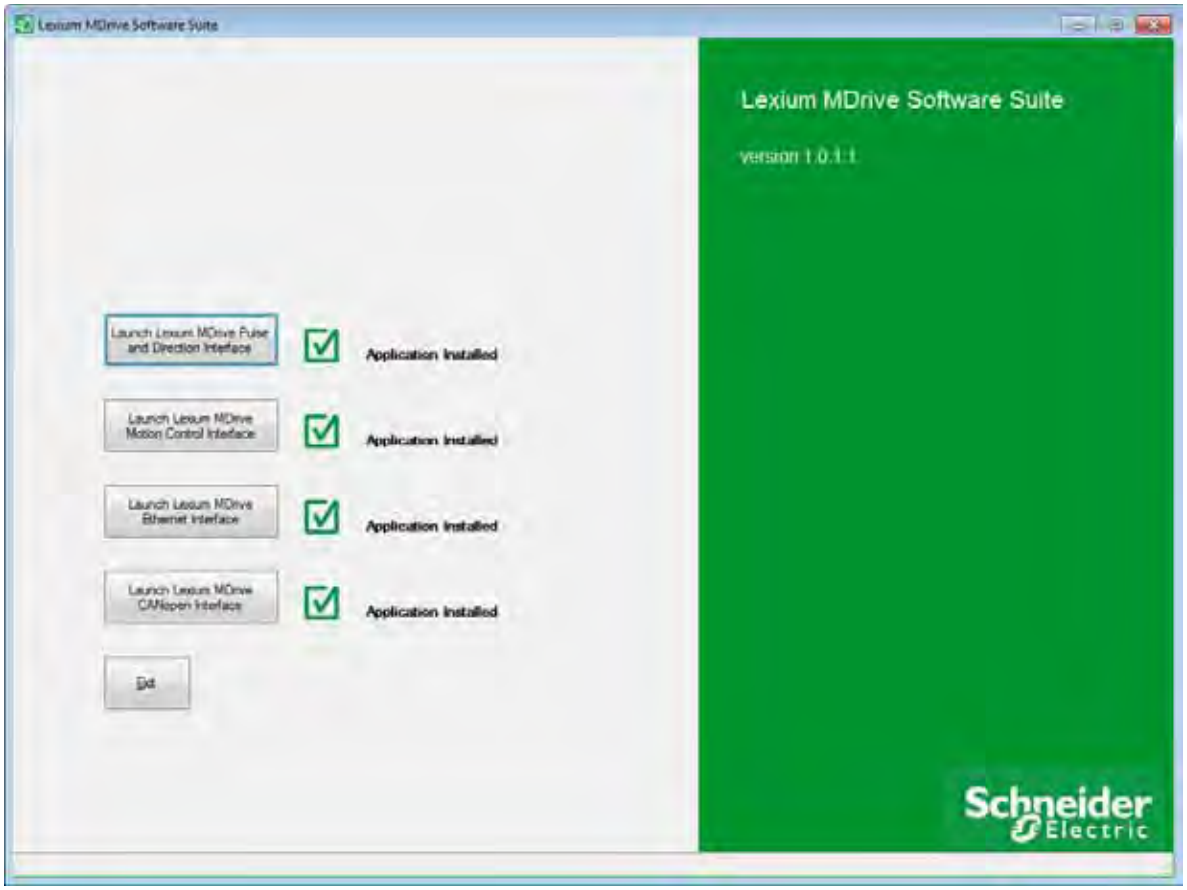
Lexium MDrive Software Suite

Programming and configuration utilities

Product manual

V1.00, 05.2015



Schneider Electric

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Lexium MDrive Software Suite Manual		
Date	**Revision**	**Changes**
02/20/2013	V1.00, 02.2013	Initial Release
08/15/2013	V1.00, 08.2013	Added support for Lexium MDrive TCP/IP and CANopen products
03/03/2014	V1.00, 03.2014	Added support for Encoder Remap Utility
04/29/2014	V1.00, 04.2014	Added support for LMD Software Suite 1.0.0.9, including Lexium MDrive Profinet.
08/14/2014	V1.00, 08.2014	Minor corrections and updates throughout.
02/04/2015	V1.00. 02.2015	Updated to reflect LMD Software Suite 1.0.1.1 release.
05/15/2015	V1.00. 05.2015	Updated to reflect LMD Software Suite 1.0.1.3 release.

Revision V1.00, 03.2014

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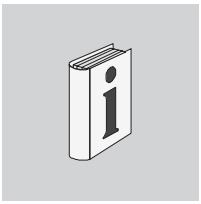
Writing conventions and symbols



Work steps

If work steps must be performed consecutively, this sequence of steps is represented as follows:

- ■ Special prerequisites for the following work steps
- ▶ Step 1
- ◁ Specific response to this work step
- ▶ Step 2

If a response to a work step is indicated, this allows you to verify that the work step has been performed correctly.

Unless otherwise stated, the individual steps must be performed in the specified sequence.

Bulleted lists

The items in bulleted lists are sorted alphanumerically or by priority. Bulleted lists are structured as follows:

- Item 1 of bulleted list
- Item 2 of bulleted list
  - Subitem for 2
  - Subitem for 2
- Item 3 of bulleted list

Making work easier

Information on making work easier is highlighted by this symbol:

Sections highlighted this way provide supplementary information on making work easier.

Parameters

Parameters are shown as follows

```
RC      Motor Run Current
```

Menu paths "⇨"

Action steps within the menu are described with complete menu path and the"⇨" symbol

e.g. "⇨ File ⇨ Save As..."

Units of measure

Measurements are given US units, metric values are given in SI units in parenthesis.

Examples:

1.00 in (25.4 mm)
100 oz-in (70 N-cm)

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1 Introduction

1

1.1 General features

The Lexium MDrive Software Suite is a software application for Windows® based PCs that facilitates the configuration, programming and diagnostics of Lexium MDrive products.

The Lexium MDrive Software Suite contains the following modules:

- Pulse/direction Configuration Utility
- Motion Control Programmer
- Ethernet Configuration Utility
- CANopen Configuration Utility

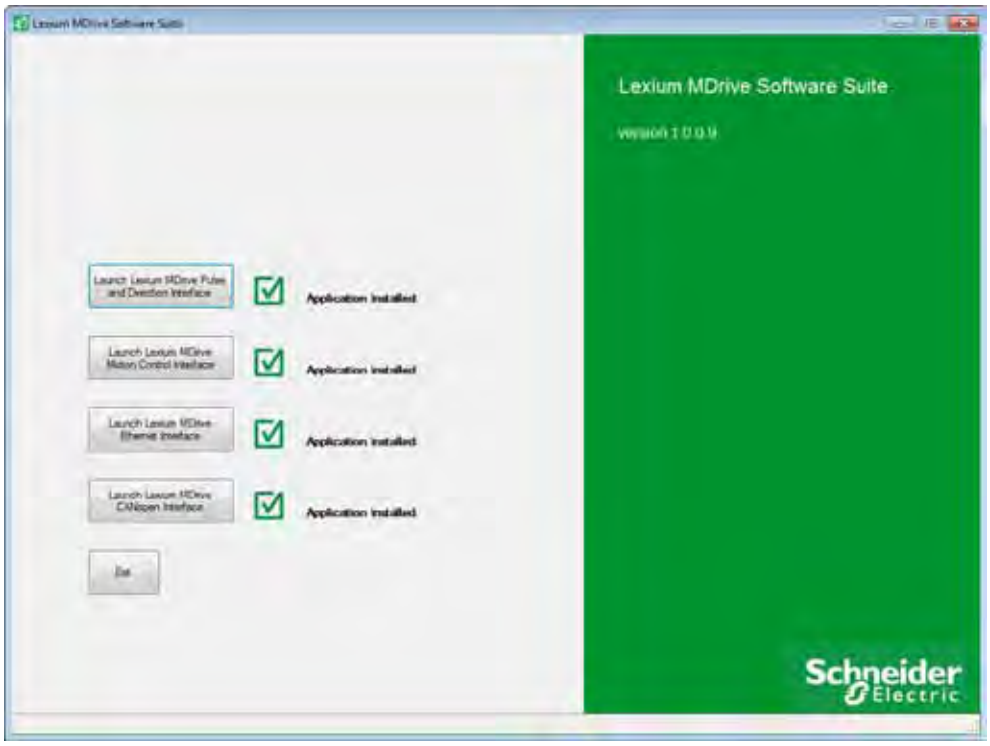

Figure 1.1: Lexium MDrive Software Suite

The main screen, or start page, of the Software Suite performs as an installer/launcher for the program modules

1.2 Pulse/direction configuration utility

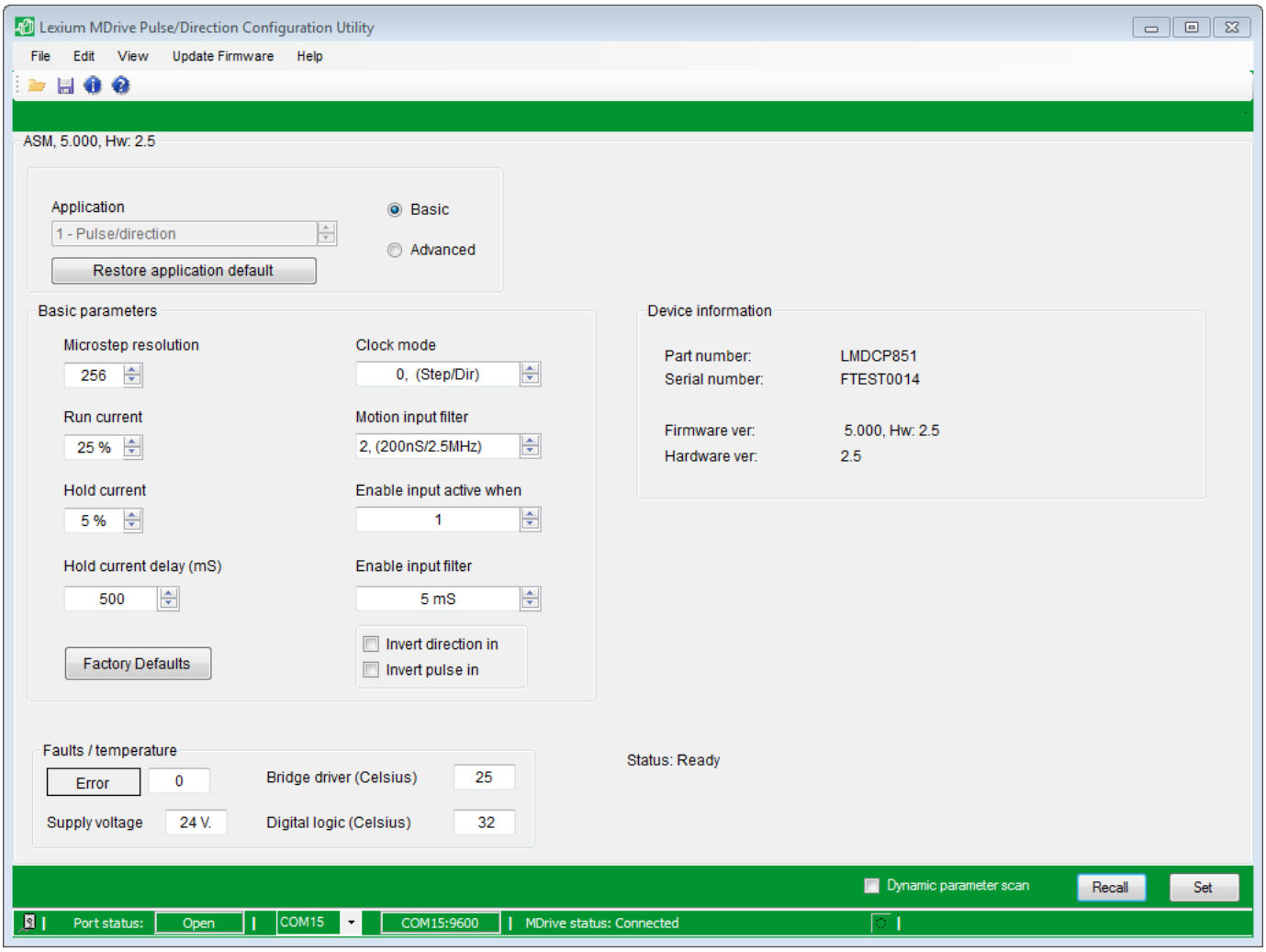

Figure 1.2: Pulse/direction configuration utility

1.2.1 Description and features

The Pulse/direction configuration utility is used to configure the parameters for the Lexium MDrive Pulse/direction models.

- Establish a connection to the device
- Set parameters for and set the following modes:
  - Step/direction mode
  - Torque mode (encoder equipped models only)
  - Speed control mode
  - Velocity mode

- Set the device parameters by functional grouping:
  - hMT settings (encoder equipped models only)
  - Analog input settings
  - Communication bus settings
  - I/O settings
  - Motion settings
- Display device status and version information
- Archive and duplicate device parameters
- Display error information
- Upgrade product application firmware

Note that this software is REQUIRED to perform an application firmware update

1.2.2 Supported devices

The software supports all models of the Lexium MDrive Pulse/direction.

See the device hardware manual for wiring and connection information.

The software and all associated product documents are available on the Internet at:

http://motion.schneider-electric.com/

You must be familiar with the Windows operating system to work with the Programming and configuration utilities.

1.2.3 MD-CC404-000 USB to RS-422 Converter

USB-pluggable converter to set/program communication parameters in 32- or 64-bit. Includes pre-wired DB9 mating cable.

Description	Part number
USB to RS-422/485 communication converter	MD-CC404-000

Figure 1.3 MD-CC404-000 USB to RS422/485 converter

1.3 Motion Control Programmer

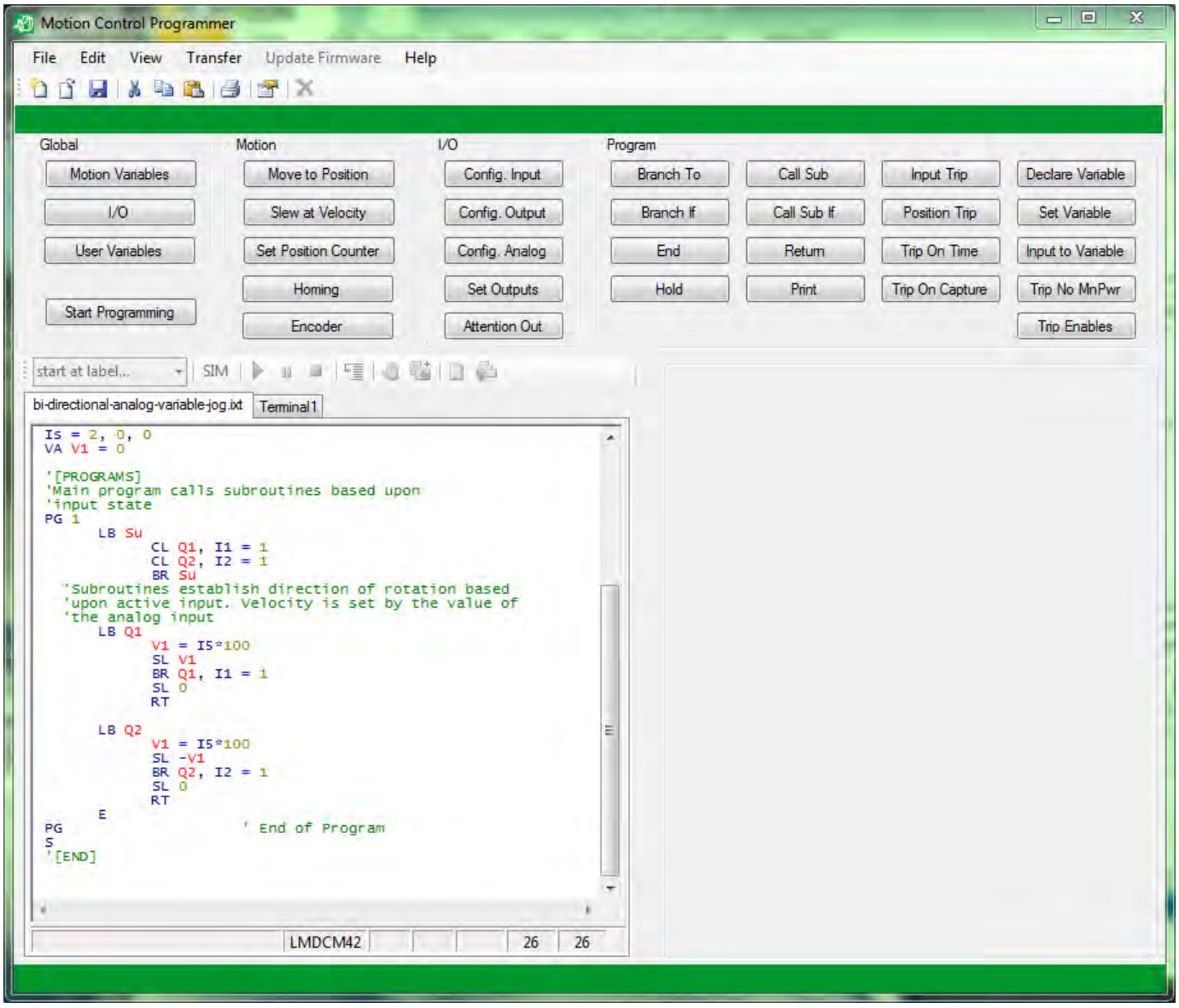

Figure 1.4: Motion Control Programmer

1.3.1 Description and features

The Motion Control programmer is a software interface used to write, simulate and transfer programs to and from the Lexium MDrive Motion Control products.

Program elements are created using buttons for specific functions and may be modified in color coded program editor tabs (multiple simultaneous tabs allowed). Real time streaming commands may be entered into an ASCII/ANSI terminal emulator tab. Multiple terminal tabs may be simultaneously connected to different Lexium MDrive Motion Control devices for system development.

Features include:

- Color coded program editor
- Multiple program editor tabs may be used simultaneously
- Display device status and version information
- Archive and duplicate device parameters
- Display error information
- Upgrade product application firmware

Note that this software is REQUIRED to perform an application firmware update

1.3.2 Supported devices

The software supports the following products:

- Lexium MDrive Motion Control (P/N: **LMD**x**M**xxx)
- Lexium MDrive TCP/IP products when used in MCode/TCP - or configuration (connected through port 503)
  - (P/N: **LMD**x**E**xxx)
  - (P/N: **LMD**x**N**xxx)

See the device hardware manual for wiring and connection information.

The software and all associated product documents are available on the Internet at:

http://motion.schneider-electric.com/

You must be familiar with the Windows operating system to work with the Programming and configuration utilities.

1.3.3 MD-CC404/405-000 USB to RS-422 Converter

USB-pluggable converters to set/program communication parameters in 32- or 64-bit. Includes pre-wired DB9 mating cable.

Description	Part number
USB to RS-422/485 (DB9 male to DB9 female)	MD-CC404-000
USB to RS-422/485 (DB9 male to M12 male)	MD-CC405-000

Figure 1.5: MD-CC404-000 USB to RS422/485 converter

1.4 Ethernet TCP/IP Configuration Utility

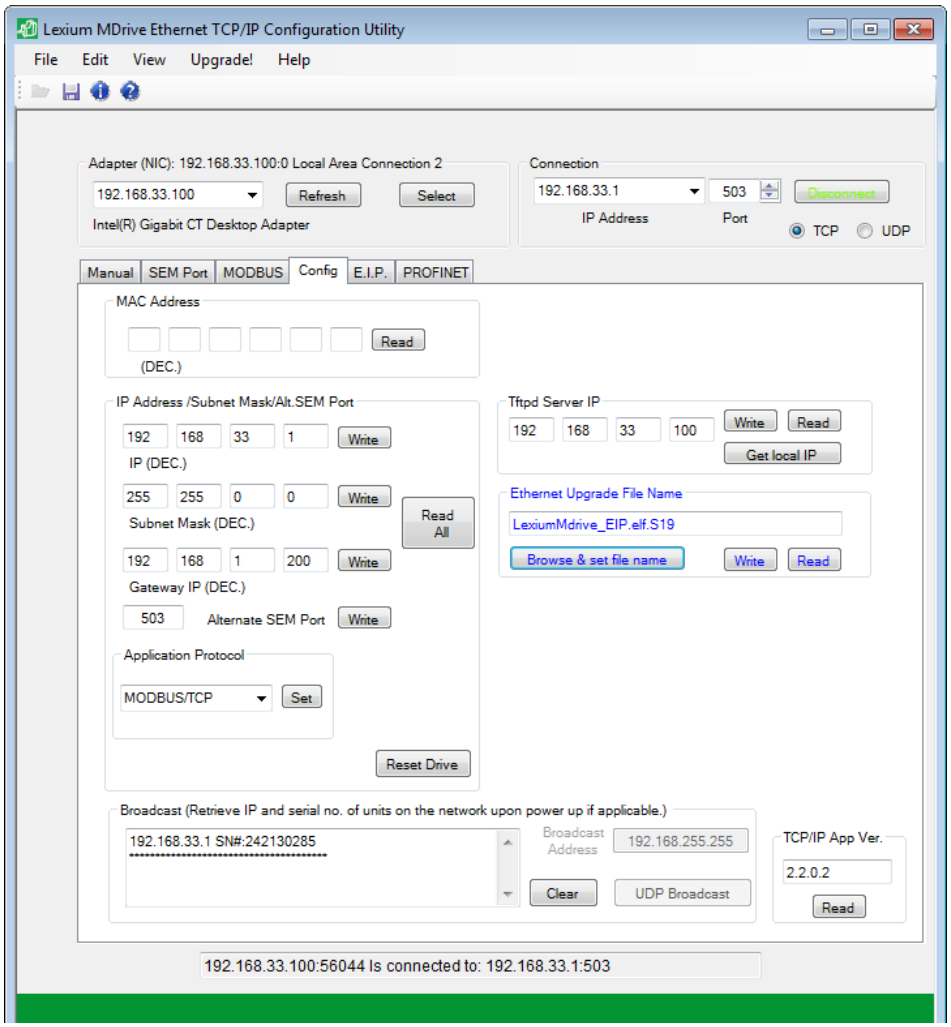

Figure 1.6: Ethernet Configuration Utility

1.4.1 Description and features

The Ethernet Configuration Utility is a software interface used to configure and perform functional testing on Lexium MDrive Ethernet TCP/IP products.

The primary configuration parameters are:

- Load desired application: MODBUS/TCP (default), EtherNet/IP or Profinet IO
- Set the device IP address
- Set the Subnet mask and gateway address.

Features include:

- Functional Test for MODBUS/TCP
- User-defined mapping of the EtherNet/IP assembly object
- User-defined mapping of the Profinet IO Input and Output slots
- Upgrade Ethernet application firmware
-

Note that this software is REQUIRED to configure the addressing of the device and perform an application firmware update!

1.4.2 Supported devices

The software supports the following products:

- Lexium MDrive Ethernet (P/N: **LMD**x**E**xxx)
- Lexium MDrive Profinet IO (P/N: **LMD**x**N**xxx)

See the device hardware manual for wiring and connection information.

The software and all associated product documents are available on the Internet at:

http://motion.schneider-electric.com/

You must be familiar with the Windows operating system to work with the Programming and configuration utilities.

1.5 CANopen Configuration Utility

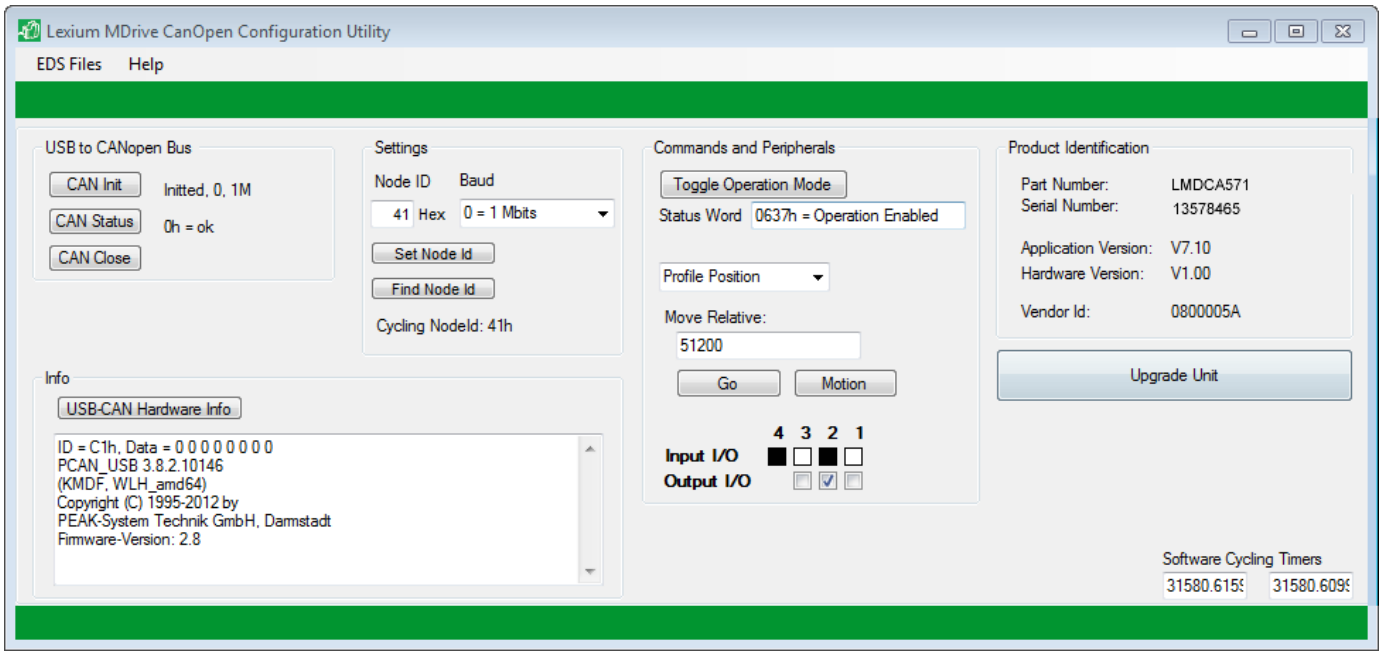

Figure 1.7: CANopen Configuration Utility

1.5.1 Description and features

The CANopen Configuration Utility is a software interface used to configure and perform functional testing on Lexium MDrive CANopen products.

The primary configuration parameters are:

- Node ID (Default 41h)
- BAUD rate (Default 1 Mbps)

Features include:

- Functional test motion in Profile position and profile velocity
- Functional test read inputs
- Functional test write outputs
- Read device information
- Upgrade application firmware

Note that this software and related USB to CANopen adapter are REQUIRED to perform an application firmware update

1.5.2 Supported devices

The software supports the following products:

- Lexium MDrive CANopen (P/N: **LMD**x**A**xxx)

See the device hardware manual for wiring and connection information.

The software and all associated product documents are available on the Internet at:

http://motion.schneider-electric.com/

You must be familiar with the Windows operating system to work with the Programming and configuration utilities.

1.5.3 MD-CC501/502-000 USB to CANopen Converter

The CANopen Configuration Utility ONLY works with the MD-CC500-000 USB to CANopen converter or an equivalent PEAK/Phytec CANopen adapter.

Description	Part number
USB to CANopen (DB9 male to DB9 female)	MD-CC501-000
USB to CANopen (DB9 male to M12 female)	MD-CC502-000

Figure 1.8: MD-CC501-000 USB to CANopen adapter kit

The adapter kit includes the USB to CANopen converter, a 6’ adapter cable and a termination resistor block.

See Section 7 For installation instructions.

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2 Before you begin - safety information

2

The information provided in this manual supplements the product manual. Carefully read the product manual before using the product.

2.1 Qualification of personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used.

All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

2.2 Intended use

The functions described in this manual are only intended for use with the basic product; you must read and understand the appropriate product manual.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented.

Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design).

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted is prohibited and can result in hazards.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

The product must NEVER be operated in explosive atmospheres (hazardous locations, Ex areas).

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2.3 Hazard categories

Safety instructions to the user are highlighted by safety alert symbols in the manual. In addition, labels with symbols and/or instructions are attached to the product that alert you to potential hazards.

Depending on the seriousness of the hazard, the safety instructions are divided into 4 hazard categories.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION

CAUTION used without the safety alert symbol, is used to address practices not related to personal injury (e.g. **can result** in equipment damage).

2.4 Basic information

⚠ DANGER

UNINTENDED CONSEQUENCES OF EQUIPMENT OPERATION

When the system is started, the drives are usually out of the operator's view and cannot be visually monitored.

- Only start the system if there are no persons in the hazardous area.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical functions.
- System control paths may include communication links. Consideration must be given to the implication of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines. 1)
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death or serious injury.

1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems".

2.5 Standards and terminology

Technical terms, terminology and the corresponding descriptions in this manual are intended to use the terms or definitions of the pertinent standards.

In the area of drive systems, this includes, but is not limited to, terms such as “safety function”, “safe state”, “fault”, “fault reset”, “failure”, “error”, “error message”, “warning”, “warning message”, etc.

Among others, these standards include:

- IEC 61800 series: “Adjustable speed electrical power drive systems”
- IEC 61158 series: “Industrial communication networks - Fieldbus specifications”
- IEC 61784 series: “Industrial communication networks - Profiles”
- IEC 61508 series: “Functional safety of electrical/electronic/ programmable electronic safety-related systems”

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3 Installation

3

Source Programming and configuration utilities

The latest version of the Programming and configuration utilities is available for download from the internet:

http://motion.schneider-electric.com

Use of this software is required to define the functionality of the device.

3.1 PC requirements

System requirements

The minimum hardware requirements for installation and operation of the software are:

- IBM compatible PC
- Windows XP Service pack 3 or more recent
- Monitor with minimum 1024 x 768 resolution
- Free USB port
- Internet connection (for software download and updates)

Recommended accessories

See Table 3.1.

Interface connector	Fieldbus	PC interface	Communication interface kit part number
DB9M	RS-422/485	USB	MD-CC404-001
M12F 5-pos A-coded	RS-422/485	USB	MD-CC405-001
DB9M	CANopen	USB	MD-CC501-001
M12M 5-pos A-coded	CANopen	USB	MD-CC502-001
RJ45	Ethernet	RJ45	Standard CAT5 cable - source locally
M12M 4-pos D-coded	Ethernet	RJ45	MD-CS640-000

Table 3.1 Communication interface kits

3.2 Installation procedure

We recommend backing up important data regularly and always before installing new software.

- ▶ Verify the PC meets the requirements.
- ▶ Connect to the internet and download the “Lexium MDrive Software Suite installation file from http://motion.schneider-electric.com/
- ▶ Unzip the file to a location on you hard drive.
- ▶ Start the installation via the file “setup.exe”
- ◁ The following dialog box is displayed:

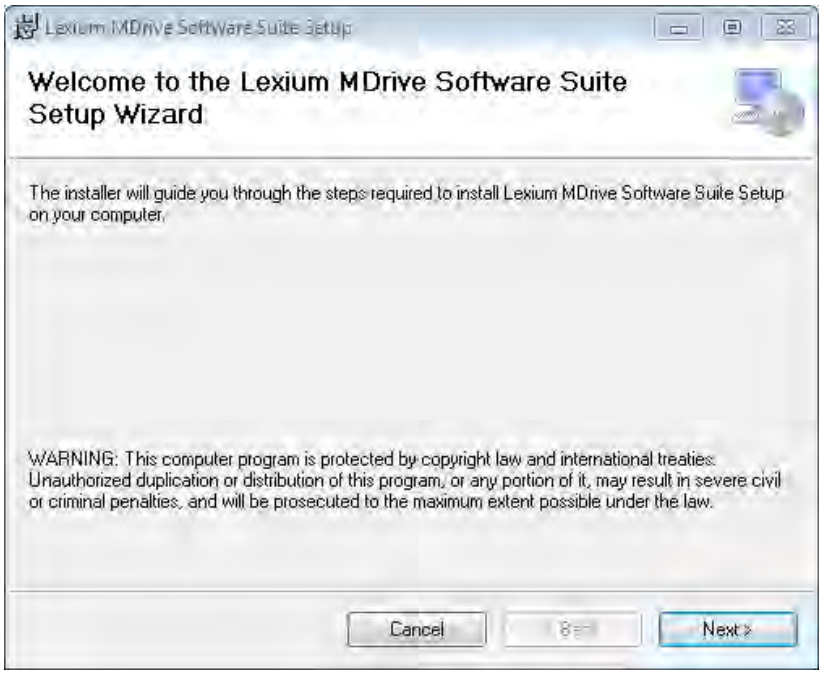

Figure 3.1: Setup wizard

▶ Click the button labeled “Next”

◁ The following dialog box is displayed:

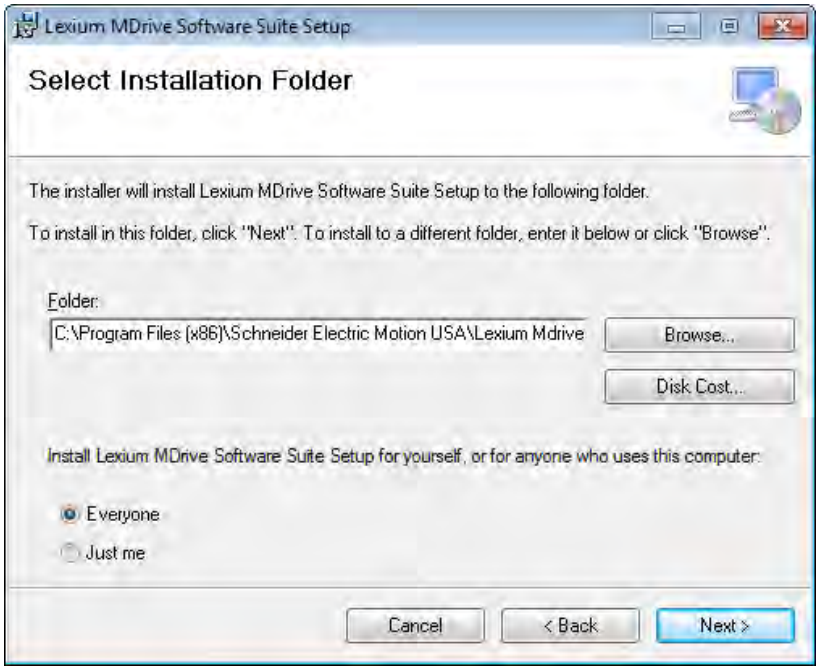

Figure 3.2: Select installation folder

▶ Click the button labeled “Next”

▶ Step through the remaining installation steps

▶ To launch the software, select Lexium MDrive Software Suite from the start menu or launch using the desktop icon

▶ Install the Application relevant to the device type you are using by clicking the appropriate install button on the main screen of the Software suite.

The install button will become the launch shortcut when the application is installed. (See Figure 3.3)

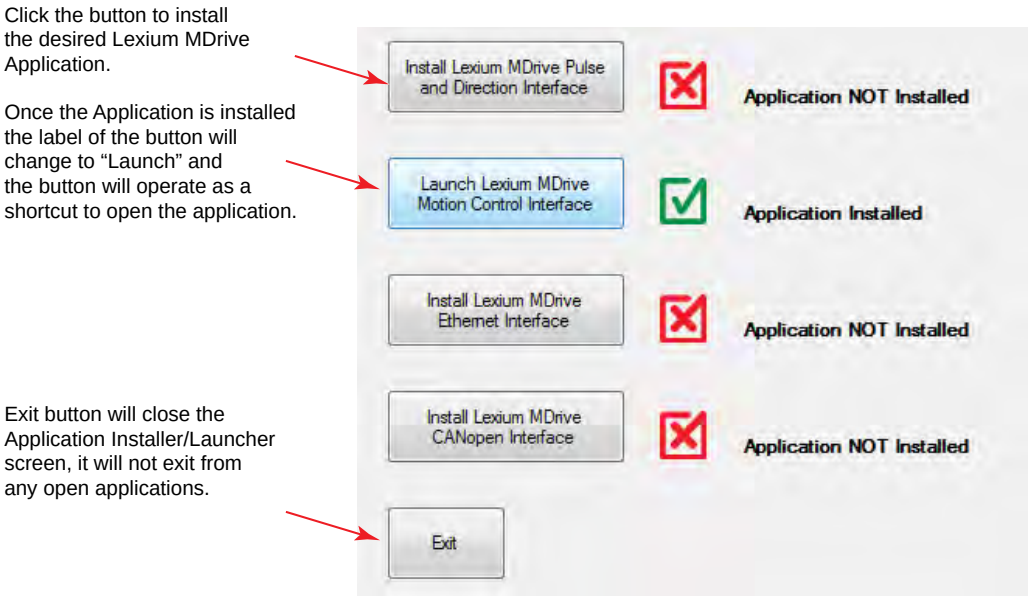

Figure 3.3: Install - Launch Buttons

▶ Refer to the section of this document relating to your Lexium MDrive model for usage instructions on the application appropriate to your device.

◁ Pulse/direction: Section 4

◁ Motion Control: Section 5

◁ Ethernet: Section 6

◁ CANopen: Section 7 (Product not currently available.)

4 Pulse/direction configuration utilty

4

⚠WARNING

LOSS OF CONTROL

The product is unable to detect an interruption of the network link.

- Verify that connection monitoring is on.
- The shorter the time for monitoring, the faster the detection of the interruption.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠WARNING

UNINTENDED OPERATION

The product is unable to detect an interruption of the network link.

- Do not write values to reserved parameters.
- Do not write values to parameters unless you fully understand the function.
- Run initial tests without coupled loads.
- Verify that the system is free and ready for the movement before changing parameters.
- Verify the use of the word sequence with fieldbus communication.
- Do not establish a fieldbus connection unless you have fully understood the communication principles.

Failure to follow these instructions can result in death, serious injury or equipment damage.

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4.1 Installation

The Pulse/direction configuration utility is installed via the Lexium MDrive Software Suite startup window.

This section assumes the Software Suite has been installed and is ready to use. If this has not been accomplished please follow the instructions in Section 3 of this document.

4.1.1 Install the Pulse/direction module

- ▶ Launch the Lexium MDrive Software Suite
- ▶ On the left pane of the start-up screen, click the button marked “Install Lexium MDrive Pulse and Direction Interface.”
  - ◁ The following installation wizard dialog will appear:

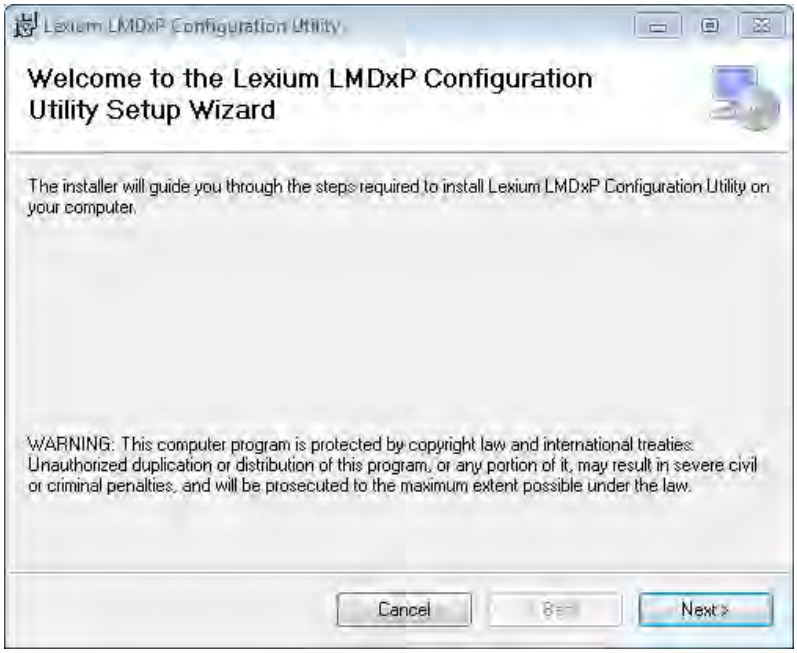


Figure 4.1: Pulse/direction utility install

- ▶ Follow the prompts to complete the installation
  - ◁ The button on the start-up screen will now be labeled

    “Launch Lexium MDrive Pulse and Direction Interface”.

4.2 Connect to the Lexium MDrive Pulse/direction unit

In order to be used the Pulse/direction Configuration Utilty requires an active connection to a Pulse/direction product via the RS-422/485 bus

Ensure that the recommended Communication Interface Kit or equivalent is installed and functioning.

Communication status bar

Figure 4.2: Communication status bar

The communication status/properties bar indicates and gives access to the COM port status and settings. The status bar will be the same for Basic or Advanced modes.

(A) Connected/disconnected indicator

(B) Port status: gives indication that the Port specified in (C) is closed or open. Clicking this will change the state if available. NOTE: This indicates whether or not the COM port is open or closed. It does not indicated communications with the device is active.

(C) Communication port selector

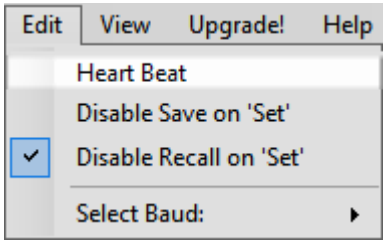
(D) COM port: BAUD rate. Shows the selected port and BAUD rate set.

(E) MDrive connection status. Displays the connection status of the Lexium MDrive product.

Connection procedure

Use the diagram in Figure 4.2 as a reference for the following process.

- ▶ Verify all cabling is securely connected to the Lexium MDrive. (See hardware manual)
- ▶ Verify that the communications converter is connected and working.
- ▶ Apply power to the Lexium MDrive
- ▶ Select the COM port used from the COM Port selector (C) on the status bar.
- ▶ Click (B) [Closed] on the port status field of the Status Bar.
  - ◁ Indicator should change to open.
  - ◁ MDrive status (E) should change to N/A
- ▶ From the Menu select ⇨Edit ⇨Heart Beat



- ◁ MDrive status (E) should change to Connected.

4.3 Basic mode

The Pulse/direction configuration utility has the ability to run in basic or advanced operational modes.

The main differences between the two modes of operation are in the available parameters and functions. The Basic settings will only display the parameters needed for basic functionality in Pulse/direction mode, where the device speed and direction will be based upon the input signal seen on the hardware inputs.

The utility will launch in basic mode on initial startup. Communications may be established, advanced modes selected and parameters set at that time.

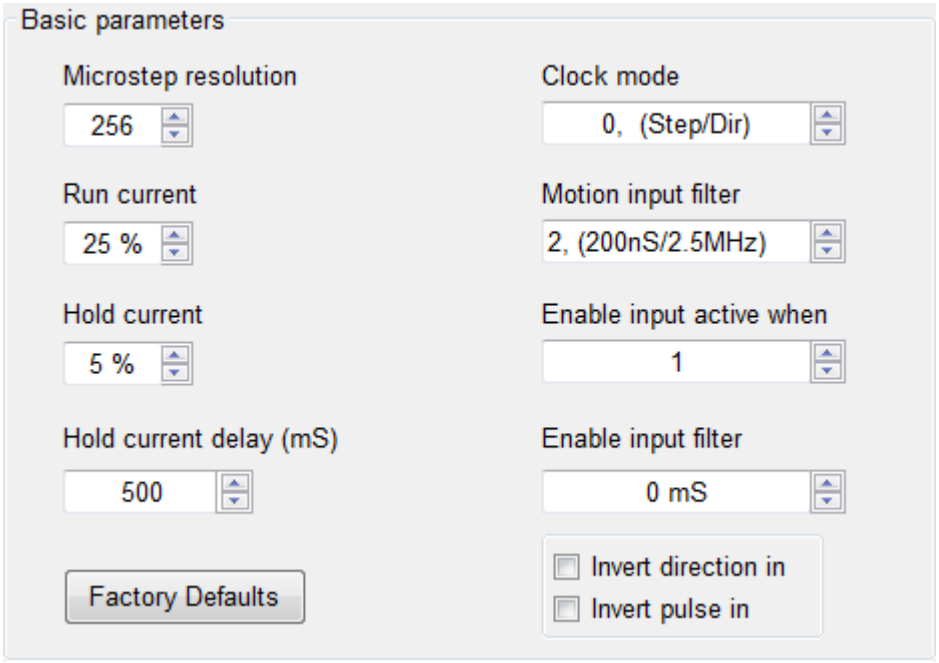


Figure 4.3: Basic parameters for pulse-direction mode

4.3.1 Basic parameters

<table>
<tr><th>Name</th><th>ASCII</th><th>Description / Value</th><th>Range</th><th>Default</th></tr>
<tr><td>Microstep Resolution</td><td>MS</td><td>Sets the microstep resolution in microsteps/fullstep.
Binary
<table>
<tr><th>microsteps/step</th><th>steps/revolution</th></tr>
<tr><td>1</td><td>200</td></tr>
<tr><td>2</td><td>400</td></tr>
<tr><td>4</td><td>800</td></tr>
<tr><td>8</td><td>1600</td></tr>
<tr><td>16</td><td>3200</td></tr>
<tr><td>32</td><td>6400</td></tr>
<tr><td>64</td><td>12800</td></tr>
<tr><td>128</td><td>25600</td></tr>
<tr><td>256</td><td>51200</td></tr>
<tr><td colspan="2">Additional resolution settings</td></tr>
<tr><td>180</td><td>36000 (0.01°/µstep)</td></tr>
<tr><td>108</td><td>21600 (1 arc-min/µstep)</td></tr>
<tr><td>127</td><td>25400 (0.001 mm/µstep)</td></tr>
</table>
Decimal
<table>
<tr><th>microsteps/step</th><th>steps/revolution</th></tr>
<tr><td>5</td><td>1000</td></tr>
<tr><td>10</td><td>2000</td></tr>
<tr><td>25</td><td>5000</td></tr>
<tr><td>50</td><td>10000</td></tr>
<tr><td>100</td><td>20000</td></tr>
<tr><td>125</td><td>25000</td></tr>
<tr><td>200</td><td>40000</td></tr>
<tr><td>250</td><td>50000</td></tr>
</table></td><td>See table below</td><td>256</td></tr>
<tr><td>Run current</td><td>RC</td><td>Motor running current in percent.</td><td>1 ... 100</td><td>25</td></tr>
<tr><td>Hold current</td><td>HC</td><td>Motor holding (reduction) current in percent.</td><td>0 ... 100</td><td>5</td></tr>
<tr><td>Hold current delay time</td><td>HT</td><td>Represents the time delay in milliseconds between the last motion input and the shift to the commanded holding current.</td><td>0 ... 65000</td><td>500</td></tr>
<tr><td>Clock mode</td><td>CM</td><td>Sets the clock input mode to pulse/direction, quadrature or CW/CCW inputs.
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>Step/direction mode</td></tr>
<tr><td>1</td><td>Quadrature or A/B mode</td></tr>
<tr><td>2</td><td>CW/CCW or up/down mode</td></tr>
</table></td><td>0 ... 2</td><td>0</td></tr>
<tr><td>Filter motion input</td><td>FM</td><td>Sets the filtering for the pulse/direction inputs.
<table>
<tr><th>Value</th><th>Meaning</th><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>50 ns/10 MHz</td><td>5</td><td>900 ns/555 kHz</td></tr>
<tr><td>1</td><td>150 ns/3.3 MHz</td><td>6</td><td>1.7 µs/294 kHz</td></tr>
<tr><td>2</td><td>200 ns/2.5 MHz</td><td>7</td><td>3.3 µs/151 kHz</td></tr>
<tr><td>3</td><td>300 ns/1.67 MHz</td><td>8</td><td>6.5 µs/76.9 kHz</td></tr>
<tr><td>4</td><td>500 ns/1.0 MHz</td><td>9</td><td>12.9 µs/37.8 kHz</td></tr>
</table></td><td>0 ... 9</td><td>2</td></tr>
<tr><td>Enable active</td><td>EA</td><td>Sets the active logic state of the enable input.
<table>
<tr><th>Value</th><th>Meaning</th></tr>
<tr><td>0</td><td>Input is active when logic LOW</td></tr>
<tr><td>1</td><td>Input is active when logic HIGH</td></tr>
</table></td><td>0/1</td><td>0</td></tr>
</table>

Enable input filter	FE	Filter enable input in milliseconds	0 ... 255	0

Value	Meaning
0	No filtering of input
1 - 255	Input filter time in milliseconds

Using the controls, set the parameters to the values required by your application.

Click the “Set button to store the settings in the Lexium MDrive memory.

The “Recall button will retrieve the previously stored settings.

4.4 Advanced mode

CAUTION

MULTI-MODE OPERATION

This device will operate differently in each mode of operation. It is critical that all documentation be read completely. A clear understanding of how the device is to be employed be present before attempting to install or commission the device.

Failure to follow these instructions can result in equipment damage.

4.4.1 Applications

Advanced mode allows for the selection of the different operating applications of the device which are:

- Pulse/direction (P)
- Speed control (S)
- Torque mode (T)
- Velocity control (V)
- The mode may be selected

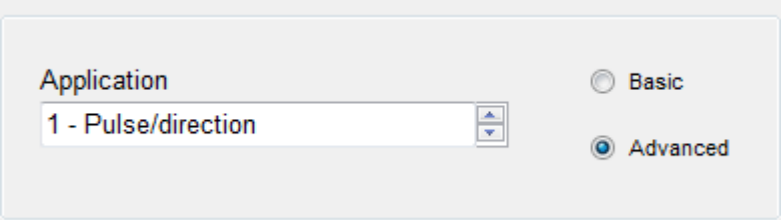


Figure 4.4: Application selector

Note that available parameters will vary between applications

Parameterization methods

This Section covers parameterization using the Hybrid Configuration Utility.

The parameters may be set/changed using an ANSI Terminal emulator program and two character mnemonic commands representing the parameter followed by a value.

Application specific parameters

Some parameters are application specific. When using the software unavailable parameters will be disabled or invisible on the software screens.

Organization of this Section

The parameter details of this section are organized by application. Parameter descriptions that are common to multiple applications are repeated as the defaults may change between applications.

All screen captures show the factory defaults and available parameters for that specific mode.

Use the Subsection appropriate to the used application for setup details.

4.4.2 HMT Setup/ Status (Encoder equipped products only)

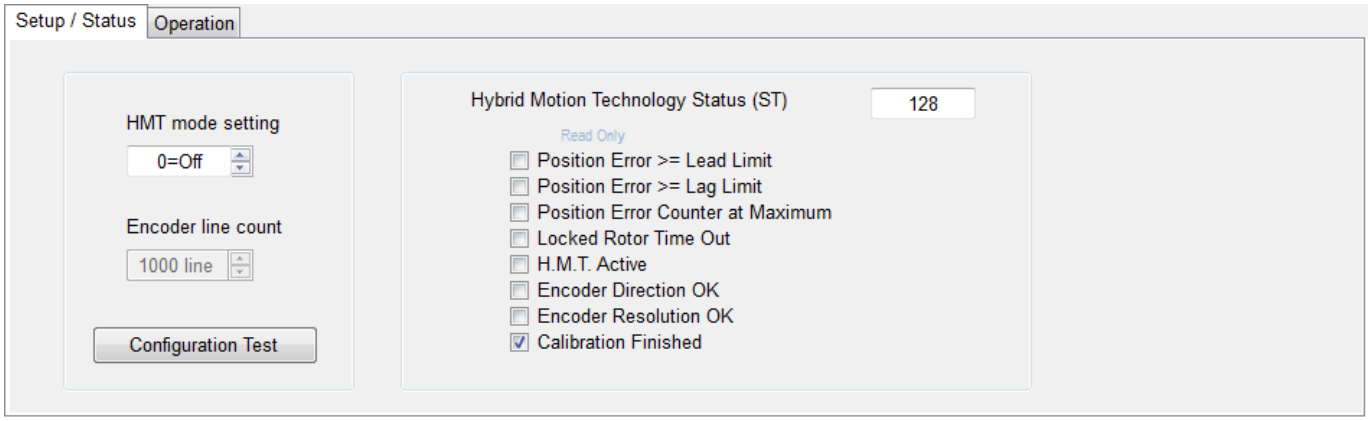


Figure 4.5: HMT settings

NOTE: HMT is only available on Lexium MDrive Pulse/direction units with an internal encoder. These tabs will not be visible on units without an encoder.

Name	ASCII	Description / Value	Range	Default	Mode Availability			
					P	S	T	V
HMT mode setting	AS	HMT mode defines the enable/disable state of the HMT and the current mode.	0 ... 3	0	X	X		X
				3			X	

Value	Meaning
0	HMT disabled, anti-stall and encoder functions unavailable
1	HMT enabled, current control at fixed run (RC) and hold (HC) current settings as set on Motion Settings Tab.
2	HMT enabled, current control varies as needed to perform move
3	HMT enabled in torque mode. Note AS=3 is the only available mode when in torque control mode.

Hybrid Motion Technology Status

Read-only fields display the status of the HMT block. Active conditions will display as checked, and as a BCD integer in the text field on the upper right.

4.4.3 HMT operation (Encoder equipped products only)

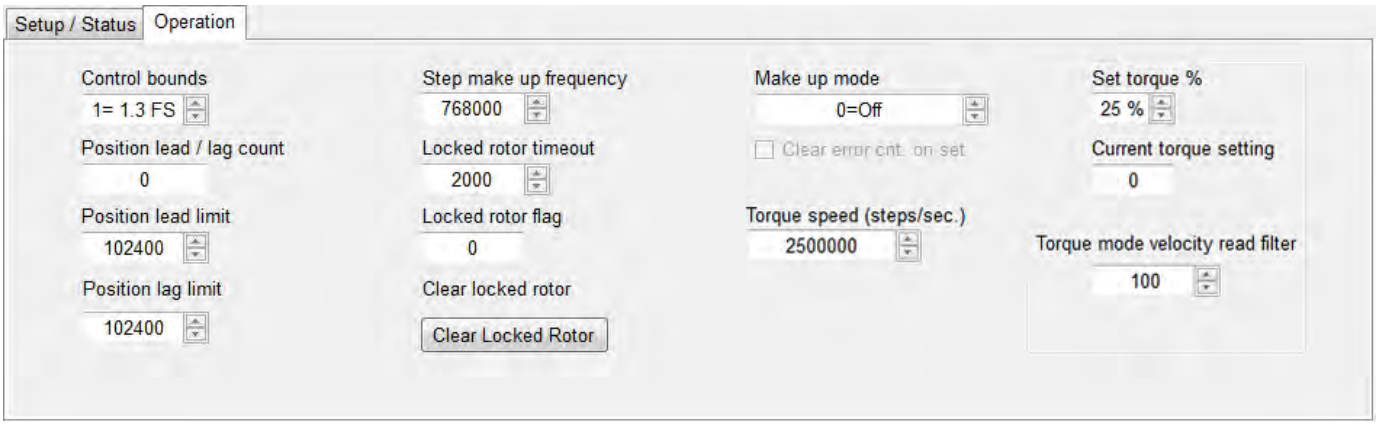


Figure 4.6: HMT operation

Name	ASCII	Description / Value	Range	Default	Mode Availability			
					P	S	T	V
Control bounds	CB	Control bounds defines the limits in which HMT will maintain the rotor-stator relationship in full motor steps to eliminate a stall.	0 ... 3	1	X	X	X	X
Position Lead/lag counter	LL	Read-only field displays the position lead/lag step count. To clear, select a value for MU, check “Clear Error Cnt.” Click set, then click Recall. The count will be zero. Calibrating will also reset the count.			X	X	X	X
Position lead limit	LD	Sets the position lead limit in counts at which position a locked rotor condition will assert.	31-bits	102400	X	X	X	X
Position lag limit	LG	Sets the position lag limit in counts at which position a locked rotor condition will assert.	31-bits	102400	X	X	X	X
Step make up frequency	MF	Make up frequency sets the velocity during position make up when make up mode MU=1.	367 ... 2560000	768000	X	X	—	X
Locked rotor timeout	LT	Locked rotor time-out in milliseconds. This is the time from the locked rotor flag activates to the disabling of the output bridge.	2 ... 65535	2000	X	X	X	X
Locked rotor flag	LF	Read-only field indicating the free/locked state of the rotor.			X	X	X	X
Clear locked rotor	CF	Clicking this button will clear the locked rotor error (LR).			X	X	—	X

Value	Meaning	
0	1.1 — highest torque	
1	1.3 — high torque, medium speed	Best overall performance
2	1.5 — high speed, medium torque	
3	1.7 — highest speed	

Value	Meaning
0	Rotor is not locked
1	Rotor is locked

Name	ASCII	Description / Value	Range	Default	Mode Availability			
					P	S	T	V
Make-up mode	MU	Make up selection for position make up. **Value** / **Meaning** 0 — Position make-up disabled 1 — Use make-up speed (MF) as make-up speed 2 — Use system speed (SS) as make-up speed	0 ... 2	0	**X**	**X**	**—**	**X**
		Clear error count. If checked, LL count will be cleared on an MU change and set. **Value** / **Meaning** Unchecked — Do not clear lead/lag counter (LL) Checked — Clear lead/lag counter (LL)	0/1	0	**X**	**X**	**—**	**X**
Torque speed	TS	Torque speed sets maximum response frequency for torque mode.	0 ... 5000000	2500000	**—**	**—**	**X**	**—**
Torque percent	TQ	Sets the percentage of motor torque the device will maintain.	0 ... 100	25	**—**	**—**	**X**	**—**
Current torque setting	T	Read-only field displays the current motor torque.	0 ... 100	—	**—**	**—**	**X**	**—**
Torque mode velocity read filter	VF	VF takes a value of 0 to 1000. It can be defined as 0 = no filtering and 1000 = most filtering. Because the Torque Velocity is computed and the encoder is sampled every mSec there can be fluctuation in the result. The filtering compensates for this fluctuation.	0 ... 1000	100	**—**	**—**	**X**	**—**

4.4.4 Advanced communication settings

The advanced communication settings are available but in many cases may not be required for use in typical applications outside changing the BAUD rate if required.

The Lexium MDrive Pulse/direction may be used in RS-422/485 networks in party mode. This would be set up using this tab.

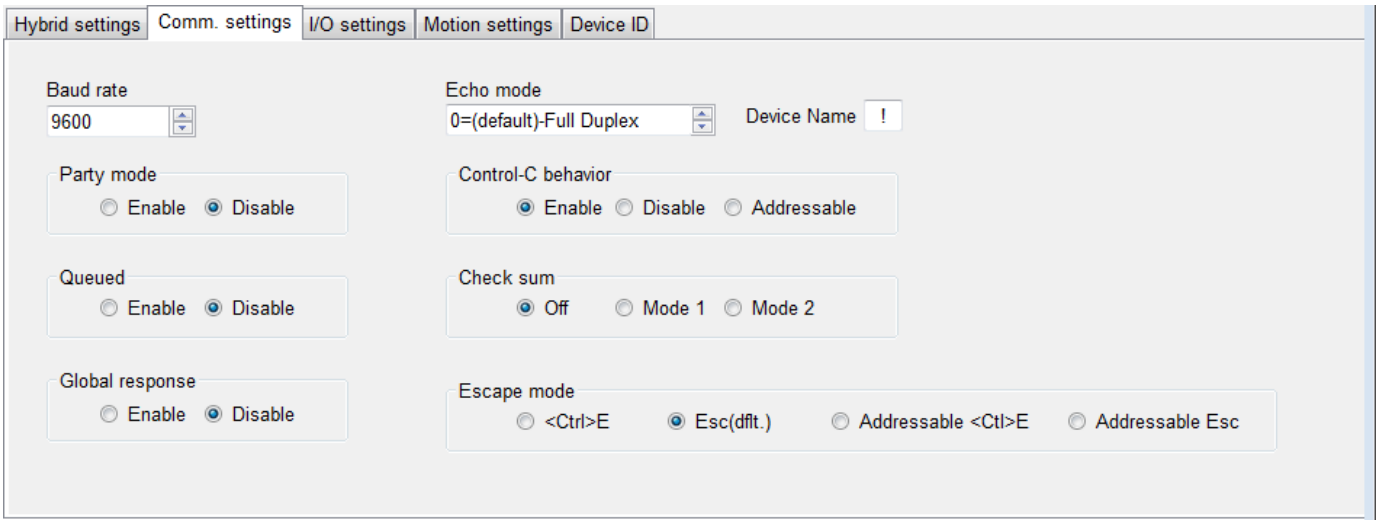


Figure 4.7: Advanced communication settings

Name	ASCII	Description / Value	Range	Default
BAUD rate	BD	Sets the communication BAUD rate 4800 9600 19200 38400 115200	—	9600
Party mode	PY	Enable/disable party mode operation 0 = disable 1 = enable	0/1	0
Queued	QD	Allows multiple queued devices to respond to the caret “^” address character. 0 = disabled 1 = enabled	0/1	0
Global response	DG	The DG flag enables or disables device response to global commands made while in party mode. 0 = disabled 1 = enabled 2 = addressable	0 ... 2	0
CTRL+C behavior	CE	Configure the device to respond or not respond to a CTRL+C software reset, or if the device will respond to an addressable reset in party mode. 0 = disabled 1 = enabled 2 = addressable	0 ... 2	0

Name	ASCII	Description Value	Range	Default
Checksum	CK	Puts the device into Check Sum Mode. When enabled, all communications with the device require a Check Sum to follow the commands. 0 = disabled 1 = ack/nak cksum+error 2 = ack/nak cksum only	0 ... 2	0
Echo mode	EM	The Echo Mode Flag will set the full/ half duplex configuration of the RS- 485 channel. 0 = full duplex 1 = half duplex 2 = list/print only 3 = Queue immediate 4 = computer friendly	0 ... 4	0
Device name	DN	Set the device name for party mode operation. Valid names A-Z, a-z, 0-9	—	!

Procedure: changing the BAUD rate

- ▶ In the Baud selector on the Comm. Settings tab, select the desired BAUD rate: 4800, 9600, 19200, 38400 or 115200.
- ▶ Click “Set”.
  - ◁ A dialog will open instructing a power cycle of the device.
- ▶ Power cycle the device, click OK on the dialog.
- ▶ Browse to the “Device ID” tab.
- ▶ Click the button “Find my com settings”
  - ◁ The software will cycle through a detection sequence and set itself to the set BAUD rate.

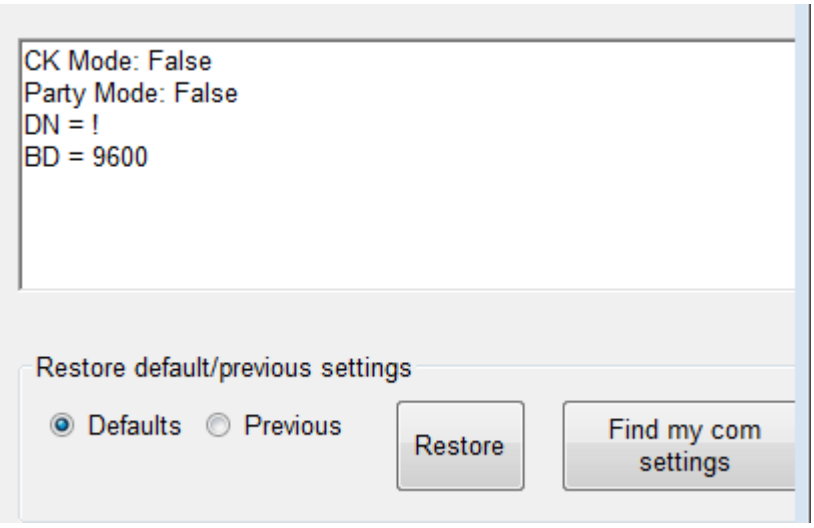


Figure 4.8: Find COM settings utility

The settings may also be reset to either the default settings or the settings previously stored to NVM.

4.4.5 Advanced I/O settings

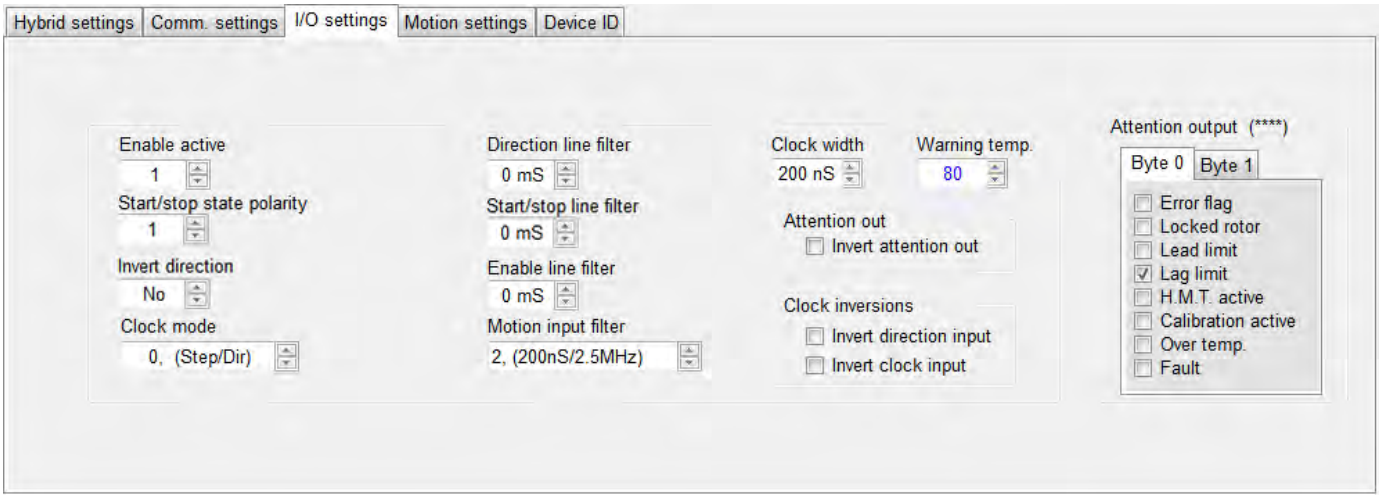


Figure 4.9: Advanced I/O settings

Name	ASCII	Description / Value	Range	Default	Mode Availability			
					P	S	T	V
Enable active	EA	Sets the active logic state of the enable input. **Value** / **Meaning** 0 – Input is active when logic LOW 1 – Input is active when logic HIGH	0/1	0	X	X	X	X
Stop/ start state polarity	—	Allows the user to invert the stop/start input **Value** / **Meaning** 0 – Input is active when logic LOW 1 – Input is active when logic HIGH	0/1	0	—	X	X	X
Invert direction	—	Allows the user to invert the direction input **Value** / **Meaning** 0 – Do not invert direction 1 – Invert direction	0/1	0	—	X	X	X
Clock mode	CM	Sets the clock input mode to pulse/direction, quadrature or CW/CCW inputs. **Value** / **Meaning** 0 – Step/direction mode 1 – Quadrature or A/B mode 2 – CW/CCW or up/down mode	0 ... 2	0	X	—	—	—
Direction line filter	—	Filter direction input in milliseconds **Value** / **Meaning** 0 – No filtering of input 1 - 255 – Input filter time in milliseconds	0 ... 255	0	X	X	X	X

<table>
<tr><th rowspan="2">Name</th><th rowspan="2">ASCII</th><th rowspan="2">Description / Value</th><th rowspan="2">Range</th><th rowspan="2">Default</th><th colspan="4">Mode Availability</th></tr>
<tr><th>P</th><th>S</th><th>T</th><th>V</th></tr>
<tr><td>Stop/start line filter</td><td>—</td><td>Filter stop/start input in milliseconds<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>No filtering of input</td></tr><tr><td>1 - 255</td><td>Input filter time in milliseconds</td></tr></table></td><td>0 ... 255</td><td>0</td><td>—</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Enable line filter</td><td>FE</td><td>Filter enable input in milliseconds<table><tr><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>No filtering of input</td></tr><tr><td>1 - 255</td><td>Input filter time in milliseconds</td></tr></table></td><td>0 ... 255</td><td>0</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Filter motion</td><td>FM</td><td>Sets the filtering for the velocity generator.<table><tr><th>Value</th><th>Meaning</th><th>Value</th><th>Meaning</th></tr><tr><td>0</td><td>50 ns/10 MHz</td><td>5</td><td>900 ns/555 kHz</td></tr><tr><td>1</td><td>150 ns/3.3 MHz</td><td>6</td><td>1.7 µs/294 kHz</td></tr><tr><td>2</td><td>200 ns/2.5 MHz</td><td>7</td><td>3.3 µs/151 kHz</td></tr><tr><td>3</td><td>300 ns/1.67 MHz</td><td>8</td><td>6.5 µs/76.9 kHz</td></tr><tr><td>4</td><td>500 ns/1.0 MHz</td><td>9</td><td>12.9 µs/37.8 kHz</td></tr></table></td><td>—</td><td>2</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Clock width</td><td>—</td><td>Sets the maximum response time for the system</td><td>100 to 1285 nS</td><td>100</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Warning temp</td><td>WT</td><td>Set the temperature level at which an error will be generated.</td><td>0...84</td><td>80</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Invert attention output</td><td>—</td><td>When checked, will invert the active state of the attention output</td><td>—</td><td>—</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Clock inversions</td><td>CI</td><td>When checked, will invert the active state of the step and direction inputs independently.</td><td>—</td><td>—</td><td>X</td><td>—</td><td>—</td><td>—</td></tr>
</table>

Attention output

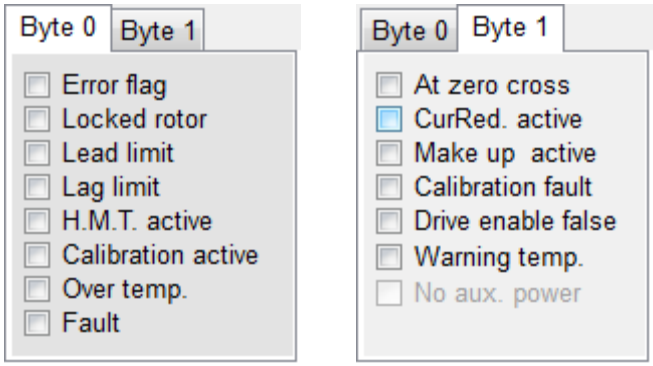


Figure 4.10: Attention output

Name	ASCII	Description / Value	Range	Default
Attention output	AO	Configures the attention output to activate on specified condition by checking the box.	0 ... 16383	0

Value	Meaning	Value	Meaning
1	Software error	128	Reserved
2	Locked rotor	256	At zero crossing
4	Lead limit reached	512	Hold current active
8	Lag limit reached	1024	Make-up active
16	HMT active	2048	Calibration fault
32	Calibration active	4096	Drive enable false
64	Over-temperature	8192	Warning Temp

4.4.6 Advanced motion settings

The Advanced Motion settings tab is used to configure the advanced motion parameters and can consist of three sub tabs depending on the selected mode of operation.

The foillowing table details the sub-tabs seen when in each mode.

Sub-Tab	Mode Availability			
	P	S	T	V
Motion	X	X	X	X
Analog	—	X	X	—
Velocity	—	X	—	X

Table 4.1 : Advanced Motion tab

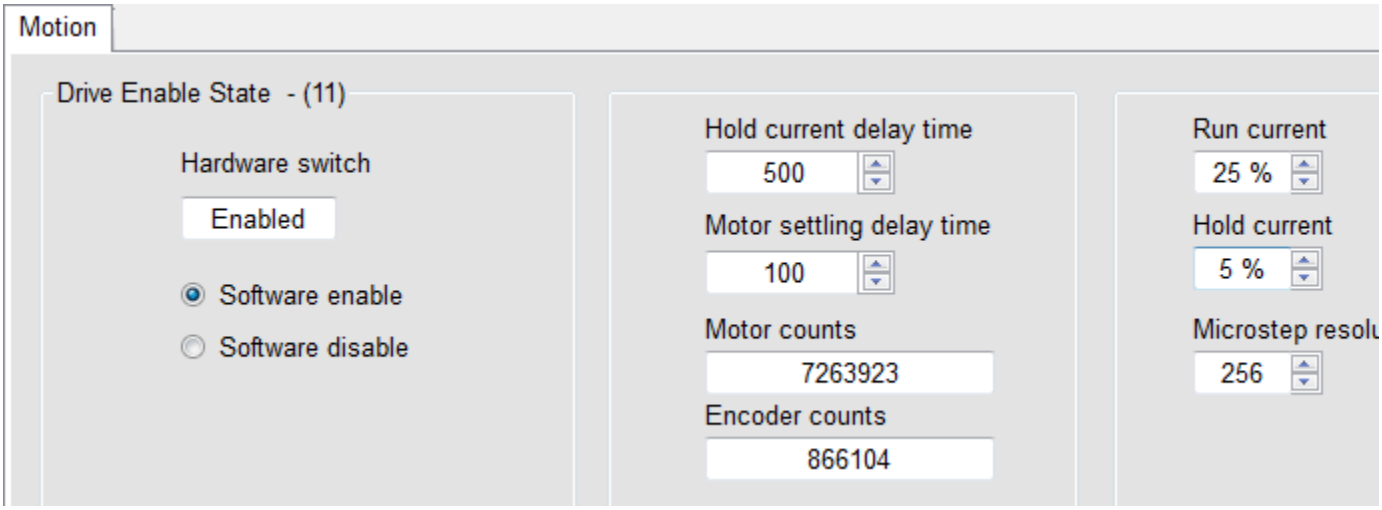


Figure 4.11: Motion settings tab

Name	ASCII	Description / Value	Range	Default	Mode Availability			
					P	S	T	V
Hardware Switch	—	Read-only field displays the state of the enable input	—	Enabled	X	X	X	X
Hold current delay time	HT	Represents the time delay in milliseconds between the last motion input and the shift to the commanded holding current.	0 ... 65000	500	X	X	—	X
Motor settling delay time	HT	Represents the time delay in milliseconds the shaft is allowed to settle before shifting to hold current.	0 ... 65000	500	X	X	—	X
Motor counts	C1	Read only field displays the motor counts	—	—	X	X	X	X
Encoder counts	C2	Read only field displays the encoder counts	—	—	X	X	X	X
Hold current	HC	Motor holding (reduction) current in percent.	0 ... 100	5	X	X	—	X
Run current	RC	Motor running current in percent.	1 ... 100	25	X	X	—	X
Step resolution	MS	Sets the microstep resolution in microsteps/fullstep.	See table below	256	X	X	X	X

Binary

microsteps/step	steps/revolution
1	200
2	400
4	800
8	1600
16	3200
32	6400
64	12800
128	25600
256	52100
Additional resolution settings	
180	36000 (0.01°/µstep)
108	21600 (1 arc-min/µstep)
127	25400 (0.001 mm/µstep)

Decimal

microsteps/step	steps/revolution
5	1000
10	2000
25	5000
50	10000
100	20000
125	25000
200	40000
250	50000

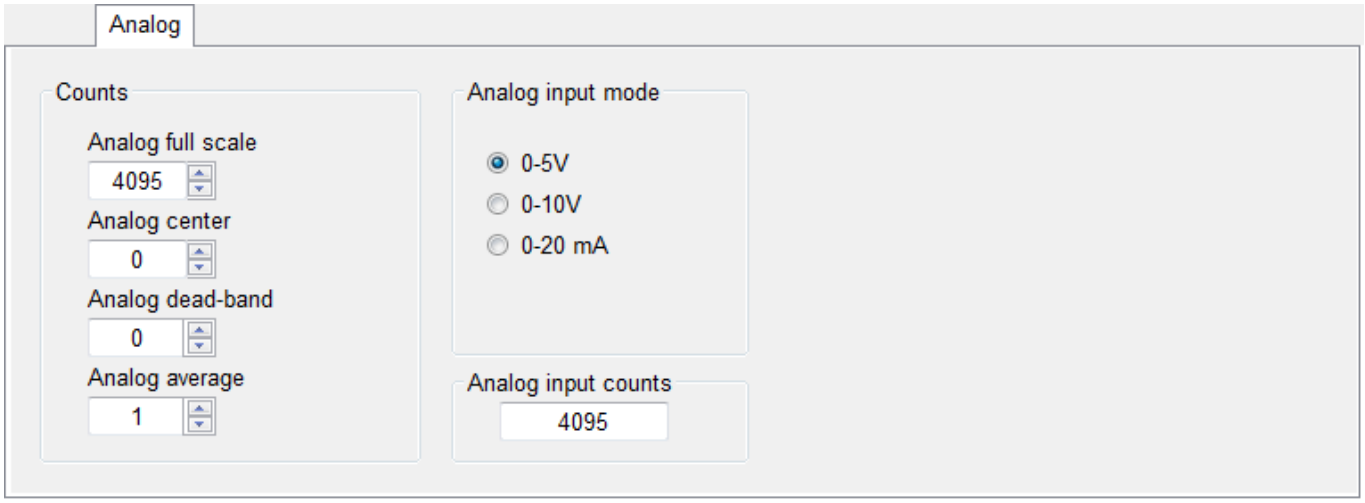


Figure 4.12: Analog settings

Name	ASCII	Description / Value	Range	Default	Mode Avaialbility			
					P	S	T	V
Analog full scale	AF	Sets the full scale range of the analog input. By default it is at the maximum allowed range. The max voltage of the selected input mode will = 100% of the preset torque or speed.	0 ... 4095	4095	—	X	X	—
Analog center	AC	Sets the center point of the analog full scale for directional control using the analog input.	0 ... 4094	0	—	X	X	—
Analog deadband	AD	Sets the ± deadband for the analog center (AC).	0 ... 255	1	—	X	X	—
Analog average	AA	Input filtering for the analog input.	1 ... 1000	1	—	X	X	—
Analog mode	AM	Sets the analog input to respond to: **Value** / **Meaning** 0 / 0 to 5 V 1 / 0 to 10 V 2 / 0 to 20 mA	0 ... 2	0	—	X	X	—

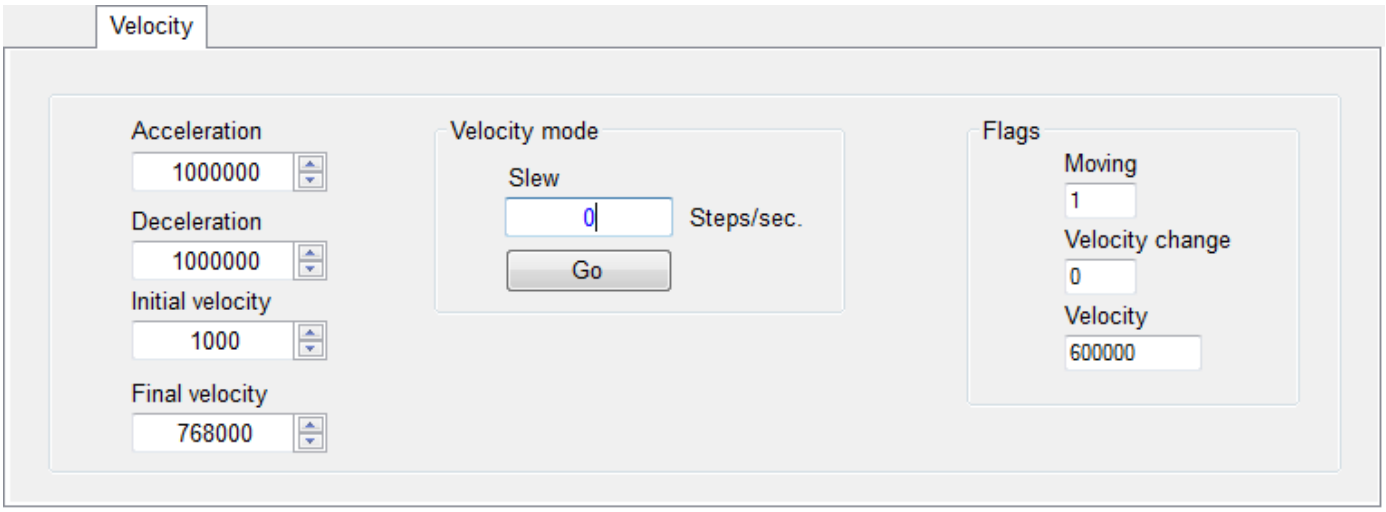


Figure 4.13 :Velocity settings

Name	ASCII	Description / Value	Range	Default	Mode Availability			
					P	S	T	V
Acceleration	A	Motor acceleration in steps/second^2.	1x10^6	1000000	—	X	—	X
Deceleration	D	Motor deceleration in steps/second^2.	1x10^6	1000000	—	X	—	X
Initial velocity	VI	Start velocity of the motor. Motor will accelerate from VI to VM based on the voltage measured on the analog input.	1 ... 2560000	1000	—	X	—	X
Maximum velocity	VM	Maximum velocity the motor will attain at the maximum voltage measured at the analog input.	VI ... 2560000	768000	—	X	—	X
Slew	SL	Command to slew at constant velocity. Slew rate may be changed on the fly. SL=0 will decelerate to stop.			—	—	—	X
Moving	MV	Read-only status flag indicates whether or not the axis is in motion. **Value** / **Meaning** 0 / Motor is not moving 1 / Motor shaft is in motion			—	X	—	X
Velocity changing	VC	Read-only status flag indicates wether or not the axis is accelerating or decelerating. **Value** / **Meaning** 0 / Velocity is not changing 1 / Velocity is changing			—	X	—	X
Current Velocity	V	Read-only register displays the current velocity of the axis.			—	X	—	X

4.4.7 Device ID tab

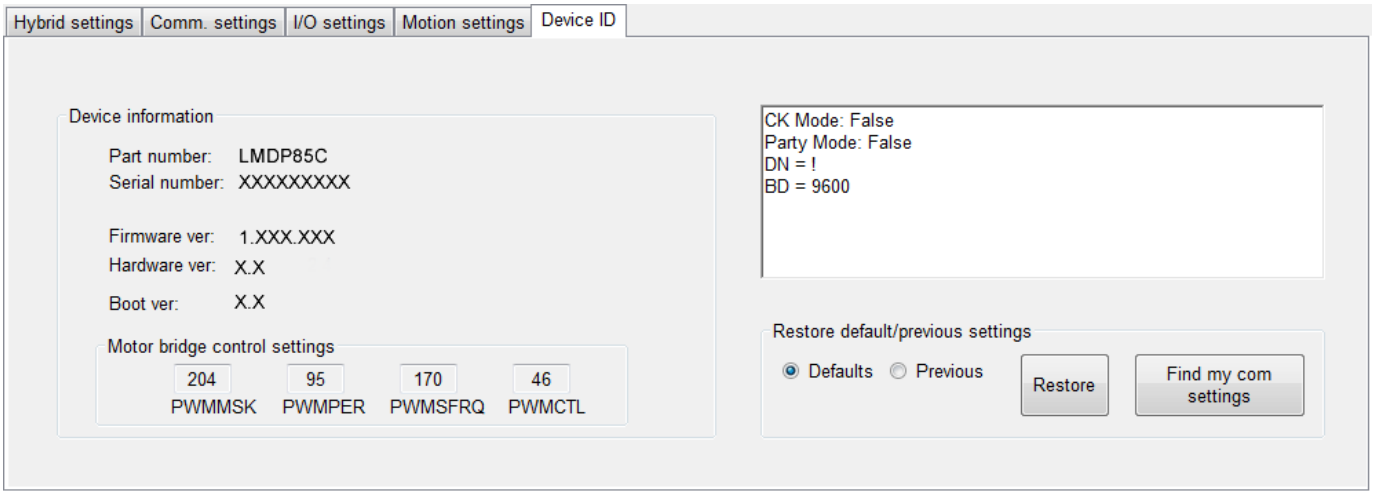


Figure 4.14: Device ID

The Device ID tab contains the relevant information such as part number, serial number, and firmware and hardware versions.

A diagnostic window is also present for finding the communications settings and restoring factory defaults

4 4.8 Fault frame

The fault frame is accessible via the ⇨ View ⇨ Fault Frame menu.

It contains information such as the error code, if an error exists, the internal temperature of the device and the power supply voltage.

When the Dynamic Parameter Scan item is checked, these parameters will refresh with the heartbeat.

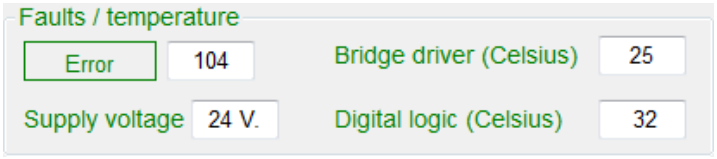


Figure 4.15: Fault frame

Internal temp. The internal temp field displays the internal temperature of the device. It will display two numbers, the first is the temperature of the output bridge electronics. The second is the temperature of the Digital logic.

Supply voltage Displays the voltage of the power supply

4.5 Upgrading firmware

The firmware for the Lexium MDrive Pulse/direction is field upgradable via the Pulse/direction configuration utility.

The latest firmware is available online at http://motion.schneider-electric.com.

Note that during the upgrade process the devices will change BAUD rate to 19200 bps.

- ▶ Download and extract the latest firmware to a location on your hard drive.
  - ◁ Ensure that the COM port is connected and communication is active.
- ▶ Select ⇨ Upgrade! from the menu.
- ▶ Select the upgrade *.SEM file from you drive

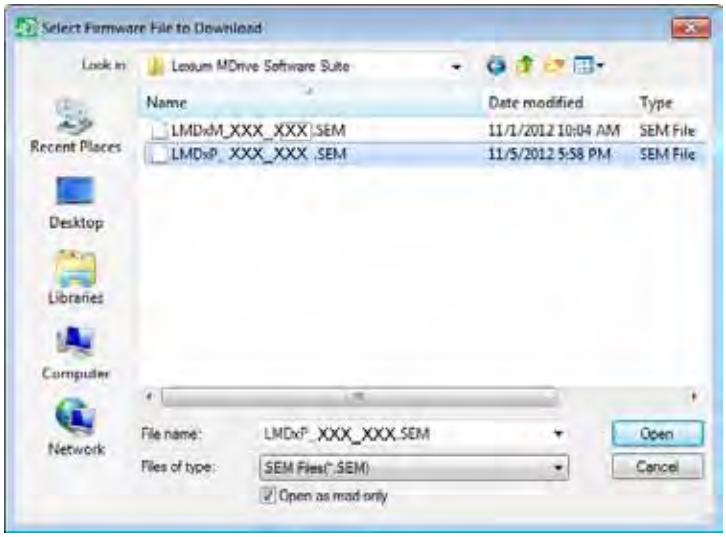


Figure 4.16: Select upgrade file

- ▶ Verify the desire to upgrade by clicking Update Firmware.

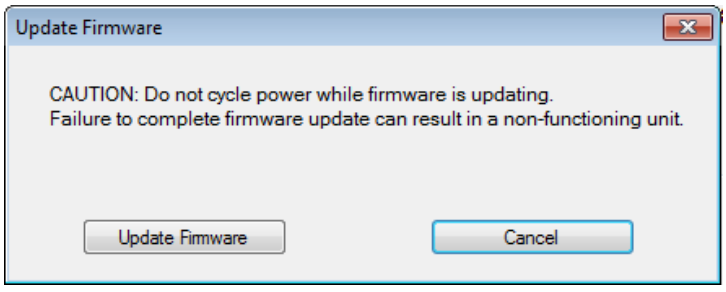


Figure 4.17: Update verification

▶ The upgrade dialog will appear showing the version number of the firmware selected. Click the Upgrade button.

▶ A dialog requesting a power cycle of the device will appear. Cycle the power to the Lexium MDrive, click OK.

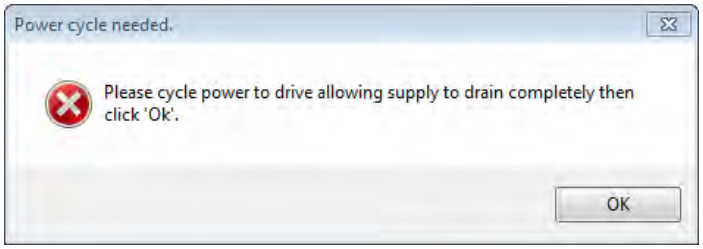


Figure 4.18: Cycle power to device

◁ The upgrade process will take 2 - 3 minutes. When complete, the Upgrade done dialog will open.

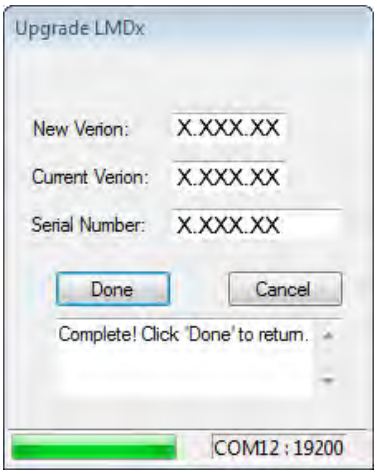


Figure 4.19: Upgrade complete

4.6 Encoder Remap Utility (Closed Loop models only)

⚠WARNING

UNINTENDED OPERATION

The Lexium MDrive must meet several conditions in order to be remapped successfully.

- The unit MUST be uncoupled from any loads, the shaft MUST be free to rotate in both directions
- Do not remap the encoder unless you fully understand the function.

Failure to follow these instructions can result in death, serious injury or equipment damage.

4.6.1 Remap process

Proper function of the hMT circuitry requires that the precise alignment of the motors rotor and stator be stored in relation to the internal magnetic encoder. This is done at the factory during the manufacturing process and will typically not be required again.

▶ Ensure that the motor shaft is uncoupled and able to move freely in both Clockwise and Counterclockwise directions.

▶ From the “View” menu select “Encoder Remap Utility”.

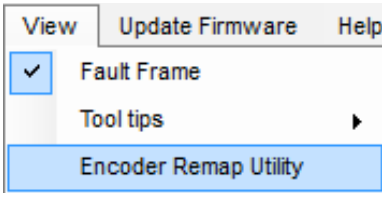


Figure 4.20: Run remap utility

▶ If the motor shaft is free to move in both directions, click OK.

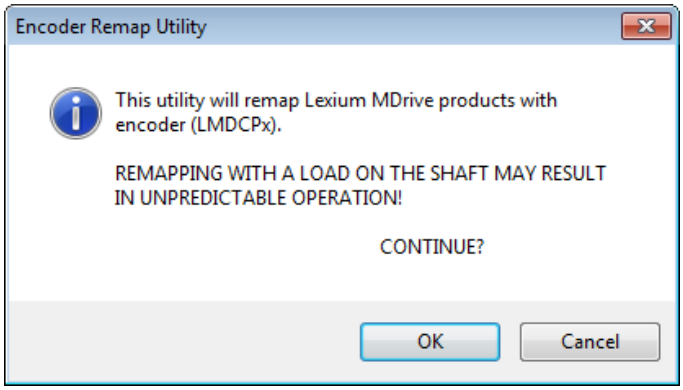


Figure 4.21: Verify motor shaft uncoupled from loads and free to move

▶ Once communications is verified, acknowledge the understanding the motion will occur by clicking OK.

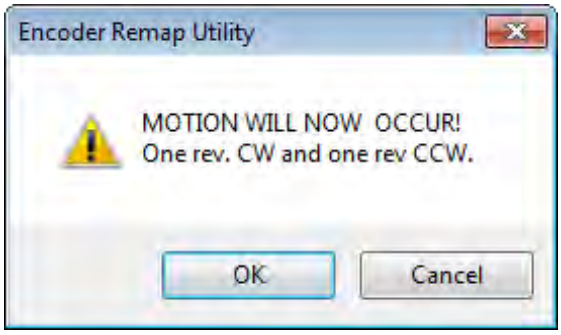


Figure 4.22: Motion will occur notice

◁ The motor will turn one revolution clockwise, then one revolution counter-clockwise.

◁ The device has been successfully remapped.

◁ Should remap fail: contact the factory.

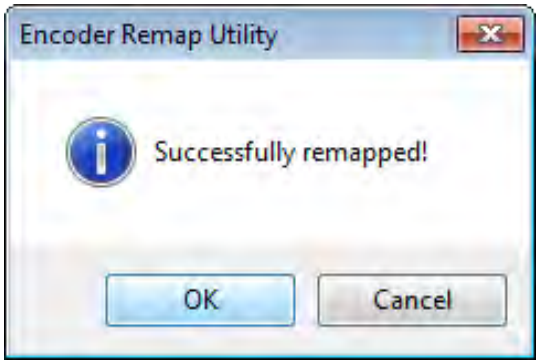


Figure 4.23: Remap successful

5 Motion Control programmer

5

⚠WARNING

LOSS OF CONTROL

The product is unable to detect an interruption of the network link

- Verify that connection monitoring is on.
- The shorter the time for monitoring, the faster the detection of the interruption.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠WARNING

UNINTENDED OPERATION

The product is unable to detect an interruption of the network link

- Do not write values to reserved parameters.
- Do not write values to parameters unless you fully understand the function.
- Run initial tests without coupled loads.
- Verify that the system is free and ready for the movement before changing parameters.
- Verify the use of the word sequence with fieldbus communication.
- Do not establish a fieldbus connection unless you have fully understood the communication principles.

Failure to follow these instructions can result in death, serious injury or equipment damage.

5.1 Dependency note

IMPORTANT! This section covers the basic functionality of this software with regard to its use with a Lexium MDrive Motion Control device.

Use of the Lexium MCode Software and Programming Reference manual is required as this document does not cover the MCode programming language.

5.2 Installation

The Motion Control Programmer is installed via the Lexium MDrive Software Suite startup window.

This section assumes the Software Suite has been installed and is ready to use. If this has not been accomplished please follow the instructions in Section 3 of this document.

5.2.1 Install the Motion Control Programmer module

- ▶ Launch the Lexium MDrive Software Suite
- ▶ On the left pane of the start-up screen, click the button labeled “Install Lexium MDrive Motion Control Interface.”
  - ◁ The following installation wizard dialog will appear:

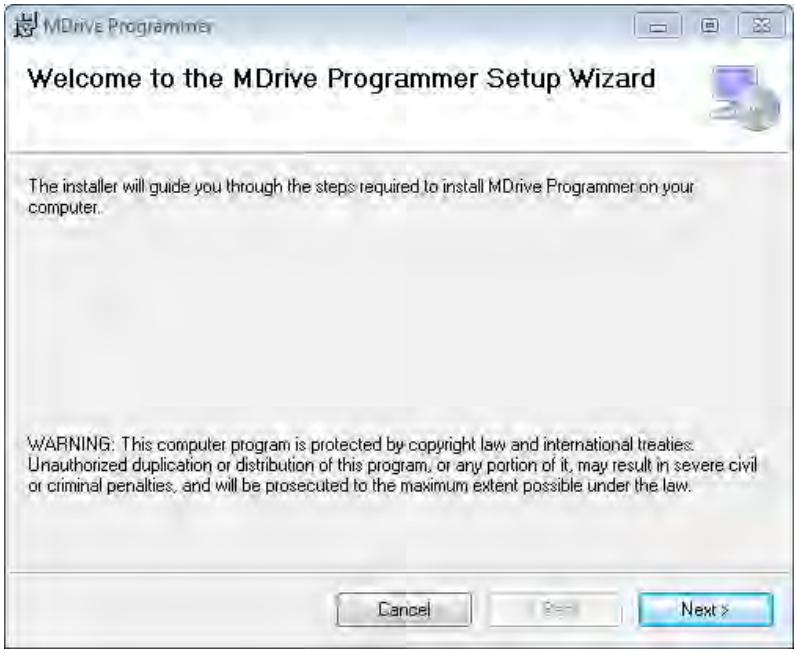


Figure 5.1: Motion Control utility install

- ▶ Follow the prompts to complete the installation
  - ◁ The button on the start-up screen will now be labeled

    “Launch Lexium MDrive Motion Control Interface”.

5.2 Screen overview

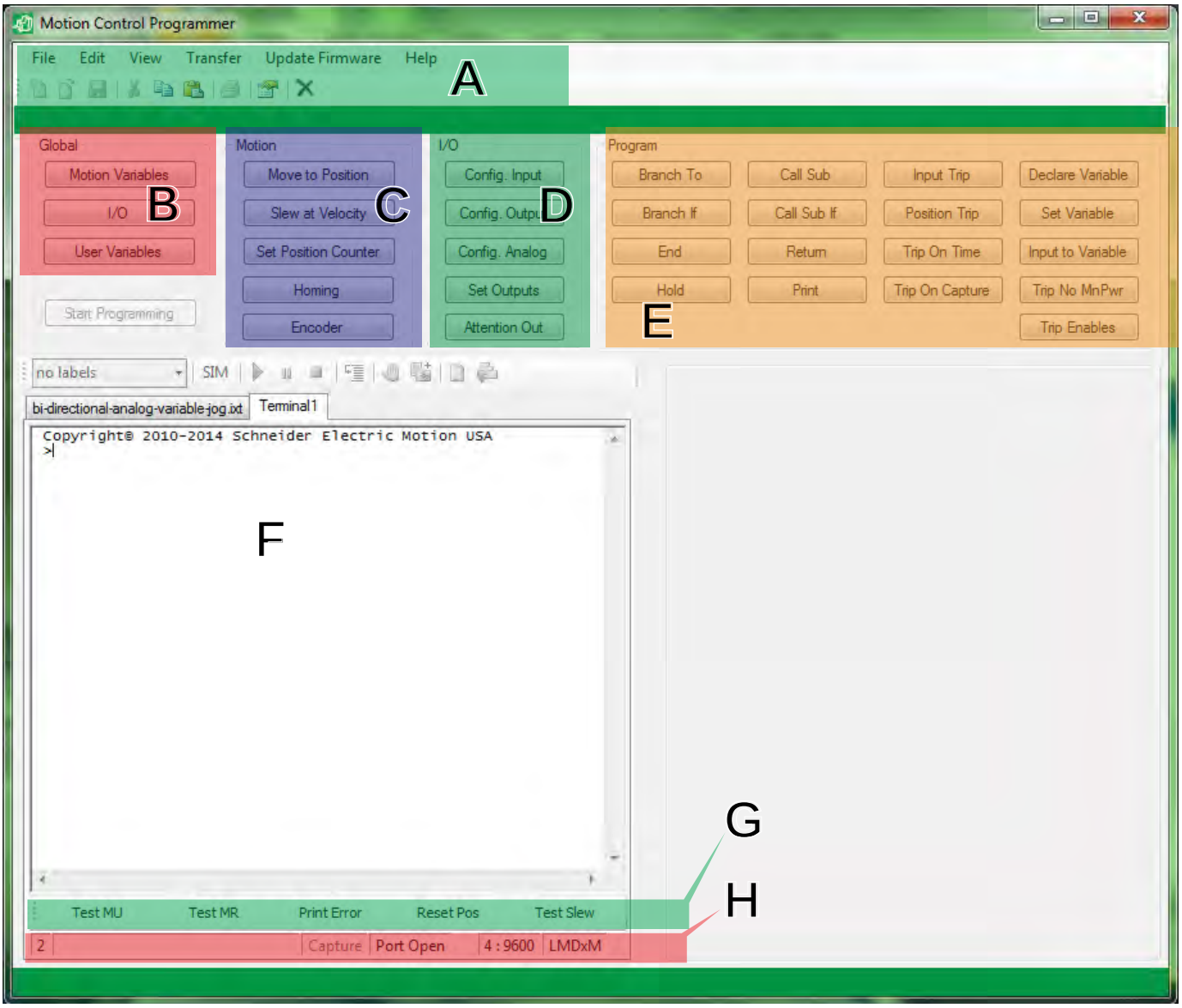


Figure 5.2: Motion Control utility Screen overview

The Motion Control Programmer is a self contained programming GUI and ASCII/ANSI terminal emulator

A - Menu and button bar Used for standard windows file operation functions such as creating, opening and saving files. Setting and changing preferences, as well as transferring files to and from a connected Lexium MDrive.

5.2.1 Program button groupings

The program button grouping gives GUI access to the most commonly used MCode commands.

NOTE: Though these buttons will configure program commands, a knowledge of MCode is still needed to perform advanced programming functions. The detailed information of each command may be accessed using the MCode manual.

NOTE: These buttons will ONLY insert the command or parameter into a program editor window for future download to the Lexium MDrive. Immediate commands via the terminal window MUST be typed in manually.

B- Global parameter setting This button group is used for configuring global parameters inside a Lexium MDrive program. These parameters will be inserted into a Program editor tab of the Motion Control Programmer.

C- Motion Commands This button group is used for entering motion commands into a Lexium MDrive program, setting position counter, homing mode and encoder related commands. These will be inserted into a Program editor tab of the Motion Control Programmer.

D- I/O Commands This button group is used for entering input and output commands into a Lexium MDrive program, configuring inputs and outputs locally within the program, and setting outputs. These will be inserted into a Program editor tab of the Motion Control Programmer.

E- Program Commands This button group is used for entering program related commands into a Lexium MDrive program, performing unconditional and conditional Branches, subroutine calls and assigning trip functions. These will be inserted into a Program editor tab of the Motion Control Programmer.

5.2.2 Desktop/work area (F)

The desktop work aera of the Motion Control programmer contains the key items:

1) Program editor tab
2) Terminal tab
3) Simulator area

Program editor tab

The program editor tab is the entry area for Lexium MCode prgrams, commands may be entered by either using the button groupings, or by manually entering the command or parameters.

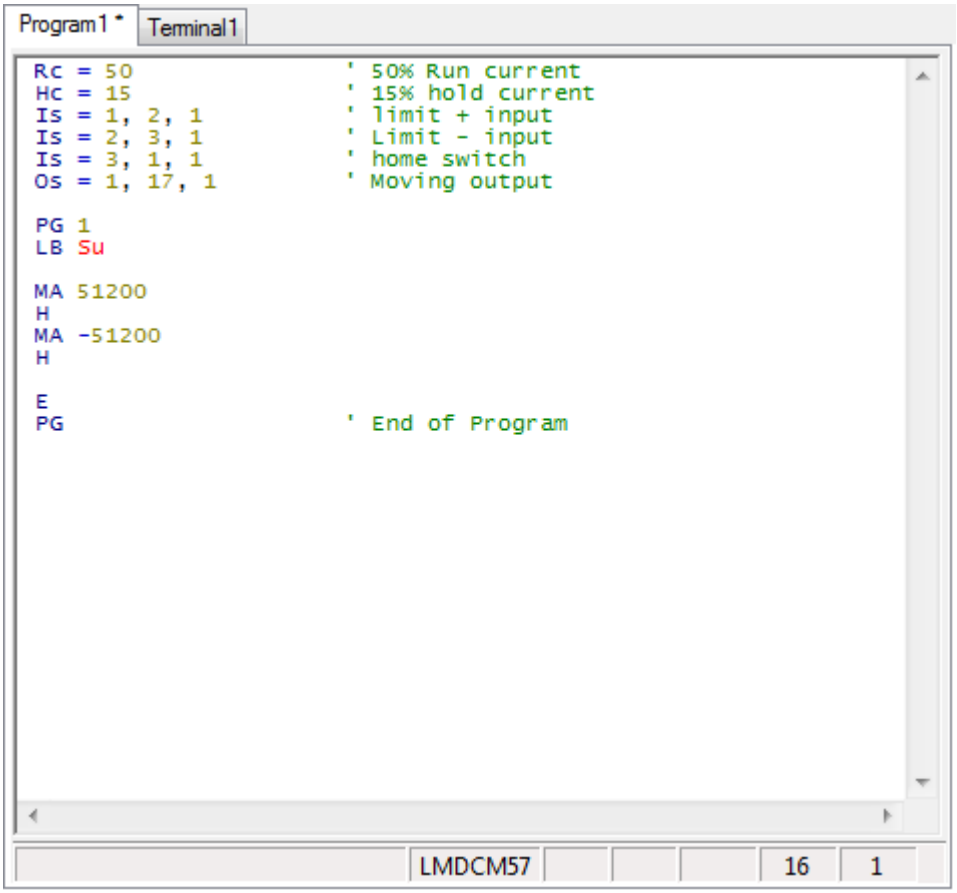


Figure 5.3: Program editor window

Key points about the program editor:

- Multiple tables editor tabs may be simultaneously open, allowing for multiple programs to be developed and tested
- The items on the lower status bar may be double clicked to open preferences such as the device being programmed.

Editor Window status bar

The editor window status bar shows the detail such as:

- Part number being programmed: This is an important setting as different part numbers may have different features available, selecting the correct part number ensures the availability of the correct features.
- Row and column number display. Displays the row and column position of the cursor.

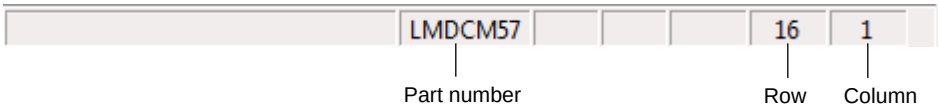


Figure 5.4: Program editor status bar

Program Editor Preferences

The Program Editor window preferences may be accessed two ways:

1) From the menu bar ⇨Edit ⇨Preferences⇨Editor Settings.
2) By double-clicking the Part Number field of the status bar.

The preferences may be used to set your color and font preferences or as mentioned, more importantly, the product part number.

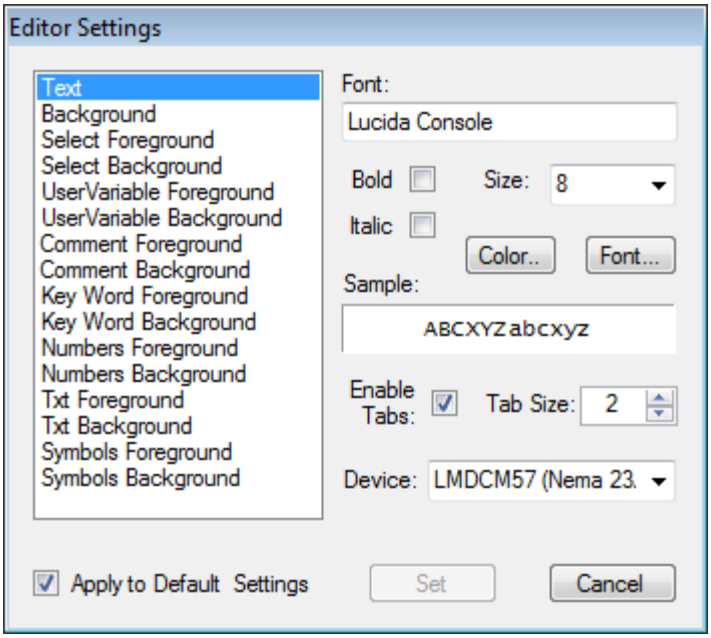


Figure 5.5: Program editor preferences dialog.

NOTE: If multiple editor tabs are used, the Editor settings are set for each tab individually.

Terminal tab

The terminal tab is basically an ASCII/ANSI Terminal Emulator window configured to be used to communicate directly to Lexium MDrive products over either RS-422/485 or Ethernet communication interface.

Immediate mode MCode commands may be issued directly to the selected Lexium MDrive product.

Note that the Programmer button groups will not input commands into the terminal tab.

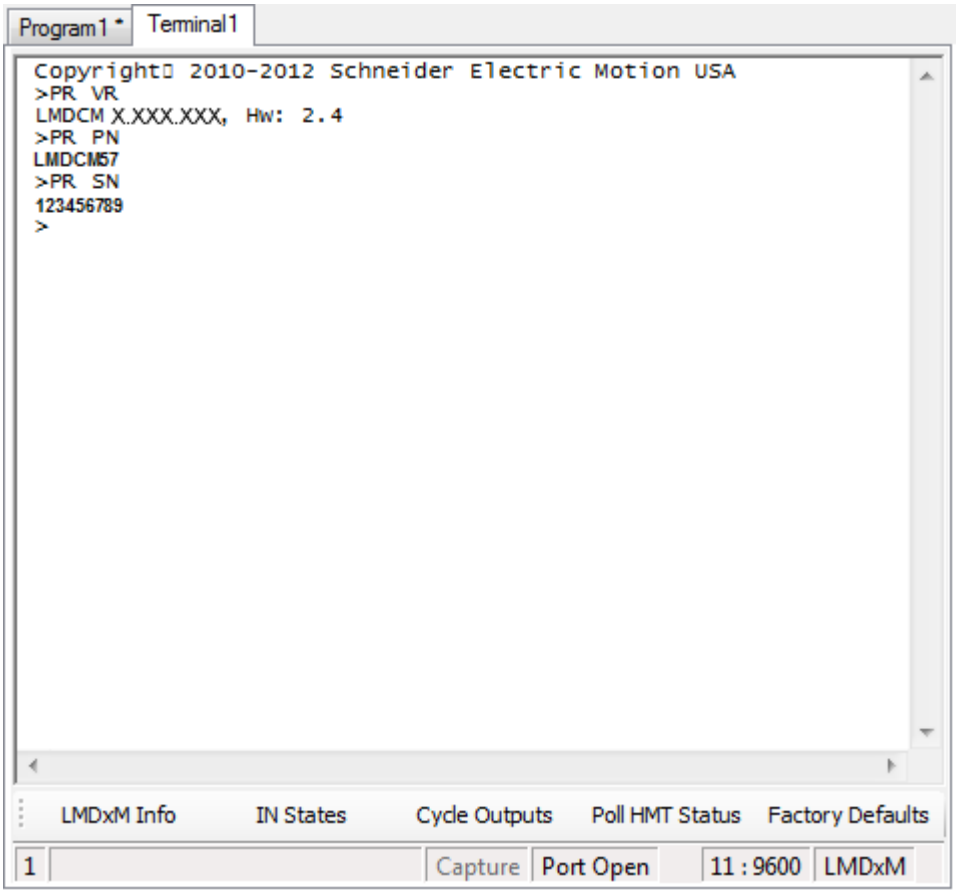


Figure 5.6: Terminal tab

Key points about the Terminal Tab:

- Multiple tables editor tabs may be simultaneously open, allowing for multiple devices to be connected to different COM ports.
- Function Key groups may be programmed for easy access to desired functions.
- The items on the lower status bar may be double clicked to open preferences such as the COM Port, BAUD rate and device type.

Function Key bar

Function key groups may be assigned to specific functions as desired by the user. The function keys are programmed using a string of MCode commands and control codes to define actions such as CR/LF, time delays and etc.

A default function key group is provided for simple diagnostic functions such as display device information, test I/O, factory defaults.

Figure 5.7: Function keys

Function Key setup

Function keys are configured using the Function Key Setup dialog, which may be accessed by right-clicking anywhere on the Function Key bar.

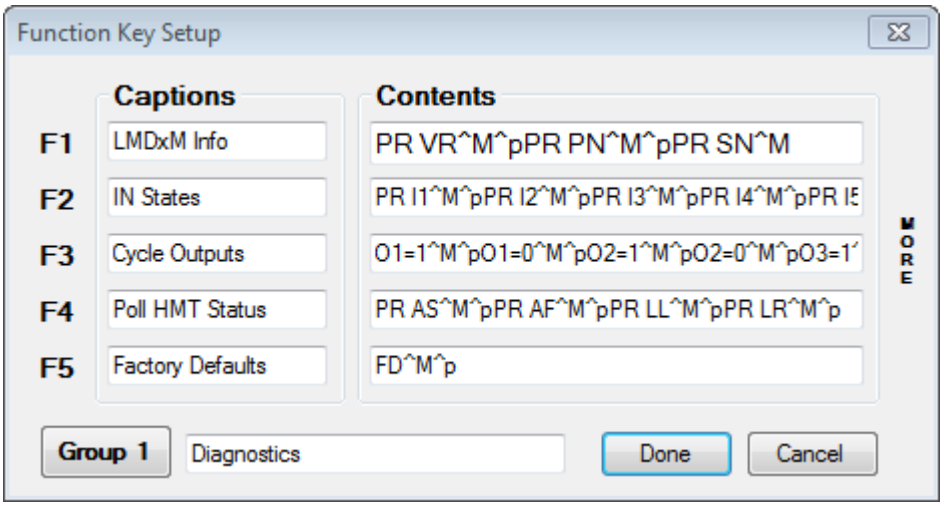


Figure 5.8: Function Key Setup dialog

As shown in Figure 5.8, function keys are defined by a string of MCode commands and control codes.

Fore example:

PR VR^M^p**PR PN**^M^p**PR SN**^M

Will display the device information such as Firmware version, Part Number and Serial number using the MCode command, followed by a carriage return (^M) and a 1 second delay (^p)/ (MCode commands are in bold red for easier display.)

Available control codes are accessed by right-clicking into a function key setup field.

Function keys may be enabled or disabled, and the number of function key groups set in the Terminal Format dialog of the Terminal Settings.

Terminal tab status bar

The terminal status bar displays the status of:

- Active function key group. Additional function key groups may be defined in the Terminal Settings dialog under “Terminal Format” and accessed by right-clicking the active group number.
- Port status, shows the open, closed status of the COM port. Double-clicking will open/close the COM port.
- Connected port and BAUD Rate. Double-clicking will open the Communication Preferences dialog.

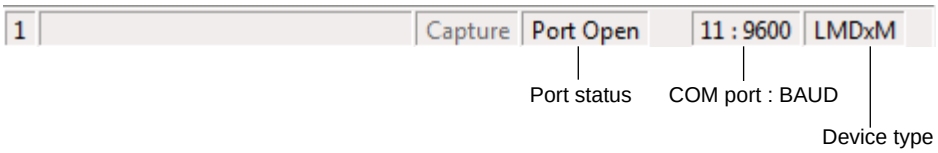


Figure 5.9: Terminal tab status bar

Terminal preferences

The Terminal Settings dialog consists of two tabs:

1) Communication Settings
2) Terminal Format

It is accessed by:

1) From the menu bar ⇨Edit ⇨Preferences⇨Terminal Settings.
2) By double-clicking the COM port:BAUD field of the status bar.

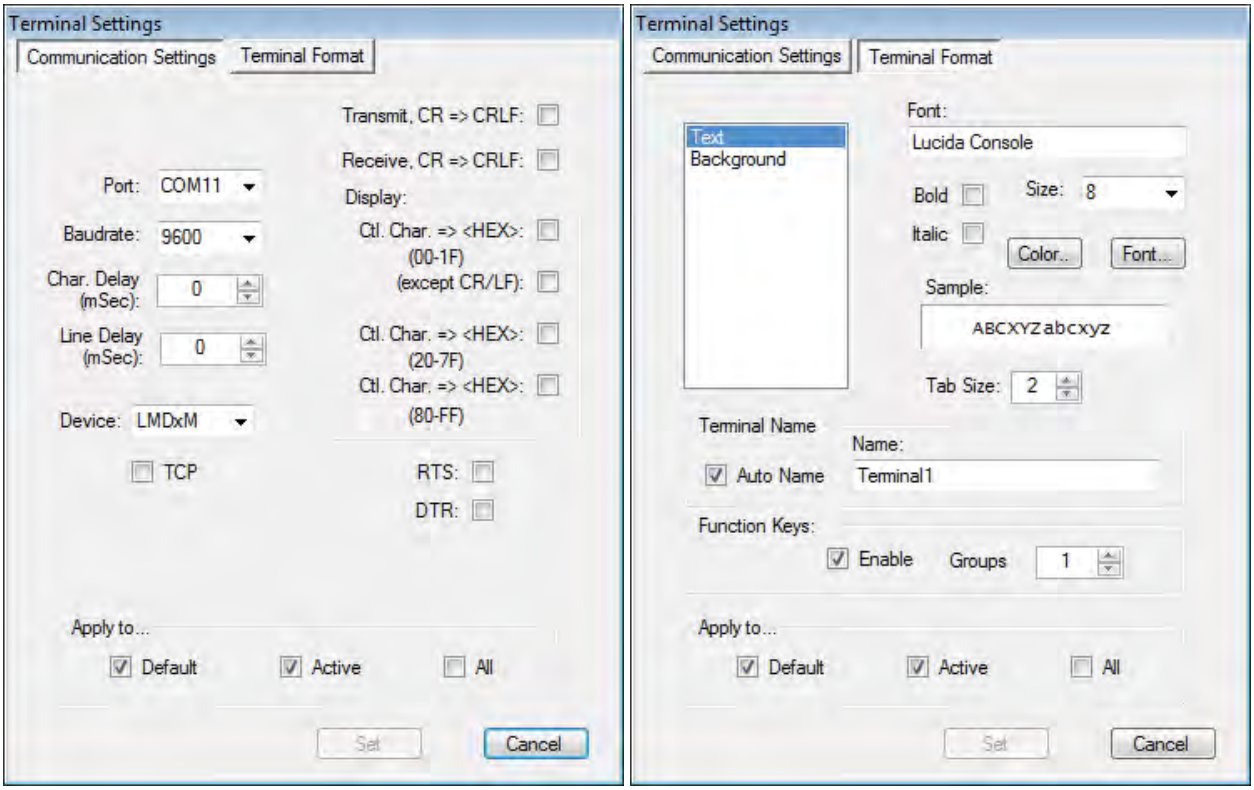


Figure 5.10: Terminal Settings

Communications Settings Tab

The communications settings tab allows you to set the basic settings for the active terminal tab. These settings are configured to the selected device's factory defaults. Typically the only changes will be to the COM Port used and the BAUD rate.

Terminal Format Tab

Used to set the formatting of the Terminal's colors and fonts.

This dialog is also where Function keys may be enabled or disabled, and the number of function hey groups set.

5.3 Connecting to your Lexium MDrive

Requirements

- RS-422/485 converter and drivers installed.
- COM Port known.
- Lexium MDrive Software Suite and Motion Control Programmer installed.
- Lexium MDrive connected to RS-422/485 and powered on.

Procedure

- ▶ Click the tab labeled “Terminal 1”.
- ▶ Open the Terminal Settings dialog by either selecting ⇨Edit ⇨Preferences⇨Terminal Settings from the menu or by double-clicking the COM port:BAUD field of the status bar.
- ▶ Select the device you are communicating with:
  LMDxM - Lexium MDrive
  The communication settings will automatically be set for the device selected.
- ▶ Select the COM port you are connecting to. (The drop down will only show available ports.)
- ▶ Click “Set”.
- ▶ Connect to the device by clicking the “Port Closed” field on the status bar of the Terminal tab.
- ▶ Key in CTRL+C.
- ◁ The sign-on message below should appear.

```
Copyright 2010 - 2013 Schneider Electric Motion USA

>
```

The sign-on message indicates that you are up and running. You may now begin to issue immediate mode commands and/or download programs to your Lexium MDrive.

5.4 Developing and transferring a program

To acclimate to the Motion Control Programmer environment we will create a short program that will perform some motion profile, then download it to the Lexium MDrive.

5.4.1 Set global parameters

- In this subsection the goal is to set some global parameters. Global parameters are set outside of the program and apply universally to the device.

▶ Click the Motion Variables button in the Global frame, the Global Motion Variables dialog will open.

◁ Change the Run Current to 50%

◁ Change the Hold Current to 15%

◁ Check “Set Changes Only”

◁ The remaining variables will be left as default.

▶ Click Set - The settings will populate in the editor window

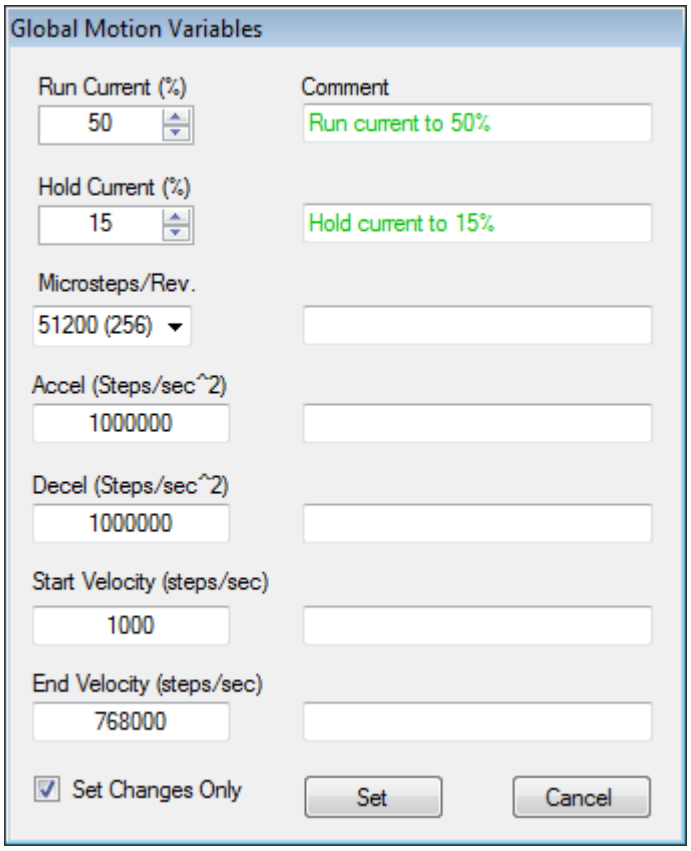


Figure 5.11: Global Motion Variables

▶ Click the I/O Variables button in the Global frame, the Global I/O Settings dialog will open.

◁ Select IN 1 as LIMIT Plus

◁ Select IN 2 as LIMIT Minus

◁ Check “Set Changes Only”

◁ The remaining I/O points will be left as default.

▶ Click Set - The settings will populate in the editor window

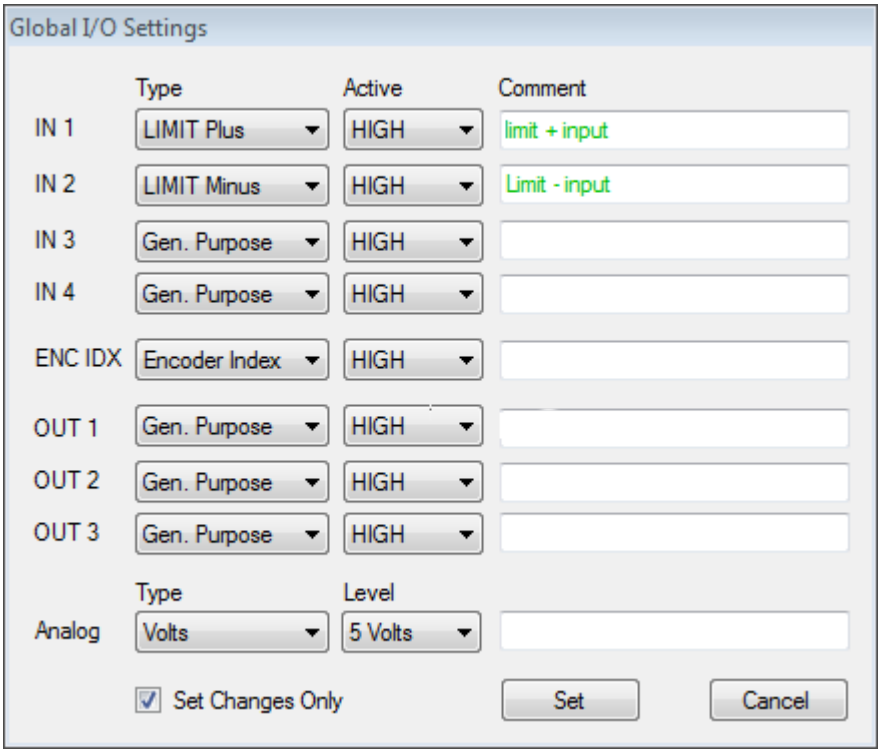


Figure 5.12: Global I/O Settings

NOTE: If the I/O points are not connected to the Lexium MDrive the program will still run the motion profile portion of the program.

5.4.2 Write the program

■ In this subsection the goal is to write a short program that will perform a move, test for a limit, perform a move in the opposite direction and again test a limit. If a limit is see, a subroutine will launch to display a message,

▶ Click the Start Programming button.

◁ Label the program X1

◁ Address = 1

▶ Click “Set”

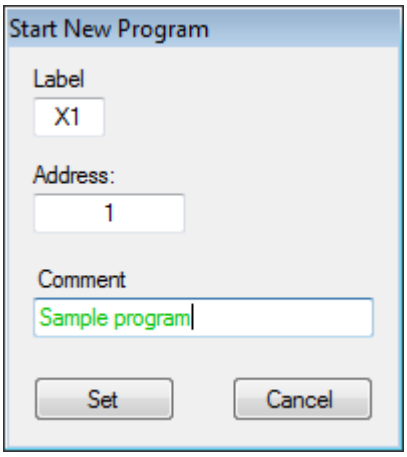


Figure 5.13: Start New Program dialog

Define the motion and limit response

▶ Click the Move to Position button in the Motion frame. The Move To dialog will open.

◁ Enter 512000 in the Move to field

◁ Leave Absolute radio checked

◁ Leave Use Current Motion Settings checked

▶ Click “Set”

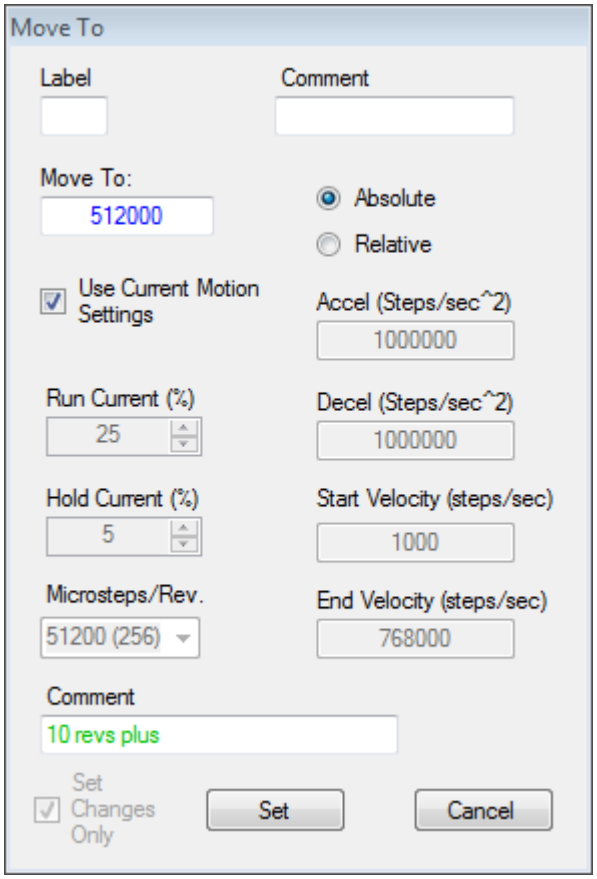


Figure 5.14: Move to dialog

▶ Click the Hold button in the Program frame. The Hold dialog will open.

◁ Ensure that the “Moving” radio is selected. Click “Set”

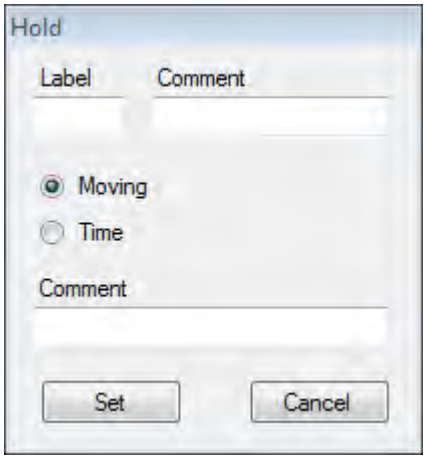


Figure 5.15: Hold dialog

▶ Click the Call Sub If button in the Program frame. The Call Subroutine iF dialog will open dialog will open.

◁ In the “Call Subroutine Label dropdown, manually enter “Z1”

◁ In the “If:” field enter Er (You may also right click and select the variable from the context menu.)

◁ In the “Is:” field enter “=” (You may also right click and select this from the context menu.)

◁ In the “Value:” field enter “83” (This is the error number for positive limit reached.”

▶ Click “Set”

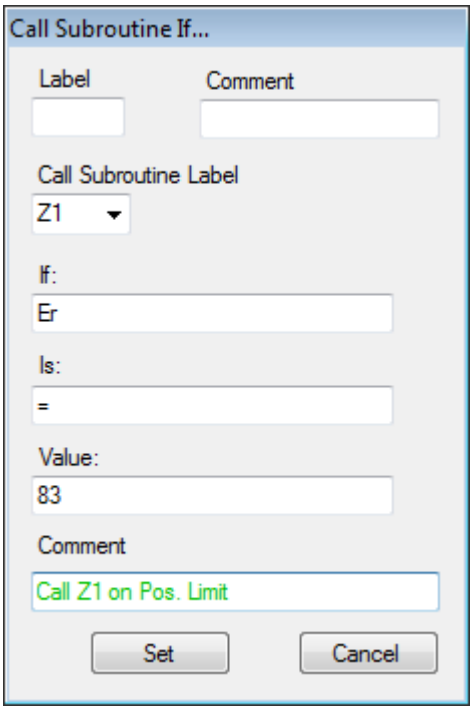


Figure 5.16: Call if dialog

- ▶ Click the Move to Position button in the Motion frame. The Move To dialog will open.
  - ◁ Enter -512000 in the Move to field
  - ◁ Leave Absolute radio checked
  - ◁ Leave Use Current Motion Settings checked
- ▶ Click “Set”
- ▶ Click the Hold button in the Program frame. The Hold dialog will open.
  - ◁ Ensure that the “Moving” radio is selected. Click “Set”
- ▶ Click the Call Sub ... If button in the Program frame. The Call To .... IF dialog will open dialog will open.
  - ◁ In the “Call Subroutine Label dropdown, manually enter “Z2”
  - ◁ In the “If:” field enter Er (You may also right click and select the variable from the context menu.)
  - ◁ In the “Is:” field enter “=” (You may also right click and select this from the context menu.)
  - ◁ In the “Value:” field enter “84” (This is the error number for negative limit reached.”
- ▶ Click “Set”
- ▶ Click the “Branch To” button in the Program frame.
  - ◁ Select X1 from the Branch to Label dropdown.
  - ◁ Click “Set”.
- ▶ Click the End button in the Program frame. A character E should appear at the end of your program text.

Building the subroutines

In this case the subroutines will each trigger an output, Output 1 will be active if the Positive limit is reached, output 2 will be active if the negative limit is reached. The program will branch back to the beginning of the subroutine until the limit input is cleared.

- ▶ In the Editor window, beneath the E:
  - ◁ Type in LB Z1, this identifies the Positive limit subroutine as Z1.
- ▶ Click the “Set Outputs” button in the I/O frame
  - ◁ Check O1
- ▶ Click “Set”

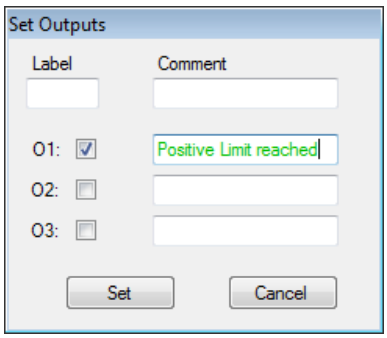


Figure 5.17: Set Outputs dialog

- ▶ Click the “Branch If” button in the Program frame. The Branch To... If dialog will open.
  - ◁ Enter Z1 in the Branch to Label field.
  - ◁ Enter I1 in the If field.
  - ◁ Enter = in the Is field.
  - ◁ Enter 1 in the Value fieled.
- ▶ Click “Set”.

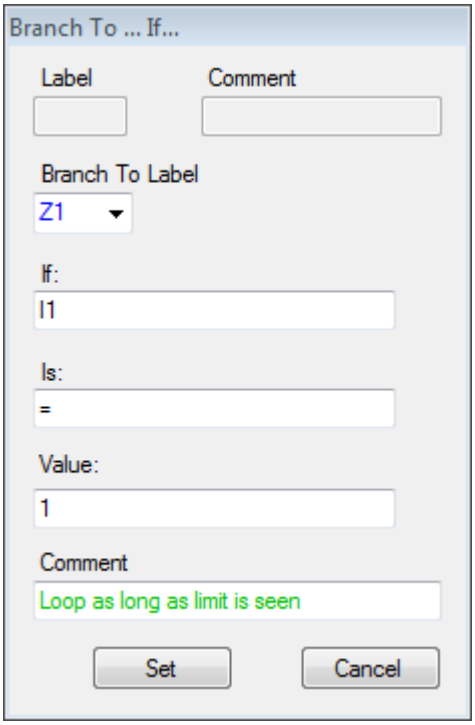


Figure 5.18: Branch to... If dialog

- ▶ In the Editor window, type in Er=0 after the last line of code. This will clear the error set by the Positive Limit being reached.
- ▶ Click the “Set Outputs” button in the I/O frame.
  - ◁ Uncheck the O1 check box.
- ▶ Click “Set”.
- ▶ Click the “Return” button in the Program frame.

- ▶ Repeat the above steps using:
  - ◁ Z2 as a subroutine label.
  - ◁ O2 as the output.
  - ◁ I2 as the trigger input.
- ▶ Everything else will be the same.
- ▶ Click the “End Programming” button

▶ When completed your program should look like what is seen in Figure 5:19.

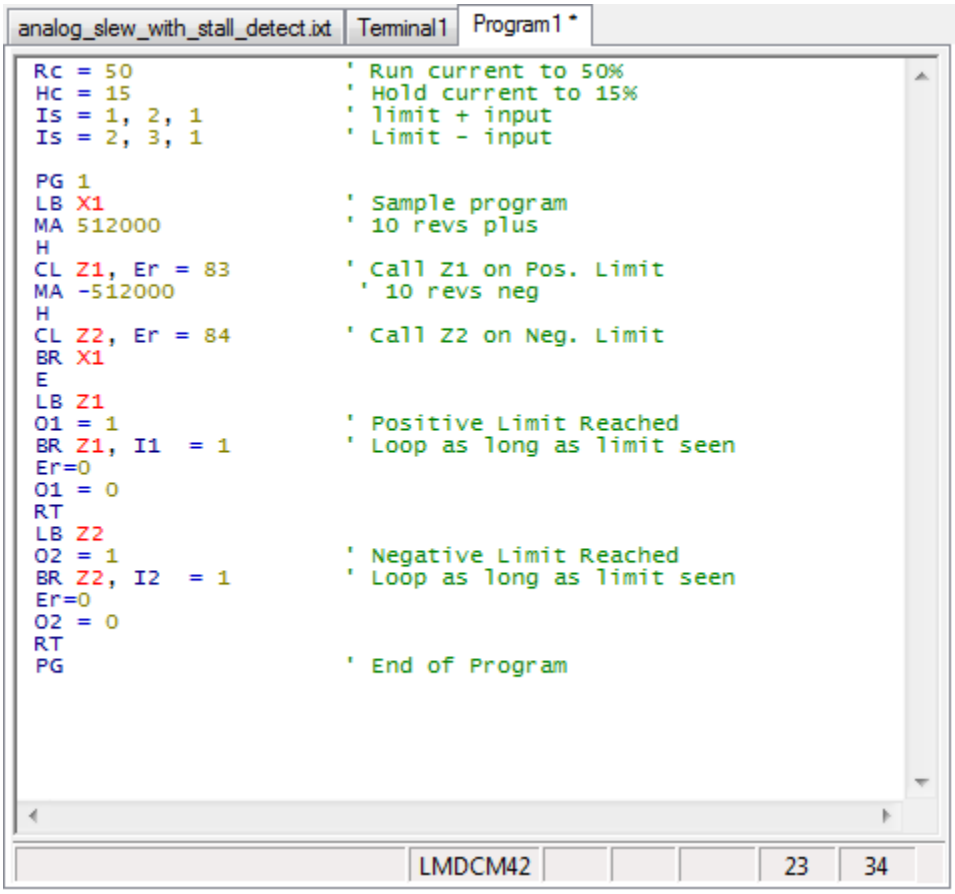


Figure 5.19: Program1

5.4.3 Transfer the program

- The Lexium MDrive must be connected to the appropriate communication Port.
- The port must be open.
- The Lexium MDrive should be in a factory default configuration, which may be accomplished by entering FD in the Terminal tab.

▶ Verify active communication by entering CTRL+C

◁ The sign on message should appear.

Download the program

The following procedure will step you through transferring the program to your device.

▶ Click ⇨Transfer ⇨Download ⇨From: Program1.ixt

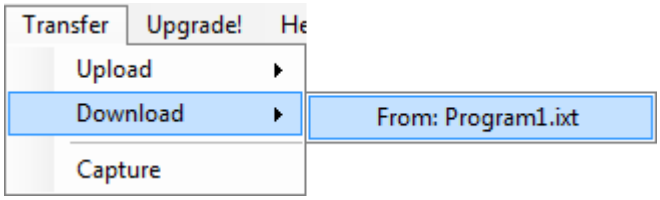


Figure 5.20: Transfer menu

◁ The Download dialog should open.

◁ Leaving Variable and Programs unchecked, click the “Download” button.

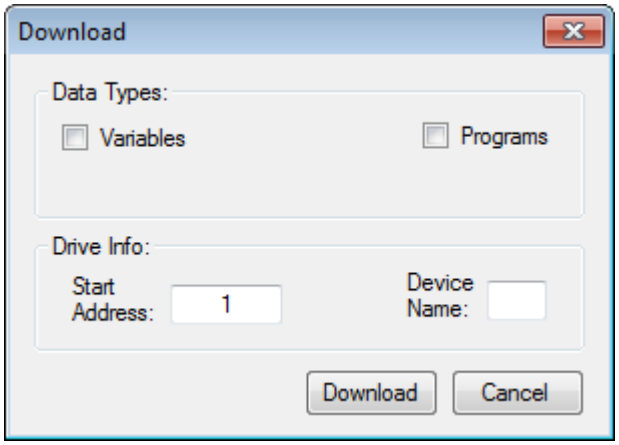


Figure 5.21: Download dialog

▶ The program download will be shown in the terminal (Figure 5.22).

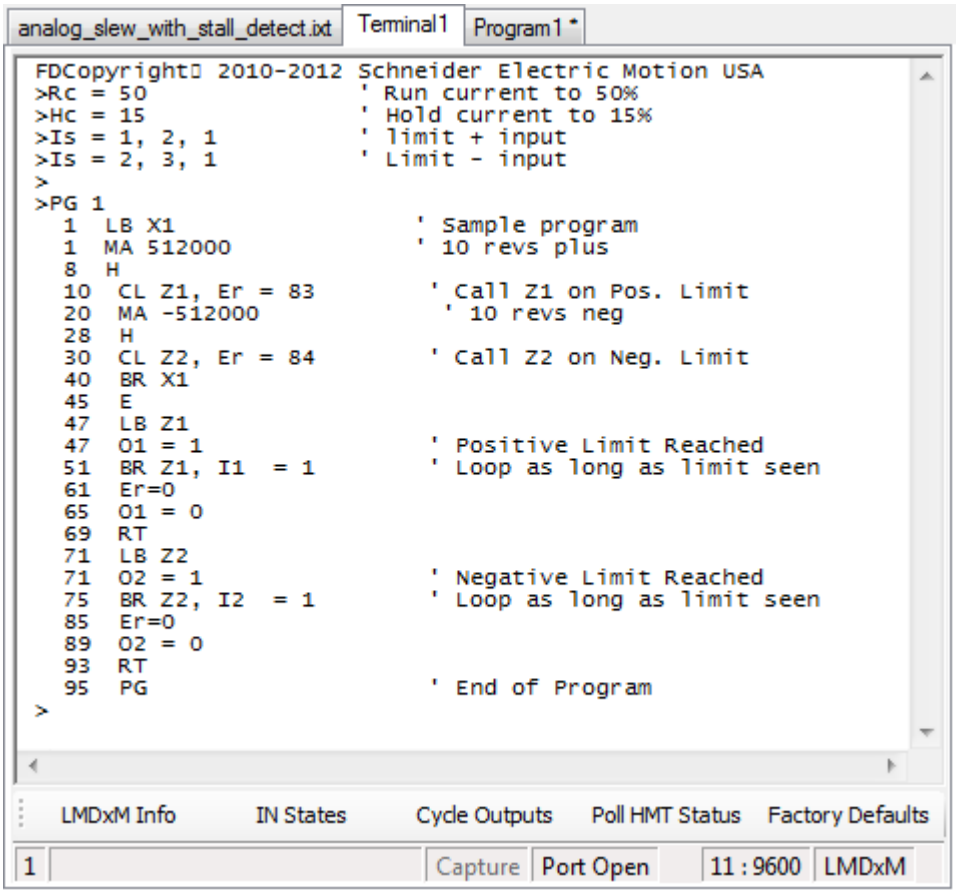


Figure 5.22: Program downloaded to Lexium MDrive

- ▶ As a final step, click into the terminal window and enter the save command by typing in the letter “S” then the enter key.
- ▶ The program is stored in memory and ready to run.

5.4.4 Execute the program

- ▶ To execute the program:
  - ◁ Enter “EX X1” into the terminal.

The motor should begin moving back and forth. When an input switch is activated the appropriate output will activate HIGH, and remain so until the limit is deactivated, whereupon motion will resume.

5.4 Upgrading firmware

Requirements

- Lexium MDrive Software Suite with Motion Control Programmer installed.
- The firmware upgrade *.SEM file
- Lexium MDrive Motion Control, powered and connected to communications,

NOTE: Firmware should be upgrade on an as required basis. Do not upgrade unless the application requires an added feature or unless instructed by Application support.

Once begun the Firmware upgrade process must be completed.

Procedure

▶ Click the tab labeled “Terminal 1”

▶ Enter FD to reset the drive to factory settings.

▶ Click the menu item Upgrade!

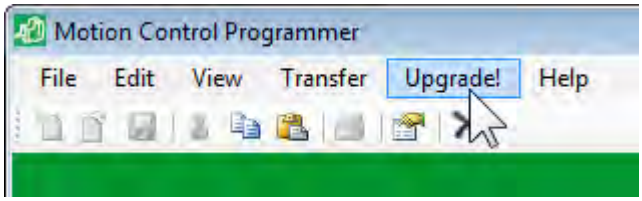


Figure 5.23: Upgrade menu

▶ Select the *.SEM upgrade file from the folder in which it was extracted.

◁ The select file dialog will open.

◁ Select the upgrade file. This file will have a *.SEM extension.

◁ Click “Open”

▶ Verify the desire to upgrade by clicking Update Firmware.

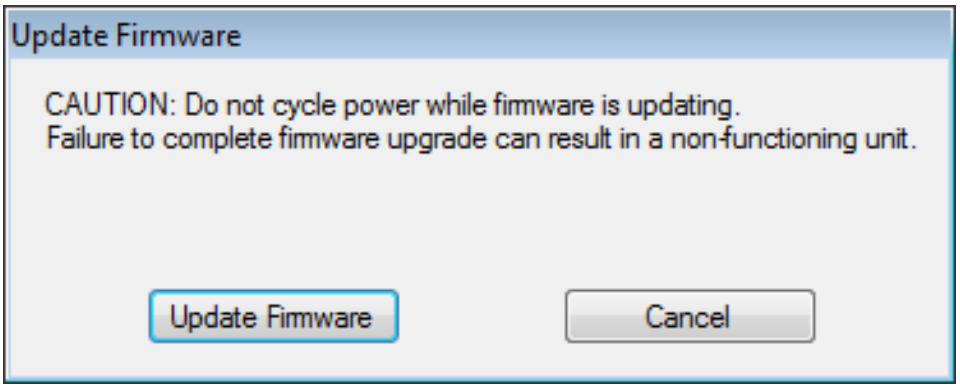


Figure 5.24: Update verification

▶ On the Upgrade LMDx dialog click “Connect”

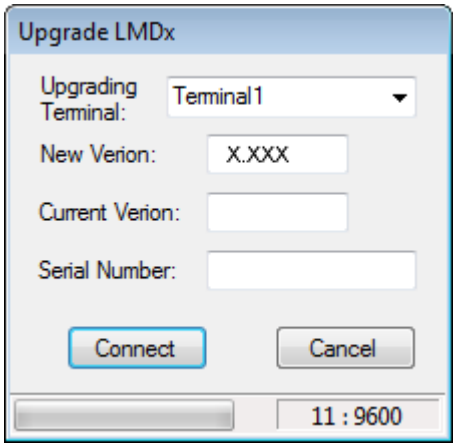


Figure 5.25: Upgrade dialog - Connect

◁ The upgrade utility will attempt to connect to the device.

◁ If connection is successful, the previous version number will appear in the field.

◁ Click “Upgrade”

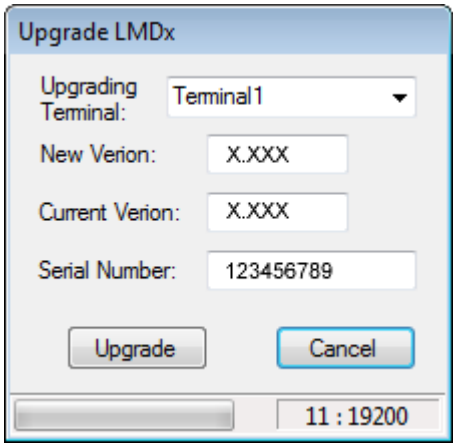


Figure 5.26: Upgrade dialog - Upgrade

▶ The Upgrade process will run. Progress is noted by the green bar on the lower left of the dialog Note that this will take 3-4 minutes

▶ When complete click “Done”

◁ The Lexium MDrive is now ready for use.

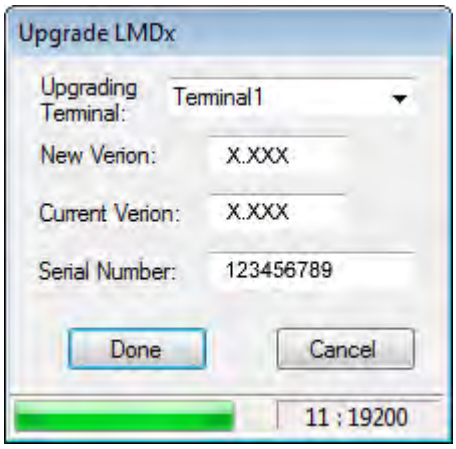


Figure 5.27: Upgrade dialog - Done

5.5 Encoder Remap Utility (Closed Loop models only)

⚠WARNING

UNINTENDED OPERATION

The Lexium MDrive must meet several conditions in order to be remapped successfully.

- The unit MUST be uncoupled from any loads, the shaft MUST be free to rotate in both directions
- Do not remap the encoder unless you fully understand the function.

Failure to follow these instructions can result in death, serious injury or equipment damage.

5.5.1 Remap process

Proper function of the hMT circuitry requires that the precise alignment of the motors rotor and stator be stored in relation to the internal magnetic encoder. This is done at the factory during the manufacturing process and will typically not be required again.

▶ Ensure that the motor shaft is uncoupled and able to move freely in both Clockwise and Counterclockwise directions.

▶ From the “View” menu select “Encoder Remap Utility”.

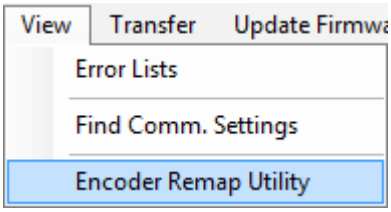


Figure 5.28: Run remap utility

▶ If the motor shaft is free to move in both directions, click OK.

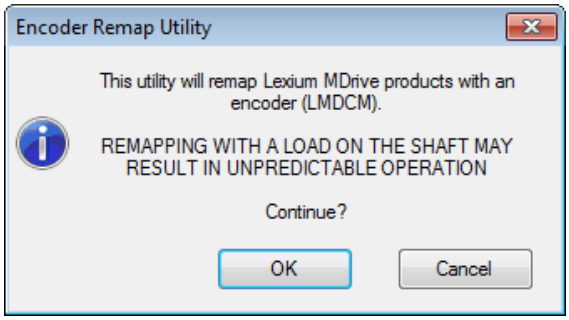


Figure 5.29: Verify motor shaft uncoupled from loads and free to move

▶ The software will verify that the device is communicating. Click OK.

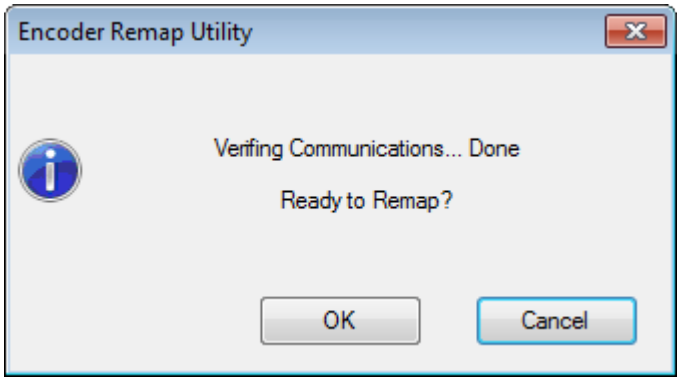


Figure 5.30: Verifying communications

▶ Once communications is verified, acknowledge the understanding the motion will occur by clicking OK.

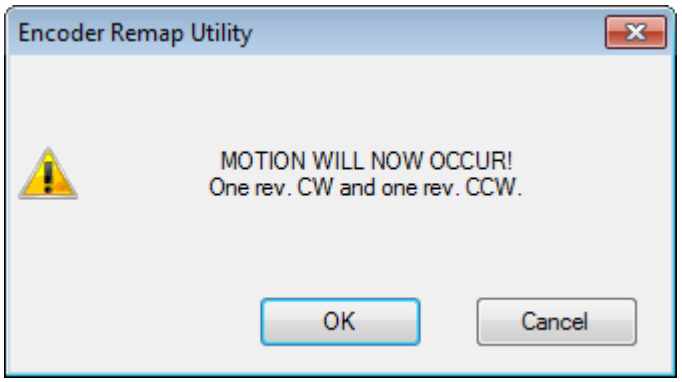


Figure 5.31: Motion will occur notice

◁ The motor will turn one revolution clockwise, then one revolution counter-clockwise.

◁ The device has been successfully remapped.

◁ Should remap fail: contact the factory.

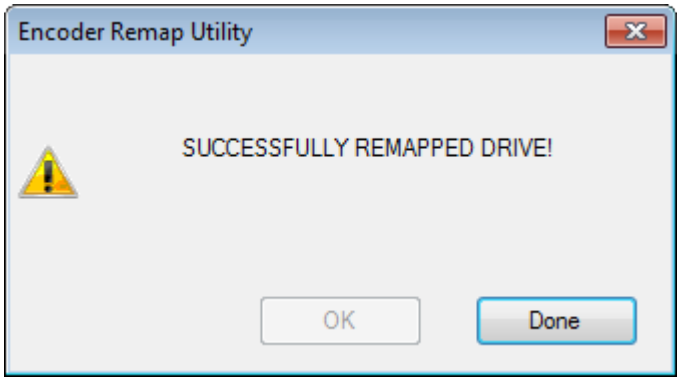


Figure 5.32: Remap successful

5.6 Motion Analyzer Utility

The motion analyzer is a graphing tool that allows the user to plot a move and quickly obtain data on that move, them make adjustments to the optimize the motion variables such as acceleration/deceleration, initial and maximum velocity

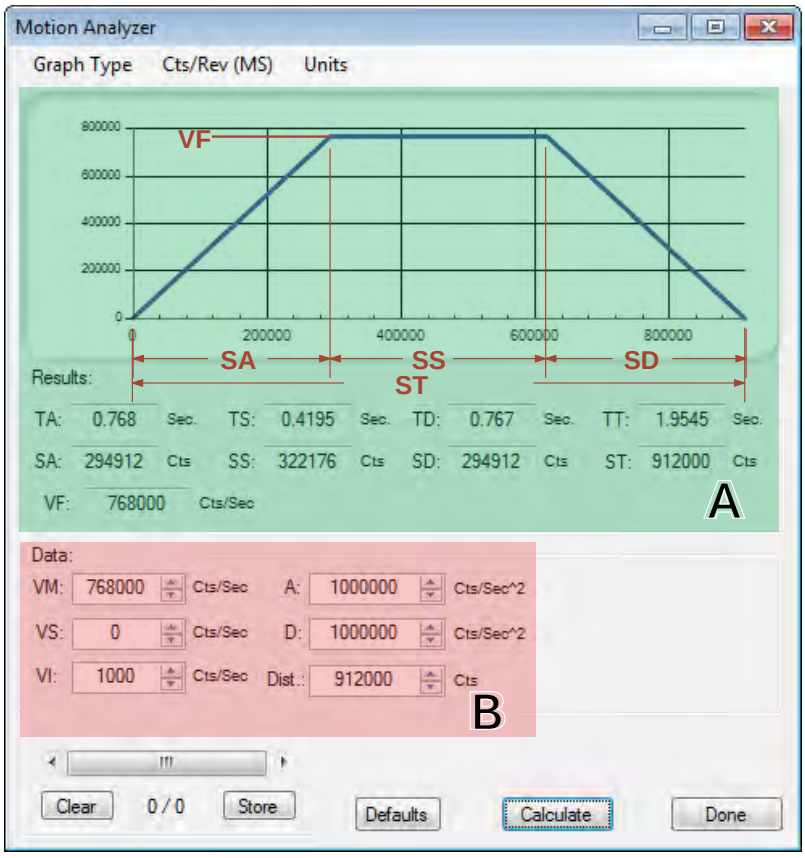
Moves may be shown in three types of graph:

1) Velocity vs position.
2) Velocity vs time.
3) Position vs time.

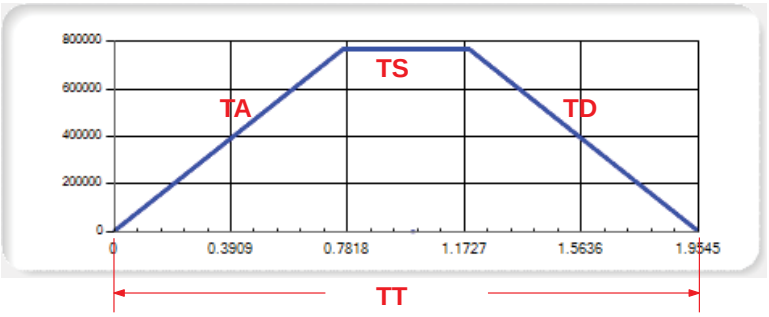
The user may also select the units for the move, either in counts (Steps), shaft revolutions or degrees.

The motion analyzer utility functions independently of either the terminal program editor tabs,

Velocity vs Position



Velocity vs Time



Position vs Time

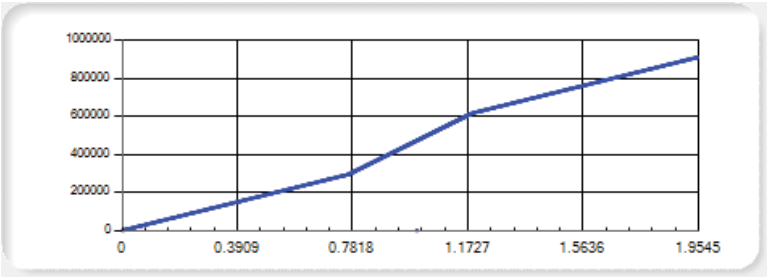


Figure 5.33: Motion Analyzer Utility

A — Motion analyzer plot, contains the graph, which may be viewed as velocity over position, velocity over time, or position over time, and a detailed analysis of the move.

The detailed values (read only) are:

TA	Acceleration time in seconds.
TS	Slew time in seconds (time at the max velocity of the move).
TD	Deceleration time in seconds.
TT	Total time of the move in seconds.
SA	Acceleration distance in selected unit (counts/ degrees/revs).
SS	Slew distance in the selected unit.
SD	Deceleration distance in the selected unit.
ST	Total distance in the selected unit.
VF	Maximum shaft velocity achieved during the move.

B — Input data, these values represent the MCode motion variable which would be set in a motion profile in a program.

Note that while these may be entered into the analyzer in revolutions or degrees, they will need to be converted back to counts before being entered into a program, or the appropriate mathematics included as part of the program's global variables.

They are:

VM	Maximum velocity.
VS	Initial velocity for a move-on-move (this is not an MCode variable).
VI	Initial velocity.
A	Acceleration.
D	Deceleration
Dist	Move distance commanded by a MA (move absolute) or MR (move relative).

Table 4.7: Motion analyzer screen

Accessing the motion analyzer

Menubar:

▶ Click the menubar item: View ⇨ Motion Analyzer

6 Ethernet TCP/IP Configuration Utility

6

⚠WARNING

LOSS OF CONTROL

The product is unable to detect an interruption of the network link

- Verify that connection monitoring is on.
- The shorter the time for monitoring, the faster the detection of the interruption.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠WARNING

UNINTENDED OPERATION

The product is unable to detect an interruption of the network link

- Do not write values to reserved parameters.
- Do not write values to parameters unless you fully understand the function.
- Run initial tests without coupled loads.
- Verify that the system is free and ready for the movement before changing parameters.
- Verify the use of the word sequence with fieldbus communication.
- Do not establish a fieldbus connection unless you have fully understood the communication principles.

Failure to follow these instructions can result in death, serious injury or equipment damage.

6.1 Installation

The Ethernet TCP/IP Configuration Utility is installed via the Lexium MDrive Software Suite startup window.

This section assumes the Software Suite has been installed and is ready to use. If this has not been accomplished please follow the instructions in Section 3 of this document.

6.1.1 Install the Ethernet TCP/IP Configuration Utility module

▶ Launch the Lexium MDrive Software Suite

▶ On the left pane of the start-up screen, click the button labeled “Install Lexium MDrive Ethernet Interface.”

◁ The installation wizard dialog will appear:

▶ Follow the prompts to complete the installation

◁ The button on the start-up screen will now be labeled “Launch Lexium MDrive Ethernet Interface”.

■ Note on Windows Firewall: A dialog may pop up during the installation process requesting access through Windows Firewall. Activate the check boxes through all networks to allow access.

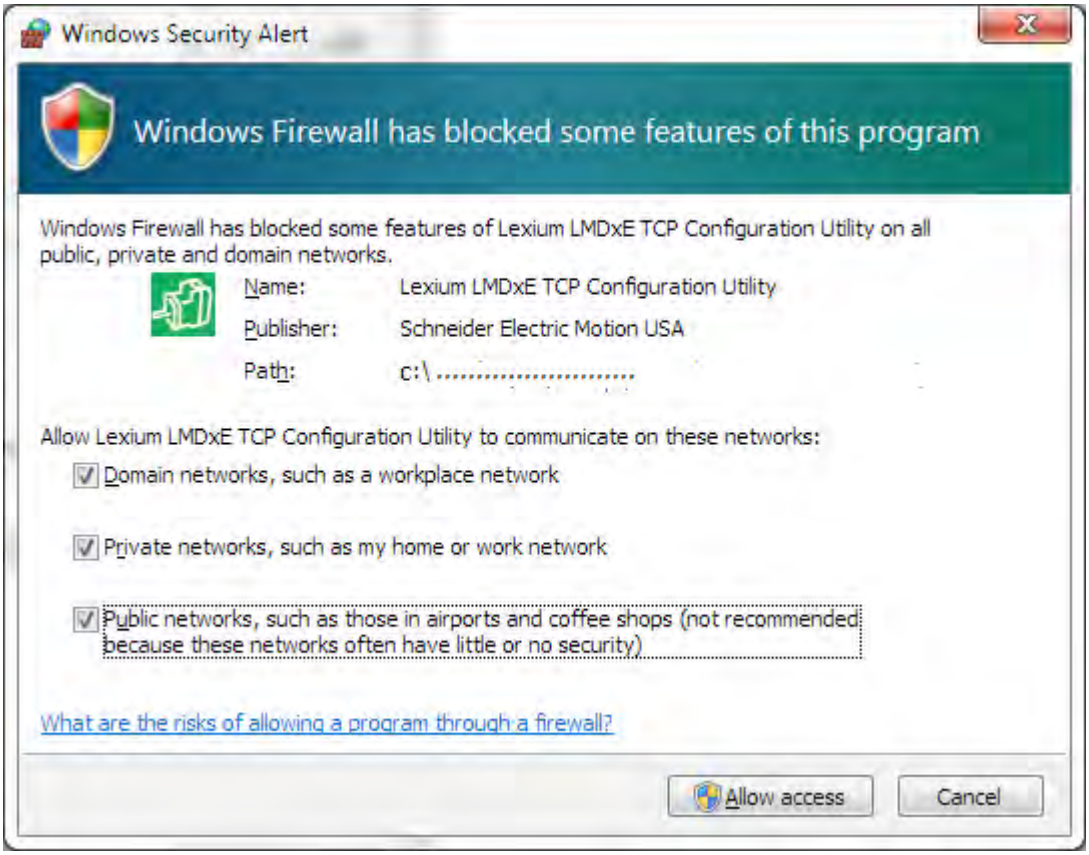


Figure 6.1: Windows Firewall alert

6.2 Configuration screen overview

The configuration tab will be the default tab that opens when the program launches. This tab is key to the configuration of the device. The remaining tabs are geared toward functional testing and custom mapping of the EtherNet/IP assembly object and Profinet IO registers.

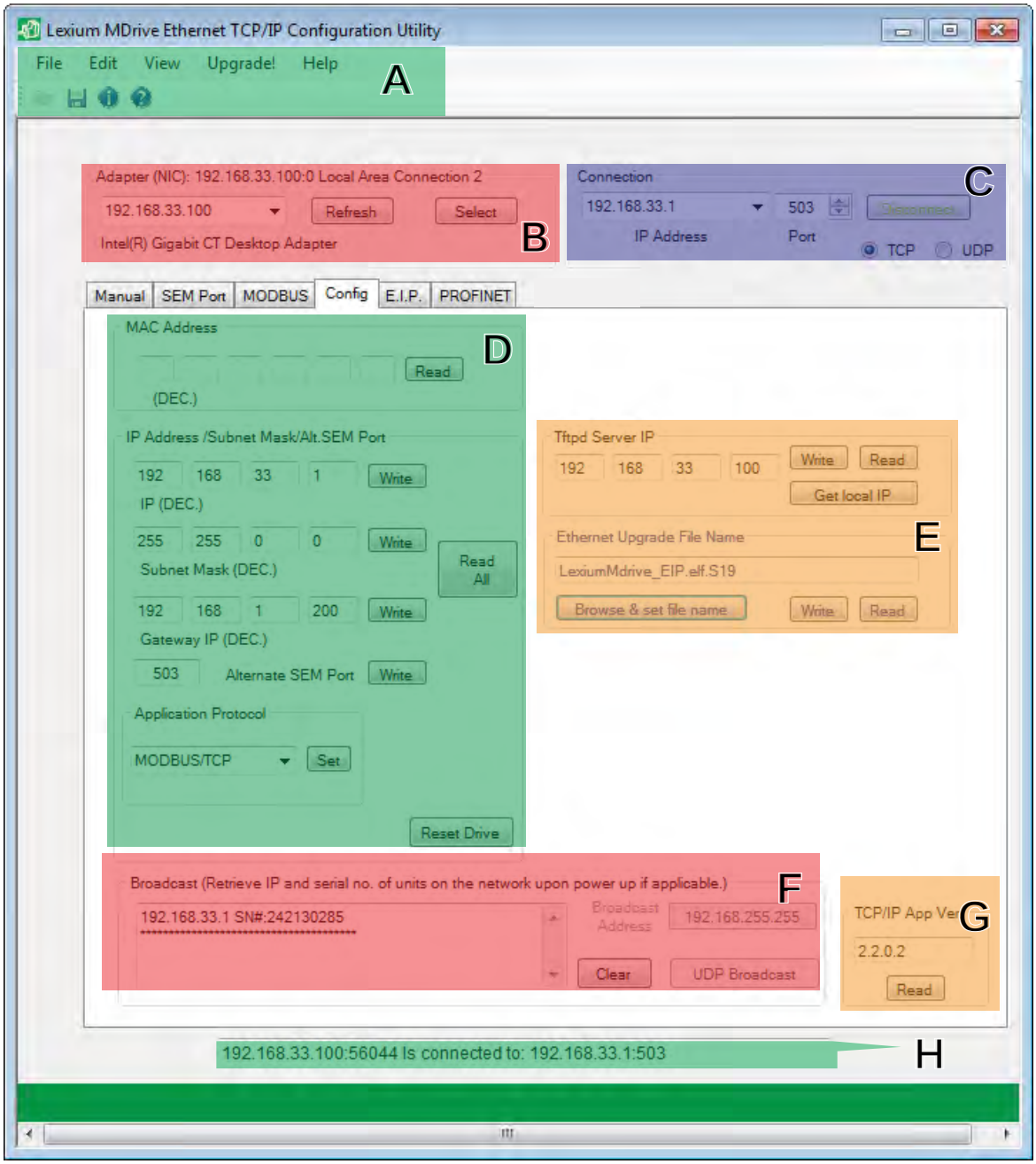


Figure 6.2: Configuration tab

A - Menu and button bar

Used for standard windows file operation functions such as creating, opening and saving files. Setting and changing preferences, as well as transferring files to and from a connected Lexium MDrive.

6.2.1 Configuration tab sections

The configuration tab is grouped into containers for the various configuration functions.

B - NIC adapter selection

Container used to select the network adapter connected to your Lexium MDrive Ethernet product. We recommend installing a secondary adapter card on your PC, or using a laptop not connected to a corporate network to commission the device to the required IP and SUBNET mask.

C- Connection

Once selected, the software will scan the network adapter for connected devices. The default settings for the Lexium MDrive Ethernet are:

- IP: 192.168.33.1
- Port: 503 (Port 503 is the default SEM/Configuration port)
- Subnet mask: 255.255.0.0

D - Base configuration

The fields in this container set the basic configuration parameters for the device such as:

- IP address
- Subnet mask
- Gateway address
- Alternate SEM configuration port
- Application selection (EtherNet/IP or MODBUS/TCP) by default the application protocol is EtherNet/IP

E - Firmware upgrade server

The Ethernet Controller firmware is upgraded using a local installation of Tftpd server to send the new firmware to the device.

NOTE: The firmware updated using this utility is strictly for the Ethernet Network Interface controller of the Lexium MDrive and EtherNet/IP and MODBUS/TCP applications. The firmware for the Motion Controller is a separate package and us upgraded using the Motion Control Programmer program.

See Section 5 of this document.

F - Broadcast

UDP Broadcast will send a UDP request over IP 255.255.255.255 and will return the IP address and serial number of all Lexium MDrive products located on the network.

The Lexium MDrive Ethernet will also broadcast it's IP address upon power up (TCP Application version 2.2.0.2 or greater).

V1.00, 05.2015

G - Status bar Connection status will display here.

H - Application version Displays the version of the Ethernet controller firmware, EtherNet/IP and MODBUS/TCP applications.

6.3 Base configuration of the device

6.3.1 Connect to the device using the SEM factory defaults

- ▶ Launch the TCP/IP Configuration Utility
- ▶ Select the Adapter (NIC) to which the Lexium MDrive Ethernet is interfaced to. Click select. The refresh button may be used if the NIC IP is not shown on the dropdown.

  Once selected, the NIC information will display above and below the selector as shown in Figure 6.3.

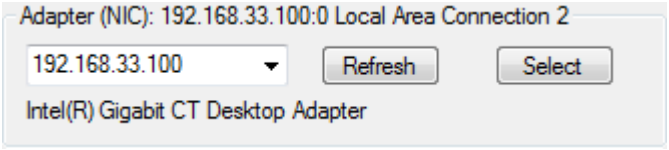


Figure 6.3: Select the adapter (NIC)

- ▶ In the container labeled “Connection” ensure that the default IP Address, 192.168.33.1 is visible in the dropdown and 503 in the port field.

  Click the “Connect” button. Connection active status will be indicated by the button text turning green, and the status bar showing a connected status.

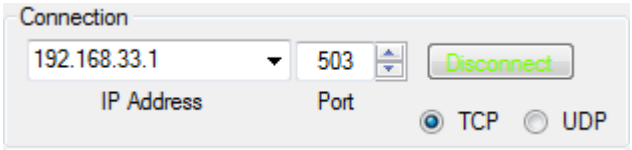


Figure 6.4: Connection container

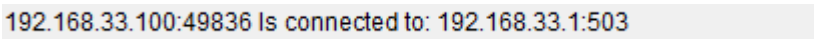


Figure 6.5: Connected status

- ◁ The device should be connected and is ready for configuration of basic parameters.

6.3.2 Configuring the base parameters

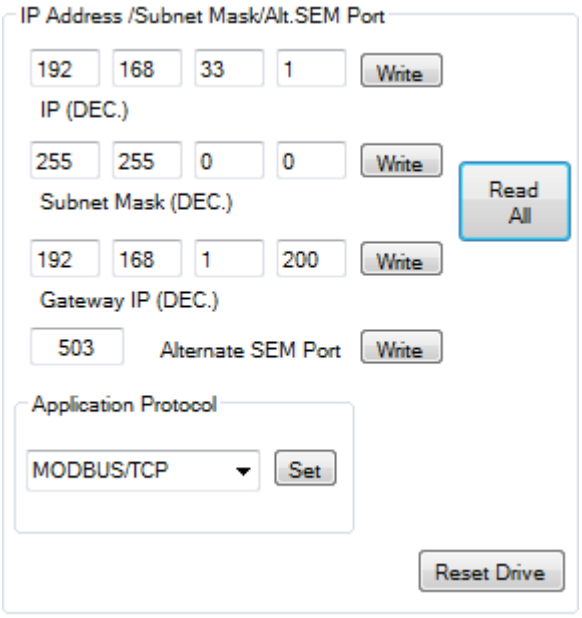


Figure 6.5: IP Address/Subnet Mask container

NOTE: The IP address, Subnet Mask and Gateway Address settings may be dependant on the network architecture within your company network. Assistance from your IT department may be required when configuring the TCP/IP parameters of this device!

If your network configuration is outside the IPv4 Private Network block (192.168.0.0 — 192.168.255.255) a second NIC should be installed onto the machine being used to configure the device.

- ▶ Enter the IP address to the desired IP. Click “Write”.
- ▶ Set the Subnet Mask to the desired mask. Click “Write”.
- ▶ Set the appropriate Gateway IP. This will only be used if your device will be in a building or systems where several networks are present.
- ▶ If desired, an alternate port can be entered to use the device as a programmable controller using MCode/TCP.
- ▶ Disconnect from the device by clicking “Disconnect” in the Connection container.
- ▶ Click the “Reset Drive” button (TCP Application 2.2.0.2 or greater) or cycle power to the device.
- ▶ Select the new IP address in the Connection container and click “Connect”.
  - ◁ The status bar should give connected information to the new IP address.

6.3 Application selection

Lexium MDrive Ethernet

The Lexium MDrive Ethernet features three applications or modes of operation:

- EtherNet/IP
- MODBUS/TCP
- Profinet IO
- MCode/TCP

By default the EtherNet/IP application is loaded on the device.

MCode/TCP is always available on TCP port 503 regardless of the loaded application..

To change the Ethernet Application:

▶ Select the desired application in the Application Protocol drop-down.

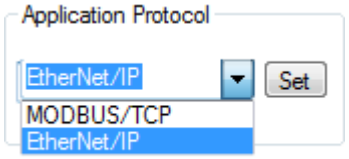


Figure 6.6: Application Protocol selection

▶ Click “Set”.

▶ Click the “Reset Drive” button (TCP Application 2.2.0.2 or greater) or cycle power to the device.

◁ Upon re-connection, the selected application protocol will be available.

Lexium MDrive Profinet

The Lexium MDrive Profinet features two applications or modes of operation:

- Profinet IO
- MCode/TCP

The Profinet application is automatically selected. MCode/TCP is connected on Port 503

6.3.1 EtherNet/IP application settings

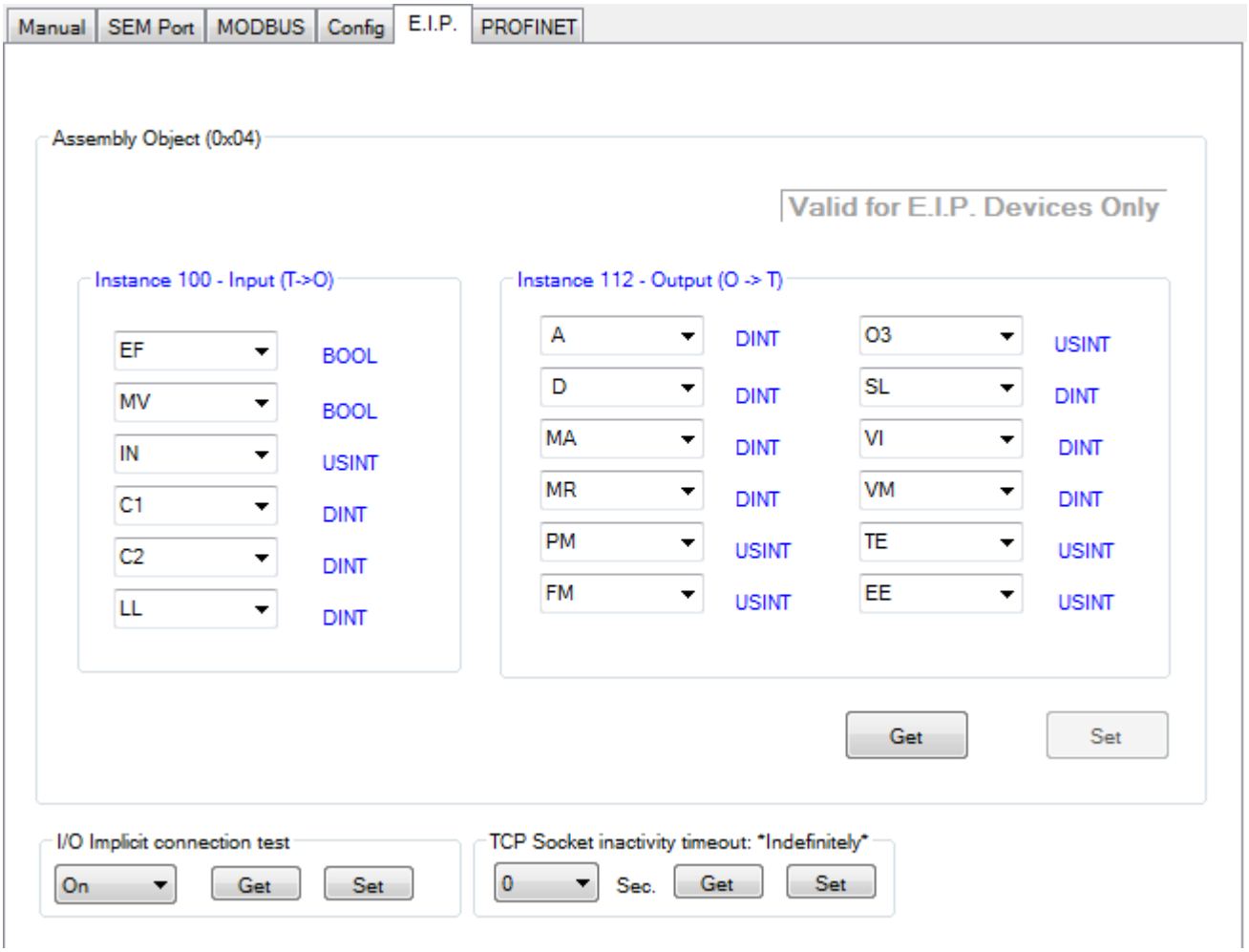


Figure 6.7: Mapping the EtherNet/IP Assembly object

The EtherNet/IP configuration options contained in the TCP/IP Configuration Utility is variable mapping of the EIP assembly object.

The I/O implicit connection test is used to configure the Lexium MDrive for use with PLC's such as the ControlLogix 1400, which are not capable of Implicit messaging. The Assembly object mapping is ignored by such PLC's.

Note that mapping changes must be reflected in the PLC setup to be valid.

See the EtherNet/IP Fieldbus Manual for Lexium MDrive for Manufacturer supported objects and PLC setup information.

This document is available online at:

http://motion.schneider-electric.com

6.3.2 MODBUS/TCP application setting and functional test

Setting the MODBUS/TCP protocol

▶ Select the MODBUS/TCP application in the Application Protocol dropdown.

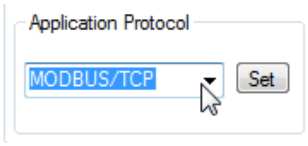


Figure 6.8: MODBUS/TCP Application Protocol selection

▶ Click “Set”.

▶ Click the “Reset Drive” button (TCP Application 2.2.0.2 or greater) or cycle power to the device.

◁ Upon re-connection, the MODBUS/TCP application protocol will be available.

◁ Connect to IP.ADDRESS:502 (TCP Port 502) to use the MODBUS/TCP application.

Functional testing of MODBUS/TCP

▶ With the MODBUS/TCP application protocol loaded, connect to your device’s IP address on TCP Port 502.

◁ Click the MODBUS tab to access basic MODBUS/TCP Functions.

◁ With the Device ID tab visible, click the “Read” button to read the device ID (0x2B) Object data. See Figure 6.9.

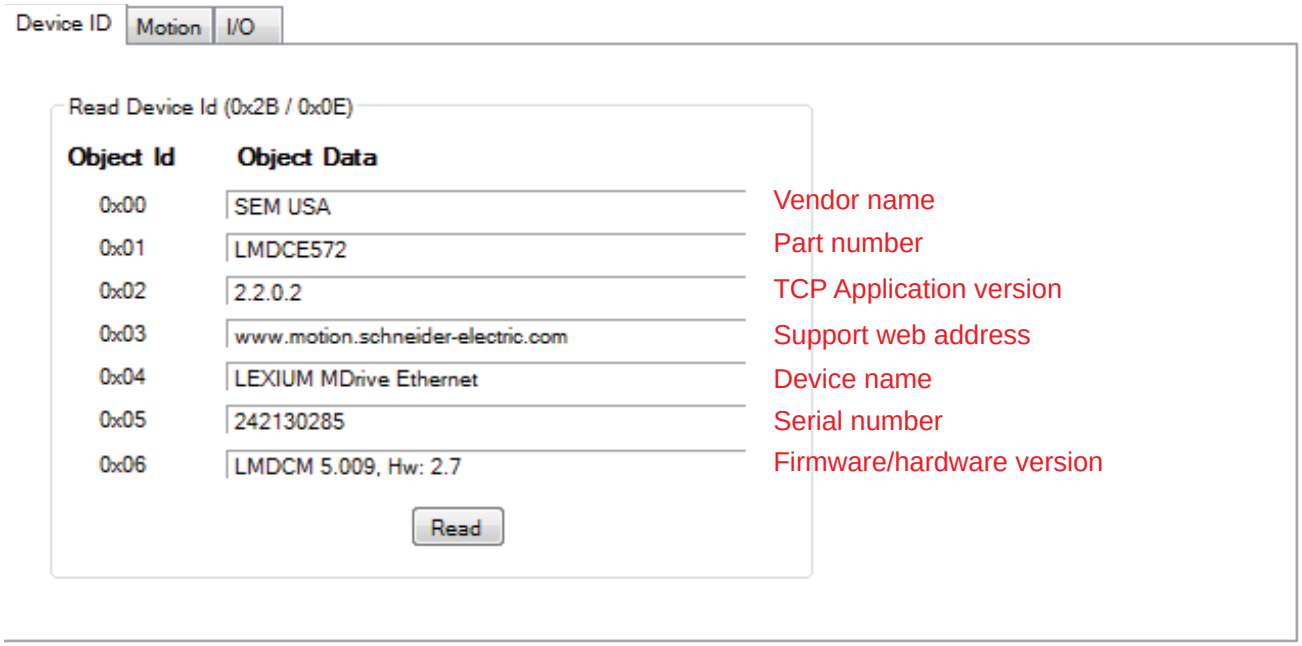


Figure 6.9: Lexium MDrive MODBUS/TCP Device ID object

▶ Select the “Manual” tab.

◁ This tab displays the raw MODBUS data that was read from the device. In this case, the Device ID Object data which was just read using the MODBUS tab.

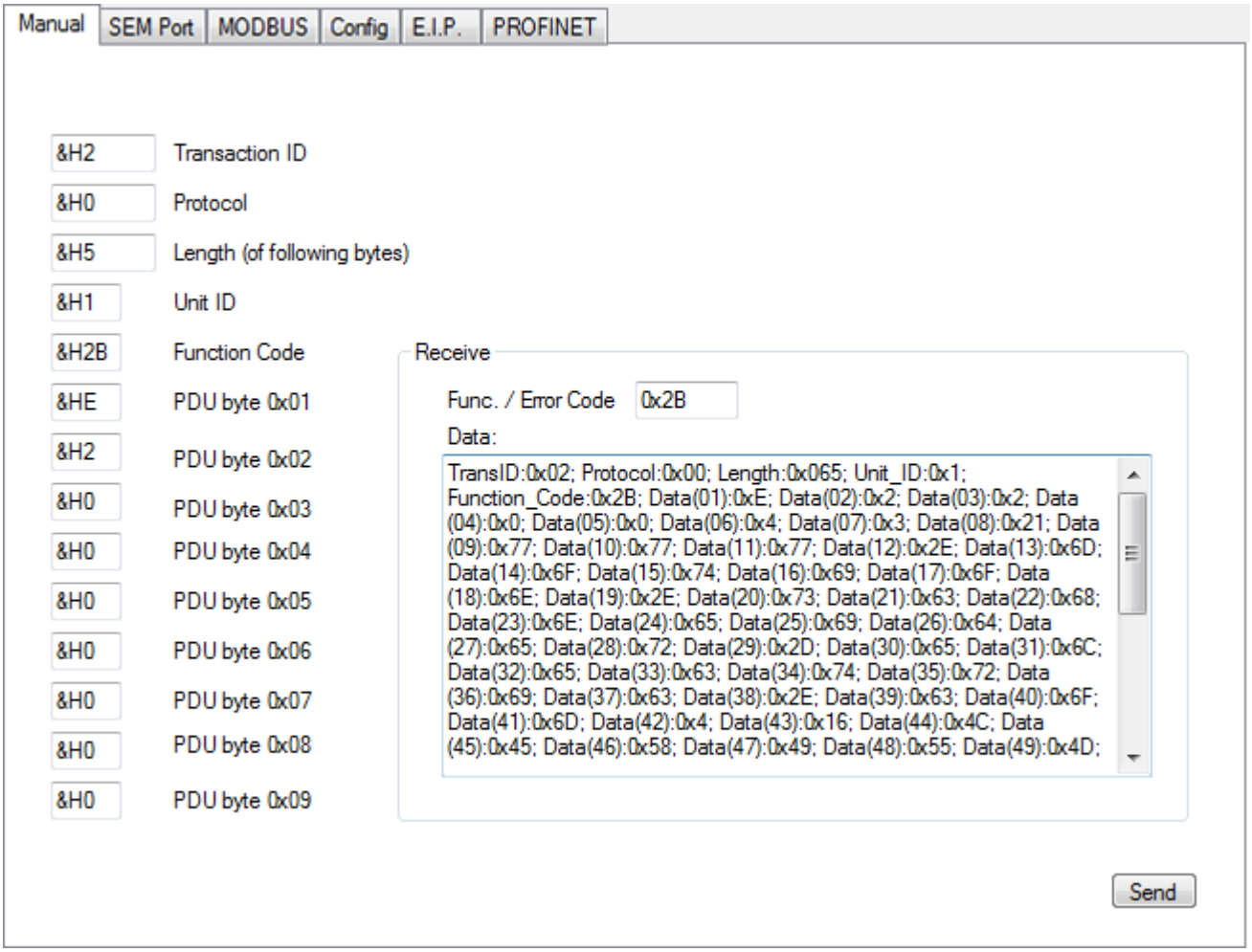


Figure 6.10: Lexium MDrive MODBUS/TCP Device ID data in raw form

Additional MODBUS/TCP functional tests may be exercised using the MODBUS and Manual tabs of the TCP/IP Configuration Utility.

The MODBUS ⇨ Motion tab can be used to read/write a number of Motion variables and perform relative and absolute point-to-point moves, or slew the axis at a specified velocity.

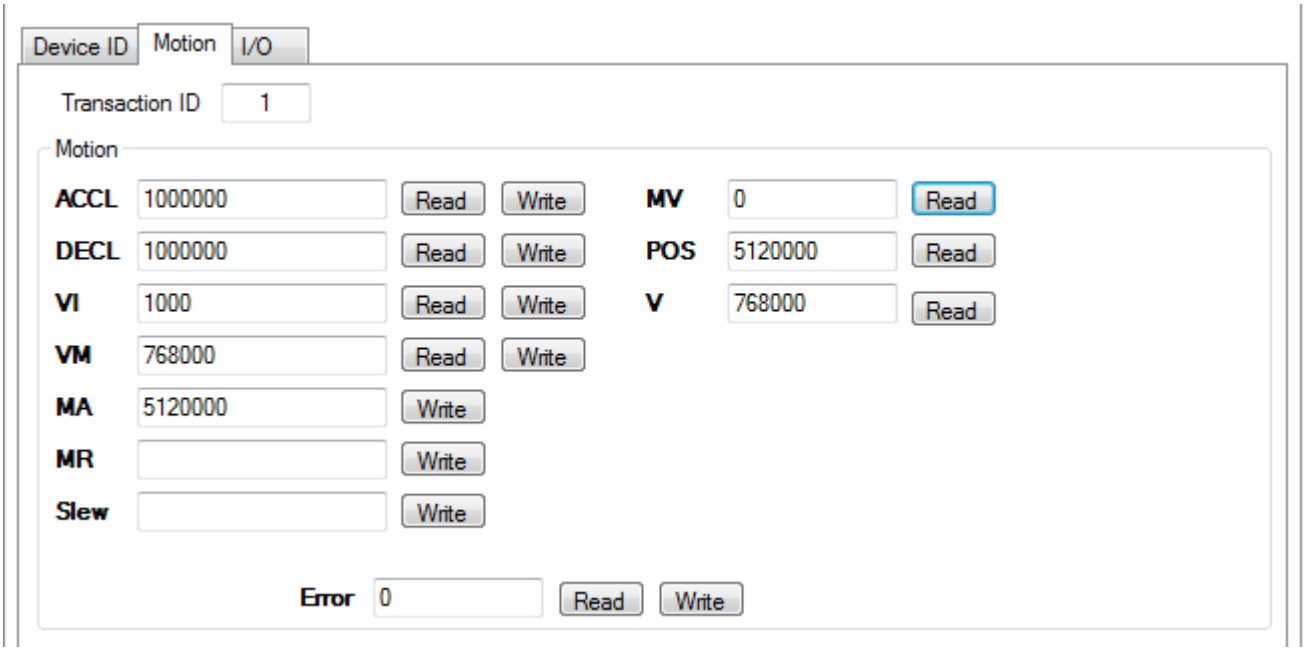


Figure 6.11: Lexium MDrive MODBUS/TCP Motion tab

To test a move:

- ▶ Enter 51200 0 in the MA field.
- ▶ Click “Write”.
  - ◁ The axis should move ten revolutions in the positive direction.

The MODBUS ⇨ I/O tab can be used to read the state of inputs and write the state of outputs.

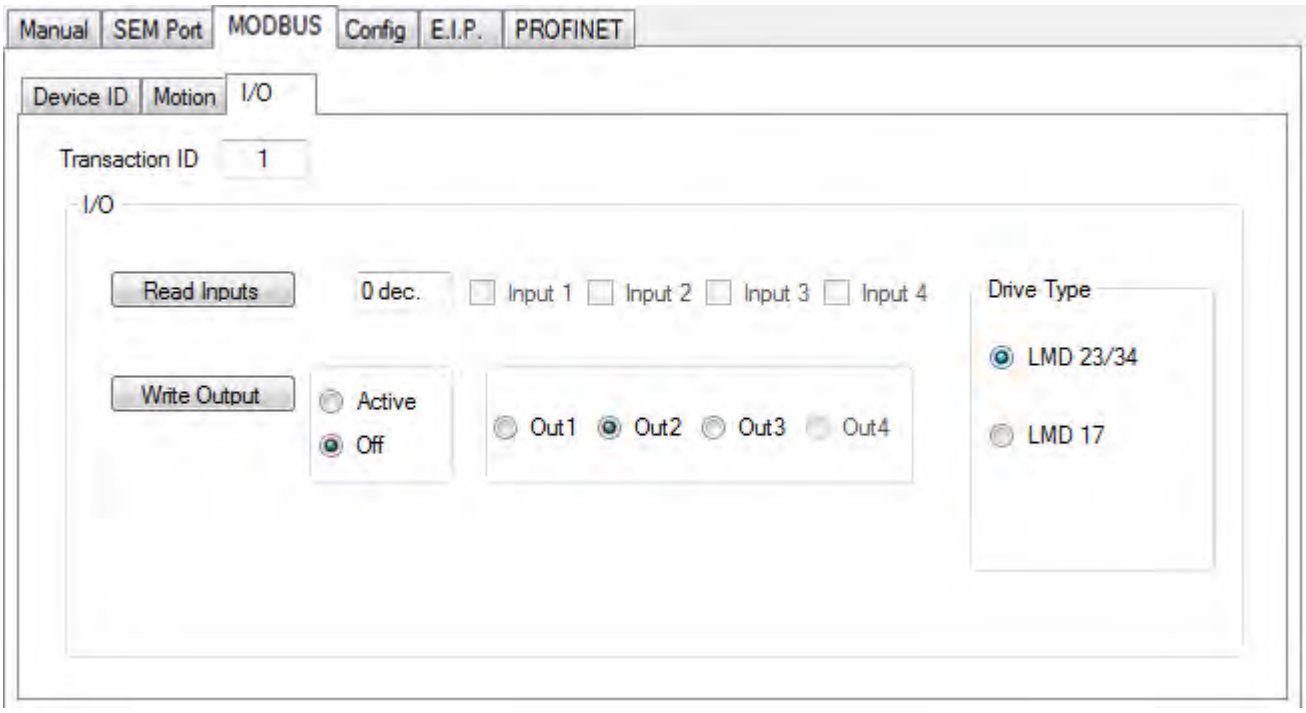


Figure 6.12: Lexium MDrive MODBUS/TCP I/O tab

To test an I/O point:

▶ Click “Read Inputs”

◁ The binary-coded-decimal state of the inputs will be read to the text field, The active inputs will be checked..

The MODBUS/TCP protocol

For information on the function codes associated with MODBUS/TCP, see the MODBUS/TCP Fieldbus Manual, available online at:

http://motion.schneider-electric.com

6.3.3 MCode/TCP application functional test

MCode/TCP is always available on TCP port 503 regardless of the installed specialty application protocol.

Functional testing via the TCP/IP Configuration Utility uses the SEM Port tab of the program. The tab features a simple Terminal emulator and will only function if TCP port 503 is connected.

To test the functionality of MCode:

- ▶ Connect to the Lexium MDrive product using IP.ADDRESS:503.
- ▶ Open the SEM Port tab.
- ▶ Click into the bottom text area.
- ▶ Key in CTRL+C on your keyboard.
  - ◁ The copyright sign on message should appear in the terminal area on top.
  - ◁ You may run MCode/TCP commands directly from this terminal.

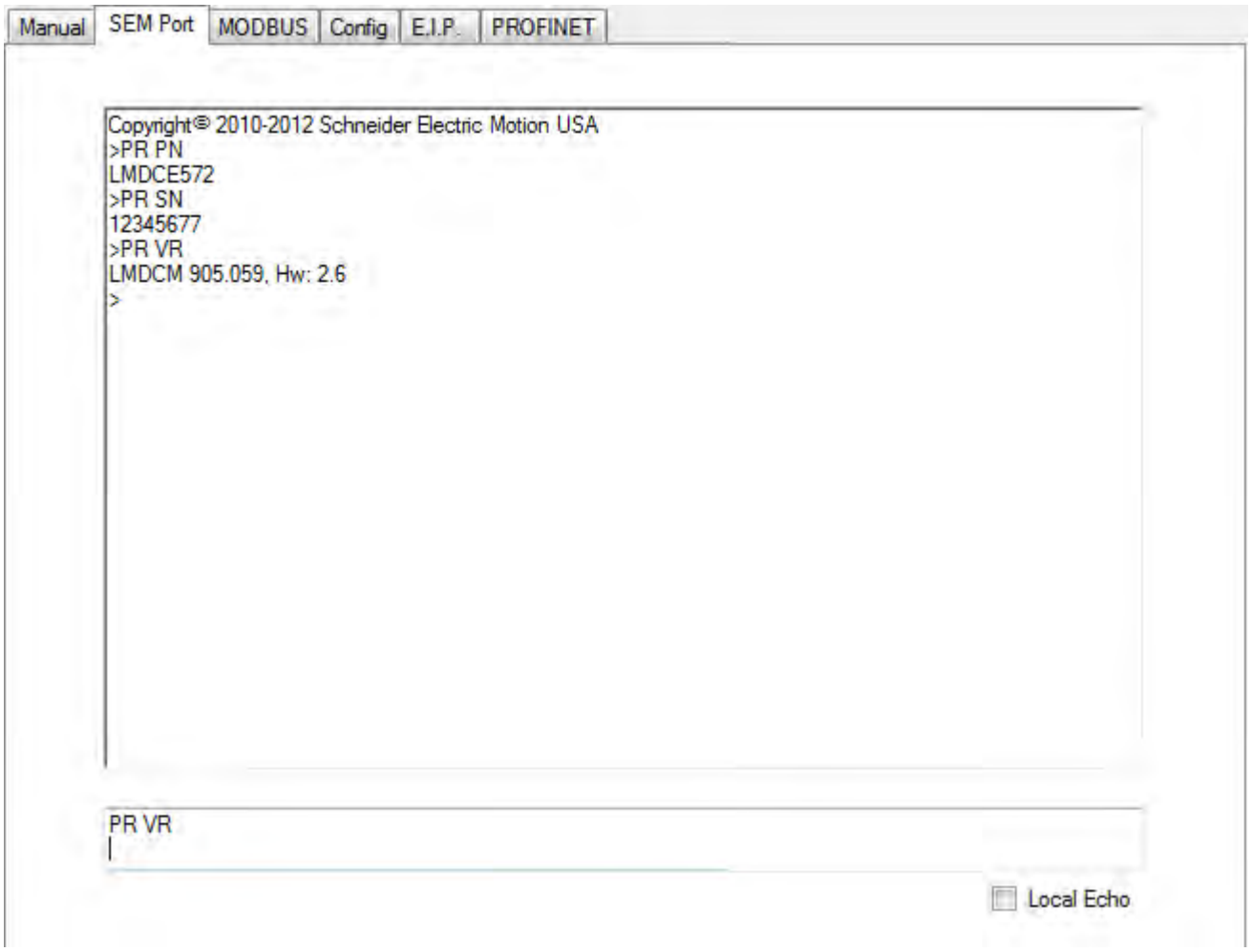


Figure 6.13: Lexium MDrive SEM Port tab

Once configured ad tested for MCode/TCP usage the device may now be programmed using the Motion Control Programmer Software Application available as part of the Lexium MDrive Software Suite.

For MCode Programming and Reference, please see the Lexium MCode Programming and Reference Manual, available online at:

http://motion.schneider-electric.com

6.4 Mapping the Profinet IO registers

Profinet IO features 38 output registers and 34 input registers. These registers are by default mapped to corresponding MCode mnemonics and can be remapped or set to NULL for increased speed and response time.

As with EtherNet/IP The Profinet Lexium MDrive is configured using the TCP/IP Configuration utility, but cannot be exercised without an appropriate PLC.

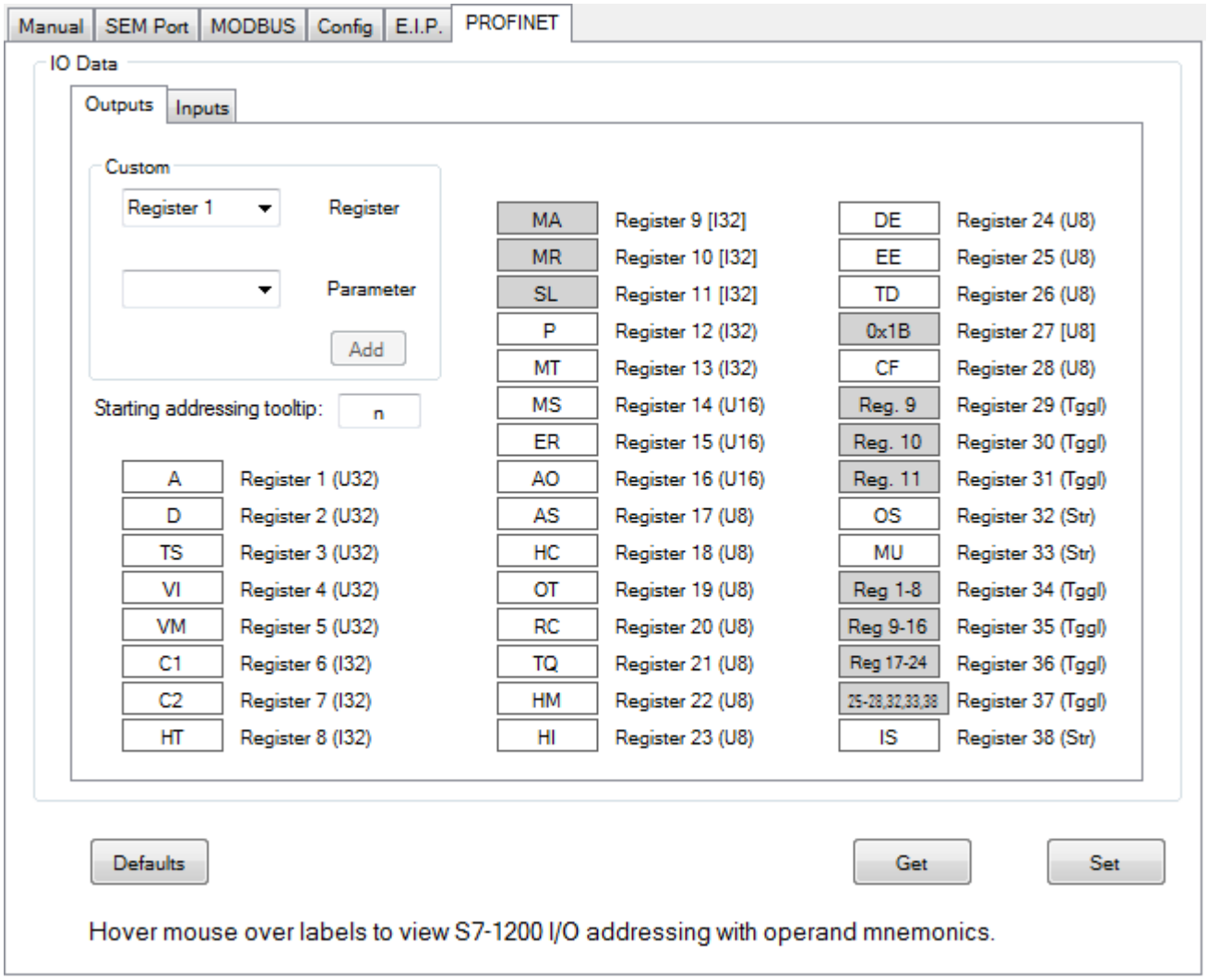


Figure 6.14: Profinet IO output mapping

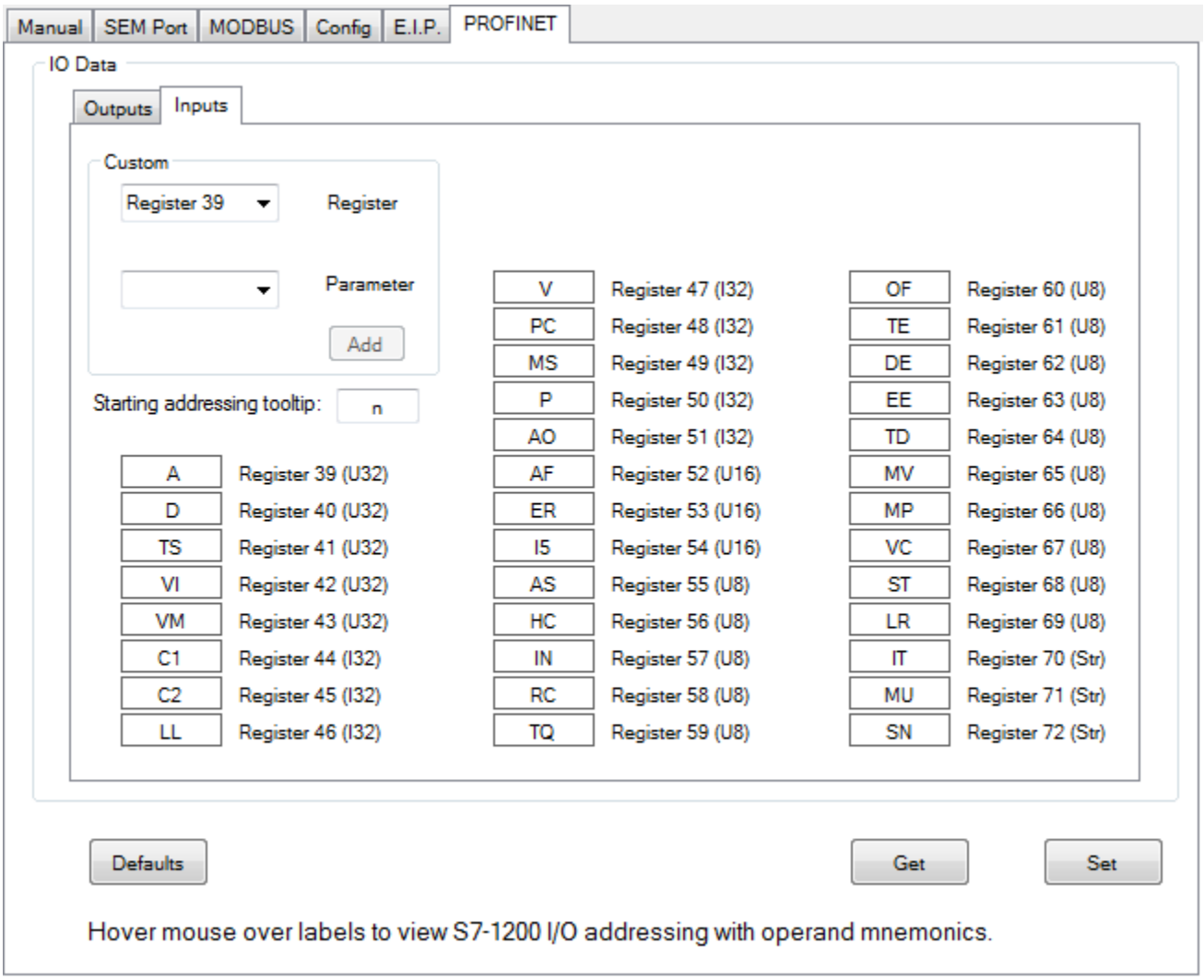


Figure 6.15: Profinet IO input mapping

6.4.1 Change parameter mapping

Each IO register, with the exception of the registers in gray fields, may be remapped to a desired parameter or set to a NULL state based on the parameter data-type.

To change mapping:

- ▶ Select the Register number you wish to re-map
  - ◁ The second dropdown will populate with the available parameters.
- ▶ Select the desired parameter or NULL
- ▶ Click ADD.

Tip: Only set the registers for the parameter's required by you application, set the remaining registers to NULL. This will reduce the time required to cycle the values.

6.4.2 Asserting a SAVE command

(LMD Software Suite version 1.0.1.3 above)

The SAVE (MCode “S”) command may be mapped to any single bit register (Output registers 24-26 or 28).

When one of these registers is configured as the save, it is important to note that the save process takes approximately 1000 mS to process, during which time the device will not respond to other IO communications.

When using the option, the register mapped to “Save” should only be asserted for 500mS, then de-asserted by the master PLC/.

When mapping the SAVE command to a register the TCP/IP Conigration Utility will launch the following warning dialog:

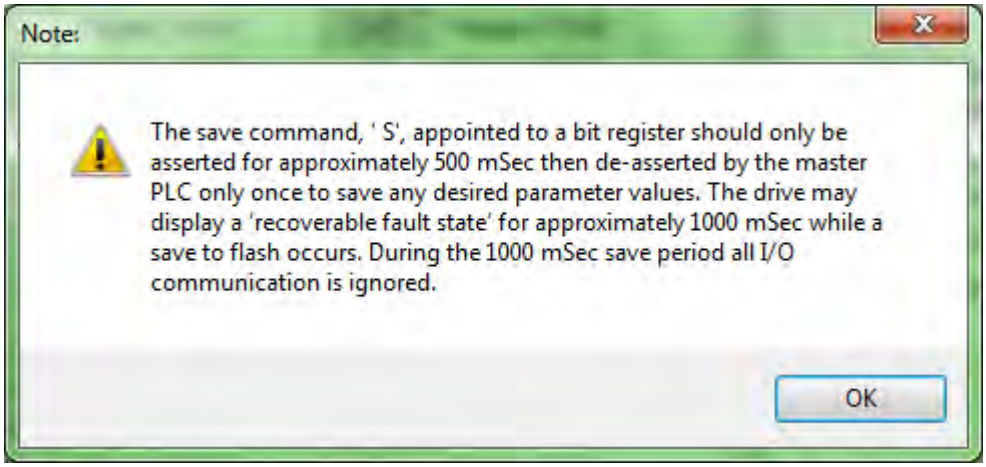


Figure 6.16: Mapping the SAVE command warning.

6.5 Upgrading the application firmware and application code

CAUTION

APPLICATION FIRMWARE UPGRADE PROCESS

The steps of this process must be completed in sequential order as instructed or the device may become unable to communicate.

- Follow all instructions in this section as instructed.
- Do not update the application firmware unless directed to by SEM applications support.

Failure to follow these instructions can result in equipment damage.

NOTE: In this context the term "Application Firmware" applies ONLY to the Ethernet controller firmware containing the EtherNet/IP and MODBUS/TCP application code.

It DOES NOT apply to the Lexium MDrive Firmware. Upgrading the Lexium MDrive Firmware is accomplished using the Motion Control Programmer Software Application.

NOTE: Windows Firewall MUST be configured to allow inbound and outbound traffic on UDP port 69 in prder to perform the upgrade.

See Application Note: Windows Firewall configuration for Ethernet firmware upgrade on the SEM web site at http://motion.schneider-electric.com/support/design_application.html

6.5.1 Preparing for upgrade

The first step toward performing an upgrade is to ensure the device is connected to TCP port 503, and that the Tftpd server IP and upgrade file location is set and written.

▶ Select the NIC adapter to which the Lexium MDrive is interfaced to (See Section 6.3.1)

▶ Connect to your configured IP address on TCP port 503 (See Section 6.3.1).

▶ Set the Tftpd server IP:

– Click the button "Get Local IP"

◁ The IP should match the IP of the connected NIC

▶ Click the "Write" button.

Figure 6.16: Tftpd server IP setting

▶ In the Ethernet Upgrade File Name container click “Browse & set file name”

◁ Select the *.S19 upgrade file on your hard drive.

▶ Click the “Write” button

◁ Proceed to the Upgrade Process

6.5.2 Process the upgrade

▶ On the menu, click the “Upgrade!” item.

▶ Verify the file name selected in Section 6.4.1 is the desired file.

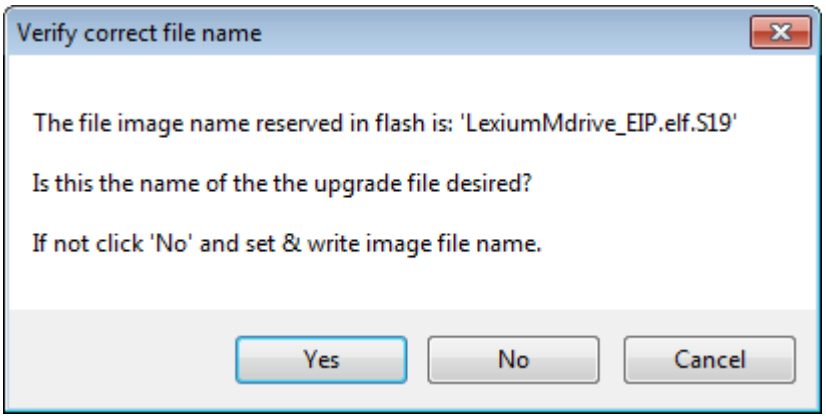


Figure 6.17: Verify file

▶ Click “Yes” if valid, click “No” and repeat the last two steps of Section 6.5.1 if not.

▶ Enter the Upgrade unlock code requested by the GUI.

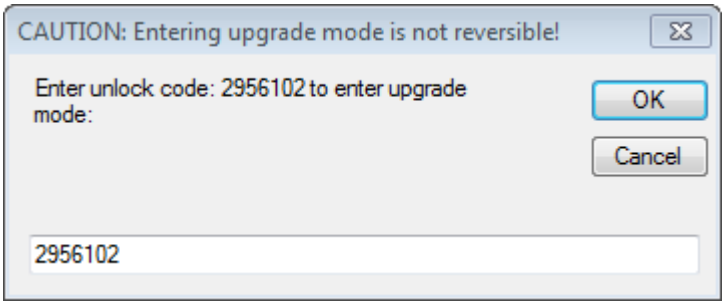


Figure 6.18: Enter unlock code for upgrade

- ▶ Click “No” on the select Ethernet Firmware Upgrade file.
- ▶ Cycle power to the Lexium MDrive as instructed
  - ◁ The software will automatically reconnect on power up and process the upgrade.

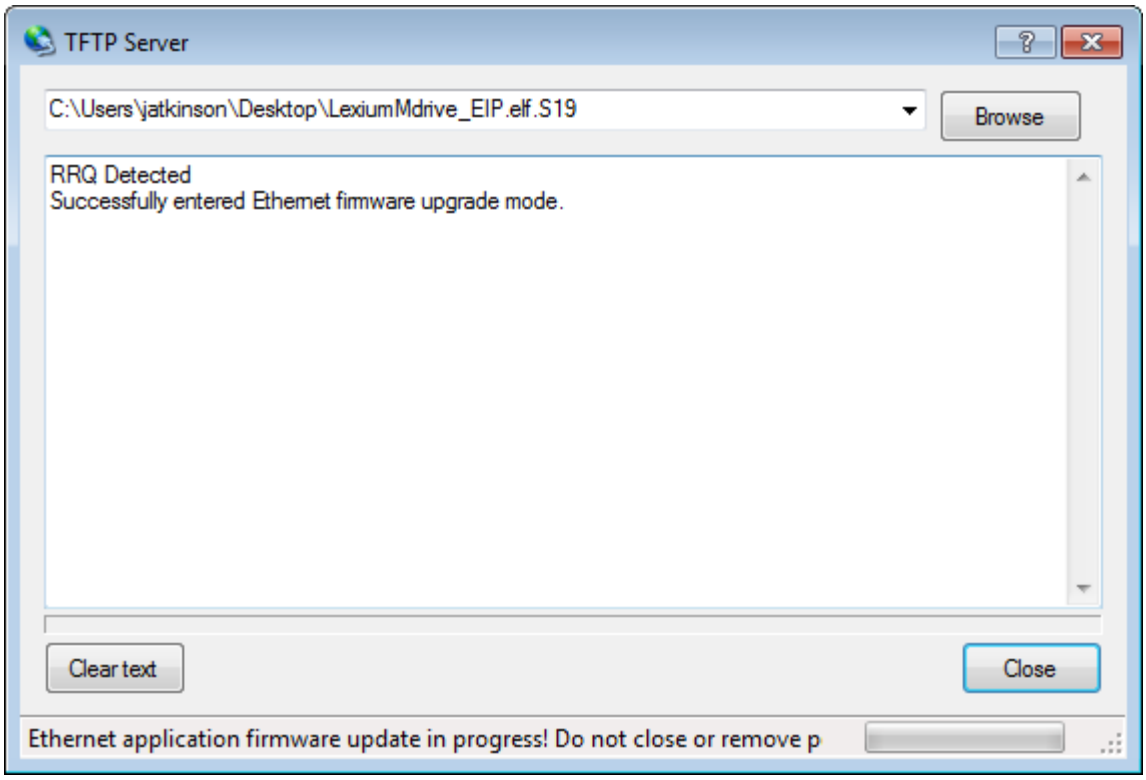


Figure 6.19: Upgrade in process

- ▶ Once upgrade is complete, close the Tftpd Server dialog.
- ▶ Cycle power to the Lexium MDrive.

NOTE: The Upgrade process will reset the IP address and Subnet Mask to factory default settings. The device must be re-configured to use in a network.

6.6 Encoder Remap Utility (Closed Loop models only)

⚠WARNING

UNINTENDED OPERATION

The Lexium MDrive must meet several conditions in order to be remapped successfully.

- The unit MUST be uncoupled from any loads, the shaft MUST be free to rotate in both directions
- Do not remap the encoder unless you fully understand the function.

Failure to follow these instructions can result in death, serious injury or equipment damage.

6.6.1 Remap process

Proper function of the hMT circuitry requires that the precise alignment of the motors rotor and stator be stored in relation to the internal magnetic encoder. This is done at the factory during the manufacturing process and will typically not be required again.

▶ Ensure that the motor shaft is uncoupled and able to move freely in both Clockwise and Counterclockwise directions.

▶ From the “View” menu select “Encoder Remap Utility”.

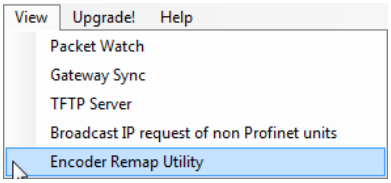


Figure 6.20: Run remap utility

▶ If the motor shaft is free to move in both directions, click OK.

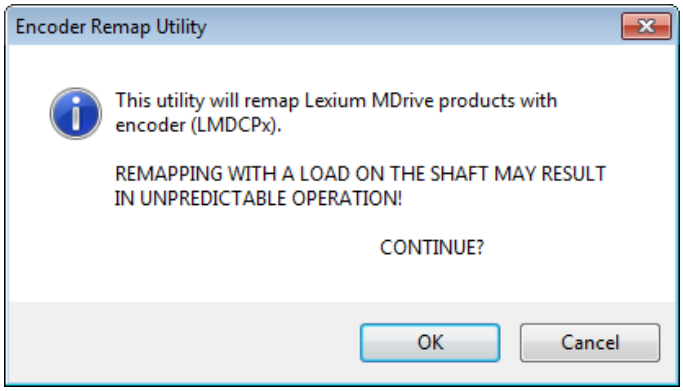


Figure 6.21: Verify motor shaft uncoupled from loads and free to move

▶ Once communications is verified, acknowledge the understanding the motion will occur by clicking OK.

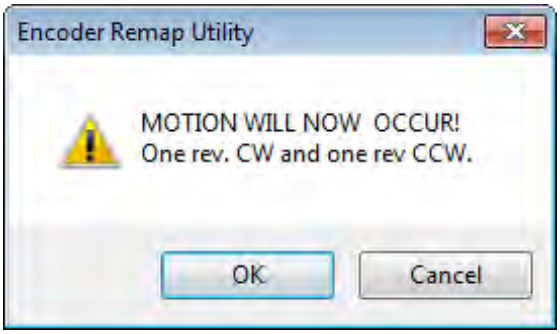


Figure 6.22: Motion will occur notice

◁ The motor will turn one revolution clockwise, then one revolution counter-clockwise.

◁ The device has been successfully remapped.

◁ Should remap fail: contact the factory.

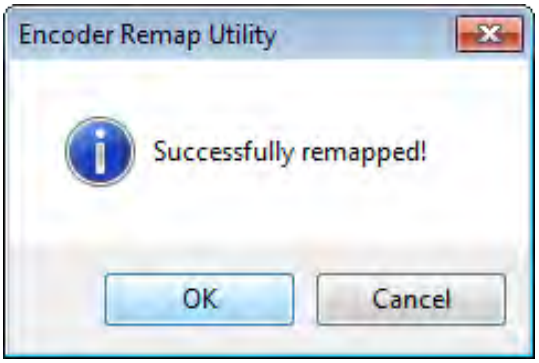


Figure 6.23: Remap successful

7 CANopen Configuration Utility

7

⚠WARNING

LOSS OF CONTROL

The product is unable to detect an interruption of the network link

- Verify that connection monitoring is on.
- The shorter the time for monitoring, the faster the detection of the interruption.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠WARNING

UNINTENDED OPERATION

The product is unable to detect an interruption of the network link

- Do not write values to reserved parameters.
- Do not write values to parameters unless you fully understand the function.
- Run initial tests without coupled loads.
- Verify that the system is free and ready for the movement before changing parameters.
- Verify the use of the word sequence with fieldbus communication.
- Do not establish a fieldbus connection unless you have fully understood the communication principles.

Failure to follow these instructions can result in death, serious injury or equipment damage.

7.1 Installation

The CANopen Configuration Utility is installed via the Lexium MDrive Software Suite startup window.

This section assumes the Software Suite has been installed and is ready to use. If this has not been accomplished please follow the instructions in Section 3 of this document.

7.1.1 Installation requirements

- IBM compatible PC
- Windows XP Service pack 3 or more recent
- Monitor with minimum 1024 x 768 resolution
- MD-CC501-000 USB to CANopen adapter kit or comparable PEAK/Phytec CANopen adapter dongle or PC card installed.
- Free USB port
- Internet connection (for software download and updates)

7.1.2 MD-CC501-000 installation

Description	Part number
USB to CANopen communication converter	MD-CC501-000

Figure 7.1: MD-CC501-000 USB to CANopen communication converter kit.

Communication converter kit contains converter, a six foot cable and a terminating resistor plug. Drivers are on the included DVD or may be downloaded from the internet from this page: PEAK SYSTEMS.

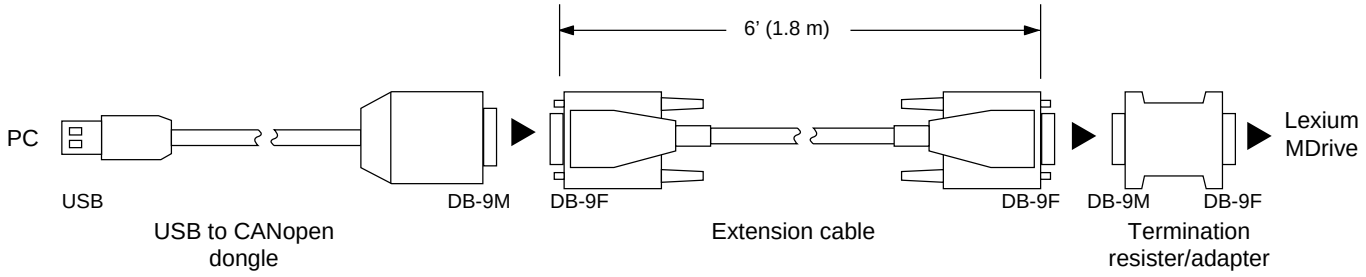


Figure 7.2: MD-CC501-000 dimensions and connection.

NOTE: Do not plug in the adapter until completing the following installation procedure.

Installation

NOTE: Setup the driver **BEFORE** connecting the PCAN-USB adapter to the computer for the first time.

NOTE: **DO NOT** use a USB extension cable to connect the PCANUSB adapter to the computer. The use of an extension cable does not comply with the USB specification and can lead to malfunction of the adapter.

- ▶ Ensure that you are logged in as user with administrator privileges (not required for normal use following installation).
- ▶ Insert the supplied DVD into the appropriate drive of the computer. Usually a navigation program appears a few moments later. If not, start the file Intro.exe from the root directory of the DVD.

Figure 7.3: DVD Autoplay dialog

- ▶ On the page English > Drivers select the entry PCAN-USB

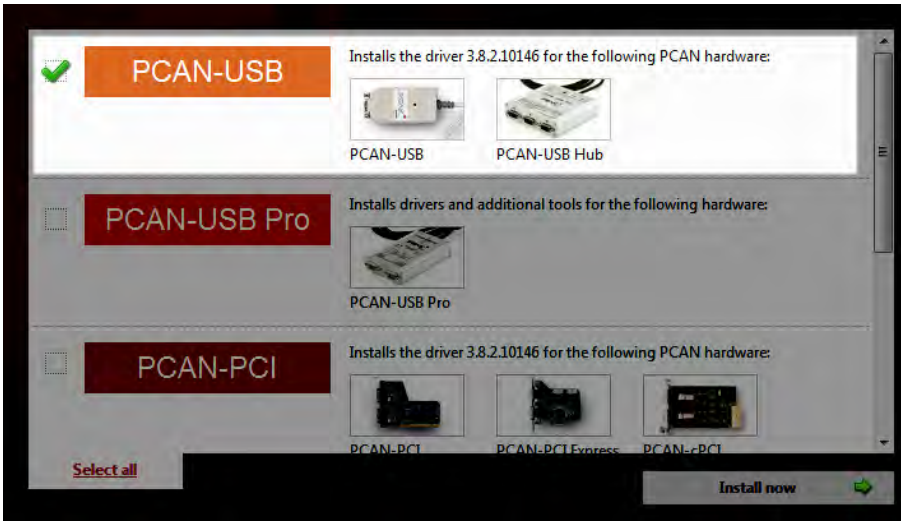


Figure 7.4: Adapter selection

- ▶ Click on Install now. The setup program for the driver will be launched.

- ▶ Follow the instructions of the dialogs that follow.
  - ◁ **NOTE:** On the “Select Components dialog under “Software Components” you may deselect the PCAN-view CANbus monitor, it is not required for using the CANopen Configuration Utility.
- ▶ Connect the MD-CC501-000 adapter to a USB port of the computer or of a connected USB hub.
  - ◁ Windows notifies that new hardware has been detected.
- ▶ **Windows XP only:** A Wizard dialog box appears. Follow its instructions. Select the automatic software installation during this procedure.
  - ◁ All Windows operating systems: The drivers are found and installed by Windows.
- ▶ Following successful installation the red LED on the MD-CC501-000 will be illuminated.
- ▶ You may now connect the adapter to the Lexium MDrive using the 6’ interface cable and termination block as shown in Figure 7.2.

7.1.3 Install the CANopen Configuration Utility module

▶ Launch the Lexium MDrive Software Suite

▶ On the left pane of the start-up screen, click the button labeled “Install Lexium MDrive CANopen Interface.”

◁ The following installation wizard dialog will appear:

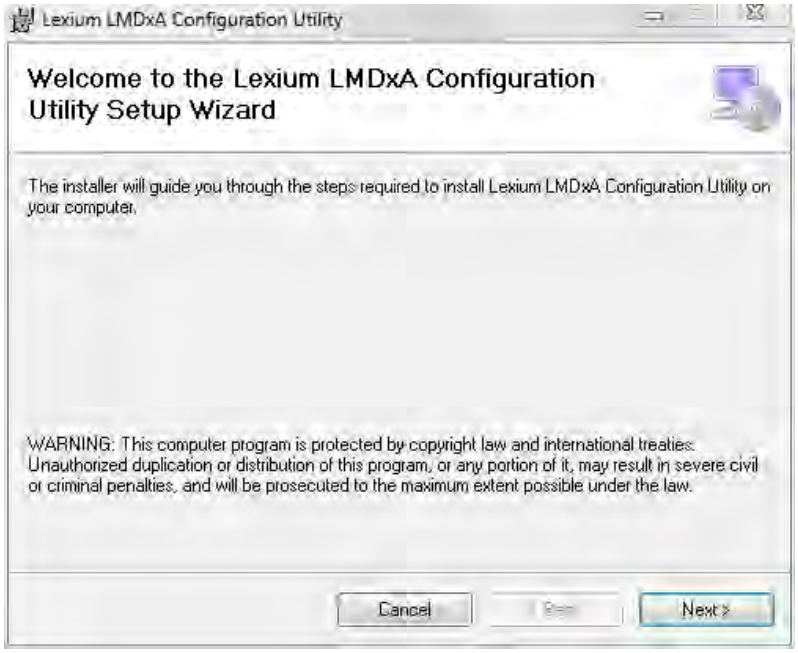


Figure 7.5: Install the CANopen Configuration Utility

▶ Follow the prompts to complete the installation

◁ The button on the start-up screen will now be labeled

“Launch Lexium MDrive CANopen Interface”.

7.2 Configuration screen overview

The configuration tab will be the default tab that opens when the program launches. This tab is key to the configuration of the device. The remaining tabs are geared toward functional testing and custom mapping of the EtherNet/IP assembly object and Profinet IO registers.

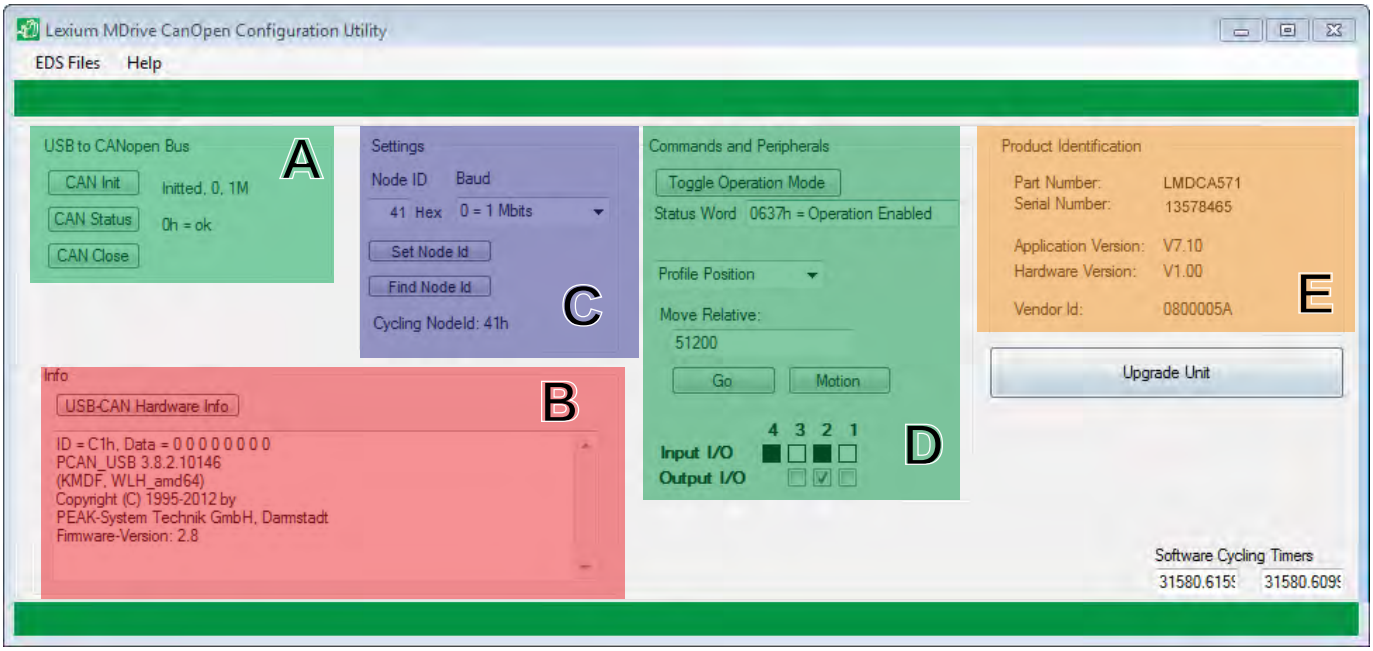


Figure 7.6: CANopen Configuration Utility main screen

7.2.1 Configuration screen sections

The configuration screen is grouped into containers for the various configuration functions.

A- USB to CANopen bus

Container used to initialize/monitor status/close the CAN connection to the Lexium MDrive CANopen.

B - Info

The info container contains a display text area which will display the data sent to the Lexium MDrive CANopen.

A button is provided to also read the information on the connected CAN adapter.

C -Settings

Container used to display/change the BAUD rate and Node ID. The default BAUD is 1 Mbps and the default node ID is 41 hex.

D - Commands and Peripherals The controls in this container are used to test functionality of the of the CANopen connection by allowing the user to page through the states of the CANopen State Machine, Test motion in either Profile Position or Profile Velocity and exercise the I/O points.

E - Product identification This container contains all the identification information of the product such as Part number, serial number, and version information.

7.3 Using the CANopen Configuration Utility

7.3.1 Initialize communication

- ▶ With DC power and CAN bus connected, apply power to the Lexium MDrive.
- ▶ Open the CANopen Configuration Utility
- ▶ Click the button CAN Init
  - ◁ The USB to CANopen Bus container will display the connection status as shown in Figure 7.7. Additionally the LED on the MD-CC501-000 should be blinking rapidly.

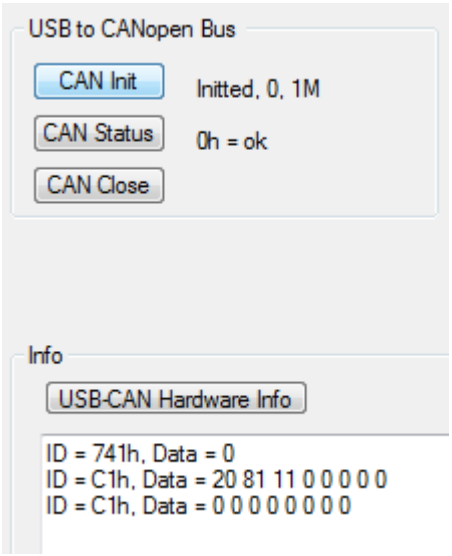


Figure 7.7: CANopen communication initialized

Troubleshooting connection

Should the CAN Init fail:

- ▶ Power down the Lexium MDrive
- ▶ Check cables can connections
- ▶ Verify the cable drivers are installed and working
  - ◁ The LED on the MD-CC501-000 should be solid red.
- ▶ Verify BAUD rate and node ID
  - ◁ With the CANopen Configuration Utility open, cycle power to the Lexium MDrive to induce a boot-up message.
  - ◁ Click the Find Node Id button in the Settings container.
  - ◁ The program will search the node ID and BAUD rate and Init at the correct setting.

7.3.2 Change Node ID/BAUD rate

The defaults for the Lexium MDrive are:

- ■ Node ID: 41 hex
- ■ BAUD rate: 1 Mbps

NOTE: when changing the Node ID, the change takes place instantaneously, changing the BAUD rate requires a power cycle of the Lexium MDrive when using the CANopen Configuration Utility.

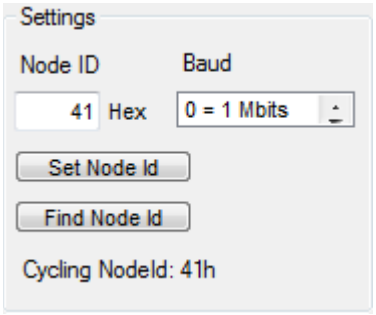


Figure 7.8: Settings container

To change the settings

- ▶ Change the default Node ID to the desired ID
- ▶ Change the BAUD rate to the desired setting
- ▶ Click the Set Node Id button
- ▶ Click the CAN Close button to close the connection to the CAN bus.
  - ◁ Cycle power to the Lexium MDrive
- ▶ Click the Find Node Id button
  - ◁ The Lexium MDrive will be reconnected at the new Node ID/ BAUD rate

7.3.3 Perform functional testing

The CANopen Configuration Utility provides limited functional testing ability to verify operation:, it allows:

- Cycle through the stages of the CANopen state machine
- Exercise motion in DSP402 Profile Position mode
- Exercise motion in DSP402 Profile velocity mode
- Read the state of inputs, write to outputs

\

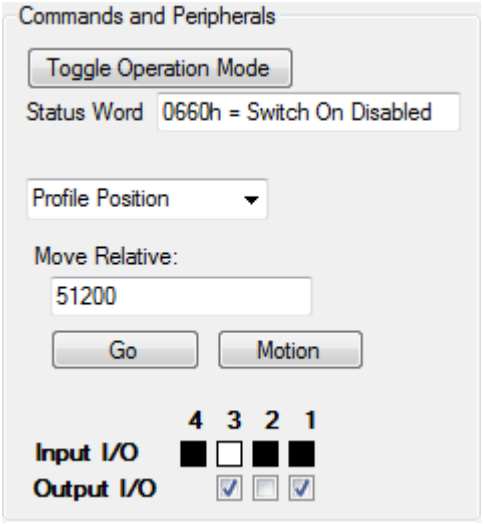


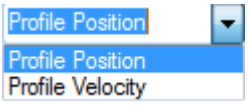
Figure 7.9: Settings container

Toggle the state machine

▶ Click the Toggle Operation Mode to cycle through the state machine. You are ready to perform functional testing when the Status word field reads `0637h - Operation Enabled`

Move the motor

▶ Select the DSP402 motion profile.



▶ Enter a value the field (by default 51200 steps, or one revolution is entered).

▶ Click Go

◁ The motor will move, verifying functionality

◁ NOTE: If profile velocity was selected the motor will accelerate to the entered velocity. Motion my be halted by clicking Motion and resumed again by clicking Halt.

Using the I/O If connected, I/O functionality may be tested. The CANopen Configuration Utility will read the state of inputs and write the state of outputs.

7.4 Upgrading application firmware

The application firmware on the Lexium MDrive CANopen is field upgradable using a simple process.

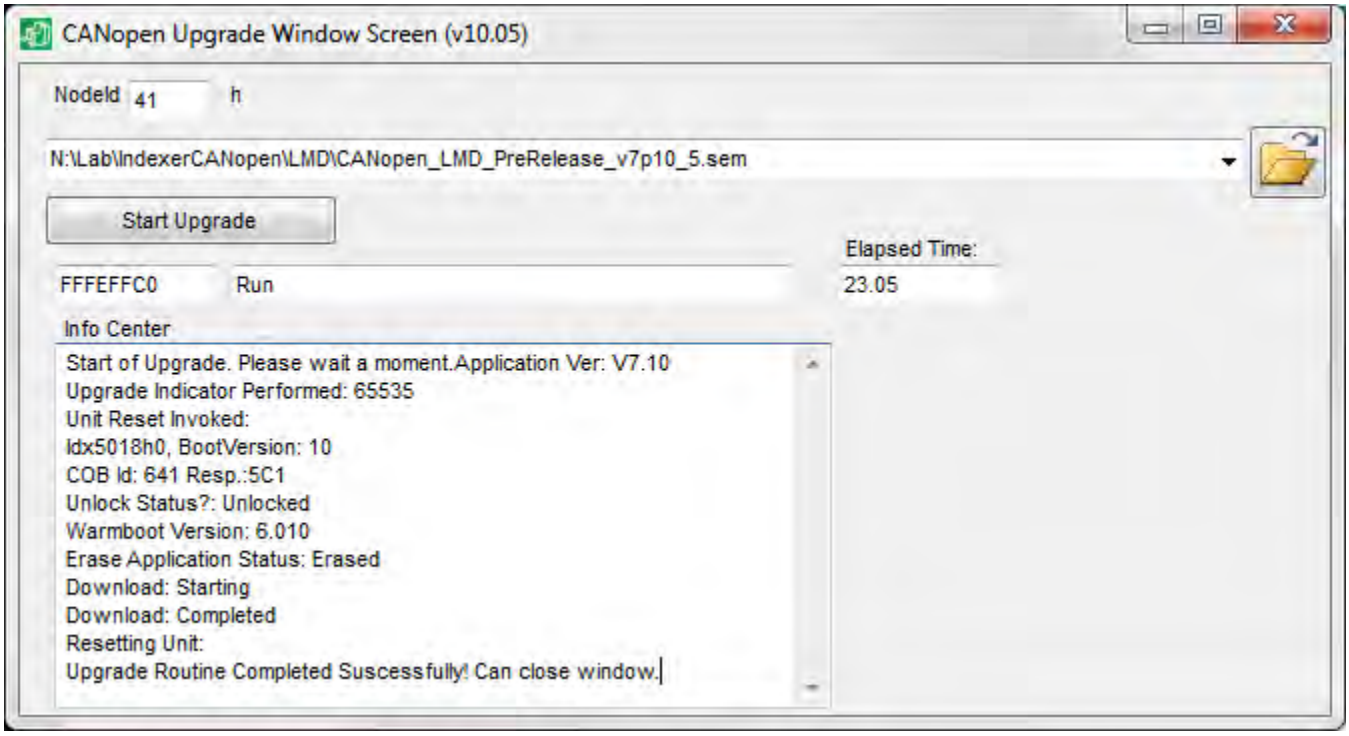


Figure 7.10: Upgrade dialog

7.4.1 Upgrade process

- ▶ Download the firmware upgrade zip file from the internet at: http://motion.schneider-electric.com and extract to your desktop.
- ▶ Click the “Upgrade Unit” button. The Upgrade dialog (Figure 7:10) will open.
- ▶ Click the  button and browse to the location of the *.SEM firmware file and select it.
- ▶ Click 
  - ◁ The upgrade wil process and complete in approximately two minutes.

7.5 Encoder Remap Utility (Closed Loop models only)

⚠WARNING

UNINTENDED OPERATION

The Lexium MDrive must meet several conditions in order to be remapped successfully.

- The unit MUST be uncoupled from any loads, the shaft MUST be free to rotate in both directions
- Do not remap the encoder unless you fully understand the function.

Failure to follow these instructions can result in death, serious injury or equipment damage.

7.5.1 Remap process

Proper function of the hMT circuitry requires that the precise alignment of the motors rotor and stator be stored in relation to the internal magnetic encoder. This is done at the factory during the manufacturing process and will typically not be required again.

▶ Ensure that the motor shaft is uncoupled and able to move freely in both Clockwise and Counterclockwise directions.

▶ Open the CANopen Configuration Utility and Init, the CAN bus, toggle operation mode until the Status Word is “Operation Enabled”.

▶ From the “View” menu select “Encoder Remap Utility”.

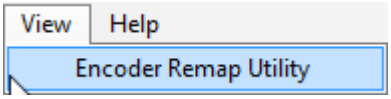


Figure 7.10 Run remap utility

▶ If the motor shaft is free to move in both directions, click OK.

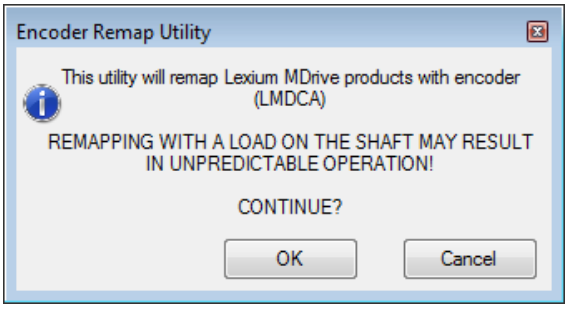


Figure 7.11: Verify motor shaft uncoupled from loads and free to move

▶ The software will verify that the device is communicating. Click OK.

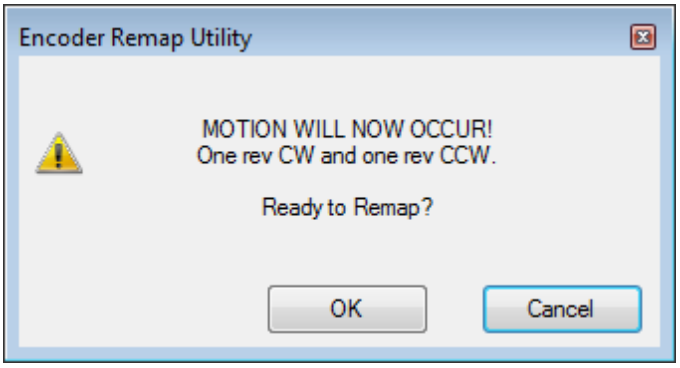


Figure 7.12 Motion will occur notice

▶ Once communications is verified, acknowledge the understanding the motion will occur by clicking OK.

◁ The motor will turn one revolution clockwise, then one revolution counter-clockwise.

◁ The device has been successfully remapped.

◁ Should remap fail: contact the factory.

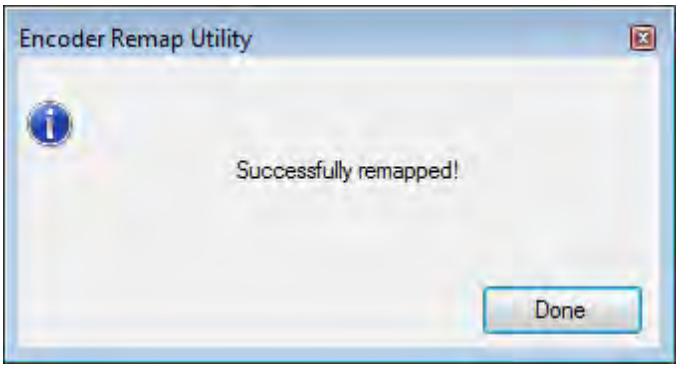


Figure 7:13: Remap successful

8 Glossary

8

8.1 Units and conversion tables

The value in the specified unit (left column) is calculated for the desired unit (top row) with the formula (in the field).

Example: conversion of 5 meters [m] to yards [yd]
5 m / 0.9144 = 5.468 yd

8.1.1 Length

	in	ft	yd	m	cm	mm
in	—	/ 12	/ 36	* 0.0254	* 2.54	* 25.4
ft	* 12	—	/ 3	* 0.30479	* 30.479	* 304.79
yd	* 36	* 3	—	* 0.9144	* 91.44	* 914.4
m	/ 0.0254	/ 0.30479	/ 0.9144	—	* 100	* 1000
cm	/ 2.54	/ 30.479	/ 91.44	/ 100	—	* 10
mm	/ 25.4	/ 304.79	/ 914.4	/ 1000	/ 10	—

8.1.2 Mass

	lb	oz	slug	kg	g
lb	—	* 16	* 0.03108095	* 0.4535924	* 453.5924
oz	/ 16	—	* $1.942559*10^{-3}$	* 0.02834952	* 28.34952
slug	/ 0.03108095	* $1.942559*10^{-3}$	—	* 14.5939	* 14593.9
kg	/ 0.453592370	/ 0.02834952	/ 14.5939	—	* 1000
g	/ 453.592370	/ 28.34952	/ 14593.9	/ 1000	—

8.1.3 Force

	lb	oz	p	dyne	N
lb	—	* 16	* 453.55358	* 444822.2	* 4.448222
oz	/ 16	—	* 28.349524	* 27801	* 0.27801
p	/ 453.55358	/ 28.349524	—	* 980.7	* $9.807*10^{-3}$
dyne	/ 444822.2	/ 27801	/ 980.7	—	/ $100*10^{3}$
N	/ 4.448222	/ 0.27801	/ $9.807*10^{-3}$	* $100*10^{3}$	—

V1.00, 05.2015

8.1.4 Power

	HP	W
HP	—	* 745.72218
W	/ 745.72218	—

8.1.5 Rotation

	min^{-1} (RPM)	rad/s	deg./s
min^{-1} (RPM)	—	* π / 30	* 6
rad/s	* 30 / π	—	* 57.295
deg./s	/ 6	/ 57.295	—

8.1.6 Torque

	lb·in	lb·ft	oz·in	Nm	kp·m	kp·cm	dyne·cm
lb·in	—	/ 12	* 16	* 0.112985	* 0.011521	* 1.1521	* $1.129*10^{6}$
lb·ft	* 12	—	* 192	* 1.355822	* 0.138255	* 13.8255	* $13.558*10^{6}$
oz·in	/ 16	/ 192	—	* $7.0616*10^{-3}$	* $720.07*10^{-6}$	* $72.007*10^{-3}$	* 70615.5
Nm	/ 0.112985	/ 1.355822	/ $7.0616*10^{-3}$	—	* 0.101972	* 10.1972	* $10*10^{6}$
kp·m	/ 0.011521	/ 0.138255	/ $720.07*10^{-6}$	/ 0.101972	—	* 100	* $98.066*10^{6}$
kp·cm	/ 1.1521	/ 13.8255	/ $72.007*10^{-3}$	/ 10.1972	/ 100	—	* $0.9806*10^{6}$
dyne·cm	/ $1.129*10^{6}$	/ $13.558*10^{6}$	/ 70615.5	/ $10*10^{6}$	/ $98.066*10^{6}$	/ $0.9806*10^{6}$	—

8.1.7 Moment of inertia

	$lb·in^2$	$lb·ft^2$	$kg·m^2$	$kg·cm^2$	$kp·cm·s^2$	$oz·in^2$
$lb·in^2$	—	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
$lb·ft^2$	* 144	—	* 0.04214	* 421.4	* 0.429711	* 2304
$kg·m^2$	* 3417.16	/ 0.04214	—	* $10*10^{3}$	* 10.1972	* 54674
$kg·cm^2$	* 0.341716	/ 421.4	/ $10*10^{3}$	—	/ 980.665	* 5.46
$kp·cm·s^2$	* 335.109	/ 0.429711	/ 10.1972	* 980.665	—	* 5361.74
$oz·in^2$	/ 16	/ 2304	/ 54674	/ 5.46	/ 5361.74	—

8.1.8 Temperature

	°F	°C	K
°F	—	(°F - 32) * 5/9	(°F - 32) * 5/9 + 273.15
°C	°C * 9/5 + 32	—	°C + 273,15
K	(K - 273.15) * 9/5 + 32	K - 273.15	—

8.1.9 Conductor cross section

AWG	1	2	3	4	5	6	7	8	9	10	11	12	13
mm²	42.4	33.6	28.7	21.2	18.8	13.3	10.5	8.4	8.6	5.3	4.2	3.3	2.6

AWG	14	15	16	17	18	19	20	21	22	23	24	25	26
mm²	2.1	1.7	1.3	1.0	0.82	0.65	0.52	0.41	0.33	0.26	0.20	0.16	0.13

8.2 Terms and Abbreviations

AC Alternating current

Acceleration The time rate of change of velocity with respect to a fixed reference frame. The commanded step rate is started at a base velocity and accelerated at a slew velocity at a defined and controlled rate or rate of changes.

ASCII American Standard Code for Information Interchange. Standard for coding of characters.

Back Electro-Motive Force (Back EMF) Also known as regeneration current, the reversed bias generated by rotation of the magnetic field across a stator's windings. Sometimes referred to as counter EMF.

CAN (Controller Area Network), standardized open fieldbus as per ISO 11898, allows drives and other devices from different manufacturers to communicate.

CANopen CANopen is a CAN-based higher layer protocol. It was developed as a standardized embedded network with highly flexible configuration capabilities. CANopen was designed motion oriented machine control networks, such as handling systems. It is used in many various fields, such as medical equipment, off-road vehicles, maritime electronics, public transportation, building automation, etc

Closed Loop System In motion control, this term describes a system wherein a velocity or position (or both) sensor is used to generate signals for comparison to desired parameters. For cases where loads are not predictable, the closed loop feedback from an external encoder to the controller may be used for stall detection, position maintenance or position verification.

Daisy Chain This term is used to describe the linking of several devices in sequence, such that a single signal stream flows through one device and on to another

DC	Direct current
Deadband	A range of input signals for which there is no system response.
Default value	Factory setting.
Detent Torque	The periodic torque ripple resulting from the tendency of the magnetic rotor and stator poles to align themselves to positions of minimal reluctance. The measurement is taken with all phases de-energized.
Direction of rotation	Rotation of the motor shaft in a clockwise or counterclockwise direction of rotation. Clockwise rotation is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.
DOM	The Date of manufacturing on the nameplate of the device is shown in the format DD.MM.YY, e.g. 31.12.06 (December 31, 2006).
Duty Cycle	For a repetitive cycle, the ratio of on time to total cycle time.
EMC	Electromagnetic compatibility
Encoder	Sensor for detection of the angular position of a rotating component. The motor encoder shows the angular position of the rotor.
Error class	Classification of errors into groups. The different error classes allow for specific responses to faults, e.g. by severity.
Fatal error	In the case of fatal error, the drive is not longer able to control the motor, so that an immediate switch-off of the drive is necessary.
Fault	Operating state of the drive caused as a result of a discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.
Fault reset	A function used to restore the drive to an operational state after a detected fault is cleared by removing the cause of the fault so that the fault is no longer active (transition from state “Fault” to state “Operation Enable”).
Forcing	Forcing switching states of inputs/outputs
Full Duplex	The transmission of data in two directions simultaneously. For example, a telephone is a full-duplex device because both parties can talk at the same time.

Ground Loop A ground loop is any part of the DC return path (ground) that has more than one possible path between any two points.

Half Duplex The transmission of data in just one direction at a time. For example, a walkie-talkie is a half-duplex device because only one party can talk at a time.

Half Step This term means that the motor shaft will move a distance of 0.9 degree (400 steps per shaft revolution) instead of moving 1.8 degree per digital pulse.

Hybrid Motion Technology™ (HMT) A motor control technology representing a new paradigm in brushless motor control. By bridging the gap between stepper and servo performance, HMT offers system integrators a third choice in motion system design.

Hybrid Motors Hybrid stepper motors feature the best characteristics of PM and VR motors. Hybrid steppers are best suited for industrial applications because of high static and run torque, a standard low step angle of 1.8°, and the ability to Microstep. Hybrid stepper motors offer the ability to precisely position a load without using a closed-loop feedback device such as an encoder.

Holding Torque The maximum torque or force that can be externally applied to a stopped, energized motor without causing the rotor to rotate continuously. This is also called “static torque”.

I/O Inputs/outputs

Inc Increments

Index pulse Signal of an encoder to reference the rotor position in the motor. The encoder returns one index pulse per revolution.

Inertia A measure of an object’s resistance to a change in velocity. The larger an object’s inertia, the greater the torque required to accelerate or decelerate it. Inertia is a function of an object’s mass and shape. For the most efficient operation, the system-coupling ratio should be selected so that the reflected inertia of the load is equal to or no greater than 10 times the rotor inertia of the stepper motor.

Inertia (Reflected) Inertia as seen by the stepper motor when driving through a speed change, reducer or gear train.

Lag The amount (in full motor steps) that the rotor lags the stator. Lag conditions are caused by loading on the motor shaft, as during transient loading or rapid acceleration.

Lead The amount (in full motor steps) that the rotor leads the stator. Lead conditions are caused by an overhauling load, as during periods of rapid deceleration.

Limit switch Switch that signals overtravel of the permissible range of travel.

Load Any external resistance (static or dynamic) to motion that is applied to the motor.

Locked rotor When the lag/lead limit is reached, a timer starts a countdown that is determined by the user. The locked rotor will assert itself by triggering a flag and, depending on the selected mode, by disabling the output bridge.

Loss of synchronization In traditional stepper systems, when the lead/lag relationship of the rotor and stator reaches two full motor steps, the alignment of the magnetic fields is broken and the motor will stall in a freewheeling state. Hybrid Motion Technology eliminates this.

Microstepping A control electronic technique that proportions the current in a stepper motor's windings to provide additional intermediate positions between poles. Produces smooth rotation over a wide range and high positional resolution. Typically, step resolutions range from 400 to 51,200 steps per shaft revolution.

Motor phase current The available torque of a stepper motor is determined by the motor phase current. The higher the motor phase current the higher the torque.

Multidrop A communications configuration in which several devices share the same transmission line, although generally only one may transmit at a time. This configuration usually uses some kind of polling mechanism to address each connected device with a unique address code.

NEMA The acronym for the National Electrical Manufacturer's Association, an organization that sets standards for motors and other industrial electrical equipment.

Node guarding Monitoring of the connection with the slave at an interface for cyclic data traffic.

Open Loop System An open loop motion control system is where no external sensors are used to provide position or velocity feedback signals, such as encoder feedback of position.

Opto-Isolated A method of sending a signal from one piece of equipment to another without the usual requirement of common ground potentials. The signal is transmitted optically with a light source (usually a Light Emitting Diode) and a light sensor (usually a photo-sensitive transistor). These optical components provide electrical isolation.

Parameter Device data and values that can be set by the user.

Persistent Indicates whether the value of the parameter remains in the memory after the device is switched off.

PLC Programmable logic controller

Position lead/lag The HMT circuitry continually tracks the position lead or lag error, and may use it to correct position.

Position make-up When active, the position make-up can correct for position errors occurring due to transient loads. The lost steps may be interleaved with incoming steps, or reinserted into the profile at the end of a move.

Power stage The power stage controls the motor. The power stage generates currents for controlling the motor on the basis of the positioning signals from the controller.

Pull-In Torque This is the maximum torque the stepper motor can develop when instantaneously started at that speed.

Pull-Out Torque This is the maximum torque that the stepper can develop once an acceleration profile has been used to “ramp” it to the target speed.

Quick Stop Function used to enable fast deceleration of the motor via a command or in the event of a malfunction.

Resolution The smallest positioning increment that can be achieved.

Resonance The frequency that a stepper motor system may begin to oscillate. Primary resonance frequency occurs at about one revolution per second. This oscillation will cause a loss of effective torque and may result in loss of synchronism. The designer should consider reducing or shifting the resonance frequency by utilizing half step or micro-step techniques or work outside the primary resonance frequency.

Rotor The moving part of the motor, consisting of the shaft and the magnets. These magnets are similar to the field winding of a brush type DC motor

Rotor Inertia	The rotational inertia of the rotor and shaft.
RS485	Programming and configuration utilities as per EIA-485 which enables serial data transmission with multiple devices.
Sinking Current	Refers to the current flowing into the output of the chip. This means that a device connected between the positive supply and the chip output will be switched on when the output is low.
Slew	The position of a move profile where the motor is operating at a constant velocity
Sourcing Current	Refers to the current flowing out of the output of the chip. This means that a device connected between the chip output and the negative supply will be switched on when the output is high.
SSM	Shaft Snap Minimization, a calibration technique to reduce the “clunk” that is characteristic of step motors when powered.
Stall detection	Stall detection monitors whether the index pulse is always correctly triggered at the same angle position of the motor shaft.
Stator	The stationary part of the motor. Specifically, it is the iron core with the wire winding in it that is pressed into the shell of the frame. The winding pattern determines the voltage constant of the motor.
Torque ramp	Deceleration of the motor with the maximum possible deceleration, which is only limited by the maximum permissible current. The higher the permissible braking current, the stronger the deceleration. Because energy is recovered up depending on the coupled load, the voltage may increase to excessively high values. In this case the maximum permissible current must be reduced.
Variable current control	When active, variable current control will control the motor current as such to maintain the torque and speed on the load to what is required by the profile. This leads to reduced motor heating and greater system efficiency.
Warning	If not used within the context of safety instructions, a warning alerts to a potential problem detected by a monitoring function. A warning is not a fault and does not cause a transition of the operating state. Warnings belong to error class 0.
Watchdog	Unit that monitors cyclic basic functions in the product. Power stage and outputs are switched off in the event of faults.
Zero crossing	The point in a stepper motor where one phase is at 100% current and the other is at 0% current.

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WARRANTY

Reference the web site at www.motion.schneider-electric.com for the latest warranty and product information.

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