5 Ethernet/IP Communication Profile

5.1 Synchronous Parameter Access in Delta-specific Mode (Tables for Control Word and Status Word)

Table 1: 60xx Output Message (Host Controller→Drive) (Pr.09-30=1)

Bytes	Order	Address	Attribute	bit	Value	bit	User Rights	Speed Mode	Position Mode	Home Mode	Torque Mode	Notes
0	LSB	6000h	RW	0	0	CMD_ACT	4	fcmd=0	None	Stop Home	Tcmd=0	
					Pulse 0							
					1			fcmd=Fset(Fpid)			Tcmd=Test	Requires SERVO_ON=1
					Pulse 1				POScmd= POSset	Execute Home once		Requires SERVO_ON=1
				1	0	EXT_CMD1	4	FWD run command	Change when drive stops			
					1			REV run command	Immediate change			
				2	0	EXT_CMD2	4		Absolute movement			
					1				Relative movement			
				3	0	HALT	3	drive runs till target speed reaches	drive runs till target position reaches	Continue to return to home	Feed (Continue to run to target torque)	
					1			drive stops by declaration setting	Lock (drive stops at current position by declaration setting)	drive stops at current position by declaration setting	Lock (torque stops at current speed)	
				4	0	LOCk	4	drive runs till target speed reaches				
					1			frequency stops at current frequency				
				5	0	JOG	4	JOG OFF	JOG OFF	JOG OFF	JOG OFF	
					1							
					Pulse 1			JOG RUN	JOG RUN	JOG RUN	JOG RUN	
				6	0	QSTOP	2	None	None	None	None	
					1			Quick Stop	Quick Stop	Quick Stop	Quick Stop	
				7	0	SERVO_ON	1	Servo OFF	Servo OFF	Servo OFF	Servo OFF	
					1			Servo ON	Servo ON	Servo ON	Servo ON	
1	MSB			11–8	0000	GEAR	4	Main speed	Main position		Main torque	
					0001– 1111			1st–15th speed and frequency selection	1st–15th position selection			
				13–12	00	ACC/DEC	4	1st Acceleration time	1st Acceleration time			
					01			2nd Acceleration time	2nd Acceleration time			
					10			3rd Acceleration time	3rd Acceleration time			
					11			4th Acceleration time	4th Acceleration time			
				14	0	EN_SW	4	Multi-step command and	Multi-step command and		Multi-step command and	

Bytes	Order	Address	Attribute	bit	Value	bit	Speed Mode	Position Mode	Home Mode	Torque Mode	Notes
					1		acceleration/ deceleration time switching are not allowed	acceleration/ deceleration time switching are not allowed		acceleration/ deceleration time switching are not allowed	
							Multi-step command and acceleration/ deceleration time switching are allowed	Multi-step command and acceleration/ deceleration time switching are allowed		Multi-step command and acceleration/ deceleration time switching are allowed	
				15	Pulse 1	RST	4	Clear error code	Clear error code	Clear error code	Clear error code	
2	LSB	6001h	RW			Mode Cmd					
3	MSB										
4	LSB	6002h	RW			Velocity Cmd	Velocity Cmd	Speed command (without numbers)	Profile velocity (without numbers)	/	Profile velocity (without numbers)	
5	MSB										
6	LSB	6003h	RW								
7	MSB										
8	LSB	6004h	RW			Pos Cmd	Pos Cmd		Position command (with numbers)	/	/	
9	MSB										
10	LSB	6005h	RW								
11	MSB										
12	LSB	6006h	RW			Torq Cmd	Torq Cmd		/	/	Torque command (with numbers)	
13	MSB										
14	LSB	6007h	RW					Reserved	Reserved	Reserved	Reserved	
15	MSB										
16	LSB	6008h	RW					Reserved	Reserved	Reserved	Reserved	
17	MSB										
18	LSB	6009h	RW					Reserved	Reserved	Reserved	Reserved	
19	MSB										

Table 2: 61xx Input Message (Drive→Host Controller) (Pr.09-30=1)

Bytes	Order	Address	Attribute	bit	Value	bit	Speed Mode	Position Mode	Home Mode	Torque Mode	Notes
0	LSB	6100h	R	0	0	ARRIVE	Frequency command not reached	Position command not reached	Zero command unfinished	Torque command not reached	
					1		Frequency command arrival	Position command reached	Zero command completed	Torque command reached	
				1	0	DIR	FWD	FWD	FWD	FWD	
					1		REV	REV	REV	REV	
				2	0	WARN	No warning	No warning	No warning	No warning	
					1		Warning occurred	Warning occurred	Warning occurred	Warning occurred	
				3	0	ERROR	No error	No error	No error	No error	
					1		Error occurred	Error occurred	Error occurred	Error occurred	
				5	0	JOG	None	None	None	None	
					1		On JOG	On JOG	On JOG	On JOG	
				6	0	QSTOP	None	None	None	None	
					1		On Quick Stop	On Quick Stop	On Quick Stop	On Quick Stop	
				7	0	SERVO_ON	PWM OFF	PWM OFF	PWM OFF	PWM OFF	
					1		PWM ON	PWM ON	PWM ON	PWM ON	
1	MSB			8	0	Ready	Ready OFF	Ready OFF	Ready OFF	Ready OFF	
					1		Ready ON	Ready ON	Ready ON	Ready ON	
				15–9							
2	LSB	6101h	R			Mode Cmd					
3	MSB										
4	LSB	6102h	R			Velocity cmd	Actual output	Actual output	Actual output	Actual output	
5	MSB										

Bytes	Order	Command	Address	Attribute		frequency	frequency	frequency	frequency	
6	LSB		6103h	R						
7	MSB									
8	LSB		6104h	R	Pos Cmd	Actual position (absolute)	Actual position (absolute)	Actual position (absolute)	Actual position (absolute)	
9	MSB									
10	LSB		6105h	R						
11	MSB									
12	LSB		6106h	R	Torq Cmd	Actual torque	Actual torque	Actual torque	Actual torque	
13	MSB									
14	LSB		6107h	R		Reserved	Reserved	Reserved	Reserved	
15	MSB									
16	LSB		6108h	R		Reserved	Reserved	Reserved	Reserved	
17	MSB									
18	LSB		6109h	R		Reserved	Reserved	Reserved	Reserved	
19	MSB									

Table 3: 20xx Output Message (Host Controller→Drive) (Pr.09-30=0)

Bytes	Order	Command	Address	Attribute	Value	Definition	Description
0	LSB	Operation Command	2000h	W	**b1–10** 00: No function 01: Stop 10: Run 11: JOG+Run	Operation command unchanged Stop operation command Normal command operation JOG command	1. Bits in this column are used for operating actions. The commands are one-shot and run only when VFD receives commands. Therefore, Master only needs to issue the command once. VFD always runs the command issued by Master unless new commands are issued. 2. Bits in this column work only when VFD sets parameter selection operation command source as communication.
					b3–b2 Not used		
					b5–b4 00: No function 01: FWD 10: REV 11:Change direction	Direction command unchanged FWD direction command REV direction command Change current direction command	1. Bits in this column are used for operating actions. The commands are one-shot and run only when VFD receives commands. Therefore, Master only needs to issue the command once. VFD always runs the command issued by Master unless new commands are issued. 2. Bits in this column work only when VFD sets parameter selection operation command source as communication.
					b7–b6 00: 1st Accel./Decel. time 01: 2nd Accel./Decel. time 10: 3rd Accel./Decel. time 11: 4th Accel./Decel. time	1st acceleration/deceleration time selection 2nd acceleration/deceleration time selection 3rd acceleration/deceleration time selection 4th acceleration/deceleration time selection	Bits in this column are used for switching acceleration or deceleration time through communication when VFD operates. Parameter VFD can provide four kinds of settings for acceleration or deceleration time and use one-shot method to switch by bits in this column.
1	MSB				**b11–b8** 0000: Main speed 0001: 1st step speed 0010: 2nd step speed 0011: 3rd step speed 0100: 4th step speed 0101: 5th step speed 0110: 6th step speed 0111: 7th step speed 1000: 8th step speed 1001: 9th step speed 1010: 10th step speed 1011: 11th step speed 1100: 12th step speed 1101: 13th step speed 1110: 14th step speed 1111: 15th step speed	Multi-step speed and frequency switching selection	1. Bits in this column are used for switching VFD's operation frequency through communication. Parameter VFD can provide 15 kinds of settings for operating speed and use one-shot method to switch by bits in this column. 2. You have to set 2000h b12=1 or you cannot use this multi-step speed and frequency switching function through communication. 3. If you want to know the current running speed of this multi-step speed and frequency switching function, check address 2017h.
					b12 1: Enable b11–b6	Enable multi-step speed and frequency and acceleration or deceleration time switching function	
					b14–b13 00: No function 01: Operation command controlled by PU 10: Operation command by Pr. setting 11: Switch between PU and Pr. setting	Switching for operation command source	Bits in this column are used for enforcedly switching operation command source through communication. If VFD operation source setting is not controlled by communication, you can use the bits in this column to enforcedly switch to communication or restore to parameter setting.
					b15		
2	LSB	Speed Set Point Command	2001h	W	**b15–b0** VFD Set Point Command	VFD multi-unit setup command	1. Bits in this column are used for issuing setting commands to VFD through communication. The default unit for this setting is Hz or otherwise (can be known from 211Dh bit12). If the units are Desc, address 2123h–2124h can be read. 2. Bits in this column work only when VFD frequency source parameter is set as the
3	MSB						

Bytes	Order	Command	Address	Attribute		Value		Definition	Description
									way of communication.
4	LSB	VFD Fault/Control Command	2002h	W	b0	1:EF (external fault) ON		External Fault (EF) enabled	1. This bit is used for triggering an external fault to VFD to stop the running status. The method for stopping can be set by VFD parameter. 2. This bit operates by on-shot method and this fault can only be restored by Fault Reset command.
					b1	1: Reset		Fault Reset command	This bit is used for resetting the status from Fault to Ready.
					b2	1: b.b. ON		External B.B. (Base Block) enabled	This bit is used for triggering an external B.B. to VFD to pause the running status. When bit=0 (BB is dismissed), VFD immediately returns to its former status.
					b3	1: HAND-ON/LOC-ON command		HAND/LOCAL frequency operation source enabled	Whether switching HAND/AUTO or LOC/REM would lead to running STOP depends on motor drive's parameter settings.
					b4	1: AUTO-ON/REM-ON command		AUTO/REMOTE frequency operation source enabled	
5	MSB				b15–b5	Not used			
6	LSB		2003h	W	b15–b0	Reserved		Reserved	Reserved
7	MSB								
8	LSB		2004h	W	b15–b0	Reserved		Reserved	Reserved
9	MSB								
10	LSB		2005h	W	b15–b0	Reserved		Reserved	Reserved
11	MSB								
12	LSB		2006h	W	b15–b0	Reserved		Reserved	Reserved
13	MSB								
14	LSB		2007h	W	b15–b0	Reserved		Reserved	Reserved
15	MSB								
16	LSB		2008h	W	b15–b0	Reserved		Reserved	Reserved
17	MSB								
18	LSB		2009h	W	b15–b0	Reserved		Reserved	Reserved
19	MSB								

Table 4: 21xx Input Message (Drive→Host Controller) (Pr.09-30=0)

Bytes	Order	Command	Address	Attribute		Value	Definition	Description
0	LSB	Fault Status	2100h	R	b7–b0	Error Code	Fault codes	Bits in this column are used for checking if VFD occurs any fault, and using the fault codes to substitute 32XXh to obtain the description strings for the fault.
1	MSB				b15–b8	Warn Code	Warning codes	Bits in this column are used for checking if VFD occurs any warnings, and using the warning codes to substitute 33XXh to obtain the description strings for the fault.
2	LSB	Operation Status	2101h	R	b1–b10	00: RUN LED light off, STOP LED light up (Drive Stop)	Run and stop status	Bits in this column are used for checking VFD's running status in order to control its LED display.
						01: RUN LED blink, STOP LED light up (Drive Decelerate during the drive stopping)		
						10: RUN LED light up, STOP LED blink (Drive standby)		
						11: RUN LED light up, STOP LED light off (Drive Run)		
					b2	1: JOG active	JOG running status	
					b4–b3	00: REV LED light off, FWD LED light up (Forward)	Operation direction status	Bits in this column are used for checking VFD's running direction status in order to control its LED display.
						01: REV LED blink, FWD LED light up (Reverse to Forward)		
						10: REV LED light up, FWD LED blink (Forward to Reverse)		
						11: REV LED light up, FWD LED light off (Reverse)		
					b5	1: Factory parameters opened	Factory parameter ON/OFF status (not used)	
					b6	Reserved		
					b7	1: Operation command controlled by external terminal		Bits in this column are used for checking whether VFD's current operation command source is external terminal or not. If bit=1, external terminal has the highest processing priority. Master communication can obtain control rights only when it switches operation command source by 2000h b14–13.
					b8	1: Main Freq. controlled by communication		Bits in this column are used for checking the current VFD frequency command source.
					b9	1: Main Freq. controlled by external terminal (AI)		
					b10	1: Operation command controlled by Communication		Bits in this column are used for checking whether the current VFD operation command source are communication or not.
3	MSB				b11	1: Parameters been locked	Parameter Lock ON/OFF status	Bits in this column are used for checking whether VFD's parameters are locked or not. If bit=1, the values for reading parameters are always 0.
					b12	0: AC drive stop, 1: AC drive run	VFD actual running output status (RUNNING=1)	
					b13	Jog command	JOG running	

								command status (CMDJOG=1)	
						b14			
						b15			
4	LSB	VFD Variable Monitor	2102h	R	b15–b0	Frequency Command		Bits in this column are used for displaying VFD's current running frequency command values (2dot value) with its unit Hz.
5	MSB							
6	LSB		2103h	R	b15–b0	Output Frequency		Bits in this column are used for displaying VFD's current output frequency values (two-dot value) with its unit Hz.
7	MSB							
8	LSB		2104h	R	b15–b0	Output Current		Bits in this column are used for displaying VFD's current output current values (one-dot value) with its unit A.
9	MSB							
10	LSB		2105h	R	b15–b0	DC BUS Voltage		Bits in this column are used for displaying VFD's current DC BUS voltage values (one-dot value) with its unit V.
11	MSB							
12	LSB		2106h	R	b15–b0	Output Voltage		Bits in this column are used for displaying VFD's current output voltage values (one-dot value) with its unit V.
13	MSB							
14	LSB		2107h	R	b15–b0	Multi-step speed		Bits in this column are used for displaying VFD's current multi-step speed and frequency values.
15	MSB							
16	LSB		2108h	R	b15–b0			
17	MSB							
18	LSB		2109h	R	b15–b0	Value of the counter		
19	MSB							
20	LSB		210Ah	R	b15–b0	Power factor angle (0–180.0 degree)		
21	MSB							
22	LSB		210Bh	R	b15–b0	Torque (xxxx.x N-M)		
23	MSB							
24	LSB		210Ch	R	b15–b0	Motor speed (rpm)		
25	MSB							
26	LSB		210Dh	R	b15–b0	PG feedback pulse count		
27	MSB							
28	LSB		210Eh	R	b15–b0	PG reference pulse count		
29	MSB							
30	LSB		210Fh	R	b15–b0	Output Power (xx.xxkW)		
31	MSB							

Table 5: Disconnection Treatment (CMC-EIP01→Drive)

Address	Attribute	Value		Definition	Description
2505h	R	P9-63	Card Fault	This section is only allowed to be written by the card.	This address can correspond to VFD's communication parameter.