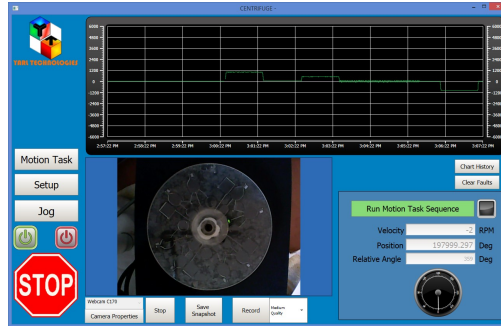


# Software User Interface for Kollmorgen Drive



## Human Machine Interface (HMI)

## User Guide

### DISCLAIMER

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# 1 Introduction

This HMI application is written by Yarl Technologies Pty Ltd, Australia, using Kollmorgen Visualization Builder platform. This application will run on any standard PC with Microsoft Windows 7 or above. The application will run for 30 minutes on demo mode, which should be more than adequate to carry out the experiment with the centrifuge. In order to run for a longer duration, a USB dongle is required. This can be purchased directly from Kollmorgen. Yarl Technologies grants permission for the user to modify this application to suit their needs should they wish to add any further features or modify layout.

Download and install the following two software from the Kollmorgen website.

Kollmorgen WorkBench (Kollmorgen WorkBench GUI Setup EN rev1-13-0-60816, WorkBench.exe Version: 1.13.0.60816 or higher version) download from (<http://www.kollmorgen.com/en-us/products/drives/servo/akd/>) the file is under “Software/Firmware” tab and below the heading “General”, which is about 112.2Mb.

Kollmorgen Visualization Builder 2.10 (Kollmorgen Visualization Builder IDE EN Rev 2.15.2029) download from (<http://www.kollmorgen.com/en-us/products/machine-controls/hmi/kollmorgen-visualization-builder/>) the file is under “Software” tab and below the heading “General”, which is about 426.3Mb.

The HMI application “Centrifuge xxx.vb2” written by Yarl Technologies can be opened by the Kollmorgen Visualization Builder software. This HMI application uses the in-built motion task commands of the drive to control and monitor the process. Hence the accuracy and precision of the motion tasks are within the specifications / limitations of the drive. The HMI application will help the user to create motion task, write them to the drive, run and monitor the motion task on the drive. The detailed features of the HMI application are explained in this user guide.

Kollmorgen WorkBench software will connect to the drive directly and allow the user to verify the motion tasks and other parameters set on the drive by the HMI application. Once the user is confident in using this HMI application, there is no need to use the Kollmorgen WorkBench software.

## 2 Setup

In order to allow the HMI application to communicate with the drive via Ethernet, connect the drive, motor as per the usual setup. Please refer to the user manual of Kollmorgen drive and motor. Then follow the steps below to setup the HMI application.

### 2.1 Network

Once all the power and communication cables are connected to the drive and motor, make sure the PC and the drive network are connected to the same network. Power up the drive and start the Kollmorgen WorkBench software. This software should detect the Kollmorgen Drive as shown in figure 2.1 below. If unsure on how to use the WorkBench software, please refer to Kollmorgen WorkBench software manual. Note down the IP address of the drive (e.g. 192.168.0.7). You will need this to setup the HMI software.

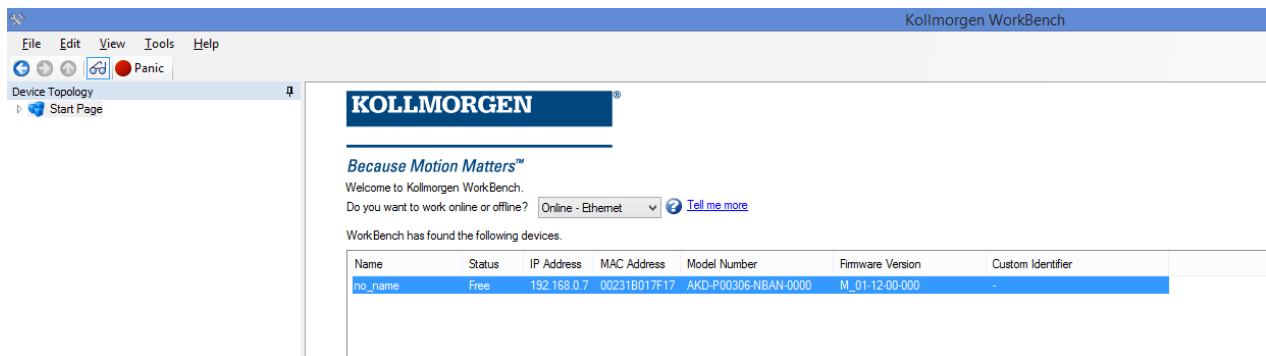


Figure 2.1. WorkBench software lists the IP address of the Drive.

## 2.2 HMI Software

The application “Centrifuge” is written using the Kollmorgen Visualization Builder software and it communicates with the drive via Ethernet Modbus to control and monitor the centrifuge. Start the Kollmorgen Visualization software and open the application “Centrifuge\_Vxxxxxxx.kvb2”.

On the left side under “Project Explorer” click on “Tags” in the Functions tab and it should open the Tags configuration page as shown in figure 2.2.

Click on “Controllers” tab and then click on “Settings” button. It should pop up a “Modbus Master RTU/TCP/IP” window as shown in figure 2.2.

Click on “Stations” tab to set the IP address of the Kollmorgen Drive. Do not change any other parameters.

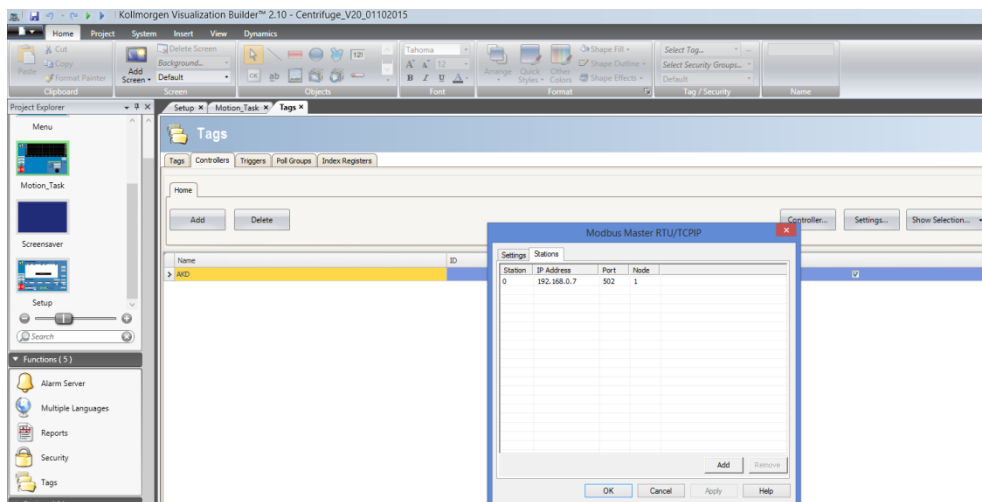


Figure 2.2 Kollmorgen Visualization Software IP address configuration.

Ensure the following values for each parameter: Station = 0; IP Address = “copy the same IP address of the drive identified in WorkBench software as described in section 2.1”; Port = 502 ; Node = 1.

Click the Apply button and then OK button to set the communication setting for the drive. In order to make sure the settings have been saved, click on the “Settings” button, then click on “Stations” tab again to verify it has the same IP address (it has been noted that in some occasions, the

application reverts back to its default IP address). Once the IP address is set, save the application. Close the “Tags” tab. This setup needs to be done only when you connect to the drive for the first time. If the drive and the PC are connected to the network that uses dynamic IP address allocation, then there is a possibility that the drive will be assigned a new IP address at startup. In this case, you need to follow the steps described in section 2.1 and 2.2.

## 2.3 Run Application

Select the “Project” tab from the menu and click on “Run” button as shown in Figure 2.3.1. This will compile the application and open a new window as shown in Figure 2.3.2. Alternatively you can also click on the green play icon on the title bar to run the application. When this application is run for the first time, after it compiles, it also creates an executable file “Centrifuge\_Vxxxxxx.exe” with current network settings in the Temp\Output sub-folder. Locate this file and create a shortcut of this executable file and place it on the desktop. For subsequent use, you can run this executable file direct from the desktop instead of starting the Kollmorgen Visualization Builder software.

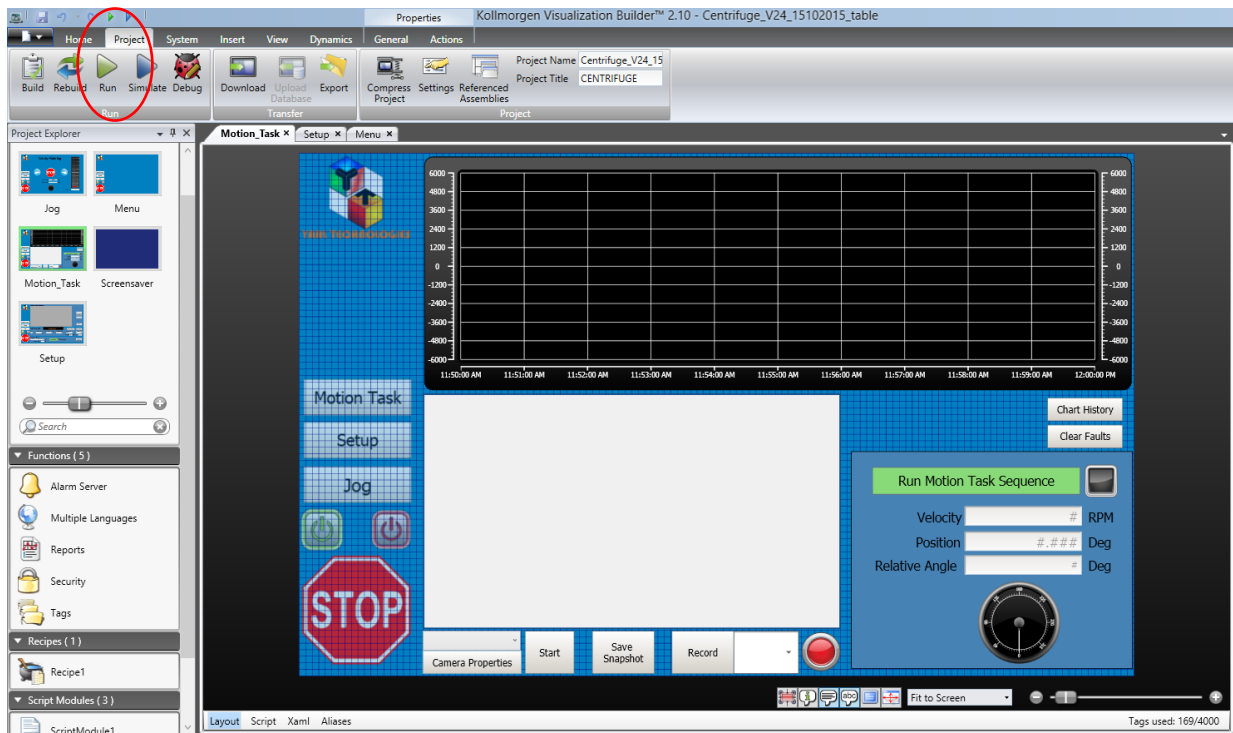


Figure 2.3.1 Centrifuge application in Kollmorgen Visualization Builder.



Figure 2.3.2 Centrifuge application in run mode.

Every time this application is run, a warning pop-up window will display “Running in demo mode (Missing Dongle) - time left: 30 minutes”. This window will pop-up again when there are only 5 minutes remaining. When the time limit is up, it will automatically close this application. There is no limit in the number of times you can run this application. In order to run for a longer duration, a USB dongle, which holds a license key, is required. This can be purchased directly from Kollmorgen. Once the USB dongle is installed, it will not pop up with this warning and it will not automatically close the application.

When the application is able to communicate with the drive, the velocity value will be continuously changing between  $\pm 3$  rpm indicating that the drive is maintaining the motor shaft at current position. If the velocity value does not change, then the application is not able to communicate with the drive. Do not proceed any further until the communication issue is resolved. In this case, repeat the setup steps starting from section 2.1.

As shown in figure 2.3.2, on the left side the three buttons “Motion Task”, “Setup”, “Jog” open the respective page. As default the Motion Task page opens when the application is run. The other three buttons on the left side are:



Button - Enable the Drive



Button - Disable the drive



Button - stop the drive

All the buttons on the left side are available when any of the pages are open. This is to allow ease of navigation between the pages. Click on Yarl Technologies logo to view the information on contact details for technical support.

## 2.4 Motion Task

The default page Motion Task opens when you run the Centrifuge application. The Motion task page allows user to run the motion task sequence loaded in the drive. Make sure the current sequence in this application is the same as that which is loaded in the drive. If they are not the same, then it will not run as expected.

When the application is able to communicate with the drive, the velocity value will be continuously changing between  $\pm 3$  rpm indicating that the drive is maintaining the motor shaft at current position. If the velocity value does not change, then the application is not able to communicate with the drive. In this case you may want to first try turning the power off to the Kollmorgen drive and after few seconds turn it back on.

The chart displays the 10 minutes of velocity and the button “History” will display the past velocity values. Click on any part of the chart screen to turn on /off the cursor with a yellow arrow. Move the arrow to read the velocity at that point. The figure 2.4.1 shows the cursor control. Click on the eye icon to turn on/off the velocity plot. Click on the X button to close the control.

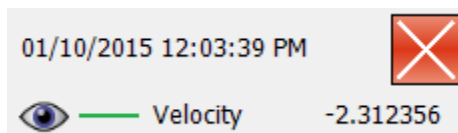


Figure 2.4.1 Chart cursor control

“Clear Faults” button clears any warnings or faults on the drive.

“Run Motion Task Sequence” button runs the motion tasks loaded in the drive. Before running the motion task sequence, make sure the initial disk position is set by homing, which is outlined in the setup page. While the motion task sequence is running, the user cannot navigate to any other pages, as this page is continuously monitoring the status of the drive. To abort the motion task sequence, click on the Stop button. The Enable and Disable buttons are also active while the motion task sequence is running. It is not advisable to use these two buttons while a motion task is running, unless it is essential to disable the drive. Always use the Stop button to stop the drive.

The position dial shows the relative angle to the initial home position. The pointer is just a representation of the direction and velocity of rotation.

The List box on the left bottom corner lists all video camera devices detected by Microsoft Windows. Once a camera is selected, pressing the “Start” button will capture the video image and display in the window above. Other features related to the selected camera will become visible after the “Start” button is pressed.

## 2.5 Setup

The Setup page has three regions, one for Motion Task Sequence where you can create a new sequence, open an existing sequence file (sequence files are typically named as recipe.csv), save a sequence file and refresh the sequence display with new information. The middle region is for editing a single motion task. In this region, you can create a new task or edit an existing task or delete a task. The third region is for programming the motion task sequence to the drive. In this region, you can set the initial disk position by homing and then write to drive. Each of these three regions is further explained below.

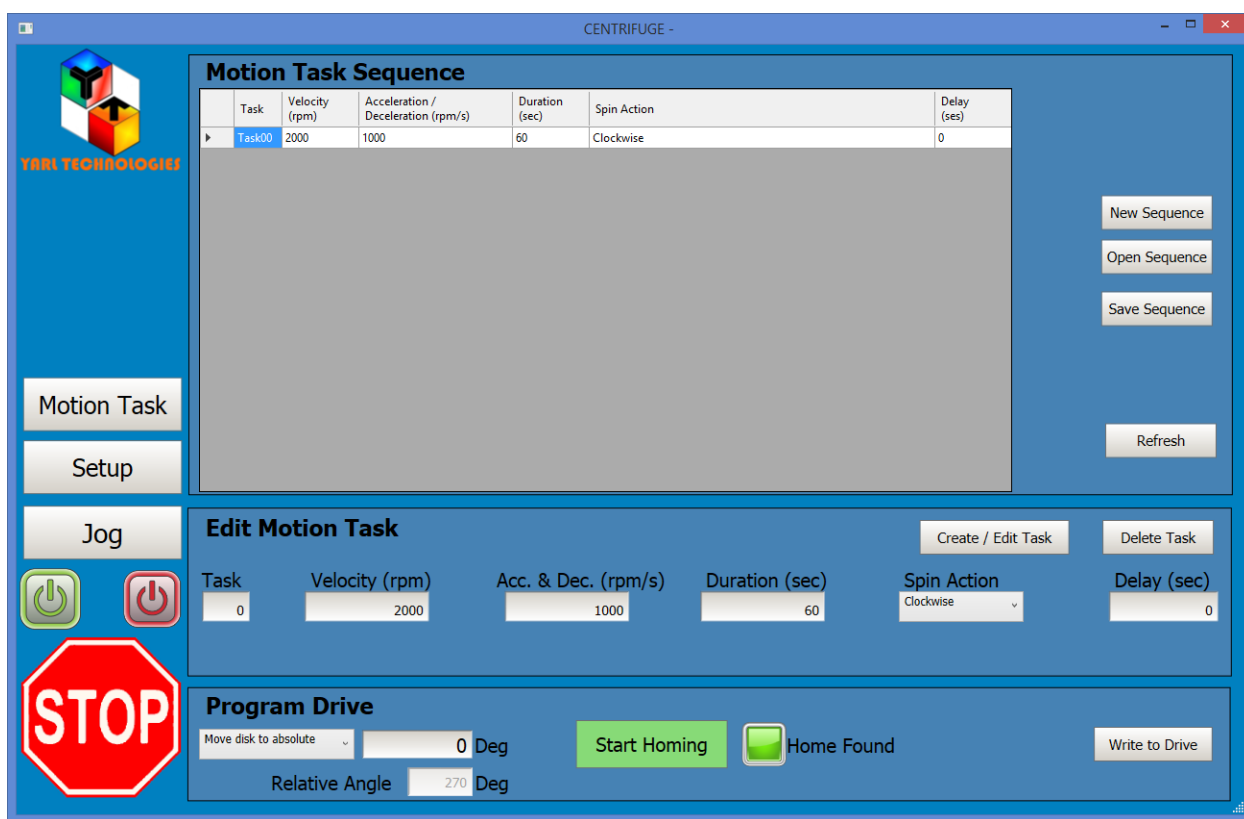


Figure 2.5.1 Setup page to configure the motion task sequence.

### 2.5.1 Motion Task Sequence

Figure 2.5.2 shows the controls available for creating a new sequence, opening an existing sequence or saving a sequence. The sequence file is saved in csv format, which can be opened and edited by Microsoft Excel or any other spreadsheet software which supports csv file format. The motion task sequence table lists each task and all the tasks are linked to each other. This means that you need to arrange the tasks in the order starting with Task00. You can enter up to 24 tasks in one sequence. A typical motion task sequence list is shown in figure 2.5.3.





“New Sequence” button: This will open a blank template recipe file called “New.csv” located in Temp\Output\Template sub folder of the project folder. If a sequence file is already loaded then when you click on “New Sequence” button, it will prompt to delete each task one by one to clear the workspace. Click on “Refresh” button to populate the table with tasks.

“Open Sequence” button to open an existing recipe.csv file: All sequence files are located in “Temp\Output” sub folder but you can save these files in a different location. When you click on “Open Sequence” button, if a sequence already exists, then it will prompt to delete each task one by one to clear the workspace. Click on “Refresh” button to populate the table with tasks.

“Save Sequence” button to save a sequence file: Sequence files are located in “Temp\Output” sub folder but you can save these files in a different location.

“Refresh” button to update the table with new values after clicking on any of the buttons in this section.

### 2.5.2 Create / Edit Motion Task

Figure 2.5.4 shows the typical motion task fields. In this section, typically all the fields are prefilled with default values. The Motion task will execute in order starting from Tasko and each task is linked to the next task. So, when creating a new motion task, **DO NOT** change the task number. First select the Spin Action, and depending on this selection, different fields are presented. The Spin Action options are: Clockwise, Anti-Clockwise, Mix, Stop at Initial, and Stop at. If Clockwise or Anti-Clockwise is selected, enter the velocity, acceleration, duration and the delay time. Then click on “Create / Edit Task” button once. The Task number will automatically increment.

The screenshot shows the 'Edit Motion Task' form with the following fields and values:

Task	Velocity (rpm)	Acc. & Dec. (rpm/s)	Duration (sec)	Spin Action	Delay (sec)
0	2000	1000	60	Clockwise	0

Buttons: Create / Edit Task, Delete Task

Figure 2.5.4 Edit Motion Task – Spin Action Clockwise or Anti-Clockwise

If Mix is selected for Spin Action as shown in figure 2.5.5, then enter velocity, acceleration, number of mix cycles, and the sweep angle. Then click on “Create / Edit Task” button once. The Task number will automatically increment.

The screenshot shows the 'Edit Motion Task' form with the following fields and values:

Task	Velocity (rpm)	Acc. & Dec. (rpm/s)	Mix Cycles	Spin Action	Mix Sweep Degree (d)
1	80	1000	10	Mix	180

Buttons: Create / Edit Task, Delete Task

A diagram of a mix cycle is shown, consisting of two 'd' shaped segments connected by a horizontal line.

Figure 2.5.5 Edit Motion Task – Spin Action Mix

If Stop at initial is selected for Spin Action as shown in figure 2.5.6, then enter velocity, acceleration, and the delay time. Then click on “Create / Edit Task” button once. The Task number will automatically increment.

Edit Motion Task				
Task	Velocity (rpm)	Acc. & Dec. (rpm/s)	Spin Action	Delay (sec)
9	400	330	Stop at initial	5

Create / Edit Task      Delete Task

Figure 2.5.6 Edit Motion Task – Spin Action Stop at initial

If Stop at is selected for Spin Action as shown in figure 2.5.7, then enter velocity, acceleration, delay time, and the angle at which the disk should stop (this angle is relative to initial home position). Then click on “Create / Edit Task” button once. The Task number will automatically increment.

Edit Motion Task				
Task	Velocity (rpm)	Acc. & Dec. (rpm/s)	Spin Action	Delay (sec)
1	2000	1000	Stop at	0

Stop at: 180 Deg

Create / Edit Task      Delete Task

Figure 2.5.7 Edit Motion Task – Spin Action Stop at a specified angle relative to initial position

To remove any task from the sequence, click on the “Delete Task” button. It will prompt you to select the task number to be deleted. As mentioned before, all tasks are linked to each other, so deleting a task in the middle will cause possible error in execution of the motion task sequence. Always delete the last task one by one.

To edit any task from the sequence, enter the task number in the Task field first and press the enter key on keyboard. It will load all the values relating to that task. Alternatively, select the entire row of any task from the sequence table, with left mouse click on the row header and it will load all the values relating to that task as shown in figure 2.5.8. Change any values for that task and then press the “Create / Edit Task” button once. This task will be updated with new values. The Task number will automatically increment to a new task number (e.g. if there are 5 tasks already in the list and task 2 was edited, when the “Create / Edit Task” button is pressed, task 2 will be updated with new values and the task number will automatically increment to 6).

10

Motion Task Sequence

Task	Velocity (rpm)	Acceleration / Deceleration (rpm/s)	Duration (sec)	Spin Action	Delay (ses)
Task00	2000	100	4	Clockwise	6
Task01	150	200		24 Mix cycles at 175 sweep degrees	
Task02	1111	400	7	Clockwise	5
▶ Task03	1300	600		Stop at 270 degrees	4
Task04	1400	800	5	Anti-Clockwise	3
Task05	440	1000		33 Mix cycles at 155 sweep degrees	
Task06	2222	300	8	Clockwise	7
Task07	555	521		Stop at 122 degrees	9
Task08	1440	378	3	Anti-Clockwise	8
Task09	400	330		Stop at initial position	5

New Sequence

Open Sequence

Save Sequence

Refresh

Edit Motion Task

Create / Edit Task

Delete Task

Task

Velocity (rpm)

Acc. & Dec. (rpm/s)

Spin Action

Delay (sec)

3

1300

600

Stop at ▼

4

Stop at: 270 Deg

Figure 2.5.8 selecting a row in motion task sequence to edit the values.

### 2.5.3 Program Drive

Figure 2.5.9 shows the fields for writing the sequence to drive. In this section, the motion task sequence will be written to the Kollmorgen drive. Before writing to the drive, make sure the disk is moved to the initial position. There are two options for setting the home position. Select the “Move Disk By” and then enter the angle by which the disk should move. Then click on the “Start Homing” button once. The disk will rotate the angle you have entered. The Home found indicator should become green to indicate that the disk has completed the move. Click again the “Start Homing” button, and it will move the disk by another angle you have entered. To move in the opposite direction, enter a negative angle value. This feature will help to position the disk to the desired angle.

Program Drive

Move disk to absolute ▼

0 Deg

Start Homing

Home Found

Write to Drive

Relative Angle

0 Deg

Figure 2.5.9 Program Drive – setting initial disk position and programming the drive

Select “Move disk to absolute” and then enter the angle by which the disk should move. The motor shaft has an absolute zero angle reference and this action will move the disk to the absolute position. If the angle is set to 0 degrees, and then the “Start Homing” button is clicked, the disk will move to the motor shaft absolute zero angle. Enter any other angle and the disk will move to that angle referenced to the absolute zero angle of the motor shaft. To move in the opposite direction, enter a negative angle value. This feature will help to position the disk to an absolute angle of the motor shaft.

Once the disk is homed, click on “Write to Drive” button. The motion task sequence will be written to drive and it should take about 10 to 20 seconds. As shown in figure 2.5.10 the progress bar indicates the writing progress. While the sequence is being written, do not press any button, as it may interrupt the writing to the drive memory. The progress bar in the middle will indicate the process and once completed, the progress bar will disappear. Note: the navigation buttons will be hidden while writing to drive. To abort the writing to drive, click on the “Stop” button.

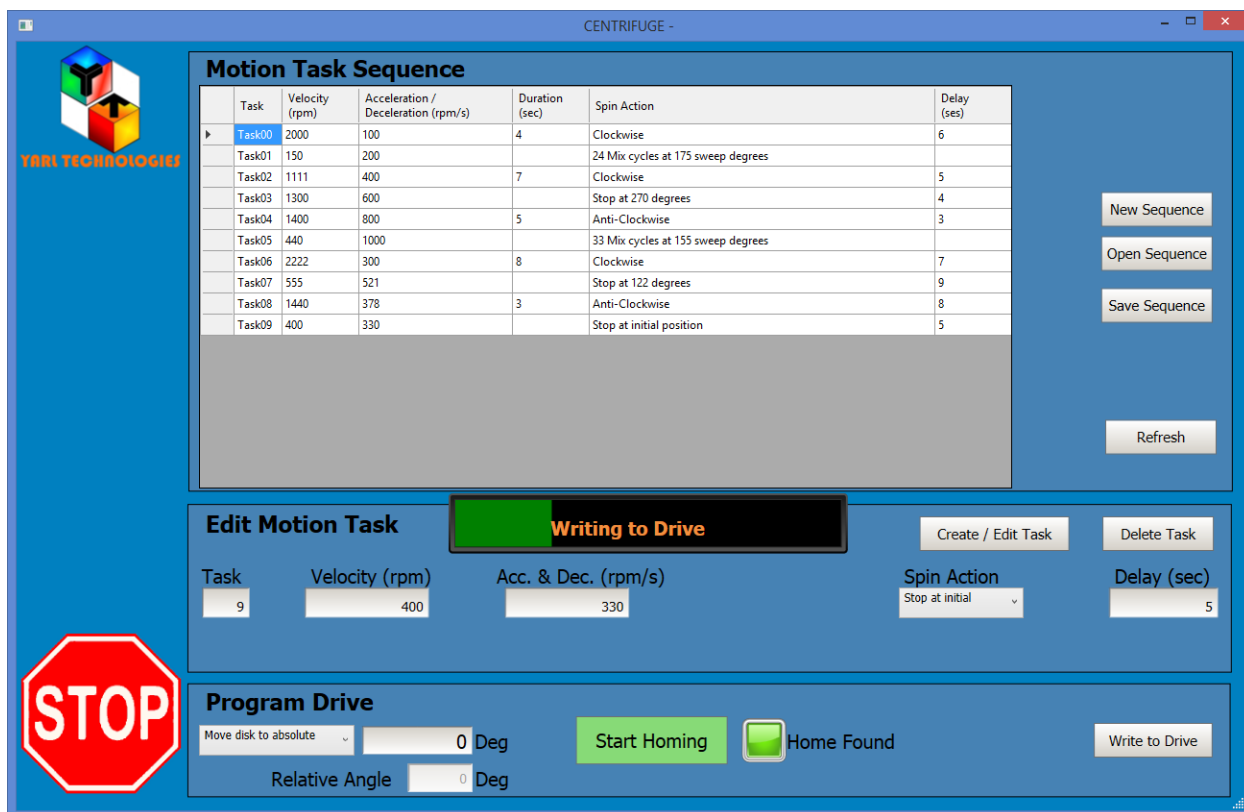


Figure 2.5.10 Program Drive – writing to drive progress indication.

To confirm the sequence is written to the drive, open the Kollmorgen WorkBench software and connect to the drive. Then check the Motion Task window to verify all motion tasks have been written. If any of the motion tasks are missing, then return back to Centrifuge application and click on the “Write to Drive” button.

The motion task values shown on WorkBench may not exactly match the numbers shown in this HMI application. This is due to Modbus transaction of decimal values as integers (e.g. on the HMI application the velocity could be shown as 2000 rpm, on Workbench it may show as 1999.997 rpm). Also when the motion task is a mix action, the HMI creates a dummy motion task and the values shown in WorkBench are just mere numbers to fill the fields, and this motion task will not be executed. Instead, the drive will run the service motion to alternate the direction of the motor shaft.

Once verified that the motion task sequence has been written to the drive, click on the “Motion Task” button to navigate to the motion task page. If you identify any blank motion task in WorkBench, click

on the “Write to Drive” button again. This may happen due to Modbus TCP/IP communication delays. Sometimes it is helpful to delete all tasks in WorkBench (by right clicking and selecting delete all and then save to drive button) before you click on “Write to Drive” button.

## 2.6 Jog

Figure 2.6.1 shows the Jog page which allows the user to test the drive. Select the jog speed by either using the slide control or by entering a value into the jog speed field. Click and hold down on the right arrow to rotate the motor shaft in clockwise direction or click and hold down on the left arrow to rotate the motor shaft in anti-clockwise direction.

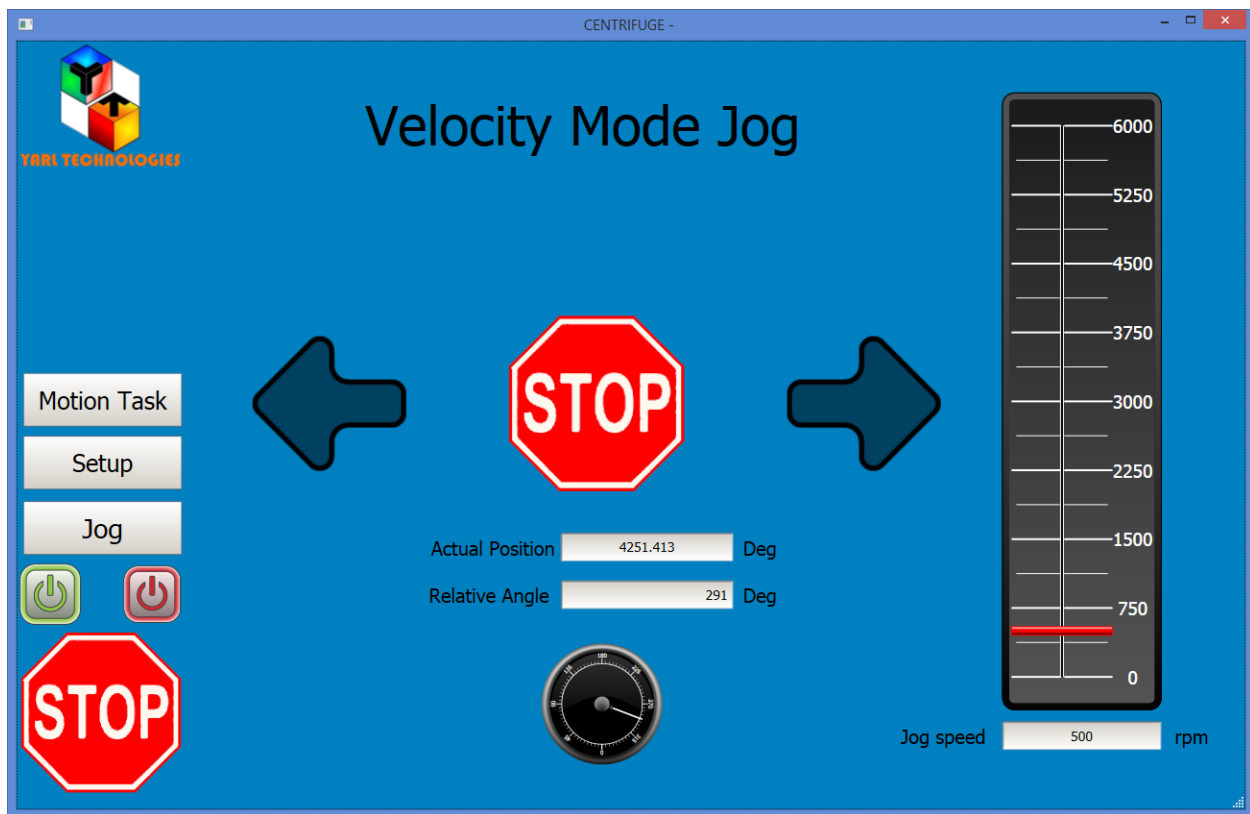


Figure 2.6.1 Jog – Testing the drive.

The Actual position indicator shows the accumulated position value in degrees. The relative angle indicator shows the angle relative to the home position.

## 2.7 Motion Task

Once the motion task sequence has been written to the drive, you can run the motion task sequence. Since this application runs for 30 minutes in demo mode, make sure there is sufficient time left to execute the motion task sequence. If not, close the application and then run again. Make sure to load the same recipe file from the setup page and set the same home position. When the motion task sequence is running, this application will just monitor the tasks that are being run.

If the motion task sequence consists ONLY of clockwise or anti-clockwise direction moves, then there is no possibility of a disk position error occurring. In this scenario, even if you do not load the same recipe file, it will be fine. But if the sequence consists of any mix cycle, then at the end of each mix task, the disk may not stop at the same position registered at the start of the mix task. The reason for this is that the mix task is executed in the velocity mode – meaning that the drive accuracy is on velocity rather than on position. This application continuously monitors each task and compares with the recipe file and if it finds any position error after a mix task, then this application will correct the next task position values in the drive to compensate for the error. The maximum error could be  $\pm 359$  degrees.



Figure 2.7.1 Motion Task – after writing the sequence, having loaded the same recipe file and about to run the motion task.

The following figures 2.7.2 to figure 2.7.6 show typical motion task sequence runs.

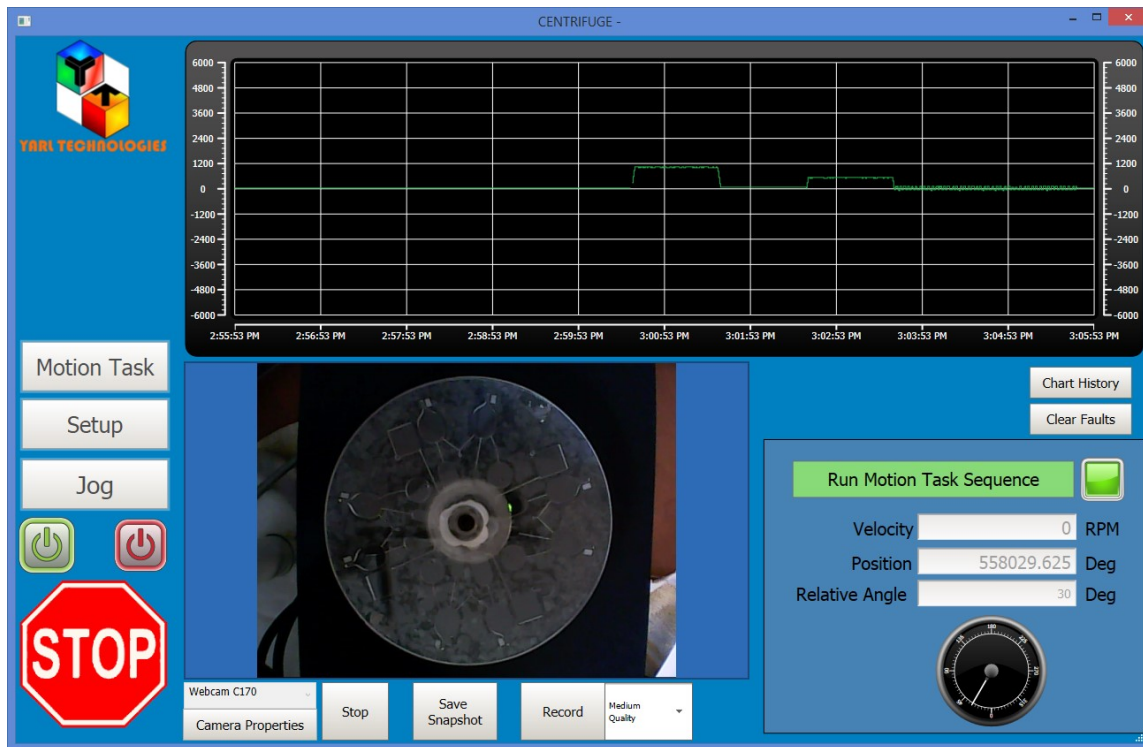


Figure 2.7.2 Motion Task – stopped at 30 degrees and waiting for 30 seconds before continuing to the next task

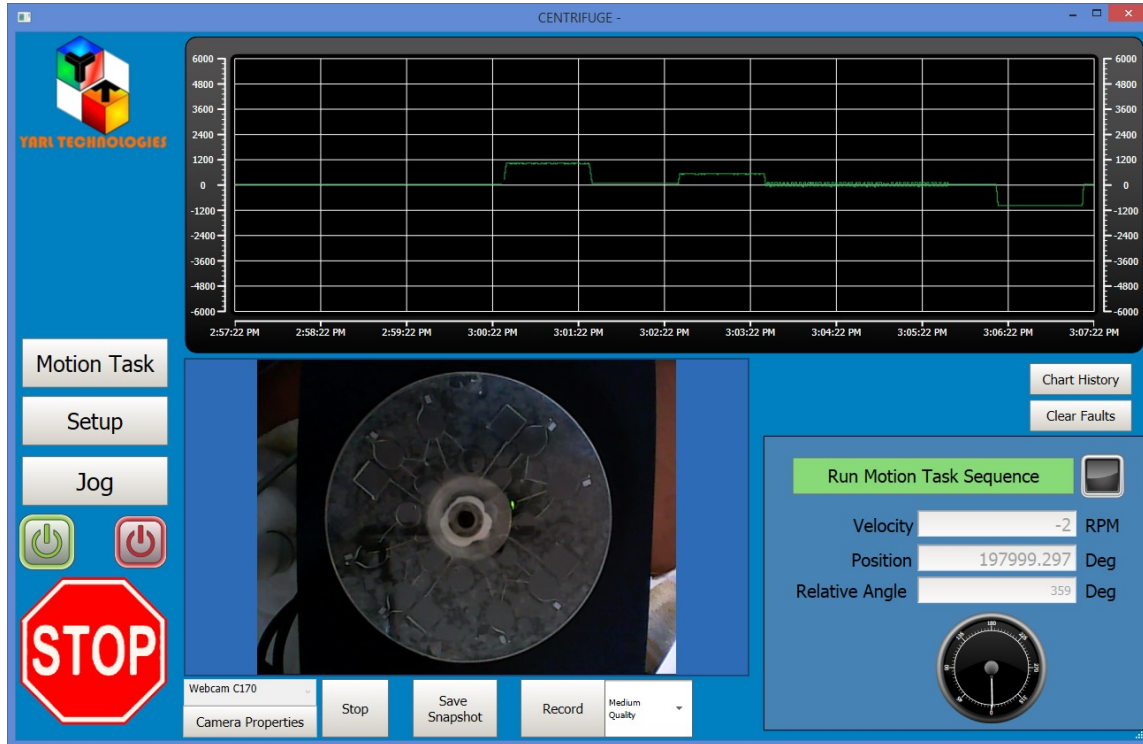


Figure 2.7.3 Motion Task – after completion of the motion task sequence.



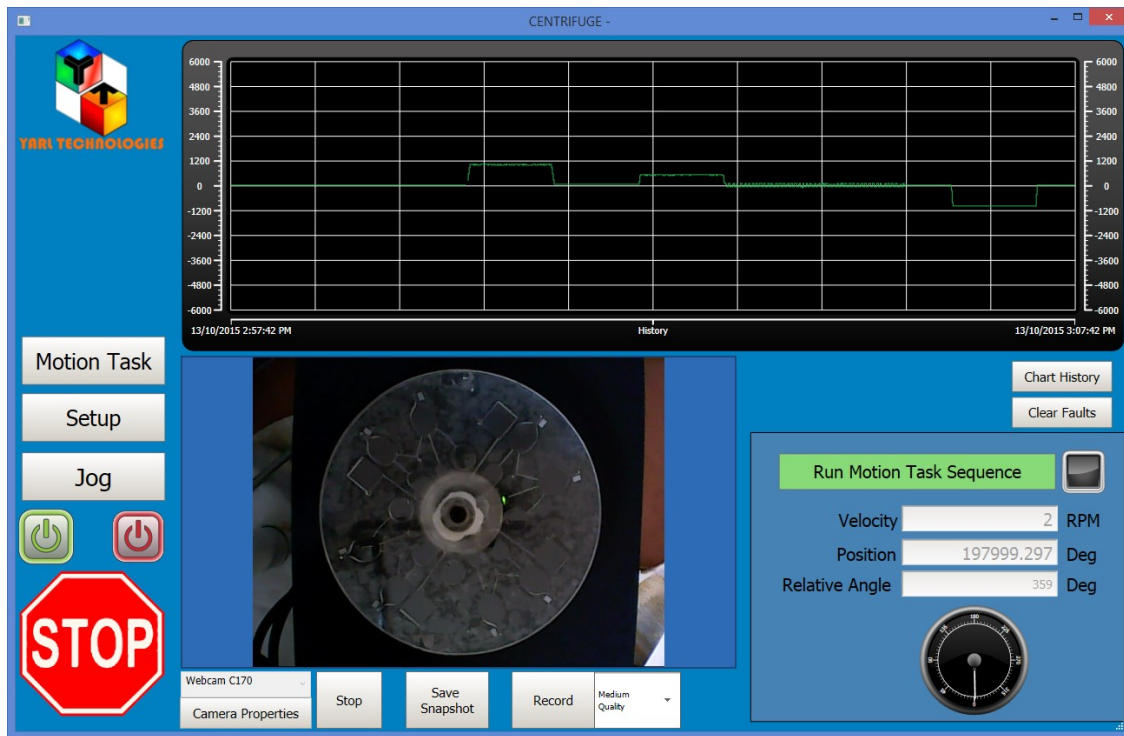


Figure 2.7.4 Motion Task – after completion of the motion task sequence showing chart history.

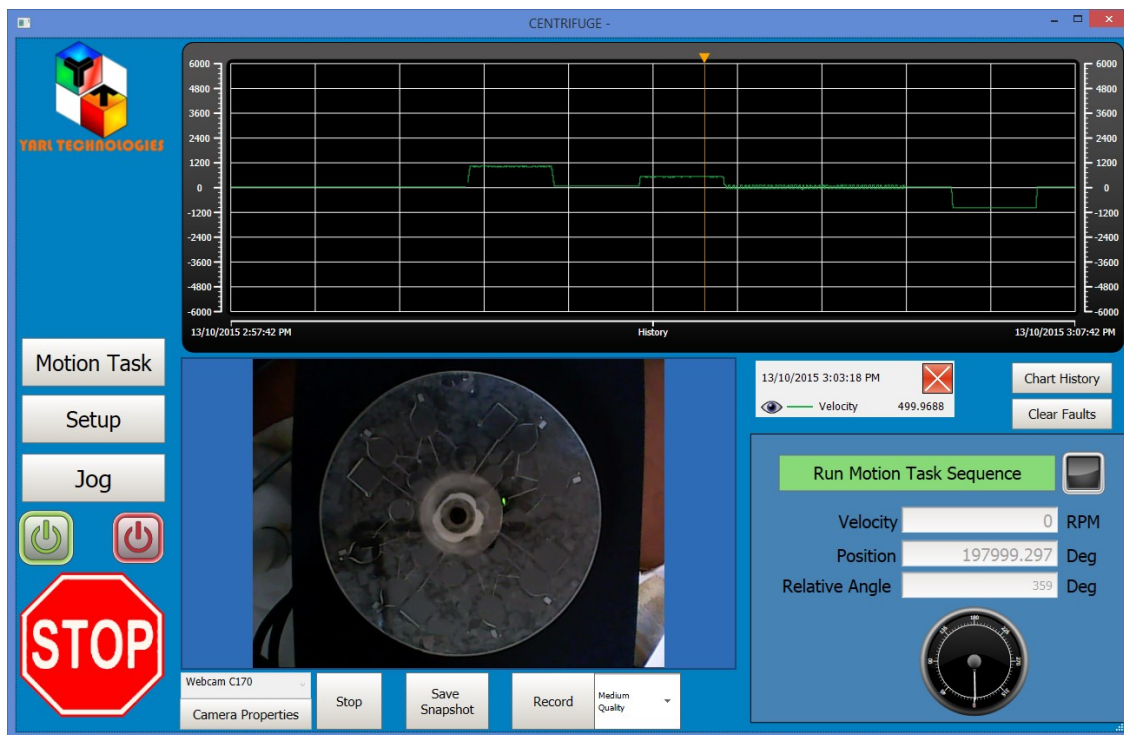


Figure 2.7.5 Motion Task – after completion of the motion task sequence – showing cursor controls.



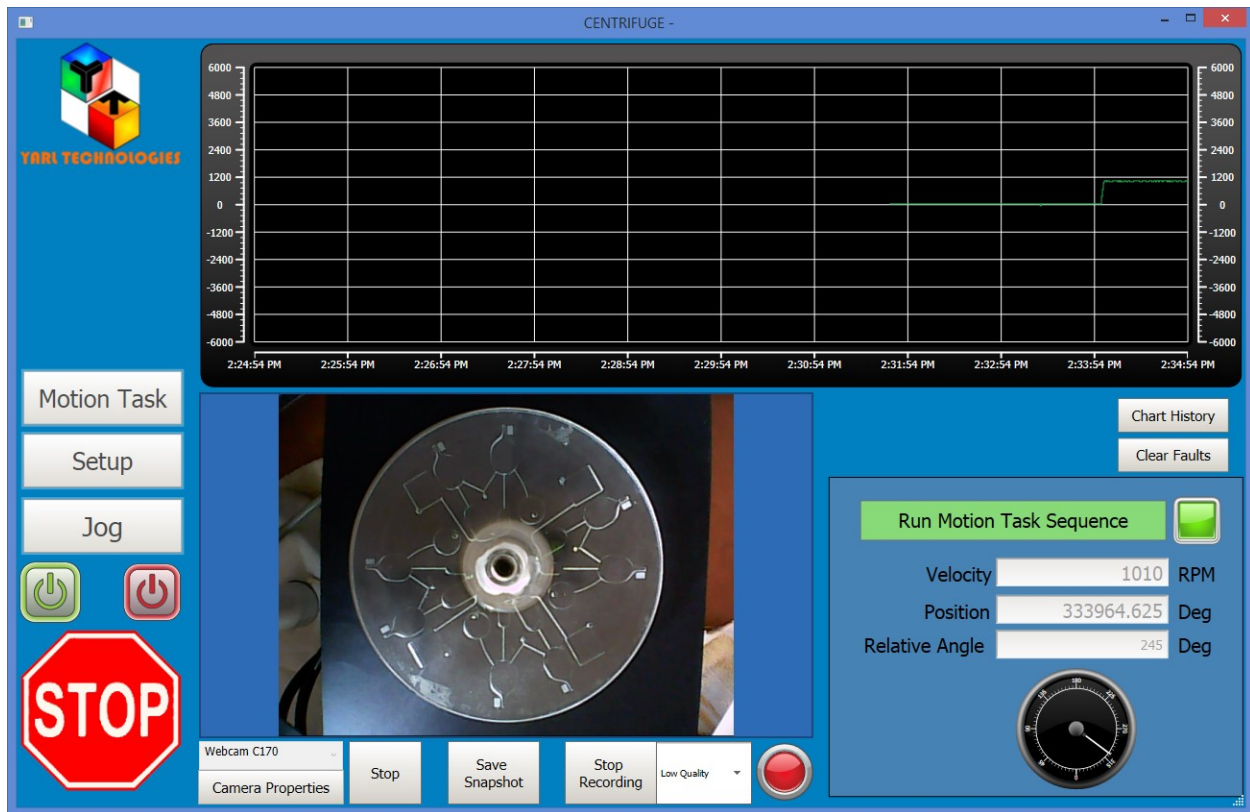


Figure 2.7.6 Motion Task – Video recording in progress, the red icon will blink while recording.

Once the motion task sequence has been written to the drive, select the camera and click on the “Start” button. This button text will change to “Stop” and should be clicked to stop the camera. While the camera is on, click on the “Camera Properties” button to adjust various camera properties available on that camera. Click on the “Save Snapshot” button to save a still image in jpeg format. A pop-up window will allow the user to select the file path and file name of the still image. Click on the “Record” button to start video recording. While recording, the red indicator will blink to indicate the video stream is being written to the file and the button text will change to “Stop Recording”. A pop-up window will allow the user to select the file path and file name of the video file. Before pressing the “Record” button, the user can select the quality of the video file. Three options are available: low, medium and high quality video image (low quality will be in MPEG4 format with very small file size; high quality will be in raw format with very large file size). Click on the “Stop Recording” button to complete the video recording and close the video file properly. If the video file is not closed properly, you may not be able to open or view the video file.

## 2.8 Technical Support

The HMI application is written using the Kollmorgen visualization builder software and hence, the user should be able to edit and add new features to this application. The Kollmorgen visualization builder uses drag and drop icons for simple intuitive programming in addition to using the powerful C sharp scripting tools for advanced programming. Yarl Technologies will provide any initial guidance to facilitate familiarization with this software. Furthermore, the user can easily access the technical support information on the Kollmorgen website and in general, use Google search to access a range of 'how to' tips.

For any technical support please contact:

Kollmorgen Technical Support: <http://www.kollmorgen.com/en-us/service-and-support/technical/technical-support/>

Yarl Technologies Pty Ltd:

Leeming,  
Perth, WA 6149.  
Australia.

Ph: +61458748684

Email: [yarltechnologies@gmail.com](mailto:yarltechnologies@gmail.com)  
<http://www.yarltechnologies.com>

To purchase a Kollmorgen USB Dongle for 250 tags or any motion task technical support:

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Caringbah NSW 2229  
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Fax: +61 2 9525 3878

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