

FM350-1 功能模块的使用与说明

SIEMENS A&D CS
2004-5-10

首先 我们建议您访问 siemens A&D 公司的技术支持网站：

www4.ad.siemens.de

在检索窗口中键入相关产品或问题的 **关键字**，获取关于产品或问题的详细信息和手册。

The screenshot shows the homepage of the Siemens A&D CS support website. At the top, there is a navigation bar with links for File, Edit, View, Favorites, Tools, and Help. Below the navigation bar is a toolbar with icons for Back, Forward, Stop, Home, Search, Favorites, Media, and others. The address bar contains the URL <http://www4.ad.siemens.de/>. The main header features the Siemens logo. To the right of the logo are links for Search, Sitemap, Home, Help, MySupport, and About us, along with an English language selection dropdown. A red circle highlights the address bar and the search bar. A red arrow points from the text "输入关键字搜索" (Enter keyword search) to the search bar. The left sidebar contains sections for Automation and Drives Service & Support, Contacts (with links to worldwide contacts, field service, spare parts, and technical support), Quick-Links (with links to newsletter, forum, expert communication), and Specific Search. The main content area includes sections for Product Support, Services, and Support Shop. The Product Support section features an image of a racing car and a stack of papers. The Services section features an image of two people. The Support Shop section features an image of a shopping cart. To the right, there is a sidebar titled "News and Online-Help" with sections for PITBOARD, FACTS, SUPPORT TOUR, NEWS, and LINKS. It also displays "Pitboard-News:" and "FAQ for Cash!".

FM350-1 概述

单通道智能计数模板，可连接 5V 增量编码器、24V 增量编码器、带方向信号的脉冲传感器，5V 信号最大 500Hz，24V 信号最大 200Hz，具有软件门和硬件门控制计数和测量，带比较值输出。FM350-1 可以在 IM153-1、IM153-2、S7-300 系统中使用。

安装和接线

在选择好计数传感器后需要确认模板侧面的跳线块，A 对应 5V 信号，D 对应 24V 信号。

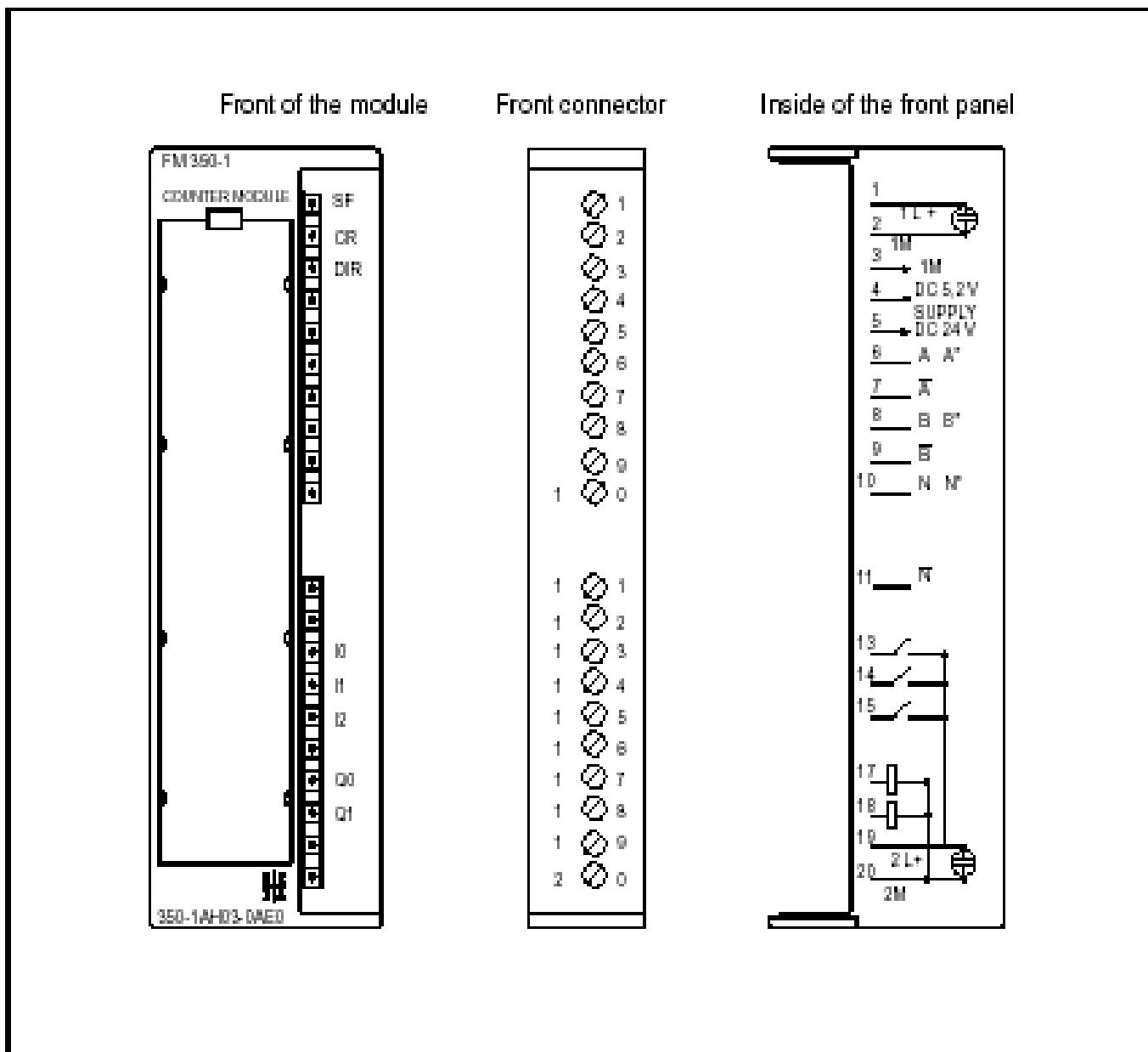


Figure 3-1 Front Connector of the FM 350-1

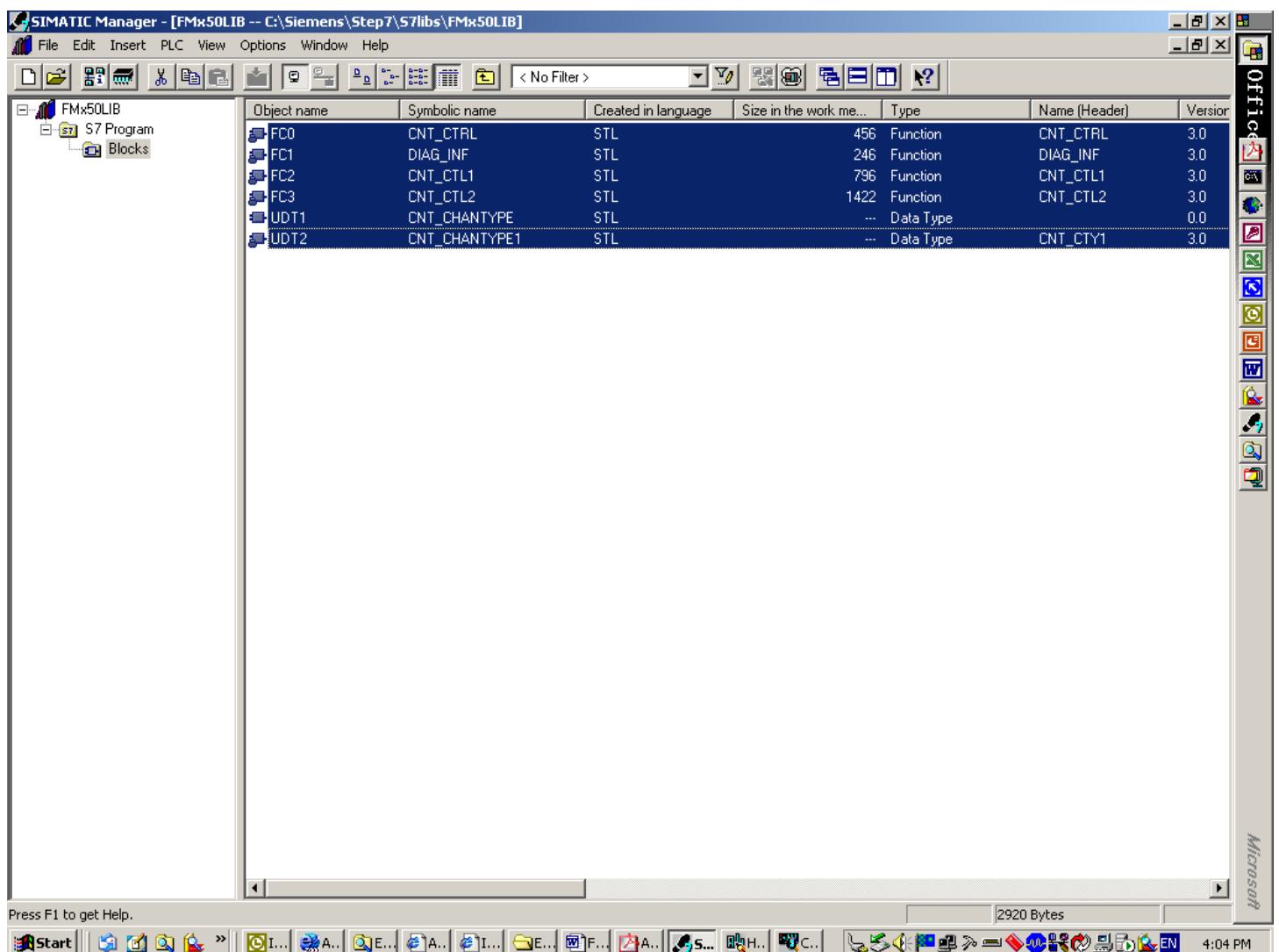
Front Connector Assignments

Table 3-1 Front Connector Assignments

Connection	Name	Input/ Output	Function								
Auxiliary voltage											
1	1L+	INP	24 V auxiliary voltage								
2	1M	INP	Auxiliary voltage ground								
			5 V encoder RS 422, symmetric	24 V encoder, asymmetric	24 V pulse generator with direction level	24 V initiator					
3	1M	OUTP	Encoder supply ground								
4	5.2VDC	OUTP	5.2 V encoder supply								
5	24VDC	OUTP	24 V encoder supply								
6	A A*	INP	Encoder signal A	Encoder signal A*							
7	\overline{A}	INP	Encoder signal \overline{A}	-							
8	B B*	INP	Encoder signal B	Encoder signal B*	Direction signal	-					
9	\overline{B}	INP	Encoder signal \overline{B}	-							
10	N N*	INP	Encoder signal N	Encoder signal N*	-						
11	\overline{N}	INP	Encoder signal \overline{N}	-							
12	-	-	-								
Digital inputs and digital outputs											
13	I0	INP	Digital input DI Start								
14	I1	INP	Digital input DI Stop								
15	I2	INP	Digital input DI Set								
16	-	-	-								
17	Q0	OUTP	Digital output DO0								
18	Q1	OUTP	Digital output DO1								
Load voltage											
19	2L+	INP	24 V load voltage								
20	2M	INP	Load voltage ground for the digital inputs and outputs								

操作方式

首先安装 FM350-1 软件，在 SIMATIC Manager 中打开库 FMx50LIB。复制所有的块进入自己的项目。仅仅 6ES7 350-1AH03-0AE0 具有测量功能。



下面描述几个功能块的性能和区别

FC0 计数和测量功能，使用 UDT1 生成的数据块

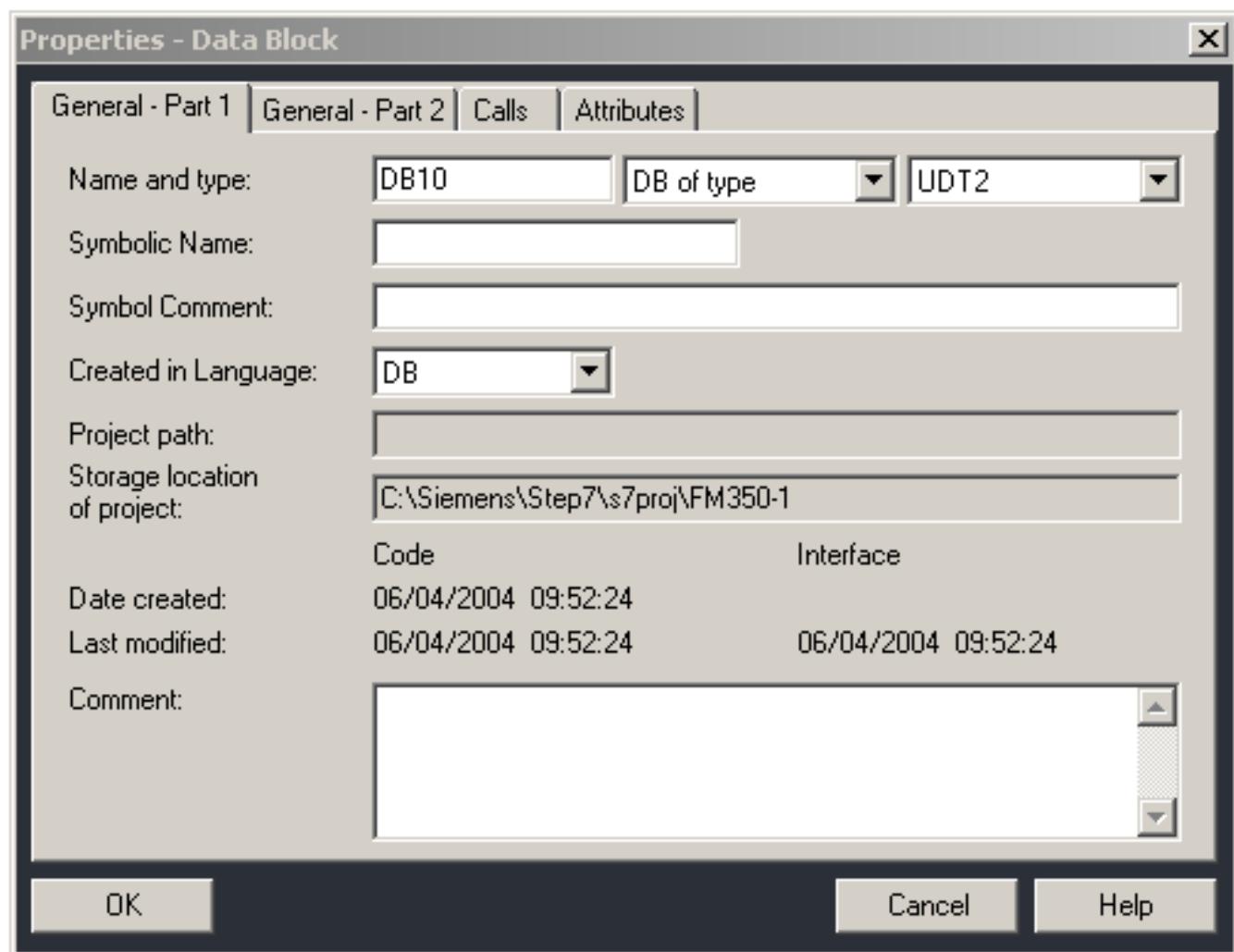
FC1 诊断 FM 模板

FC2 计数和测量功能，支持等时模式，能够在操作中改变参数和置位、复位输出。使用 UDT2 生成的数据块。

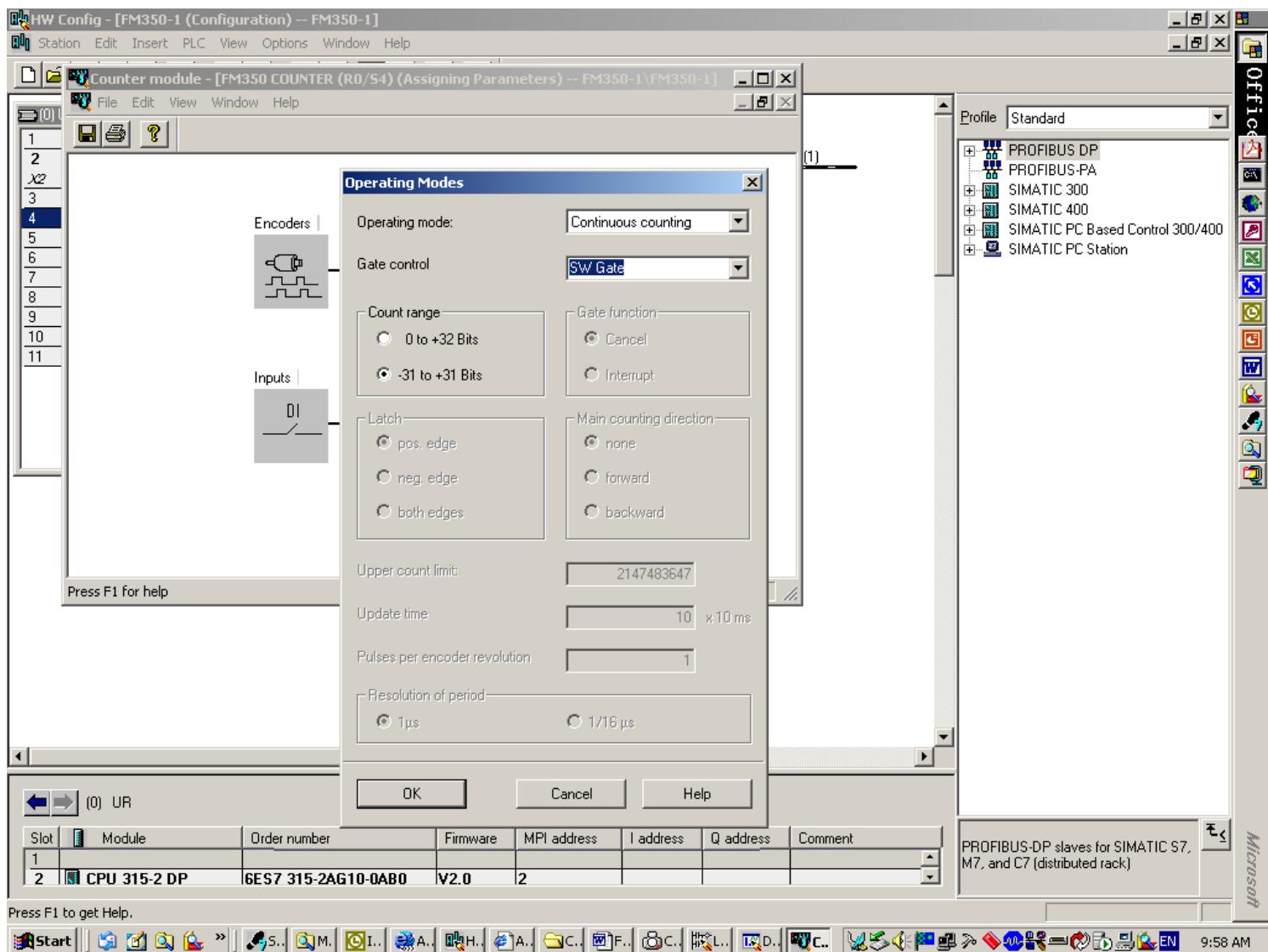
FC3 功能和 FC2 基本一样，但仅仅使用在等时模式，对等时模式进行了优化，运算速度在等时模式比 FC2 快

计数模式

首先生成应用程序数据块



连续计数(continuous counting)



```

L      256
T      DB10.DBW    6          //输入FM模板地址

L      P#256.0
T      DB10.DBД    8          //输入通道号，地址乘8

CALL  "CNT_CTRL"
DB_NO  :=10
SW_GATE :=M1.0
GATE_STP:=M1.1
OT_ERR_A:=M1.2
SET_D00 :=M1.3
SET_D01 :=M1.4
OT_ERR  :=M1.5
L_DIRECT:=M1.6
L_PREPAR:=M1.7
T_CMP_V1:=M2.0
T_CMP_V2:=M2.1
C_DOPARA:=M2.2
RES_SYNC:=M2.3
RES_ZERO:=M2.4

```

软件门置 1

从 DB10. DBD34 读计数值

单次计数(single counting)

单次计数方法同连续计数一样，但当达到上限或下限最大计数值时，必须从新启动计数器。

周期计数 (Periodic counting)

周期计数和连续计数控制方法一样，但当达到上限或下限最大计数值时，从装载值开始从新计数。

打开和关闭门功能

硬件门包含常 1 (level-controlled) 控制和边沿触发(edge-controlled)

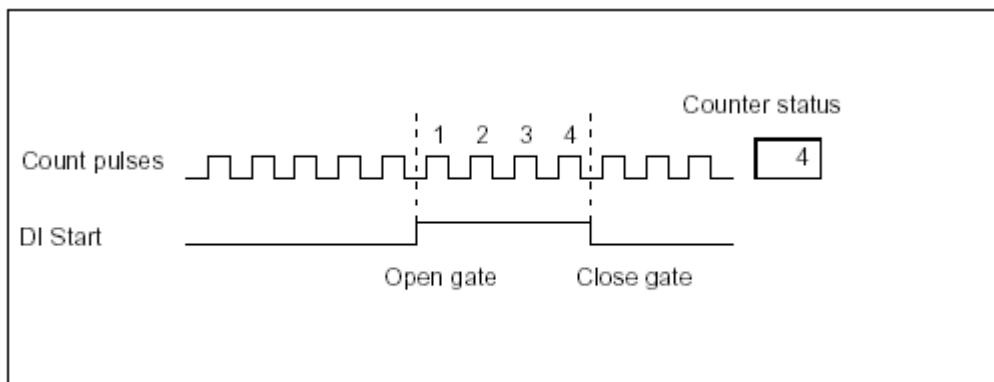


Figure 8-10 Level-Controlled Opening and Closing of the Hardware Gate

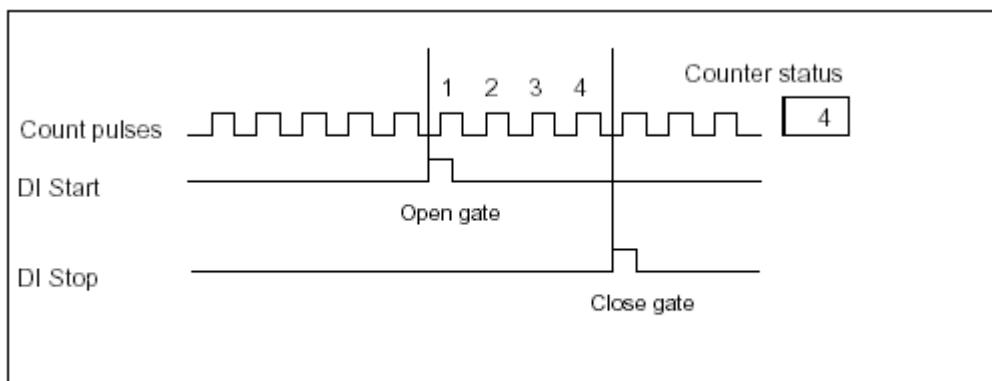
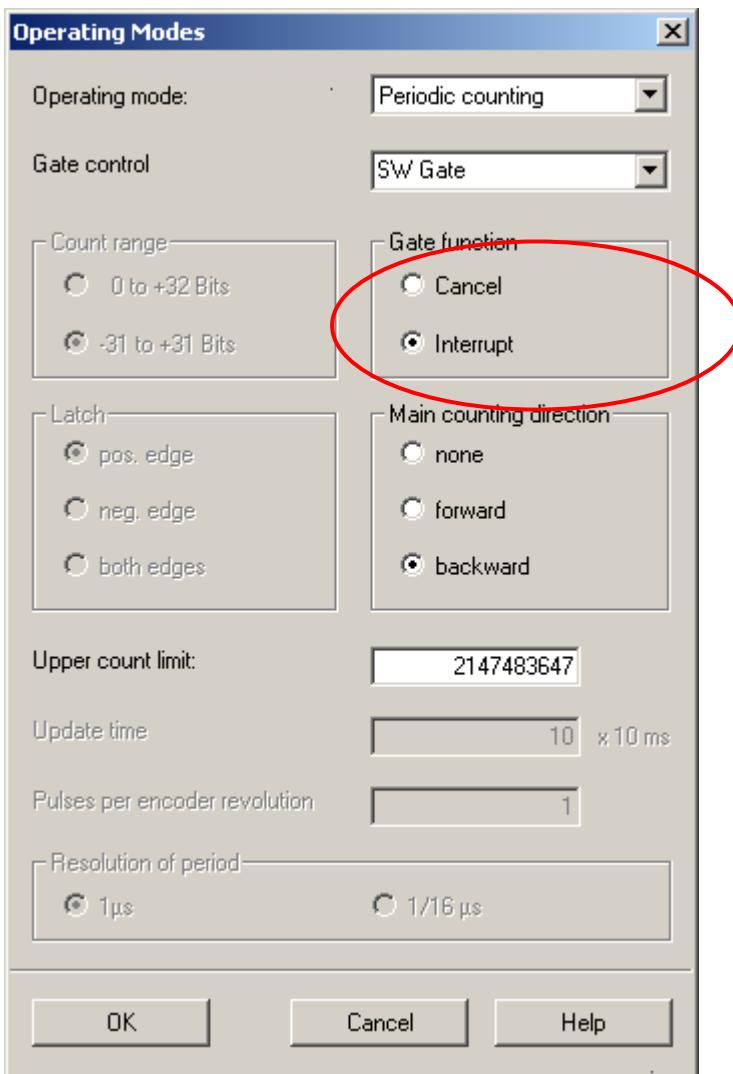


Figure 8-11 Edge-Controlled Opening and Closing of the Hardware Gate

软件门仅仅有 level-controlled.

取消和中断门功能:



这个功能都是由 GATE_STP 输入参数来实现的

```

L      256
T      DB10.DBW    6          //输入FM模板地址

L      P#256.0
T      DB10.DBG    8          //输入通道号，地址乘8

CALL  "CNT_CTL1"
DB_NO   :=10
SW_GATE :=M1.0
GATE_STP:=M1.1
OT_ERR_A:=M1.2
SET_D00 :=M1.3
SET_D01 :=M1.4
OT_ERR  :=M1.5
L_DIRECT:=M1.6
L_PREPAR:=M1.7
T_CMP_V1:=M2.0
T_CMP_V2:=M2.1
C_DOPARA:=M2.2
RES_SYNC:=M2.3
RES_ZERO:=M2.4

```

取消门控制功能是当 GATE_STP 置 1，计数停止，保持当前计数值。门再启动从装载值开始计数。

中断门控制功能是当 GATE_STP 置 1，计数停止，保持当前计数值。门再启动从当前位置开始计数。

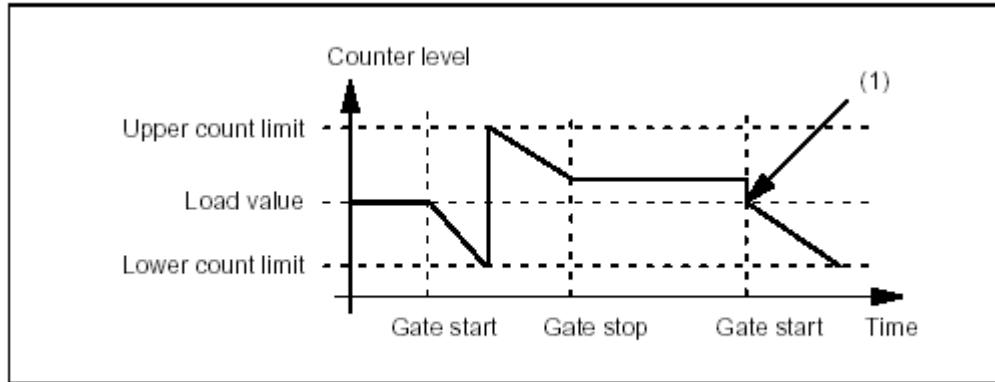


Figure 8-13 Continuous counting, down, Cancel gate function

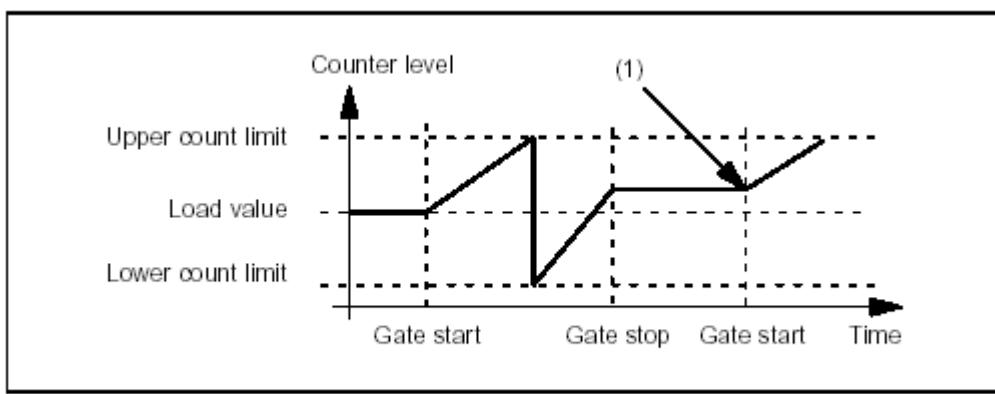


Figure 8-14 Continuous counting, down, Interrupt gate function

比较值输出

```

L      256
T      DB10.DBW    6          //输入FM模板地址

L      P#256.0
T      DB10.DBD    8          //输入通道号，地址乘8

CALL "CNT_CTL1"
DB_NO   :=10
SW_GATE :=M1.0
GATE_STP:=M1.1
OT_ERR_A:=M1.2
SET_D00 :=M1.3
SET_D01 :=M1.4
OT_ERR  :=M1.5
L_DIRECT:=M1.6
L_PREPAR:=M1.7
T_CMP_V1:=M2.0
T_CMP_V2:=M2.1
C_DUPARA:=M2.2
RES_SYNC:=M2.3
RES_ZERO:=M2.4

```

置 1

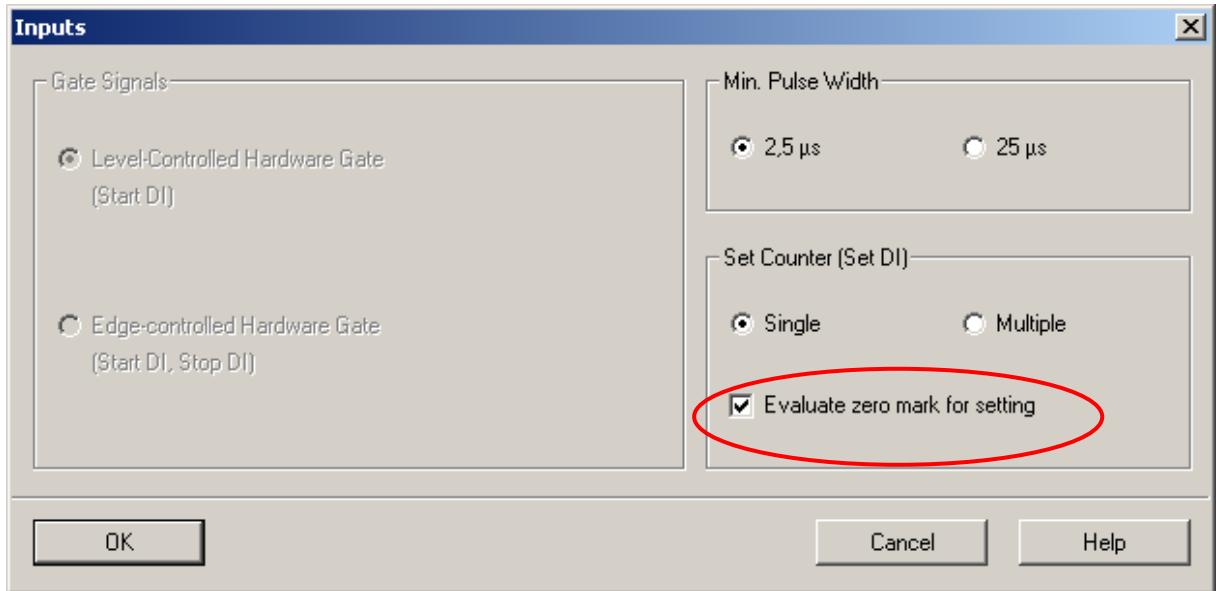
同时输入比较值到 DB 块， 分配输出点功能。

设定计数值 (set counter)

软件能够使用 L_DIRECT 或 L_PREPAR 随时修改计数值（装载 DBD14 值）

硬件能够使用模板外部输入点 DI_SET 或 DI_SET 和编码器的零脉冲随时修改计数值（装载 DBD14 值）

当使用硬件 DI_SET 时，DB 块的位 ENSET_UP 和 ENSET_DN 需要置 1，当使用编码器零脉冲时必须选择：



锁存和释放功能(latch/retrigger)

这个功能主要靠 FM 模板数字输入 Start DI 的边沿脉冲（不小于 1ms）锁存计数值(latch)，同时计数器从装载值从新开始计数(retrigger)。计数器计数要求软件门同时置 1，在数据块 LATCH_LOAD (DBD30) 读出锁存值。

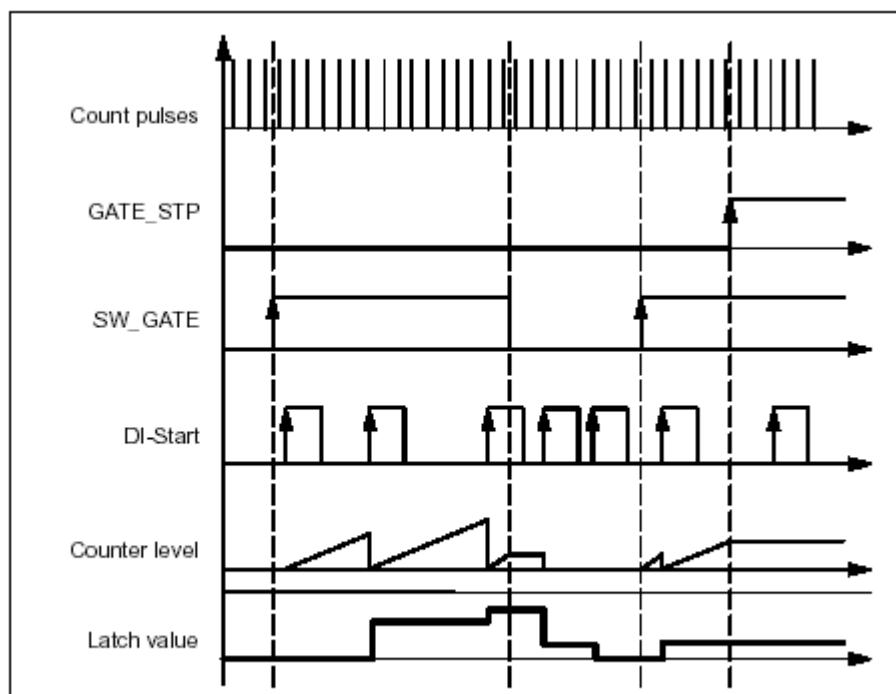


Figure 8-27 Latch/Retrigger when load value = 0 and a positive edge at Start DI

上图可以看出当软件门置 0 时，计数值将保持，Start DI 边沿脉冲还能够锁存计数值，但不会再计数，只能从装载值装载。

单独锁存功能(latch)

此功能仅仅在 Start DI 边沿触发计数值锁存，计数器一直连续计数，直到软件门置 0，计数器停止，保持当前值。

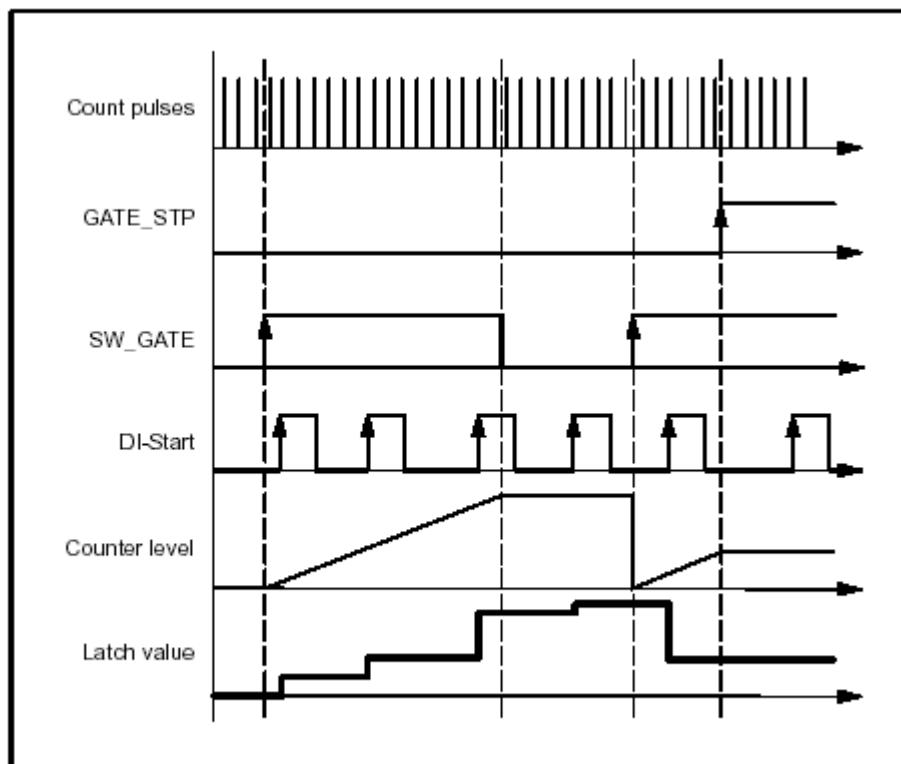


Figure 8-28 Latch when load value = 0 and a positive edge at Start DI

两个脉冲边沿的时间测量

在 FM350-1 中有个 1M 的内部时钟，依据 Start DI 的 2 个上升沿测量之间的时间，编码器选择内部 1M 时钟，任何计数模式，门控制选择 latch/retrigger。测量值在 LATCH_LOAD(DBD30) 中读出。时基 us。

测量方式

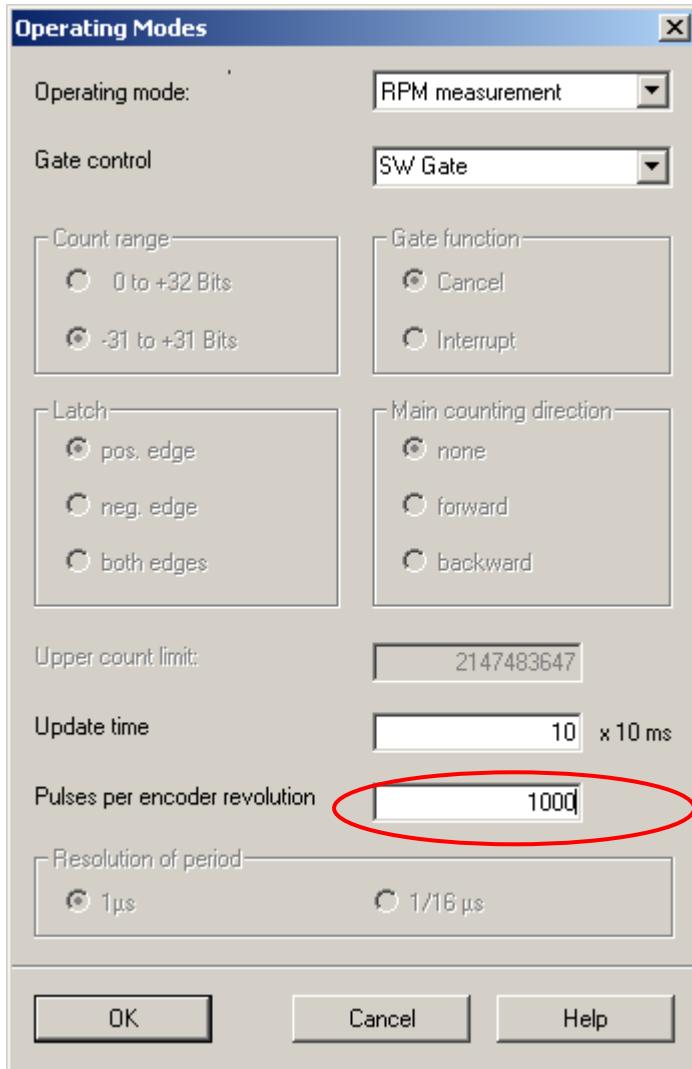
测量方式分为频率测量 (frequency measurement)，转速测量 (RPM measurement)，持续周期测量 (continuous periodic measurement)

频率测量

分辨率为 $\text{Hz} \times 10^{-3}$ ，通过门控制，在 LATCH_LOAD(DBD30) 读出。

转速测量

分辨率 1×10^{-3} /min，通过门控制，在 LATCH_LOAD(DBD30) 读出。必须输入编码器每圈脉冲数。



持续周期测量

分辨率 1μs，门控制，在 LATCH_LOAD(DBD30) 读出。

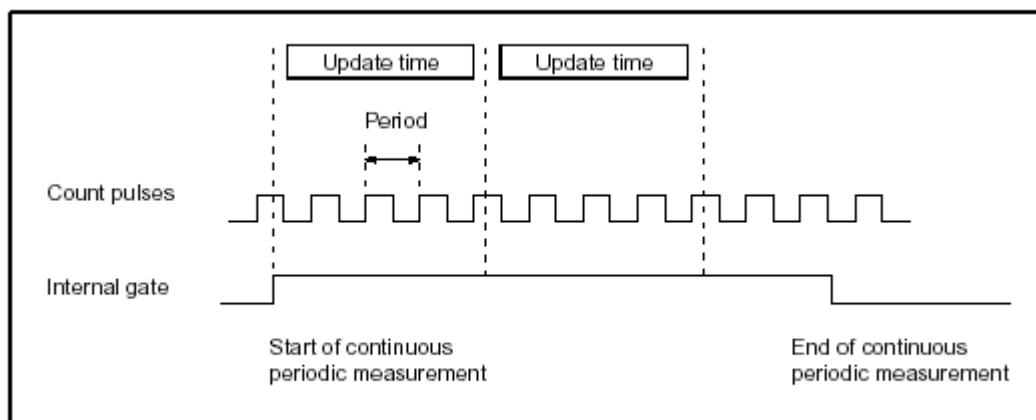


Figure 8-34 Periodic measurement of the gate function

中断的使用

调用 OB40，状态在 OB40 中读出。

Contents Of: 'Environment\Interface\TEMP'				
	Name	Data Type	Address	Comment
Interface	OB40_EV_CLASS	Byte	0.0	Bits 0-3 = 1 (Coming event). Bits 4-7 = 1 (Event class 1)
TEMP	OB40_STRT_INF	Byte	1.0	16#41 (OB 40 has started)
	OB40_PRIORITY	Byte	2.0	Priority of OB Execution
	OB40_OB_NUMBR	Byte	3.0	40 (Organization block 40, OB40)
	OB40_RESERVED_1	Byte	4.0	Reserved for system
	OB40_IO_FLAG	Byte	5.0	16#54 (input module), 16#55 (output module)
	OB40_MDL_ADDR	Word	6.0	Base address of module initiating interrupt
	OB40_POINT_ADDR	DWord	8.0	Interrupt status of the module
	OB40_DATE_TIME	Date_And...	12.0	Date and time OB40 started

Table 8-17 Assignment of the bits of the variable OB40_POINT_ADDR

Byte	Bit	Meaning: Interrupt in the Case of...
8	0	Opening the gate
	1	Closing the gate
	2	Overflow (Count mode)
		Measured value outside limits (Measure mode)
	3	Underflow (Count mode)
		End of measurement (Measure mode)
	4	Reaching comparison value 1 in the up direction
	5	Reaching comparison value 1 in the down direction
	6	Reaching comparison value 2 in the up direction
	7	Reaching comparison value 2 in the down direction
9	0	Zero pass
	5	Sets the counter with an external signal (synchronization)
	7	Latch