

User Manual



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WARNING: Improper operation of CNC equipment can result in severe injury. Keep hands, fingers, loose clothing, long hair and all other body parts a safe distance away from moving parts.

Parts List

Max32 board USB A to USB B Cable 5.25 VDC 3 Watt Mini USB AC Power Adaptor

Key Features

- 32 bit Processor for ultra fast motion
- Serial commands through USB Port
- 24-bit motion commands; up to 16,777,215 steps per motion
- 77 Hz to 140 KHz adjustable step rate with 1 Hz

resolution

- Four-axis linear interpolation
- Hardware linear ramping in 1 to 10 Hz increments (user adjustable)
- User adjustable ramp up/down for fast sequences
- 3k motion command buffer for fast sequences of motion
- Dual limit switch inputs per axis (TTL or pull-up)
- E-stop input (TTL or pull-up) for instant stop
- Spindle clockwise and counter-clockwise digital outputs for solid state relays
- Flood and mist coolant digital outputs for solid state relays
- User-configured digital output for solid state relays
- One pulse-width modulated or 0-5VDC (un-buffered) analog spindle speed output for spindle motor speed control
- One auxiliary digital input (TTL 5 VDC) for monitoring
- KCam 4 compatible
- X,Y,Z,A Axis outputs: Step, Direction, Enable
- X,Y,Z,A Axis inputs: Forward Limit Switch, Reverse Limit Switch
- Stable motion with any operating system including Win98-Windows 7 32/64-bit
- Output frequency is smooth and consistent regardless of PC operating system load
- All inputs and outputs isolation interface ICs with a 1KV rating for protection between the I/O terminals and the controller/PC for noise immunity and safety
- 32 bit Hardware Quadrature Encoder Counters for all four axis to verify position



Introduction

Max32 is a PC-controlled USB step and direction pulse generator that provides exceptionally smooth operation at a reasonable price. It interfaces a PC running Microsoft Windows and a set of four stepper motor drivers, and uses a microcontroller to convert USB serial commands to pulses. MaxStepper can control auxiliary devices such as relays. It has inputs for monitoring devices or auxiliary switches. Encoders may be used to verify motor position on each axis.





Installation

- 1. Connect the USB A to B cable to an open USB port at the rear of the PC.
- 2. Plug in the mini USB AC power adapter to a wall outlet and to Max32's I/O +5 VDC connector.
- 3. Connect the stepper motor drivers to the X, Y, Z and A axis terminals.
- 4. Connect the E-Stop switch to the terminals

Setup

- Start the KCam software.
 From the Setup menu, select Port Setup.
- 3. Select Serial Port (Max32 v5.xx (Figure 1).

to Port Setup			2		X
Port VO Controls MaxStepper LPT Se	tup LPT Info(Gene	eral)			
Port Type Serial Port (Max32 v5.xx ▼ Parallel Port 10 DLL used C InpOut32.dll Win95/98 C DPort.dll Win95/98/NT The I/O DLL one should choose depends on the Operating System. A choice is given incase problems occur with ports on some PC's or Operating Systems.	Output Names - Spindle CW: Spindle CCW: Mist: Flood: Auxellary:	Spindle CW Spindle CW Coolant Mist Coolant Flood Auxillary			
				Abbia	Cancel

Figure 1

5. Select the MaxStepper tab (Figure 2).

B Port Setup		
Port VO Controls Max	xStepper LPT Setup LPT Info(General)	
Port Status	General VO Encoders	
Comm Port 2	Max Inputs and Outputs	
	Invert X Direction X Limits Invert Spindle CW Spindle CW OUTI	
0.05	Invert X Limit Invert Coolant Mist Spindle CCW DUT2	
SASF: 2 •	Invert V Direction V Limits Reserved Coolant Mist DUT3	
Present	Invert Y Limit Reserved Coolant Flood OUT4	
Comms: 20798 Errors: 0 CS Er: 0 Buffer: 3600 Rev: 5.0.0 Date:11/05/2011 Hz: CByte2: 0 CByte2: 0 VVDog: 1 SASF: 2 InMotion: False Cmd Ind: 0	Invert Z Direction Z Limits Invert B Direction B Limits Invert B Limit Invert B Limit Pwt-Durts Pwt-Durts Invert B Limit Pwt-Durts Pwt-Durts	
	Invert A Direction A Limits Invert C Direction C Limits Invert A Enable □ □ □ Invert A Enable □ □ □ Invert A Limit □ □ □	
	Options Ramp Rate 5 VM Output Naximum Spindle 10 Value	
	Min. Arc Length 0.00000" - Invert PW/M Output	
Clear Reset		
		Cance

Figure 2

6. Under Port Status, select the MaxStepper Comm Port that Microsoft Windows created when the USB cable was connected to Max32. You may need to open Microsoft Device Manager to determine the port number.



- 7. Make appropriate adjustments to the **Max Inputs and Outputs** and **Encoders** to suit your stepper motor driver requirements.
- 8. Click **Apply** to save your parameters.
- 9. You should see the MaxStepper firmware Rev and Date information in the Port Status group.

AaxStepper	General VO Encoders
Comm Port 2 🔳	Max Inputs and Outputs Aux 1/0
	Invert X Direction X Limits Invert Spindle CW Spindle CW DUT1
	Invert X Limit Invert Coolant Mist Spindle CCW 0UT2
SASF: 2	Invert Y Direction T Y Limits Invert Coolant Flood C Coolant Mist OUT3
Present	Invert Y Enable Reserved Coolant Flood DUT4
Comms: 40243 Errors: 0 CS: Er: 0 Jene: 500 Rev: 500 Date: 11/05/2011 CByte1: 0 CByte2: 0 WDog: 1 SASF: 2 ImMotion: False Cmd Ind: 0	Invert Z Direction Z Limits Invert B Direction B Limits (h(high) M(low) Invert Z Enable Invert B Enable Invert B Limits (hover B Limits) (hover B Limits) (hover B Limits) (hover B Limits)
	Invert A Direction □ A Limits Invert O Direction □ C Limits Invert A Enable □ < > Invert C Enable < > Invert A Limit □ < > Invert C Limit E-STOP
	Options Ramp Rate 5 - Hz/step Maximum Spindle 10 Value
	Min. Arc Length 0.00000 V Invert PW/M Output
Clear Reset	

Figure 3

- 10. Close the **Port Setup** window.
- 11. From the **View** menu, select **CNC Controls**, and test the motors with the jog buttons. The motors should move as the jog buttons are pressed.

CNC Controls				• ×	
× <mark>00</mark> .	0000	000	Zero XLim	it	
ү <mark>00</mark> .	Y 00.000000				
z <mark>00</mark> .	Z 00.000000 Zero Zero Zimit				
A <mark>00</mark> .	A 00.000000				
Feed Ove	ride Sp	indle CW	Spindle	∍ ccw l	
		olant Mist	Coolan	t Flood	
			Auxi	llary	
Manual Autor	Manual Automatic Timing Process Status				
			<	>	
<u> </u>		Single Ste	р Ке •	eboard Jog	
G01 X100 Y100 Z100 A100 Goto					
Move to Re-Tool	Move to Home				
MOTORS ENABLED					
	Fiau	re 4			

Setup is complete, and you are now ready to use KCam.



Wiring Diagrams



Diagram 1 - Typical Motor Connection

Note: If your motor drivers do not have an enable input, leave the Max32 Enable outputs unused.



Diagram 2 – PC USB Port and Power Supply Connection



Circuit Board Mounting Pattern



Diagram 3 - Mounting Pattern

Jumper Settings

Jumpers JP1 and JP2 should both have shunts in place when using the supplied AC Adapter to power the Isolated Inputs and Outputs. If you wish to power the Inputs from a separate power supply than the Outputs, remove the shunts from JP1 and JP2 and connect a separate +5 VDC power supply to X7's +5 and CM terminals. Note that the +5 and CM terminals are bussed between X4, X5 and X6. They are also bussed between terminals X7, X8 and X9. Jumpers JP1 and JP2 connect the two busses together. One or Two external power supplies connected to the X4 and X7 terminals may also be used if the supplied AC adapter is not desired.

Jumper JP3 allows removal of the filter capacitor and resistor from the PWM output. When the shunt is placed across Pins 1 and 2, the PWM output is converted to a 0 to 5VDC analog signal. When the shunt is



placed across pins 2 and 3, the PWM output is not filtered and can be sent to a device requiring a digital signal. Note that the 0-5 volt filtered analog signal is not buffered. It will not source low impedance loads.



Encoder Parameters

Read Enable option will turn on the encoder software in Max32

Stop on Fault option will cause Max32 to halt motion operations when the encoder position error exceeds the **Max Error**.

Mode parameter sets the encoder quadrature count mode. Typically 1X mode is used.

- 1X quadrature count mode (one count per quadrature cycle).
- 2X quadrature count mode (two counts per quadrature cycle).
- **4X** quadrature count mode (four counts per quadrature cycle).

C. Factor is a multiplier used to recalculate the Encoder Counts so that Encoder CPR will match Step Counts. The Encoder Counts = C.Factor x Encoder Pulses.

Max Error is the maximum allowed error between the encoder position and the step count before a position fault is set. Position faults are latched on and must be cleared manually. Position faults can be cleared by setting the axis position, setting the encoder position or homing the table.

Port VO Controls MaxS	tepper LPT Setup LPT Info	(General)		
MasStepper 2 ▼ CommPot 2 ▼ SASF: 1 ▼ <u>Communication</u> Present Comme: 63400 Erros: 0 CS Er. 0 Len Er. 0 Buffer: 755 Buffer: 75	X Encoder Read Enable ▼ Stop on Fault ▼ Mode: 1X ▼ C. Factor: 2 ▼ Max Enor: 10 ▼ Enc Ont 0 Step Cnt: 800000 Z Encoder Read Enable ▼ Stop on Fault ▼ Mode: 1X ▼ C. Factor: 1 ▼ Max Enor: 10 ▼ Enc Cnt 0 Step Cnt: 800000	Y Encoder Read Enable ▼ Stop on Fault ▼ C. Factor: 2 ▼ Max Error: 10 ▼ Enc Cnt: 0 Step Cnt: 800000 - A Encoder Read Enable ▼ Stop on Fault ▼ Mode: 1X ▼ C. Factor: 1 ▼ Max Error: 10 ▼ Enc Cnt: 0 Step Cnt: 400000	Set Encoder Position	
			ОК Арр	ly Cancel

Figure 5

Example 1:

Stepper Motor Axis Specs: full step mode, 200 Steps per Rev, 2000 SPI Encoder Specs: 200 CPR in 1X mode

Mode=1X, C. Factor = Motor SPR / Encoder CPR = 200/(200*Mode) = 1 Max Error = 10 (steps) , (10+1)//2000 = .0055"

Example 2:

Stepper Motor Axis Specs: ¼ step mode, 800 Steps per Rev, 8000 SPI Encoder Specs: 1000 CPR in 1X mode Mode=1X, C. Factor = Motor SPR / Encoder CPR = 800/(1000xMode) = .8 Max Error = 10 (steps), (10+1)//8000 = .001375"

Example 3:

Stepper Motor Axis Specs: ¼ step mode, 800 Steps per Rev, 8000 SPI Encoder Specs: 1000 CPR in 1X mode Mode=4X, C. Factor = Motor SPR / Encoder CPR = 800/(1000xMode) = .2



Max Error = 10 (steps) , (10+1)/8000 = .001375" Troubleshooting

Problem	Solution
I just installed Max32. The Status bar shows	Make sure Max32 is connected properly to a working
"MaxStepper Failure" and the Port Setup	USB port on the PC. Verify and correct the KCam
Window shows an increasing number in the	communication port configuration that matches the port
Error status.	in the Microsoft Device Manager.
When I press the jog buttons, the position	Check and correct any mistakes with the wiring to the
displays show change, but the motors do not	stepper motor drivers.
move.	 Is the enable wire connected? Drivers may need this
	to operate the motors.
	The enable output may be inverted. If so, reverse the
	setting in the Port Setup window.
	 Make sure power is applied to the stepper motor
	drivers.
	 If the axis limit switches are displayed as set and
	limits are not engaged, reverse the Invert Axis Limit
	as needed.
	Check the E-Stop switch circuit. It should be closed
	during normal operation.
The stepper motors move, but one or more are	Reverse the Invert Axis Direction in the Port Setup
running backwards.	window as needed.
The stepper motors move, but one or more do	Verify the Limit Switch wiring by manually testing the
not stop with limit switches.	switches and reviewing the limit buttons in the Port
	Setup window. Reverse the Limit Switches Disabled
- <u>-</u>	in the Table Setup window.
The stepper motors move, but one axis	Swap the step and direction wires to the stepper motor
occasionally goes in the wrong direction.	driver for that axis.
The spindle speed output does not work with	A special type of SSR is required for spindle speed
my Solid State Relay (SSR).	control. A Crydom MCPC1225A Proportional Controller
	SSR or similar model along with JP3 set correctly will
	convert the PVVIII signal on terminal X6 to a variable 110
A "Mey Feult" ecoure when is going	VAC power source for a spindle motor of Dremei tool.
A Max Fault occurs when jogging	num on the Stop on Fault option in the Fort Setup
	the Max Error parameter. Encoder feedback can be
	corrected by adjusting the C. Factor until Enc. Cot
	matches the Sten Cnt when jogging. Use the Set
	Encoder Position or axis Zero button prior to log tests
	to match the step and encoder values.