

Industrial Automation Headquarters

Delta Electronics, Inc. Taoyuan Technology Center No.18, Xinglong Rd., Taoyuan City, Taoyuan County 33068, Taiwan TEL: 886-3-362-6301 / FAX: 886-3-371-6301

Asia

Delta Electronics (Jiangsu) Ltd. Wujiang Plant 3 1688 Jiangxing East Road, Wujiang Economic Development Zone Wujiang City, Jiang Su Province, P.R.C. 215200 TEL: 86-512-6340-3008 / FAX: 86-769-6340-7290

Delta Greentech (China) Co., Ltd. 238 Min-Xia Road, Pudong District, ShangHai, P.R.C. 201209 TEL: 86-21-58635678 / FAX: 86-21-58630003

Delta Electronics (Japan), Inc. Tokyo Office 2-1-14 Minato-ku Shibadaimon, Tokyo 105-0012, Japan TEL: 81-3-5733-1111 / FAX: 81-3-5733-1211

Delta Electronics (Korea), Inc. 1511, Byucksan Digital Valley 6-cha, Gasan-dong, Geumcheon-gu, Seoul, Korea, 153-704 TEL: 82-2-515-5303 / FAX: 82-2-515-5302

Delta Electronics Int I (S) Pte Ltd. 4 Kaki Bukit Ave 1, #05-05, Singapore 417939 TEL: 65-6747-5155 / FAX: 65-6744-9228

Delta Electronics (India) Pvt. Ltd. Plot No 43 Sector 35, HSIIDC Gurgaon, PIN 122001, Harvana, India TEL: 91-124-4874900 / FAX: 91-124-4874945

Americas Delta Products Corporation (USA) Raleigh Office P.O. Box 12173,5101 Davis Drive, Research Triangle Park, NC 27709, U.S.A. TEL: 1-919-767-3800 / FAX: 1-919-767-8080

Delta Greentech (Brasil) S.A. Sao Paulo Office Rua Itapeva, 26 - 3° andar Edificio Itapeva One-Bela Vista 01332-000-São Paulo-SP-Brazil TEL: 55 11 3568-3855 / FAX: 55 11 3568-3865

Europe

Deltronics (The Netherlands) B.V. Eindhoven Office De Witbogt 15, 5652 AG Eindhoven, The Netherlands TEL: 31-40-2592850 / FAX: 31-40-2592851

TP-0143620-01

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TP70P Quick Start



:051-37133855-6 (L) WWW.ARCOKALA.COM

2014-10-31



TP70P Quick Start

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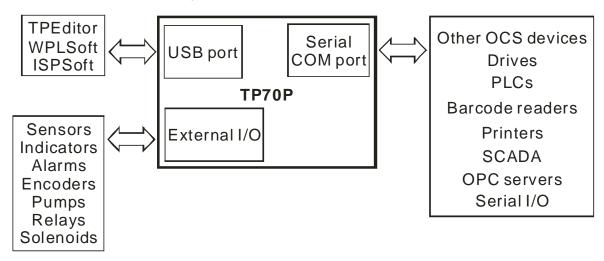
Chapter 1 Introduction

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1.1 Introduction of TP70P

TP70P is highly flexible in that it can be connected to various devices. The devices which can be connected to TP70P are shown in the block diagram below.



The functions of TP70P are described below.

- The LCD on TP70P can display 65535, and is a touchscreen.
- TP70P provides various kinds of objects, including X-Y curves, circular meters, bars, sliders, and alarms.
- TP70P supports PLC Links.
- The driver in TP70P supports Delta controllers. It can be connected to Delta servers, inverters, and temperature controllers.
- There are two serial communication ports. One supports PLC communication, and the other supports TP70P communication.
- The USB port on TP70P can communicate with a computer. It supports the use of WPLsoft/ISPsoft/TPEditor to upload/download a program and to monitor devices.
- There are four models which have different I/O configurations. They can be connected to various types of output devices.

1.2 Related Manuals

The manuals related to TP70P are described below.

- TP70P Instruction Sheet: TP70P Instruction Sheet provides information related to TP70P for users who use TP70P for the first time. (TP70P Instruction Sheet is attached to a TP70P series text panel.)
- DVP-ES2/EX2/SS2/SA2/SX2/SE&TP Operation Manual: DVP-ES2/EX2/SS2/SA2/SX2/SE&TP Operation Manual Introduces the PLC instructions supported by TP70P. Users can find the manual on the Delta website.
- TPEditor User Manual: TPEditor User Manual introduces the usage of TPEditor, including the interface of TPEditor, and the objects which can be displayed on a text panel. Users can find the manual on the Delta website or in TPEditor.
- WPLSoft User Manual: WPLSoft User Manual introduces the usage of WPLSoft, including the interface of WPLSoft, and the objects which can be used. Users can find the manual in WPLSoft.
- ISPSoft User Manual: ISPSoft User Manual introduces the usage of ISPSoft, including variables, connections, programs, and function blocks. Users can find the manual on the Delta website or in ISPSoft.
- TP70P Quick Start: TP70P Quick Start introduces the functions of TP70P, the wiring of TP70P, the installation of TP70P, the system of TP70P, and the usage of TP70P.

1.3 Profile and Dimensions

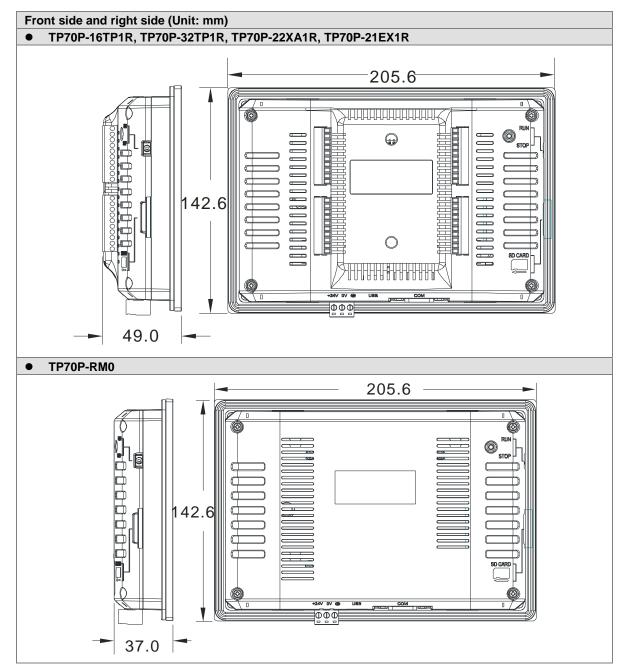
1.3.1 Profile





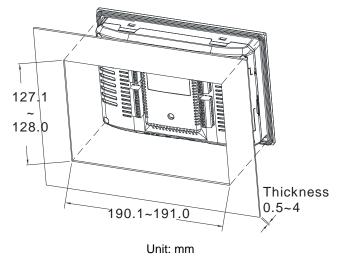


1.3.2 Dimensions of TP70P

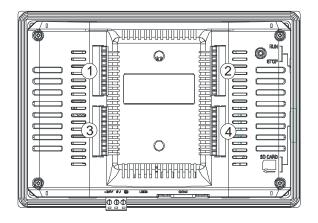


1.3.3 Dimensions of an Opening

If protection against water is required (NEMA 4X), a hole should be made to a tolerance of ± 0.1 mm.



1.4 Definitions of External Connectors



TP70P-	16TP1R
1	2
S/S	C0
X0	Y0
X1	Y1
X2	Y2
X3	Y3
X4	Y4
X5	Y5
X6	Y6
X7	Y7
-	

Т	TP70P-32TP1R					
1	0	3	4			
S/S0	C0	S/S0	C1			
X0	Y0	X10	Y10			
X1	Y1	X11	Y11			
X2	Y2	X12	Y12			
X3	Y3	X13	Y13			
X4	Y4	X14	Y14			
X5	Y5	X15	Y15			
X6	Y6	X16	Y16			
X7	Y7	X17	Y17			

TF	TP70P-22XA1R								
1	0	3	4						
S/S0	C0	V0+	V3+						
X0	Y0	VI0-	VI3-						
X1	Y1	10+	13+						
X2	Y2	V1+	FE						
X3	Y3	VI1-	VO4						
X4	Y4	l1+	IO4						
X5	Y5	V2+	AG						
X6	Y6	VI2-	VO5						
X7	Y7	l2+	105						
		FE	AG						

TP70P-21EX1R						
1	0	3	4			
S/S0	C0	10+	L3+			
X0	Y0	10-	L3-			
X1	Y1	FE	13-			
X2	Y2	l1+	FE			
Х3	Y3	l1-				
X4	Y4	FE	L4+			
X5	Y5		L4-			
X6	Y6	IO2	14-			
X7	Y7	AG	FE			
	-	FE				

1

1.5 Functional Specifications

	Model	TP70P	TP70P	TP70P	TP70P	TP70P		
Specifications		-32TP1R	-16TP1R	-22XA1R	-21EX1R	-RM0		
	Screen/Color	7" TFT LCD (6	5535 colors)					
	Resolution	800×480 pixel	S					
Display	Backlight type	LED backlight	(It has a lifespa	an of twenty the	ousand hours a	at a		
	Dacklight type	temperature of						
	Display area	Width × Heigh	t = 154 × 85 (U	nit: mm); 7 inc	nes (diagonal)			
Driver		Delta product						
		Transmission:	Virtual commu	nication port				
		Data length: 7						
USB port		Stop bit: 1 bit of						
			None/Odd/Ever					
			rate: 9,600 bps					
	1	USB port: Type B USB connector						
		RS-485				RS-232		
		Data length: 7 bits or 8 bits						
	0.0140	Stop bit: 1 bit or 2 bits						
	COM2	Parity check: None/Odd/Even						
		Transmission rate: 9,600 bps~115,200 bps Connector: Male DB-9 connector (Please refer to section 1.9 for more						
Extension			ale DB-9 conne	ctor (Please re	ter to section 1	.9 for more		
communication		information.) RS-485/RS-42				RS-485		
ports						KS-485		
		Data length: 7 bits or 8 bits Stop bit: 1 bit or 2 bits						
	СОМЗ	Parity check: None/Odd/Even						
	001113	Transmission rate: 9,600 bps~115,200 bps						
		Connector: Male DB-9 connector (Please refer to section 1.9 for more						
		information.)						
		· · · · · ·	m is downloade	d to a text pan	el by means of	the virtual		
Monitoring devi	ces	After a program is downloaded to a text panel by means of the virtual communication port on the text panel, the devices in the PLC connected						
		to the text panel can be monitored.						

1.5.1 Arrangement of I/O Terminals

Model	TP70P	TP70P	TP70P	TP70P	TP70P
Specifications	-32TP1R	-16TP1R	-22XA1R	-21EX1R	-RM0
Digital input terminal	X0~X7, X10~X17 (16 terminals)	X0~X7 (8 terminals)	X0~X7 (8 terminals)	X0~X7 (8 terminals)	
Digital output terminal	Y0~Y7, Y10~Y17 (16 terminals)	Y0~Y7 (8 terminals)	Y0~Y7 (8 terminals)	Y0~Y7 (8 terminals)	
Analog input terminal			Voltage/Current 4 channels (12-bit)	Current 2 channels (12-bit)	
Analog output terminal			Voltage/Current 2 channels (12-bit)	Current 1 channel (12-bit)	
Temperature input terminal (Pt100)				2 channels (16-bit)	

1.5.2 Devices in a PLC

M Z Latching MS12-M/6/: 286 auxiliary relays (*2) M2048-M4095: 2048 auxiliary relays (*2) M1000-M1999: 1000 auxiliary relays relay total Special Special M1000-M1999: 1000 auxiliary relays Some of them are latching auxiliary relays relay total T T T 100 ms (If M1028 is On, T64-T126 will be 10 millisecond timers.) TO-T126: 127 timers (*1) T128-T183: 56 timers (*1) Z56 timers (*1) 10 ms (If M1038 is On, T200-T245 will be 1 millisecond timers.) T200-T239: 40 timers (*1) Z56 10 ms (If M1038 is On, T200-T245 will be 1 millisecond timers.) T200-T245 (accumulation), 6 timers (*1) Z56 11 ms T127: 1 timer (*1) T246-T249 (accumulation): 4 timers (*1) T246-T249 (accumulation): 4 timers (*1) Cource C223-C223: 24 counters (*1) 22-bit tup/down counter C224-C232: 9 counters (*2) 140 C224-C232: 9 counters (*2) C237-C250: 14 counters (*2) 3 22-bit high-speed up/down counter C235, C236: 2 one-phase one-input counter (*2) 100 22-bit high-speed up/down counter S10-S19: 10 stepping relays (*2) 3 23-bit high-speed up/down counter S10-S19: 10 stepping relays (*1) 1024 243 S2-bit high-speed up/down counter S				Item	Range					
V External output relay Y0-Y/; Y10-Y17 Y10-Y17 M Žiji T General M0-M511: 512 auxiliary relays (*1) M2000-M2047: 48 auxiliary relays (*2) M20048-M4095: 2048 auxiliary relays (*2) M2048-M4095: 2048 auxiliary relays (*2) M2048-M4095: 2048 auxiliary relays (*2) M1000-M1999: 1000 auxiliary relays (*2) M1000-M1999: 1000 auxiliary relays Some of them are latching auxiliary relays T250-T255 (accumulation): 6 timers (*1) T240-T245 (accumulation): 6 timers (*1) T240-T245 (accumulation): 6 timers (*1) T240-T249 (accumulation): 4 timers (*1) C0-C111: 112 counters (*1) C112-C127: 16 counters (*1) C112-C127: 16 counters (*1) C233-C234: 2 counters (*1) C233-C234: 2 counters (*1) C233-C234: 2 counters (*2) C235-C235: 2 counters (*2) C251: 1 two-phase two-input counter (*2) in to court in to court in to c251: 1 two-phase two-input counter (*2) S10-S19: 10 stepping relays (S10-S19 and the instruction IST are used together.) (*2) Eatching S10-S19: 10 stepping relays (*2) False S10: 784 stepping relays (*2) False S10: 784 stepping relays (*2) False S10: 784 stepping relay	X	X External input relay			X0~X7; X10~X17					
Reg M Section Mo-MS11: 512 auxiliary relays (*1) M788-M999: 232 auxiliary relays (*1) M2000-M2047: 48 auxiliary relays (*1) M2000-M2047: 48 auxiliary relays (*1) M2000-M1299: 1000 auxiliary relays (*2) M2048-M4095: 2048 auxiliary relays (*2) M2048-M4095: 2048 auxiliary relays (*2) M2048-M4095: 2048 auxiliary relays Some of them are latching auxiliary relays M1000-M1999: 1000 auxiliary relays M0-T126: 121 timers (*1) T128-T183: 56 timers (*1) T128-T183: 56 timers (*1) T128-T183: 56 timers (*1) T128-T183: 56 timers (*1) T120-T245 will be 1 millisecond timers.) Z56 10 ms (if M1038 is On T200-T245 will be 1 millisecond timers.) T0-T126: 127 timers (*1) T240-T245 (accumulation): 6 timers (*1) Z56 11 ms T127: 1 timer (*1) T246-T249 (accumulation): 4 timers (*1) T0-C111: 112 counters (*1) C218-C199: 72 counters (*1) 140 C200-C223: 24 counters (*1) C200-C223: 24 counters (*1) C200-C223: 24 counters (*2) 3 32-bit high-speed up/down counter C235, C236: 2 one-phase one-input counters (*2) 3 court in to 32-bit high-speed up/down counter S10-S19: 10 stepping relays (*1) 1024 3 40 mg S2-bit 113 S10-S19: 10 stepping relays (*2) 1024	Y	Y			Y0~Y7; Y10~Y17	- (^4)				
M Empty Empty General M768-M999: 232 auxiliary relays (*1) M2000-M2047: 48 auxiliary relays (*1) M512-M767: 256 auxiliary relays (*2) M5048-M4099: 1000 auxiliary relays (*2) M1000-M1999: 1000 auxiliary relays (*2) M1000-M1999: 1000 auxiliary relays (*2) To-T126: 127 timers (*1) T128-T183: 56 timers (*1) T128-T183: 56 timers (*1) T184-T199 (for subroutines): 16 timers (*1) T260-T245 will be 1 millisecond timers.) T200-T239: 40 timers (*1) T240-T245 (accumulation): 6 timers (*1) Z56 time total T T T10 ms (if M1038 is On T0-T245 will be 1 millisecond timers.) T200-T239: 40 timers (*1) Z56 time T240-T245 (accumulation): 6 timers (*1) Z56 time total T T T64-T126 will be 1 millisecond timers.) T200-T239: 40 timers (*1) Z56 time T240-T245 (accumulation): 6 timers (*1) Z56 time total T T T64-T126 will be 1 millisecond timers.) T200-T239: 40 timers (*1) Z56 time T240-T245 (accumulation): 4 timers (*1) Z56 time total T T T64-T126 will be 1 millisecond timers.) T200-T239: 40 timers (*1) Z56 time total Z56 time total T T T64-T126 will be 1 millisecond timers.) T200-T245: 200 conters (*1) Z56 time total Z56 time total Z56 timers Z56 timers				·						
Part Form Special Some of them are latching auxiliary relays T </td <td></td> <th></th> <td>A</td> <td>General</td> <td></td> <td></td>			A	General						
Part Form Special Some of them are latching auxiliary relays T </td <td></td> <th></th> <td>Xil</td> <td></td> <td></td> <td></td>			Xil							
Part Form Special Some of them are latching auxiliary relays T </td <td>M</td> <th>м</th> <td>iar</td> <td></td> <td></td> <td>auxiliary</td>	M	м	iar			auxiliary				
Province Special Some of them are latching auxiliary relays T <td></td> <th></th> <td>Y T</td> <td>Latching</td> <td></td> <td>relays in</td>			Y T	Latching		relays in				
Province Special Some of them are latching auxiliary relays T <td>ela</td> <th></th> <td>ela</td> <td></td> <td></td> <td>- total</td>	ela		ela			- total				
T F				Special						
T F	it				* · ·					
T F	lev			•						
T F	ice									
T Image 10 ms (if M1038 is On, T200-T239: 40 timers (*1) T200-T239: 40 timers (*1) time total T200-T245 will be 1 T200-T239: 40 timers (*1) T200-T239: 40 timers (*1) time total T200-T245 will be 1 T200-T245 (accumulation), 6 timers (*1) T127: 1 timer (*1) timers (*1) T1 ms T127: 1 timer (*1) T246-T249 (accumulation): 4 timers (*1) time total C0-C111: 112 counters (*1) C128-C199: 72 counters (*1) time total C112-C127: 16 counters (*2) C200-C223: 24 counters (*1) total C200-C223: 29 counters (*2) C237-C250: 14 counters (*2) total C237-C250: 14 counters (*2) C237-C250: 14 counters (*2) 3 court in to C2052-C255: 3 counters (*2) C235, C236: 2 one-phase one-input counters (*2) 3 court in to C2052-C255: 3 counters (*2) C251: 1 two-phase two-input counter (*2) 1 024 T Initialization S0-S9: 10 stepping relays (*1) 1 024 Sile Returning to zero S10-S19: 10 stepping relays (*2) relay Latching S20-S127: 108 stepping relays (*1) total Alarm S912-S1023: 112 stepping relays (*1) total Alarm S912-S102				millisecond timers.)		256				
C Vertex 1200-1245 will be 1 millisecond timers.) T240-T245 (accumulation), 6 timers (*1) 1044 1 ms T127: 1 timer (*1) T246-T249 (accumulation): 4 timers (*1) T127: 1 timer (*1) T246-T249 (accumulation): 4 timers (*1) 140 C0-C111: 112 counters (*1) C128-C199: 72 counters (*1) C128-C199: 72 counters (*1) 140 C200-C223: 24 counters (*1) C224-C232: 9 counters (*2) 140 C237-C250: 14 counters (*2) C237-C250: 14 counters (*2) 140 C237-C250: 14 counters (*2) C237-C250: 14 counters (*2) 140 C235, C236: 2 one-phase one-input counters (*2) C252-C255: 3 counters (*2) 3 C251: 1 two-phase two-input counters (*2) C251: 1 two-phase two-input counters (*2) 3 Returning to zero S10-S19: 10 stepping relays (S10-S19 and the instruction IST are used together.) (*2) 1024 Latching S20-S127: 108 stepping relays (*1) 1024 Alarm S912-S1023: 112 stepping relays (*2) relay T Present value in a timer T0-T255: 256 timers C0-C199: 200 16-bit counters	т	т	limei			timers in				
C 1 ms T246-T249 (accumulation): 4 timers (*1) C 16-bit up counter C0-C111: 112 counters (*1) C128-C199: 72 counters (*1) C112-C127: 16 counters (*2) C112-C127: 16 counters (*2) 140 C224-C232: 9 counters (*1) C224-C232: 9 counters (*1) 140 C237-C250: 14 counters (*2) C237-C250: 14 counters (*2) 140 C237-C250: 14 counters (*2) C237-C250: 14 counters (*2) 140 C252-C255: 3 counters (*2) C237-C250: 14 counters (*2) 3 C251: 1 two-phase one-input counter (*2) 3 cour Initialization S0-S9: 10 stepping relays (*1) 3 Returning to zero S10-S19: 10 stepping relays (*1) 1024 Latching S20-S127: 108 stepping relays (*2) relay Ceneral S128-S911: 784 stepping relays (*1) total Alarm S912-S1023: 112 stepping relays (*2) relay T Present value in a timer T0-T255: 256 timers C0-C-C199: 200 16-bit counters			7		T240~T245 (accumulation), 6 timers (*1)					
C Verticity 16-bit up counter 1246-1249 (accumulation): 4 timers (*1) 140 C0-C111: 112 counters (*1) C128-C199: 72 counters (*1) 140 C112-C127: 16 counters (*2) C200-C223: 24 counters (*1) Court in to G23-C234: 2 counters (*2) C237-C250: 14 counters (*2) 140 C237-C250: 14 counters (*2) C237-C250: 14 counters (*2) 3 C0-C111: 112 counters (*2) C237-C250: 14 counters (*2) 3 C252-C255: 3 counters (*2) C235, C236: 2 one-phase one-input counters (*2) 3 C0-C111: 112 counters (*2) C235, C236: 2 one-phase one-input counters (*2) 3 C0-C111: 112 counters (*2) C235, C236: 2 one-phase one-input counters (*2) 3 C0-C111: 112 counters (*2) C235, C236: 2 one-phase one-input counters (*2) 3 C0-C111: 112 counters (*2) S10~S19: 10 stepping relays (S10~S19 and the instruction IST are used together.) (*2) 1024 C111: 112 counters (*2) S10-S19: 10 stepping relays (*1) 1024 C111: 112 counters (*2) S128-S911: 784 stepping relays (*1) 1024 C12: 11 two-phase two-input relays (*1) S128-S911: 784 stepping relays (*1) 1024 C12: 11 training S128-S911: 784 stepping relays (*2) <t< td=""><td></td><th></th><td></td><td>4</td><td>T127: 1 timer (*1)</td><td></td></t<>				4	T127: 1 timer (*1)					
C16-bit up counterC0~C111: 112 counters (*1) C128~C199: 72 counters (*1) C112~C127: 16 counters (*2) C200~C223: 24 counters (*1) C224~C232: 9 counters (*1) C224~C232: 9 counters (*2) C233~C234: 2 counters (*2) C233~C234: 2 counters (*2) C235~C250: 14 counters (*2) C252~C255: 3 counters (*2)140 cour in to C224~C232: 9 counters (*1) C224~C232: 9 counters (*2) C233~C234: 2 counters (*2) C252~C255: 3 counters (*2)140 cour in to C224~C232: 9 counters (*1) C224~C232: 9 counters (*2) C235~C236: 2 one-phase one-input counters (*2)140 cour in to courtin to c224~C232: 9 counters (*2) C252~C255: 3 counters (*2)8aaaaa9abbaa10ac235, C236: 2 one-phase one-input counters (*2)310court c251: 1 two-phase two-input counter (*2)aa11bacourt in to c251: 1 two-phase two-input counter (*2)102411court instruction IST are used together.) (*2)aa11court instruction IST are used together.) (*2)aa11court instruction IST are used together.) (*2)aa11as128~S911: 784 stepping relays (*1)a11aas128~S911: 784 stepping relays (*2)a12court in to instruction IST are used together.) (*2)aa13as128~S911: 784 stepping relays (*2)a14as128~S912.S1023: 112 stepping relays (*2)a14acourt in total <td< td=""><td></td><th></th><td></td><td>1 ms</td><td>T246~T249 (accumulation): 4 timers (*1)</td><td></td></td<>				1 ms	T246~T249 (accumulation): 4 timers (*1)					
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Real C Solution C200~C223: 24 counters (*1) 140 C200~C223: 29 counters (*1) C200~C223: 9 counters (*1) Courting Solution S2-bit up/down counter C233~C234: 2 counters (*2) C233~C234: 2 counters (*2) C237~C250: 14 counters (*2) C237~C250: 14 counters (*2) 3 C252~C255: 3 counters (*2) C235, C236: 2 one-phase one-input counters (*2) 3 C251: 1 two-phase two-input counter (*2) 1024 Initialization S0~S9: 10 stepping relays (S10~S19 and the instruction IST are used together.) (*2) step Returning to zero S10~S19: 10 stepping relays (S10~S19 and the instruction IST are used together.) (*2) relay Latching S20~S127: 108 stepping relays (*1) total Alarm S912~S1023: 112 stepping relays (*1) total Alarm S912~S1023: 112 stepping relays (*2) total T Present value in a timer T0~T255: 256 timers C0~C199: 200 16-bit counters					16-bit up counter					
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Returning to zero Since Si					C200~C223: 24 counters (*1)					
S S			с	S			- counters in total			
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T Present value in a timer T0~T255: 256 timers C Present value in a counter	3	3	ı Di	Latching	S20~S127: 108 stepping relays (*2)	relays in				
T Present value in a timer T0~T255: 256 timers C Present value in a counter			ela	General	S128~S911: 784 stepping relays (*1)	total				
C Present value in a counter C0~C199: 200 16-bit counters			Ÿ	Alarm	S912~S1023: 112 stepping relays (*2)					
C Present value in a counter	Т	Т	Pres	ent value in a timer	T0~T255: 256 timers					
Construction C200~C254: 55 32-bit counters Construction C200~C254: 55 32-bit counters General D0~D407: 408 data registers (*1) D600~D999: 400 data registers (*1) D3920-D3999: 80 data registers (*1)		~	Droc	ont value in a counter	C0~C199: 200 16-bit counters					
Ö: D0~D407: 408 data registers (*1) General D600~D999: 400 data registers (*1) D3920-D3999: 80 data registers (*1)	Re		Fles	ent value in a counter	C200~C254: 55 32-bit counters					
General D600~D999: 400 data registers (*1)	gig				D0~D407: 408 data registers (*1)					
	iter				D600~D999: 400 data registers (*1)					
	< <br< td=""><th></th><td>D</td><td>D3920~D3999: 80 data registers (*1)</td></br<>		D		D3920~D3999: 80 data registers (*1)					
Retentive D408~D599: 192 data registers (*2) 5000	oro		Ita	Potontivo	D408~D599: 192 data registers (*2)	5000 data				
D Data registers D3920~D3999: 80 data registers (*1) D Data registers D408~D599: 192 data registers (*2) 5000 D2000~D3919: 1920 data registers (*2) D1000~D1999: 1000 data registers (*2) registers in tota	d D	D	reç	Retentive	D2000~D3919: 1920 data registers (*2)	registers				
D1000~D1999: 1000 data registers (Some of them in total	evi		jist		D1000~D1999: 1000 data registers (Some of them	in total				
B Special are retentive data registers.)	Ce		er	Special	č (
D4000~D4999: 1000 data registers (*2)										
Index E0~E7, F0~F7: 16 data registers (*1)				Index	E0~E7, F0~F7: 16 data registers (*1)					





	Item Range		Range	
	Ν	N Master control loop		N0~N7: 8 N devices
	Р	Pointer		P0~P255: 256 pointers
-			External interrunt	I000/I001(X0), I100/I101(X1)
°.	I	ਙ	External interrupt	(01: Rising edge-triggered; 00: Falling edge-triggered)
Pointer		Interrupt	Timer interrupt	1602~1699, 1702~1799: 2 interrupts (Time base=1 ms)
		<u>r</u>	High-speed interrupt	I010: 1 interrupt
		¥	Communication	I150 (COM2): 1 interrupt (*3)
			interrupt	
0	к	Docir	mal system	K-32,768~K32,767 (16-bit operation)
0n	n	K Decimal system		K-2,147,483,648~K2,147,483,647 (32-bit operation)
Constant		Have	de almal avatam	H0000~HFFFF (16-bit operation)
1 T	н	пеха	decimal system	H0000000~HFFFFFFF (32-bit operation)

Note:

*1: They are not latching/retentive devices. They can not be changed.

*2: They are latching/retentive devices. They can not be changed.

*3: Please refer to section 1.9 for more information.

*4: Please refer to section 1.5.1 for more information.

1.6 Electrical Specifications

1.6.1 Specifications for PLCs

Model		TP70P	TP70P	TP70P	TP70P	
Item CPU	-16TP1R -32TP1R -22XA1R -21EX1R -RM0					
	32-bit ARM Cortex-M4 MCU Flash ROM: 128 MB					
Program memory			92 MP)			
Internal	64 Mbytes	(OS: 30 MB/Backup: 16 MB/User AP: 82 MB)				
memory						
Retentive memory	32 Kbytes	32 Kbytes				
Supply voltage	24 V DC (-15%~20	0%) (DC input pow	er polarity reversal	protection)		
Electric						
energy	5W	5W	5W	5W	3W	
consumption						
Power protection	DC input power polarity reversal protection					
Insulation impedance	$> 5~\text{M}\Omega$ (The voltage between all I/O terminals and the ground is 500 V DC.)			.)		
Noise immunity	ESD (IEC 61131-2, IEC 61000-4-2): 8 kV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2 kV, Digital I/O: 1 kV, Analog & Communication I/O: 1 kV Damped-Oscillatory Wave: Power Line: 1 kV, Digital I/O: 1 kV RS (IEC 61131-2, IEC 61000-4-3): 26 MHz~1 GHz, 10 V/m					
Ground	The diameter of the ground used should not be less than the diameters of the wires connected to the power terminals of the PLC used. (If several PLCs are used simultaneously, please use single-point ground.)					
Battery	3 V CR2032 batter		<u> </u>			
Battery lifespan	3 years at a temperature of 25°C					
Operating temperature	0°C~50°C Relative humidity: Pollution degree 2		~40℃】,10%~55%	₀ RH【41~50℃】		

Model	TP70P	TP70P	TP70P	TP70P	TP70P
ltem	-16TP1R	-32TP1R	-22XA1R	-21EX1R	-RM0
Storage	0000 0000				
temperature	-20°C~60°C				
Vibration/Sho	International standards IEC61131-2, IEC 68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST				EC 68-2-27 (TEST
ck resistance	Ea)				
Dimensions	175.8 × 108.6 × 59.2 mm (Width × Height × Depth)				
Cooling	Transfer of thermal energy via convection				

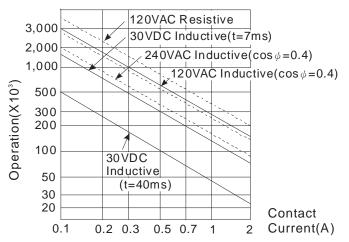
1.6.2 Electrical Specifications for Digital Input Terminals

Model		l Electrical specifications for digital input terminals		
Item		24 V DC (-15% ~ 20%) single common terminal		
Input terminal		X0, X1	X2~X7, X10~X17	
Input form		Sinking current: Current flows into the terminal S/S. Sourcing current: Current flows from the terminal S/S.		
Input voltage (±10%)		24 V DC, 5 mA		
Input impeda	nce	4.7 kilohm		
Maximum inp frequency	ut	10 kHz 60 Hz		
Action levle	Off→On	> 16.5 V DC		
On→Off		< 8 V DC		
Response	Off→On	<20 us	10 ms	
time	On→Off	<50 us		

1.6.3 Electrical Specifications for Digital Output Terminals

Model		Electrical specifications for digital output terminals	
Output typ	e	Relay	
Voltage		250 V AC, < 30 V DC	
	Resistance	1.5 A/point (5 A/COM)	
Current	Inductance	#1	
	Bulb	20 W DC/100 W AC	
Response	Off→On		
time On→Off		Approximately 10 ms	
Maximum output frequency		50 Hz	

#1: Life curves



1.6.4 Electrical Specifications for Analog I/O Terminals

Model	Electrical specifications for the analog I/O terminals on TP70P-22XA1R				
Item	Voltage input	Current input	Voltage output	Current output	
Analog input range	±10 V	±20 mA			
Analog output range			±10 V	0~20 mA	
Digital conversion range	±2000	±1000	±2000	0~4000	
Resolution	12 bits	11 bits	12 bits	12 bits	
Resolution	(1 lsb=5 mV)	(1 lsb=20 uA)	(1 lsb=2.5 mV)	1 lsb=5 uA	
Input impedance	Above 200 kΩ	250 Ω			
Output impedance		100 Ω			
Overall accuracy If a signal reaches full scale at a temperature of 25° C (77°F), there will the range of $\pm 0.5^{\circ}$ If a signal reaches full scale at a temperature in the range of $0\sim55^{\circ}$ C (3) there will be an error in the range of $\pm 1^{\circ}$.					
Response time	3 ms/channel	<u></u>			
Isolation	No isolation				
Absolute input range	±15 V	±32 mA			
Digital data type	16-bit two's complem There are 11 significa				
Maximum output current (Allowable load)			10 mA (1 kΩ~2 MΩ)	0~500 Ω	
Protection	-	-	The voltage output terminals are equipped with short circuit protection. (Please do not short-circuit the voltage output terminals for a long time, otherwise they may be burned.) The current output terminals can have open circuits.		

Electrical specifications for the analog I/O terminals on TP70P-22XA1R

Electrical specifications for the analog I/O terminals on TP70P-21EX1R

Model	Electrical specification	ons for the analog I/O te	erminals on TP70P-21EX1R	
Item	Current input	Current output	Temperature measurement	
Sensor type			2-wire/3-wire Pt100	
Driving current			1.6 mA	
Analog input range	0~20 mA		-20° C ~160° C	
Analog output range		0~20 mA		
Digital conversion range	0~2000	0~2000	-200~1600	
Resolution	11 bits (1 lsb=10 uA)	12 bits (1 lsb=10 uA)	12 bits (0.1°C)	
Input impedance	250 Ω			
Output impedance		100 Ω		
Overall accuracy	Overall accuracy If a signal reaches full scale at a temperature of 25° C (77°F), there will be an error in the range of $\pm 0.5\%$. If a signal reaches full scale at a temperature in the range of $0 \sim 55^{\circ}$ C (32~131°F), there will be an error in the range of $\pm 1\%$.			
Response time	3 ms/channel		300 ms × Quantity of channels	
Isolation	No isolation			
Absolute input range	0~32 mA			
Digital data type	16-bit two's complement			
Digital data type	There are 11 significant bits.			

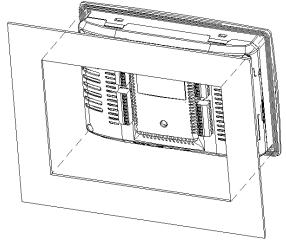
Model	Electrical specificati	Electrical specifications for the analog I/O terminals on TP70P-21EX1R			
Item	Current input	Current output	Temperature measurement		
Maximum output					
current		0~500 Ω			
(Allowable load)					
		The current output			
Protection		terminals can have			
		open circuits.			

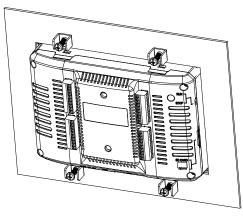
1.7 Installation

Please put (embed) TP70P into a control panel. Use the fasteners and the screws in the container in which TP70P is packaged. Insert the fasteners into the slots on TP710P, and then tighten the screws. (The torque applied to the screws should be 4.75 kg-cm. It can not exceed 4.75 kg-cm, otherwise the panel will be destroyed. If the fasteners are not used correctly, Delta does not guarantee a degree of resistance to water. Please see the figures below. The control panel should be watertight and dustproof, or meet corresponding specifications (IP66/NEMA 4).

Please do not install TP70P in the following environments.

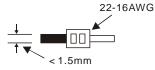
- Environments in which there are dust, oily smoke, metal powder, and corrosive or flammable gas
- High-temperature and humid environments
- Environments in which TP70P may be shocked and vibrated directly





Wiring terminals

1. Please connect 22 to 16 AWG (1.5 mm) single-core or twin-core cables to the input/output terminals on TP70P.



The torque applied to the screws on TP70P should be 1.90 kg-cm (1.65 in-lbs). Only copper leads which can resist the heat above $60^{\circ}C/75^{\circ}C$ can be used.

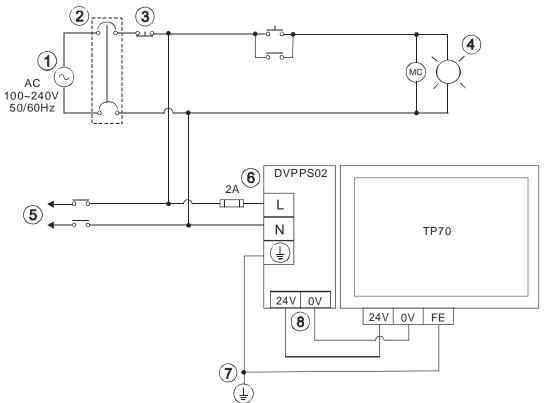
- Please connect 22 to 12 AWG single-core or twin-core cables to the power input connector on TP70P. (Only copper leads which can resist the heat above 60°C/75°C can be used.) The torque applied to the screws on the PLC connected to TP70P should be in the range of 5~8 kg-cm (4.3~6.9lb-in).
- 3. Please do not wire the terminal •. Input cables and output cables should not be put in the same cable tray.
- 4. When users tighten screws and wire terminals, they should prevent tiny metallic conductors from dropping into TP70P. After the wiring of TP70P is complete, the users have to ensure that TP70P can radiate heat normally.

1.8 Wiring

1.8.1 Wiring a Power Input Connector

The power supplied to TP70P is DC power. When users use TP70P, they have to note the following points.

- Please connect wires to the terminals +24V and 0V. The power supplied to TP70P should be in the range of 20.4 V DC to 28.8 V DC. If the voltage of the power supplied to TP70P is less than 20.4 V DC, TP70P will stop running, and output devices will be off.
- If a power cut is shorter than 10 milliseconds, TP70P will not stop running. If a short cut is long, or the voltage of the power supplied to TP70P decreases, TP70P will stop running, and output devices will be off. If power is restored after a power cut, TP70P will automatically resume running. (There are latching auxiliary relays and retentive registers in TP70P. Users should use them carefully when they design a program.)
- The power supplied to TP70P is DC power. A Delta power supply module (DVPPS02/DVPPS05) can be used to supply power to TP70P. In order to protect DVPPS02/DVPPS05, users need to have the protection circuit shown below.

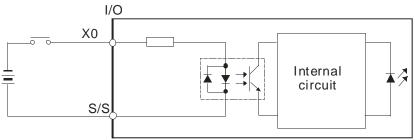


1	AC power supply: 100~240 V AC, 50/60 Hz
2	Circuit breaker
3	Emergency stop: An emergency stop button can be used to cut off power when an emergency occurs.
4	Power indicator
5	AC load
6	2 A fuse
\bigcirc	Ground (Impedance: Less than 100 Ω)
8	DC power supply: 24 V DC

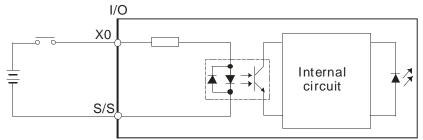
1.8.2 Wiring Input Terminals

The power supplied to input terminals are DC power. There are two types of current. They are sinking current and sourcing current.

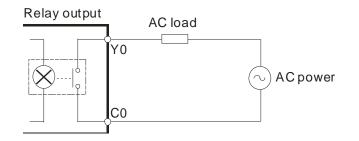
• Sinking current



• Sourcing current

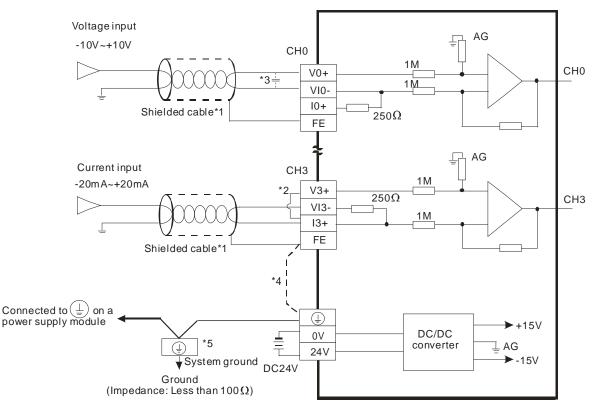


1.8.3 Wiring Relay Output Terminals

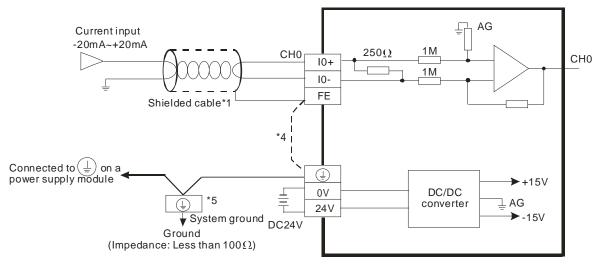


1.8.4 Wiring Analog Input Channels

• TP70P-22XA1R



• TP70P-21EX1R



*1: Please isolate analog input cables from other power cables.

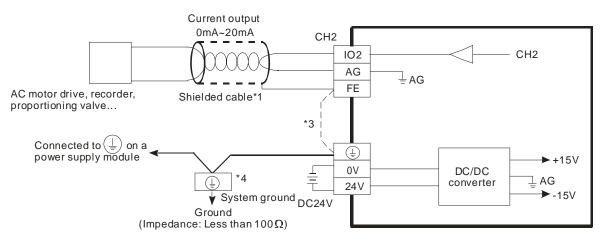
*2: If current is connected, the connection between V3+ and I3+ need to be a short circuit.

*3: If ripple voltage results in interference with the wiring, please connect a 0.1~0.47 μ F and 25 V capacitor.

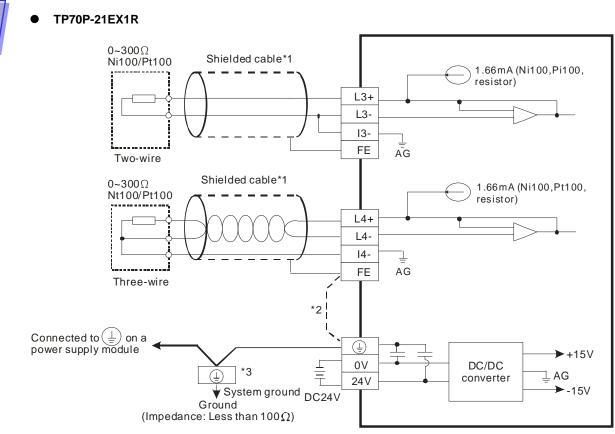
- *4: If there is much noise, please connect the terminal FE to the ground terminal.
- *5: Please connect the ground terminal on a power supply module and the analog input terminal FE to the system ground, and then ground the system ground or connect the system ground to a distribution box.

1.8.5 Wiring Analog Output Channels TP70P-22XA1R Voltage output -10V~+10V CH4 VO4 CH4 *2= 104 AG Shielded cable*1 AC motor drive, recorder, ≟AG FE proportioning valve... Current output CH5 0mA~20mA VO5 CH5 105 AG ≟AG FE AC motor drive, recorder, Shielded cable*1 proportioning valve... *3 Connected to (\downarrow) on a (†) power supply module ►+15V 0V DC/DC Γ *4 ⊒ AG converter 24V ▼____ ▼System ground DC24V ►-15V Ground (Impedance: Less than 100Ω)

• TP70P-21EX1R



- *1: Please isolate analog output cables from other power cables.
- *2: If the ripple voltage of the input terminal of the load connected is large, and results in interference with the wiring, please connect a 0.1~0.47 μF and 25 V capacitor.
- *3: If there is much noise, please connect the terminal FE to the ground terminal.
- *4: Please connect the ground terminal on a power supply module and the analog output terminal FE to the system ground, and then ground the system ground or connect the system ground to a distribution box.



1.8.6 Wiring Temperature Measurement Input Terminals

- *1: The cables connected to the input terminals should be cables or shielded twisted pair cables which can be connected to temperature sensors, and should be kept separate from other power cables and cables which may generate noise.
- *2: If there is much noise, please connect the terminal FE to the ground terminal.
- *3: Please connect FE on a power supply module and the temperature measurement input terminal FE to the system ground, and then ground the system ground or connect the system ground to a distribution box.
- *4: Please do not wire the terminal •.

1.9 Definitions of the Pins in Communication Ports

• 11701			
Pin	RS-485 (COM2)	RS-485 (COM3)	
5	GND	GND	
6	D+	N/C	
7	D-	N/C	
8	N/C	D+	9876
9	N/C	D-	

• TP70P-16TP1R, TP70P-21EX1R, TP70P-22XA1R, TP70P-32TP1R

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• TP70P-RM0

Pin	RS-232 (COM2)	RS-485 (COM3)
1	N/C	N/C
2	RX	N/C
3	ТХ	N/C
4	N/C	N/C
5	GND	GND
6	N/C	D+
7	N/C	D-
8	N/C	N/C
9	N/C	N/C

1.10 Controllers Supporting TP70P

Controllers supporting TP70P Delta servers, Delta AC motor drives, Delta temperature controllers, and Delta PLCs

<u>Wiring:</u>

TP70P COM3 (RS-485)	Controller Male CN3 connector (RS-485)	Controller Pins in a male CN3 connector	
RS-485+ (8)	(3)485+ (5)485+		
RS-485- (9)	(4)485- (6)485-		
GND (5) —	GND(1)		

• Delta AC motor drive

TP70P COM3 (RS-485)	Controller RJ11 connector (RS-485)	Controller Pins in an RJ11 connector
RS-485+ (8)	SG+(4)	_
RS-485- (9)	SG-(3)	
GND (5)	GND(1)	1~6

• Delta temperature controller

TP70P COM3 (RS-485)	Controller RS-485
RS-485+ (8)	D+(10)
RS-485- (9)	D-(9)

• Delta PLC

4	TP70P COM3 (RS-485)	Controller RS-485
	RS-485+ (8)	D+
	RS-485- (9)	D-



Chapter 2 Writing Programs

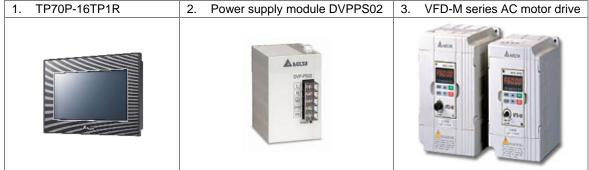
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2.1 Preparations

2.1.1 Hardware

The hardware required is list below.



2.1.2 Software

The software required is listed below.

- WPLSoft version 2.36 or above
- TPEditor version 1.9 or above

2.1.3 Tools and Materials

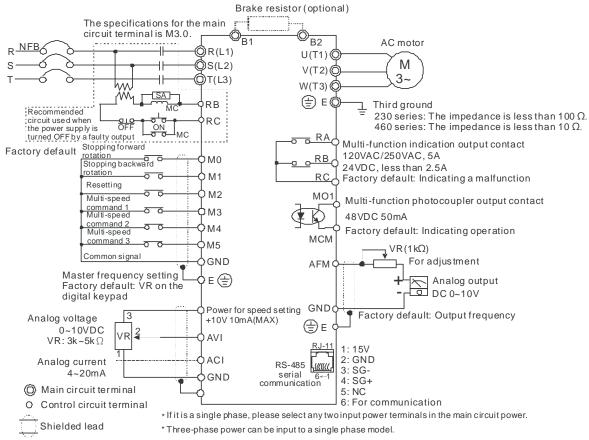
The tools and the materials which are required are list below.

- One personal computer (The software mentioned above has been installed.)
- One 100~240 V AC and 50/60 Hz power supply
- One coil of wire
- One screwdriver
- One USB cable (Pleae refer to section 3.1 for more information about installing a USB driver.)

2.2 Wiring

After users install a text panel, they can wire the text panel. In order to ensure that the users can write programs smoothly, the users need to at least connect power cables. Please connect power cables to a text panel when the text panel is disconnected. The structure required is like the one shown below.





2.2.1 Wiring Diagram for a Delta VFD-M Series AC Motor Drive

% Please refer to VFD-M User Manual for more information.

2.2.2 Wiring Diagram for External Terminals

TP70P series text panel External I/O connector	VFD-M series AC motor drive
C0	GND
Y0	M0
Y1	M1

2.2.3 Wiring Diagram for Communication

TP70P COM3 (RS-485)	Controller RJ11 connector (RS-485)	Controller Pins in an RJ11 connector
RS-485+ (8)	SG+(4)	
RS-485- (9)	SG-(3)	
GND (5)	GND(1)	1~6

Parameter	Setting	Description	
P00	03	A master frequency is determined by an RS-485 port.	
P01	01	Operation is controlled by external terminals. STOP on a keypad is effective.	
P03	60	Maximum operating frequency (50.00~400.0 Hz)	
P08	1.50	Minimum output frequency (0.10~20.00 Hz)	
P88	01	The communication address of the VFD-M series AC motor drive is 1.	
P89	01	Baud rate: 9600 bps	
P92	01	MODBUS ASCII mode Data format: <7, E, 1>	

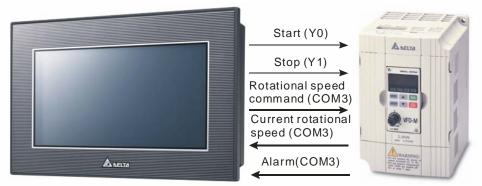
2.2.4 Setting Parameteres in a Delta VFD-M Series AC Motor Drive

% If an AC motor dirve can not operate normally due to the fact that parameters are not set correctly, users can set P76 to 10 (restore all parameters to the default value 60 Hz), and then set other parameters according to the table above.

2.3 Example

After users install, wire and power up hardware, they can prepare to write programs. In order to make the users have a specific target and a specific direction before they begin to write programs, the manual provides a common example for the users. The complete procedure which starts with the creation of a new project and ends with the downloading of the project to a PLC is described step by step.

• Structure of a system



Control

The communication between a PLC and a Delta VFD-M series AC motor drive is described here. Y devices on TP70P are used to control the forward/backward rotation of the AC motor drive. RS-485 communication (COM3) is used to read/set the frequency of signals output by the VFD-M series AC motor drive. If the AC motor drive breaks down, an alarm signal in the AC motor drive will be sent to TP70P.

Actions:

- 1. If the AC motor drive rotates forwards, its forward rotation indicator will be on, and the input which makes the the AC motor drive rotate barckwards will be ineffective.
- 2. If the AC motor drive rotates backwards, its backward rotation indicator will be on, and the input which makes the the AC motor drive rotate forwards will be ineffective.
- 3. If stop control is input, the operation of the AC motor drive will stop, and its stop indicator will be on.
- 4. The users can input a frequency range. The frequency range that the users set should be between the maximum operaring frequency of the AC motor drive and the minimum operaring frequency of the AC motor drive.
- 5. If the AC motor drive sends an error code, the operation of the AC motor drive will stop.

I/O devices in the PLC:

- 1. Forward rotation control (M0)
- 2. Backward rotation control (M1)
- 3. Stop control (M2)
- 4. Forward rotation switch (Y0)

- 5. Backward rotation swithc (Y1)
- 6. Stop indicator (M3)

Objects displayed on TP70P:

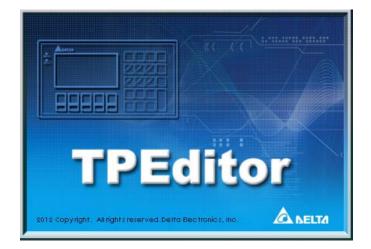
- 1. Forward rotation control
- 2. Backward rotation control
- 3. Stop control
- 4. Rotational speed input
- 5. Forward rotation indicator
- 6. Backward rotation indicator
- 7. Stop indicator
- 8. Current rotational speed
- 9. Warning message

2.4 Writing a Program for a Text Panel

The writing of a program for a text panel is described in this section. Please refer to TPEditor User Manual for more infomraiton about the functions of TPEditor.

Step 1: Start TPEditor. (Start→Programs→Delta Industrial Automation→PLC→TPEditor x.xx→TPEditor x.xx)

Welcom screen



Main screen

Delta THidtar	10:00
Be Lift Ver Devils Dhat protfestions Disatistic Cognesister Jud (Drine Bris	

Step 2: After in the standard toolbar is cliked, a new project will be added. In the **New Project** window, select **DELTA VFD Inverter** in the **HMI**<=>**PLC** section, select **TP70P** in the **TP Type** drop-down list box, and type "TP70-VFD CTRL" in the **File Name** box.

HMI <=> PLC Set Device Type	
DELTA VFD Inverter	•
ТР Туре	
TP70P	•
File Name	
TP70-VFD CTRL	
OK	Cancel

After OK in the New Project window is clicked, a project environment will be displayed.

	TP7	70-VFD CTRL - Delta TPEditor	
	File	Edit View Compile Object Local Page Setting Global Setting Communication Iool Window Help	
		╔╔╗╗╗╗╷╖╔╔┇╗╗╗┥┥╡╔╴╎┇┊╸╡╟╗╝╖╢	
			Г
		□ O Ć O O D	
		0	□ TP Page
			0:
			Boot Page
		(4)	3
	μ		
-			
5 -	X X 49,	, Y: 18 Device Type: DELTA VFD Inverter TP Type:	TP70P

The interface of TPEditor is described below. Please refer to TPEditor User Manual for more information.

- Menu bar, standard toolbar, and object arrangement toolbar: The main functions of TPEditor are included. The functions which are used more frequently are on the standard toolbar, and the functions which are used less frequently are on the menu bar.
- Geometric object toolbar and object toolbar: They provide buttons used for drawing figures and creating buttons. There are some other objects on the **Object** menu.
- B Page management area: Users can view/add/delete pages.
- **4** Working area: Users can edit pages in this area.
- **9** Status bar: The information about the current project and communication is displayed here.

2.4.1 Planning Objects

After users make sure of system requirements, they can plan messages which need to be displayed. The objects and the pages which need to be planned for the example in this chapter are described below.

Planning objects

- Forward rotation control→A button is used. After users press the button, the AC motor drive connected will
 rotate forwards.
- Backward rotation control→A button is used. After users press the button, the AC motor drive connected will rotate backwards.
- Forward rotation indicator → A multi-state image is used. If the AC motor drive connected rotates forwards, a green indicator will be on, and a message saying that the AC motor drive rotates forwards will appear.
- Backward rotation indicator → A multi-state image is used. If the AC motor drive connected rotates backwards, a yellow indicator will be on, and a message saying that the AC motor drive rotates backwards will appear.
- Stop indicator → A multi-state image is used. If the AC motor drive connected stops running, a red indicator will be on, and a message saying that the AC motor drive stops running will appear.
- Current rotational speed→A numeric display is used. The current rotational speed of the AC motor drive connected can be read by means of RS-485 communication.
- Error message →A message display is used. The state of the AC motor drive connected can be monitored by means of RS-485communication. If an error code in the AC motor drive connected is read, the error message corresponding to the error code will be displayed on the text panel used.
- Rotational speed input→A numeric input is used. A frequency can be written to the AC motor drive connected by means of RS-485 communication. If a minimum value and a maximum value are typed in the Limit Setting section, users can be prevented from setting a frequency which is not in the range of the minimum operating frequency of the AC motor drive connected to the maximum operating frequency of the AC motor drive connected.

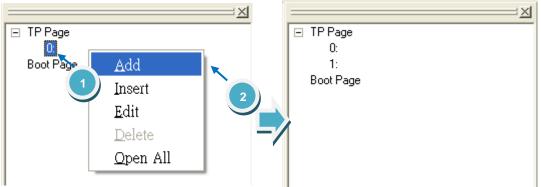
Planning pages

- Plan a boot page on which the connection between TP70P and a VFD-M series AC motor drive is displayed.
- The state of the AC motor drive used is displayed on page 0, that is, the current rotational speed of the AC motor drive, a warning message, forward rotation control, backward rotation control, and stop control are displayed on page 0.

2.4.2 Managing Pages

Adding a page

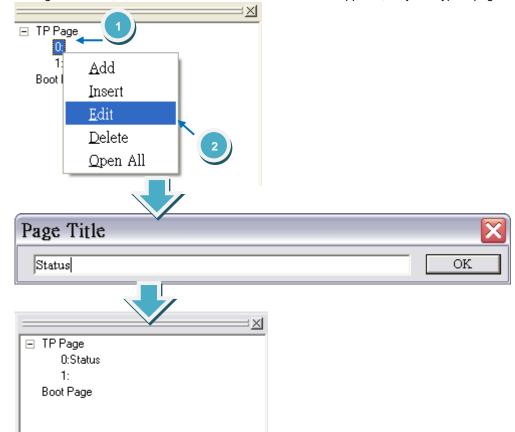
Users have to add to two pages first. After the users right-click **TP Page** in the page management area, and click **Add** on the context menu which appears, a page will be added.



2

Editing the title of a page

The users have to give names to the two pages. After the users right-click a page number in the page management area, and click Edit on the context menu which appears, they can type a page title.



2.4.3 Creating Objects

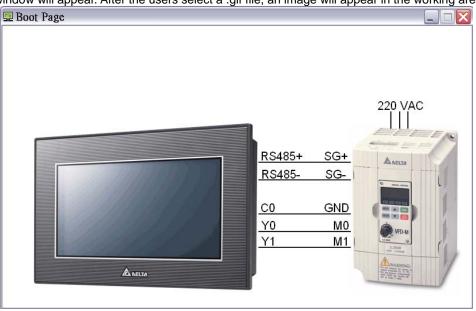
After users click an object on the object toolbar, they can click where they want to begin the selection of an area in the working area, hold down the left mouse button, and drag the cross over the area that they want to select. After the users double-click the object in the working area, the window used for setting the object will be opened.

The objects on the object toolbar are described below. Please refer to TPEditor User Manual for more information.

- **Static Bitmap** (**III**): The files that TP70P supports are .gif files. The resolution of TP70P is 480×800 pixels. If the size of an image exceeds the resolution, the part which is left will not be displayed.
- Static Text (A): Text is displayed.
- Numeric/ASCII Display (N): The value in a related device is read, and displayed on the screen of TP70P.
- Bar Graph (): The value in a related device is read, and represented by a bar according to the target value, the maximum value, and the minimum value which are set.
- Circle Meter (): The value in a related device can be represented by the number to which the pointer on the dial of a meter points. The upper limit set can be differentiated from the lower limit set by means of the region colors set.
- Button (
 Button ():After users press a button, the state of the device related to the button will be changed, or a function can be set, e.g. the page selected will be displayed or passwords can be set.
- **RTC Display** (1): The time on the real-time clock in TP70P is displayed on the screen of TP70P, or the time in related devices will be read and dispalyed on the screen of TP70P.

- Mlulti-State Bitmap/Lable (
): The function of a multi-state image is the same as that of a dynaic image. The difference between a multi-state image and a dynamic image is that text can be inserted in a multi-state image.
- Numeric Input (): A numeric input displayed on the screen of TP70P is used to write a value to a related device.
- X-Y Curve (
): The values in related devices can be represented by an X-Y curve displayed on the screen of TP70P.
- Alarm (<u>></u>): An alarm and a system alarm are used together. If a condition set is met, an alarm will appear.
- Slider (
): Users can write a value to a related device by move the indicator on a slider displayed on TP70P.

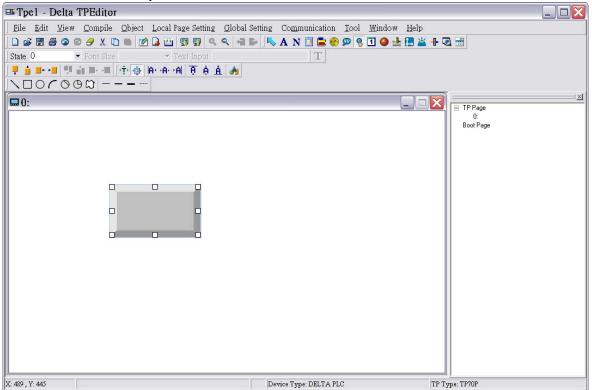
The users have to plan pages and add object. They have to add an image representing the connection between TP70P and an AC motor drive to the boot page. They need to click on the object toolbar, click where they want to begin the selection of an area in the working area, hold down the left mouse button, and drag the cross over the area that they want to select. After the users double-click the object in the working area, an **Open** window will appear. After the users select a .gif file, an image will appear in the working area.



The state of the AC motor drive used is displayed on page 0, that is, the current rotational speed of the AC motor drive, a warning message, forward rotation control, backward rotation control, and stop control are displayed on page 0.



If the users want to add an object to a page, they have to click an object type on the object toolbar, click where they want to begin the selection of an area in the working area, hold down the left mouse button, and drag the cross over the area that they want to select.



After the users add an object, they have to set the parameters related to be object. After users double-click a button in the working area, the **Button Setting** window will appear. In the example in this chapter, Y0 in TP70P is used to control the forward rotation of an AC motor drive. If a button is pressed, M0 will be ON. If M0 is ON, Y0 will be ON. If the button is pressed again, M0 will be OFF. Consequently, the button type selected in the **Button Type** drop-down list box is **Push On/Off**, and the **Internal PLC Setting** option button and M0 in the **Refer Device** window are selected.

Preview	Property Display Button Type Fush On Off	
Total States 2 +	Refer Device Write-in Interlock Setting Read State OFF v	
Current State	Value Type Unsigned Value Length 16 Bats Call Setting Cal	
	OK Cancel	

	Refer Device	1
C PLC	☑ Device Name M 💌	
C TP		J
Internal PLC Setting	Device Number	
C External PLC Setting	0 1 2 3 4 5	OK
Connect Com COM3 💌	6 7 8 9 A B	Clear
PLC Address 1	CDEF./	



After the users click the **Property** tab in the window used to set the parameters of an object, they can set the appearance of the object. After the users click the **Property** tab in the **Button Setting** window, they can select a value in the a **Border Width** box, select colors in the **Button Event Color Setting** section, and type text or select an image in the **States** section. The text displayed on a button varies with the current state of the button. In the example in this chapter, "FORWARD" need to be displayed on the forward rotation control button created if the forward rotation control button is not pressed yet, and "Running..." need to be displayed on the rotation control button created if the forward rotation control button control button is pressed. Consequently, the users have to type "FORWARD" in the **Button Text** when **0** in the **Current State** drop-down list box is selected, and they have to type "Running" in the **Button Setting** window, the setting of the parameters and the appearance of the button created will be complete.

FORWARD	Background Celor	Test Alignment Middle v Middle v Font Setting Font Font Color
		OK Cancel
tion Setting	Property Display	OK Cancel

Picture Gif Read

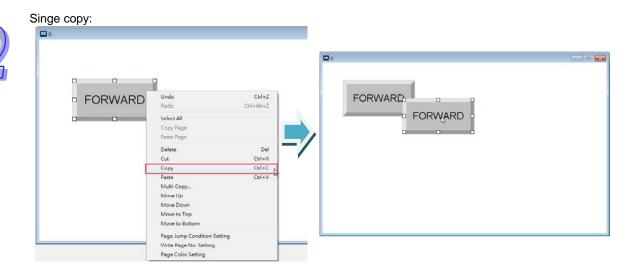
Gif Clear

Can

OK

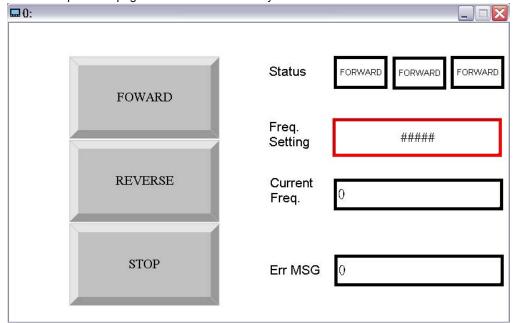
()

If the users want to make a copy of an object in the working area, they have to click the object, right-click the object, click **Copy** on the context menu which appears, right-click the object, and click **Paste** on the context menu which appears. If the users want to make several copies of an object in the working area, they have to click the object, right-click the object, click **Multi-Copy...** on the context menu which appears, select checkboxes, values or an option button in the **Multi-Copy** window, and click **OK**.



Multiple copies:

1:			Multi-Copy	×
			Copies	
			Set Copies Horizontally	1 1
- FORWA	Undo	Ctrl+Z	Set Copies Vertically	3 •
	Redo Select All	Ctrl+Alt+Z	Interval	
	Copy Page Paste Page		Distance Point Horizontally	<u>.</u>
	Delete	Del	Distance Point Vertically 2	· ·
	Cut Copy	Ctrl+X Ctrl+C		
	Paste Multi-Copy	Ctrl+V	✓ Shift Address	
L	Move Up	6		
	Move Down Move to Top		Orient Horizontally	
	Move to Bottom Page Jump Condition Setting		C Orient Vertically	
	Write Page No. Setting			
	Page Color Setting		OK Cancel	
 1:				
	- FORWARD			
	FORWARD			
	FORWARD			
	FORVARD	<i>₽</i>		



The users can complete the page shown below in the way described above.



Setting the parameters of objects:

	Object	Object Button/Objec Related device		vice		
Item	description	t type	Communication method	Device address	Other settings	
1	Forward rotation control	Push On/Off	Internal PLC	MO	-	
2	Backward roation control	Push On/Off	Internal PLC	M1	-	
3	Stop control	Momentary	Internal PLC	M2	-	
4	Forward rotation indicator	Multi-State Bitmap/Lable	Internal PLC	Y0	Background color (1/0): Green/White	
5	Backward rotation indicator	Multi-State Bitmap/Lable	Internal PLC	Y1	Background color (1/0): Yellow/White	
6	Stop indicator	Multi-State Bitmap/Lable	Internal PLC	М3	Background color (1/0): Red/White	
7	Rotational speed input	Numeric Input	COM3, station address 1	\$2001	In the Value Setting section: Integer Number: 3 Decimal Number: 2 In the Limit Setting section: Max Value: 600 Min Value: 15	
8	Current rotational speed	Numeric/ASC II Dispaly	COM3, station address 1	\$2102	-	

9

2.4.4 Basic Configuration

After users click **Basic Configuration** on the **Tool** menu, they can click **PC** <=> **TP Communication Setting**, **TP** <=> **PLC Protocol**, or **TP Other Setting** in the **Basic Configuration** window.

PC <=> TP Communication Setting

Before users download the program in TPEditor to a text panel, or upload the program in a text panel to their personal computer, they have to click PC <=> TP Communication Setting in the Basic Configuration window. The users have to use a USB cable to connect the text panel to the personal computer. The communication ports on the personal computer are displayed in TPEditor. After the users select the communication port which is connected to the text panel, they can download the program in TPEditor to the text panel, or upload the program in the text panel to the personal computer.

Basic Configuration				0.
TP <=> TP Communication Set	PC Communication Setting TP Station Address PC COM Port	(PC <=> TP)	Communications Port (Communications Port (TPD4G-BL-CU USB Por	COM2)
< _ >	Baud Rate	9600	-	Property
		OK	Cancel	1

TP <=> PLC Protocol

After users click **TP <=> PLC Protocol** in the **Basic Configuration** window, they can set a communication protocol between a text panel and an external device. The text panel can be connected to the external device only if the communication protocol of the text panel and the communication of the external device are the same. In the example in this chapter, the communication protocol between the VFD-M series AC motor drive used and TP70P is "9600, 7, E, 1".

Basic Configuration	
PC <>> TP Communication Set IP <>> PLC Protocol IP Other Setting	Protocol Setting(TP <>> PLC) Object Communication Setting ↓ Default COM Port Set TP Port ↓ Internal ComPort ↓ External ComPort
	COM3 RS485 Baud Rate 9600 - Data Length 7 - Parity Even - Stop Bit 1 -
€ →	OK Cancel



TP Other Setting

After users click **TP Other Setting** in the **Basic Configuration** window, they can select a station address, set the brightness of the backlight that illuminates the screen of TP70P, enable the buzzer of TP70P, set a password, select a boot page, etc. In the example in this chapter, a user-defined boot page is designed, and therefore the **User Define** option button in the **Start-Up Menu Display** section is selected.

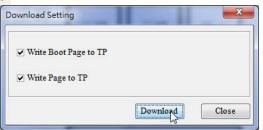
Basic Configuration			
PC <=> TP Communication Set	Menu Setting		
TP <=> PLC Protocol	Set Default TP Address	1	
TP Other Setting	Backlight Brightness		10
	Backlight Time	0 .	Minutes
	Function Setting		
	Download PC Time		
	Upload/Download Protect Pas	sword Setting	
	Enable		
	Start-Up Menu Display		
	○ TP Default	User Define	
< III >>	Start-Up Menu Delay Time	3	Seconds
	<u></u>	OK	Cancel

2.4.5 Compile and Downloading a Program

After users write a program, and adjust related settings, they can download the program to a text panel. The users have to compile the program first. After the users click **Build All** on the **Compile** menu, or in the standard toolbar, the program will be compiled. If the program is compiled successfully, the percentage of memory used will be shown.

D 0:			TP Page 0 Boot Page
	FOWARD	Status FORWARD REVERSE STOP	
		Freq. Setting ######	
	REVERSE	Current Freq.	Property
	STOP	Err MSG 0	

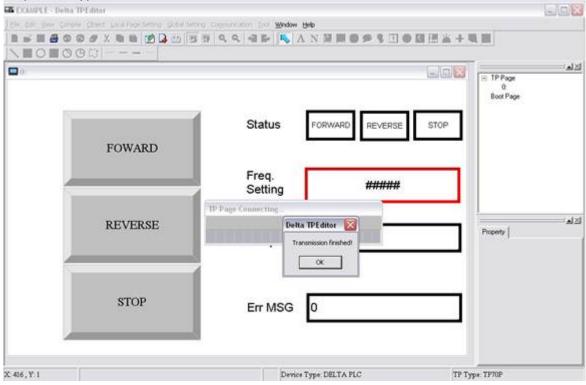
After the program is compiled, the users can download the program. After the users click **Write to TP** on the **Communication** menu, or on the standard toolbar, the **Download Setting** window will appear.



After the users make sure of the pages which need to be downloaded, and click **Download** in the **Download Setting** window, the **Confirm** window will appear.

Confirm			\ge
?	Are you su	re to transfer to 1	ſP?
	Yes	No	

After the transmission of the program is complete, a message saying the the downloading of the program is complete will appear.

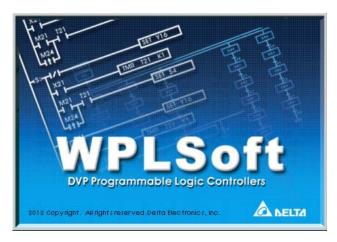


2.5 Writing a Program for a PLC

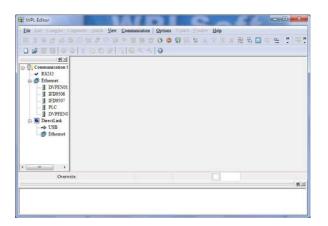
TP70P can be used to integrate control, and execute and display functions. The conditions which control actions can be created in a PLC program. The writing of a program for the PLC used in the example in this chapter is described below. The Delta software which supports TP70P is WPLSoft and ISPSoft. Please refer to WPLSoft User Manual and ISPSoft User Manual for more information about the usage of WPLSof and ISPSoft. In the example in this chapter, WPLSoft version 2.36 is used to write a program for the PLC used. Step 1: Start WPLSoft. (Start→Programs→Delta Industrial Automation→PLC→WPLSoft 2.36→WPLSoft 2.36)



Welcom screen



Main screen



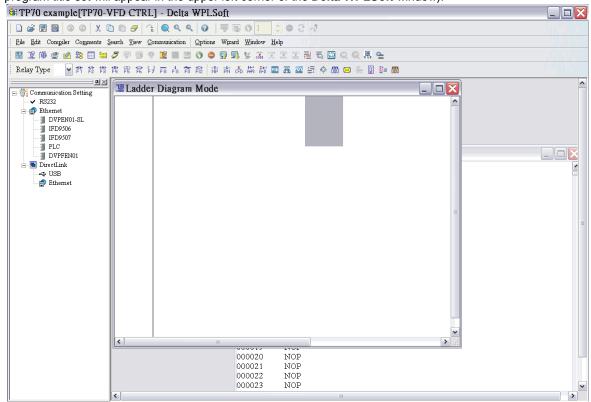
Step 2: After is cliked, a new project will be added. In the **Select a PLC Model** window, type "TP70-VFD CTRL" in the **Program Title** box, select **TP70P/TP70G** in the **Select** drop-down list box, and type "TP70 example" in the **File Name** box.

Select a PLC Model					
Program Title TP70-VFD CTRL					
Select TP70P/TP	70G ▼				
Communication Setting					
RS232 (COM9) Setting					
File Name					
TP70 example					
OK	Cancel				

Step 3: After **Setting** in the **Communication Setting** section is clicked, the **Communication Setting** window will appear. Select **RS232** in the **Type** drop-down list box, and select the communication port which is connected to TP70P. The communication protocol set in the **Communication Setting** window need to be the communication protocol of TP70P. The default communication protocol set in the **Communication Setting** window is "9600, 7, E, 1". Select **1** in the **Station Address** box. Click **OK** after the adjustment of settings in the **Communication Setting** window is complete.

onnection Setup		
Туре	RS232	
onumunication Setti	26	Communications Port (COM Communications Port (COM
COM Port	COMI	TP04G-BL-CU USB Port (CO
Data Length	7	💌 🦳 RTU (S bits)
Parity	Even	•
Stop Bits	1	Auto-detect
Baud Rate	9600	•
Station Address	1	- Default
Ethernet Setting	-	
🗖 Amiga IP		
Port	502	
Baud Rate Decide PLC Setting WPL Setting	dby	
Setup Responding	Time	
Times of Auto-ret	ry	3 3
Time Interval of A	uto-retry (sec) 3 🗄

After **OK** in the **Communication Setting** window is clicked, a project environment will be displayed (the program title set will appear in the upper left corner of the **Delta WPLSoft** window).



2.5.1 Planning a Program

In order to meet the requirements of the system used in the example in this chapter, the following conditions need to be planned.

Planning devices

- M0→Forward rotation control
- M1→Backward rotation control
- M2→Stop control
- M3→Stop flag
- Y0→Forward rotation output
- Y1→Backward rotation output

Planning actions

- If M0 is ON, Y0 will be ON.
- If M1 is ON, Y1 will be ON.
- If M2 is ON, Y0 and Y1 will be OFF.
- If Y0 is ON, M1 will be ineffective.
- If Y1 is ON, M0 will be ineffective.
- If Y0 and Y1 are OFF, the AC motor drive used will stop running, and M3 will be ON.



2.5.2 Control Program

The control program shown below is created according to the conditions planned in section 2.5.1. Please refer to WPLSoft User Manual for more information about the usage of WPLSoft.



2.5.3 Compiling and Downloading a Program

After users write the program shown in section 2.5.2, they can download the program to TP70P. The users have to compile the program first. After the users click **Ladder => Instruction** on the **Compiler** menu, or on the standard editing toolbar, the program will be compiled. The result of the comipiling of the program is shown in the message area in WPLSoft.

😂 WPL Editor - [Ladder Diagram Mode]
E File Edit Compiler Comments Search View Communication Options Wizard Window Help
🖩 🖩 🕼 🖉 📾 🔚 🎜 🖓 💷 🔍 👂 🧱 🖩 🕾 🕥 🇢 💀 🖳 😒 🦝 🎬 🔍 🛳 🐥 🏹 🐺
🗋 🗅 😅 📰 🖾 💿 🔍 🛝 🗈 🕤 🥏 🍋 🔍 🔍 🚱 Relay Type 🕂 🖥 背 数 鹊 鹊 鹊 扇 詩 前 🚲 🍹
■ ● M0 Y1 ■ R232 ■ Ethemet ■ DVPEN01 ■ IFD9506 ■ IFD9507 ■ I
Overwrite Row:0 20/7920 Steps
Compiling is complete!

After the program is compiled, the users can download the program. After the users click **Setup**, the **Transfer Setup** window will appear. The users can select checkboxes in the **Transfer Setup** window. Owing to the fact that there are comments on the devices in the program, the **Device Comment** checkbox in the **Transfer Setup** window is selected.

Transfer Setup					
Communication Mode					
PC => PLC					
✓ Program					
Cancel					
Initialize Device Comment					
Synchronize Project and PLC Password					
TRetentive Range					
🔲 Default Value					
□ RTC					
E Backup to Flash (EH2/EH2L/SV)					



After the users select the **Device Comment** checkbox, the **System Block** window will appear. The users can select devices and set device ranges.

	Device	Min.	Max.	Start	End
	X	0	377	0	377
	Y	0	377	0	377
	M	0	999	0	999
	M	2000	4095	2000	4095
	S	0	1023	0	1023
	Т	0	255	0	255
	С	0	255	0	255
	D	0	999	0	999
	D	2000	4999	2000	4999
Mer	mory Rema	uin: 7	843 Steps		

2

After the users click **OK** in the **Transfer Setup** window, the program will be downloaded to TP70P.

2.6 Monitoring and Debugging a Program

2.6.1 Monitoring a Program

When a program is executed by a system, users can understand the current logic state of the system by monitoring the program, or test the system by chaning the values in devices.

Minotring a program

Users have to open the program which has been compiled in section 2.5.3.

After the users click *[7]*, the program will be monitored. The program is composed of a logic program,

and the information related to devices. (The states of Boolean devices are indicated by green backgrounds or white backgrounds, and the information about other devices is indicated by values or text.)

			(Y0) F_OUTPUT
м1	Y0		(Y1)
NEVERSE	F_OUTPUT		R_OUTPUT
\vdash		RST	мо
STOP			FORWARD
		RST	M1
			REVERSE
		RST	M2
			STOP (M3) STOP_S
			END

If the users want to chage the state of a device, they can right-click the device, and click an item on the context menu which appears. In the figure below, M0 is set to ON.

MO	Y1		
FORWARD	R_OUTPUT		(YO F_OUTPUT
M1 REVERSE	Set On Set Off Change Present Value ASCII Input Forced Devices List		(Y1 R_OUTPUT
M2	Rising-edge Trigger Falling-edge Trigger	RST	M0 FORWARD
		RST	M1 REVERSE
		RST	M2 STOP

Note: **Set On** and **Set Off** can not be used to change the state of a device corresponding to an actual I/O device because the state of the actual I/O device immediately overwrites the value which is set. **Force ON** and **Force OFF** can be used instead.



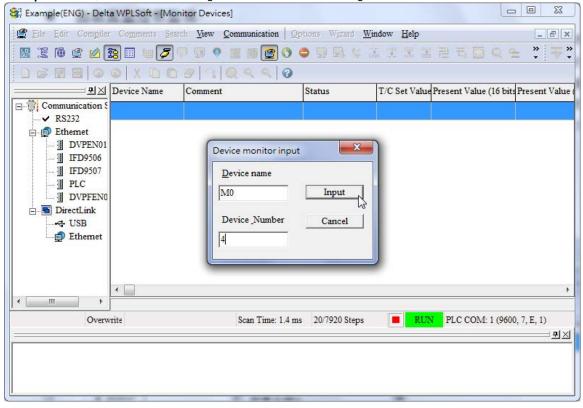


Minotring devices

It is sometimes inconvenient for users to search for devices in a logic program that the users test, and change the values in the devices because the devices are in different sections of the logic program. Besides, sometimes the purpose of modifying the values in devices in a program is not to debug the program, but to test an external device. If the users want to change the values in devices in a program by monitoring the program, they may not easily find the devices, and they need to have the program. To solve these problems, the users can use a device monitoring table. If the users change the values in devices in a program by means of a device monitoring table, they do not even need the program.

The users have to click I , and then double-click the device monitoring table which appears.

After the users type a device name and the number of devices, and click **Input** in the **Device monitor input** window, devices will be brought into the device monitoring table.





🗱 Example(ENG) - Delta WPLSoft - [Monitor Devices]						
🔮 Eile Edit Compiler Comments Search View Communication Options Wizard Window Help						
ﷺ 肇 알 ≱ 甄 ☞ 🦻 및 및 🍳 🦉 🗑 🗑 🎬 🖉 🌒 🖉 🖉 🖉 🖉 🖉 🖉 🖉 🖉 🖉 🖉						
D 🛱 🗄 🗃 🗿 💿 🗶 D 🖸 🍠 🕞 🔍 < < 🕗						
	Device Name	Comment	Status	T/C Set Value Pre	esent Value (16 bits	Present Valu
Communication S	M0	FORWARD	0			
RS232	M1	REVERSE	Ō			
DVPEN01	M2	STOP	tŏ			
IFD9506	M3	STOP_S	ĕ			
PLC			-			
DVPFEN0						
🖻 🔚 DirectLink						
🗐 Ethernet						
	٠ 🗌					
4 III 1]					
Overw	vrite	Scan Time: 1.4 n	ns 20/7920 Steps	RUN	PLC COM: 1 (9600	, 7, E, 1)
·····································						<u> </u>

The states of the devices broght into the device monitoring table will be shown only if is pressed. If the users want to chage the state of a device, they can right-click the device, and click an item on the context menu which appears. M0 is set to ON here. When M0 is ON, Y0 is ON, the AC motor drive used rotates forwards, and the users can see that the forward rotation indicator on the screen of TP70P is green.

💱 WPL Editor - [Monitor Devices]							
Eile Edit Compiler	Co <u>m</u> ments <u>S</u> earc	h <u>V</u> iew <u>C</u> ommunication Op	otions W <u>i</u> zard <u>W</u> ir	ndow <u>H</u> elp	_ 8 ×		
🔛 🏽 🖷 🔮 🖉 📴 🖮 🍠 🛡 💷 🔍 🦉 🕲 🕒 🌚 🖳 😒 👗 🏋 📰 🗮 🖉 🔍 🍝 🌹 🏹							
	Device Name	Comment	Status	T/C Set Value Present Value ((16 bits Present Value		
⊡	M0	FORWARD	•				
Ethemet	M1	REVERSE	Ō	Set On	6		
DVPEN01	M2	STOP	Ó	Set Off Rising-edge Trigger			
RS232 Image: Constraint of the second sec	M3	STOP_S	•	Falling-edge Trigger			
PLC	Y0	F_OUTPUT	0	Force	+		
DVPFEN0	Y1	R_OUTPUT		Forced Device Table			
USB				Delete	Del		
🗐 Ethernet				Cut	Ctrl+X		
				Сору	Ctrl+C		
				Paste	Ctrl+V		
	•			Clear All	Þ		
	rite Row: 0	Scan Time: 1.4 ms	20/7920 Steps	Device Comment			
Overwi	ine Row. 0	20/1920 Steps	Display Item	▶ <u></u> ₽×			
			Export to CSV File				
			-				



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		013QQQ	20		
1000	Device Name	Comment	Status	T/C Set Value Prese	nt Value (16 bitsPresent Val
Communication S	M0	FORWARD	•		
RS232	M1	REVERSE	Ō		
DVPEN01	M2	STOP	Ŏ		
IFD9506	M3	STOP_S	ŏ		
PLC	YO	F_OUTPUT			
DVPFEN0	Y1	R_OUTPUT	0		
⊡ 🔄 DirectLink					
Ethemet	-				L
	< 🗌				
				<u> </u>	
Overw	rite Row: 6	Scan Tir	me: 1.4 ms 20/7920 Steps	RUN PI	LC COM: 1 (9600, 7, E, 1)
					(<u>무</u>

2.6.2 Removing System Errors

When a system runs, errors may occur. If users follow the procedure introduced in this chapter, there will be no error. After a program is written to a PLC, M1004 will be ON if an error occurs. The reason for the error may be that operands (devices) are invalid, or syntax is incorrect. It is indicated by the error code (hexadecimal value) in D1004. D1004 can be monitored by means of WPLSoft.

1. Click Edit Monitored Devices on the View menu in WPLSoft.

62 INCP D10	🖏 Dvp0 - I	Delta WPLSoft - [Mo	nitor Ladder Diagram]						_ 2 🛛
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With Comparison Workspace With Withow 0 Mean Long Data Format Ei 1 Minor Ei 1 Minor Ei 12 Minor Ei 12 Minor Ei 12 Minor Ei 13 Sep C Dagram Mode Ei 14 Minor Ei 15 SprC Dagram Mode Ei 16 Ei Ei 17 Minor Ei 18 Sep C Dagram Mode Ei 19 Berlow Connent List Ei 1000 Ei Sine Connent List 11 K0000 C251 V0 12 Minor Ei Sine Connent List 14 K0000 C251 V0 15 Synglel Table K0000 C251 V0 16 V0 Ei V0 Ei 1000 Ei Sine Farmer List K0000 Ei 1000 Ei V0 Ei V0 100 Ei V0 Ei V0 100 Ei V0 Ei V0 100 Ei V0 Ei V		1300X	- Lis Mais M						
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1 Ebsting Formal Setting			- Oathar wingow						•
M1002 Zoom K0 K0 12 M1000 E kåt Monkeel Devices								EI	
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Buel Device Report Ctrl+Alt+U K0 K0000 C251 Y0 Action Transition Editor Shift+Alt+L K0 K40000 C251 Y0 Symbol Table K40000 C251 1010 Symbol Table K0 K0 K0 PHSCS K60000 C251 1010 Symbol Table K0 K0 K0 F8 Y0 K0 K0 F8					DONT	C251	K1000		
Show Contract K2000 C251 Y0 Actor Transition Editor. Shift+Alt+L K0 Syndpol Table K40000 C251 Y0 Syndpol Table K40000 C251 1010 Syndpol Table K0 K0 OPHSCS K60000 C251 1010 Syndpol Table K0 K0 Syndpol Table K0 K0 Overwrite Row 2, Col. 4 Soan Time: 14 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)		1000							
K0 K40000 C251 Y0 System Block K0 DHSCS K60000 C251 1010 58 Y0 K0 K0 63 M1000 Sprime I Ams 68/7520 Steps K0 63 M1000 SET Y0 K0 64 V0 Sprime I Ams 68/7520 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)			2 Show Comment	K20000	C251		YD		
K0000 C.251 Y0 58 Y0 K0 62 INCP D10 63 IOIO SET Y0 64 Scan Time: 14 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)				1	КО				
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58 Y0 K0 62 INCP D10 63 FEND FEND 66 SET Y0 66 Overwrite Row: 2, Col: 4 Scan Time: 1.4 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)			System Block	}	KO		0/4/0	90	
62 FEND 63 FEND 64 Star Time: 1.4 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)			DHSC	S K60000	C251		1010		
62 63 1010 66 Overwrite Row: 2, Col: 4 Scan Time: 1.4 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP103 (PLC Station Address: 1)	58	YD			100020			КО	
63 1010 66 Overwrite Row: 2, Col. 4 Soan Time: 1.4 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)							INCP	D10	
63 1010 56 Overwrite Row: 2, Col. 4 Soan Time: 1.4 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)	62	1.1							
I010 SET Y0 66								FEND	
1010 SET Y0 66	63	M1000							
Overwrite Row: 2, Col: 4 Scan Time: 1.4 ms 68/7920 Steps RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)	1010						SET	YO	
Overwrite Rowr 2, Col: 4 Scan Time: 1 4 ms 68/7920 Steps T RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP703 (PLC Station Address: 1)	66								
		Overanite Boar 2	Col 4 Scan Time: 1.4 ms 68/7920 Stens	RIN PI	C COM: 1 (9600 7 E 1	I) TP7	0P/TP70(3/PI	(Station Address: 1)	<u>×</u>
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	-								

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😰 Eile Edit	Compiler Comm	ents Search View	<u>Communication</u>	ptions Wizard	Mindow Help				_ 0
		000	30990	0		1.1			
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evice Name	Comment	Status	T/C Set Value	Present Value (16	bi Present Value (3.		Format	T/C Set Value Refere	
01004				HD03	H24220D03	F0.000	Hexadecimal		
	Overwrite Row	1	Scan Time: 1.5 n	as 107/7920 Step	s EPRIM	PLC COM: 1 (960).	7, E, 1)	TP70P/TP70G (PLC Station, Address; 1)	
	Overwrite Row	-1	Sean Time: 1.5 n	na 107/7920 Step	s EPROP	PLC COM: 1 (9600,	7, E, 1)	TP70P/TP70G (PLC Station Address: 1)	
	Overwrite Row	-1	Scan Time: 1.5 n	ns 107/7920 Step	s PPRO	PLC COM: 1 (960),	7, E, 1)	TP70P/TP70G (PLC Station Address: 1)	
DBS ² winces a			Sean Time: 1.5 n	ns 107/7920 Step	s EPRO	PLC COM: 1 (9600,	7, E, I)	TP70P/TP70G (PLC Station Address: 1)	
	erand (Error code: 0		Scan Time: 1.5 n	ns 107/7920 Step	s Trico	PLC COM: 1 (9600,	7, E, 1)	TF70F/TF70G (PLC Station Address: 1)	
DHSC5 misues op Reference Step Nu	erand (Error code: 0		Scan Time: 1.5 n	ns 107/7920 Step	\$ EPRO	PLC COM: 1 (9600,	7, E, 1)	TP70P/TP70G (PLC Station Address: 1)	
	erand (Error code: 0		Scan Time: 1.5 n	ns 107/7920 Step	s PP Priv	PLC COM: 1 (960),	7, E, 1)	TP70P/TP70G (PLC Station Address: 1)	
	erand (Error code: 0		Scan Time: 1.5 n	ns 107/7920 Step	s FFR	PLC COM: 1 (960),	7, E, I)	TP70P/TP70G (PLC Station Address: 1)	
	erand (Error code: 0		Scan Time: 1.5 n	na 107/7920 Step	s EFC	PLC COM: 1 (9600,	7, E, I)	TP70P/TP700 (PLC Station Address: 1)	
	erand (Error code: 0		Scan Time: 1.5 n	ns 107/7920 Step	s EFR.	PLC COM: I (9600,	7, E, 1)	ТР70РЛР703 (PLC Station Address: 1)	
	erand (Error code: 0		Sean Time: 1.5 n	ns 107/7920 Step	s EPRO	PLC COM: 1 (9600,	7, E, D	TP70P/TP70G (PLC Station Address: 1)	

3. The error code shown in the figure above is HD03. It indicates that the operands of the instruction DHSCS are invalid. After DHSCS is checked, and the operands are modified, the error will be eliminated.

Image: Pile Edit Complete Commention Setuch Yiew Qommanication Options Wigard Window Help Image: Pile Pile Pile Pile Pile Pile Pile Pile	_ 8 x
22 1巻 (1) (22 22 23 21 24 27 27 25 24 24 24 24 24 24 24 24 24 24 24 24 24	
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D1004 H0 H24220000 F0.000 Hezadacianal	
Overwrite Scan Time: 1.4 ms 68/7920 Steps 🔲 RUN PLC COM: 1 (9600, 7, E, 1) TP70P/TP70G (PLC Station Address: 1)	
	<u></u>



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3. I	Installing a USB Driver	
3.2	Descriptions of the Communication Ports on TP70P	
3.3	Setting COM2	
3.4	Using COM2 as a Master Station	
	Setting COM3	
	Setting an RTU Mode for COM3	
	Using COM3 as a Slave Station	
	Data Exchange	

3.1 Installing a USB Driver

[Question] How to install a USB driver?

- [Answer] If users use TP70P for the first time, they have to follow the steps below, and install a USB driver.
- Download the latest version of TPEditor from the official website of Delta, and install the software. (Official website of Delta: <u>http://www.delta.com.tw</u>)
- 2. After a USB cable is connected to a USB port on the computer, the **Found New Hardware Wizard** window will appear. Please select the **Install from a list or specific location (Advanced)** option button, and click **Next**.

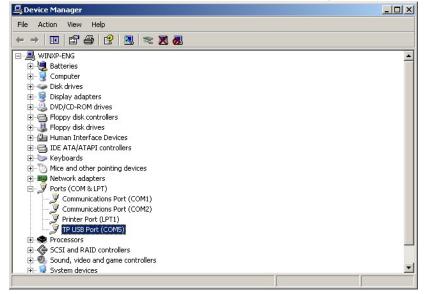




 Select the Include this location in the search checkbox, select the USB folder contained inside the directory where TPEditor is installed, and click Next. (Default path: C:\Program Files\Delta Industrial Automation\TPEditor X.X\USB)

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TPEdkor 1.90 BN Bn Bn Coup
E BIN
🗉 🧰 BmpGroup
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 After the installation of the USB driver selected is complete, the communication port connected to TP70P will be displayed in the Ports (COM & LPT) section in the Device Manager window.



5. The communication port which is connected to TP70P is also shown in the PC COM Port box in the PC Communication Setting (PC <=> TP) section in TPEditor.

-PC Communication Setting (PC <=>	TP)	
TP Station Address	1	$\overline{\cdot}$
PC COM Port	COM5	
Baud Rate	115200	▼

 TP70P can communicate with the computer by means of the communication port. TPEditor is used to upload/download a text panel program, and WPLSoft is used to upload/download/monitor a PLC program.

3.2 Descriptions of the Communication Ports on TP70P

[Question] What are the differences among the communication ports on TP70P, and methods of setting the communication ports, and how to set them?

[Answer] There are three communication ports on TP70P. The modes that the communication ports supports are different, and the methods of setting the communication ports are also different. Please refer to the table below for more information. COM1, COM2 and COM3 can be used simultaneously. The station address of COM1 and the station address of COM2 are the same. The station address of COM3 is different from the station address of COM1 and the station address of COM2.

Communication port	Interface	Mode supported	Method of setting a communication port
		COM1 supports connection to software,	Users have to install a
COM1	USB	and the uploading/download of a	USB driver if COM1 is
		program.	used for the first time.
			COM2 is set by means of
COM2	*1	PLC mode	special D devices and
	1	FLC mode	special M devices in the
			PLC.
СОМЗ	*1	Text panel mode	COM3 is set by means of
COMS		lext parter mode	objects in the text panel.

*1. Please refer to section 1.9 for more information.

COM1

COM1 can not function as a master station. It only supports the uploading/downloading of a program. If users use COM1 for the first time, they need to install a USB driver so that the computer can identify the virtual communication port which is connected to COM1. Please refer to section 3.1 for more information about installing a USB driver.

COM2

COM2 can be used as a master station or a slave station. It supports ASCII/RTU communication. Users can set a serial transmission rate. The maximum transmission rate which can be set is 115 kbps. The users can set the number of data bits, a parity bit, and the number of stop bits. If RTU communication is used, the number of data bits must be eight. D1120 in the PLC is used to set a communication protocol. If a communication error occurs in COM2, the users can check special M devices.

COM3

COM3 supports the text panel. After a driver is selected, COM3 can function as a master/slave station, and support ASCII/RTU communication. Users can set a serial transmission rate. The maximum transmission rate which can be set is 115 kbps. The users can set the number of data bits, a parity bit, and the number of stop bits. If a communication error occurs in COM3, a warning window showing that a communication error occurs will appear on the screen of the text panel.

3.3 Setting COM2

[Question] How to set COM2?

[Answer] COM2 supports the PLC. It is set in the same way as a DVP series PLC is. It is set by means of special D registers and special M devices. Please refer to the table below for more information.

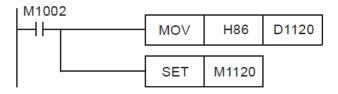
Communication parameter	Register
Communication format	D1120
The communication set holds.	M1120
ASCII (Off)/RTU (On) mode	M1143
Slave station address	D1121
Communication timeout	D1129
A communication timeout occurs.	M1129

Users can set a communication protocol according to the table below.

		Contents		
b0	Data length	0: 7 1: 8 (If PTU communication is used the number of data bits		
		(If RTU communication is used, the number of data bits set must be 8.)	5	
b1		00: None		
b1 b2	Parity bit	01: Odd		
		11: Even		
b3	Number of stop bits	0: 1 bit		
		1: 2 bits		
		0001 (H1): 110		
		0010 (H2): 150		
		0011 (H3): 300		
		1011 (H4) 600		
		0101 (H5): 1200		
b4		0110 (H6): 2400		
b5	Serial transmission rate	0111 (H7): 4800		
b6 b7		1000 (H8): 9600		
		1001 (H9): 19200		
		1010 (HA): 38400		
		1011 (HB): 57600		
		1100 (HC): 115200		
		1101 (HD): 500000		
		1110 (HE): 32150		
b8	Start-of-text character	None D1124		
b9	First end-of-text character	None D1125		
b10	Second end-of-text character	None D1126		
b11~b15	undefined	·		

Example: COM2 uses ASCII communication.

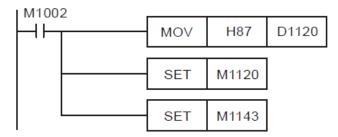
If the communication format that COM2 uses is the ASCII communication protocol (9600, 7, E, 1), the program code below must be added to the top of the program in the PLC. When the PLC runs during the first program scan, it checks whether M1120 is ON. If M1120 is ON, the setting of COM2 will be changed according to the value in D1120.





Example: COM2 uses RTU communication.

If the communication format that COM2 uses is the RTU communication protocol (9600, 8, E, 1), the program below will be required.



3

Notes:

- 1. After the modification of the communication format that COM2 uses is complete, the communication format that COM2 uses will not change if the PLC stops running.
- 2. After the modification of the communication format that COM2 uses is complete, the communication protocol that COM2 uses will be the default communication protocol (9600, 7, E, 1) if the PLC is turned off and then powered when it stops running.
- If COM2 functions as a slave station, users only need to set a communication format. If COM2 functions as a master station, a Modbus command will need to be sent by means of a communication instruction (MODRD/MODWR/MODRW)

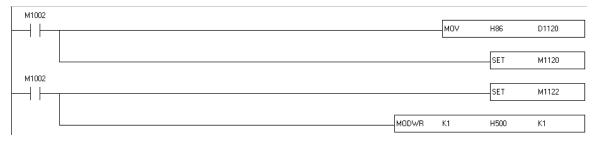
3.4 Using COM2 as a Master Station

[Question] How to use COM2 as a master station?

[Answer] If COM2 is used to as a master station connected to another device, commands will need to be sent by means of the Modbus instructions in the program in the PLC. Please refer to Chapter 4 in DVP-ES2/EX2/SS2/SA2/SX2/SE&TP Operation Manual for more information about the communication ports on a PLC. (Users can download DVP-ES2/EX2/SS2/SA2/SX2/SE&TP Operation Manual from the official website of Delta (http://www.delta.com.tw).)

Using COM2 to read the data in a DVP series PLC and write data to a DVP series PLC is described below. **Example: COM2 is used to set Y0 on a DVP series PLC to ON.**

Step 1: Please download the program below to TP70P.



Step 2: Connect COM2 to the two RS-485 wires connected to a DVP series PLC. When TP70P runs, Y0 on the DVP series PLC is ON.



Step 3: If communication error judgement is required, the program below can be added. If communication data is transmitted normally, M0 will be ON. If a communication timeout occurs, M1 will be ON. If the data received is incorrect, M2 will be ON. If parameters of an instruction are set incorrectly, M3 will be ON. Users can judge the state of communication by means of these flags.



3.5 Setting COM3

[Question] How to set COM3?

[Answer] COM3 supports the text panel. After a driver is selected, COM3 can function as a master/slave station. Users can set a communication format for COM3 in the **Basic Configuration** window in TPEditor. The drivers supported by TP70P are shown in the table below. The setting of COM3 is described below.

Master/Slave	Driver
	Delta PLC
	Delta Inverter VFD
	Delta ASD AC Servo
Master	Delta VFD ASCII Mode
	Delta VFD RTU Mode
	Delta Modbus ASCII
	Delta Modbus RTU
	Modicon Modbus RTU Mode
Slove	Modbus Slave ASCII Mode
Slave	Modbus Slave RTU Mode



Example: COM3 is used to read the value in D0 in a DVP series PLC. Step 1: Select DELTA PLC in the HMI <=> PLC section in the New Project window.

New Project
HMI <=> PLC Set Device Type
DELTA PLC
ТР Туре
TP70P
File Name
Tpe0
OK

Step 2: Create a numeric display in the working area. Select the **External PLC Setting** option button, and set a PLC address in the **Refer Device** window. (In the example, the PLC address set is 1.)

Refer Device					
D0		Font Set	ing	Font	
		Alignmer	nt	Align Left 💌	
Value Type	Unsigned 💌	🗖 Leadi	ng Zeros		
Value Length	Refer Device				
			Refer Device	e	7
Integer Numbe	C PLC				
Decimal Numb			🔽 Device N	ame D 💌	
	C TP				
			Device Nu	mher 0	
	C Internal PLC Setting		Device Nu	moer º	
	• External PLC Setting		0 1	2 3 4 5	OK
	Connect Com COM3		6 7	8 9 A B	
					Clear
	PLC Address 1		CD	EF. /	
	(0~255)				Close

Step 3: In the **Basic Configuration** window, click **TP** <=> **PLC Protocol**, and then set a communication format for COM3. (In the example, the communication format set is (9600, 7, E, 1).)

Basic Configuration	
PC <=> TP Communication Set	Protocol Setting(TP <=> PLC)
TP <=> PLC Protocol	Object Communication Setting
No. TP Other Setting	Default COM Port Default PLC Address
	Set TP Port Set PLC Address
	Internal ComPort
	C External ComPort
	Apply
	COM3
	RS485
	Baud Rate 9600 💌
	Data Length 7
	Parity Even
	Stop Bit 1
< >>	
	OK Cancel



Step 4: Compile the program created, and download the program to TP70P. Connect COM3 on TP70P to an RS-485 communication port on a PLC.



3.6 Setting an RTU Mode for COM3

[Question] How to set an RTU mode for COM3?

[Answer] When COM3 functions as a master station, it supports three RTU drivers. One is a Delta VFD RTU mode. It supports the RTU modes of Delta AC motor drives. Another is a Delta Modbus RTU mode. It can be used to connect a product which supports Delta Modbus. The other is a Modicon Modbus RTU mode. It can be used to connect a product which supports Modicon Modbus RTU communication. The example below describes how a TP70P series text panel which uses Delta Modbus RTU communication is connected to a PLC.

Example: An RTU mode is used to read the value in D0 in a DVP series PLC. Step 1: Select DELTA Modbus RTU in the HMI <=> PLC section in the New Project window.

New Project
HMI <=> PLC
Set Device Type
DELTA Modbus RTU
TP Type TP70P
File Name
Tpe0
OK



Step 2: Create a numeric display in the working area. Select the **External PLC Setting** option button, and set a PLC address in the **Refer Device** window. (In the example, the PLC address set is 1.) Type a standard Modbus communication address in the **Device Number** box.

Refer Device		Setting Font	
Value Type	Unsigned 🔽 🗆 L	eading Zeros	
Value Length	Refer Device		
Integer Number Decimal Number	© PLC © TP	Refer Device	
	Internal PLC Setting External PLC Setting	Device Number 404097	OK
	Connect Com COM3	• 6789AB • CDEF.7	Clear

Step 3: In the Basic Configuration window, click TP <=> PLC Protocol, and then set a communication format for COM3. (In the example, the communication format set is (9600, 7, E, 1).)

Basic Configuration							
Trotocol Setting(TP <=> PLC)							
TP <=> PLC Protocol	Object Communication Setting						
N TP Other Setting	🔽 Default COM Port 📄 Default PLC Address						
	Set TP Port Set PLC Address						
	© Internal ComPort						
	C External ComPort						
	Apply						
	СОМЗ						
	R\$485						
	Baud Rate 9600 💌						
	Data Length 7						
	Parity Even						
	Stop Bit 1						
<							
	OK. Cancel						

Step 4: Compile the program created, and download the program to TP70P. Connect COM3 on TP70P to an RS-485 communication port on a PLC.



3.7 Using COM3 as a Slave Station

[Question] How does a device read data in TP70P through COM3 on TP70P?

[Answer] COM3 supports Modbus slave ASCII/RTU modes. The example below describes how a device read data in TP70P through COM3 on TP70P.



Example: A PLC modifies data in TP70P through an RTU mode.

Step 1: Select Modbus Slave RTU Mode in the HMI <=> PLC section in the New Project window.

New Project
HMI <=> PLC Set Device Type Modbus Slave RTU Mode
TP Type TP70P
File Name Tpe0
OK

Step 2: Create a numeric display in the working area. Type a Modbus communication address in the **Device Number** box.

Refer Device		Font Settin Alignment	g	Font Align Left 💌	
Value Type	Unsigned 💌	🔽 Leading	Zeros		
Value Length	Refer Device				
Integer Number Decimal Number	C PLC © TP		Refer De		
	 Internal PLC Settin External PLC Settin 			Number 0	OK
	Connect Com CC PLC Address 1 (0~255))M3 🔻		7 8 9 A B D E F . /	Clear Close

Step 3: In the **Basic Configuration** window, click **TP** <=> **PLC Protocol**, and then set a communication format for COM3. (In the example, the communication format set is (9600, 7, E, 1).)

Basic Configuration	
PC <=> TP Communication Set	Protocol Setting(TP <=> PLC)
TP <=> PLC Protocol	Object Communication Setting
N TP Other Setting	✓ Default COM Port □ Default PLC Address
	Set TP Port Set PLC Address
	Internal ComPort
	C External ComPort
	C External ComPort
	Apply
	COM3
	RS485
	Baud Rate 9600 💌
	Data Length 7
	Parity Even 💌
	Stop Bit 1
<	
	OK Cancel

Step 4: Compile the program created, and download the program to TP70P. Connect COM3 on TP70P to an

RS-485 communication port on a PLC.

Step 5: Download the program below to the PLC.

M1002				
\vdash \vdash		моч	H86	D1120
			SET	M1120
M1002				
\vdash \vdash			SET	M1122
	MODWR	K1	HO	K1
1				



Step 6: When the PLC runs, users can see that the value displayed on the screen of TP70P is changed to 1.



3.8 Data Exchange

[Question] How does TP70P exchange data with a device by means of COM3 instead of objects in TP70P? [Answer] TP70P can exchange data with a device by means of COM3. Users have to select the **Read Block Setting** checkbox and the **Write Block Setting** checkbox, and specify devices in the **Read/Write Block Setting** section in the **System Parameter Setting** window. The devices specified are groups of consecutive devices. Thirty-two values at most can be read/written at a time. The example below describes how TP70P communicates with a DVP series PLC by means of COM3. The communication is composed of two parts.

- 1. **Read Block Setting**: The values in D0~D7 in the DVP series PLC are read, and then put in D0~D7 in TP70P.
- 2. Write Block Setting: The values in D10~D17 in TP70P are written to D10~D17 in the DVP series PLC.
- Read Block Setting: The values in D0~D7 in the DVP series PLC are read, and then put in D0~D7 in TP70P.



Step 1: Click System Parameter Setting on the Global Setting menu.

Step 2: Select the Read Block Setting checkbox in the Read/Write Block Setting section. Read Start Addr.: The values in D0~D7 in the DVP series PLC are read. Write Start Addr.: The values which are read are put in D0~D7 in TP70P.

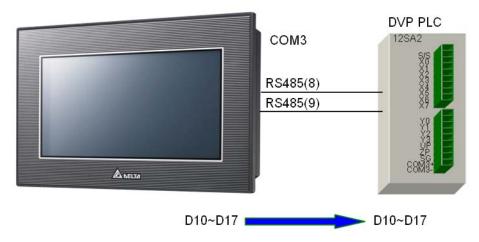
System Parameter Setting	×
Page Auto-Jump/Backlight Control	
Page Auto-Jump Refer Device	Backlight Control Refer Device
Read/Write Block Setting ✓ Read Block Setting	
Read Start Addr. D0	Length 8
Write Start Addr. D0	
🖵 Write Block Setting	
Write Start A.ddr.	Length 2
Read Start Addr.	
	OK Close

Step 3: Click ... at the right side of the Read Start Addr. box. Select the External PLC Setting option button and D0 in the Refer Device window.

Page Auto-Jump/Backlight Control 🔽 Enable		
Page Auto-Jump Refer Device Backlig	the Control Refer Device	
Read/Write Block Setting	© PLC	Refer Device
Read Start Addr. D0	C TP C Internal PLC Setting	Device Number 0
Write Block Setting Write Start A ddr.	External PLC Setting	0 1 2 3 4 5 OK
Read Start Addr.	Connect Com COM3 PLC Address 1 (0~255)	6 7 8 9 A B C D E F . /



• Write Block Setting: The values in D10~D17 in TP70P are written to D10~D17 in the DVP series PLC.



Step 1: Select the Write Block Setting checkbox in the Read/Write Block Setting section. Write Start Addr.: Values are written to D10~D17 in the DVP series PLC. Read Start Addr.: Values in D10~D17 in TP70P

System Parameter Setting 🛛 🛛 🔀				
Page Auto-Jump/Backli Enable	ght Control			
Page Auto-Jump Refer I	Device Back	light Control Refer Device	9	
Read/Write Block Settin	g			
🔲 Read Block Setting				
Read Start Addr.		Length 2	1	
Write Start Addr.				
🔽 Write Block Setting				
Write Start Addr.	D10	Length 8		
Read Start Addr.	D10			
		OK Clos	e	



Step 2: Click ... at the right side of the Write Start Addr. box. Select the External PLC Setting option button and D10 in the Refer Device window.

Page Auto-Jump/Backlight Control		
Page Auto-Jump Refer Device Backl	ight Control Refer Device	
Read/Write Block Setting	Refer Device	
🕅 Read Block Setting		Refer Device
Read Start Addr.	C PLC	🔽 Device Name D 🔻
Write Start Addr.	C TP	
✓ Write Block Setting	C Internal PLC Setting	Device Number 10
Write Start Addr. D10	External PLC Setting	0 1 2 3 4 5 OK
Read Start Addr. D10	Connect Com COM3	6 7 8 9 A B Clear
	PLC Address 1	C D E F . /
	(0~255)	

Step 3: After the steps above are complete, and the program in TPEditor is downloaded to TP70P, TP70P can exchange data with the DVP PLC series by means of COM3.

MEMO

