

KREMFOR

HYPERDRIVE-3



The Integrated PLC Based Programmable Stepper Motor Controller

- Programmable, microstepping digital stepping motor controller.
- Operates from 12 volts to 32 volts DC.
- Drives bipolar stepper motors up to 3.5 amps.
- Acceleration and Deceleration specified in Rpm/Sec^2 .
- Programmable speed expressed in RPM.
- Movement is specified as either a number of steps or a speed.
- Includes an RS485/422 serial interface for interactive control.
- Four isolated constant current inputs.
- Two isolated digital outputs.
- Four power or torque settings.
- Four microstepping settings: 1, 2, 8, 16.
- Four output bridge mode settings.
- Fully programmable using a simple programming language.
- Current program can be saved in non-volatile storage.
- The stored program can be automatically loaded and executed at power up from non-volatile storage.

Introduction

The Hyperdrive is an Australian designed and manufactured programmable stepper motor controller. It combines in the one device a Programmable Logic Controller (PLC) and a Stepper Motor Controller (SMC). The built-in PLC provides a set of program commands and instructions a user can use to define and program the parameters of a particular motor movement profile.

Four inputs can be used to monitor events occurring during a profile and alter the profile as required. Two outputs can be used to affect external events based on the profile. A motor move profile can consist of an acceleration phase, a constant speed phase, and a deceleration phase, where the entire motor move profile is constrained to take a specified number of steps. The profile can alternatively be a continuous set of speed settings with various accelerations between settings.

Serial Control

The Hyperdrive is controlled over an RS422/485 (4 or 2 wire) differential serial interface using a set of instructions and parameters that define the movement profile such as the speed, the number of steps and the acceleration. It may also be used to make changes within the various modes the controller is capable of.

Control can be from an interactive terminal program on a PC connected to the Hyperdrive via a USB to RS422/485 interface, or directly via the serial link from an external control program running in either a PC or PLC.

A particular set of motor instructions (a program) can be entered, edited and executed entirely from within the Hyperdrive. Alternately the program can be prepared in an external editor and downloaded to the Hyperdrive as required. The program can be dynamic (i.e. lost when power is removed), or stored in on-board non-volatile memory. In the latter case the Hyperdrive can also be

programmed to automatically start the stored program on power up. This means that once a program has been written and qualified for a particular application, the Hyperdrive will run that program every time the machine is powered up.

Input and Output Options

There are four input lines and two output lines that may be configured under program control to either control the motor profile in the case of inputs, or provide outputs that relate to points in the set motor profile. An action can be programmed to occur on a particular input being turned on or off - an input event. The action can be to pause the program waiting on that event, or branch to some other part of the program on that event. The resulting action could initiate a deceleration event, stop the motor, or take some other action entirely.

Program commands

The Hyperdrive is controlled using a set of instructions and parameters that define the movement profile such as the speed, direction, power, acceleration, the number of steps and a number of modes. An output can be programmed to turn on or off at any point within the program or after a specified number of steps.

Each program line starts with a line number and that number/instruction can be referred to from elsewhere in the program as a go to destination. Here is a very small example program:

```
100 Setrpm 240      ; set speed
110 Accel 1200     ; set accel
120 Dir CCW        ; run CCW
130 ContWhen 1, on ; wait for input 1
140 DoSteps 6400   ; run for 6400 steps
150 WaitFor        ; wait until done
160 Delay 100      ; 100 mSec delay
170 Out 2, on      ; set output on
```

This table is a complete list of commands and/or program instructions. Most have one or more parameters that further define the required action. Many can be part of a stored program (shown with a * in the P column).

Instruction	P	Discussion
Accel	*	Sets the motor acceleration rate in Rpm/Sec ² .
Angle	*	Sets the attached motor's basic step angle.
Baktrak	*	Reverses from current position for accumulated steps to date.
Baud		Sets the communication baud rate.
Clear		Clears the current program.
ClrAddr		Switches from addressed (network) mode to direct mode.
ContWhen	*	Pauses the program until the specified input has the specified state.
DcyMode	*	Sets the output power bridge current decay mode.
Debounce	*	Sets the delay time before an input is considered true.
DecelNow	*	Sets the motor to immediately stop at the nominated decel rate.
Delay	*	Pauses the program for the specified delay time (milliseconds).
Dir	*	Sets the motor direction.
ELoop	*	Marks the end of a program loop.
End	*	Marks the end of a program.
ESC	*	Receiving this character causes an immediate halt.
Exit	*	Signals a particular networked Hyperdrive to halt a running program.
Go		Starts the current program running.
GoTo	*	Unconditionally changes the program flow to the specified address.
Halt	*	Causes a programmed immediate halt.
JumpIf	*	Causes a GoTo based on the specified input having the specified state.
List		List the current program to the terminal.
Load		Loads a program stored in non-volatile storage.
Loop	*	Defines the start of a program loop. Can loop forever or the parameter count.
Mode	*	Sets the mode – can be step or speed.
Monitor	*	Arms the program to jump to an address if an input state changes.
MonSkip	*	As for Monitor but jump state can be the current state.
NetClose		Closes the current network access to this Hyperdrive.
NetOpen		Opens this Hyperdrive for access over a common RS485/422 line.
Out	*	Causes the addressed output to change to the specified state (on or off).
Power	*	Selects from four power settings for the motor.
Program		Prepares the Hyperdrive to receive a new program.
PSteps	*	Prints (transmits) the current step count since the previous Step command.
Renum		Renumbers the current program.
Reset		Resets all Hyperdrive state to power up values.
RPMCtrl	*	Configures the Hyperdrive to use an encoder to set speed.
RS485		Switches the default comms mode from 4 to 2 wire mode (RS422 to RS485).
RunUp		Configures the Hyperdrive to load and run the stored program on power up.
Save		Saves the current program to non-volatile storage.
SetAddr		Sets the network address for subsequent networked access.
SetRPM	*	Defines the destination RPM.
State		Lists the current value of all Hyperdrive states.
Step	*	Sets the number of steps for the next movement.
StepMode	*	Configures the motor's microstep definition.
StopPwr	*	Selects a stopped power from the four power settings.
WaitFor	*	Pauses the program internally while a Step command executes.

Hyperdrive3 Specifications

Absolute Maximum Ratings	
Supply voltage	32 volts DC
Motor Peak Current	3.5 amps
Ambient temperature	-10° C to 55° C

Operating Characteristics		
Operating Voltage	12 – 28 volts DC	
Motor Type	Bipolar two phase	
Motor Power Settings and corresponding Maximum Peak Currents	20%	0.7 amps
	50%	1.75 amps
	75%	2.625 amps
	100%	3.5 amps
Motor Step Modes (1:1 is the motor basic step angle)	1:1 1:2 1:8 1:16	
Decay Mode Settings	0% (none) 25% decay 50% decay 100% decay	
Step Angle	Set to match motor. Default is 1.8°	
Acceleration	Motor and load inertia dependant. Programmable maximum up to 30,000 Rpm/Sec ² , minimum is 30 Rpm/Sec ² .	
Control lines input voltage	5 V min, 24 V max.	
Control line maximum output current	30 mA	
Control line maximum output voltage	60 volts	
Maximum speed at given Step Mode setting		
1 microstep/step	9000 RPM	
2 microsteps/step	6000 RPM	
8 microsteps/step	3000 RPM	
16 microsteps/step	1500 RPM	