HAPN-HPVFV frequency inverter
Modbus RTU Communication protocol
User manual

V3.0302

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Profile

The manual is special for Modbus RTU communication of low voltage HPVFV frequency inverter.

Technical specification:

1. RS-485 interface

2. Half duplex communication

3. Support 2400, 4800, 9600, 19200 bps

4. Format
   1) Initial bit: 1
   2) Data bit: 8
   3) Parity bit: 1 (able/disable)
   4) Stop bit: 1 (2 bits if disable parity bit)

Response time:
   Normal response time: 30mSec.< t <100mSec.
   Long response time: 100mSec.< t <1000mSec.

Wiring and Setting

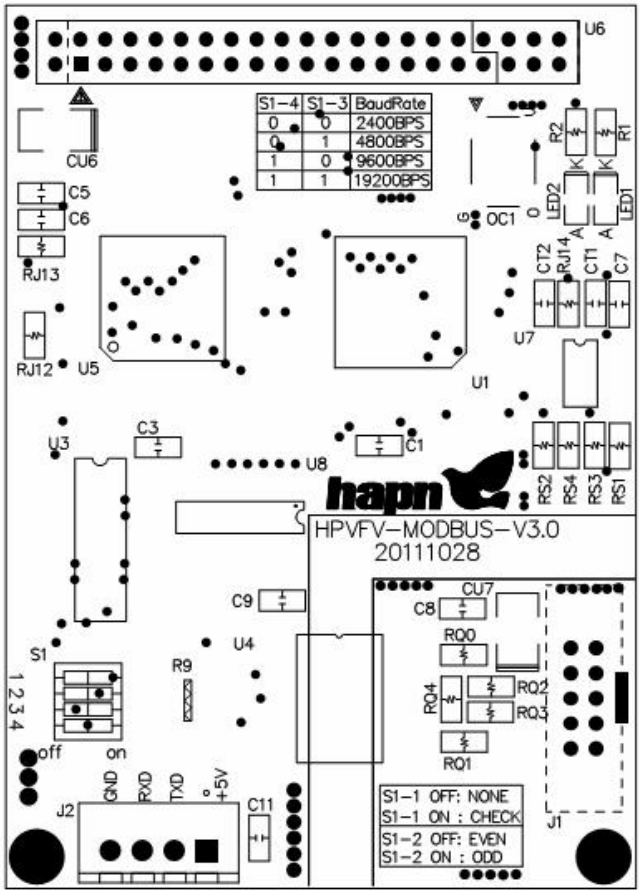

Figure 1. Modbus RTU circuit board

1. Parity bit setting
Set parity bit through DIP/S1 switch:

Set S1-1 as OFF, no parity bit.
Set S1-1 as ON, parity bit activated, the type be up to S1-2.
Set S1-2 as OFF, parity bit as even check.
Set S1-2 as ON, parity bit as odd check.

2. Bit rate setting

Set bit rate through DIP switch

S1-4	S1-3	Bit rate
OFF	OFF	2400
OFF	ON	4800
ON	OFF	9600
ON	ON	19200

3. Communication activate

Parameter	Menu display	Set	Description
P27.0	PB_Connect	[0]Disable [1]Enable	0- disable 1- able

4. Sub-station define

Parameter	Menu	Set	Description
P27.1	Station_No	0~127	Modbus RTU

Note: The products does not support broadcast commands.

The number of sub-station does not define to 0.

5. Communication fault

Parameter	Menu	Set	Description
P27.2	PB_Err_Act	[0]Normal STOP [1]E-STOP [2]Free-RUN [3]IGNORE	When communication fault

6. The delay time of communication fault

Parameter	Menu	Set	Description
P27.3	PB_Err_Dly	1ms-3000mS	The delay time when communication fault

7. Input data setting

Parameter	Menu	Set	Description
P27.4	PB_DI_Cfg	1-16Words 16Word	Data exchange bit 16

8. Output data setting

Parameter	Menu	Set	Description
P27.5	PB_DO_Cfg	1-16Words 16Word	Data exchange bit 16

9. Output data 1. Data connection setting

Parameter	Menu	Set	Description
P27.6	PB_DO[1]	as figure	Output data set 1 (Modbus address 30001) Data connection

10. Output data 1. Data connection setting

Parameter	Menu	Set	Description
P27.7	PBDO1_Scl	[0]Percent[%] [1]Actual	Output data set 1(Modbus address 30001)Data

Note: when chose the data as [%], output data should be X10.
For example: output data as 1234(dec), means 123.4%

Data setting

11. Output 2~16 data connection setting

Parameter	Menu	Set	Description
P27.8	PB_DO[2]	As figure	Output data bit setting 2~16 (Modbus address 30002~30016)
P27.10	PB_DO[3]		
P27.12	PB_DO[4]		
P27.14	PB_DO[5]		
P27.16	PB_DO[6]		
P27.18	PB_DO[7]		
P27.20	PB_DO[8]		
P27.22	PB_DO[9]		
P27.24	PB_DO[10]		
P27.26	PB_DO[11]		
P27.28	PB_DO[12]		
P27.30	PB_DO[13]		
P27.32	PB_DO[14]		
P27.34	PB_DO[15]		
P27.36	PB_DO[16]		

12. Output 2~16 data connection setting

Parameter	Menu	Set	Description
P27.9	PBDO2_Scl	[0]Percent[%]	Output data bit setting 2~16 (Modbus address 30002~30016)
P27.11	PBDO3_Scl	[1]Actual	
P27.13	PBDO4_Scl		
P27.15	PBDO5_Scl		
P27.17	PBDO6_Scl		
P27.19	PBDO7_Scl		
P27.21	PBDO8_Scl		
P27.23	PBDO9_Scl		
P27.25	PBDO10_Scl		
P27.27	PBDO11_Scl		
P27.29	PBDO12_Scl		
P27.31	PBDO13_Scl		
P27.33	PBDO14_Scl		
P27.35	PBDO15_Scl		
P27.37	PBDO16_Scl		

Data Setting

13. Control word 1 data connection setting

Parameter	Menu	Set	Description
P27.38	CtrlWord1	[0]Not Used [1]PB Drive Input 1 ~ [16] PB Drive Input 16	Control word setting 1 (Modbus address 00001~00016) Data connection

14. Control input 2 data connection setting

Parameter	Menu	Set	Description
P27.39	CtrlWord2	[0]Not Used [1] PB Drive Input 2 ~ [16] PB Drive Input 16	Control word setting 2 (Modbus address 00017~00032) Data connection

15. Control input 3 connection setting

Parameter	Menu	Set	Description
P27.40	CtrlWord3	[0]Not Used [1] PB Drive Input 3 ~ [16] PB Drive Input 16	

Note:
When Ctrl Word 1~3 connect with PB Drive Input directly, the digital input interface is invalid.

Note:
After program, have to shut down and re-start the power to activate the new setting.

MODBUS RTU FUNCTIONS

HPVFV supports Modbus RTU functions as:

Code	Operation register	Function	Operation
01	00001~00032	Read the coil status	Read PB_DRIVE_IN1..2 data
02	10001~10032	Read input status	Read PB_DO1..2 data
03	40001~40016	Read holding register	Read PB_DRIVE_IN1..16 data
04	30001~30016	Read input register	Read PB_DO1..16 data
05	00001~00032	Force single coil status	Force PB_DRIVE_IN1..2 bit
06	40001~40016	Set single holding register	Set PB_DRIVE_IN1..16 bit
08	-	Analyze	Check communication
15	00001~00032	Force multi coils status	Force PB_DRIVE_IN1..2 multi bit
16	40001~40016	Set multi holding registers	Set PB_DRIVE_IN1..16 multi bit

Note:

1) PB_DRIVE_IN1、PB_DRIVE_IN2 read/write able.
2) PB_DO1、PB_DO2 read only.
3) 00001~00032 & 40001、40002 same effect in drive operating.
4) 10001~10032 & 30001、30002 same read result from drive.

Example of parameter setting

A. Output data setting

1、PB_DO1 set as status word 1 (ST_WORD1) . Know the ST_WORD1 concatenated coding from link list as 64

Set P27.6=64, P27.7=Actual on menu

2、PB_DO2 set as status word 2 (ST_WORD2) . Know the ST_WORD1 concatenated coding from link list as 65

Set P27.8=65, P27.9=Actual on menu

3、PB_DO3 set as (Digital Inputs) .

Know Digital Inputs concatenated coding as 63

Set P27.10=63, P27.11=Actual on menu

4、PB_DO4 set as (Error Code) .

Know the Error Code concatenated coding as 62

Set P27.12=62, P27.13=Actual on menu

5、PB_DO5 set as (Output Frequency)

Know Output Frequency concatenated coding from link list as 85

Set P27.14=85, P27.15=Actual on menu

6、PB_DO6 set as (Output Current)

Know Output Current (rms) concatenated coding from link list as 97

Set P27.16=97, P27.17=Actual on menu

7、PB_DO7 set as (Output Voltage)

Know Output Voltage (rms) concatenated coding from link list as 98

Set P27.18=98, P27.19=Actual on menu

8、PB_DO8 set as (Line Voltage)

Know Line Voltage (rms) concatenated coding from link list as 99

Set P27.20=99, P27.21=Actual on menu

9、PB_DO9 set as (Torque Output)

Know Torque Output concatenated coding from link list as 88

Set P27.22=88, P23.23=Actual on menu

10、PB_DO10 set as (Load Torque)

Know Load Torque concatenated coding from link list as 89

Set P27.24=89, P27.25=Actual on menu

11、PB_DO11 set as (DC-BUS Voltage)

Know DC-BUS Voltage concatenated coding from link list as 78

Set P27.26=78, P27.27=Actual on menu

12、PB_DO12 set as (Measured motor speed)

Know Measured motor speed concatenated coding from link list as 87

Set P27.28=87, P27.29=Actual on menu

13、PB_DO13 set as (Warning Code)

Know Warning Code concatenated coding from link list as 61

Set P27.30=61, P27.31=Actual on menu

14、PB_DO14 set as (Heat-sink Temperature)

Know Heat-sink Temperature concatenated coding from link list as 96

Set P27.32=96, P27.33=Actual on menu

Example of parameter setting

B. Control words
1. Set CtrlWord1 as PB_DRIVE_IN1 to activate PB_DRIVE_IN1 to control drives.
Set P27.38=1 on menu and P3.0=3 (Fieldbus)
2. Set CtrlWord2 as PB_DRIVE_IN2 to activate PB_DRIVE_IN2 to control drives and PID
Set P27.39=2 on menu
3. Activate PB_DRIVE_IN3 to control output frequency. Know PB_DRIVE_IN3 concatenated coding from link list as 44
Set P31.0=44 on menu and P3.1=3 (Free_Func)

C. Able communication to control and set sub-station serial number.
1. P27.0=1 able communication control
2. P27.1=6 set sub-station serial number as 6
3. P27.2=3 if communication fault, ignore
4. P27.4=16
5. P27.5=16

Note:
After program, have to shut down and re-start the power to activate the new setting.

Data

After above setting, define the data as below:

Input register:

<table>
<tr><td>Modbus address</td><td></td></tr>
<tr><td>30001</td><td>Status word 1
<table>
<tr><td>Byte(address)</td><td>Name</td><td>Description</td></tr>
<tr><td>0 (10001)</td><td>Ready</td><td>0->free 1->ready</td></tr>
<tr><td>1 (10002)</td><td>run/stop</td><td>0->stop 1->run</td></tr>
<tr><td>2 (10003)</td><td>Motor brake control</td><td>0->brake off 1->brake on</td></tr>
<tr><td>3 (10004)</td><td>Fault status</td><td>0->no fault 1->fault</td></tr>
<tr><td>4 (10005)</td><td>Alarm status</td><td>0->no fault 1->alarm</td></tr>
<tr><td>5 (10006)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>6 (10007)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>7 (10008)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>8 (10009)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>9 (10010)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>10 (10011)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>11 (10012)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>12 (10013)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>13 (10014)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>14 (10015)</td><td>Reserve</td><td>Programmable</td></tr>
<tr><td>15 (10016)</td><td>Reserve</td><td>Programmable</td></tr>
</table></td></tr>
<tr><td>30002</td><td>Status word 2
<table>
<tr><td>Byte(address)</td><td>Name</td><td>Description</td></tr>
<tr><td>0 (10017)</td><td>Alarm logic 1</td><td>0->no alarm 1->alarm</td></tr>
<tr><td>1 (10018)</td><td>Alarm logic 2</td><td>0->no alarm 1->alarm</td></tr>
<tr><td>2 (10019)</td><td>Alarm logic 3</td><td>0->no alarm 1->alarm</td></tr>
<tr><td>3 (10020)</td><td>Fault logic 1</td><td>0->no alarm 1->alarm</td></tr>
<tr><td>4 (10021)</td><td>Fault logic 2</td><td>0->no alarm 1->alarm</td></tr>
<tr><td>5 (10022)</td><td>Reserved</td><td>Programmable</td></tr>
<tr><td>6 (10023)</td><td>Reserved</td><td>Programmable</td></tr>
<tr><td>7 (10024)</td><td>Reserved</td><td>Programmable</td></tr>
<tr><td>8 (10025)</td><td>Reserved</td><td>Programmable</td></tr>
<tr><td>9 (10026)</td><td>Reserved</td><td>Programmable</td></tr>
<tr><td>10 (10027)</td><td>Reserved</td><td>Programmable</td></tr>
<tr><td>11 (10028)</td><td>Reserved</td><td>Programmable</td></tr>
</table></td></tr>
</table>

12 (10029)	Reserved	Programmable
13 (10030)	Reserved	Programmable
14 (10031)	Reserved	Programmable
15 (10032)	Reserved	Programmable

<table>
<tr><td>Modbus address</td><td></td></tr>
<tr><td>30003</td><td>Digital input
<table>
<tr><td>Byte</td><td>Name</td><td>Description</td></tr>
<tr><td>0</td><td>Ready</td><td>7# terminal status</td></tr>
<tr><td>1</td><td>Run/stop status</td><td>8# terminal status</td></tr>
<tr><td>2</td><td>Brake control</td><td>9# terminal status</td></tr>
<tr><td>3</td><td>Fault status</td><td>10# terminal status</td></tr>
<tr><td>4</td><td>Alarm status</td><td>11# terminal status</td></tr>
<tr><td>5</td><td>Reserved</td><td>12# terminal status</td></tr>
<tr><td>6</td><td>Reserved</td><td>13# terminal status</td></tr>
<tr><td>7</td><td>Reserved</td><td>14# terminal status</td></tr>
<tr><td>8</td><td>Reserved</td><td>15# terminal status</td></tr>
<tr><td>9</td><td>Reserved</td><td>user-defined</td></tr>
<tr><td>10</td><td>Reserved</td><td>user-defined</td></tr>
<tr><td>11</td><td>Reserved</td><td>user-defined</td></tr>
<tr><td>12</td><td>Reserved</td><td>user-defined</td></tr>
<tr><td>13</td><td>Reserved</td><td>user-defined</td></tr>
<tr><td>14</td><td>Reserved</td><td>user-defined</td></tr>
<tr><td>15</td><td>Reserved</td><td>user-defined</td></tr>
</table></td></tr>
<tr><td>30004</td><td>Fault code</td></tr>
<tr><td>30005</td><td>Output frequency=30005 / 100 Hz</td></tr>
<tr><td>30006</td><td>Output current=30006 / 10 A</td></tr>
<tr><td>30007</td><td>Output voltage=30007 / 10 V</td></tr>
<tr><td>30008</td><td>Power voltage = 30008 / 10V</td></tr>
<tr><td>30009</td><td>Output torque = 30009/10 Nm</td></tr>
<tr><td>30010</td><td>Motor torque = 30010/10 Nm</td></tr>
<tr><td>30011</td><td>DC bus line voltage = 30011/10 V</td></tr>
<tr><td>30012</td><td>Motor speed = 30012 rpm</td></tr>
<tr><td>30013</td><td>Alarm code</td></tr>
<tr><td>30014</td><td>Cooling temperature = 30014/10</td></tr>
<tr><td>30015..16</td><td>Reserved and programmable</td></tr>
</table>

Holding register:

Modbus address	
40001	Ref CtrlWord1 (address 00001-00016)
40002	Ref CtrlWord2 (address 00017-00032)
40003	Define 0-8192 (0x2000) answer 0-100%
40004…16	Programmable

Data address description

[68] Control word1

byte	Name	description
0	Run/stop ctrl	0->stop 1->run
1	Fwd/rev ctrl	0->fwd 1->rev
2	Driver	0->able 1->disable
3	Multi speed ctrl 0	0000-> disable 0001~1111 speed grade 1~15
4	Multi speed ctrl 1	
5	Multi speed ctrl 2	
6	Multi speed ctrl 3	
7	Fault reset	1->reset
8	Step run control	1->step run speed value =Jog_SetPt (P9.0)
9	Analogue input reference	
10	Analogue input control	0->AI 1 as ref 1->AI 2 as ref
11	External fault A	0->fine 1->fault
12	External fault B	0->fine 1->fault
13	Motor select	0->motor 1 1->motor 2
14	Motor brake	0->brake off 1->brake on
15		

[69] Control word 2

Byte	Name	Description
0	Ref+	0->stop 1->run
1	Ref-	0->fwd 1->rev
2	acc/dec bypass	0->disable 1->able
3	PID control able	
4	PID auto control	
5	PID gain select	
6	PID integral	

	reset	
7	Torque bypass	
8	Torque signal change	
9	Torque output 0	
10	Step run method	
11	Sub-unit run/stop status	
12		

[70]Control word 3
Undefined, programmable

[71]Control word 4

byte	name	Description
0	Synchronous control run	
1	Synchronous control fault reset	
8	RS232C run	
9	RS232C fault reset	
10	RS232C directional control	
14	Overall work	
15	Overall fault reset	