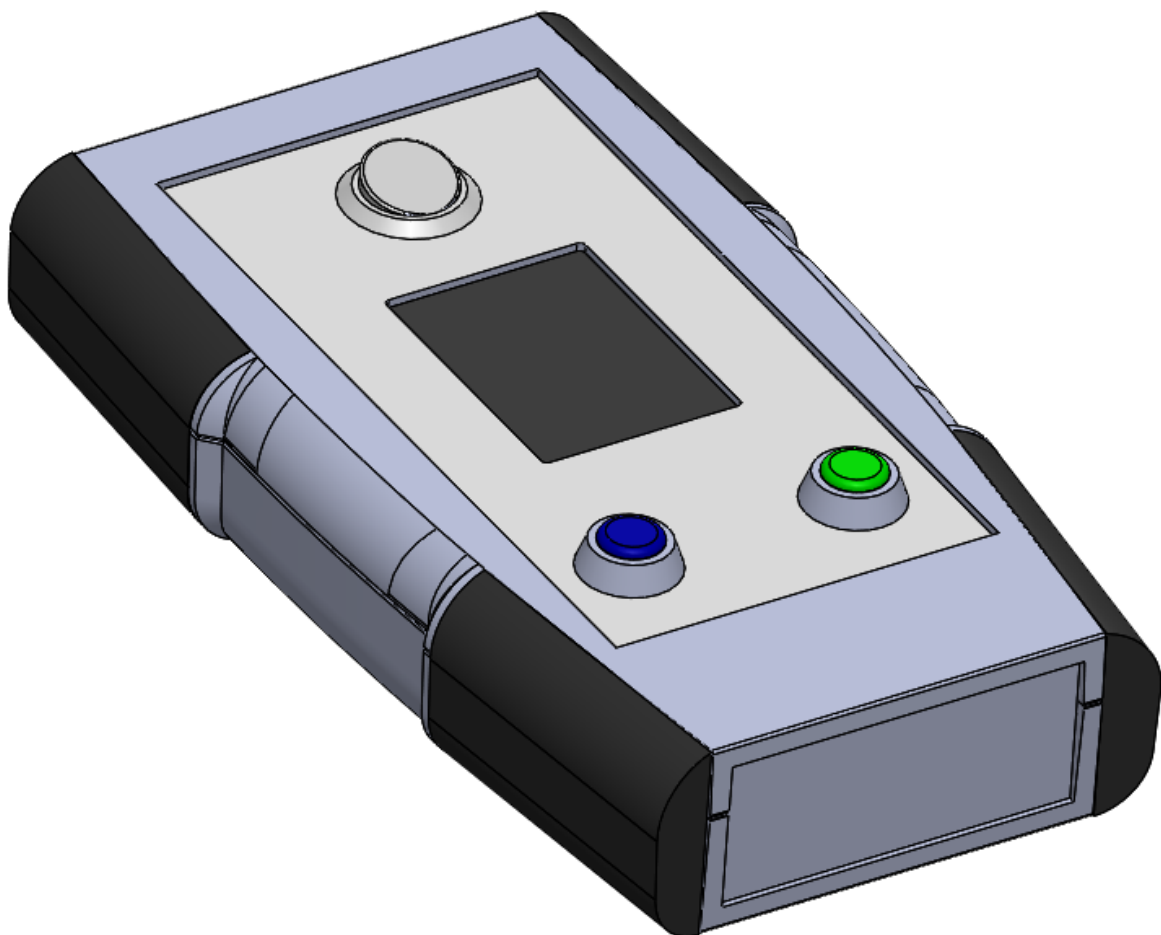




## PRODUCT INSTRUCTION MANUAL

Product: MASC-JB Handheld Jog Unit



### Product Description

Handheld Jog Unit for MASC Stepper Motor Controller

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## 1 IMPORTANT SAFETY INFORMATION!

This document is intended as a user guide to operation as determined by the design.

Position control systems are inherently hazardous. Even a small motor, if coupled to a leadscrew, gearbox, or any other form of mechanism that provides a mechanical advantage, can generate considerable force and could cause serious injury. Incorrect operation can also lead to damage to the motor or associated machinery. It is essential that the purpose of the various fault detection features built into the MASC's ST5-Q controller be fully understood and used correctly.

As such, Installation must be carried out only by competent persons who are familiar with electronic control systems

## 2 OVERVIEW

This document introduces the MASC-JB Stepper Motor Handheld Jog Unit for Applied Motion ST5-Q drives controlled over RS-485 from MASC packaged units that include a 5V supply for the Jog Unit.

### 2.1 PURPOSE

The MASC-JB Stepper Motor Jog Unit is a uniquely versatile, multi-function Jogger with system display and installed unit configuration capabilities. Direct user interaction is via a colour, resistive touchscreen and two prominent Jog Buttons mounted in a convenient Handheld enclosure. Initial configuration of the unit can be performed over USB. Up to 8 axes can be controlled from the Jog Unit when the drivers are in a RS-485 multi-drop configuration. Although a robust unit it has been designed as a low-cost replaceable item.

## 3 JOG UNIT INTERFACES

This Section provides a description and pinout details of the interfaces on the Top Panel of the CIS-MDSJ-HC-003 Jog Unit.

### 3.1 POWER

The MASC-JB unit is powered by 5V from either or both of the RS-485 or USB connectors. Under typical operation the 5V supply is intended to be via the RS-485. The Jog Unit has an isolation circuit to ensure that the internal microcontroller and USB connectivity is disconnected from the Ground and Shielding of the RS-485 cable. This provides a level of Electro Magnetic Compatibility and prevents grounding issues when connecting to an independent PC (for which a connection to mains ground is likely). Care should be taken that excess voltages are not likely over the USB port.

### 3.2 RS-485 MULTI-DROP

The RS-485 Multidrop connector is provided to allow a dedicated serial connection to a small network of MASC drivers. This can allow the control and monitoring of multiple MASC units. The 9-pin D-type Male connector has a pinout as shown in the figure below.

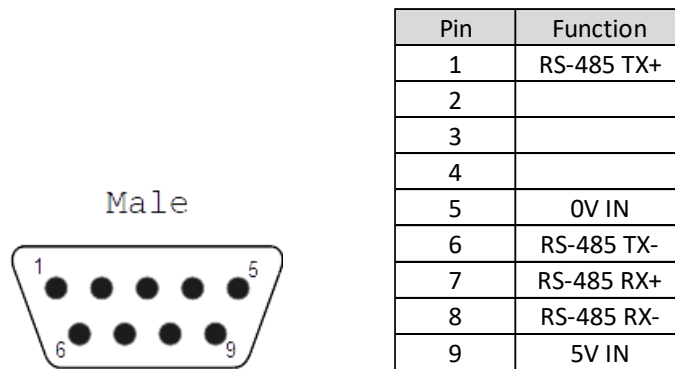


Figure 1 – RS-485 connector pinout

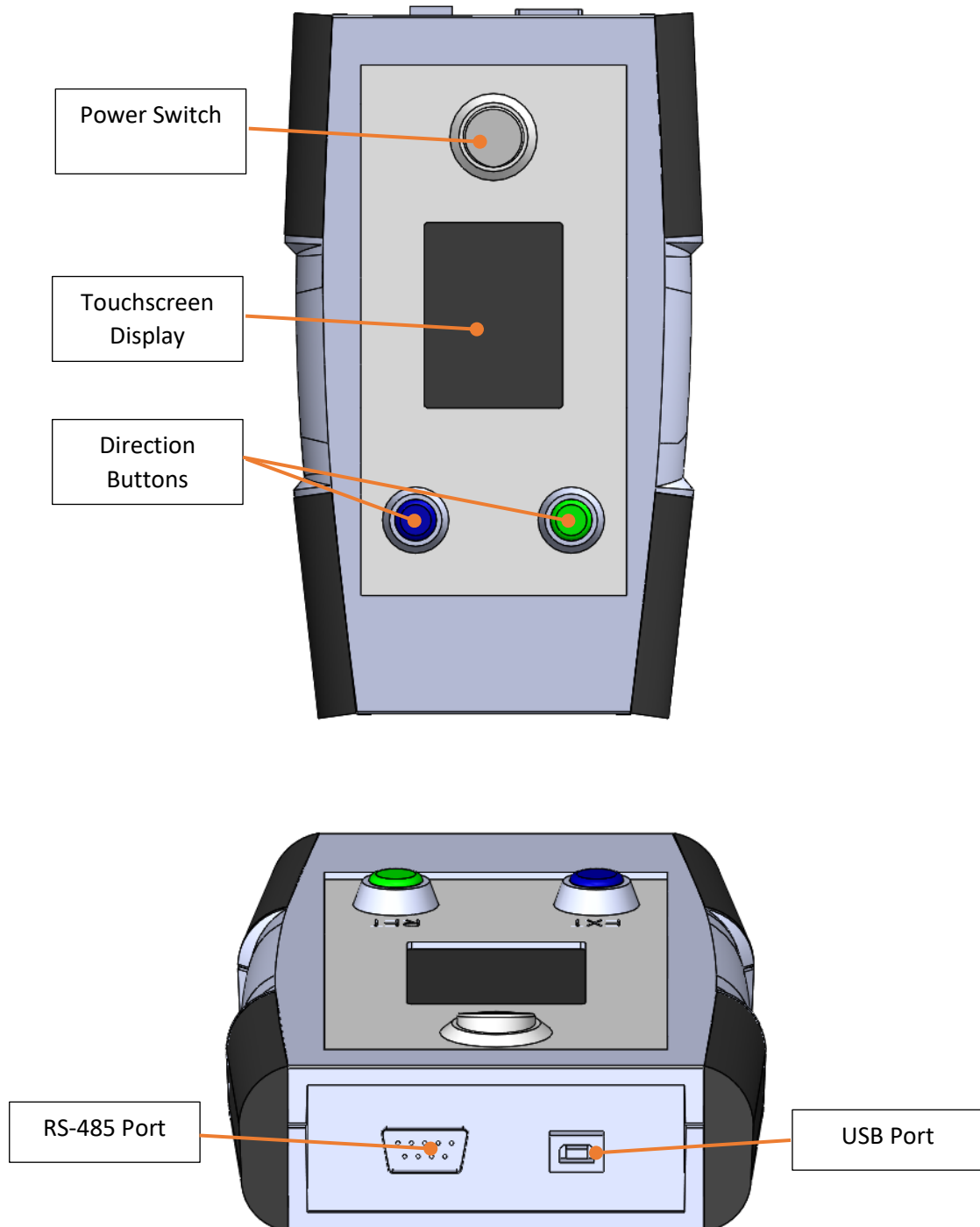
In order for RS-485 to function reliably a termination resistor is required at the end of the Multidrop network furthest from the Jog Unit (that acts as the Master). 1 x MASC-TP is supplied with each MASC controller. See MASC manual or Quick start guide for further details.=.

### 3.3 USB

A USB 2.0 Type B connector allows a firm connection with the supplied cable to a USB 2.0 Type A connector on a Windows 7 or Windows 10 PC capable of running any application that is compatible with the Jog Unit.

## 4 JOG UNIT OVERVIEW

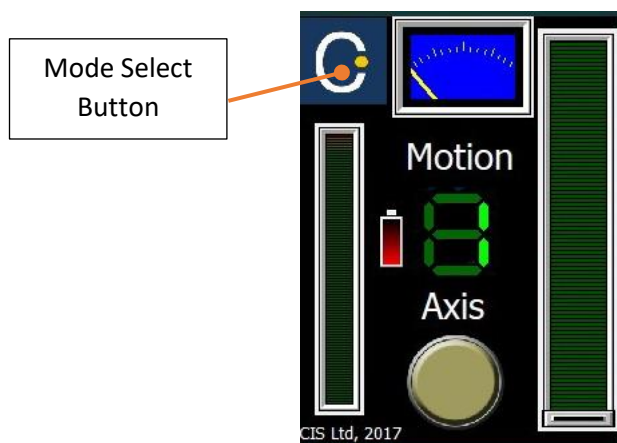
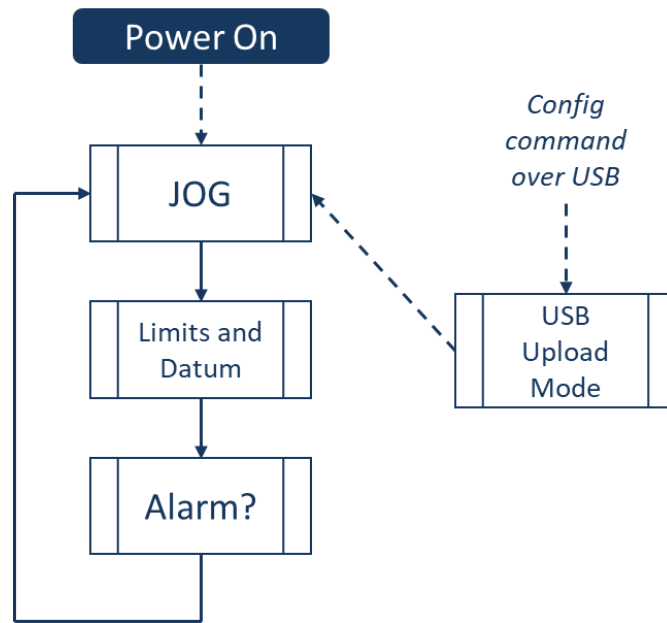
On unpacking the MASC-JB inspect it and plug it in to a USB port of a power point or PC, using the USB port on the top of the unit to give it an initial check that it can be powered up and that the touchscreen is active. When not in use switch the unit off.



A RS-485 cable is required to connect the Handheld Jog Unit to the MASC Drivers (no crossover is required).

The Handheld Jog Unit can operate from 5V supplied from either (or both) the RS-485 connector and the USB connector.

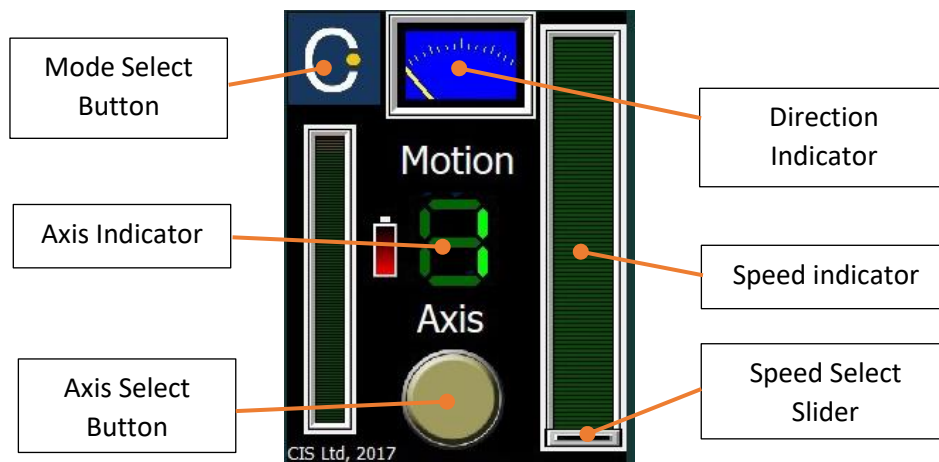
For normal use there are three modes of operation, indicated by the graphics on the colour touchscreen, with each layout matching a mode. Navigation between screens is achieved by pressing mode select button in the top left corner of the touchscreen. The functionality of the modes is as follows:



### 4.1 JOG MODE

Jog Mode is the default and normal operating mode in which jogging operations, speed selection and changing Axes can be done. On power-up the unit enters Jog Mode after a short start-up delay. In Jog Mode the speed can be selected (between pre-set min and max values) by using the speed select slider bar on the right of the screen. A single press on the desired position is sufficient to change the speed. **Note: the speed change will not take effect whilst the direction buttons are being held down. The direction button must be released and then pressed to confirm the speed change.**

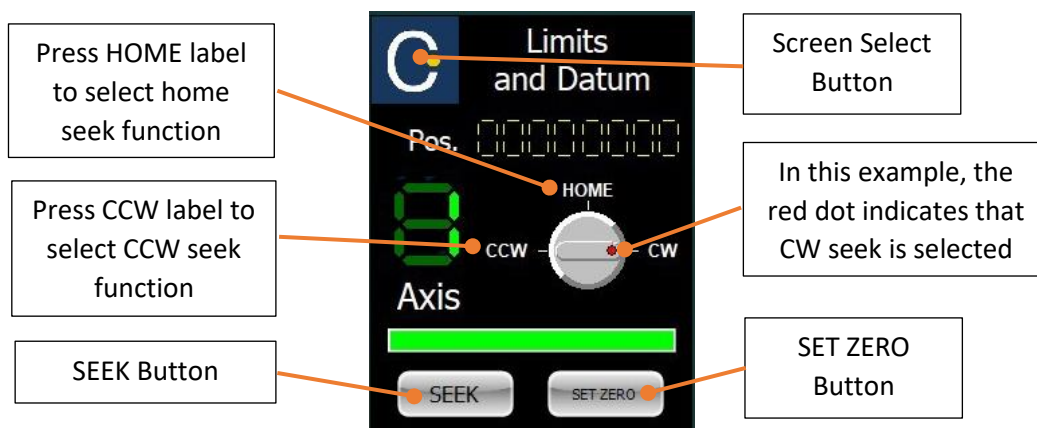
The target axis can be selected by pressing the round Axis select button on the touchscreen.



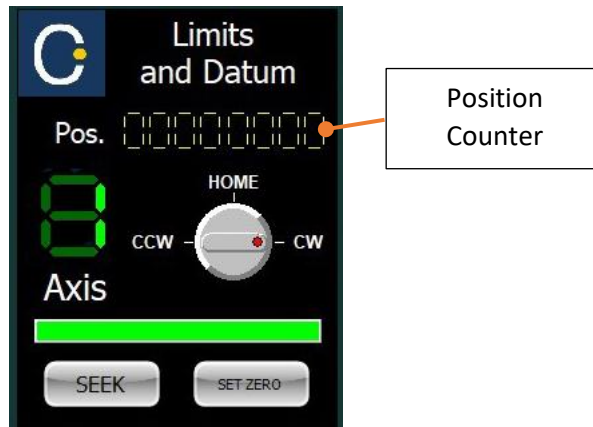
Jogging motion is achieved by pressing the Counter-Clockwise (CCW or -, Blue) or Clockwise (CW or +, Green) mechanical buttons. When the button is released motion stops. Motion is also indicated on the blue dial at the top of the touchscreen. Depending on whether the home position has been set the left bar can indicate the relative position in a CW direction from the CCW limit switch (if the correct parameters have been set in the Handheld Jog Unit).

### 4.2 LIMITS AND DATUM SEEK MODE

The Limits and Datum Seek Mode allows the datum (or home) position to be found using an automated routine. Once the datum position has been found by the driver the User can set the target Driver's position counter to Zero to allow fixed position moves and tracking of the Axis position through the counter.

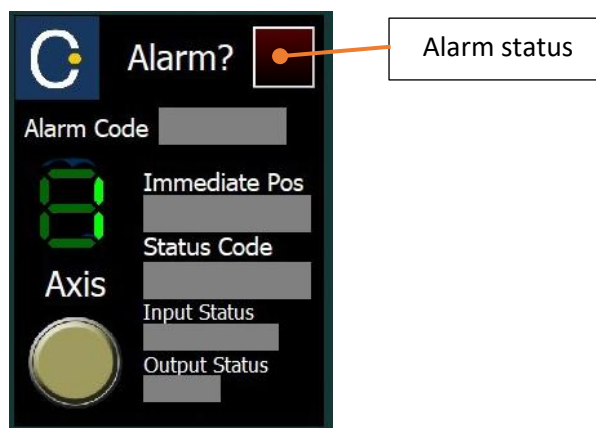


This Mode can also be used to find the counter values of the limits, once the Zero position has been set. The Limit or Home sensor can be selected as the target by touching the desired label on the Rotary Switch symbol on the screen. Once the “Seek” button has been pressed the Driver will be commanded to perform the sensor seek routine and while the motor is moving the horizontal Green bar above the buttons will change to Red. When the sensor has been found and the motor has come to rest the “Set Zero” button can be used to set the position counter of the Axis to zero. The Position field (“Pos.” on the screen) shows the counter value of the current Axis and is updated every couple of seconds.



### 4.3 STATUS MODE

In status mode a range of fields are shown that indicate Alarm, Status, Position Counter and I/O values. This can be useful for monitoring and debugging purposes. They are updated over a cycle of around 5s. On exiting this Mode any indicated Alarms are cleared in the Driver, although if an external alarm condition hasn’t been cleared or there is an internal fault the Driver will correctly continue to register the Alarm.



Field	Displayed Value Meaning
Alarm	This square box is coloured bright red when the ST-5Q has returned a non-zero value when queried periodically by an “AL” command. When the Alarm condition isn’t present, or is cleared, it returns to the background colour.
Alarm Code	The four characters that represent the Hex code for Alarm conditions in the ST-5Q unit is displayed in this screen. Refer to the Applied Motion Host



	<p>Command Reference Manual for a full description of this command but some common ones are as follows:</p> <p style="text-align: center;"><u>Hex Value</u></p> <p>0000 No alarms          0001 Position Limit          0002 CCW Limit          0004 CW Limit          0008 Over Temp          0080 Over Current          0100 Open Motor Winding          0400 Comm Error          4000 Blank Q Segment</p> <p>Note that if multiple alarm conditions are present the returned Hex value is the logical AND of the values listed above.</p>
<p>Immediate Position</p>	<p>The value returned, as a signed integer, by the Immediate Position, "IP", command.</p>
<p>Status Code</p>	<p>The four characters that represent the Hex code for Status conditions in the ST-5Q unit is displayed in this screen. Refer to the Applied Motion Host Command Reference Manual for a full description of the "SC" command but some common ones are as follows:</p> <p style="text-align: center;"><u>Hex Value</u></p> <p>0001 Motor Enabled (Motor is Disabled if this value is 0)          0004 Drive Fault (Check Alarm Code)          0008 Motor is In Position          0010 Motor is moving          0020 Motor is Jogging          0200 Alarm Present (Check Alarm Code)          0400 Homing (executing the "SH" Command)          4000 Q Program is running          8000 Initialising (at power up)</p> <p>Note that if multiple Status conditions are present the returned Hex value is the logical AND of the values listed above.</p>
<p>Input Status</p>	<p>Provides the immediate status of the ST-5Q drive's inputs, using the "IS" command.</p> <p>The nine characters represent binary values, one per character, of each available input:</p> <p style="text-align: center;"><u>Binary Field Mapping to ST-5Q Inputs</u></p> <p>xxxxxxx1 X1          xxxxxx1x X2          xxxxxx1xx X3          xxxxx1xxx X4          xxxx1xxxx X5          xxx1xxxxx X6</p>

	<p>xx1xxxxx X7/CW Limit  x1xxxxxxx X8/CCW Limit  1xxxxxxx X0</p> <p>Refer to the ST-5Q Host Command Reference and Hardware Manual for the details of these inputs and their intended uses.</p>
Output Status	<p>Provides the immediate status of the ST-5Q drive’s outputs, using the “IO” command. Only the four right-most characters that are returned are displayed as the others are always “0000” for the ST-5Q drivers:</p> <p><u>Binary Field Mapping to ST-5Q Outputs</u>  xxx1 Y1 is High (open)  xx1x Y2 is High (open)  x1xx Y3 is High (open)  1xxx Y4 is High (open)</p> <p>Refer to the ST-5Q Host Command Reference and Hardware Manual for the details of these outputs and their intended uses.</p>
Axis Selection	<p>If more than one Axis is enabled in the Jog Unit the user can cycle through the available Axes. On switching screens the selected Axis persists. If an Axis is enabled but no driver for it is present then the fields will default to “-”.</p>

## 5 CONFIGURATION

### 5.1 Configuring the Handheld Jog Unit

The Handheld Jog Unit is a flexible, software-defined unit and can have custom parameters uploaded to it using the USB connection to a PC running Microsoft Windows 7 or later. The configuration of the unit can also be checked by downloading the parameters from the Unit too. This Section covers the use of the Jog Parameter Upload Application. Parameter upload application is available from UHV Design.

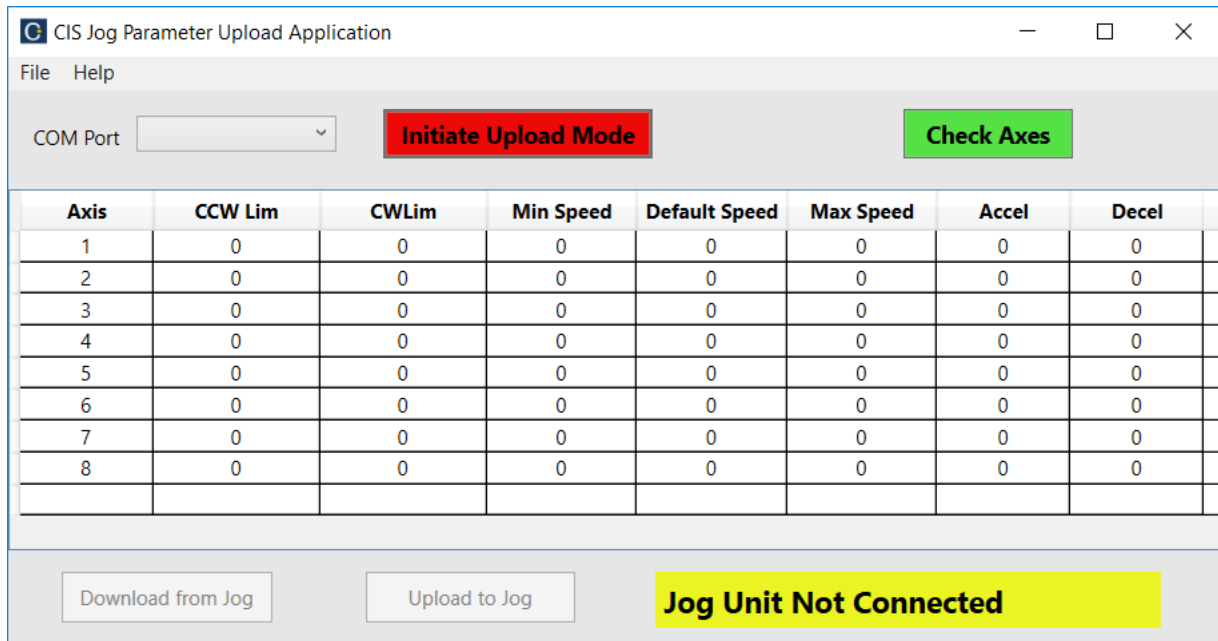
#### 5.1.1 Installing the drivers – Windows 7 only

The Application communication communicates with the Handheld Jog Unit using a serial connection over USB. This is auto-detected in Windows 10 but in Windows 7 a small executable must be run first to ensure the right Microsoft drivers are associated with the Handheld Jog Unit. It must be run with Administrator Privileges but is a once-only operation. Please obtain this executable from UHV Design. It is named “serial\_install.exe” and is a signed driver from a verified provider.

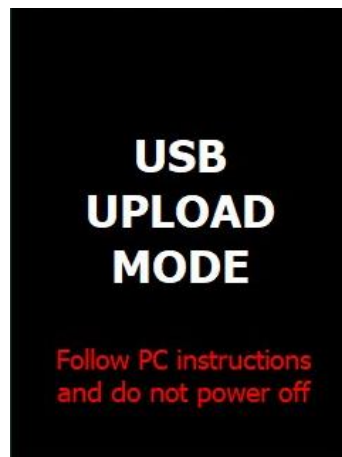
#### 5.1.2 Using the Jog Parameter Upload Application

Before opening the Jog Parameter Upload Application connect the Handheld Jog Unit to the PC using the USB cable supplied and power it up. The device should be recognized by the operating system

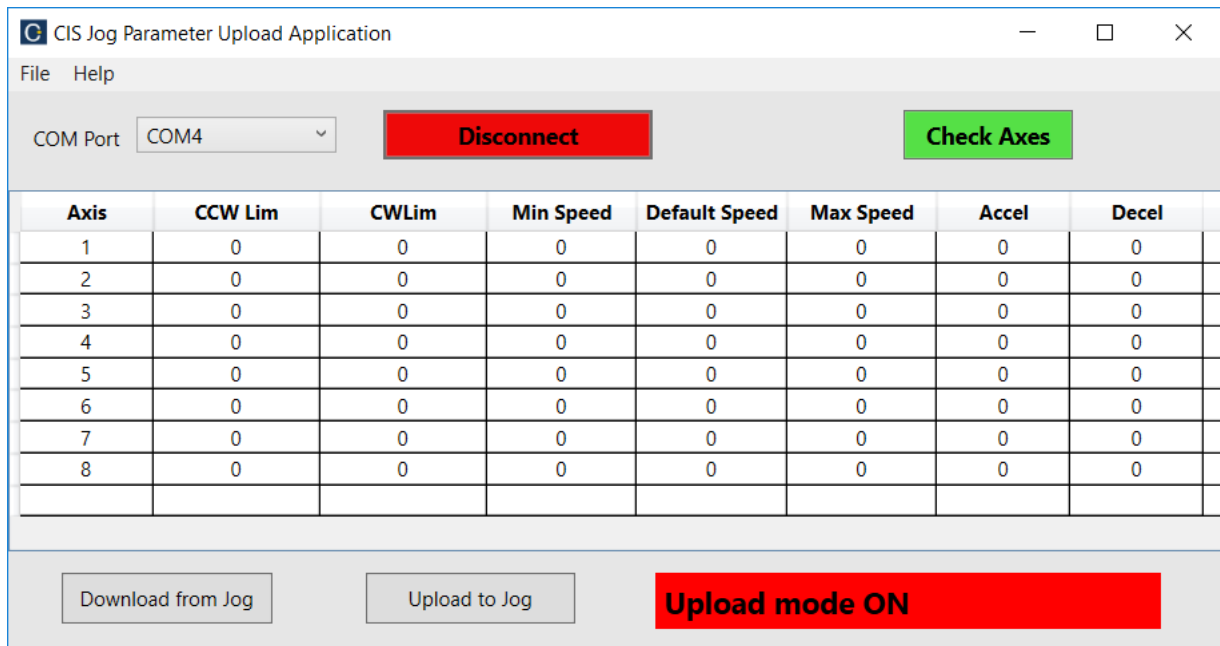
and appear in the Device Manager as a new COM port. Open the application and it should appear as shown below.



On selection of the correct COM port from the list (if there is more than one COM port open on the PC then it is the User’s responsibility to identify the correct one). The “Initiate Upload Mode” can then be selected and the touchscreen of the Handheld Jog Unit should appear. This screen ensures that all interaction with the Unit is from the PC while configuration takes place.



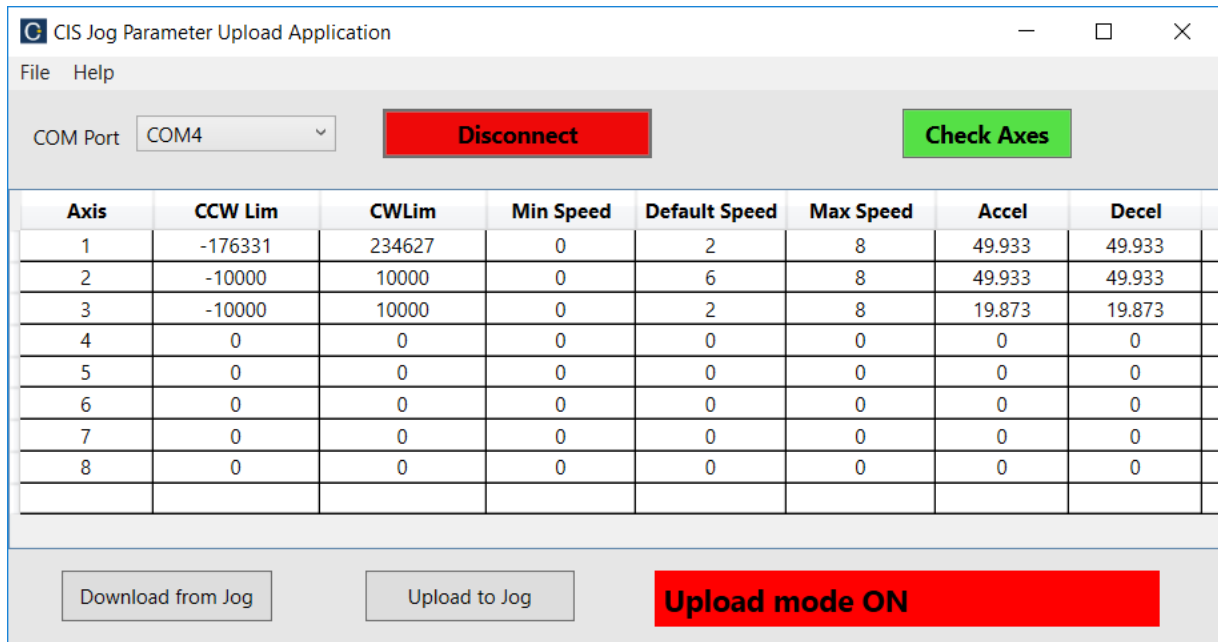
The Application will then change to look like **Error! Reference source not found.**. The user can then choose to enter the parameters for the number of Axes in the system by hand (a maximum of 8 Axes numbered from 1 to 8 are allowed), download them from the Jog unit if it has been configured already or load them from a configuration file. Configuration files are identifiable by the extension “.jog”. The use of “.jog” files is recommended to ensure there is a record of the configuration and they provide a quick and repeatable way of entering the parameters.



As there is limited non-volatile memory in the Handheld Jog Unit there are restrictions on the range and resolution of values for download. The user can check that the parameters that have been entered are legal by clicking “Check Axes”. Any values out of range or not quantized to the supported resolution will be forced to the nearest legal value. This also happens when an Upload operation is initiated.

	MIN	MAX	UNIT	QUANTIZATION
<b>Min Speed</b>	0	40	rps	0.2
<b>Max Speed</b>	0	40	rps	0.2
<b>Default Speed</b>	0	40	rps	0.2
<b>CCW Position</b>	0	-16777216	counts	1
<b>CW Position</b>	0	16777216	counts	1
<b>Acceleration</b>	0.167	10944.512	rps/s	0.167
<b>Deceleration</b>	0.167	10944.512	rps/s	0.167

A 3-Axis example configuration is illustrated below



Axis	CCW Lim	CWLim	Min Speed	Default Speed	Max Speed	Accel	Decel
1	-176331	234627	0	2	8	49.933	49.933
2	-10000	10000	0	6	8	49.933	49.933
3	-10000	10000	0	2	8	19.873	19.873
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0

The Upload operation can be initiated by selecting “Upload to Jog”. Wait for the operation to complete, indicated by a “Success” message box. When the Upload Mode is on, at any point other than during a Download or Upload Operation the “Disconnect” button can be selected to close the connection to the Handheld Jog Unit.

**Note: It is advisable to power cycle the Handheld Jog Unit once new parameters have been downloaded.**

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