



APG1505模块与三菱FX5U 系列PLC的连接应用

# 关键词: CC-LINK IE FB, APG1505 , FX5U,



# 修订记录

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### 1. 瑞天变频器modbusRTU通讯介绍

驱动器提供RS485通信接口,并支持Modbus-RTU从站通讯协议。用户可通过计算机 或PLC实现集中控制,通过该通讯协议设定驱动器运行命令,修改或读取功能码参数,读 取驱动器的工作状态及故障信息等。

1.1设置变频器的启停信号的来源

该驱动器的启停控制命令有3个来源,分别是面板控制、端子控制、通讯控制,通过功能参数 P0-02,选择采用通讯控制MODBUS-RTU。

1.2通讯启停控制

Pd-00设置通讯速率为9600bps;

Pd-01设置奇偶校验,设8个数据位,无校验,1个停止位;

Pd-02设置本机地址,设成1;

Pd-03设置应答延时间,设2ms;

Pd-04设通讯超时,设0s;可以将通讯超时时间(Pd-04)功能码设定为非0的数值,即 启动了通讯超时故障后,驱动器自动停机的功能,可避免因通讯线故障,或上位机故障而 导致的驱动器不受控运行。在一些应用中可开启这个功能。

Pd-05设传输格式, : 设成标准的 Modbus 协议。

1.3Modbus通讯地址部分介绍

1000H:写入的通信设定频率(10进制)。通信设定值是相对值的百分数,10000对应 100.00%,-10000对应-100.00%。对频率量纲的数据,该百分比是相对最大频率(P0-10)的 百分数;对转矩量纲的数据,该百分比是P2-10。

1001H:运行频率地址

2000H:控制命令输入到驱动器(只写),该值为0001表示正转运行。

## 2.模块参数及IP地址配置

2.1 LAEConfig软件界面介绍



2.2 扫描网络中的硬件

点击 扫描模块按钮,设置需要扫描的IP地址范围(在显示区中),并且是电脑的网 络IP参数要与设置的在同一网段内。点击"开始"进入扫描阶段。就会在设置的IP范围内,把扫描 上来的模块显示出来。

LA_Config			
	<ul> <li>⊥ 100</li> </ul>	? 🖂 🖬	
APG1505(192.168.0.3)	Product ing	Scanning module     Net     Local I 192.168.0.205     IF Range: 192.168.0     USB     COMI1 (SEGGER JLink CDC)	2 2 3 192.108.0.5 UART Port) ~
	Dasic Settings Modbus配置 Message monitor	mone Baudrate Comm PollMode	4     Scan     stop       Modbus as Master     >       9600     >       8 Data, None Parity, 1 >       Interval     >

2.3修改模块的IP地址

点击工具栏中的 按钮,点击全局扫描,选中IP地址进行修改,点击修改IP地址。进入分配IP地址的过程,分配是否成功可以在后面的状态列中显示出来。



## 安如下通信参数设置,关键是要与变频器参数设置一致

设置静态IP,模式设为modbus主站;通讯速率为9600bps;设8个数据位,无校验,1个停止位;交换高低字节;

C APG1505		
基本设置	IP地址分配方式	静态IP~
基本设置 todbus配置	IP地址分配方式 模式*	静态IP ~ Wodbus as Master ~
基本设置 todbus配置 通讯监控	IP地址分配方式 模式* 波特率	静态IP ~ Modbus as Master ~ 9600 ~
基本设置 (odbus配置 通讯监控	IP地址分配方式 模式* 波特率 通信参数	静态IP ~ Modbus as Master ~ 9600 ~ 8 Data, None Parity, 1~
基本设置 iodbus配置 通讯监控	IP地址分配方式 模式* 波特率 通信参数 通信方式*	静态IP ~ Modbus as Master ~ 9600 ~ 8 Data, None Parity, 1~ 相同间隔 ~
基本设置 odbus配置 通讯监控	IP地址分配方式 模式* 波特率 通信参数 通信方式* 超时时间	静态IP ~ Modbus as Master ~ 9600 ~ 8 Data, None Parity, 1~ 相同间隔 ~ 500ms ~
基本设置 odbus配置 通讯监控	IP地址分配方式 模式* 波特率 通信参数 通信方式* 超时时间 轮询时间	静态IP ~ Modbus as Master ~ 9600 ~ 8 Data, None Parity, 1~ 相同间隔 ~ 500ms ~ 200ms ~

具体通讯如下:

功能码1,设置端口1,06写单个寄存器,寄存器地址为4096 (1000H=4096)运行频率; 功能码2,设置端口1,06写单个寄存器,寄存器地址为8192 (2000H=4096)运行方式; 功能码3,设置端口1,06读保持寄存器,寄存器地址为4097 (1001H=4097)当前频率;

在参数设定区设定模块参数。设置完成之后点击

LA_Config				
	ŝ ? Z 🖬			
APG1505(192.168.0.3) 3 () () () () () () () () () ()				
			0+#PC1505(CCLT	MK IF FR-PTH Mactor 図学)
- 基本设	置 从机地址 功能码	客存器地址 数据长度		IL ID NIC MASCEL MIX
Modbusž	1 1 06 写単个寄存器 ▼	4096 1	34	
通讯监	· 注 2 1 06 写单个寄存器 ▲	8192 1	56	
	3 1 03 读保持寄存器	4097 1	34	
		2		

### 3.APG1505原理概述

三菱FX5U系列 PLC可以通过cc-link IE FB 通信连接APG1505,通过添加APG1505网关 模块,即可通过简易连接进行网关控制。

◆模块支持 Modbus RTU 之 485 从站通讯。

◆模块支持 Modbus RTU 之 485 主站通讯。

3.1接线端子定义

引脚	信号	描述
1	TR1	终端电阻选择接线
2	DA	接收/发送数据,线 A(红色)
3	DG	数据地
4	DB	接收/发送数据,线 B(红色)
5	TR2	终端电阻选择接线

3.2状态寄存器

status 为网关的状态寄存器定义如下:

Bit: 7	Bit: 6	Bit: 5	Bit: 14	Bit: 0
保留	接收错误	超时	错误码	运行状态

关于 Bit: 1...4 的错误码说明

Bit: 4	Bit: 3	Bit: 2	Bit: 1	10 进制表示	描述
0	0	0	0	0	无错误
0	0	0	1	1	非法注册地址
0	0	1	0	2	非法参数
0	0	1	1	3	接收数据错误
0	1	0	0	4	发送超时错误
0	1	0	1	5	主机现在正忙
0	1	1	0	6	执行函数错误

3.3控制寄存器

control 是网关的控制寄存器, 定义如下:

Bit: 37	Bit: 2	Bit: 1	Bit: 0
保留	复位网关	错误清楚	启动 / 停止

### 4.调试环境

-三菱GX-WORKS3软件

-LA-config软件

## 5.技术实现

5.1硬件连接

1.正确连接三菱FX5U系列 PLC与APG1505模块的电源。

2.将测试对象 PLC 的RJ45接口,通过专用以太网电缆接入到远程 IO 模块的以太网口上。

3.用LA-config软件,通过RJ45接口,扫描下载参数。

4.APG1505的DA连接到变频器的A+上, APG1505的DB连接到变频器的B-上



## 5.2新建工程

打开GX Words 3软件,菜单栏中选择"工程""新建",选择PLC系列以CPU机型,在此以5U系列的CPU 为例,如图 所示。

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MELSOFT GX Works3	- D X
Project Edit Find/Replace Convert View Online Debug Recording Diagnostics Tool Window Help	
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2	

# 5.3 CC-Link IE Feild Basic参数设置

在左侧导航窗口中选择参数/FX5UCPU/模块参数/以太网端口,如图所示

MELSOFT GX Works3 C:\Use	ers\latcos\Documents\FX5U\DIDQ308802HC.gx3 - [Module F	'arameter Ethernet Port]		- 0 X
Project Edit Find/Replace	e Convert View Online Debug Recording Diagnostic	s Tool Window Help		_ & ×
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1299 C == # # # 2	: '' :::::::::::::::::::::::::::::::::	-		
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🚰 FB/FUN	🕀 😋 Basic Settings	IP Address	192.168.0.10	
🛚 🇯 Label	⊕ Im Application Settings     ■	- Subnet Mask	255.255.255.0	
🛚 🛗 Device		Commission Date Code	192.108. 0.200	
🖬 🚱 Parameter		- Communication Data Code	DINALÀ	
🔮 System Parameter		To lies or Not to lies OC-Link IEE Basic Setting	Tee	
FX5UCPU		- Network Configuration Settings	(Detailed Setting)	
CPU Parameter		Refresh Settings	(Detailed Setting)	
Kodule Paramet		BODBUS/TCP Settings		P F H M II
10 485 Serial Port		To Use or Not to Use MODBUS/TCP Setting	Not Used	
High Speed I/C		- Device Assignment	<detailed setting=""></detailed>	Input the Configurat # ×
Input Response		External Device Configuration		
🧬 Analog Input		- External Device Configuration	<detailed setting=""></detailed>	
🦸 Analog Output		Explanation		
🧬 Expansion Boar		Set the information of the own node such as IP add	iress.	
📓 Memory Card Pa				
🙆 Module Informatio				
🙀 Remote Password				
				~
	Iten List Find Result	Check Settings		
			Appl	У
	Progress			
	3			~
				~
Connectio Savigation	🔲 Output 🕮 Progress			
			FX5U Host	大写 数字

## 设置PLC主站的IP地址及子掩码,如图所示。

MELSOFT GX Works3 C:\Us	ers\latcos\Documents\FX5U\DIDQ308802HC.gx3 - [Module	Parameter Ethernet Port]		- 0 X
Project Edit Find/Replace	Convert View Online Debug Recording Diagnostic	cs Tool Window Help		- 8 3
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Navigation 🛛 🕮 🗸	뿹 ProgPou [PRG] [Local 🧧 ProgPou [PRG] [LD] 1S	🗧 📅 1 [Device/Buffer Mem 🛛 🛱 2 [Device/Buffer Mem	n 🛛 🖧 Module Parameter Eth 🗡	💶 🔍 👻 Element Selection 🛛 🕸
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Module Configuratic		Own Node Settings		1 STAN
🛚 🚾 Program	9 <u>e</u> 8z	E IP Address	2	Display Target:
😰 FB/FUN	🖶 🙋 Basic Settings	- IP Address	192.168.0.10	
🛚 ն Label	- Ovn Node Settings	Subnet Hask	255.255.255.0	
🛚 🚰 Device	- MODBUS/TCP Settings	- Default Gateway	192.168. 0.200	
🖩 🚱 Parameter	External Device Configuration	Communication Data Code	Binary	
🧬 System Parameter	Brom Application Settings	To Hen or Not to Hen O'-Link HE Bacic Sotting	Inc	
E C2 FX5UCPU	1	- Network Configuration Settings	(Detailed Setting)	
CPU Parameter	<b>1</b>	Refresh Settings	(Detailed Setting)	
E Module Paramet		BODBUS/TCP Settings		
# 485 Serial Port		- To Use or Not to Use MODBUS/TCP Setting	Not Used	F   1   Wi   Li
D High Speed I/C		Device Assignment	<detailed setting=""></detailed>	Input the Configurat 7 >
Input Response		External Device Configuration		
Analog Input		- External Device Configuration	<detailed setting=""></detailed>	
🖸 Analog Output		Tenlanation		
🔮 Expansion Boar		Set to determine how many bits of the IP address a	are used as the network address, which is used to identify the network.	
📕 Memory Card Pa		Masked bit has been specified from top between the	e top bit and bit 2. Her 24 hits of TP address to the subnet week	
🙆 Module Informatio		[Setting range]	es et bite vi il dudecco to the sublet much.	
🌆 Remote Password		- Empty - 0.0.0.1 to 255.255.255.255 (in decimal)		
				$\checkmark$
	a state Find Paula	Check Cetting		
	Item List Find Result	Settings		

\_\_\_\_\_

设置好主站地址及子掩码后,在 CC-Link IE Field Basic设置窗口中勾选"USE" CC-Link IE Field Basic,设置网络配置设置,如图所示。

Ation * * Ation * Ati	A ProgPou [PRG] [Local      Setting Iten List      Input the Setting Iten to	Recording Digits	. The second sec	em 🖤 2 (Device/Buffer Me	ØØ₽ Max: ▼	<b>*</b> .	
pation + × Configuratic Program B/FUN Label Device	Composition of the setting Item to	ProgPou [PRG] [LD] 1S.	Setting Iten	em 🖓 2 (Device/Buffer Me		-	
and in the second secon	The ProgPou (PRG) (Local Setting Iten List Input the Setting Iten to	ProgPou (PRG) (LD) 1S.	🗣 1 [Device/Buffer M	em 🖓 2 [Device/Buffer Me			
All oject Module Configuratic Program B/FUN Label Device	Setting Iten List Input the Setting Iten to		Setting Iten		P Module Parameter Eth X	d b ,	Element Colection
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rogram 3/FUN abel evice	Der Der		IP Address				THE MENT
abel	TE BA		IP Address		192, 168, 0, 10 2		Display Target:
evice	- Ovn Node Settings		Subnet Hask		255 . 255 . 255 . 0		
· · · · · · · · · · · · · · · · · · ·	- CC-Link IEF Basic	Settings	🗌 🗌 Default Gatewa	/	192.168.0.200		
rameter	External Device Co	nfiguration	Communication Da	ta Code	Binary		1
ystem Parameter	🗄 🌆 Application Settings		CC-Link IEF Basic	Settings			
X5UCPU			To Use or Not to	Use CC-Link IEF Basic Settin	ug Use	1	
CPU Parameter	1		- Network Configur	ation Settings	<detailed setting=""></detailed>	1	
Module Paramet	l	•	- Refresh Settings		<pre></pre>		
B Ethernet Port			To Use or Not to	Hee MODRIIS/TCP Setting	Not lised		P F H M
485 Serial Port			Device Assignmen	t	<detailed setting=""></detailed>		Input the Configur
High Speed I/C			External Device C	onfiguration			
Analog Input			External Device	Configuration	<detailed setting=""></detailed>		
Analog Output							
note russword			- 0.0.0.1 to 255.25	.255.255 (in decimal)		~	
	Item List Find Result		Check	Restore the Derault Settings			
		etting iten	ton		Setting		-
		Own Node Settings					
		🕞 IP Address					
		IP Address		192.168.0.10			
		— IP Address — Subnet Mask		192.168.0.10 255.255.255.0			
		- IP Address - Subnet Mask - Default Gateway		192 . 168 . 0 . 10 255 . 255 . 255 . 0 192 . 168 . 0 . 200	3		
		IP Address Subnet Mask Default Gateway Communication Data Co	de	192.168.0.10 255.255.255.0 192.168.0.200 Binary	3		
		IP Address Subnet Mask Default Gateway Communication Data Co GC-Link HF Basic Sett	de i <b>ngs</b> T⊂=ink IME Rasic Setting	192.168.0.10 255.255.255.0 192.168.0.200 Binary	3		
		IP Address Subnet Mask Default Gateway Connunication Data Co 3CC-Link IKF Basic Sett To Use or Not to Use C Wetwork Configuratio	de ings CC-Link IEF Basic Setting m Settings	192.168.0.10 255.255.255.0 192.168.0.200 Binary Use (Detailed Satting)	3		
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		IP Address Subnet Mask Defailt Gateway Communication Data Co CC-Link IKF Basic Sett To Use or Not to Use ( <i>Refreeh Settings</i> MODBUS/TCP Settings	de i <b>ngs</b> DC-Link IEF Basic Setting <i>m Settings</i>	192.168.0.10 255.255.255.0 192.168.0.200 Binary Use (Detailed Setting) (Detailed Setting)	3		
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		<ul> <li>IP Address</li> <li>Subnet Mask</li> <li>Befault Gateway</li> <li>Commication Data Go</li> <li>CC-Link HFF Barie Sett</li> <li>To Use or Not to Use 0</li> <li>[Fotenck Configuration]</li> <li>NOBUS/TCP Settings</li> <li>DoBUS/TCP Settings</li> <li>DoBUS/TCP Settings</li> <li>Derice Arsigment</li> <li>External Derice Config</li> </ul>	de imgs w Setting w Setting WODBUS/TOP Setting uration	192 . 168 . 0 . 10 265 . 255 . 255 . 0 192 . 168 . 0 . 200 Binary Use (Detailed Setting) Not Used (Detailed Setting)	3		

手动添加模块,在CC-Link IE Field Basic配置窗口中,将右侧IO模块直接拖曳在下方的CPU组态中,更

改CC-Link IE Field Basic IP地址与模块地址一致,然后点击"反映设置并关闭"。



#### 5.4 IO映射配置

Item	Setting
Own Node Settings	
😑 IP Address	
IP Address	192.168.0.10
- Subnet Mask	255.255.255.0
Default Gateway	192.168.0.200
Communication Data Code	Binary
CC-Link IEF Basic Settings	
To Use or Not to Use CC-Link IEF Basic Setting	Use
Network Configuration Settings	<detailed setting=""></detailed>
Refresh Settings	<detailed setting=""></detailed>
TODBUS/TCP Settings	
To Use or Not to Use MODBUS/TCP Setting	Not Used
Device Assignment	<detailed setting=""></detailed>
External Device Configuration	
<ul> <li>External Device Configuration</li> </ul>	<detailed setting=""></detailed>
planation et the Refresh. he setting is necessary to transfer data automati ile register, and refresh data register). Is set the CC-Link IE Field Network Basic, it is r	cally between the link device (RX/RY/RWr/RWw) and CPU device (user device, ^ required to set the Network Configuration Settings and Refresh Setting.
Check Kestore the Delault Settings	

在CC-Link IE Field Basic配置窗口中,设置远程IO模块德输入输出的起始点位,如图所示。

CC-Link IE Field Basic输出点映射方式:每个从站占用64个点即64DI、64DO、32AI、32AO。此处设置 的输入输出点对应起始点为 X100, Y100, 寄存器输入输出点对应起始地址为D500, D600。

	Link Side	9					CPI	V Side			
Device Name	Points	Start	End		T	-	201100	Rano			Land .
RX	64	00000	0003F	+	Specify Devi	~	X	~	64	100	177
Y.	64	00000	0003F	+	Specify Devi	~	Y	~	64	100	177
Wr	32	00000	0001F	+	Specify Devi	~	D	~	32	500	531
RVv	32	00000	0001F	+	Specify Devi	~	D	~	32	600	631
xplanation											
xplanation Het the Refree He setting in He register o set the CC'	h. necessar and refi Link IE F	ry to tr esh dat 'ield Ne	ansfer a regis twork E	data ter). Sasic,	automatically it is requir	be	etween th to set t	ie link the Netw	device ork Con	(RX/RY/H figurati	Wr/RW .on Se

5.5 PLC的连接测试

WWW.LATCOS.CN

点击在线,连接到PLC,选择直连,选择本电脑的网卡,点击连接测试。



5.6诊断通讯状态

完成参数配置后,将工程下载到PLC后可通过在线诊断检测通讯状态,菜单栏中选择"诊断"CC-Link IE Field Basic诊断窗口中查看从站IO模块的状态,如图所示。

	ink <b>IE</b>	F ield Basic	Change	IP Address Display	Monitor St	atus	1	ſ
		Dasic	• DE	C OHEX		Monitoring	Start Monitoring	Stop Monitoring
Specify CPU	Target Module	e lule						
Master S	Station Statu	IS						
(Paramet Total Slav	er) ve Stations	1 IP A	ddress 192.168.0.	10 Error Co	No Error			Error Details
Networ	k Status							
- Rough	Diagnostics -							
Link Sca	an Time/Error	Stations						
Gro	pup No.1	Present Present	3 ms 4aximum	4 ms	Minimum	1 ms	Error Stns: 0 Un	fixed Stns: 0 
Gro	oup No.3	Present	ms Maximum	ms	Minimum	ms		
6	aun No 4				_			
Gro	50p 190.4	Present	- ms 4aximum	ms	Minimum	ms		
– Detailed Diagnosti	d Diagnostics - ics Target Gro	Present oup Group No.1	IP Address	Transmission Sta	Disconnections	Time-out Co	The Latest Frror	Error Details
Gro – Detaileo Diagnosti Station 1	d Diagnostics - ics Target Gro	Present oup Group No.1 Reserved Station No Setting	IP Address 192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0	Time-out Co	The Latest Error No Error	Error Details
Gro — Detaileo Diagnosti Station 1	d Diagnostics - ics Target Gro Occpd Stns 1	Present Group No.1 Reserved Station No Setting	IP Address 192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0	Time-out Co 0	The Latest Error No Error	Error Details
Gro — Detaileo Diagnosti Station 1 	d Diagnostics	Present up Group No.1 Reserved Station No Setting 	IP Address 192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0 	Time-out Co 0 	The Latest Error No Error	Error Details
Gro — Detaileo Diagnosti Station 1  	d Diagnostics ics Target Gro . Occpd Stns 1  	Reserved Station No Setting	IP Address           192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0  	Time-out Co 0  	The Latest Error No Error 	Error Details Error Detail
Gro – Detailer Diagnosti Station 1 	d Diagnostics ics Target Gro . Occpd Stns 1  	Present Group No.1 Reserved Station No Setting	IP Address 192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0   	ms	The Latest Error No Error  	Error Details / Error Detail
Gro – Detailer Diagnosti Station 1    	d Diagnostics ics Target Gro . Occpd Stns 1   	Present up Group No.1 Reserved Station No Setting 	IP Address 192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0   	ms	The Latest Error No Error	Error Details / Error Detail
Gru — Detailer Diagnost Station 1     	d Diagnostics ics Target Gro . Occpd Stns 1    	Present	IP Address     192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0   	ms	The Latest Error No Error   	Error Details Error Detail
Gro Detailer Diagnost Station 1        	d Diagnostics ics Target Gro Occpd Stns 1    	Present	IP Address           192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0	ms	The Latest Error No Error       	Error Details
Gro — Detaileo Diagnost Station 1   	d Diagnostics ics Target Gro Coccpd Stns 1   	Present	IP Address           192.168.0.3	Transmission Sta Transmitting Transmittin	Minimum Disconnections 0	ms	The Latest Error No Error       	Error Details
Gru — Detailer Diagnost Station 1  	d Diagnostics	Present	IP Address           192.168.0.3	Transmission Sta Transmitting	Minimum Disconnections 0	ms	The Latest Error No Error       	Error Details Error Detail 
Grit — Detailer Diagnost Station 1  	d Diagnostics	Present           up         Group No.1           Reserved Station           No Setting	IP Address           192.168.0.3 <tr< td=""><td>Transmission Sta Transmitting</td><td>Minimum Disconnections 0</td><td> ms</td><td>The Latest Error No Error       </td><td>Error Details.</td></tr<>	Transmission Sta Transmitting	Minimum Disconnections 0	ms	The Latest Error No Error       	Error Details.

## 6. 创建程序

Y100置一是使能网关;

X100是寄存器的状态。

D500表示变频器的当前频率其值为2500,即25hz。

D600表示变频器要设的频率这里设5000对应25hz, D601赋值1表示正传启动。











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