only Variables

Address	ASCII command	Description	Range	Default value	Format
009	ANIN1	Analog 1 input	-20000 to 20000	-	DW
010	ANIN2	Analog 2 input	-20000 to 20000	-	DW
039	DICONT	Nominal current of the drive	1.5 to 20	Hardware Defined	DW (F)
041	DIPEAK	Peak current drive	3.0 to 40	Hardware Defined	DW (F)
088	I	Real value of current	-	-	DW (F)
089	I2T	RMS average current	0 to 100	-	DW
093	ID	D component of the real value of the current	-	-	DW (F)
091	ICMD	Setpoint value of current	-2*DICONT to 2*DICONT	-	DW (F)
095	IMAX	Limit of current for motor and drive combination	0.3 to 40	Min of DIPEAK and MIPEAK	DW (F)
112	IQ	Q component of the real value of the current	-	-	DW (F)
136	MDBCNT	Number of motor data sets	1 to 127	-	W
154	MONITOR 1	Analog 1 output voltage	-10000 to 10000	-	W
155	MONITOR 2	Analog 2 output voltage	-10000 to 10000	-	W
192	PBAL	Real value of the ballast power	0 to 1500	-	DW
197	PE	Slave position error	Long int	-	DW
200	PFB	Current position checking	Long int	-	DW

Address	ASCII command	Description	Range	Default value	Format
210	PRD	Measured position counter hardware	0 to 1048575	-	DW
215	PV	Instantaneous speed of the position regulator	Long int	-	DW
272	TEMPE	Internal temperature	-20 to 90	-	DW
273	TEMPH	Real value of the radiator temperature	-20 to 90	-	DW
274	TEMPM	Motor temperature	0 to 10000	-	DW
280	V	Measured speed (rpm)	-15000 to 15000	-	DW
282	VBUS	Bus voltage	0 to 900	-	DW
286	VCMD	Speed setpoint	-	-	DW (F)
292	VMAX	Maximum system load	0 to 12000	-	DW (F)

List of Logical Variables and Status Registers

Table of read only logical variables

Table of variables

Address	ASCII command	Description	Range	Default value	Format
004	ACTIVE	Power stage activated / deactivated	0=deactivated 1=activated	-	W
006	AENA	Initialization stage of software validation	0=inactive 1=active	1	W
221	READY	Software validation status	0.1	-	W

Table of read only state registers

Table of registers

Address	ASCII command	Description	Range	Default value	Format
097	IN1	Status of hardware logical input 1	0 (low),1 (high)	-	W
100	IN2	Status of hardware logical input 2	0 (low),1 (high)	-	W
103	IN3	Status of hardware logical input 3	0 (low),1 (high)	-	W
106	IN4	Status of hardware logical input 4	0 (low),1 (high)	-	W
109	INPOS	Movement task completed in the window configured by PEINPOS	0=not in pos 1=in pos	-	W
174	O1	Status of hardware logical output 1	0 (low),1 (high)	-	W
177	O2	Status of hardware logical output 2	0 (low),1 (high)	-	W
181	OPTION	Option ID card	Int (=word)	-	W
251	STAT	Drive status word	Int (=word)	-	W

Read/Write Status Registers

Table of Read/ Write Status Registers

Table of registers

Address	ASCII command	Description	Range	Default value	Format
015	ANZERO1	Analog input zero 1 (ANOFF1)	-	-	W
016	ANZERO2	Analog input zero 2 (ANOFF2)	-	-	W
024	CLRFAULT	Clear/acknowledge drive error	-	-	W
306	COLDSTART	Reset drive	-	-	W
029	CONTINUE	Continue the previous position control order	-	-	W
043	DIS	Software deactivation	-	-	W
048	EN	Software activation	-	-	W
115	K	Stop (=Deactivate)	-	-	W
131	LOAD	Data loading from EProm to RAM	-	-	W
141	MH	Start reference point	-	-	W
145	MJOG	Start Jog	-	-	W
233	RSTVAR	Factory adjustment of variables	-	-	W
234	S	Movement stop and drive deactivation	-	-	W
235	SAVE	Saves variables in EProm from RAM	-	-	W
240	SETREF	Configure a reference point	-	-	W
241	SETROFFS	ROFFS automatic configuration	-	-	W
254	STOP	Stop movement task	-	-	W
322	MOVE	Stop movement task indicated Start command bit movement in the DRIVECOM word in PeerCop.	0,1 ...180,192...255	-	W

How to obtain Product ID

ModBus Plus address = 10000

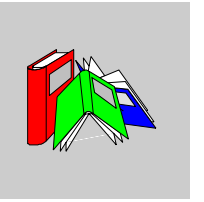
Register layout of data read back:

- Length of manufacturer name (14h)
- Manufacturer
- Length of model name (0Ah)
- Model name
- Reference name
- Software version
- Product
- Software Ref.No.

The response length is 46 bytes.
Reading a Premium station will preferably need to be done in access % MBxx with xx = 2* the address of the reception buffer %MWyy.

For example: buffer = %MW1150 or %MB2300
With a Quantum station using Concept issue a READ_REG block with a value of 10001 on the SLAVEREG pin, 23 (words) on the NO_REG pin and a 4x register of your choice on the REG_READ pin to store the return data.

Glossary



G

Global Data This is a database updated by each station on the network.

L

Lexium Schneider Automation speed drive product family.

M

Modbus Plus Communication protocol based on the logic token bus principle.

Modsoft Software factory associated to Quantum PLCs.

P

Peer Cop — A rapid and efficient means of being able to send the command data to a "slave" station.

Premium — Schneider Automation program PLC family.

Q

Quantum — Schneider Automation program PLC family.

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