



KOLLMORGEN

# SqStep4 SynqNet Stepper Drive

## Operating Instructions

Version 1.1 - 03/07

Valid for HW/SW Version 1.0

Keep all product manuals as a product component during the life span of the product.

Pass all product manuals to future users/owners of the product

KOLLMORGEN STEPPER DRIVE ver 1 C104 PV 07 04 MAR 2007.doc

## Revision History

[illegible]

## Important Notice

**Copyright© Kollmorgen Servotronix Ltd 2007**

**Kollmorgen Servotronics Ltd** holds the copyright to this manual. All rights are reserved and no part of this publication may be reproduced or transmitted in any form or by any means without prior written consent from **Kollmorgen Servotronics Ltd**.

## Disclaimer

The information in this manual was accurate and reliable at the time of its release. However, **Kollmorgen Servotronics Ltd.** reserves the right to change the specifications of the product described in this manual without notice at any time.

This document contains proprietary and confidential information of **Kollmorgen Servotronics Ltd.** The contents of the document may not be disclosed to third parties, translated, copied or duplicated in any form, in whole or in part, without the express written permission of **Kollmorgen Servotronics Ltd.**

## Registered Trademarks

All other proprietary names mentioned in this manual are the trademarks of their respective owners.

**Print Version 007**

## March 2007

## How to Contact Us

Danaher Motion is committed to quality customer service. Our goal is to provide the customer with information and resources as soon as they are needed. In order to serve in the most effective way, contact your local sales representative for order status and delivery information, product information and literature,

and application and field technical assistance. If you are unaware of who your local sales representative is, please contact us at:

**Email:** [sep@danahermotion.com](mailto:sep@danahermotion.com) and specify **SynqNet Support** in the subject line.

## Important Safety Information

The information found in this section is designed for your safety and the prevention of needless repairs to the machine.

### Operational Warnings and Cautions



#### **DANGER**

**Danger means that the situation described will cause death or injury to you or someone else if the safety information is not obeyed.**



#### **NOTE**

**Please take note of the fact that.....**



#### **CAUTION**

**Caution means that the situation described could cause damage to the equipment or the program.**



#### **WARNING**

**Warning means that the situation described can cause damage to either the equipment or the program and we recommend that only an experienced operator should perform these adjustments.**

# Contents

REVISION HISTORY .....	I
IMPORTANT NOTICE .....	I
HOW TO CONTACT US .....	I
IMPORTANT SAFETY INFORMATION .....	II
Operational Warnings and Cautions .....	ii
<b>1 INTRODUCTION .....</b>	<b>1</b>
<b>1.1 ABOUT THIS GUIDE.....</b>	<b>1</b>
1.1.1 Downloading Manuals from our Website .....	1
<b>2 PRE-INSTALLATION REQUIREMENTS .....</b>	<b>3</b>
<b>2.1 LAB ELECTRICAL REQUIREMENTS .....</b>	<b>3</b>
<b>2.2 REQUIRED CABLES .....</b>	<b>3</b>
<b>2.3 MOTION CONTROL CARD (MEI) .....</b>	<b>4</b>
2.3.1 What is SynqNet.....	4
2.3.2 Acquiring the Latest SynqNet Software Version .....	4
2.3.3 PC Requirements .....	4
<b>3 INSTALLING THE HARDWARE .....</b>	<b>5</b>
<b>3.1 UNPACKING INSTRUCTIONS .....</b>	<b>5</b>
<b>3.2 GENERAL .....</b>	<b>6</b>
3.2.1 Safety .....	6
3.2.2 Grounding .....	6
<b>3.3 CONNECTING THE DRIVE CABLES.....</b>	<b>7</b>
<b>4 INSTALLING THE MEI CONTROLLER CARD .....</b>	<b>8</b>
<b>4.1 INSTALLING THE MEI CONTROLLER CARD.....</b>	<b>8</b>
<b>4.2 INSTALLING THE MEI DRIVERS.....</b>	<b>8</b>
<b>4.3 INSTALLING THE MOTION CONSOLE PROGRAM.....</b>	<b>12</b>
<b>5 USING THE MOTION CONSOLE.....</b>	<b>13</b>
<b>5.1 LOADING THE MOTION CONSOLE.....</b>	<b>13</b>
<b>5.2 CONFIGURING THE MOTOR PARAMETERS.....</b>	<b>16</b>
5.2.1 Uploading the Motor Parameters (get command) .....	17
5.2.2 Editing the Motor Configuration File .....	18
5.2.3 Downloading the Motor Parameters (set command) .....	20
<b>5.3 CONFIGURING THE MOTION CONTROL CONSOLE .....</b>	<b>20</b>
5.3.1 Mapping the Axes .....	20
5.3.2 Setting the Motor Configuration Parameters .....	21
5.3.3 Clearing the Errors.....	24
5.3.4 Setting the Axes Motion Parameters .....	24
5.3.5 Set Amp Enable .....	25
5.3.6 Start and Stop the Motors.....	25
<b>6 ERROR MESSAGES .....</b>	<b>26</b>

6.1	USING THE SQDRIVEMSG UTILITY.....	26
6.1.1	Example.....	27
6.1.2	Error Messages .....	27
APPENDIX A	HARDWARE SPECIFICATIONS .....	28
A.1	MECHANICAL .....	28
A.1.1	Physical Characteristics .....	28
A.1.2	Front Panel .....	28
A.1.3	Weight .....	28
A.2	ELECTRICAL SPECIFICATIONS.....	29
A.3	ENVIRONMENTAL SPECIFICATIONS.....	30
APPENDIX B	CONFIGURATION FILE PARAMETERS .....	31
B.1	NUMBER OF MICRO STEPS.....	32
B.2	PEAK CURRENT LEVEL .....	32
B.3	CURRENT REDUCTION LEVEL .....	32
B.4	CURRENT REDUCTION TIME .....	32
B.5	HEAT-SINK TEMPERATURE.....	32
B.6	BUS VOLTAGE.....	32
APPENDIX C	MOTOR CONNECTIONS.....	34
C.1	8 LEAD MOTORS.....	34
C.1.1	Parallel 8 Lead .....	34
C.1.2	Series 8 Lead .....	35
C.2	6 LEAD MOTORS.....	35
C.2.1	Half Coil 6 Lead .....	35
C.2.2	Full Coil 6 Lead .....	36
C.3	4 LEAD MOTORS.....	36
APPENDIX D	CONNECTOR PIN-OUTS .....	37
D.1	LOGIC POWER.....	37
D.2	BUS POWER .....	37
D.3	MOTOR CONNECTOR .....	38

## Chapter 1

## INTRODUCTION

## 1.1 About this Guide

This guide is written for integration engineers that want to create a working environment on the test bench. Installation and step by step setup instructions are included.

A more detailed description of the system is provided in the SqStep Technical Manual which is included together with our applications notes, in Acrobat-Reader format on the accompanying CD-ROM in multiple languages. You can print out this documentation on any standard commercial printer. You can also purchase a printed copy of the documentation from us at the following E-mail address [sep@danahermotion.com](mailto:sep@danahermotion.com) and specify **SynqNet Support** in the subject line.

It is strongly recommended that only suitable personnel install and setup the system.



1. The guide is divided into the following sections
2. Unpacking the Drive
3. Drive Hardware Setup
4. SynqNet Installation
5. Configuring the SynqNet Motion Console
6. Configuring the Drive Parameters
7. Operating the Drive

### 1.1.1 Downloading Manuals from our Website

You can use the link [www.DanaherMotion.com](http://www.DanaherMotion.com) to download our product manuals from the **DanaherMotion** website.


### 1.1.2 Product Identification


Check the product labeling on the packaging and the product and confirm that you have received the correct product, SqST4. This can be confirmed from the product label which should conform to that illustrated below




VOLTAGE IN: 12 - 42 VDC

RATING	INPUT	OUTPUT
VOLTAGE	42 VDC	42VDC
CURRENT	14 Amps	3 Amps/Axis
POWER	550W	500W

Serial Number:  
Z07B-00014

Base Model:  
SqST4

Factory P/N:  
PRD-0064ST40-02

## PRE-INSTALLATION REQUIREMENTS

This section describes all the equipment required to test drive the stepper drive.

### 2.1 Lab Electrical Requirements

The following equipment must be readily available in order to install and setup the **SqStep4 SynqNet Stepper Drive** and the **SynqNet** PC controller.

**Table 1: Electrical Requirements**

Requirement	Description
<b>Bus Power Supply</b>	
<b>Power Supply Type</b>	Unregulated or Regulated
<b>Output Voltage</b>	12 to 42 Volts
<b>Output Current</b>	1.5 to 10 Amps The output current depends on motor selection, load and power supply voltage.
<b>Current Limit</b>	Adjustable
<b>Logic Power Supply</b>	
<b>Power Supply Type</b>	Regulated
<b>Output Voltage</b>	24V +-10%
<b>Output Current</b>	1A
<b>Stepper Motors</b>	
<b>Stepper Motor Type</b>	Permanent Magnet or Hybrid Stepper
<b>Voltage</b>	12 - 42 Vdc
<b>Current</b>	0.4 – 3 Arms
<b>Maximum Inductance per phase</b>	0.18 * Minimum supply voltage
<b>Leads</b>	4,6,8 Wire motors

### 2.2 Required Cables

See [Appendix D Connector Pin-Outs](#) on page 37 for the information required to build the cables

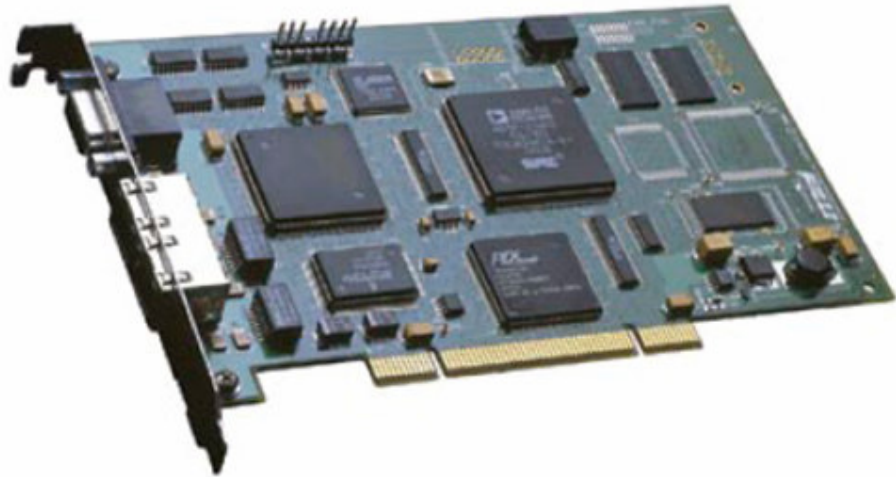


## 2.3 Motion Control Card (MEI)

You need to acquire a SynqNet PC controller card from MEI as the motion control of the motor is performed by this card.

### 2.3.1 What is SynqNet

**SynqNet** is a high-performance; synchronous network technology specifically designed for multi-axis motion control applications. It is the only system that dramatically reduces system wiring while simultaneously provides higher performance than conventional analog control systems.



### 2.3.2 Acquiring the Latest SynqNet Software Version

You must download the latest version of the SynqNet MPI software for your card from the MEI support site. Use the **Download** tab on the website.

When downloading the software you are prompted to get a password to unzip the downloaded file.



#### NOTE

**The MPI-setup version must be 03.04.00 or later.**

For further details please visit to the Motion Engineering Website:

<http://www.motioneng.com/>

### 2.3.3 PC Requirements

Any PC running:

- ☐ Microsoft Windows 2000 or better
- ☐ Acrobat reader version 5 or better
- ☐ Internet browser (IE recommended)

## INSTALLING THE HARDWARE

This section includes the:

- ☐ Unpacking the hardware
- ☐ General information on installing the SynqNet system
- ☐ IMPORTANT safety information
- ☐ Grounding information
- ☐ Connecting the drive cables

### 3.1 Unpacking Instructions

Upon receipt of the equipment, inspect the components to ensure that no damage has occurred during shipment. If damage has occurred, notify the carrier immediately. Check all shipping material for connector kits, documentation, diskettes, CD-ROM, or other small pieces of equipment before disposing of the packing material.



#### IMPORTANT INFORMATION

**Do not dispose of shipping materials until the packing list has been thoroughly checked and all items accounted for.**

**When removing all packing material and equipment from the shipping container be aware that some of the shipped items may be small enough to be accidentally discarded.**



#### ESD WARNING

**Electronic components in this equipment are design-hardened to reduce sensitivity to ESD (Electro Static Discharge) however, proper procedures should be taken when handling the equipment to avoid any damage.**

## 3.2 General

These installation steps are designed to lead you through the proper installation and setup of the SynqNet system. They were developed with the assumption that you have a fundamental understanding of basic electronics, computers, mechanics, and proper safety practices. However, you do not have to be an expert in motion control to install and operate the drive system. It is recommended that you read the entire manual completely before attempting installation or operating the equipment.

### 3.2.1 Safety



#### **DANGER**

**High voltages could be present as well as dangerous and hazardous conditions.**

**Be certain to follow all national and local codes during installation.**

### 3.2.2 Grounding

System grounding is essential for proper performance of the drive system. A ground bus bar may be used as a single point ground for the system. Safety grounding should be provided to all pieces of the system from a star point. In addition to the safety grounding, a high frequency ground must be provided that connects the back panel to the enclosure and, ultimately, to earth ground. The objective is to provide an extremely low impedance path between the filters, drives, power supplies, and earth ground.

This high frequency ground is accomplished with the use of a flat braid or copper bus bar. It is important not to rely on a standard wire for the high frequency ground. In general, a wire has an inductance of 8nH-per-inch, regardless of diameter. At higher frequencies because the voltage runs on the surface of the conductor, this unwanted inductance between grounds equates to limited filter performance.



#### **NOTE**

**When connecting high frequency grounds, use the shortest braided ribbon or braided cable as possible.**

### 3.3 Connecting the Drive Cables

1. Before connecting the cables ensure that the power source is powered **OFF**.
2. Use Figure 1 and the two tables below to connect the cables.
3. When all the power cables are connected, turn on the power source.
4. Connect the communications cable.

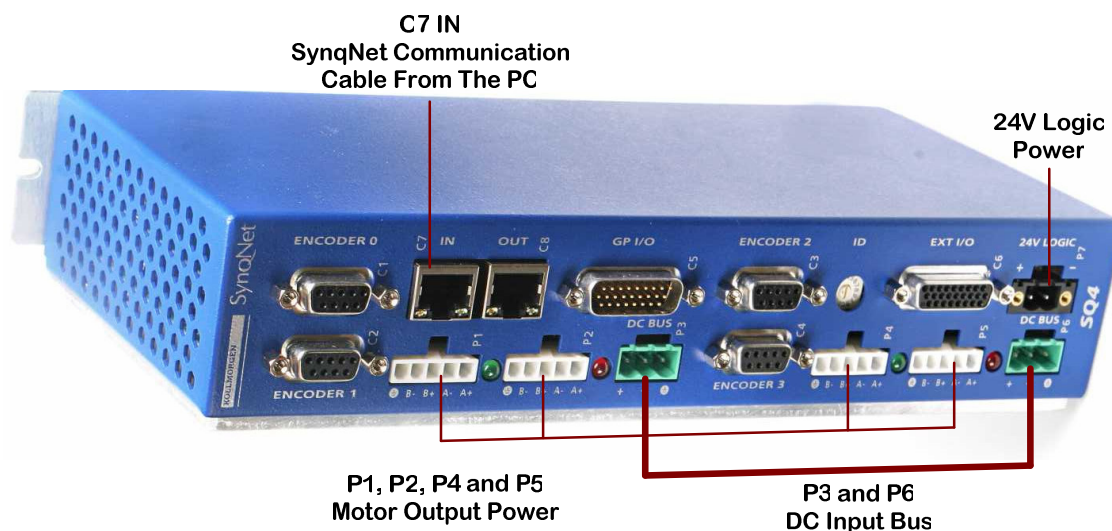


Figure 1: Front Cable Connection Panel

Table 2: Cable Connection Chart

STEP	Connect Cable	To	Description
1	24V Logic Power	P7	12 to 42 Volts at 12 Amps.
2	Encoder	C1 to C4	Not usually required for stepper motors
3	DC Bus (Input)	P3 and P6	DC power for driving the motors (12 to 42 Volts and 12 Amps).
4	Motor Power Pin 2 Phase A + Pin 3 Phase A- Pin 4 Phase B+ Pin 5 Phase B-	P1, P2, P4 and P5	Maximum Output Rating is 50V at 5 Amps. The motor power connectors are 5 pin sockets (including ground) therefore you may need to change the motor connections to 4 wire. If so see Motor Connections in Appendix C on page 34.
5	Communication IN	C7	Connect one end of the SynqNet communications cable to the <b>IN</b> connector. The other end connects to the Motion Control card when it is installed to the PC.

Table 3: Connector Grouped by Axis

Plug Group	Axis 0	Axis 1	Axis 2	Axis 3
Encoder	Encoder 0 (C1)	Encoder 1 (C2)	Encoder 2 (C3)	Encoder 3 (C3)
Output Power	M0 (P1)	M1 (P2)	M2 (P4)	M3 (P5)
Input Bus	B0 (P3)		B1 (P6)	

## INSTALLING THE MEI CONTROLLER CARD

This section installs the:

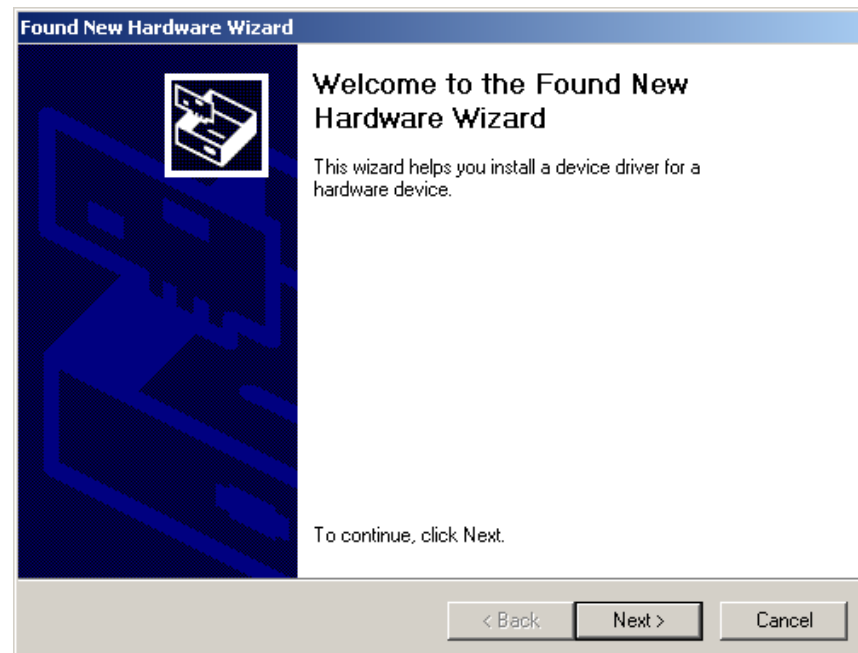
- ☐ MEI Controller card
- ☐ The MEI Drivers
- ☐ SynqNet communication cable that is connected to the drive

### 4.1 Installing the MEI Controller Card

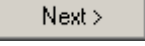
1. Install the **SynqNet** motion controller card using the instructions you received from the manufacturer.
2. Connect the communication cable that has one side connected to the motor drive to the **OUT** connector on the newly installed SynqNet card.

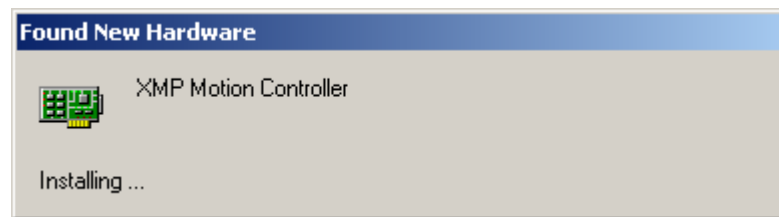
### 4.2 Installing the MEI Drivers

1. Power **ON** the PC.

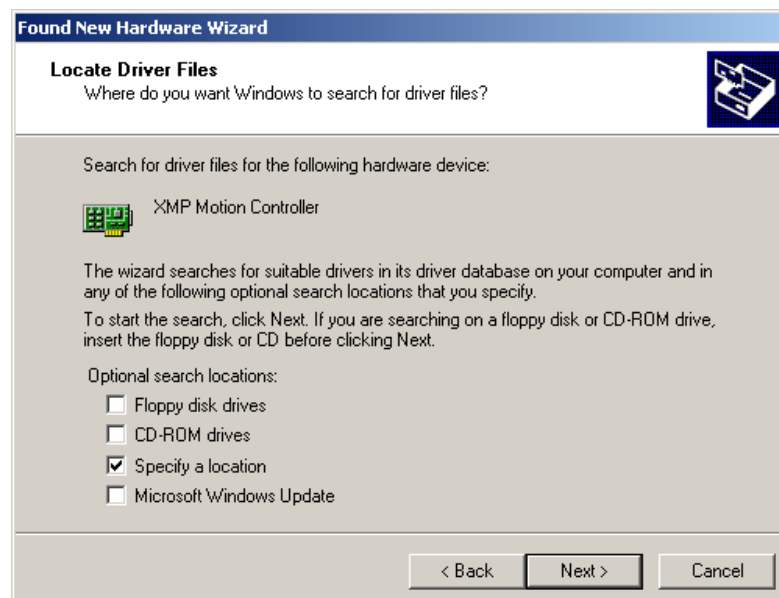


The system has found the newly installed motion controller card.

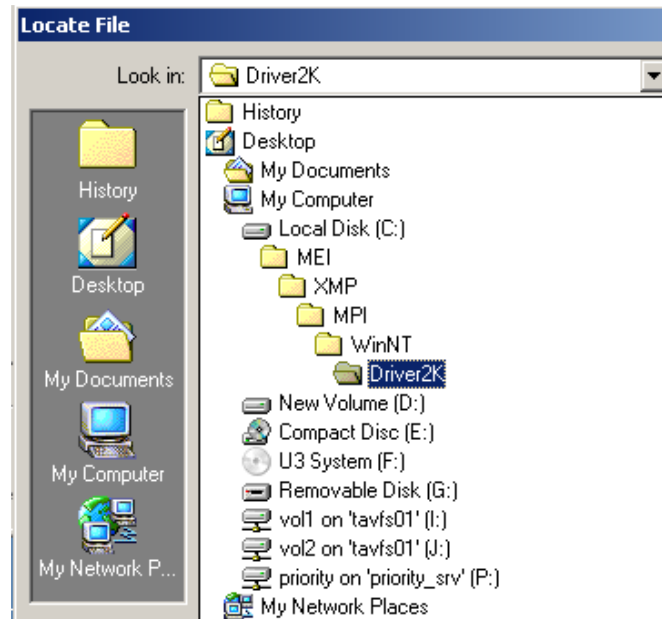
2. Click the  button to continue.



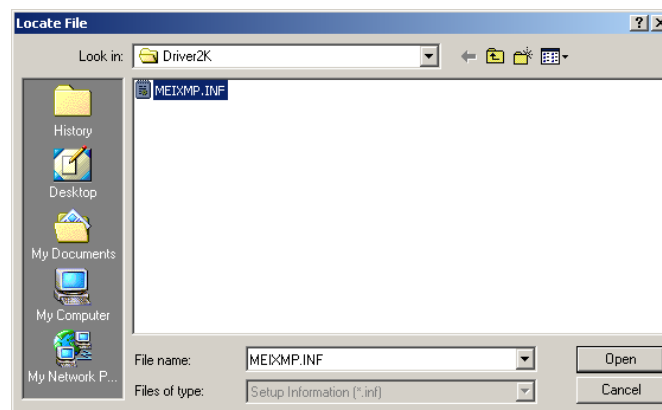
3. Click the  button.



4. Select the **Specify a location** checkbox.
5. Click the  button.



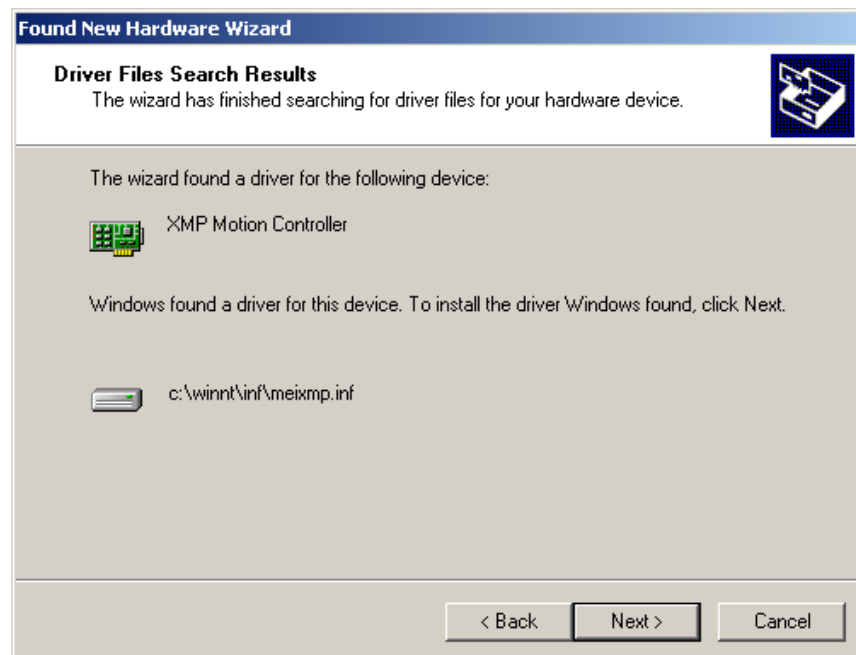
If you are running Windows NT open the folder as shown above.



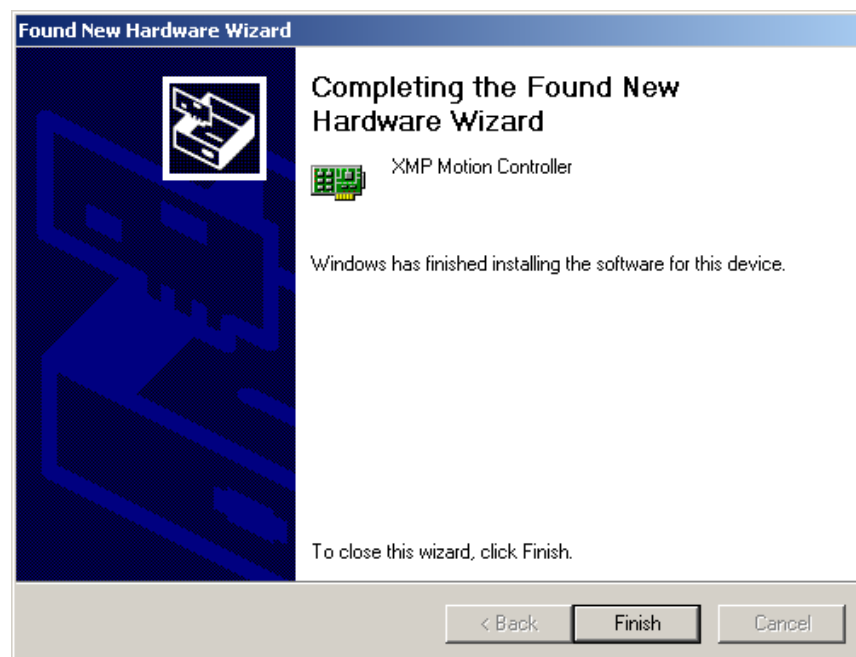
6. Either double-click the **MEIXMP.INF** file, or select it and click the **Open** button.




7. Click the  button.



8. Click the  button.



9. Click the  button.



## 4.3 Installing the Motion Console Program


1. Install the file **03.04.XX\_WinNTSetup.exe** (or later version) on your PC.

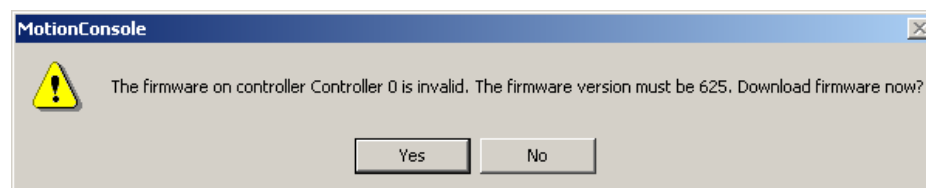
If you did not receive this file either download it from our website

<http://support.motioneng.com/>.

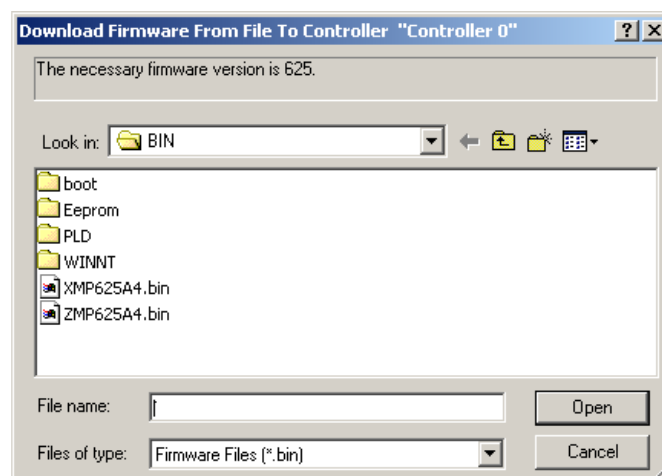
To open the program you are required to get a **password** from [support@motioneng.com](mailto:support@motioneng.com). Installing this file places the **Motion Console** icon on the desktop.



2. From the desktop, click the  icon.



3. Click the  button.



The necessary firmware version is displayed on the top of the window (625).

4. Select the **XMPxxx.bin** file.



Downloads the binary image to the SqNode.

5. Click the  button.

## Chapter 5

## USING THE MOTION CONSOLE

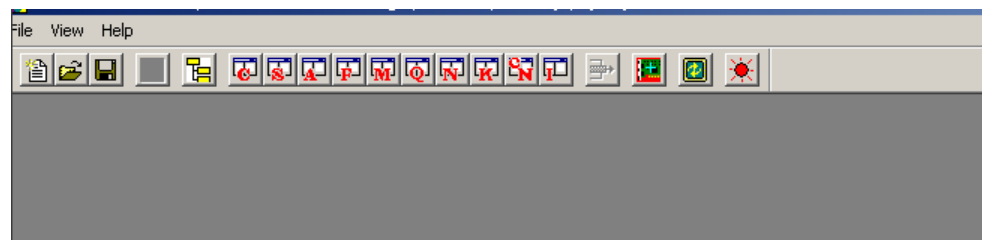
This section describes in a step-by-step format how to:

- ❑ Use the Motion Console to synchronize the SynqNet to the drive
- ❑ Configuring the motor parameters using a text editor
- ❑ Configuring the motion control console

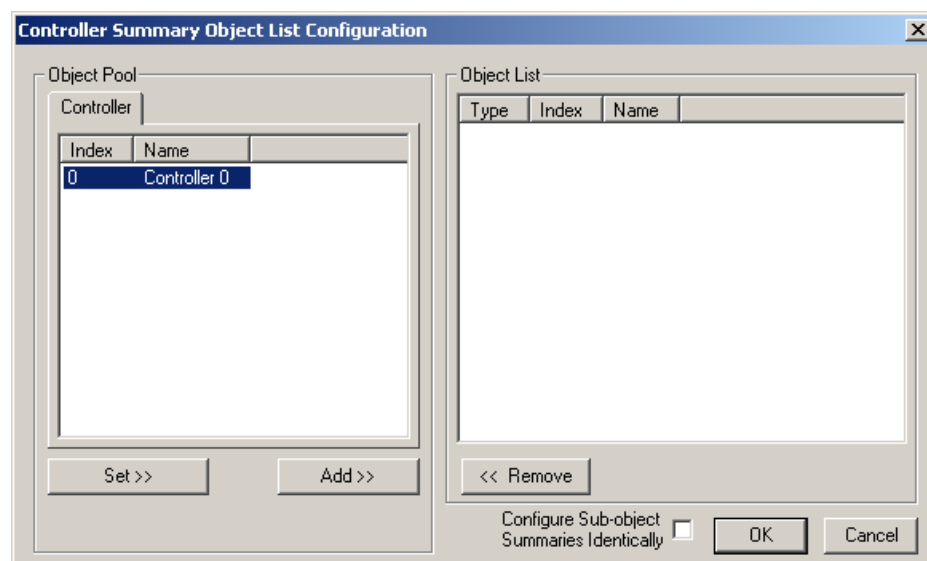
## 5.1 Loading the Motion Console

### ◆ To load the motion console application:

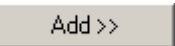
1. If the **Motion Console** is not open, then from the desktop, click the icon.

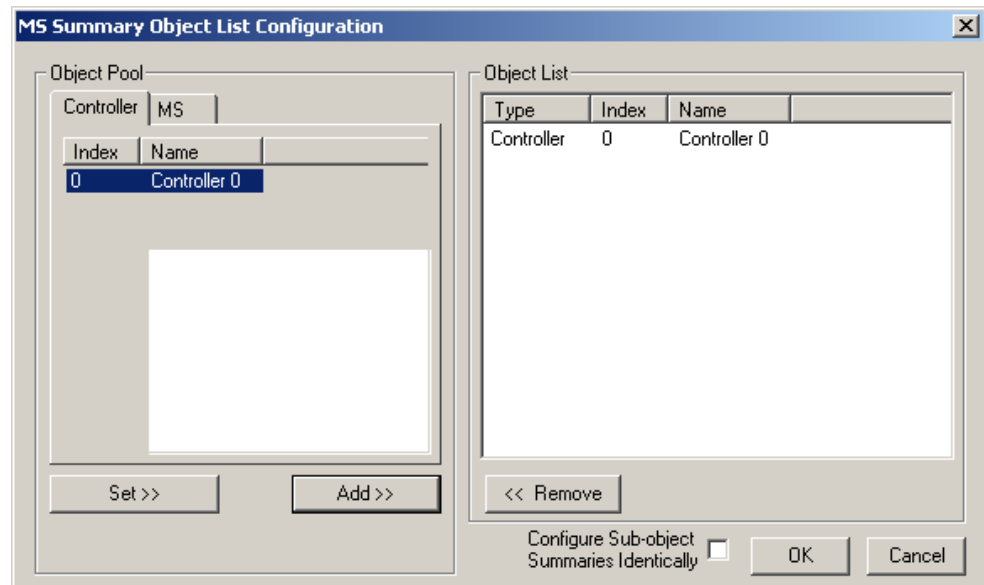


2. Click the  toolbar button.




3. From the **Object Pool** pane, select the controller to add to the **Object List**.

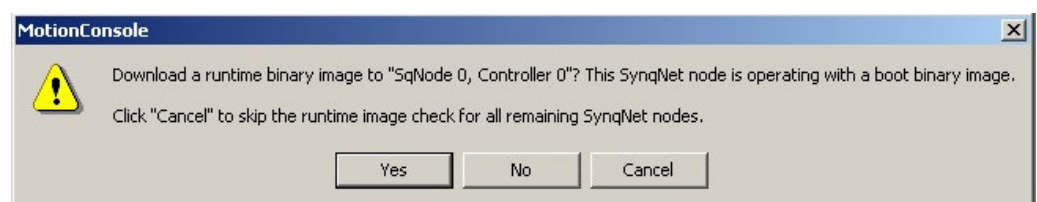
4. Click the  button.



5. Click the  button.

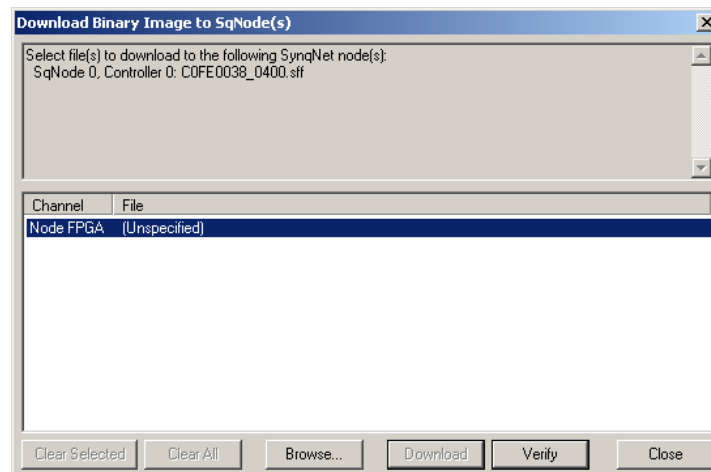


6. Click the  button to synchronize the controller and drive.



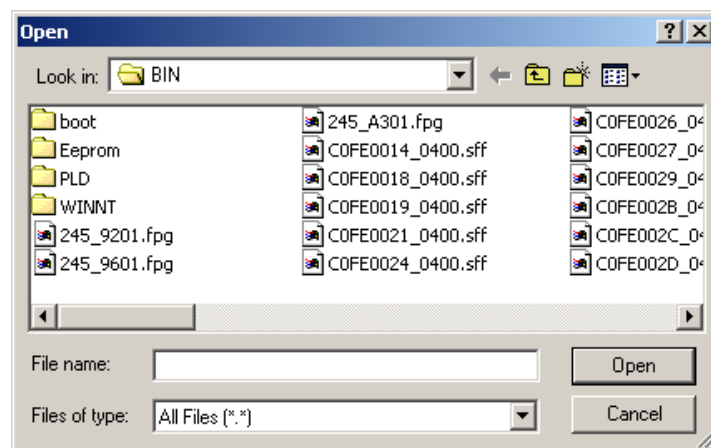
If the FPGA Runtime has not been previously installed the following message is displayed.

7. Click the  button.

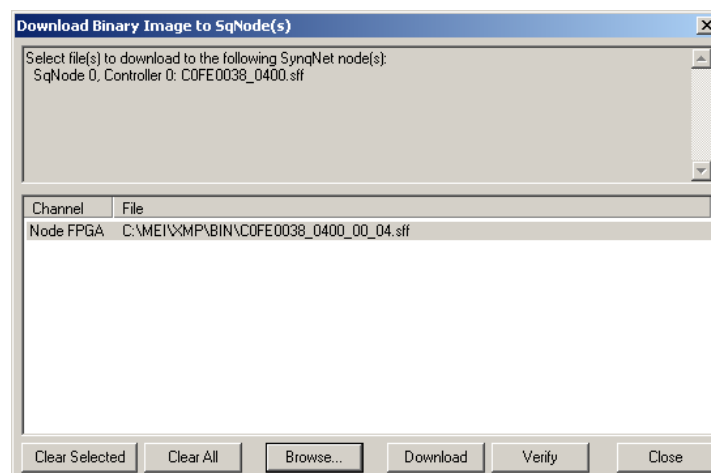


You are asked to select the **COFE0038\_0400.sff** file.

8. Click the **Browse...** button to select the file.

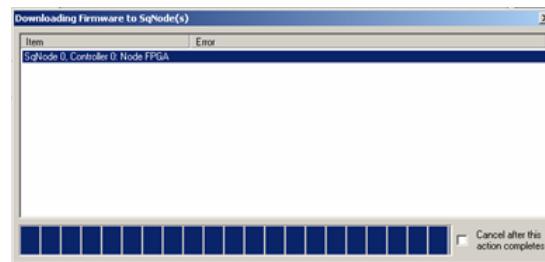


9. Select the **COFE0038\_0400.sff** file.



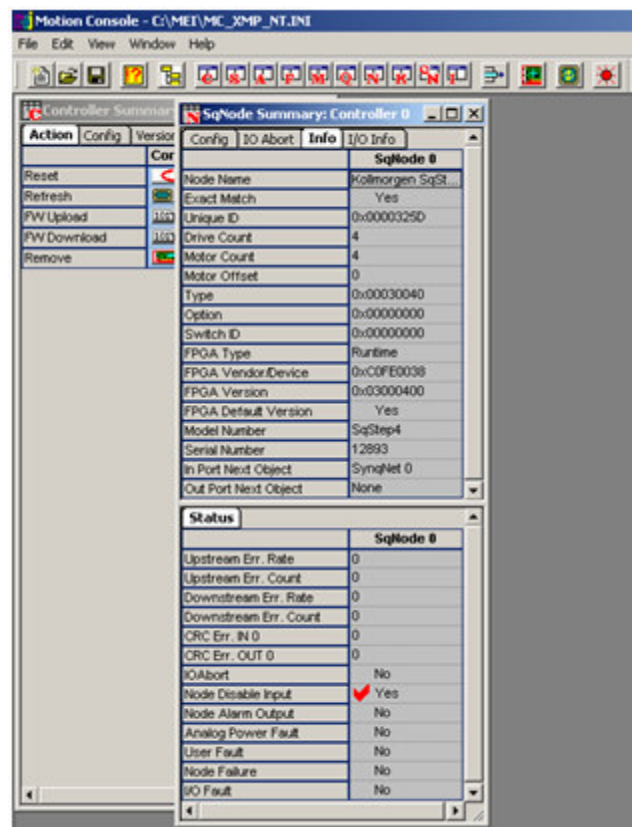
The **COFE0038\_0400.sff** file is now ready to be downloaded.

10. Click the **Download** button

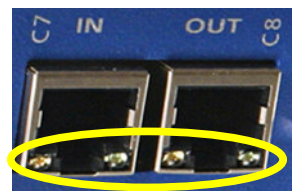


The download progress is shown above.

11. Click the  button and click the **Info** tab.



The **Motion Console** opens after synchronizing the controller and drive.



Communication  
LED Indicators

Communication is established between the controller and the drive. The **SynqNet** controller is synchronized with the drive and the Yellow LEDs change from blinking to solid **ON**.

## 5.2 Configuring the Motor Parameters

**NOTE**

The motor parameters can only be uploaded once the SynqNet controller is synchronized with the drive. See previous section.

This section explains how to upload the motor configuration parameters from the motor drive controller using a Dos **-get** command to the PC and saved in the **Config.dc** file. Once on the PC we can configure the parameters to suit the specific motors you want to connect to the drive controller. When the file is configured it is downloaded back onto the drive controller using a **-set** command.

### 5.2.1 Uploading the Motor Parameters (get command)

◆ **To upload the motor parameters from the drive unit:**

1. At the command prompt, enter the following command:  
**sqDriveconfig -get config.dc -map kollmorgen SqStep.dm**

This command fetches the parameters from the motor drive.

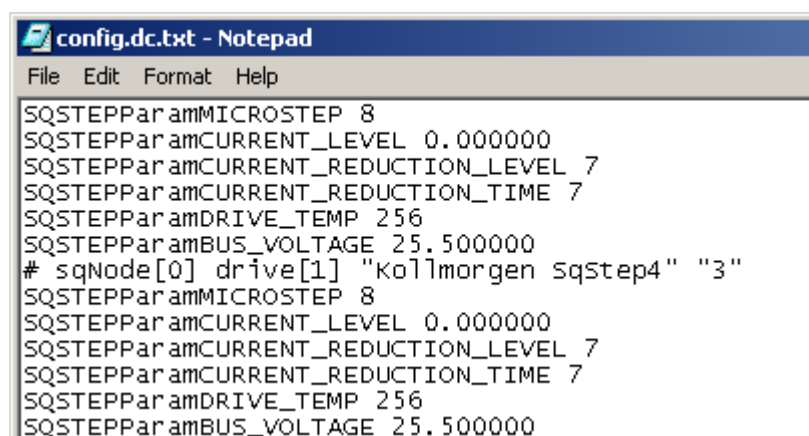
2. Press the **ENTER** key.
3. Enter **Y** and press the **ENTER** key, to the message,

**Do you want to overwrite the existing file (y/n)?**

The motor parameters for the four axes (0, 1, 2 and 3) are uploaded to the PC.

4. Open the **Config.dc** file in any text editor.

**Located at: C:\MEI\XMP\BIN\WINNT.**



```
config.dc.txt - Notepad
File Edit Format Help
SQSTEPParamMICROSTEP 8
SQSTEPParamCURRENT_LEVEL 0.000000
SQSTEPParamCURRENT_REDUCTION_LEVEL 7
SQSTEPParamCURRENT_REDUCTION_TIME 7
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
# sqNode[0] drive[1] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 8
SQSTEPParamCURRENT_LEVEL 0.000000
SQSTEPParamCURRENT_REDUCTION_LEVEL 7
SQSTEPParamCURRENT_REDUCTION_TIME 7
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
```

The motor parameters are shown in the example above.

## 5.2.2 Editing the Motor Configuration File

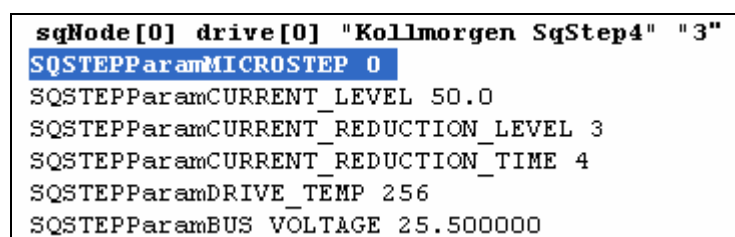
The motor parameters must now be changed to suit the specific motors that are to be connected to the drive controller. The parameters are:

- ☐ Number of micro steps
- ☐ Number of Micro Steps
- ☐ Peak Current Level
- ☐ Current Reduction Level
- ☐ Current Reduction Time
- ☐ Drive Temperature not implemented in this version (Read Only)
- ☐ Drive Bus Voltage displayed in Volts (Read Only)

### 5.2.2.1 Setting the Number of Micro Steps

#### ◆ To set the number of micro steps:

The number of micro-steps per FULL STEP determines the quality of the resulting current sine wave.



```
sqNode[0] drive[0] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
```

- ☐ Use the table below to change the micro step parameters on all 4 axes.

Micro Steps	1	2	4	8	16	32	64	128	256
Parameter	8	7	6	5	4	3	2	1	0

### 5.2.2.2 Setting the Peak Current Level

#### ◆ To set the peak current level:

Amplitude of the sine wave produced is a percentage of the drive peak rated current which is 4 Amps.

```
sqNode[0] drive[0] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
```

☐ Use the formula below to change the peak current level on all 4 axes.

$$\text{PeakSine} = \text{DIpeak} * \frac{X}{100}$$

Where X: is a value between 0 and 100 and DIpeak=4.5

### 5.2.2.3 Setting the Current Reduction Level

When the current reduction feature is active the drive controller reduces the current to a percentage of the current peak level amplitude.

```
sqNode[0] drive[0] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
```

#### ◆ To set the current reduction level:

☐ Use the table below to change the current reduction level on all 4 axes.

Reduction Level	100%	87.5%	75%	62.5%	50%	37.5%	25%	12.5%
Parameter	7	6	5	4	3	2	1	0

### 5.2.2.4 Setting the Current Reduction Time

This is the period of time in seconds from when no step pulses are detected and the current reduction feature is activated.

```
sqNode[0] drive[0] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
```

#### ◆ To set the current reduction time:

☐ Use the table below to change the current reduction time on all 3 axes.

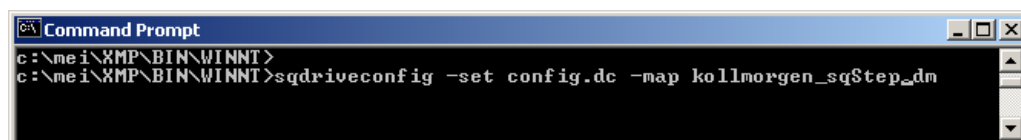


Reduction Time	X	32s	16s	8s	4s	2s	1s	0.5s
Parameter	7	6	5	4	3	2	1	0

### 5.2.3 Downloading the Motor Parameters (set command)

◆ **To download the motor parameters to the drive unit:**

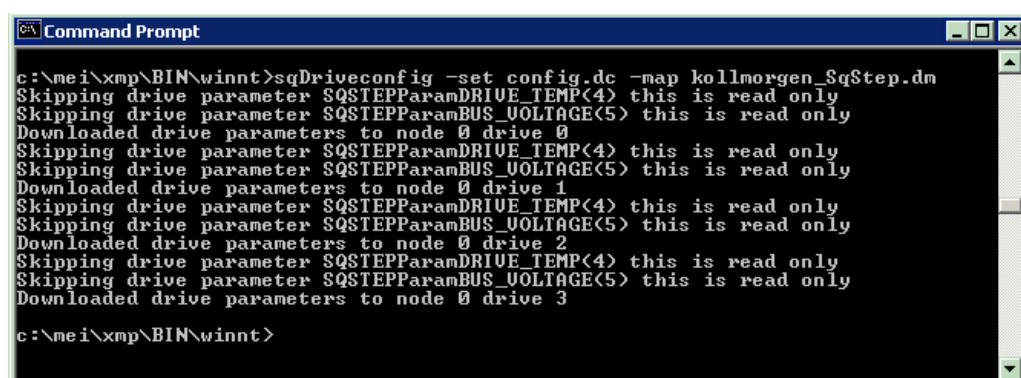
1. At the command prompt, enter the following command:  
**sqDriveconfig -set config.dc -map kollmorgen sqStep.dm**



This command downloads the parameters to the motor drive.

2. Press the **ENTER** key.
3. Enter **Y** and press the **ENTER** key, to the message,

**Do you want to overwrite the existing file (y/n)?**



The motor parameters for the four axes (0, 1, 2 and 3) are downloaded to the motor drive.

## 5.3 Configuring the Motion Control Console



This section describes how to:

- ☐ Map the axes
- ☐ Setting the motor configuration parameters
- ☐ Clearing the errors
- ☐ Setting the axes motion parameters

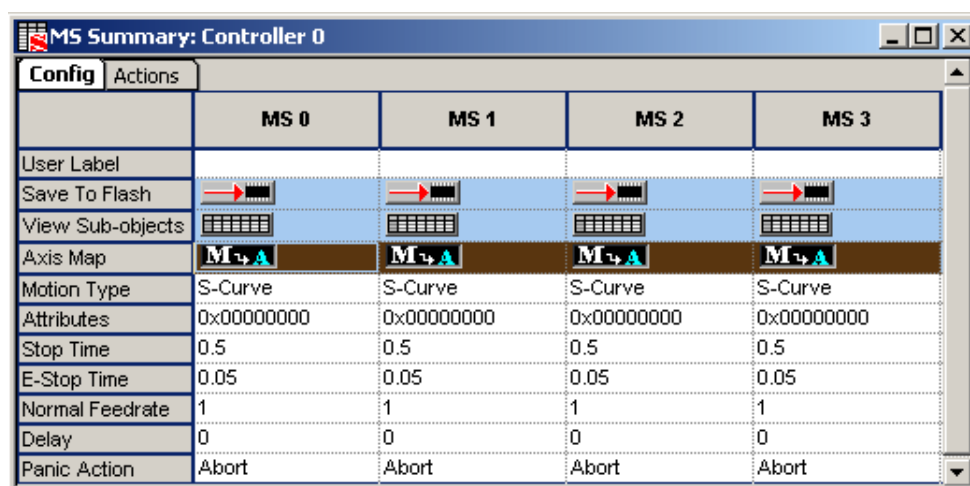
**You must perform the configuration in the sequence listed below.**

### 5.3.1 Mapping the Axes



1. From the toolbar, click the  button.
2. Add the selected controller to the **Object List**.
3. Click the  button.

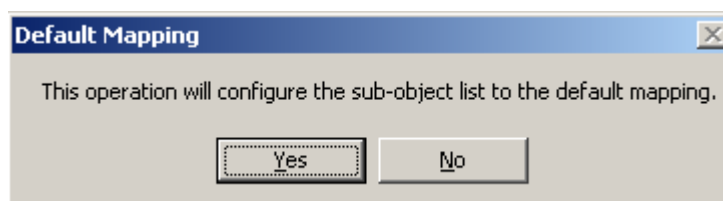
- Click the **Config** tab if it is not selected.



- Click **Axis Map**.

This selects the complete row.

- Hold down the **Shift** key and click all the buttons in sequence.

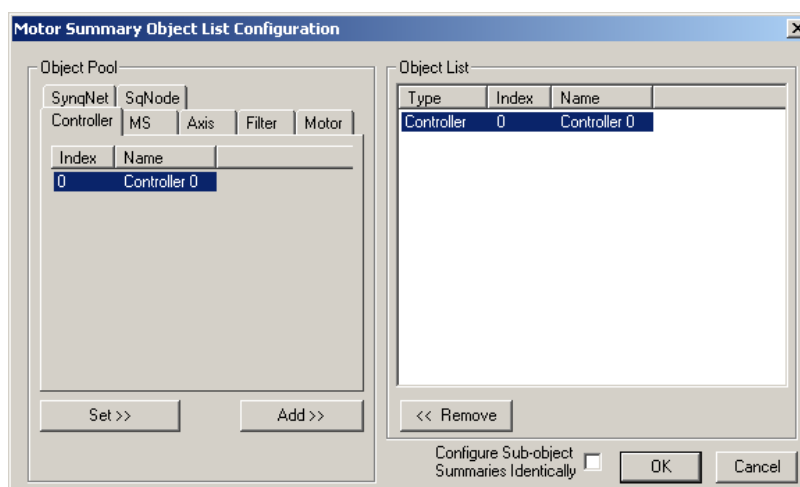


- Click the button to configure the **sub-object** list to the default mapping.

### 5.3.2 Setting the Motor Configuration Parameters


This section is used to set the motor parameters.

- From the toolbar, click the button.

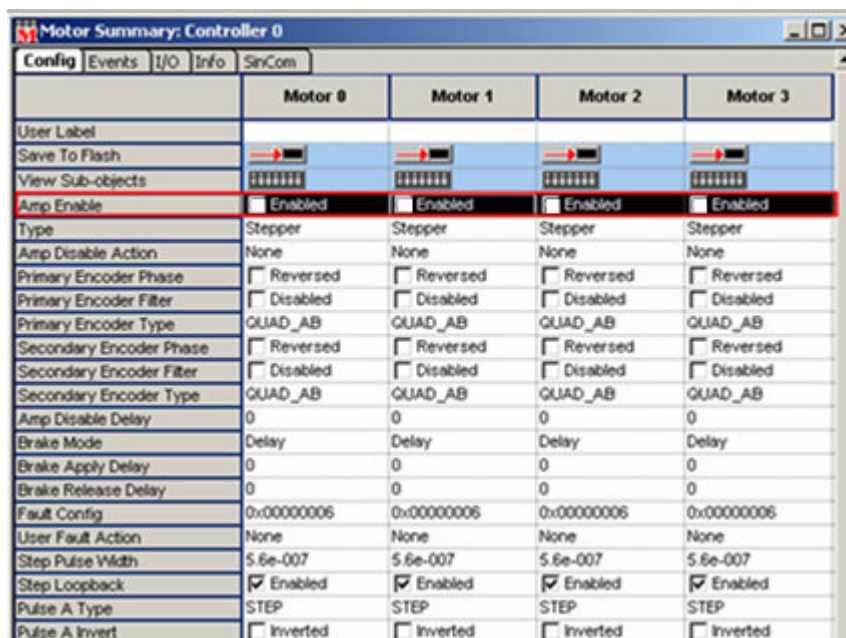


In this example the controller is already added.

2. From the **Object Pool** select the controller to add to the **Object List**.

3. Click the  button.

4. Click the  button.



The **MS Summary** window opens displaying the **Config** tab.

5. Select the **Set Loopback** checkboxes (**Enabled**) for each motor.

User Fault Action	None	None	None	None
Step Pulse Width	5.6e-007	5.6e-007	5.6e-007	5.6e-007
Step Loopback	<input checked="" type="checkbox"/> Enabled	<input checked="" type="checkbox"/> Enabled	<input checked="" type="checkbox"/> Enabled	<input checked="" type="checkbox"/> Enabled
Pulse A Type	STEP	STEP	STEP	STEP
Pulse A Invert	<input type="checkbox"/> Inverted	<input type="checkbox"/> Inverted	<input type="checkbox"/> Inverted	<input type="checkbox"/> Inverted

Set **Step Loopback** to **Enabled** when an encoder is **NOT** connected.

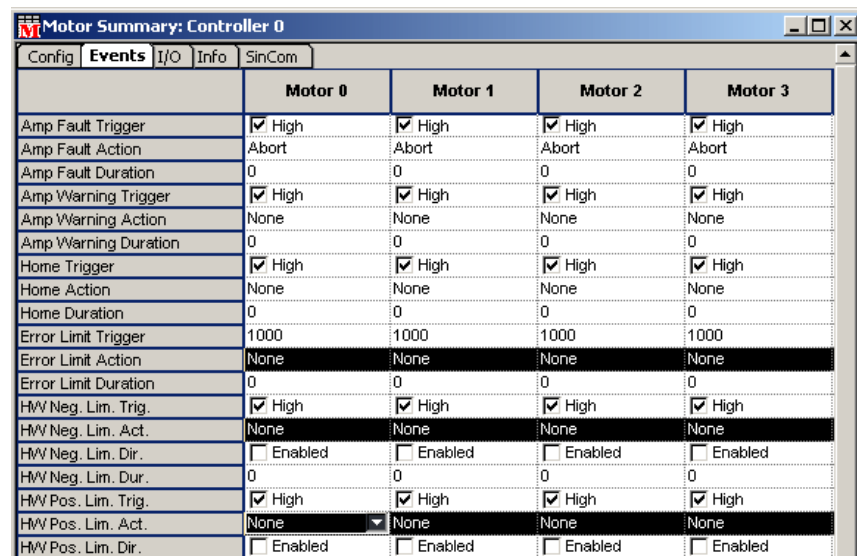
6. In the **Fault Config** row, open the list boxes and clear the **Primary Feedback** checkbox for each motor.

Fault Config	0x00000016	0x00000016	0x00000016	0x00000016
User Fault Action	<input type="checkbox"/> Amp Fault	None	None	None
Step Pulse Width	<input checked="" type="checkbox"/> Drive Fault	5.6e-007	5.6e-007	5.6e-007
Step Loopback	<input checked="" type="checkbox"/> Watchdog Fault	<input checked="" type="checkbox"/> Enabled	<input checked="" type="checkbox"/> Enabled	<input checked="" type="checkbox"/> Enabled
Pulse A Type	<input type="checkbox"/> Checksum Error	STEP	STEP	STEP
Pulse A Invert	<input type="checkbox"/> Primary Feedback	<input type="checkbox"/> Inverted	<input type="checkbox"/> Inverted	<input type="checkbox"/> Inverted
Pulse B Type	<input type="checkbox"/> Amp Not Power	DIR	DIR	DIR
	<input type="checkbox"/> Drive Not Ready			

7. Set **Type** to **Stepper** for each motor.

Amp Enable	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled
Type	Stepper	Stepper	Stepper	Stepper
Amp Disable Action	None	None	None	None
Primary Encoder Phase	<input type="checkbox"/> Reversed	<input type="checkbox"/> Reversed	<input type="checkbox"/> Reversed	<input type="checkbox"/> Reversed
Primary Encoder Filter	<input type="checkbox"/> Disabled	<input type="checkbox"/> Disabled	<input type="checkbox"/> Disabled	<input type="checkbox"/> Disabled


8. Click the **Events** tab.

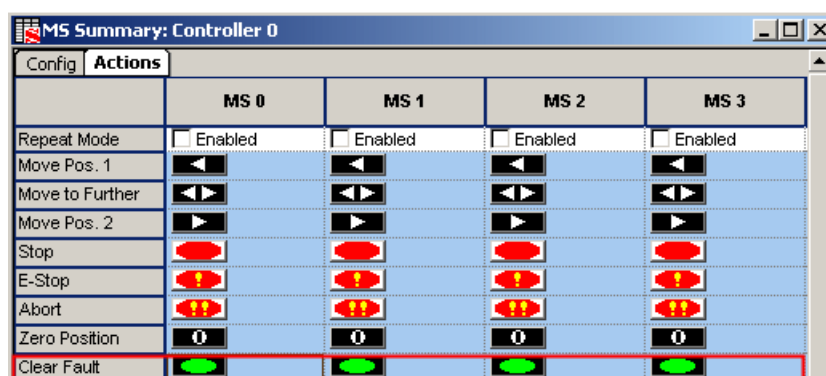


	Motor 0	Motor 1	Motor 2	Motor 3
Amp Fault Trigger	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High
Amp Fault Action	Abort	Abort	Abort	Abort
Amp Fault Duration	0	0	0	0
Amp Warning Trigger	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High
Amp Warning Action	None	None	None	None
Amp Warning Duration	0	0	0	0
Home Trigger	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High
Home Action	None	None	None	None
Home Duration	0	0	0	0
Error Limit Trigger	1000	1000	1000	1000
Error Limit Action	None	None	None	None
Error Limit Duration	0	0	0	0
HW Neg. Lim. Trig.	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High
HW Neg. Lim. Act.	None	None	None	None
HW Neg. Lim. Dir.	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled
HW Neg. Lim. Dur.	0	0	0	0
HW Pos. Lim. Trig.	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High	<input checked="" type="checkbox"/> High
HW Pos. Lim. Act.	None	None	None	None
HW Pos. Lim. Dir.	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled	<input type="checkbox"/> Enabled

9. Set **Error Limit Action** to **None** for each motor.
10. Set **HW Neg. Lim. Dir.** to **None** for each motor.
11. Set **HW Pos. Lim. Act.** to **None** for each motor.

### 5.3.3 Clearing the Errors

1. From the toolbar, click the  button.
2. Click the **Action** tab.





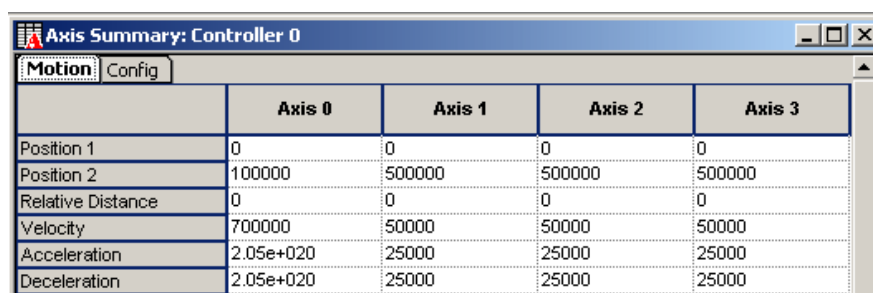
3. Click the green **Clear Fault**  button for each of the motors.

The red LEDs on the drive turn **OFF**.

### 5.3.4 Setting the Axes Motion Parameters

This section controls the motion of the motor.

1. From the toolbar, click the  button.
2. Add the selected controller to the **Object List**.
3. Click the  button.




4. Set the motion parameters on each axis for the following:
  - a. Position 1 and Position 2.
  - b. Velocity
  - c. Acceleration
  - d. Deceleration

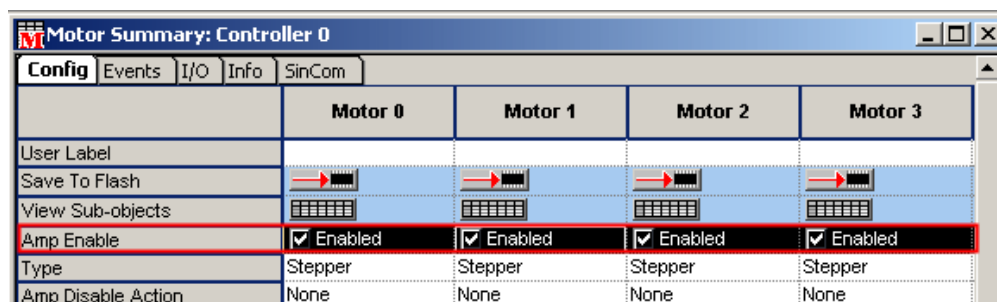


#### NOTE

All the other values are optional and can be set as required.


### 5.3.5 Set Amp Enable

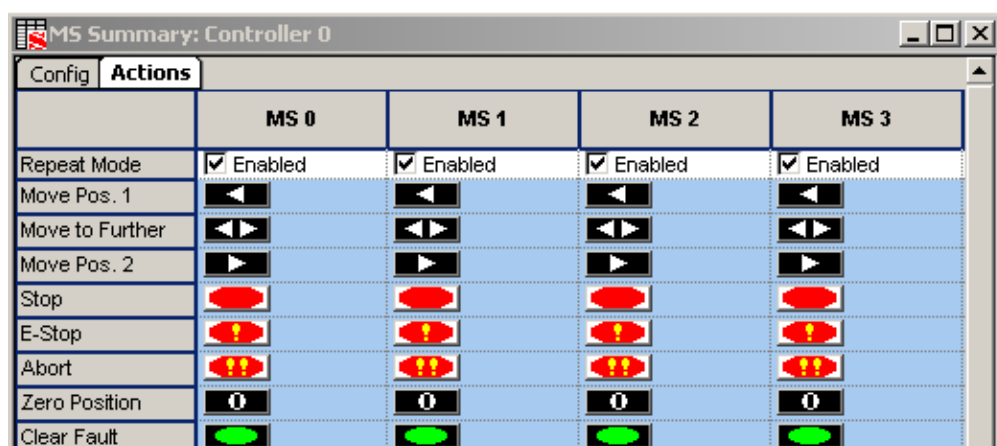
1. From the toolbar, click the  button.



2. Select the **Amp Enabled** checkbox (**Enabled**) for each motor.

### 5.3.6 Start and Stop the Motors

1. From the toolbar, click the  button.
2. Click the **Actions** tab.



3. Click **Zero Position** for all axes.
4. Click **Clear Fault** for all axes.
5. Select the **Repeat Mode** checkboxes (**Enabled**) for each motor.
6. Click to move the motor to position 1.
7. Click to move the motor to the furthest position.
8. Click to move the motor to position 2.



#### NOTE

Click the **Abort**  button to force an error and then clear it by clicking the **Clear Fault**  button.

## Chapter 6

## ERROR MESSAGES

The **sqDriveMsg Utility** displays all the faults and warnings present on the specified drive.

## 6.1 Using the sqDriveMsg Utility

- Use Table 4 below as a guide to find the required faults and warnings.

```

C:\MEI\03.03.00\XMP\bin\WinNT>sqdrivemsg -?
The sqDriveMsg utility displays all warnings and faults for the specified
drive.

sqdrivemsg  [-control #] [-server] [-port #] [-trace #] [-node #]
              [-drive #] [-motor #]

-control      Controller number (default = 0).
-server       Name of the host running server.exe.
-port         TCP/IP port on the host computer.
-trace        Bit mask to specify trace information outputs.
-node         SynqNet Node address.
-drive        Drive index relative to the node.
-motor        Motor number associated with the drive.

C:\MEI\03.03.00\XMP\bin\WinNT>

```

**Table 4 sqDriveMsg Utility Arguments**

Argument	Description
-?	Help
-control #	Controller number (default=0).
-server #	Name or IP address of the host running server.exe.
-port #	TCP/IP port on the host computer (default=3300).
-trace #	Bit mask to specify trace information outputs.
-node #	Node address of the SynqNet network (default=0).
-drive #	Index of the drive relative to the node (default=0).
-motor #	The MPI motor object mapped to the drive (default=0).



### NOTE

You can use either **-node** and **-drive**, or just **-motor** to specify the desired drive interface.

### 6.1.1 Example

To see the faults and warnings for drive 0 on node 1.

```
C:\Mei\03.03.00\Xmp\Bin\WinNT>sqdrivemsg -node 1
Fault Count = 1
Fault Read: 0x20: Invalid hall state
Warning Count = 2
Warning Read: 0x1: Bus Under-Voltage
Warning Read: 0x4: Phase-Finding is required
```

### 6.1.2 Error Messages

**Table 5 sqDriveMsg Utility Drive Faults**

Drive Fault	Description	sqStep Bits
<b>Over Current</b>	Global drive fault will effect both axes.	0
<b>Bus Over Voltage</b>	Global drive fault will effect both axes.	1
<b>Over Temperature</b>	Global drive fault will effect both axes.	2
<b>Bus Under Voltage</b>	Global drive fault will effect both axes.	3

**Table 6 sqDriveMsg Utility Axes Faults for Stepper Motors**

Axes Fault	Description	sqStep Bits
<b>Axis_0_Pulse/drn Overflow</b>	Axis 0 Pulse and Direction Counter Overflow.	4
<b>Axis_1_Pulse/drn Overflow</b>	Axis 1 Pulse and Direction Counter Overflow.	6



## Appendix A HARDWARE SPECIFICATIONS

### A.1 Mechanical

The SqStep4 SynqNet Stepper Drive provides a 4 axis small motor servo drive with a compact footprint. The figure below illustrates the system dimensions and the connector interfaces, which are all situated on the front of the unit. The unit can be positioned vertically or horizontally with mounting holes provided on the L-bracket for installing on any surface.

#### A.1.1 Physical Characteristics



Figure 2: Physical Dimensions

#### A.1.2 Front Panel

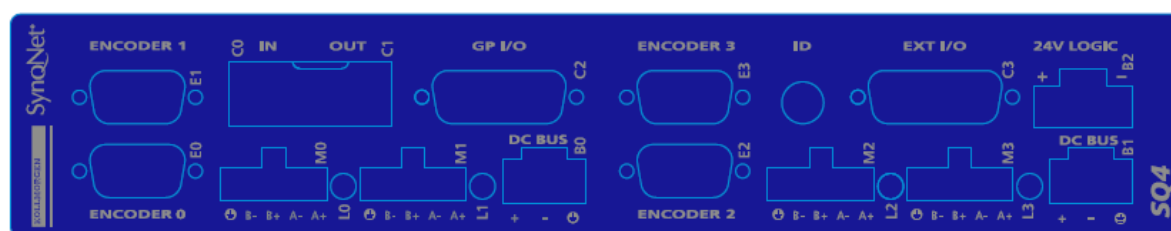


Figure 3: SqStep4 Front Panel Silk

#### A.1.3 Weight

Total weight without cables is **1.1** Kilograms.

## A.2 Electrical Specifications

**Table 7: Electrical Specifications**

Specifications	Test Condition	MIN	TYP	MAX	Unit
<b>Bus voltage</b>		12	-	42	V
<b>Logic Voltage</b>		18	24	28	V
<b>Phase output Current</b>	RMS	0.4		3	Arms
<b>Phase Output Current</b>	Peak	0.57		4.5	Apeak
<b>Logic Quiescent Current</b>	I/O Floating		250		mA
<b>Active Power Dissipation</b>	$I_{out}(\text{per axis})=3A_{rms}$		12		W
<b>Encoder Voltage Supply</b>		4.5	5	5.5	V
<b>Encoder Current Supply</b>			100	250	mA
<b>GPIO Input Voltage</b>		2		30	V
<b>GPIO Output Current</b>		0	15	60	mA
<b>GPIO Output Vce</b>				40	V
<b>High Speed I/O</b>	RS-422/485 Standard		1MB/s	10MB/s	

## A.3 Environmental Specifications

Table 8: Environmental Specifications

Specifications	Description
Ambient Temperature	0 to +50 Degrees C
Storage Temperature	-20 to 70 Degrees C
Maximum L-Bracket Temperature	70 Degree C
Current per axis without additional heat-sinking	~1.5 Arms
Ambient Humidity	10% to 90%, non condensing
Atmosphere	Without corrosive gasses or dust
Altitude	De-rated 5% per 1000ft (300m) above 3300ft (1000m)
Vibration	0.5 G



### DANGER

Additional cooling may be required to limit the plate temperature to 70°C when operating the unit at higher currents across multiple axes.



### IMPORTANT NOTE

This does not limit the peak transient current limit of 5A per axis only the continuous rated value.

## Appendix B CONFIGURATION FILE PARAMETERS

The motor parameters must now be changed to suit the specific motors that are to be connected to the drive controller. The parameters are:

- ☐ Number of Micro Steps
- ☐ Peak Current Level
- ☐ Current Reduction Level
- ☐ Current Reduction Time
- ☐ Drive Temperature (Read Only)
- ☐ Drive Bus Voltage displayed in Volts (Read Only)

```
sqNode[0] drive[0] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
#sqNode[0] drive[1] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.500000
#sqNode[0] drive[2] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.000000
#sqNode[0] drive[3] "Kollmorgen SqStep4" "3"
SQSTEPParamMICROSTEP 0
SQSTEPParamCURRENT_LEVEL 50.0
SQSTEPParamCURRENT_REDUCTION_LEVEL 3
SQSTEPParamCURRENT_REDUCTION_TIME 4
SQSTEPParamDRIVE_TEMP 256
SQSTEPParamBUS_VOLTAGE 25.000000
```

## B.1 Number of Micro Steps

The number of micro-steps per FULL STEP determines the quality of the resulting current sine wave.

**Table 9: Number of Micro Steps Parameters**

<b>Micro Steps</b>	1	2	4	8	16	32	64	128	256
<b>Parameter</b>	8	7	6	5	4	3	2	1	0

## B.2 Peak Current Level

Amplitude of the sine wave produced as a percentage of the drive peak rated current which is **4.5** Amps.

$$\text{PeakSine} = \text{DIpeak} * \frac{X}{100}$$

**Where X:** is a value between 0 and 100 and DIpeak=4.5

## B.3 Current Reduction Level

When the current reduction feature is active the drive controller reduces the current to a percentage of the current peak level amplitude.

**Table 10: Current Reduction Level Parameters**

<b>Reduction Level</b>	100%	87.5%	75%	62.5%	50%	37.5%	25%	12.5%
<b>Parameter</b>	7	6	5	4	3	2	1	0

## B.4 Current Reduction Time

This is the period of time in seconds from when no step pulses are detected and the current reduction feature is activated.

**Table 11: Current Reduction Time Parameters (Seconds)**

<b>Reduction Time</b>	None	32	16	8	4	2	1	0.5
<b>Parameter</b>	7	6	5	4	3	2	1	0

## B.5 Heat-sink Temperature

This parameter is READ-ONLY and provides the temperature of the Heatsink in degrees Celsius.

- ☐ Valid operating range from 10-80°C (50-176°F)
- ☐ Accuracy of reading ±3%



### NOTE

The over-temperature fault is set at 70°C (158°F).

## B.6 Bus Voltage

This parameter is READ-ONLY and provides the voltage of the DC bus in volts.

- ☐ Valid operating range from 0-96 Volts
- ☐ Accuracy of reading  $\pm 1\%$

**NOTE**

**The over-voltage fault is set at 48 Volts (DC).**

## Appendix C MOTOR CONNECTIONS

Because the SqStep4 SynqNet Stepper Drive uses a 4 wire configuration use this section to rewire any 8 or 6 lead motor to achieve a 4 wire configuration.



### IMPORTANT NOTE

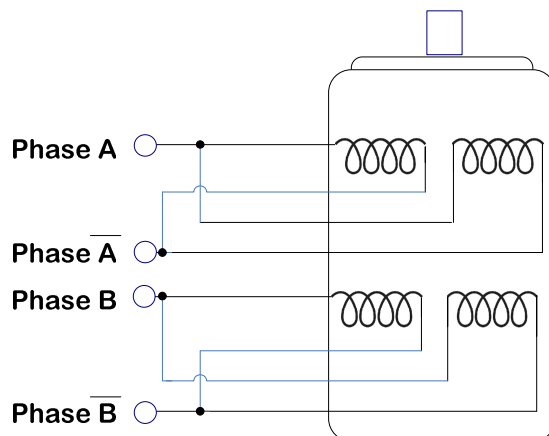
**Motor wiring should be run in a separate conduit and kept away from logic wiring to minimize noise coupled onto the logic signals. Motor cabling exceeding one foot in length should be comprised of shielded twisted pairs to reduce the transmission of EMI (Electromagnetic Interference) which can lead to rough motor operation and poor system performance..**

## C.1 8 Lead Motors

Motors using 8 leads offer a high degree of flexibility to the system designer in that they may be connected in series or parallel, thus covering a wide range of applications.

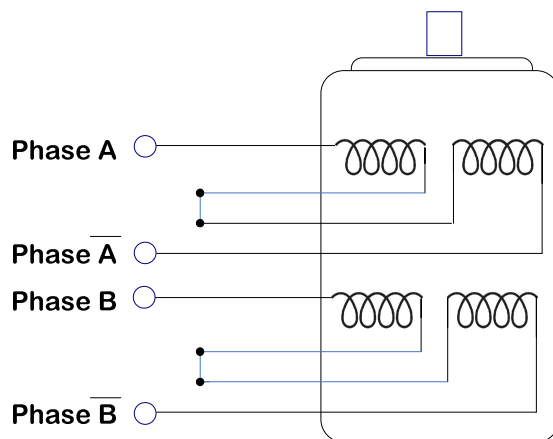
### C.1.1 Parallel 8 Lead

An 8 lead motor in a parallel configuration offers a more stable, but lower torque at lower speeds. But because of the lower inductance, there is higher torque at higher speeds. Multiply the per phase (or unipolar) current rating by 1.96, or the bipolar current rating by 1.4, to determine the peak output current.



### C.1.2 Series 8 Lead

A series motor configuration would typically be used in applications where a higher torque at lower speeds is required. Because this configuration has the most inductance, the performance starts to degrade at higher speeds. Use the per phase (or unipolar) current rating as the peak output current, or multiply the bipolar current rating by 1.4 to determine the peak output current.

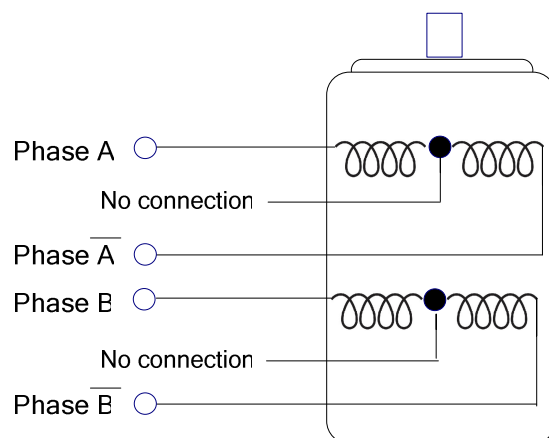


## C.2 6 Lead Motors

Like 8 lead stepper motors, 6 lead motors have two configurations available for high speed or high torque operation. The higher speed configuration or half coil (only uses one half of the motor's inductor windings). The higher torque configuration, or full coil, uses the full windings for each phase.

### C.2.1 Half Coil 6 Lead

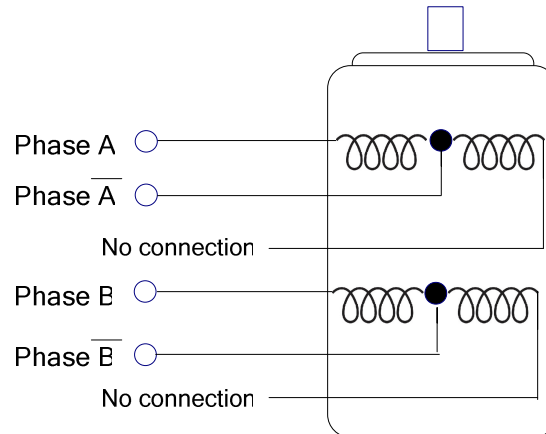
As previously stated, the half coil configuration uses 50% of the motor windings. This gives lower inductance, therefore, lower torque output. Like the parallel connection of 8 lead motor, the torque output is more stable at higher speeds. In setting the driver output current multiply the specified per phase (or unipolar) current rating by 1.4 to determine the peak output current.





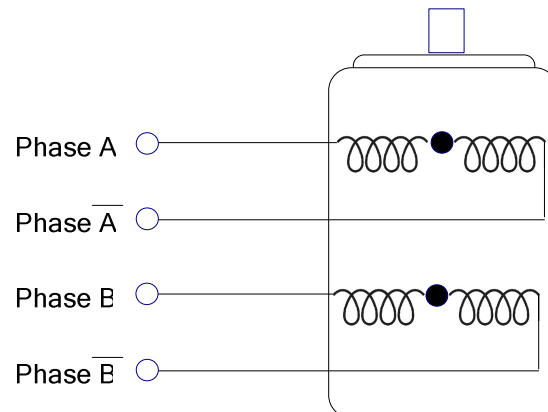
### C.2.2 Full Coil 6 Lead

The full coil configuration on a six lead motor should be used in applications where higher torque at lower speeds is desired. Use the per phase (or unipolar) current rating as the peak output current.



### C.3 4 Lead Motors

Motors using only 4 leads are the least flexible but easiest to wire. Speed and torque depends on winding inductance. In setting the driver output current, multiply the specified phase current by 1.4 to determine the peak output current.




## Appendix D CONNECTOR PIN-OUTS

This section describes the connector pin-outs. These include logic power, bus power, motor connectors and more. This section includes the following:

- ☐ Logic Power
- ☐ Bus Power
- ☐ Motor Connector

### D.1 Logic Power

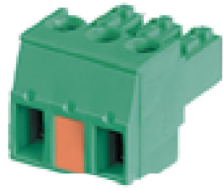
Connector Definition		
Manufacturer		Phoenix Contact
Part Number		MSTB 2,5/2-GF-5,08-BK
Mating Connector Part Number		MSTBT 2,5/ 2-STF-5,08
Pin Out		
Pin #	Description	Comments
1	Logic +	+24VDC
2	Logic -	Refer to Grounding Tree



The illustration shows a 15-position version

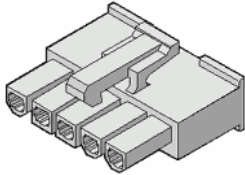
### D.2 Bus Power

Connector Definition		
Manufacturer	Sauro	
Part Number	3-pin, 5.08 pitch header with tab – CIM039M5	
Mating Connector Part Number	CTF030M5	
Pin Out		
Pin #	Description	Comments
1	Bus +	48VDC; regulated or unregulated
2	Bus -	Refer to Grounding Tree TBD
3	PE	Power Earth



## D.3 Motor Connector

Connector Definition		
Manufacturer	Molex	
Part Number	39-30-3056; 4.20mm (.165") Pitch Mini-Fit Jr.™ Header	
Mating Connector Part Number	39-01-4051 (Housing) 44476-3112 (Pins)	
Pin Out		
Pin #	Description	Comments
1	Phase A-	
2	Phase A+	
3	Phase B+	
4	Phase B-	
5	PE	Power Earth



---

## Appendix E    SALES AND SERVICES

---

We are committed to quality customer service. In order to serve in the most effective way, please contact your local sales representative for assistance.

If you are unaware of your local sales representative, please contact us.

### Europe

#### **Danaher Motion Customer Support Europe**

E-mail:                sep@danahermotion.net

Phone:                +972-3-927-3800

Fax:                    +972-3-922-8075

[www.danahermotion.net](http://www.danahermotion.net)

### North America

#### **Danaher Motion Customer Support North America**

E-mail:                sep@danahermotion.com

Phone:                +972-3-927-3800

Fax:                    +972-3-927-8075

[www.danahermotion.com](http://www.danahermotion.com)

