

8 Bipolar 24vdc High Speed Input Channels

Introduction

The 400-8-HS module provides eight +24Vdc (nominal) high speed bipolar input channels for use within the FMT-400 modular system. A maximum of 8 digital input channels (one 400-8-HS module) in main rack only are supported by the 400-CPU-B and the 400-CPU-C. Maximum bandwidth is 30KHz when used with the 400-CPU-B and 80KHz when used with the 400-CPU-C.

(Please see separate data sheet for more information on the CPU modules).

General Specifications

Storage temperature	-20 to +70 °C
Operating temperature	0 to 55 °C
Humidity	0-90%
Weight	490g
Dimensions	Standard FMT-400 size single width module
Spring terminal wire gauge	0.2 to 1.5mm csa (24 to 14 AWG)
Current consumed from rack	110mA from rack power supply
Digital Input Type	8 opto-isolated high speed bipolar digital inputs, each input individually bipolar
Digital Input Current Rating	Approximately 8mA @24Vdc
Digital Input Voltage Rating	24Vdc where <6V = OFF and >18V = ON
Max Card Bandwidth	30KHz when used with 400-CPU-B, 80KHz when used with 400-CPU-C

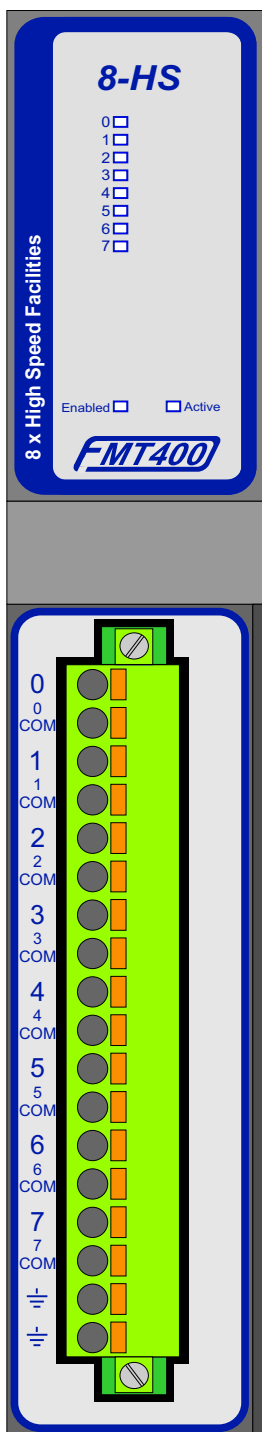


Connection Details

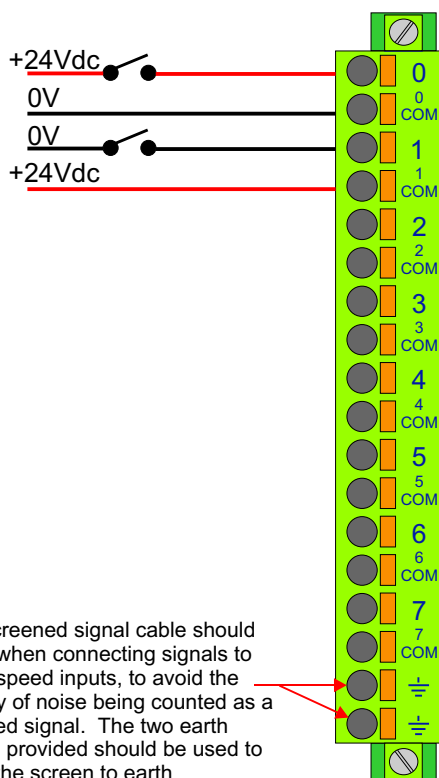
Connections should be made to the 400-8-HS connector as shown in the following diagram. The inputs are individually bipolar so it does not matter which way round connections are made to the inputs.

In the example below inputs 0 and 1 are shown connected to contacts but these could be outputs from a pulse encoder, photocell etc.

To insert wires into connector apply downwards pressure on orange tab using a small screwdriver or similar, insert wire then release pressure, the wire will be gripped firmly.



Connections to the input connector can be made as in the following diagram. It can be seen that the input common connections can be connected either to +24Vdc or 0V. The common connections are individual to each input, each input is individually bipolar.



Note: Screened signal cable should be used when connecting signals to the high speed inputs, to avoid the possibility of noise being counted as a high speed signal. The two earth terminals provided should be used to connect the screen to earth



Input Ratings

<u>Inputs</u>	<u>Nominal Rating</u>	<u>Notes</u>
HS0 - HS7	High Speed Digital Input Current Rating High Speed Digital Input Voltage Rating	Approximately 8mA @24Vdc 24Vdc where <6V = OFF and >18V = ON

LED Descriptions

<u>Label</u>	<u>Colour</u>	<u>Description</u>
0 to 7	Green	Indicates status of the digital input. When illuminated the input has been energised by an external signal.
Enabled	Yellow	When illuminated shows that the module has been correctly set up within your project in Flex32 and that the CPU module has initialised the module. If not illuminated then the module may not have been set up in your project configuration.
Active	Yellow	Flickers or illuminates whenever a high speed input comes on. Indicates that the presence of a high speed input is being written to the CPU module.

Setting Up The High Speed Inputs

The high speed inputs can be configured to implement one of the following high speed facilities.

- * Incremental Pulse Encoder.
- * High Speed Counter.
- * Fast Edge Catching
- * Interrupt Driven Instruction Language Modules (see note)

The 400-CPU-B and CPU-400-C support eight high speed inputs (HS0 - HS7) using 32 bit registers W0 - W3 as counters. HS0 and HS1 act on W0, HS2 and HS3 act on W1, HS4 and HS5 act on W2, HS6 and HS7 act on W3.

The operation of the high speed inputs is set up using the 'high speed' page in the project configuration window of Flex32.

Note: The FMT range has the ability to benefit from interrupt driven instruction language modules. This will enable a module to execute if an external interrupt is detected i.e when an input is switched on by some external signal.

The entire module will be executed when the input that is specified comes on. To make a module interrupt controlled you should either select 'Control' in the Instruction Module Editor of Flex32

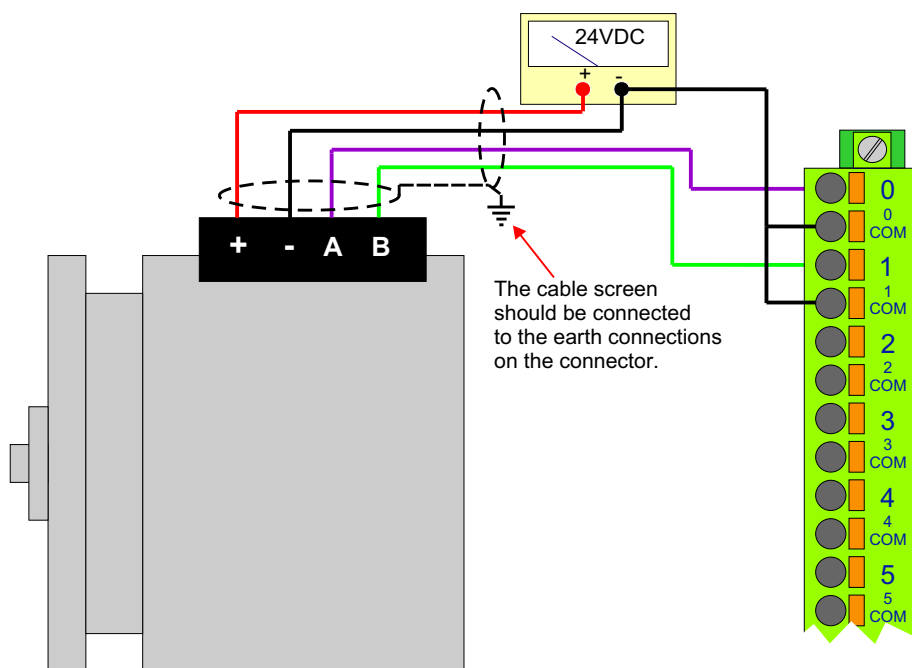
The maximum number of steps of code that can be executed in one interrupt is twenty, more than this and the firmware will raise an 'Input Interrupt overrun' error.



Useage Of The High Speed Inputs

Incremental Pulse Encoder

The diagram below shows an incremental pulse encoder with PNP (sourcing) outputs connected to the 400-8-HS. Note that screened cable is used to avoid false pulses from electrical noise.



There are three options for the resolution with which the FMT-400 will count pulses from a particular encoder. These options are set up within the 'High Speed' page of the project configuration screen of Flex32.

'Times One' will count once per encoder cycle, i.e. 100 counts for a 100 p.p.r. encoder.

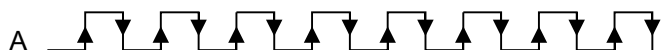
'Times Two' will count twice per encoder cycle, i.e. 200 counts for a 100 p.p.r. encoder.

'Times Four' will count four times per encoder cycle, i.e. 400 counts for a 100 p.p.r. Encoder.

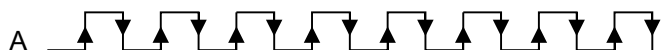
In all the above cases the current total is stored in 32 bit register W0 (if using HS0 and HS1). The value in W0 can be read by the application program at any time. The number in W0 can be cleared or pre-set at any time by moving a number to W0 with a move function.



Times One. Counting only on rising edge of 'A'



Times Two. Counting on both edges of 'A'



Times Four. Counting on both edges of 'A' and 'B'



Useage Of The High Speed Inputs (continued)

High Speed Counting

The high speed counter option is similar to the encoder setting but intended for general purpose counting. This option can be used to count input signals that are too fast to be reliably counted within the normal loop code. The 32 bit registers W0 to W3 are used to hold the counter value.

There are three high speed options for counters. The examples below are for the second channel using HS2 and HS3:

Count Up Only. Each rising edge on input HS2 will increase the total in W1 by one, input HS3 unused.

Count Down Only. Each rising edge on input HS2 will decrease the total in W1 by one, input HS3 unused.

Count Up and Count Down. Each rising edge on input HS2 will increase the total in W1 by one. Each rising edge on input HS3 will decrease the total in W1 by one.

Catching Fast Edges (only for use with ladder logic modules)

In normal operation the ladder logic code you write for the FMT-400 can only respond to pulses which are longer than the loop time of the program. For example, if the loop time is 10mS your program will not reliably respond to input signals unless they are at least 10mS long.

To cope with shorter pulses you can use the high speed features to catch pulses and guarantee they are seen by at least one application program loop. You can select from the following options.

- Catch high speed positive edges on HS0 only, HS1 unused
- Catch high speed positive edges on HS0 and HS1
- Catch high speed positive edges on HS2 only, HS3 unused
- Catch high speed positive edges on HS2 and HS3
- Catch high speed positive edges on HS4 only, HS5 unused
- Catch high speed positive edges on HS4 and HS5
- Catch high speed positive edges on HS6 only, HS7 unused
- Catch high speed positive edges on HS6 and HS7

Instruction Module Options

Using this option it is possible to activate a module of instruction language code when a high speed input comes on therefore giving the opportunity to have instruction code responding to an event only occurring for a very short period of time. You can select from the following options on the high speed page (this is using HS0 and HS1 as examples):

HS0 triggers module. When high speed input 0 is turned on the module will run

HS1 triggers module. When high speed input 1 is turned on the module will run

HS0 and HS1 trigger modules. When high speed input 0 is turned on the module will run. When high speed input 1 is turned on the module will run.

Note: In addition to the above setup, the module to be triggered by the high speed input (s) needs to be setup within the module editor, 'click' on the 'Control' button and select 'Execute whole module on Input Interrupt' also selecting the input (in this case the high speed input selected earlier) which will cause it to execute.



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Order Codes

Part Number
400-8-HS

COLTER GROUP
COLTER PRODUCTS LIMITED

UNIT 7, ZONE C
CHELMSFORD ROAD INDUSTRIAL ESTATE
DUNMOW
ESSEX
CM6 1HD

Telephone: + 44 (0)1371 876887
Fax: + 44 (0)1371 875638

E-Mail: sales@coltergroup.co.uk
Web Site: www.coltergroup.co.uk

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