AcornSix Encoder Expansion "ENCEXP12" User Guide

For revision 220119 6-1-23

Overview

ENCEXP12 is an encoder expansion board for use with MPU12 based controls. It allows additional encoder information to be transmitted to AcornSix MPU12 over the SCOUT protocol via shielded Ethernet cable.



Part # 15330

ENCEXP12 Features

Function:	Encoder Reading
Encoder/Scale/MPG Inputs:	6
Supported encoder types:	Standard Incremental Encoder signal (Differential A, B, and Z channels), and also BiSS B, BiSS C, Magnescale Yaskawa Protocol
Communication:	SCOUT Protocol over RJ45 Cable
Dimensions (W*D*H):	12 * 5 * 0.75 inches

ENCEXP12 Typical Connections



The SCOUT protocol is used by ENCEXP12. This protocol is a feature of MPU12 generation controls, which includes AcornSix. SCOUT protocol provides communication and power over RJ45 (Ethernet) cables.

Encoder Support

ENCEXP12 can support standard differential quadrature encoders or BiSS serial protocol encoders. Support for Sony Magnescale using Yaskawa encoder protocol is also included. Standard encoders must have output levels compatible with the specifications in the "ENCEXP12 Specifications" table. Standard encoders have "A" and "B" signals to transmit position information. A signal edge must be produced for every count of position change, which may limit the top speed, particularly on high resolution models. Check both the encoder's maximum frequency and "quadrature encoder input frequency" in the "ENCEXP12 Specifications" table to determine the maximum RPM an encoder is capable of before use.

BiSS is a serial protocol that overcomes the counts versus frequency issue encountered with traditional quadrature encoding. Because high resolution does not limit speed with this protocol, BiSS encoders are typically very high resolution devices. ENCEXP12 supports B and C revisions of the BiSS protocol.



ENCEXP12 Setup

Encoder connections may be used for scale feedback (DRO and/or Position Correction), spindle encoder feedback, and Manual Pulse Generator input.

Most users will setup the additional encoder ports with the AcornSix Setup Wizard which support the most common configurations.

Wizard Scales for Position Correction setup menu supports up to six scales one for each axis.

🔇 Mill CNC Control Configuration Wizard	
Axis Drive Type Input Definitions Output Definitions Axis	Velocity is the number of motor encoder counts / interrupt at which the Scales should adjust the position. Typically a value of 0.1 to 1.0 is a good starting value. Deadband is the number of encoder counts away from the commanded position that the scale position can be before compensating. Typically, you should start with a value of 0 or 1 and then increase it if the control goes into oscillation during movement.
Configuration Homing and Travel Axes Pairing Advanced	* Requires a Pro, Ultimate, or Ultimate Plus License Auto detection did not find any Encoder Expansion boards connected to the system. Encoder 1 Map Scale position to Axis X
Spindle Spindle #1 Spindle #2 Rigid Tapping PWM Setup	Encoder 1 Scale Counts/mm 200 Encoder 1 Display Scale Position on DRO No Encoder 1 Scale Velocity .5 Encoder 1 Scale Deadband 1
Touch Devices Probe Tool Touch Off	Set Encoder port 2 for Scale use Encoder 2 Map Scale position to Axis Y Yes For more information about the Encoder AcornSix expansion module, <u>dick here</u> .
Input Devices Hardwired MPG Wireless MPG Scale Input	Encoder 2 Scale Counts/mm 200 Encoder 2 Display Scale Position on DRO No Encoder 2 Scale Velocity .5
ATC L ATC Setup Preferences	Encoder 2 Scale Deadband 1 Set Encoder port 3 for Scale use Yes Encoder 3 Map Scale position to Axis Z Y
CNC Control VCP Preferences Wizard VCP Aux Keys Luke Rump VCP Aux Keys	Encoder 3 Display Scale Position on DRO Yes
Connected to CNC12	

To Setup Axis Scales for position correction in CNC12 without using the Wizard, navigate to the Scales Menu, Setup (F1) > Config (F3) > Mach. (F2) > Scales (F7).

Scale Settings							
Axis	Label	Input	Enabled	Scale Counts/Inch	Ratio	Deadband	Velocity
1	Х	0	N	0.0000	0.0000	0	0.0000
2	Y	0	N	0.0000	0.0000	0	0.0000
3	Z	18	Y	8000.0000	1.0000	1	0.5000
4	N	0	Ν	0.0000	0.0000	0	0.0000
5	N	0	N	0.0000	0.0000	0	0.0000
6	N	0	N	0.0000	0.0000	0	0.0000
7	N	0	Ν	0.0000	0.0000	0	0.0000
8	N	0	N	0.0000	0.0000	0	0.0000

Set the scale Encoder Input used per axis.

Enabled/Disabled the Scale correction.

Set the Scales's Count / Inch, and desired deadband and velocity.

Note: AcornSix Encoder inputs number are 1-3 for its onboard encoder ports

and the Encoder Expansion Board's encoder ports 1-6 are Inputs numbers 16-21.

For example, if the Z axis Scale is connected to the ENCEXP encoder port 3, I would set the Scale Input to 18 for Z.

Axis = 3, Label = Z, Input = 18, Enabled = Y, Scale Counts/Inch = 8000, Deadband = 1, Velocity = 0.5.

Note: Recommended Starting values for Deadband would be 0 or 1 and Velocity is a value in the range between 0.1 and 1.

Display Scale position on CNC12's position Digitial Read Out

Scale correction is done in the background but if you'd like to show the Scale actual position as a DRO. Set the Scale Position Display to ON and this will display a position readout of that Scale.

Set Parameter 423. Navigate to the parameter screen, Setup (F1) > Config (F3) > Parms (F3), then navigate to Parameter 423.

For example, If we wanted the first 3 Axis Scale positions displayed on the DRO in addition to Z we would set Parameter 423 = 7 which is derived by adding 1 + 2 + 4 due to this being a bitwise parameter. Any combination up to 8 axis scales can be added / removed from the DRO.

ENCEXP12 Specifications

Characteristic	Min.	Тур.	Max.	Unit
24 Volt Supply Current*	0.1	-	0.45	А
Encoder 5V total load, all 6 channels**	0	-	1	А
Quadrature encoder channel input low	0	-	0.5	V
Quadrature Encoder channel input high	2.5	-	5	V
Quadrature Encoder input frequency (per channel)	0	-	1500	khz
Size: 12 * 5 * 0.75 (W*D*H)				Inches

*Min.: = ENCEXP12 only Max.: = ENCEXP12 with full encoder load **Current draw of all encoders must be below 1A

Symptom	Possible Cause	Corrective Action
24V LED not lit	No power	Check connections to H1
3.3V LED not lit	No power or internal fault	If +24V is lit, return for repair
5V LED not lit	No power, internal fault, or overload	Disconnect encoders and check for LED again. If +24V is lit and no overload from encoders, return for repair.
FPGA OK LED not lit	ENCEXP not ready	Wait for ENCEXP12 to start and enter run mode
	Internal Fault	Return for repair
OK LED not lit	ENCEXP not ready	Wait for CNC12 software to start
	Internal Fault	Return for repair
Encoder errors (general)	Return / GND not connected	Connect encoder GND to H2 - H7 GND pin. If the encoder is not powered by ENCEXP12's +5V, this is sometimes overlooked.
	Encoder plugged in with power on	Restart ENCEXP12. The board must detect encoder type at power up because it supports multiple encoder types.
Encoder differential error	Encoder disconnected	Connect encoder and check that parameters 308 - 315 are set correctly
	Incorrect encoder type	Use differential signal type (-A, +A and -B, +B), not TTL
	Wiring connection problem	Resolve shorts or opens that result in -A and +A or -B and +B being at the same voltage
	Wiring noise immunity problem	Use appropriate shielded, twisted pair cable. Route cables away from motor, contactor, or other wires connected to inductive loads. Route cables away from high current conductors.
	Encoder output level incompatibility	Check that encoder output signals meet the levels in "ENCEXP12 Specifications" chart
Encoder quadrature error	Invalid state transition between A and B signals	See wiring issues listed for encoder differential error.

LED1 Error Codes

Error Number	Meaning	Cause	Corrective Action
1	Communication Failure	Communication lost for over 0.2 seconds	Check cable to H1 from main control board
2	Not used		
3	Not used		
4	Not used		
5	Not used		
6	Voltage failure	Power was lost	Check cable to H1 for intermittent connection or excessive voltage drop (<=18V).
7	Communication out of sync	Data in and out are not locked together in a synchronous relationship	Check cable to H1 from main control board
8	Not used		
9	Not used		

ENCEXP12 Connections and Mounting Footprint

