Summary of Tables and Charts Presented in the Text

B

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Specifications

Specification (General)	Rating or Requirement
405 CPU Firmware Requirements	Any PLC*Direct* CPU or other vendor's 405 CPU (Version 1.6 or later)
Slot for Installation	Can be installed in any CPU or expansion base. Cannot be installed in a remote base.
Maximum No. HSC's per CPU	8
No. of I/O points required	Consumes 16 X-inputs and 32 Y-outputs
Intelligence Source	Has its own microprocessor (asynchronous to the DL405 CPU)
Internal Power Consumption	300 mA maximum at 5VDC
Field Wiring Connector	Removable terminal type
Count Signal Level	4.75VDC to 30VDC less than 10mA
Maximum Count Speed	100 kHz (50% duty cycle)
Minimum Input Pulse Width	5 μs (either state)
Count Input Signal Types	Standard (UP/DOWN) or quadrature (phase differential)
Count Range	–8,388,608 to +8,388,607
Count Direction	UP or DOWN (software selectable or hardwired)
CPU Scan Time Increase per HSC in base	4.2 to 5.5 ms

Specification (INA, INB, INZ)	Rating or Requirement
Input Voltage Range	4.75VDC to 30VDC
Maximum Output Current	10 mA
ON Voltage	$\geq$ 4.75VDC
ON Current	$\geq$ 5mA
OFF Voltage	$\leq$ 2.0VDC
OFF Current	$\leq$ 1.6mA
OFF to ON Delay	$\leq$ 1.2μs at 5VDC $\leq$ 0.8μs at 12VDC $\leq$ 0.5μs at 24VDC
ON to OFF Delay	$\leq$ 1.0μs at 5VDC $\leq$ 1.2μs at 12VDC $\leq$ 2.5μs at 24VDC

Specification (CW,CCW,OUT1,OUT2)	Rating or Requirement
Output Power Source	External 10.2VDC–26.4VDC, 1A
Output Type	Open Collector
Maximum Output Current	100 mA per point
Output ON Voltage Drop	≤ 1.5VDC
Output OFF Leakage Current	≤ 100mA
Output OFF to ON Delay	≤ 22.5μs at 12VDC ≤ 21μs at 24VDC
Output ON to OFF Delay	≤ 210μs at 12VDC ≤ 270μs at 24VDC
Built–In Protection	Shut off when output driver IC=175°C (Recovers at 150°C) Shut off when short (>500mA) is detected (Recovers when short is removed)

Specification (LD, LATCH, RTS, CINH, RUN, LS1, LS2)	Rating or Requirement
Input Voltage Range	10.2VDC–26.4VDC
Maximum Input Current	10mA
ON Voltage	≥10.2VDC
ON Current	≥5mA (LD and LATCH); ≥4.8mA (RTS,CINH,RUN,LS1 and LS2)
OFF Voltage	≤4.6VDC (LD and LATCH); ≤5.6VDC (RTS,CINH,RUN,LS1 and LS2)
OFF Current	≤1.6mA (LD and LATCH); ≤2mA (RTS,CINH,RUN,LS1 and LS2)
OFF to ON Delay	≤75μs at 12VDC (LD and LATCH) ≤82.5μs at 12VDC (RTS,CINH,RUN,LS1 and LS2) ≤30μs at 24VDC (LD and LATCH) ≤37.5μs at 24VDC (RTS,CINH,RUN,LS1 and LS2)
ON to OFF Delay	≤240μs at 12VDC (LD and LATCH) ≤105μs at 12VDC (RTS,CINH,RUN LS1 and LS2) ≤260μs at 24VDC (LD and LATCH) ≤105μs at 24VDC (RTS,CINH,RUN LS1 and LS2)

Summary
Tables and Charts

X and Y Assignment Table

X No.	Function	Y No.	Function
Xn+0	ON if current count is greater than preset	Ym+0	ON to reset OUT1 and OUT2 when in HSC run
Xn+1	ON if current count is equal to preset	Ym+1	ON to reset overflow flag (Xn+3)
Xn+2	ON if current count is less than preset	Ym+2	Rising edge copies offset value into current count
Xn+3	Latched ON if overflow occurs (reset with Ym+1)	Ym+3	ON for HSC run
Xn+4	Status of CCW output	Ym+4	Used to control CCW when not in HSC RUN or Home Search
Xn+5	Status of OUT2 (brake) output	Ym+5	Used to control OUT2 when not in HSC RUN or Home Search
Xn+6	Status of CW output	Ym+6	Used to control CW when not in HSC RUN or Home Search
Xn+7	Status of OUT1 (deceleration) output	Ym+7	Used to control OUT1 when not in HSC RUN or Home Search
Xn+10	Status of Limit Switch 2	Ym+10	ON to temporarily suspend counting (inhibit counting)
Xn+11	Status of Limit Switch 1	Ym+11	Rising edge of this signal will latch the current count into memory
Xn+12	ON if doing a search for home position	Ym+12	If ON, it resets current count to zero
Xn+13	ON if a sampling is being conducted	Ym+13	OFF=Quadrature mode ON=UP/DOWN mode
Xn+14	NOT USED	Ym+14	Change state to change count direction
Xn+15	ON for loose or missing terminal block	Ym+15	Rising edge of this signal will invoke Home Search
Xn+16	ON if external power supply for outputs is missing or OFF	Ym+16	ON for x2 count operation (quadrature mode only/Ym+17 must be OFF)
Xn+17	ON if HSC fails its self test	Ym+17	ON for x4 count operation (quadrature mode only)
		Ym+20	If OFF it will reset current count to zero when current count=preset. If ON will not reset unless count is at max or minimum.
		Ym+21	Rising edge of this signal will start the sampling feature
		Ym+22	Must be ON to enable external LD function
		Ym+23	ON to reset CW and CCW
	*This manual was written for the latest version of the D4-HSC. If you have an HSC that was purchased from another vendor, it may not support these features. **Available on HSC modules with production codes 9502 (Feb.'95) or later.	Ym +24	Not Used
		*Ym+25	ON to reset Home Search error.
		*Ym+26	ON to enable reset with INZ.
		**Ym+27	If turned ON before invoking Home Search, OUT2 (brake) will turn ON when Home is found.

Shared Memory Table

Shared Memory Map

Data	Address (hex)		Address (octal)
Current Count (4 bytes)	00 to 03	Range= −8388608 thru 8388607 Format: 8-digit BCD	00 to 03
Offset Value (4 bytes)	04 to 07	Range= −8388608 thru 8388607 Format: 8-digit BCD	04 to 07
Preset Value (4 bytes)	08 to 0B	Range= −8388608 thru 8388607 Format: 8-digit BCD	10 to 13
Deceleration (4 bytes)	0C to 0F	Range= −8388608 thru 8388607 Format: 8-digit BCD	14 to 17
Latched Count (4 bytes)	10 to 13	Range= −8388608 thru 8388607 Format: 8-digit BCD	20 to 23
Timebase (2 bytes)	14 to 15	Range= 1 thru 9999 (Total time=above value x 3ms) Format: 4-digit BCD	24 to 25
Sampled Count (4 bytes)	16 to 19	Range= 0 thru 8388608 Format: 8-digit BCD	26 to 31

Data Flow Direction
(From DL405 CPU Perspective)

V-Memory	Shared Memory
Read	
Read	Write
Read	Write
Read	Write
Read	
Read	Write
Read	

Table for Determining Count Direction

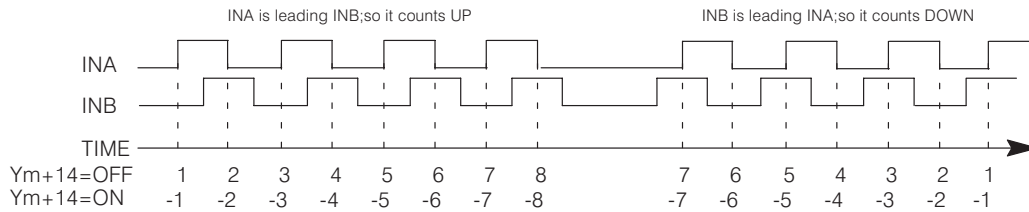| Mode Status	Direction	Criteria Used For Determining Direction
Ym+13=0	Ym+14=0	Counts UP if INA leads INB. Counts DOWN if INB leads INA (quadrature)
Ym+13=0	Ym+14=1	Counts UP if INB lead INA. Counts DOWN if INA leads INB (quadrature)
Ym+13=1	Ym+14=0	Counts UP with INA. Counts DOWN with INB (standard UP/DOWN)
Ym+13=1	Ym+14=1	Counts DOWN with INA. Counts UP with INB (standard UP/DOWN)

Counting Resolution Table (Quadrature Only)

Ym+16	Ym+17	What Causes Count Change
OFF	OFF	1x: One edge of INA
ON	OFF	2x: Both edges of INA
OFF	ON	4x: All edges of INA and INB
ON	ON	4x: All edges of INA and INB

Y No.	Function
Ym+14	Change state to change count direction
Ym+15	ON will invoke home search
Ym+16	ON for x2 count operation (quadrature mode only/Ym+17 must be OFF)
Ym+17	ON for x4 count operation (quadrature mode only)

Quadrature 1x Operation (One Edge: INA trigger)

INA is leading INB;so it counts UP   INB is leading INA;so it counts DOWN (See note below.)

INA

INB

TIME

| Ym+14=OFF | 1 | 2 | 3 | 4 | | 3 | 2 | 1 |
| Ym+14=ON | -1 | -2 | -3 | -4 | | -3 | -2 | -1 |

Note: In this resolution mode, the reason the trailing edge causes a count change (when INB leads INA) is the change will occur when INB is low only.
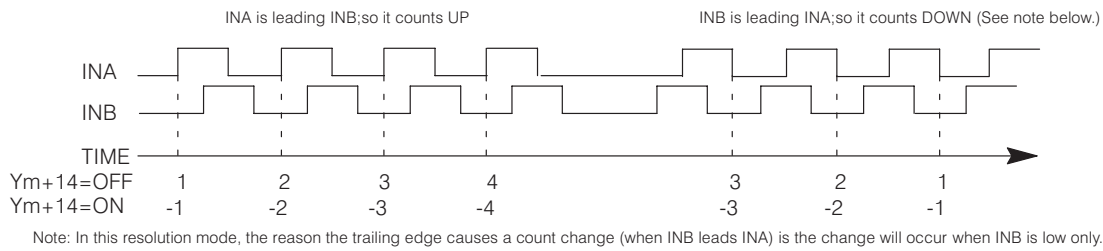
Quadrature 2x Operation (Two Edge: INA trigger)

INA is leading INB;so it counts UP   INB is leading INA;so it counts DOWN

INA

INB

TIME

| Ym+14=OFF | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Ym+14=ON | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | | -7 | -6 | -5 | -4 | -3 | -2 | -1 |

Quadrature 4x Operation (All Edges: INA and INB trigger)

INA is leading INB;so it counts UP   INB is leading INA;so it counts DOWN

INA

INB

TIME

| Ym+14=OFF | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | | 14 13 12 11 10 9 8 7 6 5 4 3 2 1 |
| Ym+14=ON | -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14 -15 | | -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 |