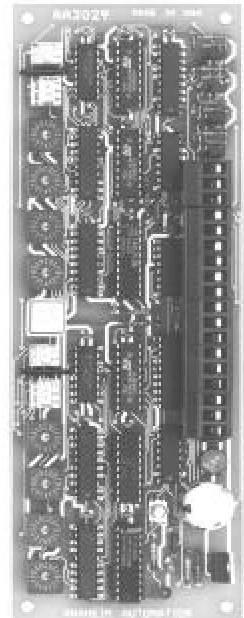
FOLLOWER - 100 & 200 Manual



FEATURES

- Utilizes positional synchronization to maintain positional accuracy and track ramping (both acceleration and deceleration)
- Dual axes with separate scaling for each axis
- Encoder or clock input
- Encoder division up to 128
- Differential encoder or single ended encoder inputs
- Backlash logic
- 16 bit internal calculations
- Open-drain clock output

DESCRIPTION

The FOLLOWER-200 is a dual axis step motor controller that runs a step motor (the slave motor) in synch with either a clock source (possibly from a master step motor controller) or an incremental encoder at a programmable ratio between 0 and 1 in 1/65536 graduations. This ratio is set by a series of switches. The slave system is controlled by two high speed RISC Micro-controllers that produce the following pulse train with an accuracy of 16 bits. This unique approach for a master-slave controller provides both speed and positional accuracy. The pulse train input can come from many different sources but usually will be from an encoder or controllers clock source.

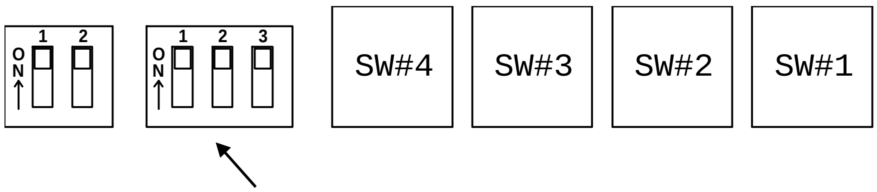
ORDERING INFORMATION

FOLLOWER-100	1-AXIS Board
FOLLOWER-200	2-AXIS Board
Call the factory for custom versions of this product	

FREQUENCY IN

ENCODER OUTPUT

The Frequency In is determined by the source of the pulses coming in. For a quadrature encoder signal, the Frequency In will equal *4 Times* the rate of the encoder due to the quadrature decoding. For Example, a 400 line encoder going 1 revolution per second will give a Frequency In of 1,600 pulses per second.



ENCODER FREQUENCY DIVIDER

The maximum frequency in is 50,000hz or quadrature state changes, it may scaled down by using the ENCODER FREQUENCY DIVIDER set of dip switches that will cause the division to be one of the following divisors: 1, 2, 4, 8, 16, 32, 64, and 128. The encoder quadrature detector output is divided by two (2) automatically. The output can then be divided again by the Encoder Frequency Divider if required.

DIVISOR	SWITCH 1	SWITCH 2	SWITCH 3
Divide by 1	ON	ON	ON
Divide by 2	ON	ON	OFF
Divide by 4	ON	OFF	ON
Divide by 8	ON	OFF	OFF
Divide by 16	OFF	ON	ON
Divide by 32	OFF	ON	OFF
Divide by 64	OFF	OFF	ON
Divide by 128	OFF	OFF	OFF

FREQUENCY IN = (Encoder Lines * Revolutions per second * 4)/2/(Divider)

CLOCK INPUT

With a Clock Input, the Frequency In is determined by the rate of the Clock Input. The clock is ***never*** divided by the Encoder Frequency Divider.

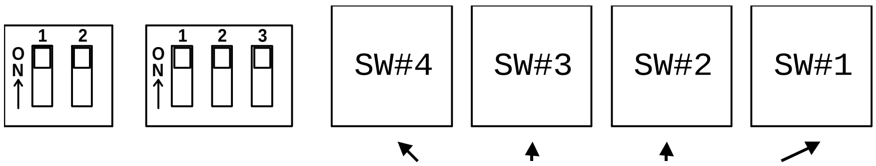
FREQUENCY IN = Clock Rate

INTERNAL FREQUENCY

The Internal Frequency is determined by the Scale Factor Dip Switch Settings. The Frequency In, as discussed in the previous page is multiplied by the scaler number. This section will help you to set the desired scaler number.

Remember: the Internal Frequency will be divided by 1, 2, 4, or 8 to produce the final Output Frequency sent to the step motor driver and it is recommended to use the highest divider (8) to obtain the smoothest pulse train output.

There are 4 hex switches to set a 16 bit scaler resulting in a number between 1 and 65,536. To determine the number set by the 4 switches you set the value for each switch and add up the values.



SCALE FACTOR DIP SWITCHES

Use the following method to determine the values for each switch:

SWITCH #1 - The rightmost switch is for values 0-15 where A=10, B=11, C=12, D=13, E=14, F=15. The value for this switch equals the switch setting.

SWITCH #2 - The second switch from the right is increased by a **multiple of 16**. Take the number 0 through 15 (where A=10, B=11, C=12, D=13, E=14, F=15) and multiply it by 16. For example a setting of 2 would make the value for this switch 2 times 16 = 32. A setting of 'A' would make the value for this switch 10 times 16 = 160.

SWITCH #3 - The third switch from the right is increased by a **multiple of 256**. Take the number 0 through 15 (where A=10, B=11, C=12, D=13, E=14, F=15) and multiply it by 16. For example a setting of 2 would make the value for this switch 2 times 256 = 512. A setting of A would make the value for this switch 10 times 256 = 2560.

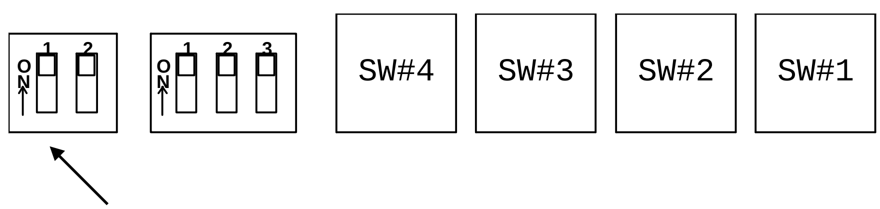
SWITCH #4 - The leftmost switch is increased by a **multiple of 4096**. Take the number 0 through 15 (where A=10, B=11, C=12, D=13, E=14, F=15) and multiply it by 4096. For example a setting of 2 would make the value for this switch 2 times 4096 = 8192. A setting of A would make the value for this switch 10 times 4096 = 40960.

Internal Frequency = (Frequency In)*(4096*Switch4+256*Switch3+16* Switch2+Switch1+1)/65536

Ratio 1 + n	Divisor	Hex
1	65535	FFFF
2	32767	7FFF
4	16383	3FFF
8	8191	1FFF
16	4095	0FFF
32	2047	07FF
64	1023	03FF
128	511	01FF
256	255	00FF
512	127	007F
1024	63	003F
2048	31	001F
4096	15	000F
8192	7	0007
16384	3	0003
32768	1	0001
65536	0	0000

FREQUENCY OUT DIVIDER

The Internal Frequency is divided by the Frequency Out Divider by 1, 2, 4, or 8 depending on the Dip Switch Settings. To obtain the maximum smoothness possible **use the largest Frequency Out Divider possible for the application.** This will produce the lowest amount of dither on the pulse train.



FREQUENCY OUT DIVIDER

DIVISOR	SWITCH 1	SWITCH 2
Divide by 1	ON	ON
Divide by 2	ON	OFF
Divide by 4	OFF	ON
Divide by 8	OFF	OFF

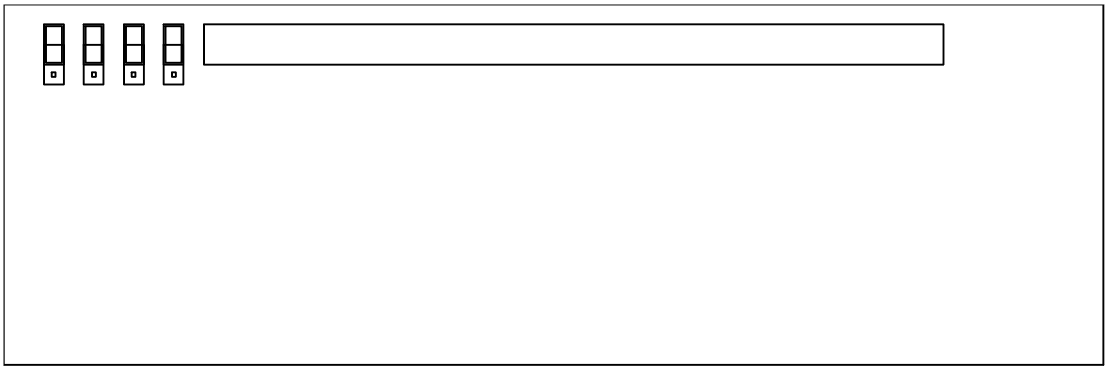
Frequency Out = (Internal Frequency) / (Frequency Out Divider)

OPERATION

To change any of the values, the reset button must be pressed after changing the DIP switches or rotary switches to accept the new values.

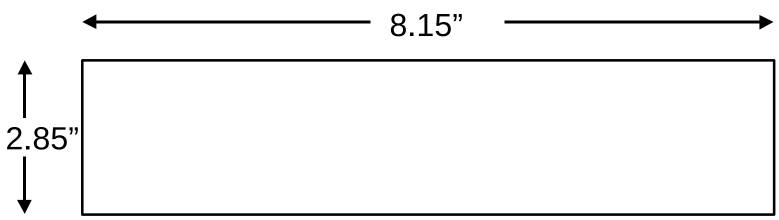
JUMPERS

The Jumpers should be in the Up Position (as shown in the diagram) for Differential Quadrature Encoder Inputs, and in the Down Position for Single-Ended Quadrature Encoder Inputs.



DIMENSIONS

The board dimensions are 8.15” x 2.85” with mounting holes at the four corners. An optional track is available for use with Din Rail mounting.



TERMINAL BLOCK DESCRIPTION

PIN #	DESCRIPTION	PIN #	DESCRIPTION
1	AC IN	10	A: ENCODER Channel B-
2	AC IN	11	A: Clock Out
3	Unregulated DC (IN or OUT)	12	0vdc
4	+5VDC IN/OUT (IN or OUT)	13	B: Clock in
5	0 VDC	14	B: ENCODER Channel A+
6	A: Clock in	15	B: ENCODER Channel A-
7	A: ENCODER Channel A+	16	B: ENCODER Channel B+
8	A: ENCODER Channel A-	17	B: ENCODER Channel B-
9	A: ENCODER Channel B+	18	B: Clock Out

SPECIFICATIONS

Maximum Frequency In	Max	50kHz clock input or quadrature state change
Output Frequency	Min Max	0.000001907 of Input Frequency ½ of Input Frequency
Input Power Requirements	AC or DC or DC	9 -12VAC, @ 50Ma +5VDC, Regulated @ 50mA 8-15VDC, Un-regulated @ 50mA

SAMPLE APPLICATION

A Conveyor turning at 2760 RPM
A 60 line encoder is attached to the conveyor shaft
This is feeding a divide-by-10 microstep driver with a 200 step/revolution motor.

The conveyor is turning at 2760 RPM which is 46 RPS.
This means that the encoder is turning at 46 RPS.
A quadrature feed from the encoder into the FOLLOWER-200 will provide a Frequency In of 5520 PPS (60 lines * 46 RPS * 4/2).

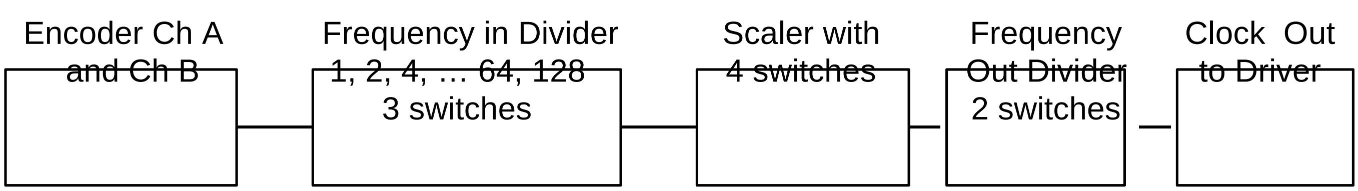
With the Encoder Frequency Divisor at **110** this gives a Divisor of 2
Frequency In = 5520/ 2 = 2760

With a 50,000 setting on the Hex Rotary Switches, the internal Frequency is:
Internal Frequency = (2760)(50000+1/65536) = 2105.71 PPS

With the Frequency Out Divisor at **11** this gives a Divisor of 1
Frequency Out = Internal Frequency / 1

If this pulse train is fed into a microstep driver with a divide-by-10 (2000 pulses per revolution), the motor would turn at 1.055 RPS.

ENCODER INPUT BLOCK DIAGRAM



Maximum Input Frequency 50Khz or quadrature state changes.

Notes:

ANAHEIM AUTOMATION