ETACH2 Features

- 0 to 4.095V and 0 to 10V or 4.095V and 10V output
- Max. input frequency adjustable from 0.03Hz to 12.7MHz
- 7kHz update rate
- Isolated SPDT relay output for overspeed or underspeed
- Droop free
- No cogging or ripple at low speeds 12-bit analog resolution
- Digital encoder direction bit output
- Programmable input frequency ranges, frequency limits and output ranges
- DIN rail mounting available
- 0 to +70C operating temperature

The ETACH2 is no longer available for purchase.

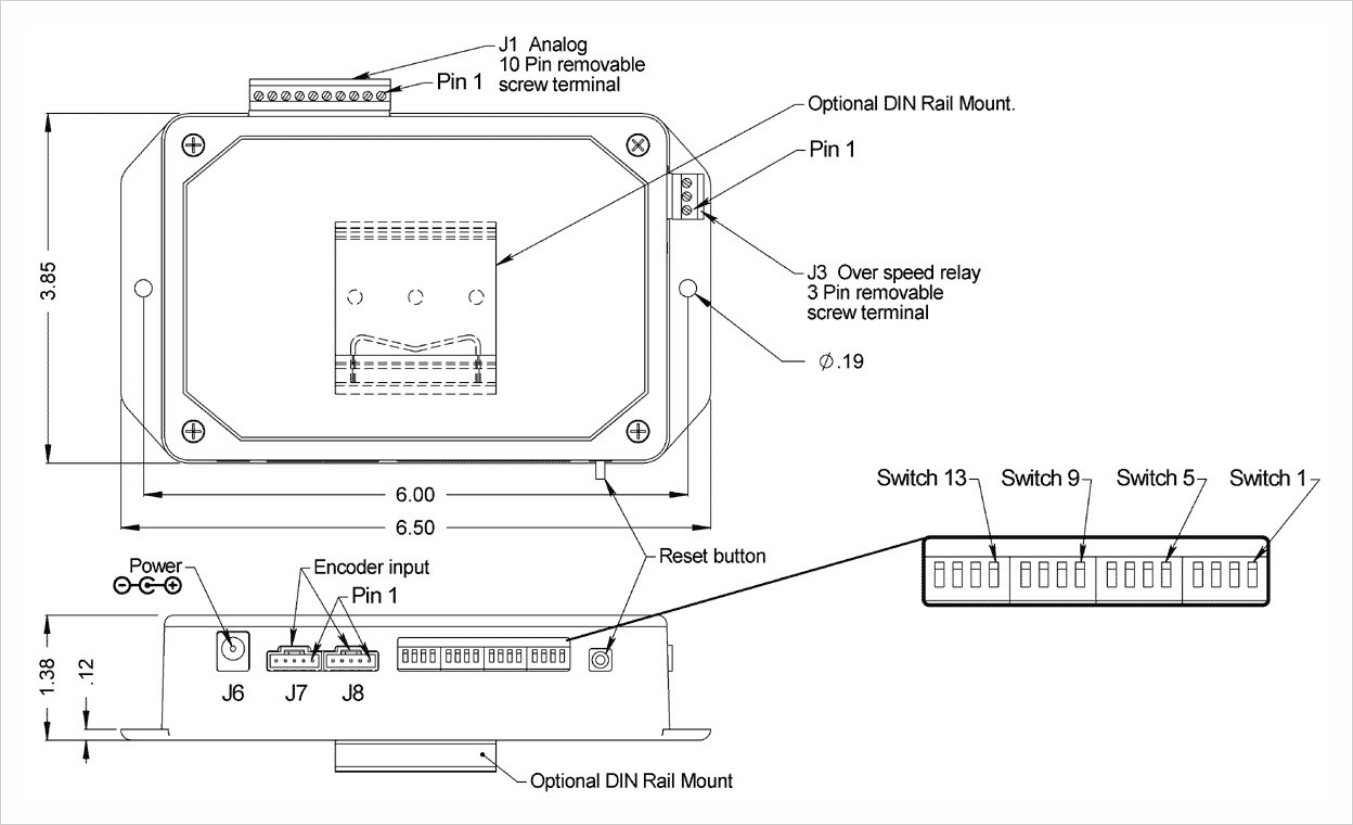
ETACH2 Product Description

The ETACH2 is a high-performance analog tachometer that converts incremental encoder signals into a stable analog voltage. The ETACH2 is fast enough to be used in a velocity or servo control loop, typically requiring a tachometer generator. The ETACH2 has a wide programmable full-scale frequency range and does not suffer from the low-speed droop and ripple typically found with traditional analog tachometer generators. Incremental quadrature encoder signals are digitally converted to provide either positive or negative voltages; positive output voltages are provided when the signals are rotated in a positive direction, and negative voltages are provided when the direction is reversed. You can also select the output to provide zero to maximum positive voltage output. A TTL digital direction bit is provided.

The ETACH2 is programmed by an array of DIP switches that determine the operating frequency range and mode of operation. Two encoder connectors are provided in parallel to make it convenient to loop the encoder signals through the ETACH2. This allows the signals to be easily applied elsewhere in a control loop. An isolated SPDT relay output, accessed through a pluggable 3-position screw terminal, provides a speed switch output that you will activate if the input frequency reaches an over speed limit programmed by the DIP switches. The minimum on time for the relay is 0.5 seconds, even if the output is momentarily triggered.

An internal switching regulator provides internal power and supplies 5VDC to the external encoder. The analog output voltage, TTL direction, and ground are accessed on a 10-pin pluggable screw terminal. The terminal also provides an alternate way of powering the ETACH2 instead of using the mini power jack.

Mechanical Drawings



Specifications

ELECTRICAL

Unless otherwise specified, all accuracy measurements assume 100kHz and within temperature range 0 to 70 C.

PARAMETER	MIN.	TYP.	MAX.	UNITS	NOTES
Quadrature Cycle Input Frequency	0	-	8.0	MHz	1 quadrature cycle = 4 quadrature states.
Non-quadrature Input Frequency	0	-	12.7	MHz	
Input Supply Voltage	11 14	12 24	18 30	Volts Volts	Through J6 or J1 pin-8. Through J1 pin-10.
Supply Current - 12V Input	- -	75 200	- -	mA mA	No encoder load. 250mA encoder load.
Supply Current - 24V Input	- -	46 103	- -	mA mA	No encoder load. 250mA encoder load.
Relay Contact Rating	-	-	2.0	A	24VDC / 125VAC
Relay Dielectric Strength	500 500	- -	- -	VAC VAC	Open contact. Contact to coil.
Relay Contact Resistance	-	-	0.1	Ohms	Contact resistance.
Direction Output Bit - Logic Low	-	-	0.4	Volts	8mA (sinking current).
Direction Output Bit - Logic High	2.4	-	-	Volts	-4mA (sourcing current).
Full Scale Output Error	-0.5 -1.5	0 0.25	0.5 1.5	% full scale % full scale	For 4.095V output mode. For 10V output mode.
Analog Output Load Impedance	680	-	-	Ohms	
Voltage Out to Encoder	4.8	5.0	5.2	Volts	Under 100mA load.
Output Voltage Update Rate	-	7.0	-	kHz	
Encoder Current	-	-	250	mA	+5V power for external encoder.
Quadrature Encoder Inputs - Logic Low*	0	0.4	0.8	Volts	
Quadrature Encoder Inputs - Logic High*	2.0	5.0	5.75	Volts	

* Diode clamped to ground and +5V, 10K pullup to +5V.

DIP SWITCH SETTINGS

The **ETACH2**is configured by an array of DIP switches. These switches are numbered from right to left. Complete explanations and switch definitions can be found below.

- Switches 1 through 10 set the frequency range.
- Switches 11 through 13 set the operation mode.
- Switch 14 is not used.
- Switches 15 and 16 set the relay output as a function of % of full range speed.

FREQUENCY RANGE

DIP switches 1 through 7 set the base frequency range in Hz or quadrature cycles per second as a binary representation of the switches. DIP switches 8, 9 and 10 provide a decimal scaling factor to the value of switches 1 and 7.

The frequency of the encoder output signal that is required to reach the full scale voltage of the **ETACH2** is determined by the following equation. **Please note:** 1 = Up Position = Switch Off, 0 = Down Position = Switch On.

*BF * SF = Encoder Frequency.*

BF (Base Frequency) is determined by setting switches SW1 though SW7 (see table 1 in *DIP Switch Definitions*). The sum of the values assigned to the switches should be between 3 and 127. To maximize the resolution of the **ETACH2** choose the largest possible value of BF that will satisfy your configuration operating requirements.

SF (Scale Factor) is determined by setting switches SW8 though SW10. Scale factors can be selected with ranges from 0.01 to 100,000 (see table 2 in *DIP Switch Definitions*).

EXAMPLE 1: ENCODER FREQUENCY = 100KHZ

Set BF to 100 (100 = 64 + 32 + 4; switches 7, 6 and 3 should be set to 1). Set SF to 1000 (SW10=1, SW9=0 and SW8=1).

*BF * SF = Encoder Frequency*
*100 * 1000 = 100 KHz.*

EXAMPLE 2: ENCODER FREQUENCY = 200 KHZ

Set BF to 20 (20 = 16 + 4; switches 5, 3 should be set to 1). Set SF to 10000 (SW10=1, SW9=1 and SW8=0).

*BF * SF = Encoder Frequency*
*20 * 10000 = 200 kHz*

MODE SELECTION

MODE 0:

Quadrature encoder input. Output voltage range is Zero Volts to +Maximum Volts.
Output is independent upon direction of encoder rotation.

- Zero Volts represents zero encoder frequency.
- +Maximum Volts represents maximum encoder frequency.

MODE 1:

Quadrature encoder input. Output voltage range is -Maximum Volts to +Maximum Volts.
Output is independent of direction of encoder rotation.

- -Maximum Volts represents zero encoder frequency.
- Zero Volts represents middle encoder frequency.
- +Maximum Volts represents maximum encoder frequency.

MODE 2:

Quadrature encoder input. Output voltage range is -Maximum Volts to +Maximum Volts.

Output is dependent upon direction of encoder rotation.

- -Maximum Volts represents maximum encoder frequency in one direction.
- Zero Volts represents zero encoder frequency.
- +Maximum Volts represents maximum encoder frequency in the opposite direction.

MODE 3:

Quadrature encoder input. Output voltage range is Zero Volts to +Maximum Volts.
Output is dependent upon direction of encoder rotation.

- Zero Volts represents maximum encoder frequency in one direction.
- 1/2 maximum Volts represents zero encoder frequency.
- +Maximum Volts represents maximum encoder frequency in the opposite direction.

MODE 4:

Single channel non-quadurature frequency input. Output voltage range is Zero Volts to +Maximum Volts.

- Zero Volts represents zero frequency input.
- +Maximum Volts represents maximum frequency input.

MODE 5:

Single channel non-quadrature frequency input.
Output voltage range is -Maximum Volts to +Maximum Volts.

- -Maximum Volts represents zero frequency input.
- Zero Volts represents 1/2 maximum frequency input.
- +Maximum Volts represents maximum frequency input.

MODE 6, MODE 7:

Not used. If switch is configured to this mode, **ETACH2** operation defaults to Mode 4.

RELAY OUTPUT

DIP switches 15 and 16 are used to program the desired percent of full scale frequency. The **ETACH2** has an isolated single pole double throw relay output contact closure that may be configured as an over speed limit switch. The relay closure may be configured as a percentage of the maximum full-scale frequency. The relay will activate at or above the programmed frequency. Once triggered, the relay will stay on for at least 0.5 seconds even if the frequency drops below the threshold.

DIP SWITCH DEFINITIONS

BASE FREQUENCY (SW1 - SW7):

MODE	SW13
SW1	1
SW2	2
SW3	4
SW4	8
SW5	16
SW6	32
SW7	64

SCALING FACTOR (SW8 - SW10):

SCALING FACTOR			= SCALING VALUE
SW10	SW9	SW8	
Down	Down	Down	= 0.01
Down	Down	Up	= 0.10
Down	Up	Down	= 1.00
Down	Up	Up	= 10
Up	Down	Down	= 100
Up	Down	Up	= 1,000
Up	Up	Down	= 10,000
Up	Up	Up	= 100,000

OPERATION MODE (SW11 - SW13):

MODE	SW13	SW12	SW11
0	Down	Down	Down
1	Down	Down	Up
2	Down	Up	Down
3	Down	Up	Up
4	Up	Down	Down
5	Up	Down	Up

RELAY OUTPUT (SW15 - SW16):

SW16	SW15	% OF FULL SCALE
Down	Down	10%
Down	Up	50%
Up	Down	90%
Up	Up	100%

PIN-OUTS

J1 ANALOG CONNECTOR:

PIN	DESCRIPTION
1	Ground
2	Output signal (0 to +10VDC) or (10VDC)
3	Output signal (0 to +4.095VDC) or (4.095VDC)
4	Ground
5	+5VDC power out
6	Encoder direction out
7	Ground
8	+12VDC in* (+11 to +18)
9	Ground
10	+24VDC in* (+14 to +30)

* Connect only one power source.

J3 RELAY CONTACTS CONNECTOR:

PIN	DESCRIPTION
1	Common
2	Normally Closed
3	Normally Open

J7 & J8 ENCODER CONNECTOR:

PIN	DESCRIPTION
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

INCLUDED ACCESSORIES

PS-12 Power supply *(https://www.usdigital.com/products/power-supplies/standard/ps-12/)*

Notes

- US Digital® warrants its products against defects in materials and workmanship for two years. See complete warranty *(https://www.usdigital.com/company/warranty)* for details.

Configuration Options

ETACH2

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the ETACH2 product page *(https://www.usdigital.com/products/ETACH2)* for pricing and additional information.