SqDC SynqNet
DC Drive

Operating Instructions
Version 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
Revision History

<table>
<thead>
<tr>
<th>Rev</th>
<th>Date</th>
<th>Valid For</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>OCT 2006</td>
<td>HW/SW Versions 1.0</td>
<td>New Quick start Guide</td>
</tr>
<tr>
<td>1.1</td>
<td>FEB 2007</td>
<td>same</td>
<td>Quick Start Guide rewritten</td>
</tr>
</tbody>
</table>

Important Notice

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Print Version 004

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** 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.
# SqDC SynqNet DC Drive

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>REVISION HISTORY</td>
<td>I</td>
</tr>
<tr>
<td>IMPORTANT NOTICE</td>
<td>I</td>
</tr>
<tr>
<td>HOW TO CONTACT US</td>
<td>II</td>
</tr>
<tr>
<td>IMPORTANT SAFETY INFORMATION</td>
<td>II</td>
</tr>
<tr>
<td>Operational Warnings and Cautions</td>
<td>ii</td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 ABOUT THIS GUIDE</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1 Downloading Manuals from our Website</td>
<td>1</td>
</tr>
<tr>
<td>2 PRE-INSTALLATION REQUIREMENTS</td>
<td>3</td>
</tr>
<tr>
<td>2.1 LAB ELECTRICAL REQUIREMENTS</td>
<td>3</td>
</tr>
<tr>
<td>2.2 REQUIRED CABLES</td>
<td>3</td>
</tr>
<tr>
<td>2.3 MOTION CONTROL CARD (DMPC)</td>
<td>4</td>
</tr>
<tr>
<td>2.3.1 What is SynqNet</td>
<td>4</td>
</tr>
<tr>
<td>2.3.2 Acquiring the Latest SynqNet Software Version</td>
<td>4</td>
</tr>
<tr>
<td>2.3.3 PC Requirements</td>
<td>4</td>
</tr>
<tr>
<td>3 INSTALLING THE HARDWARE</td>
<td>5</td>
</tr>
<tr>
<td>3.1 UNPACKING INSTRUCTIONS</td>
<td>5</td>
</tr>
<tr>
<td>3.2 GENERAL</td>
<td>6</td>
</tr>
<tr>
<td>3.2.1 Safety</td>
<td>6</td>
</tr>
<tr>
<td>3.2.2 Grounding</td>
<td>6</td>
</tr>
<tr>
<td>3.3 CONNECTING THE DRIVE CABLES</td>
<td>7</td>
</tr>
<tr>
<td>4 INSTALLING THE DMPC CONTROLLER CARD</td>
<td>8</td>
</tr>
<tr>
<td>4.1 INSTALLING THE DMPC CONTROLLER CARD</td>
<td>8</td>
</tr>
<tr>
<td>4.2 INSTALLING THE DMPC DRIVERS</td>
<td>8</td>
</tr>
<tr>
<td>4.3 INSTALLING THE MOTION CONSOLE PROGRAM</td>
<td>12</td>
</tr>
<tr>
<td>5 USING THE MOTION CONSOLE</td>
<td>13</td>
</tr>
<tr>
<td>5.1 LOADING THE MOTION CONSOLE</td>
<td>13</td>
</tr>
<tr>
<td>5.2 CONFIGURING THE MOTOR PARAMETERS</td>
<td>17</td>
</tr>
<tr>
<td>5.2.1 Uploading the Motor Parameters (get command)</td>
<td>17</td>
</tr>
<tr>
<td>5.2.2 Editing the Motor Configuration File</td>
<td>18</td>
</tr>
<tr>
<td>5.2.3 Downloading the Motor Parameters (Set command)</td>
<td>19</td>
</tr>
<tr>
<td>5.3 CONFIGURING THE MOTION CONTROL CONSOLE</td>
<td>19</td>
</tr>
<tr>
<td>5.3.1 Mapping the Axes</td>
<td>20</td>
</tr>
<tr>
<td>5.3.2 Setting the Filter Parameters (PID Coefficients)</td>
<td>20</td>
</tr>
<tr>
<td>5.3.3 Setting the Motor Configuration Parameters</td>
<td>21</td>
</tr>
<tr>
<td>5.3.4 Clearing the Errors</td>
<td>23</td>
</tr>
<tr>
<td>5.3.5 Setting the Axes Motion Parameters</td>
<td>23</td>
</tr>
<tr>
<td>5.3.6 Set Amp Enable</td>
<td>24</td>
</tr>
<tr>
<td>5.3.7 Start and Stop the Motors</td>
<td>25</td>
</tr>
</tbody>
</table>
6 ERROR MESSAGES ...........................................................................................................26
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 PEAK CURRENT LEVEL .......................................................................................31
  B.2 HEAT-SINK TEMPERATURE ................................................................................32
  B.3 BUS VOLTAGE ......................................................................................................32

APPENDIX C ENCODERS .................................................................................................33
  C.1 INCREMENTAL ENCODERS .................................................................................33
    C.1.1 Single Ended ABI Encoders ...........................................................................33
    C.1.2 Differential ABI Encoders .............................................................................34
  C.2 ABSOLUTE ENCODERS ......................................................................................34

APPENDIX D CONNECTOR PIN-OUTS ..............................................................................35
  D.1 LOGIC POWER .....................................................................................................35
  D.2 BUS POWER ..........................................................................................................35
  D.3 MOTOR CONNECTOR ............................................................................................36
  D.4 ENCODER CONNECTOR .......................................................................................36
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 SqDC 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 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 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, SqDC4. This can be confirmed from the product label which should conform to that illustrated below.

![Product Label](image_url)

<table>
<thead>
<tr>
<th>RATING</th>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLTAGE</td>
<td>42 VDC</td>
<td>42VDC</td>
</tr>
<tr>
<td>CURRENT</td>
<td>14 Amps</td>
<td>3 Amps/Axis</td>
</tr>
<tr>
<td>POWER</td>
<td>550W</td>
<td>500W</td>
</tr>
</tbody>
</table>
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 **SqDC SynqNet DC Drive** and the **SynqNet** PC controller.

### Table 1: Electrical Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bus Power Supply</strong></td>
<td></td>
</tr>
<tr>
<td>Power Supply Type</td>
<td>Unregulated or Regulated</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>12 to 42 Volts</td>
</tr>
<tr>
<td>Output Current</td>
<td>1.5 to 10 Amps</td>
</tr>
<tr>
<td></td>
<td>The output current depends on motor selection, load and power supply voltage.</td>
</tr>
<tr>
<td><strong>Logic Power Supply</strong></td>
<td></td>
</tr>
<tr>
<td>Power Supply Type</td>
<td>Regulated</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>24V ±10%</td>
</tr>
<tr>
<td>Output Current</td>
<td>1A</td>
</tr>
<tr>
<td><strong>DC Motors??</strong></td>
<td></td>
</tr>
<tr>
<td>DC Motor Type</td>
<td>Permanent Magnet Brushed DC (PMDC)</td>
</tr>
<tr>
<td>Voltage</td>
<td>0 - 42 Vdc</td>
</tr>
<tr>
<td>Current</td>
<td>3A rms (MAX), 4.5A peak (MAX)</td>
</tr>
</tbody>
</table>

## 2.2 Required Cables

See **Appendix D Connector Pin-Outs** on page 35 for the information required to build the cables.
2.3 **Motion Control Card**

You need to acquire a SynqNet PC controller card from Danaher Motion Performance Controls (DMPC) 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.

![Motion Control Card Image](image)

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 DMPC 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 Danaher Motion Performance Controls Website: [http://www.motioneng.com/](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)
Chapter 3

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**

<table>
<thead>
<tr>
<th>STEP</th>
<th>Connect Cable</th>
<th>To</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24V Logic Power</td>
<td>P7</td>
<td>12 to 42 Volts at 12 Amps.</td>
</tr>
<tr>
<td>2</td>
<td>Encoder</td>
<td>C1 to C4</td>
<td>Motor encoders 0 to 3.</td>
</tr>
<tr>
<td>3</td>
<td>DC Bus (Input)</td>
<td>P3 and P6</td>
<td>DC power for driving the motors (12 to 42 Volts and 12 Amps).</td>
</tr>
<tr>
<td>4</td>
<td>Motor Power</td>
<td>P1, P2, P4 and P5</td>
<td>Maximum Output Rating is 50V at 5 Amps.</td>
</tr>
<tr>
<td></td>
<td>Pin 2 Phase A +</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pin 3 Phase A-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Communication IN</td>
<td>C7</td>
<td>Connect one end of the SynqNet communications cable to the IN connector. The other end connects to the Motion Control card when it is installed to the PC.</td>
</tr>
</tbody>
</table>

**Table 3: Connector Grouped by Axis**

<table>
<thead>
<tr>
<th>Plug Group</th>
<th>Axis 0</th>
<th>Axis 1</th>
<th>Axis 2</th>
<th>Axis 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoder</td>
<td>Encoder 0 (C1)</td>
<td>Encoder 1 (C2)</td>
<td>Encoder 2 (C3)</td>
<td>Encoder 3 (C3)</td>
</tr>
<tr>
<td>Output Power</td>
<td>M0 (P1)</td>
<td>M1 (P2)</td>
<td>M2 (P4)</td>
<td>M3 (P5)</td>
</tr>
<tr>
<td>Input Bus</td>
<td>B0 (P3)</td>
<td>B1 (P6)</td>
<td>B2 (P7)</td>
<td>B3 (P8)</td>
</tr>
</tbody>
</table>
Chapter 4

INSTALLING THE DMPC CONTROLLER CARD

This section installs the:
- DMPC Controller card
- The DMPC Drivers
- SynqNet communication cable that is connected to the drive

4.1 Installing the DMPC 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 DMPC Drivers
1. Power ON the PC.

The system has found the newly installed motion controller card.
2. Click the Next button to continue.

3. Click the Next button.

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

![Found New Hardware Wizard](image)

Driver Files Search Results
The wizard has finished searching for driver files for your hardware device.

The wizard found a driver for the following device:
- XMP Motion Controller

Windows found a driver for this device. To install the driver Windows found, click Next.

Next >

8. Click the **Next >** button.

![Found New Hardware Wizard](image)

Completing the Found New Hardware Wizard

Windows has finished installing the software for the device.

To close this wizard, click Finish.

Finish

9. Click the **Finish** 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/](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 **Motion Console** icon.

3. Click the **Yes** 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 **Yes** button.
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 **Add>>** button.

5. Click the **OK** 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 **Yes** button.

You are asked to select the **COFE003D_0400.sff** file.

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

9. Select the **COFE003D_0400.sff** file.

The **COFE003D_0400.sff** file is now ready to be downloaded.
10. Click the **Download** button

The download progress is shown above.

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

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

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 sqDC.dm

   ![Command Prompt]

   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)?

   ![Command Prompt]

   The motor parameters for the four axes (0, 1, 2 and 3) are uploaded to the PC.
4. Open the `Config.js` file in any text editor.  
**Located at:** C:\MEI\XMP\BIN\WINNT.

![Sample Config.js file](image)

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:

- Peak Current Limit Fault Level
- Drive Temperature not implemented in this version (Read Only)
- Drive Bus Voltage displayed in Volts (Read Only)

5.2.2.1 **Setting the Peak Current Level**

◆ **To set the peak current level:**

Change the parameter `SQSTEPParamCURRENT_LEVEL` to 50 Amps.

```plaintext
# sqNode[0] drive[0] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 50.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 36.000000

# sqNode[0] drive[1] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 50.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 36.000000

# sqNode[0] drive[2] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 50.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 36.000000

# sqNode[0] drive[3] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 50.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 36.000000
```

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

\[
\text{PeakSine} = \text{Dilpeak} \times \frac{X}{100}
\]

**Where X:** is a value between 0 and 100 and Dilpeak=4.5
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:
   ```bash
sqDriveconfig –set config.dc –map kollmorgen sqDC.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)?**

   ```bash
   Do you want to overwrite the existing file (y/n)? y
   Uploaded drive parameters from node 0 drive 1
   Uploaded drive parameters from node 0 drive 2
   Uploaded drive parameters from node 0 drive 3
   ```

   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.**

If the Motion Console is not installed go first to sections 4.3 Installing the Motion Console Program on page 12 and if it is installed and not loaded, go to section 5.1 Loading the Motion Console on page 13.
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.
4. Click the Config tab if it is not selected.
5. Click Axis Map to select the complete row. This selects the complete row.
6. Hold down the Shift key and click the left-hand button.
7. Click Yes to configure the sub-object list to default mapping.

5.3.2 Setting the Filter Parameters (PID Coefficients)

1. From the toolbar, click the button.
2. From the **Object Pool** select the controller to add to the **Object List**.

3. Click the **Add** button.

4. Click the **OK** button and click the **Coeffs** tab.

5. For all four axes, enter the value of 100 for the **Kp** and **Ki** filters.

### 5.3.3 Setting the Motor Configuration Parameters

This section is used to set the motor parameters.

1. From the toolbar, click the **M** 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 `Add>>` button.

4. Click the `OK` button.

5. Set the Type to `Servo` for all four axes.

6. If you are using single ended encoders disable `Primary Feedback Fault`. **If not skip this step.**

   a. Clear the `Primary Feedback Fault` checkbox under `Fault Config`.
   b. Ensure that the `Fault Config` value is now `0X00000006`.

   If not change it manually.

7. If you are using differential encoders ensure that the `Fault Config` value is `0X00000016`. 
8. Click the **Events** tab.

9. Except for **Amp Fault Action** set the other fault actions to **None**.

10. Set the **Encoder Fault** action to:

<table>
<thead>
<tr>
<th>For Encoder Type</th>
<th>Enter the Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Ended</td>
<td>None</td>
</tr>
<tr>
<td>Differential</td>
<td>E-Stop/Abort</td>
</tr>
</tbody>
</table>

### 5.3.4 Clearing the Errors

1. From the toolbar, click the ![Clear Fault](image) button.
2. Click the **Action** tab.

3. Click the green **Clear Fault** ![Clear Fault](image) button for each of the motors.

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

### 5.3.5 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 following parameters on each axis:
   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.

5.3.6 Set Amp Enable

1. From the toolbar, click the button.

2. Select the Amp Enabled checkbox (Enabled) for each motor.
5.3.7 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.
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.

Table 4  sqDriveMsg Utility Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-?</td>
<td>Help</td>
</tr>
<tr>
<td>-control #</td>
<td>Controller number (default=0).</td>
</tr>
<tr>
<td>-server #</td>
<td>Name or IP address of the host running server.exe.</td>
</tr>
<tr>
<td>-port #</td>
<td>TCP/IP port on the host computer (default=3300).</td>
</tr>
<tr>
<td>-trace #</td>
<td>Bit mask to specify trace information outputs.</td>
</tr>
<tr>
<td>-node #</td>
<td>SynqNet Node address.</td>
</tr>
<tr>
<td>-drive #</td>
<td>Drive index relative to the node.</td>
</tr>
<tr>
<td>-motor #</td>
<td>Motor number associated with the drive.</td>
</tr>
</tbody>
</table>

**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:\Mi\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 for DC Motors

<table>
<thead>
<tr>
<th>Drive Fault</th>
<th>Description</th>
<th>sqDC Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over Current</td>
<td>Global drive fault will effect both axes.</td>
<td>0</td>
</tr>
<tr>
<td>Bus Over Voltage</td>
<td>Global drive fault will effect both axes.</td>
<td>1</td>
</tr>
<tr>
<td>Over Temperature</td>
<td>Global drive fault will effect both axes.</td>
<td>2</td>
</tr>
<tr>
<td>Bus Under Voltage</td>
<td>Global drive fault will effect both axes.</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 6 sqDriveMsg Utility Axes Faults for DC Motors

<table>
<thead>
<tr>
<th>Axes Fault</th>
<th>Description</th>
<th>sqDC Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis_0_Current Limit</td>
<td>Axis 0 Current Limit Fault</td>
<td>5</td>
</tr>
<tr>
<td>Axis_1_Current Limit</td>
<td>Axis 1 Current Limit Fault</td>
<td>7</td>
</tr>
</tbody>
</table>
Appendix A  HARDWARE SPECIFICATIONS

A.1 Mechanical
The SqDC SynqNet DC 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: SqDC4 Front Panel Silk]

A.1.3 Weight
Total weight without cables is 1.1 Kilograms.
### A.2 Electrical Specifications

#### Table 7: Electrical Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Test Condition</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus voltage</td>
<td></td>
<td>12</td>
<td>-</td>
<td>42</td>
<td>V</td>
</tr>
<tr>
<td>Logic Voltage</td>
<td></td>
<td>18</td>
<td>24</td>
<td>28</td>
<td>V</td>
</tr>
<tr>
<td>Phase output Current RMS</td>
<td></td>
<td>0.4</td>
<td></td>
<td>3</td>
<td>Arms</td>
</tr>
<tr>
<td>Phase Output Current Peak</td>
<td></td>
<td>0.57</td>
<td></td>
<td>4.5</td>
<td>Apeak</td>
</tr>
<tr>
<td>Logic Quiescent Current I/O Floating</td>
<td></td>
<td></td>
<td>250</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Active Power Dissipation</td>
<td></td>
<td></td>
<td>12</td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>Encoder Voltage Supply</td>
<td></td>
<td>4.5</td>
<td>5</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Encoder Current Supply</td>
<td></td>
<td>100</td>
<td>250</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>GPIO Input Voltage</td>
<td></td>
<td>2</td>
<td>30</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>GPIO Output Current</td>
<td></td>
<td>0</td>
<td>15</td>
<td>60</td>
<td>mA</td>
</tr>
<tr>
<td>GPIO Output Vce</td>
<td></td>
<td></td>
<td>40</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>High Speed I/O</td>
<td>RS-422/485 Standard</td>
<td>1MB/s</td>
<td></td>
<td>10MB/s</td>
<td></td>
</tr>
</tbody>
</table>
A.3 Environmental Specifications

Table 8: Environmental Specifications

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

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

- Peak Current Level
- Drive Temperature (Read Only)
- Drive Bus Voltage displayed in Volts (Read Only)

```
# sqNode[0] drive[0] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 0.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 37.500000
# sqNode[0] drive[1] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 0.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 37.500000
# sqNode[0] drive[2] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 0.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 37.000000
# sqNode[0] drive[3] "Kollmorgen SqDC4" "1"
SQSTEPParamCURRENT_LEVEL 0.000000
SQSTEPParamDRIVE_TEMP 36
SQSTEPParamBUS_VOLTAGE 37.000000
```

B.1 Peak Current Level

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

\[
\text{PeakSine} = \text{Dlpeak} \times \frac{X}{100}
\]

Where X: is a value between 0 and 100 and Dlpeak=4.5
B.2 **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%

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The over-temperature fault is set at 70°C (158°F).</td>
</tr>
</tbody>
</table>

B.3 **Bus Voltage**
This parameter is READ-ONLY and provides the voltage of the DC bus in volts.
- Valid measuring range from 0-96 Volts
- Accuracy of reading ±1%

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The over-voltage fault is set at 48 Volts (DC).</td>
</tr>
</tbody>
</table>
Two encoder options are available for use with the SqDC:

- Incremental (ABI) Encoder
- Absolute SSI based Encoder

**C.1 Incremental Encoders**

The SynqNet system can accommodate incremental encoders with and without the Index pulse use for absolute position definition. They can be supplied in either single ended or differential wiring configuration. Single ended wiring is generally cheaper than the differential output types but is more susceptible to electrical noise and provides no wire break indication.

**C.1.1 Single Ended ABI Encoders**

Single ended encoders have only one wire per output. They could have four or five wires. Two supply power and then there is A, B and I (index).

**Advantages**

- Simple to build and inexpensive

**Disadvantages**

- No line break fault detection
- Susceptible to noise
- Does not keep position information after power off

**DB-9 Wiring Diagram**

![DB-9 Wiring Diagram](image)
C.1.2 Differential ABI Encoders

**Advantages**
- More noise immunity
- Provides wire break indication

**Disadvantages**
- Does not keep position after loss of power

**DB-9 Wiring Diagram**

![Differential ABI Encoder Wiring Diagram]

C.2 Absolute Encoders

An absolute encoder provides a unique value at each position and retains actual shaft position even if power fails. The electronic interface SSI or Synchronous Serial Interface was designed for use with absolute encoders and is a digital communication protocol.

**DB-9 Wiring Diagram**

![Differential SSI Encoder Wiring Diagram]
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

<table>
<thead>
<tr>
<th>Connector Definition</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phoenix Contact</td>
<td>MSTB 2,5/2-GF-5,08-BK</td>
</tr>
<tr>
<td>Mating Connector Part Number</td>
<td>MSTBT 2,5/ 2-STF-5,08</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pin Out</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin #</td>
<td>Description</td>
<td>Comments</td>
</tr>
<tr>
<td>1</td>
<td>Logic +</td>
<td>+24VDC</td>
</tr>
<tr>
<td>2</td>
<td>Logic -</td>
<td>Refer to Grounding Tree - TBD</td>
</tr>
</tbody>
</table>

The illustration shows a 15-position version.

### D.2 Bus Power

<table>
<thead>
<tr>
<th>Connector Definition</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sauro</td>
<td>3-pin, 5.08 pitch header with tab – CIM039M5</td>
</tr>
<tr>
<td>Mating Connector Part Number</td>
<td>CTF030M5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pin Out</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin #</td>
<td>Description</td>
<td>Comments</td>
</tr>
<tr>
<td>1</td>
<td>Bus +</td>
<td>48VDC; regulated or unregulated</td>
</tr>
<tr>
<td>2</td>
<td>Bus -</td>
<td>Refer to Grounding Tree TBD</td>
</tr>
<tr>
<td>3</td>
<td>PE</td>
<td>Power Earth</td>
</tr>
</tbody>
</table>
## D.3 Motor Connector

**Connector Definition**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Molex</th>
</tr>
</thead>
</table>
| Part Number  | 39-30-3056; 4.20mm (.165") Pitch Mini-Fit Jr.

**Mating Connector Part Number**

| Mating Connector Part Number | 39-01-4051 (Housing) 44476-3112 (Pins) |

**Pin Out**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phase A-</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Phase A+</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Phase B+</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Phase B-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>PE</td>
<td>Power Earth</td>
</tr>
</tbody>
</table>

## D.4 Encoder Connector

**Connector Definition**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Stewart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>D-Type 9 pins Female</td>
</tr>
</tbody>
</table>

**Pin Out**

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Differential ABI</th>
<th>Single Ended ABI</th>
<th>Differential SSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A+</td>
<td>A</td>
<td>ENC_5V</td>
</tr>
<tr>
<td>2</td>
<td>B+</td>
<td>B</td>
<td>CLK+</td>
</tr>
<tr>
<td>3</td>
<td>I+</td>
<td>I</td>
<td>DATA+</td>
</tr>
<tr>
<td>4</td>
<td>ENC_GND (SE_CON)</td>
<td>ENC_5V (SE_CON)</td>
<td>ENC_GND (SE_CON)</td>
</tr>
<tr>
<td>5</td>
<td>ENC_GND</td>
<td>ENC_GND</td>
<td>ENC_GND</td>
</tr>
<tr>
<td>6</td>
<td>A-</td>
<td>NC</td>
<td>ENC_GND</td>
</tr>
<tr>
<td>7</td>
<td>B-</td>
<td>NC</td>
<td>CLK-</td>
</tr>
<tr>
<td>8</td>
<td>I-</td>
<td>NC</td>
<td>DATA-</td>
</tr>
<tr>
<td>9</td>
<td>ENC_5V</td>
<td>ENC_5V</td>
<td>ENC_5V</td>
</tr>
</tbody>
</table>
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

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