

High-speed Counter Module



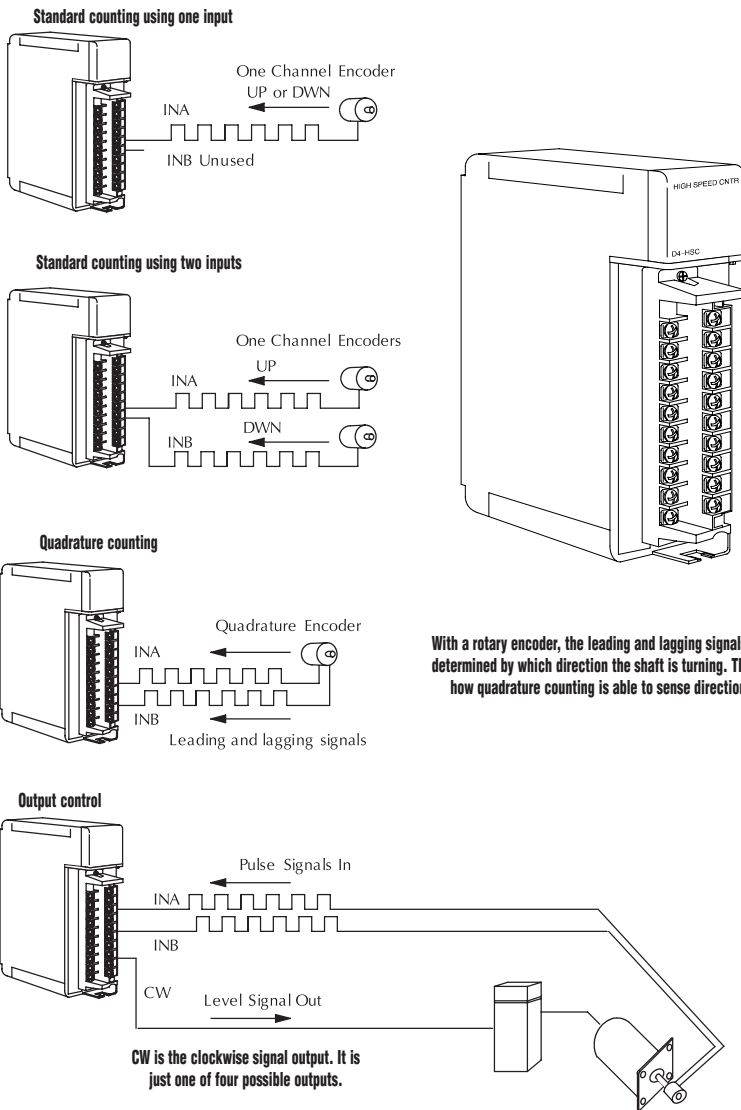
| Specifications | |
|-----------------------------------|--|
| Module Type | Intelligent |
| I/O Points Assigned | 16 X input, 32 Y output |
| Modules per CPU | Eight, in any local or expansion slot location |
| Field Wiring Connector | Removable terminal type |
| Count Signal Level | 4.75VDC-30VDC less than 10mA |
| Maximum Count Speed | 100kHz (50% duty cycle) |
| Minimum Input Pulse Width | 5µs |
| Internal Power Consumption | 300mA maximum at 5VDC (supplied by base power supply) |
| Operating Environment | 0°C to 60°C (32°F to 140°F), 5% to 95% humidity (non-condensing) |
| Manufacturer | Koyo Electronics |

Overview

The DL405 high-speed counter provides high-speed up or down counting capability. It provides the user with count data and output signals such as Clockwise, Counter-clockwise, Decelerate, and Equal. The module functions asynchronously with the DL405 CPU, allowing fast response and control.

The D4-HSC module supports the following key features:

- Quadrature or up/down encoder input
- Maximum input pulse rate of 100 kHz (50% duty cycle)
- Seven user control inputs
- Four external outputs for controlling motor modes
- Counting range from -8,388,608 to +8,388,607 with overflow
- Counter input multiplication of X1, X2, or X4
- User selectable count direction
- A or B mode selection
A mode to reset counter at preset
B mode to continue counting after preset
- Find **Home** mode to search for home position
- Sampling count to determine pulse rate



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| External Module Input Descriptions | |
|------------------------------------|---|
| IN A | Depending on mode chosen, this is either a standard UP/DOWN counter input, or one of the quadrature counter inputs. |
| IN B | Depending on mode chosen, this is either a standard UP/DOWN counter input, or one of the quadrature counter inputs. |
| IN Z | This input can be used to help you find home position for positioning control. It can also be used as an external means of resetting the counter. |
| LD (Load) | If you want to use an offset number with your counting, a rising edge signal at this terminal will copy the offset value into the current count. |
| RST (Reset) | A high (ON) signal at this terminal resets the counter to zero and it remains there until there is a transition to a low signal (OFF) |
| LATCH | You may want to store the current count. The rising edge of a signal at this terminal will store the current count in shared RAM. Counting continues with no interruption. |
| C.INH | You may want to temporarily ignore the count inputs coming in on INA and INB. A high (ON) signal at this terminal will inhibit the counting to accomplish this need. Current count is suspended until a transition to a low (OFF) signal is seen. |
| RUN | Not to be confused with Run mode of the DL405, a high (ON) signal here will activate HSC RUN. A low (OFF) signal will deactivate it. |
| LS1 and LS2 | Either or both of these terminals can be connected to limit switches to help find home position, or they can merely be used as discrete inputs. |

| External Module Output Descriptions | |
|-------------------------------------|--|
| CW | Clockwise – Turns on when the optional HSC RUN mode is invoked and the current count is less than the preset value. It will reset when the current count equals the preset value. This output can also be controlled independently from the count values with an internal output bit allocated to the HSC. |
| CCW | Counter Clockwise – Turns on when the optional HSC RUN mode is invoked and the current count is greater than the preset value. It will reset when the current count equals the preset value. It can also be controlled independently from the count values with an internal output bit allocated to the HSC. |
| OUT1 | Deceleration – If the optional HSC RUN mode is active, this output turns on when the current count equals the deceleration value. It is reset when HSC RUN mode is exited and re-entered, or when an internal output bit allocated to the HSC is enabled. |
| OUT2 | Brake – If the optional HSC RUN mode is active, this output turns on when the current count equals the preset value. It is reset when HSC RUN mode is exited and re-entered, or when an internal output bit allocated to the HSC is enabled. |

| Internal Interface Signals from DL405 CPU to D4-HSC |
|---|
| Reset OUT 1 and OUT 2 |
| Reset Overflow |
| Load Offset to Counter |
| Enabled HSC RUN |
| Enable CCW |
| Enable OUT2 |
| Enable CW |
| Enable OUT1 |
| Inhibit Counting |
| Latch Current Count |
| Reset Current Count |
| Select count Mode |
| Change Count Direction |
| Enable Home Search |
| Enable x2 Operation |
| Enable x4 Operation |
| Select Reset Operation |
| Enable Sampling |
| Copy Offset |
| Reset CW, CCW |
| Reset Home Search Error |
| Enable Reset with INZ |
| Enable OUT2 after Home Search |

| Internal Interface Signals from D4-HSC to DL405 CPU |
|---|
| Current Count > Preset Value |
| Current Count = Preset Value |
| Current Count < Preset Value |
| Count Overflow |
| CCW Status |
| OUT2 Status |
| CW Status |
| OUT1 Status |
| LS2 Status |
| LS1 Status |
| Home Search Executing |
| Sampling Executing |
| Missing Terminal Block |
| External Power Supply Failure |
| Internal HSC Error |

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 ZIPLinks 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 ZIPLink 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 | Device Type | 5 VDC (mA) | External 24 VDC Power (mA) |
| 0 | | | |
| 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, D4-430, D4-EX (expansion base unit), D4-RS (remote slave unit) | D4-454DC-1, D4-450DC-1, D4-440DC-1, D4-EXDC (expansion base unit), 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 | | | | | |
|---|---|--|---|--------------------------------------|--|
| <i>CPUs/Remote Units/ Expansion Units</i> | <i>5 VDC Current Supplied in mA</i> | <i>24V Aux Power Supplied in mA</i> | <i>CPUs/Remote Units/ Expansion Units</i> | <i>5V Current Supplied in mA</i> | <i>24V Aux Power Supplied in mA</i> |
| D4-430 CPU | 3700 | 400 | D4-EX | 4000 | 400 |
| D4-440 CPU | 3700 | 400 | D4-EXDC | 4000 | NONE |
| D4-440DC-1 CPU | 3700 | NONE | D4-RS | 3700 | 400 |
| D4-450 CPU | 3700 | 400 | D4-RSDC | 3700 | NONE |
| D4-454 CPU | 3100 | 400 | H4-EBC | 3470 | 400 |
| D4-450DC-1 CPU | 3100 | NONE | H4-EBC-F | 3300 | 400 |
| D4-450DC-2 CPU | 3100 | NONE | | | |
| D4-454DC-1 | 3100 | NONE | | | |
| Power Consumed | | | | | |
| <i>Power-consuming Device</i> | <i>5V Current Consumed</i> | <i>External 24VDC Current Required</i> | <i>Power-consuming Device</i> | <i>5V Current Consumed</i> | <i>External 24VDC Current Required</i> |
| <i>I/O Bases</i> | | | <i>Analog Modules (continued)</i> | | |
| D4-04B-1 | 80 | NONE | F4-16AD-1 | 75 | 100 |
| D4-06B-1 | 80 | NONE | F4-16AD-2 | 75 | 100 |
| D4-08B-1 | 80 | NONE | 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 |
| D4-08ND3S | 100 | NONE | F4-16DA-1 | 90 | 100+20 per circuit |
| D4-16ND2 | 150 | NONE | F4-16DA-2 | 80 | 25 max. |
| D4-16ND2F | 150 | NONE | F4-08RTD | 80 | NONE |
| D4-32ND3-1 | 150 | NONE | F4-08THM-n | 120 | 50 |
| D4-64ND2 | 300 max. | NONE | F4-08THM | 110 | 60 |
| <i>DC Input Modules</i> | | | <i>Remote I/O</i> | | |
| | | | H4-ERM100 | 320(300) | NONE |
| | | | H4-ERM-F | 450 | NONE |
| | | | D4-RM | 300 | NONE |
| <i>AC Input Modules</i> | | | <i>Communications and Networking</i> | | |
| D4-08NA | 100 | NONE | H4-ECOM100 | 300 | NONE |
| D4-16NA | 150 | NONE | H4-ECOM-F | 670 | NONE |
| | | | D4-DCM | 500 | NONE |
| | | | F4-MAS-MB | 235 | NONE |
| | | | FA-UNICON | NONE | 65 |
| <i>AC/DC Input Modules</i> | | | <i>CoProcessors</i> | | |
| D4-16NE3 | 150 | NONE | F4-CP128-1 | 305 | NONE |
| F4-08NE3S | 90 | NONE | F4-CP128-T | 350 | NONE |
| <i>DC Output Modules</i> | | | <i>Specialty Modules</i> | | |
| F4-08TD1S | 295 | NONE | H4-CTRIO | 400 | NONE |
| D4-16TD1 | 200 | 125 | D4-INT | 100 | NONE |
| D4-16TD2 | 400 | NONE | D4-HSC | 300 | NONE |
| D4-32TD1 | 250 | 140 | F4-16PID | 160 | NONE |
| D4-32TD1-1 | 250 | 140 (15V) | F4-8MPI | 225 | 170 |
| D4-32TD2 | 350 | 120 (4A max including loads) | D4-16SIM | 150 | NONE |
| D4-64TD1 | 800 | NONE | F4-4LTC | 280 | 75 |
| <i>AC Output Modules</i> | | | <i>Programming</i> | | |
| D4-08TA | 250 | NONE | D4-HPP-1 (Handheld Prog.) | 320 | NONE |
| D4-16TA | 450 | NONE | | | |
| <i>Relay Output Modules</i> | | | <i>Operator Interface</i> | | |
| D4-08TR | 550 | NONE | DV-1000 | 150 | NONE |
| F4-08TRS-1 | 575 | NONE | | | |
| F4-08TRS-2 | 575 | NONE | C-more Micro-Graphic | 210 | NONE |
| D4-16TR | 1000 | NONE | | | |
| <i>Analog Modules</i> | | | | | |
| F4-04AD | 150 | 100 | | | |
| F4-04ADS | 370 | 120 | | | |
| F4-08AD | 75 | 90 | | | |