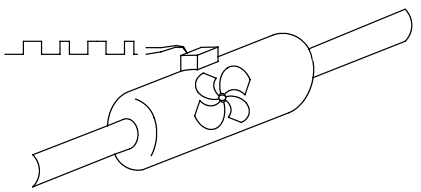
Magnetic Pulse Input Module

Overview

The F4-8MPI is an eight-channel Magnetic Pulse Input CoProcessor Module. It is designed to take input pulses from Hall effect type magnetic pick-ups, (typically found on turbine meters, tachometers and signal generators), and perform calculations. Up to eight differential inputs from magnetic pickups are wired directly to the terminal block on the front of the module.

The Magnetic Pulse module is based on the FACTS Engineering CoProcessor design. Therefore, it offers a built-in real-time battery-backed clock/calendar and a very fast floating point processor. Because of this powerful design, it can easily support Indicated Volume, Gross Volume, Volume Logging, Flow rate, and Tachometer modes. These operational modes are explained in the adjacent chart.



Specifications	
Module Type	CoProcessor, Intelligent
Number of Channels	Eight Differential per module
Modules per CPU	Eight Maximum, any slot in CPU base
Input Voltage Range	±10mV to ±10VDC peak
Input Frequency Range	DC to 5.0kHz (channels 1 to 4) DC to 2.5kHz (channel 5 to 8)
Maximum Continuous Overload	-150 to +150VDC, 220 Vrms
Input Impedance	100KΩ
Differential Low – Pass Filter	f_{-3db} = 20kHz, 6db per octave roll-off
Common Mode Voltage Range	±15VDC
Common Mode Rejection	Over common mode input voltage range
Update Time	3 PLC scans minimum
Isolation	750VDC, channels to PLC
LED Status Indicators	Power ON, Input Pulse (8 LEDs)
Field Termination	20 position removable terminal block 16 positions, ±CHn, Pulse inputs 2 positions, 24 VDC power supply
External Power Required	170mA maximum, +18 to +25VDC
Internal Power Consumption	225mA from 5VDC maximum
External Power Required	170mA maximum, +18 to +25VDC
Internal Power Consumption	225mA from 5VDC maximum
Operating Environment	0°C to 60°C (32°F to 140°F)/5% to 95% humidity (non-condensing)

Modes	
Indicated and Gross Volume	
Configuration	The module calculates Indicated Volume of flow given a K Factor. The K Factor is the nominal pulses per unit for the flow meter. This is the factory calibration number normally stamped on the flow meter housing. Indicated volume may be in pulses, gallons, dm^3 , or barrels depending on the K Factor. Gross Volume may also be calculated by substituting for the K Factor, the K Factor divided by the Meter Factor (Meter Factor is the calibration factor derived at the installation).
Output Data	Total volume of flow is output to the PLC in engineering units. The formulas used to calculate volume are: Indicated Volume = Total Pulses ÷ K Factor Gross Volume = Total Pulses ÷ (K Factor/Meter Factor)
Flow Rate	
Configuration	The flow rate calculation uses the same configuration information as the Volume calculation. The sample rate may range from .1 to 999.9 seconds, or minutes.
Output Data	Flow rate is output to the PLC in engineering units. The formula used to calculate flow rate is: (Volume last sample time – Current Volume) ÷ Sample Rate.
Volume Logging	
Configuration	Indicated or gross volume may be logged at either a particular time or at periodic intervals throughout the day. If desired, the counters may be automatically reset when the data is logged. The built-in real time battery-backed clock calendar must be set before volume logging is enabled.
Output Data	Indicated or gross volume is output to the PLC in engineering units. A one-shot flag is also set to indicate to the PLC that new data has been logged.
Tachometer	
Configuration	Tachometer applications are simply a variation of the flow rate calculation. To calculate revolutions per minute, set the K Factor equal to the number of pulses per revolution multiplied by 60. Set the Sample Rate equal to one second. To calculate pulses per second (PPS), set the K Factor equal to one and the Sample Rate equal to one second.
Output Data	RPM or PPS

Check the Power Budget

Verify your power budget requirements

Your I/O configuration choice can be affected by the power requirements of the I/O modules you choose. When determining the types and quantity of I/O modules you will be using, it is important to remember there is a limited amount of power available from the power supply.

The chart on the opposite page indicates the power supplied and used by each DL405 device. The adjacent chart shows an example of how to calculate the power used by your particular system. These two charts should make it easy for you to determine if the devices you have chosen fit within the power budget of your system configuration.

If the I/O you have chosen exceeds the maximum power available from the power supply, you can resolve the problem by shifting some of the modules to an expansion base or remote I/O base (if you are using remote I/O).

Warning: It is extremely important to calculate the power budget correctly. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

Use *ZIP*Links to reduce power requirements

If your application requires a lot of relay outputs, consider using the ZipLink AC or DC relay output modules. These modules can switch high current (10A) loads without putting a load on your base power budget. Refer to Wiring System for DL405 PLCs later in this section for more information.

This logo is placed next to I/O modules that are supported by the *ZIP*Link connection systems.

See the I/O module specifications at the end of this section.

Calculating your power usage

The following example shows how to calculate the power budget for the DL405 system. The example is constructed around a single 8-slot base using the devices shown. It is recommended you construct a similar table for each base in your system.

A				
	Base Number 0	***Device Type***	***5 VDC (mA)***	***External 24 VDC Power (mA)***
B	**CURRENT SUPPLIED**			
	CPU/Expansion Unit /Remote Slave	D4-440 CPU	3700	400
C	**CURRENT REQUIRED**			
	SLOT 0	D4-16ND2	+150	+0
	SLOT 1	D4-16ND2	+150	+0
	SLOT 2	F4-04DA	+120	+100
	SLOT 3	D4-08ND3S	+100	+0
	SLOT 4	D4-08ND3S	+100	+0
	SLOT 5	D4-16TD2	+100	+0
	SLOT 6	D4-16TD2	+100	+0
	SLOT 7	D4-16TR	+1000	+0
D	**OTHER**			
	BASE	D4-08B-1	+80	+0
	Handheld Programmer	D4-HPP-1	+320	+0
E	**Maximum Current Required**		***2820***	***100***
F	**Remaining Current Available**		***3700-2820=880***	***400-100=300***

1. Using a chart similar to the one above, fill in column 2.
2. Using the tables on the opposite page, enter the current supplied and used by each device (columns 3 and 4). Pay special attention to the current supplied by the CPU, Expansion Unit, and Remote Slave since they differ. Devices which fall into the "Other" category (Row D) are devices such as the Base and the Handheld programmer, which also have power requirements, but do not plug directly into the base.
3. Add the current used by the system devices (columns 3 and 4) starting with Slot 0 and put the total in the row labeled "maximum current required" (Row E).
4. Subtract the row labeled "Maximum current required" (Row E), from the row labeled "Current Supplied" (Row B). Place the difference in the row labeled "Remaining Current Available" (Row F).
5. If "Maximum Current Required" is greater than "Current Supplied" in either column 3 or 4, the power budget will be exceeded. It will be unsafe to use this configuration and you will need to restructure your I/O configuration. Note the auxiliary 24 VDC power supply does not need to supply all the external power. If you need more than the 400mA supplied, you can add an external 24VDC power supply. This will help keep you within your power budget for external power.

DL405 CPU power supply specifications and power requirements

Specification	AC Powered Units	24 VDC Powered Units	125 VDC Powered Units
Part Numbers	D4-454, D4-450, D4-440, D4-EX (expansion base unit), D4-RS (remote slave unit)	D4-454DC-1, D4-440DC-1, (expansion base unit), D4-EXDC D4-RSDC (remote slave unit)	D4-450DC-2
Voltage Withstand (dielectric)	1 minute @ 1,500 VAC between primary, secondary, field ground, and run relay		
Insulation Resistance	> 10MΩ at 500VDC		
Input Voltage Range	85-132 VAC (110 range) 170-264 VAC (220 range	20-28 VDC (24 VDC) with less than 10% ripple	90-146 VDC (125 VDC) with less than 10% ripple
Maximum Inrush Current	20 A	20 A	20 A
Maximum Power	50 VA	38 W	30 W

Power Requirements

Power Supplied

CPUs/Remote Units/ Expansion Units	5 VDC Current Supplied in mA	24V Aux Power Supplied in mA
D4-440 CPU	3700	400
D4-440DC-1 CPU	3700	NONE
D4-450 CPU	3700	400
D4-454 CPU	3100	400
D4-450DC-2 CPU	3100	NONE
D4-454DC-1	3100	NONE

CPUs/Remote Units/ Expansion Units	5V Current Supplied in mA	24V Aux Power Supplied in mA
D4-EX	4000	400
D4-EXDC	4000	NONE
D4-RS	3700	400
D4-RSDC	3700	NONE
H4-EBC	3470	400
H4-EBC-F	3300	400

Power Consumed

Power-consuming Device	5V Current Consumed	External 24VDC Current Required
I/O Bases		
D4-04B-1	80	NONE
D4-06B-1	80	NONE
D4-08B-1	80	NONE
DC Input Modules		
D4-08ND3S	100	NONE
D4-16ND2	150	NONE
D4-16ND2F	150	NONE
D4-32ND3-1	150	NONE
D4-64ND2	300 max.	NONE
AC Input Modules		
D4-08NA	100	NONE
D4-16NA	150	NONE
AC/DC Input Modules		
D4-16NE3	150	NONE
F4-08NE3S	90	NONE
DC Output Modules		
F4-08TD1S	295	NONE
D4-16TD1	200	125
D4-16TD2	400	NONE
D4-32TD1	250	140
D4-32TD1-1	250	140 (15V)
D4-32TD2	350	120 (4A max including loads)
D4-64TD1	800	NONE
AC Output Modules		
D4-08TA	250	NONE
D4-16TA	450	NONE
Relay Output Modules		
D4-08TR	550	NONE
F4-08TRS-1	575	NONE
F4-08TRS-2	575	NONE
D4-16TR	1000	NONE
Analog Modules		
F4-04AD	150	100
F4-04ADS	370	120
F4-08AD	75	90

Power-consuming Device	5V Current Consumed	External 24VDC Current Required
Analog Modules (continued)		
F4-16AD-1	75	100
F4-16AD-2	75	100
F4-04DA-1	70	75+20per circuit
F4-04DA-2	90	90
F4-04DAS-1	60	60 per circuit
F4-04DAS-2	60	60 per circuit
F4-08DA-1	90	100+20 per circuit
F4-08DA-2	80	150
F4-16DA-1	90	100+20 per circuit
F4-16DA-2	80	25 max.
F4-08RTD	80	NONE
F4-08THM-n	120	50
F4-08THM	110	60
Remote I/O		
H4-ERM100	320(300)	NONE
H4-ERM-F	450	NONE
D4-RM	300	NONE
Communications and Networking		
H4-ECOM100	300	NONE
D4-DCM	500	NONE
F4-MAS-MB	235	NONE
FA-UNICON	NONE	65
CoProcessors		
F4-CP128-1	305	NONE
F4-CP128-T	350	NONE
Specialty Modules		
H4-CTRIO	400	NONE
D4-INT	100	NONE
F4-16PID	160	NONE
F4-8MPI	225	170
D4-16SIM	150	NONE
F4-4LTC	280	75
Programming		
D4-HPP-1 (Handheld Prog.)	320	NONE
Operator Interface		
DV-1000	150	NONE
C-more Micro-Graphic	210	NONE