一、概述

在 SIMOTION 控制系统中，系统函数功能块“_ALM_control”可用来控制 SINAMICS 产品中的“Active Line Module” (ALM 模块) 。

关于 SINAMICS 驱动系统的手册已做为 SIMOTION 运动控制系统手册的一部分在光盘中提供。

下述软件版本中可使用此标准功能块：

- SIMOTION SCOUT V4.0 or higher
- SIMOTION Kernel V4.0 or higher

“_ALM_control”功能块不仅能用来控制“Active Line Module” (ALM 模块) 的运行及停止， 而且还能完成对该模块的简单诊断。

“_ALM_control”功能块提供操作 ALM 模块的控制字及状态字。

二、ALM 模块连接要求

- 滤波器为选件，对于大于或等于36KW的ALM，必须使用与其相配的滤波器。
- 电抗器为必须使用。

注意：接线时滤波器必须放在电抗器前面，参看图1.

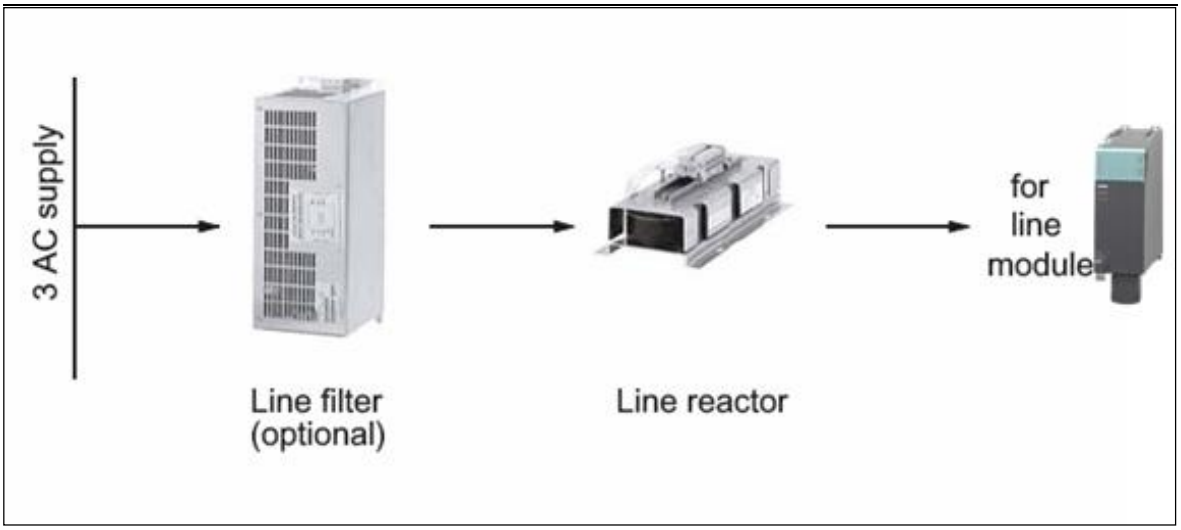


图1.

推荐的Drive_CLiQ连接，如图2所示

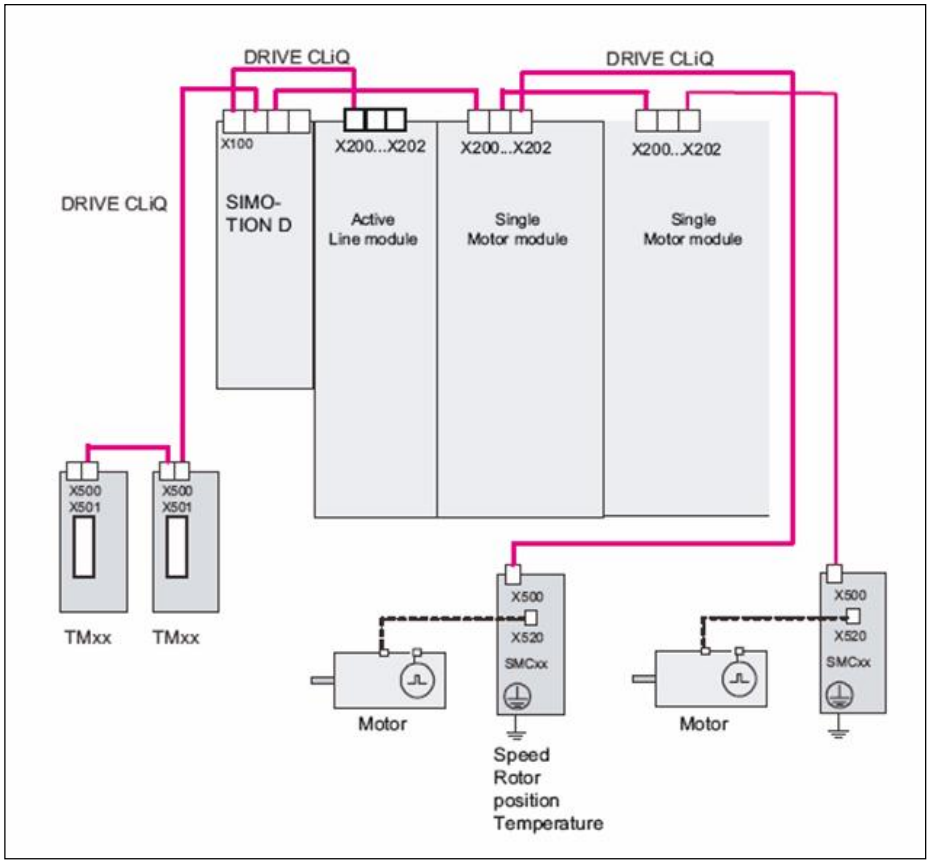


图 2.

ALM模块连线，如图3所示

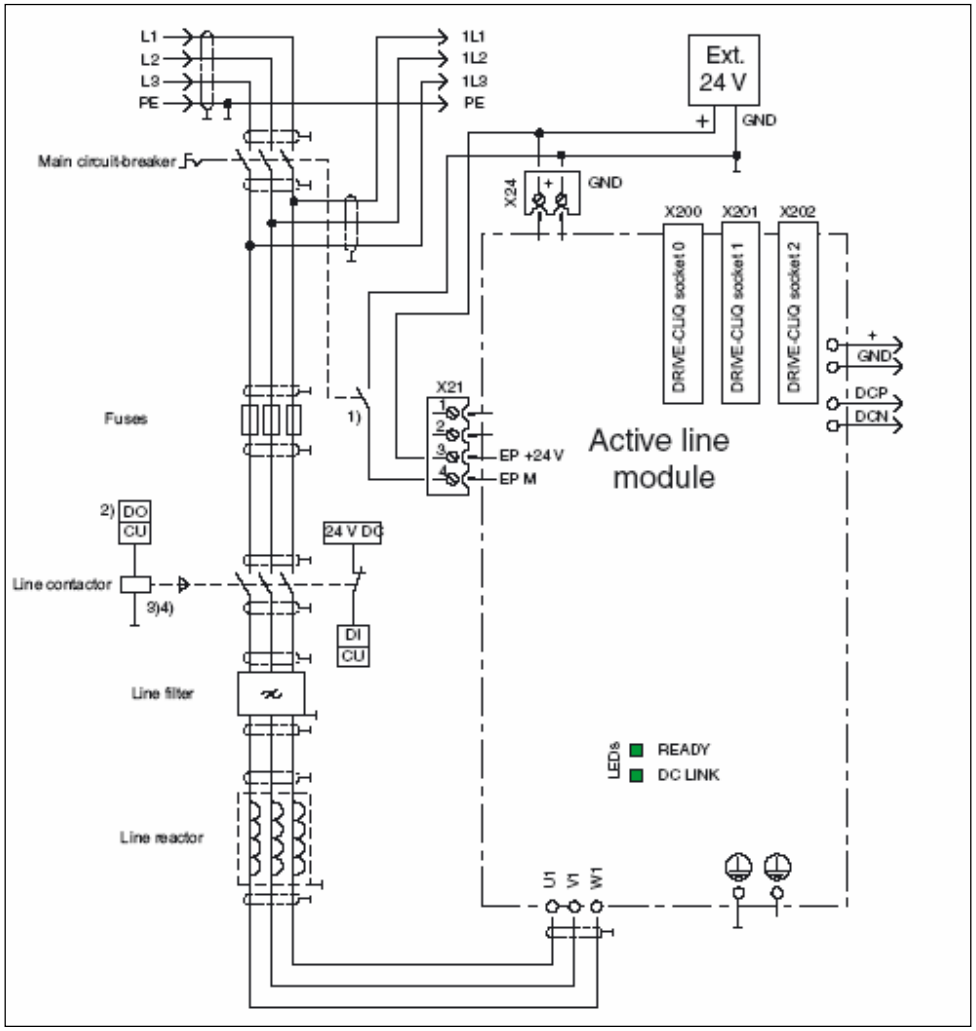


图3.

三、配置 ALM 模块

1.自动上载 SINAMICS 组件

可使用在线方式自动上载 SINAMICS 组件，ALM 模块自动上载后显示如图 4 所示。

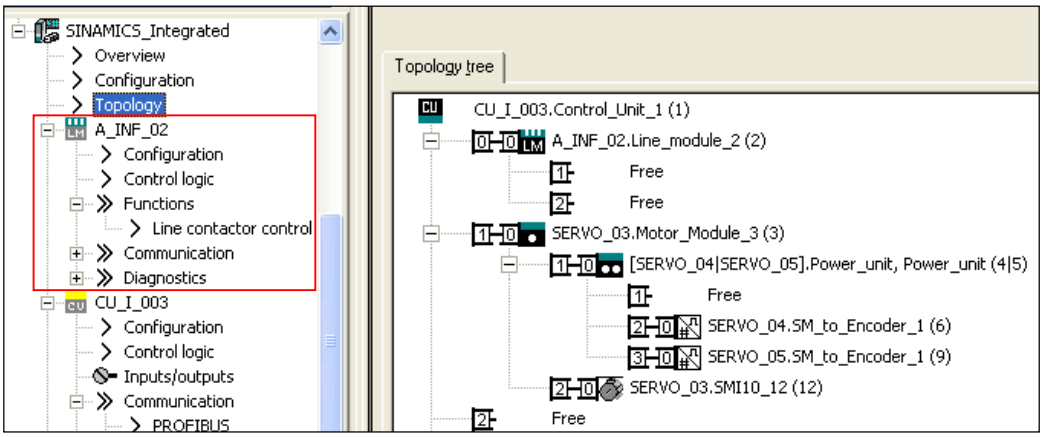


图4.

2．离线配置 ALM 模块

离线后双击图 4 中“A_INF_02”图标下的“Configration”项，出现图 5 画面。

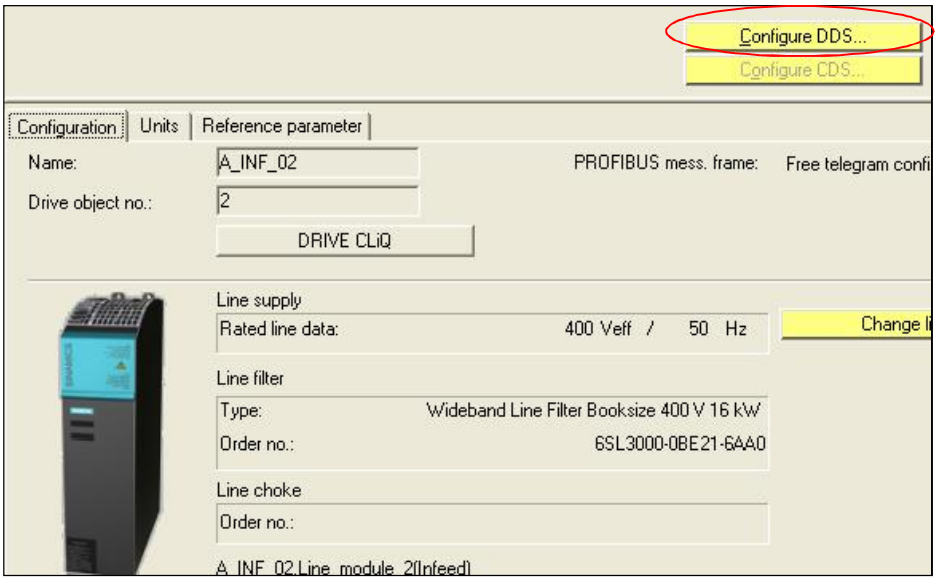


图5.

双击“Configure DDS”按钮，按照图 6-8 对 ALM 模块进行离线配置。

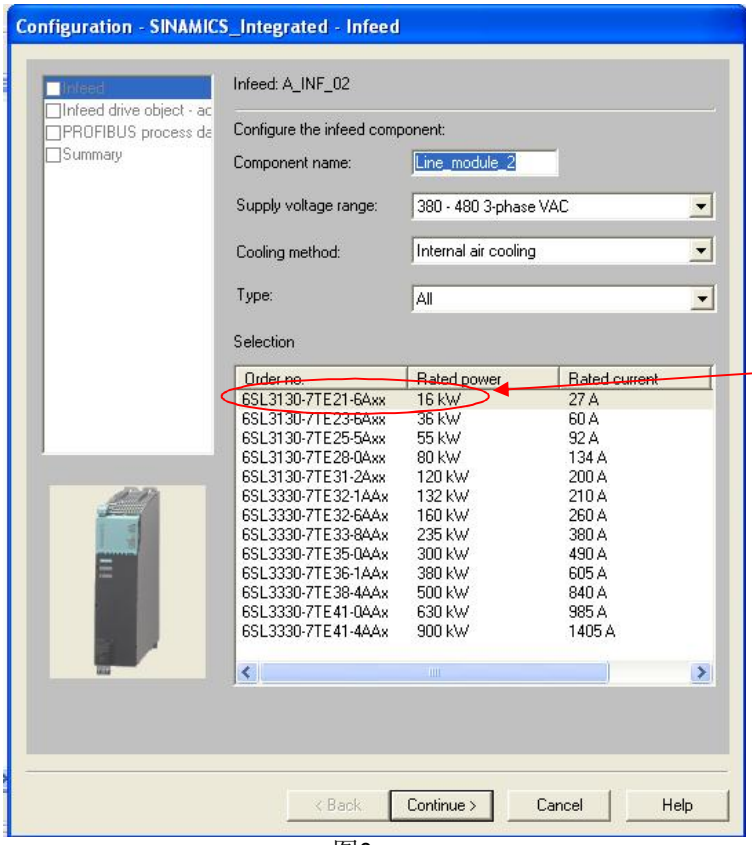
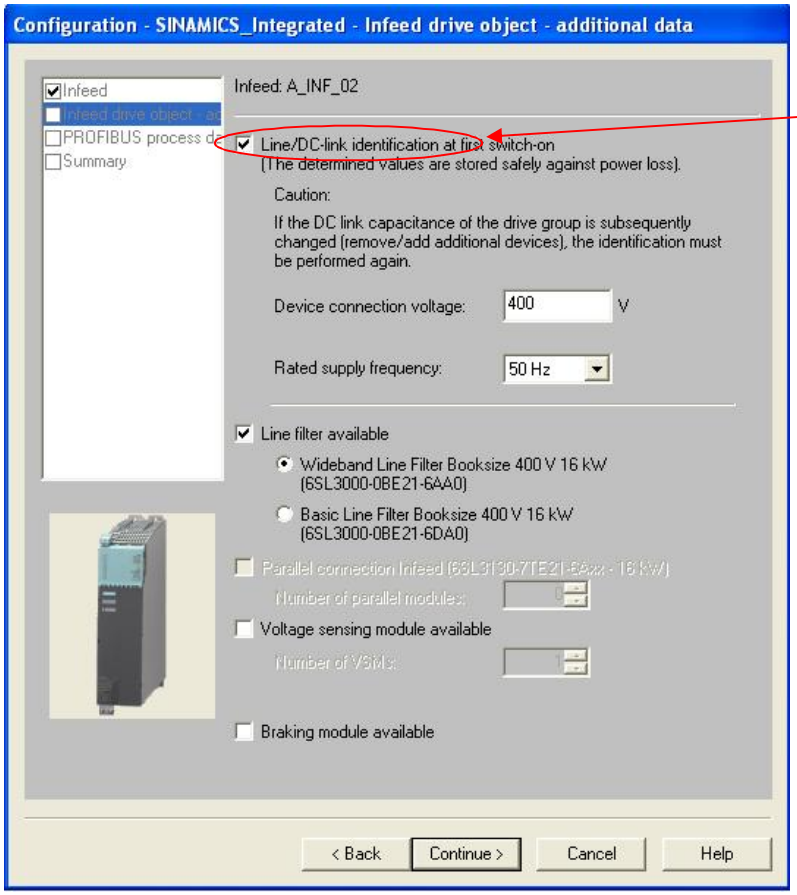
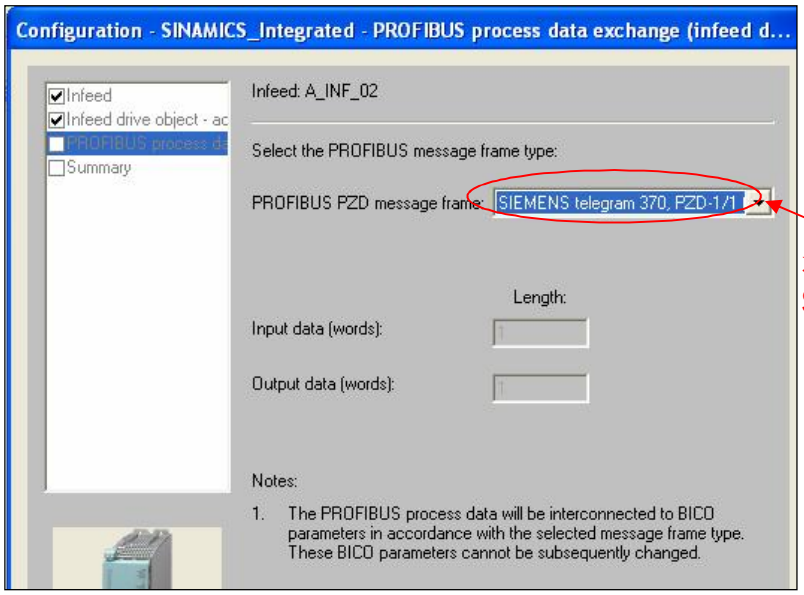

Configuration - SINAMICS_Integrated - Infeed
Infeed
Infeed drive object - ac
PROFIBUS process da
Summary
Infeed: A_INF_02
Configure the infeed component:
Component name:
Line_module_2
Supply voltage range:
380 - 480 3-phase VAC
Cooling method:
Internal air cooling
Type:
All
Selection
Order no.
Rated power
Rated current
6SL3130-7TE21-6Axx 16 kW 27 A
6SL3130-7TE23-6Axx 36 kW 60 A
6SL3130-7TE25-5Axx 55 kW 92 A
6SL3130-7TE28-0Axx 80 kW 134 A
6SL3130-7TE31-2Axx 120 kW 200 A
6SL3330-7TE32-1AAx 132 kW 210 A
6SL3330-7TE32-6AAx 160 kW 260 A
6SL3330-7TE33-8AAx 235 kW 380 A
6SL3330-7TE35-0AAx 300 kW 490 A
6SL3330-7TE36-1AAx 380 kW 605 A
6SL3330-7TE38-4AAx 500 kW 840 A
6SL3330-7TE41-0AAx 630 kW 985 A
6SL3330-7TE41-4AAx 900 kW 1405 A
< Back
Continue >
Cancel
Help
选择 ALM 模块

图6.



选择 ALM 模块第一次上电后，应进行识别

图7.



选择通讯报文格式为：
SIEMENS telegram 370,PZD-1/1

图8.

3．查看 SINAMICS 驱动设备的通讯报文配置

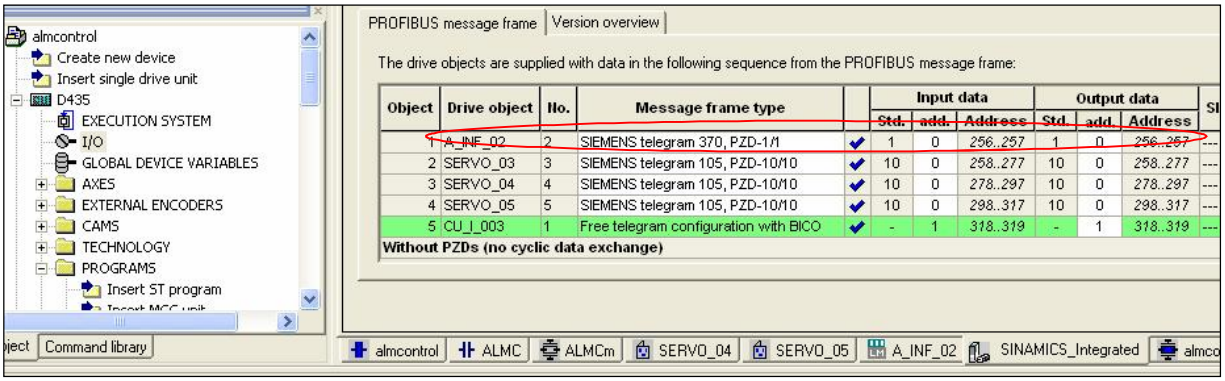


图9.

4．下载配置数据

对项目进行编译，连线并下载配置数据后，将出现图 10 所示的提示信息，提示用户需对 ALM 模块进行参数识别。

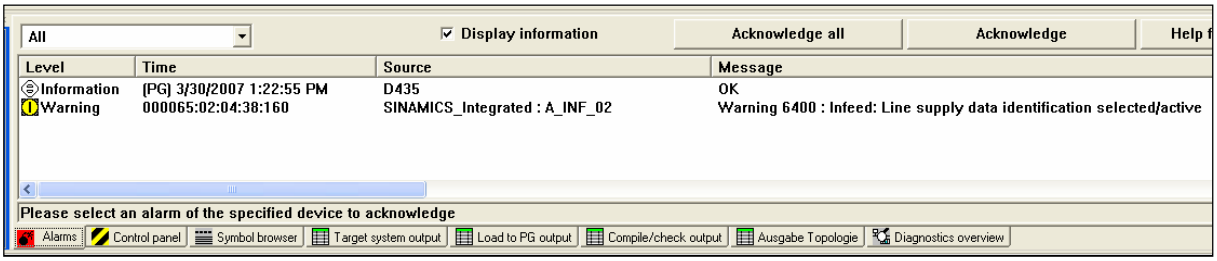


图10.

5．使用“Control Panel”

双击图 11 中的“Control panel”，出现图 12 画面。

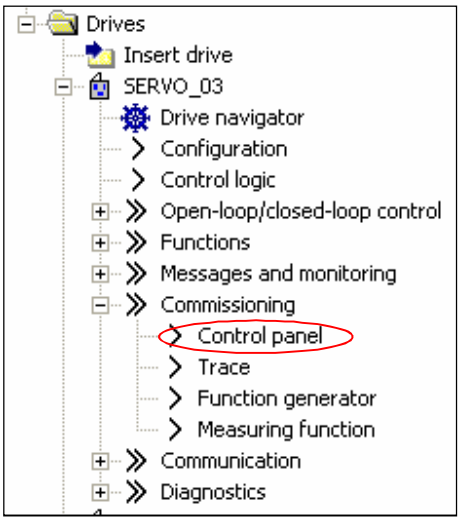


图11.

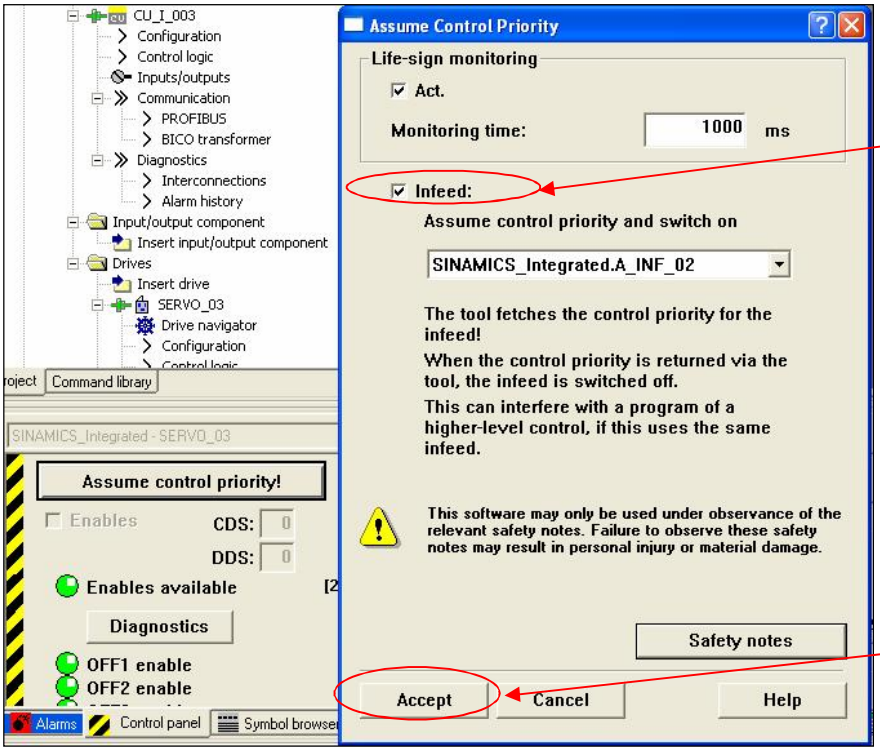


图12.

点击“Accept”按钮后，会自动进行“ALM”模块识别，识别结束后图 10 中的提示信息会自动消除。

注意：“ALM”模块识别仅在模块第一次上电时识别一次，识别成功之后不会再进行识别工作。

6．ALM 模块控制位及状态位信息介绍

表一.控制字

Signal name	Internal control word	Binector input	Display of internal control word	PROFIBUS telegram 370
ON/OFF1	STWAE.0	p0840 ON/OFF2	r0898.0	A_STW1.0
OFF2	STWAE.1	p0844 1 OFF2 and p0845 2 OFF2	r0898.1	A_STW1.1
Enable operation	STWAE.3	p0852 Enable operation	r0898.3	A_STW1.3
Disable motor operation	STWAE.5	p3532 Disable motor operation	r0898.5	A_STW1.5
Inhibit regenerating	STWAE.6	p3533 Inhibit regenerating	r0898.6	A_STW1.6
Acknowledge error	STWAE.7	p2103 1 Acknowledge or p2104 2 Acknowledge or p2105 3 Acknowledge	r2138.7	A_STW1.7
Master ctrl by PLC	STWAE.10	p0854 Master ctrl by PLC	r0898.10	A_STW1.10

表二.状态字

Signal name	Internal status word	Parameter	PROFIBUS telegram 370
Ready to power up	ZSWAE.0	r0899.0	A_ZSW1.0
Ready to run	ZSWAE.1	r0899.1	A_ZSW1.1
Operation enabled	ZSWAE.2	r0899.2	A_ZSW1.2
Fault present	ZSWAE.3	r2139.3	A_ZSW1.3
No OFF2 active	ZSWAE.4	r0899.4	A_ZSW1.4
Power-on disable	ZSWAE.6	r0899.6	A_ZSW1.6
Alarm present	ZSWAE.7	r2139.7	A_ZSW1.7
Controlled by PLC	ZSWAE.9	r0899.9	A_ZSW1.9
Pre-charging completed	ZSWAE.11	r0899.11	A_ZSW1.11
Line contactor energized feedback	ZSWAE.12	r0899.12	A_ZSW1.12

四、Simotion 控制 ALM 模块的编程方法

１．建立程序单元

在此分别介绍用 LAD、MCC 及 ST 三种编程方式来实现对 ALM 模块的控制（用户可选择其中之一）。

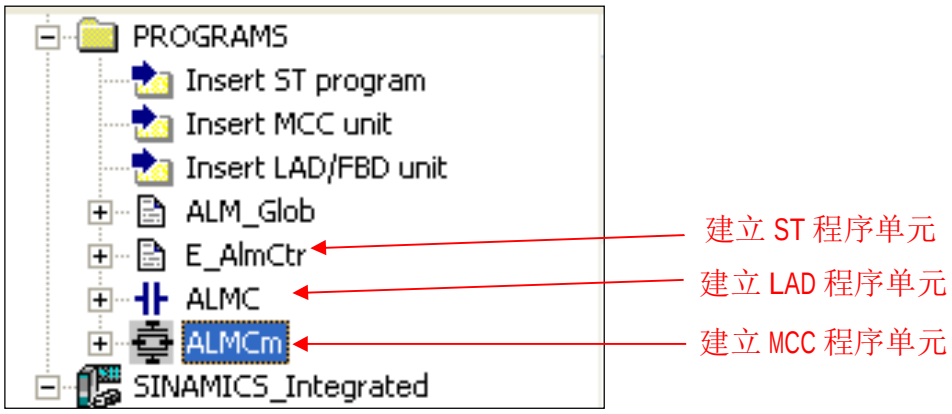


图13.

2. LAD 编程方式

(1)将函数拖曳至 network 中

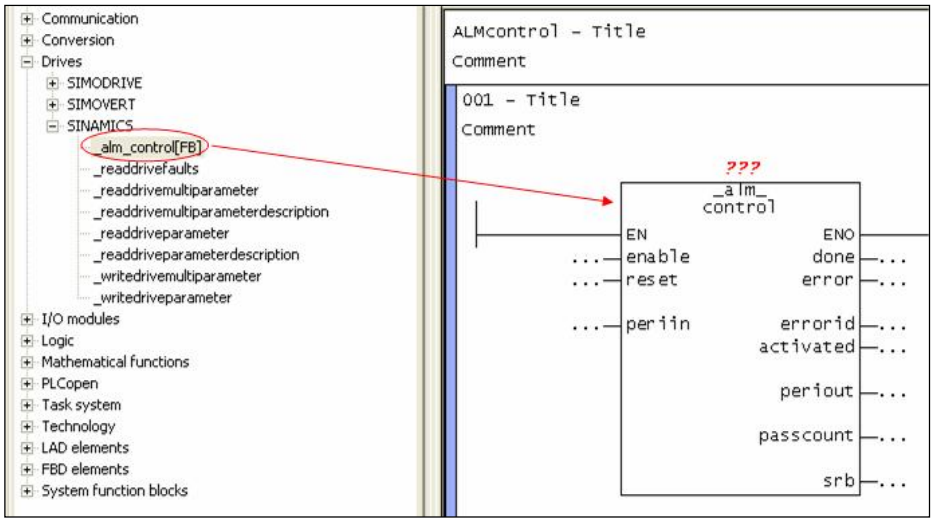


图14.

(2)建立此函数的背景数据块

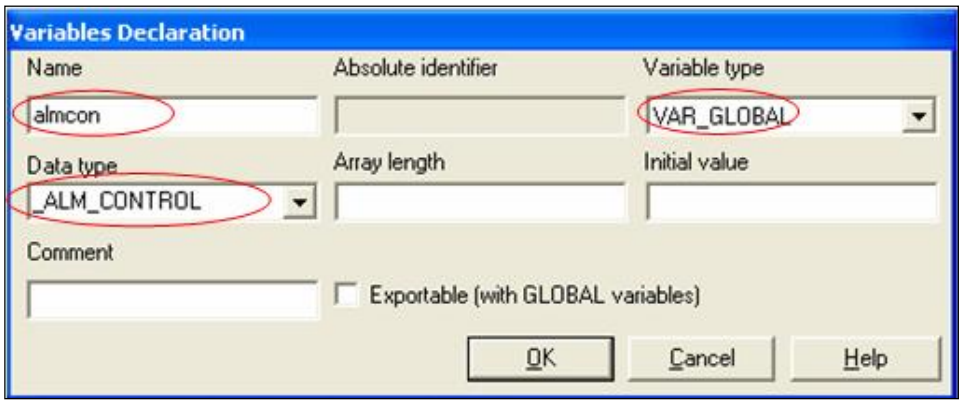
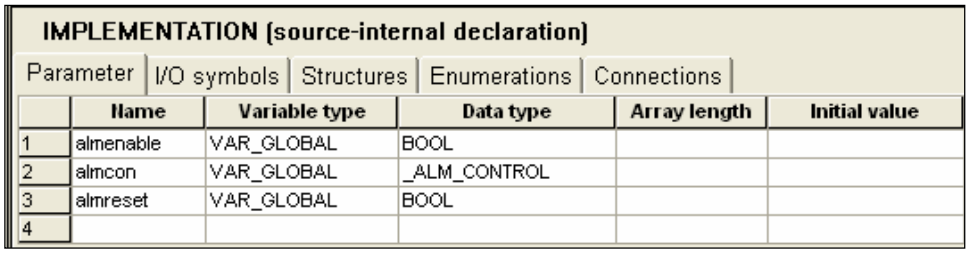


图15.

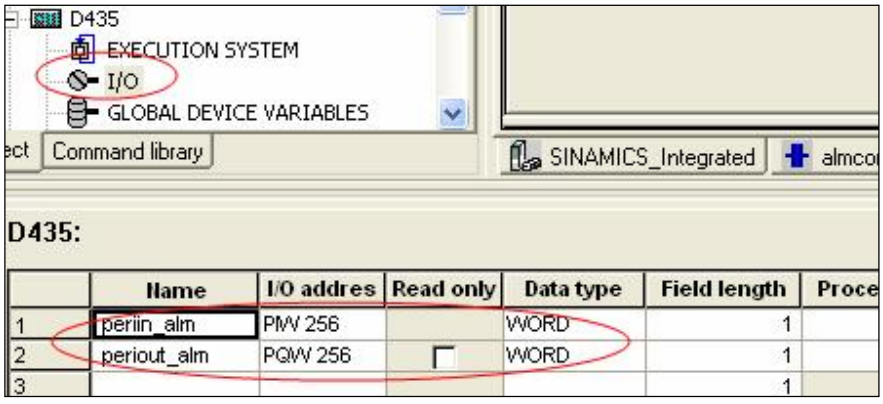
(3)在本程序单元中建立如下变量：



	Name	Variable type	Data type	Array length	Initial value
1	almenable	VAR_GLOBAL	BOOL		
2	almcon	VAR_GLOBAL	_ALM_CONTROL		
3	almreset	VAR_GLOBAL	BOOL		
4					

图16.

(4) 在I/O变量表中建立功能块的 periin 及 periout 的输入及输出地址变量，注意：PIW256 及 PQW256 分别为 ALM 的设备地址(见图9)。



	Name	I/O addres	Read only	Data type	Field length	Proce
1	periin_alm	PIW 256		WORD	1	
2	periout_alm	PQW 256		WORD	1	
3					1	

图17.

(5) 将输入及输出地址变量填写至功能块中，如图18。

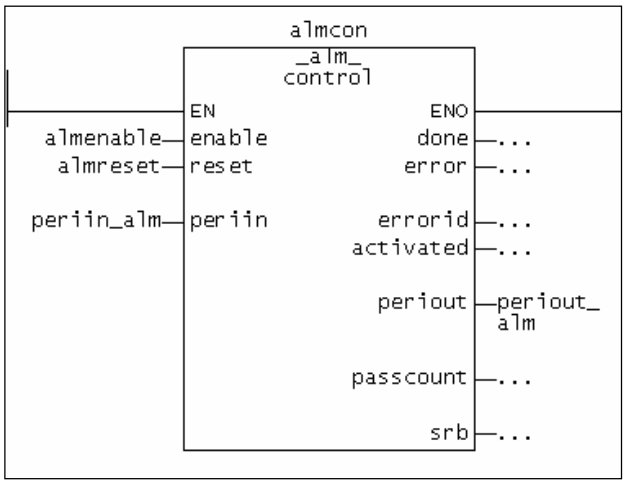


图18.

(6) 将程序分配至 BackgroundTask 中

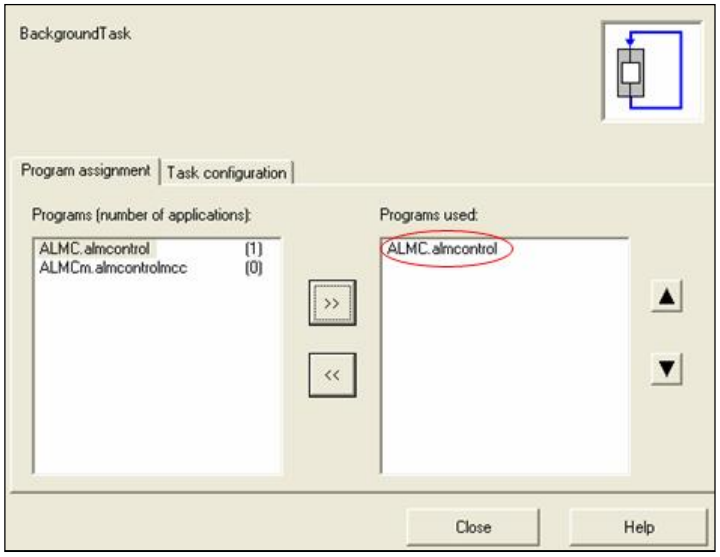


图19.

3. MCC 编程方式

(1) 建立 MCC 程序

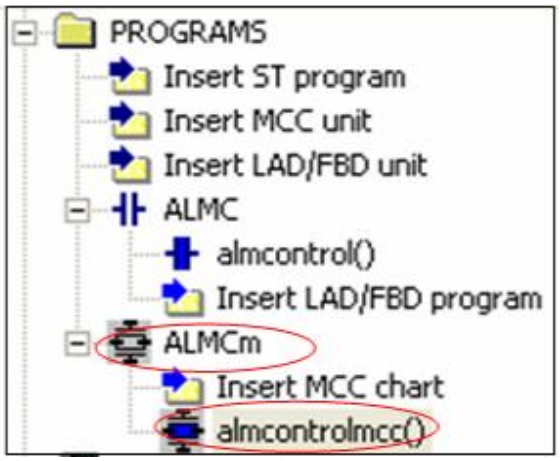


图20.

(2) 建立背景数据块

背景数据块的数据类型参看其 FB 块的 help 信息

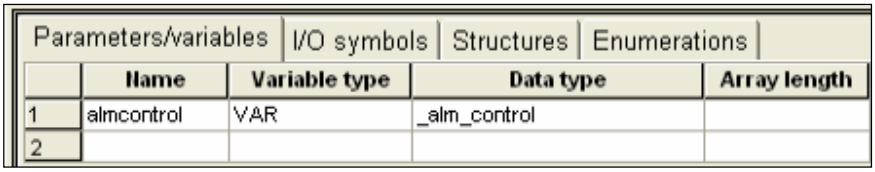


图 21.

(3) 在本程序单元中建立变量（见图 16）

(4) 在 I/O 变量表中建立功能块的 periin 及 periout 的输入及输出地址变量, 见图 17。

(5) 从 MCC 图标中将“system function call”拖入程序流程图中。

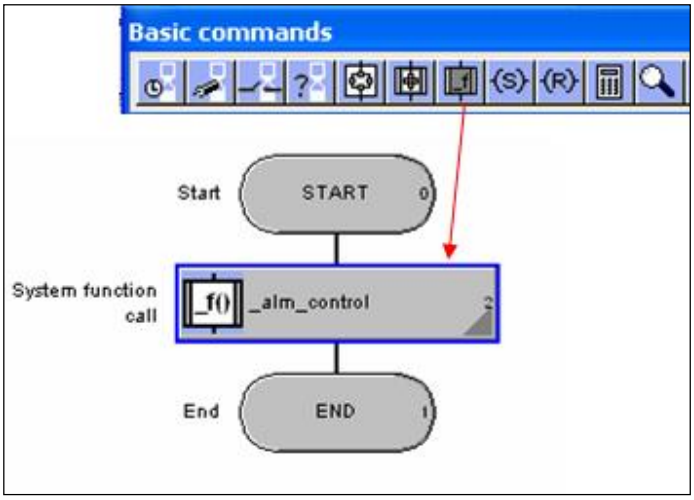


图 22.

(6) 填入 system function 及输入输出变量

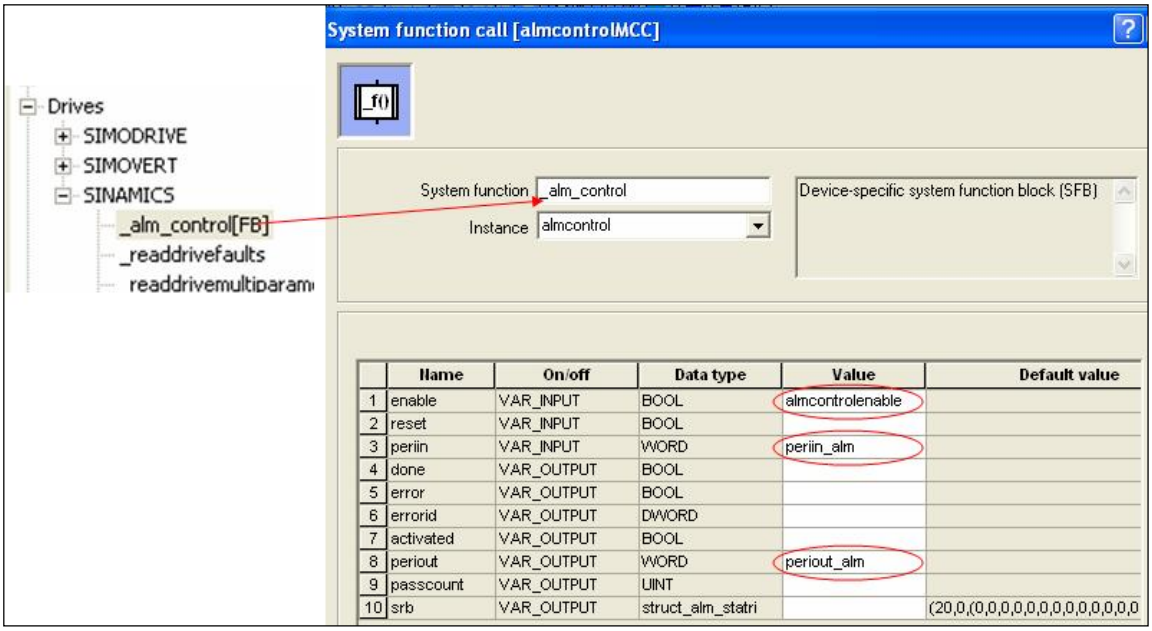


图 23.

(7) 将程序分配至 BackgroundTask 中

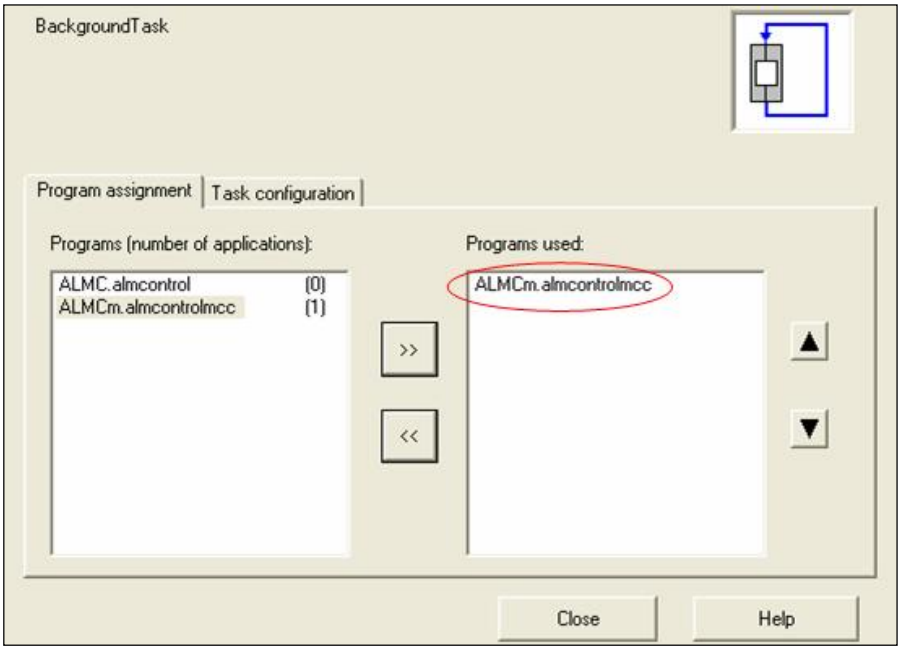


图 24.

4. ST 编程方式

(1) 建立 ST 程序

在 ST 程序单元“ E_ALMCtr ”中建立变量、背景数据块及程序。

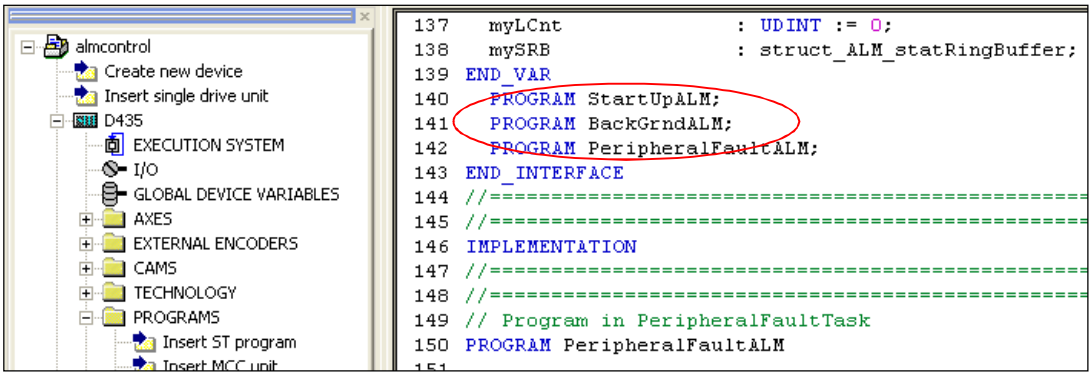


图 25.

(2) ALM 模块控制程序

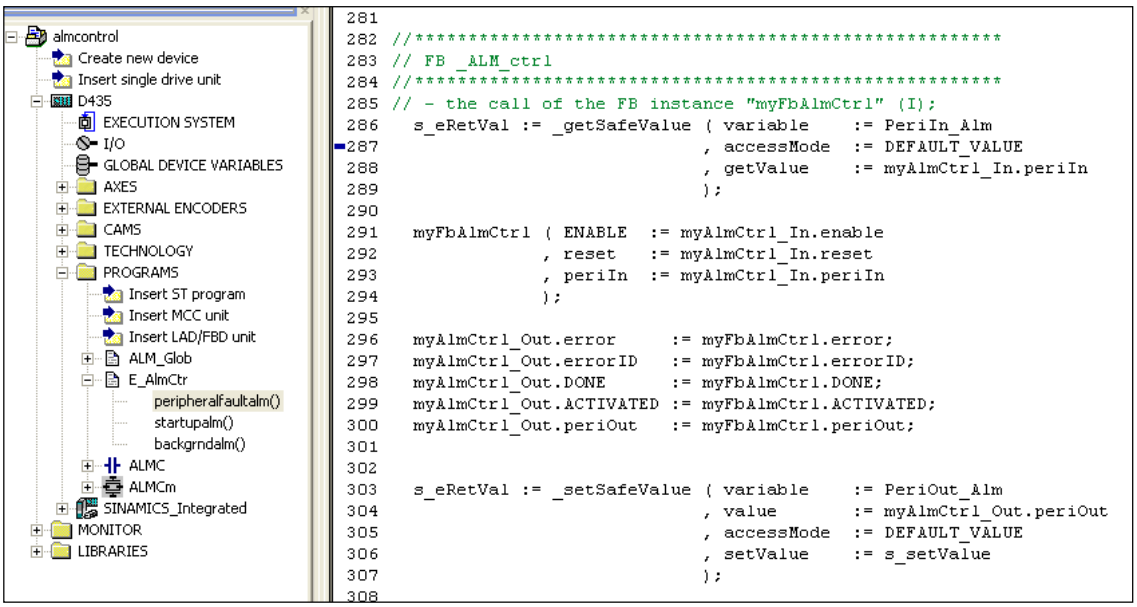


图 26.

(3)将程序分配至 BackgroundTask 中，方法同上。

5.ALM 控制功能块“ _ALM_control ”参数描述及控制时序图

Table 3-1 FB _ALM_control parameters

Name	Type	Data type	Default	Meaning
enable	IN	BOOL	FALSE	Enable/disable ALM TRUE = enable FALSE = disable
reset	IN	BOOL	FALSE	Acknowledge pending errors with rising edge
periIn	IN	WORD	0	Input variable for the ALM status word
done	OUT	BOOL	FALSE	Acknowledge **enable** for enable and disable. Signal present for a block call.
error	OUT	BOOL	FALSE	ALM error status TRUE = error during the request processing
errorID	OUT	WORD	0	Specification of the error For **error** = TRUE, the **errorID** parameter contains the error information (refer to the "Error messages" table)
activated	OUT	BOOL	FALSE	ALM status: TRUE = ALM enabled FALSE = ALM disabled
periOut	OUT	WORD	0	Output variable for the ALM control word

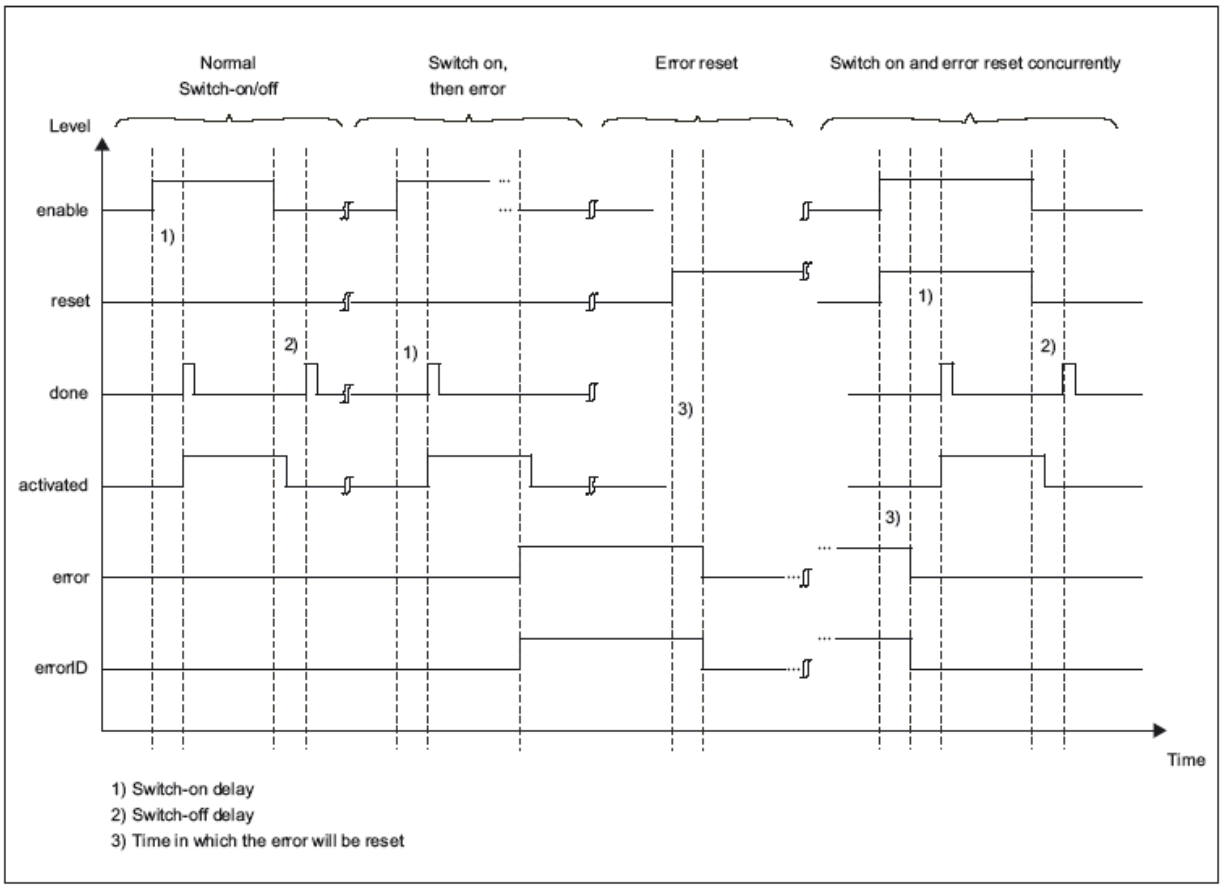


图 27.

功能描述：

(1) 当 ALM 模块无错误时，输入参数“ Enable ”的上升沿可激活 ALM 模块。当“ Enable ”从“ TRUE ”转换至“ FALSE ”时，ALM 模块处于非激活。

(2) 当出现错误时，输出参数“ error ”被置 1，错误必须通过输入参数“ reset ”的上升沿进行复位。当错误被成功确认后，ALM 模块才能由输入参数“ Enable ”的上升沿来重新激活。当 ALM 模块处于错误状态时不能由“ Enable ”的上升沿来激活，必须先对错误进行确认。

(3) 错误复位(reset)和使能(enable) 可以同时执行，当同时将“ enable ”和“ reset ”从“ FALSE ”变为“ TRUE ”时，功能块首先会对未决的错误进行复位，然后再使能 ALM 模块。

- 如果使用“ reset ”对错误已经进行确认并且无错误再出现，则 error = FALSE 且 errorID = 0。
- 如果错误仍然出现 error = TRUE 则 errorID 将被更新。

6．错误信息

当输出参数“ error ”为“ TRUE ”时，ALM 模块为错误状态。关于错误的详细描述参看“ errorID ”。

如果 ALM (errorID 2xxxx group)内部错误产生，用户必须通过适当的系统函数（如 _readDriveFaults）来获得准确的错误信息。详细描述可查阅“ System Functions/Variables list manual ”。

错误组：

错误可以被分配到下面的错误组：

Group 1xxxx: “ time-out ”出现。表示“ ALM ”模块对于“ _ALM_control ”功能块的请求没有响应或响应太迟。
Group 2xxxx: ALM 模块内部错误，状态字的“ Fault active ”位 = TRUE
Group 3xxxx: 在运行时，ALM状态字的"Control requested" 位复位。

注意：

关于 ALM 模块状态字及控制字的具体含义的描述请参看“ SINAMICS S120 Drive Functions ”手册，此手册包含在“ SIMOTION SCOUT ”光盘中。

错误信息：

Error No. (errorID)	Meaning
1xxxx	Time-out during the status transition of the ALM. • 000x < 10: specifies the status (S1…S4) that was not attained at the enable. • 00x0 > 10: specifies the status (S1…S4 x 10) that was not attained at the disable. **Examples:** 10002: During the enable, the ALM did not attain the S2 status or attained it too late. 10030: During the disable, the ALM did not attain the S3 status or attained it too late.
2xxxx	The ALM reports an internal fault using the "Fault active" bit of the status word. • xxxx specifies the status number of the ALM that is to be attained currently. • 000x < 10: specifies the state (S1…S4) for which before being attained at the enable the error was signaled. • 00x0 > 10: specifies the state (S1…S4) for which before being attained at the disable the error was signaled. • 0040 = 40: the fault was signaled in the S4 state. **Examples:** 20002: During the enable, the ALM has not yet attained the S2 state and a fault was signaled. 20030: During the disable, the ALM has not yet attained the S3 state and a fault was signaled. **Note:** The user must use the appropriate system functions, e.g. **_readDriveFaults**, to fetch the exact fault cause.
30000	For a rising edge for **enable**, the "Control requested" bit in the status word of the ALM was **FALSE**. This means that the command could not be performed.
3xxxx	The ALM has reset its "Control requested" bit in the status word during operations. The FB revokes all its bits in the status word and is waiting for new commands. • xxxx specifies the status number of the ALM that is to be attained currently. • 000x < 10: specifies the state (S1…S4) for which before being attained during the enable the above bit was revoked. • 00x0 > 10: specifies the state (S1…S4 x 10) for which before being attained during the disable the above bit was revoked. • 0040 = 40: the above bit was revoked in the S4 status. **Examples:** 30002: During the enable, the ALM has not yet attained the S2 status and the "Control requested" bit was revoked. 30030: During the disable, the ALM has not yet attained the S3 status and the "Control requested" bit was revoked.
40001	For a rising edge for **reset**, the "Control requested" bit in the status word of the ALM was **FALSE**. This means that the command could not be performed.
40002	For a rising edge of **reset**, the ALM has not reset the "Fault active" bit in the status word although the "Acknowledge fault" bit in the status word was set. **Note:** The user must use the appropriate system functions, e.g. **_readDriveFaults**, to fetch the exact fault cause.

图 28.

五、示例程序

本示例程序包含了控制模块的三种语言编程方式。在 ST 程序示例中给出了包括初始化、模块控制、错误处整等完整的 ALM 模块控制程序，仅供用户参考。

示例程序请参考附带文件：almcontr.rar。