

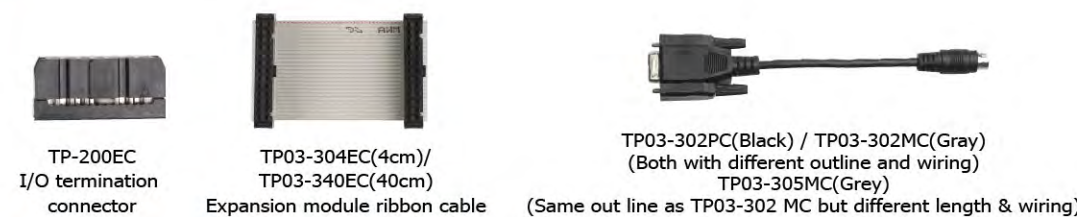
# Unique Feature

1. Main units: 14/20/26/30/36/40/60 I/O's expandable to 256 digital I/O's and 60/10 ( 12 bit)analog I/O's.
2. Four programming languages: Ladder, IL(Instruction List), SFC and FBD are all available for TP03.
3. Program memory: 4 to 16k size, including basic and application instructions, such as : ADD/SUB/MUL/DIV, trigonometry as SIN/COS/TAN...,matrix input and 7-segment LED display output and PID control with floating-point calculations.
4. Three communication ports on the main unit , can be used to establish Networks up to a maximum distance of 1.2 Km as follows:
  - (1)Computer link: One PC as master can control up to 255 units of TP03 as slaves.
  - (2)Data Link: One TP03 as master can control other TP03, up to 15 units.
  - (3)Remote I/O: One TP03 as master can control up to 4 units of TP03 as slaves, each with max 36/24 I/O's.
5. PG port can be used to connect to other equipment or operator panels OP07/OP8.
6. 2 high speed pulse output ( Max 200KHZ) can be used easily to control servo drives.
7. Built-in high speed counter ( Max 100KHZ) can be interfaced to encoders with precise pulses.
8. User program is stored in flash memory ( M type) and EEPROM ( H type).Battery back up for user data and RTC is included as standard.
9. TP03 series product have a standard height of 90mm.
10. Plugable terminals ( H type) and DIN rail mounting enables simple installation and maintenance.
11. Profibus, Devicenet and Ethernet (TCP/IP) communication Facility with option cards.
12. TP02 expansion modules are suitable for use with TP03.
13. CE/UL certification.

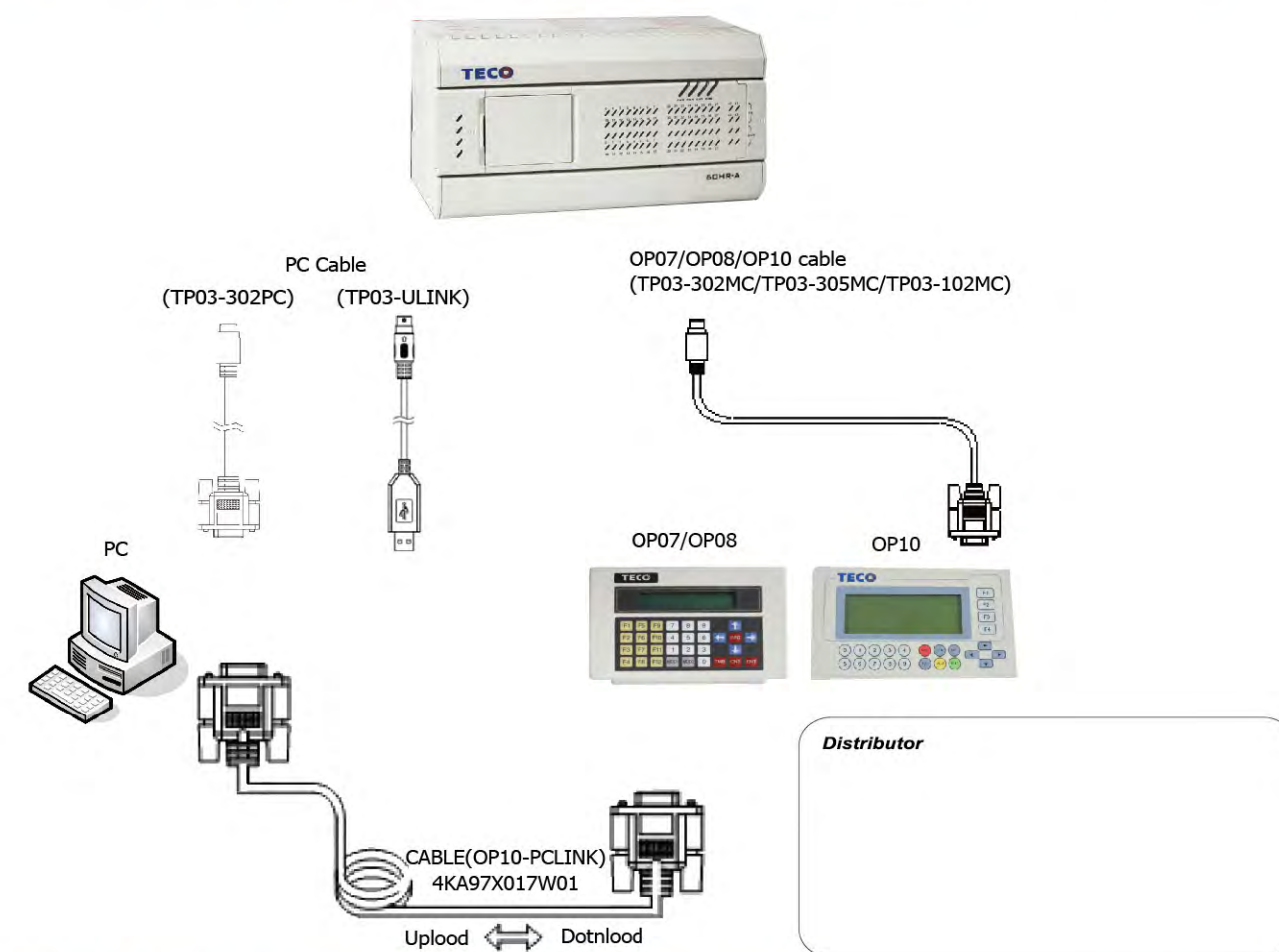
## Interface & accessory list

Model	Accessory	Description	Type No.	Remark
Main module	included as standard	I/O termination connector	TP-200EC	install TP-200EC into the connector in the last expansion module in order to form a I/O loop for D-sub type for USB type
		Battery (for 5 years)		
		RS485 Built-in(H type only)		
		Standard cover for expansion card	TP03-0CV	
PC06	included as standard	Installation manual		
		1.8M cable(black)	TP03-302PC	
		1.8M cable(grey)	TP03-ULINK	
		Compact Disk	TP03-PC06	
OP07/OP08	included as standard	1.8M cable(grey)	TP03-302MC	
TP03 Expansion module	included as standard	4cm cable for expansion module	TP03-304EC	26 pins · only for TP03 expansion module
PDA06	Option	PDA adapter	JNSWPDA	
OP08	Option	5M cable(grey)	TP03-305MC	Only for OP08
TP03 Expansion module	Option	40cm cable for expansion module	TP03-340EC	26 pins · only for TP03 expansion module
OP10	Option	1.8M cable(grey)	TP03-102MC	

### Profile



## System configuration



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## Programmable Logic Controller

# TP03 Series

**TECO**

# TP03 Series

TP03 is the latest generation of PLC developed by TECO. The high-speed and high quality programmable logic controller has following features:

- Easy to install, maintain and program.
- Basic instructions scan time: 0.31 us /step (ANDB), 0.45 us/step (LD).
- High speed counters:( 5-100KHZ) Single/Dual channel with Up/down, Set/Reset and Interrupt features.
- High speed communication ports.
- 1ms/10ms interrupt timer.
- Built-in RTC (Real Time Clock).(H type only).
- High speed pulse output function.
- RUN / STOP Switch.
- Two integrated external potentiometers on main unit.
- Various expansion modules such as A/D, D/A, Communication, etc.





## General specification

Item		Type		14S	20S	26S	36S	20M	30M	20H	30H	40H	60H		
Basic unit outline				Brick type											
Operation control				Cyclic scanning of user program											
Input/ output				Cyclic scanning of user program and input and output											
Program language				Ladder /IL(Instruction List)/SFC/FBD											
Digital I/O	Digital input	8	12	16	20			12	16	12	16	24	36		
	Digital output	6	8	10	16			8	14	8	14	16	24		
Expansion module	Digital module	Expandable to 80 points				Expandable to 128 points				Expandable to 256 points					
	Analog module	2x4AD+ & 1x2DA+ or 1x8AD & 1x2DA								1x4AD+ & 1x2DA+ & 7x8AD & 4x2DA 60 input channels /10 output channels					
Max Analog I/O				8 input channels /2 output channels				36				ANB/ORB ...etc.: 0.62μs/ step			
Scan time	Basic instruction	ANB/ORB ...etc.: 0.62μs/ step								ANB/ORB ...etc.: 0.31μs/ step					
		LD/AND/OR...etc.: 0.9μs/ step								LD/AND/OR...etc.: 0.36 ~0.45μs/ step					
	Application instruction	126				134				144					
	Digital I/O relay	X000~X377(256 points) / Y000~Y377(256 points)													
Relay and register	Auxiliary relay	General auxiliary relay: M0~M1535 ( 1536 points)				General auxiliary relay: M0~M7679 ( 7680 points) Data Link:M2000~M3023 Remote I/O:M4200~M4355,M4600~M4695 OP07/OP08:M1600~M1615									
	Step relay	S0~S1023 (1024 points)				Special auxiliary relay: M8000~M8511 ( 512points) S0~S4095 (4096 points)									
		100 points (100ms;44 points : 10ms; 46 points : 1ms with accumulating function; 4 points : 100 ms with accumulating function: 6)				512 points (100ms: 200 points : 10ms: 46 points : 1ms with accumulating function: 4 points : 100 ms with accumulating function: 6 points : 1ms: 256 points) . Analog potentiometer timer: 2 points									
	Counter	136 points (16 bit:100 points, 32bit: 36 points) General register:				256 points (16 bit: 200 points, 32bit: 56 points) General register:D0000~D7999(8000points);									
	Data register	D0~D511(512points)				File register:D2000~D3299 (1300 points) OP07/OP08:D3300									
	Index register	Special register: D8000~D8511 (512points) 32points: V000~V0015 / Z000~Z0015													
Relay and register	Stack pointer	Mark: N0~N7 ( 8points), pointerP0~P127(128points), input interruption pointer: I00~I30(4points), timer interruption pointer: I6**~I8** (3points),counter interruption pointer I010~I060 (6points)				Mark: N0~N7 ( 8points), pointer P0~P255 (256 points), input interruption pointer: I00~I50 (6points), timer interruption pointer: I6**~I8** (3points), counter interruption pointer I010~I060 (6points)									
	decimal (K) Hex (H)	16 Bit : -32,768~32,768 ; 32 Bit : -2,147,483,648~2,147,483,648 16 Bit : 0~FFFFH ; 32 Bit : 0~FFFFFH													
RTC				N.A				Built-in: Second (D8013), Minute (D8014), Hour (D8015), Day(D8016), Month (D8017),Year (D8018), week(D8019) And with 30s offset							
Run/stop Switch				Built-in											
Potentiometer				N.A				2 points built-in and 6 points expansible (TP03-6AV optional)							
High speed input (X0~X5)	High speed counter	Single channel:4 points 10KHz max				Single channel : 4points 10KHz and 2 points 5KHz max.				Single channel : 4points 100KHz and 2 points 5KHz max.					
	Interrupt input					Dual Channel: 2 points 10KHz									
High speed input (X0~X5)		4points (corresponding to I00~I30 ): Minimum pulse width 50 μs				6points (corresponding to I00~I50 ): Minimum pulse width 50 μs				6points (corresponding to I00~I50 ): Minimum pulse width 5 μs					
Pulse output	Pulse output	N.A				2 points: Y0/Y1 with acceleration/ deceleration				100KHz max.					
	PWM output	N.A				2 points: Y0/Y1									
Communication port	Frequency PC/PDA	N.A				1KHz max.									
	RS485 Communication	Built-in 1 communication port for Data Link, Remote I/O or Computer Link, max. 307.2k bps				N.A				Built-in 1 communication port for Data Link, Remote I/O or Computer Link,max. 307.2k bps					
	Expansion card	N.A				Either RS485 or RS232 communication card is available for the port and both have Modbus communication protocol, max. 307.2k bps.									
Self-diagnosis				Input/output inspection, system processing time out inspection, illegal instruction inspection, program language syntax inspection and password setting											
Supervise/ Troubleshoot				Display processing time, byte/bit character or device set											
Terminal block				Fixed, unremovable											
Dimension(WxDxH)(mm)				116 x 92 x 64		177 x 92 x 64		116 x 90 x 83		177 x 90 x 83					

## Main modules

Type	Rated Voltage	User 24Vdc	Input point		Output point		Dimension
TP03-14SR-A	100~240 VAC	250mA	point	type	point	type	116×92×64mm See Fig1
TP03-20SR-A			8		6		177×92×64mm See Fig2
TP03-26SR-A			12		8		
TP03-36SR-A			16		10		
TP03-20MR-A			16		16		
TP03-30MR-A			12		8		116×90×83mm See Fig3
TP03-20HR-A			16		14		
TP03-30HR-A			12		8		
TP03-20HR-A			16		14		
TP03-40HR-A			24		16		177×90×83mm See Fig4
TP03-60HR-A	24VDC	300mA	24		24		
TP03-40HR-D			N. A		16		
TP03-60HR-D			24		16		
TP03-20MT-A			12		8		116×90×83mm See Fig3
TP03-30MT-A			16		14		
TP03-20HT-A			12		8		
TP03-30HT-A			16		14		
TP03-40HT-A			24		16		177×90×83mm See Fig4
TP03-60HT-A			36		24		

### Profile



## Expansion module

Type No.	Power	In/Out point	Description	Dimension
TP03-01SPS-A	100~240VAC	N.A	Power source for expansion modules	57 x 90 x 83 mm
TP03-4RD		4 / 0	PT-100 temperature input * 4 channel	
TP03-4RD-K		4 / 0	PT-1000 temperature input * 4 channel	
TP03-4TM		4 / 0	J/K temperature input * 4 channel	
TP03-3MA	24Vdc	2 / 1	0~10V/0~20mA analog input * 2 channel	57 x 90 x 83 mm
TP03-2DA		0 / 2	0~10V/±10V/0~20mA analog output * 1 channel	
TP03-8AD		8 / 0	0~10V/0~20mA analog output * 2 channel	
TP03-16EMR		8 / 8	0~10V/±10V/0~20mA analog input * 8 channel	
TP03-16EMT	N.A	8 / 8	8 points DC input & 8 points relay output	57 x 90 x 83 mm
TP03-16EXD		16 / 0	8 points input & 8 points Tr. output	
TP03-16EYR		0 / 16	16 points Digital input	
TP03-16EYT		0 / 16	16 points Digital relay output	
TP03-16EYT		0 / 16	16 points Tr. outputs	

### Profile



## Expansion Cards

Type No.		Description
TP03-0CV	Built-in	Standard cover
TP03-485RS	Optional	RS485 Multi-function communication port
TP03-2AI		0~10V analog input port*2(10bit)
TP03-2TI		Timer(0~30s)input port*2
TP03-6AV		Analog potential meter input port*6
TP03-1ME		EEPROM memory

### Profile



## Expansion peripheral equipment

Type No.	Power	Description	Remark
OP07	N.A	2 line LCD ,timer and counter setting device	See Fig5
OP08	24Vdc	2 line LCD ,timer and counter setting device	See Fig5
OP10	24Vdc	4 line LCD ,timer and counter setting device	See Fig6
PC06	N.A	TP03 PLC PC software	
TP03-PDA06	N.A	TP03 PLC PDA software	

### Profile



## Communication module

Type No.	Power	Description	Dimension
TP03-DNet	24Vdc	DeviceNet slave	38 x 90 x 59mm
TP03-PBus		Profibus - DP slave	
EN01		TCP/IP	

### Profile



## Basic programming instruction list

Basic instruction list					
Mnemonic	Function	Component	Mnemonic	Function	Component
LD	Initial logical operation contact type (normal open)	X,Y,M,S,T,C	ANB	Serial connection of multiple contacts circuits	-
LDI	Initial logical operation contact type (normal closed)	X,Y,M,S,T,C	ORB	Parallel connection of multiple contacts circuits	-
AND	Serial connection of contacts (normal open)	X,Y,M,S,T,C	MPS	Stores the current result of the internal PLC operations	-
ANI	Serial connection of contacts (normal closed)	X,Y,M,S,T,C	MRD	Reads the current result of the internal PLC operations	-
OR	Parallel connection of contacts (normal open)	X,Y,M,S,T,C	MPP	Pops(recalls and removes)the currently stored result	-
ORI	Parallel connection of contacts (normal close)	X,Y,M,S,T,C	INV	Inverse	-
LDP	Initial logical operation Rising edge pulse	X,Y,M,S,T,C	MC	Denotes the start of a master control block	-
LDF	Initial logical operation Falling/trailing edge pulse	X,Y,M,S,T,C	MCR	Denotes the end of a master control block	-
ANDP	Serial connection of Rising edge pulse	X,Y,M,S,T,C	NOP	No operation	-
ANDF	Serial connection of Falling/trailing edge pulse	X,Y,M,S,T,C	END	Program end	-
ORP	Parallel connection of Rising edge pulse	X,Y,M,S,T,C	SMCS	Master control set	-
ORF	Parallel connection of Falling/trailing edge pulse	X,Y,M,S,T,C	SMCR	Master control reset	-
PLS	Rising edge pulse	-	JCS	Jump control set	-
PLF	Falling/Trailing edge pulse	-	JCR	Jump control reset	-
OUT			RST	Reset a bit device permanently OFF	-
OUTI					
OUTT	Driving timer or counter coils	X,Y,M,S,T,C	<b>Step instruction</b>		
OUT C			Mnemonic	Function	Component
OUT S			STL	Step ladder	-
SET	Sets a bit device permanently ON	-	RET	Set ladder return	-

Advance insturction list									
Instruction Type	Func. No.	Mnemonic	Function	Instruction Type	Func. No.	Mnemonic	Function		
Program flow	00	CJ	Conditional Jump	Data operation	47	ANR	Annunciator reset		
	01	CALL	Call subroutine		48	SQR	Square root		
	02	SRET	Subroutine return		49	FLT	Float point		
	03	IRET	Interrupt return		50	REF	Refresh		
	04	EI	Enable interrupt		52	MTR	Input matrix		
	05	DI	Disable interrupt		53	HSCS	High speed counter set		
	06	FEND	First end		54	HSCR	High speed counter reset		
	07	WDT	Watchdog timer		55	HSZ	High speed counter zone compare		
	08	FOR	Start a for/next loop		56	SPD	Speed detec		
09	NEXT	End a for/next loop	High speed processing	57	PLSY	Pulse Y output			
Move and compare	10	CMP		Compare	58	PWM	Pulse width modulation		
	11	ZCP		Zone compare	59	PLSR	Ramp pulse output		
	12	MOV		Move	60	IST	Initial state		
	13	SMOV		Shift move	61	SER	Search		
	14	CML		Compliment	62	ABSD	Absolute drum		
	15	BMOV		Block move	63	INCD	Incremental drum		
	16	FMOV		Fill move	64	TTMR	Teaching timer		
	17	XCH		Exchange	65	STMR	Special timer-definable		
	18	BCD	BCD binary coded decimal	Handy instruction	66	ALT	Alternate state		
19	BIN	BIN binary	67		RAMP	Ramp-variable value			
20	ADD	Addition	68		ROTC	Rotary table control			
Arithmetic and logic operations	21	SUB	Subtraction		69	SORT	Sort data		
	22	MUL	Multiplication		70	TKY	Ten key input		
	23	DIV	Division		71	HKY	Hexadecimal input		
	24	INC	Increment		72	DSW	Digital switch		
	25	DEC	Decrement		73	SEGD	Seven segment decoder		
	26	WAND	Word and		74	SEGL	Seven segment with latch		
	27	WOR	Word or	75	ARWS	Arrow switch			
	28	WXR	Word exclusive or	76	ASC	ASCII code			
	29	NEG	Negation	77	PR	Print to a display			
30	ROR	Rotation right	External I/O device	80	RS	RS communication			
31	ROL	Rotation left		81	PRUN	Optical Transmission			
Rotation and shift	32	RCR		Rotation right with carry	82	ASCI	HEX-ASCII		
	33	RCL		Rotation left with carry	83	HEX	ASCII-HEX		
	34	SFTR		Bit shift right	84	CCD	Check code		
	35	SFTL		Bit shift left	85	VRRD	Volume read		
	36	WSFR		Word shift right	86	VRSC	Volume scale		
	37	WSFL		Word shift left	87	MBUS	MODBUS		
	38	SFWR		Shift register write	88	PID	PID control loop		
	39	SFRD	Shift register read	89	EPSC	Option card set			
	40	ZRST	Zine reset	External serial device	110	ECMP	Float compare		
41	DECO	Decode	111		EZCP	Float zone compare			
42	ENCO	Encode	112		EMOV	Float Move			
Data operation	43	SUM	Sum of active bits		118	EBCD	Float to scientific		
	44	BON	Check specified bit status		119	EBIN	Scientific to float		
	45	MEAN	Mean		120	EADD	Float add		
		46	ANS		Timed annunciator set	121	ESUB	Float subtract	
						122	EMUL	Float multiplication	
						123	EDIV	Float division	
				124	EXP	Exponent arithmetic			
	Instruction Type	Func. No.	Mnemonic	Function	Instruction Type	Func. No.	Mnemonic	Function	
		125	LOGE	Natural logarithm		Float points and trigonometry	126	LOG10	Common logarithm
127		ESQR	Float square root	128			ENEG	Float Negation	
129		INT	Float-integer	130			SIN	Sine	
131		COS	Cosine	132			TAN	Tangent	
133		ASIN	Arc sine	134			ACOS	Arc cosine	
135		ATAN	Arc tangent	136			RAD	Degree to RAD	
137		GRE	Degree to Degree	138			SWAP	Float to Scientific	
139		ZRN	Zero return	140			PLSV	Pulse V	
Position	141	DRVI	Drive to increment	Real time	142		DRVA	Drive to absolute	
	143	TCMP	Time compare		144	TZCP	Time zone compare		
	145	TADD	Time add		146	TSUB	Time subtract		
	147	TRD	Read RTC data		148	TWR	Setting RTC data		
	149	GARY	Decimal to Gary code		150	GBIN	Gary code to Decimal		
	Communication	151	CRC		Cyclical Redundancy check	In line Comparison	152	DLK	Data Link
		153	RMIO		Remote I/O		154	TEXT	OP07/08 text
		155	DTLKC		Data Link Mode2		156	LD=	(S1)=(S2)
		157	LD>		(LD(S1)>(S2)		158	LD<	(LD(S1)<(S2)
159		LD<=	(LD(S1)<=(S2)	160	LD>=		(LD(S1)>=(S2)		
161		AND=	(AND(S1)=(S2)	162	AND>		(AND(S1)>(S2)		
163		AND<	(AND(S1)<(S2)	164	AND<=		(AND(S1)<=(S2)		
165		AND>=	(AND(S1)>=(S2)	166	OR=		(OR(S1)=(S2)		
167		OR>	(OR(S1)>(S2)	168	OR<		(OR(S1)<(S2)		
169	OR<=	(OR(S1)<=(S2)	170	OR>=	(OR(S1)>=(S2)				
171	OR<=	(OR(S1)<=(S2)	172	OR>=	(OR(S1)>=(S2)				
173	OR<=	(OR(S1)<=(S2)	174	OR>=	(OR(S1)>=(S2)				
175	OR<=	(OR(S1)<=(S2)	176	OR>=	(OR(S1)>=(S2)				
177	OR<=	(OR(S1)<=(S2)	178	OR>=	(OR(S1)>=(S2)				
179	OR<=	(OR(S1)<=(S2)	180	OR>=	(OR(S1)>=(S2)				
181	OR<=	(OR(S1)<=(S2)	182	OR>=	(OR(S1)>=(S2)				
183	OR<=	(OR(S1)<=(S2)	184	OR>=	(OR(S1)>=(S2)				
185	OR<=	(OR(S1)<=(S2)	186	OR>=	(OR(S1)>=(S2)				
187	OR<=	(OR(S1)<=(S2)	188	OR>=	(OR(S1)>=(S2)				
189	OR<=	(OR(S1)<=(S2)	190	OR>=	(OR(S1)>=(S2)				
191	OR<=	(OR(S1)<=(S2)	192	OR>=	(OR(S1)>=(S2)				
193	OR<=	(OR(S1)<=(S2)	194	OR>=	(OR(S1)>=(S2)				
195	OR<=	(OR(S1)<=(S2)	196	OR>=	(OR(S1)>=(S2)				
197	OR<=	(OR(S1)<=(S2)	198	OR>=	(OR(S1)>=(S2)				
199	OR<=	(OR(S1)<=(S2)	200	OR>=	(OR(S1)>=(S2)				
201	OR<=	(OR(S1)<=(S2)	202	OR>=	(OR(S1)>=(S2)				
203	OR<=	(OR(S1)<=(S2)	204	OR>=	(OR(S1)>=(S2)				
205	OR<=	(OR(S1)<=(S2)	206	OR>=	(OR(S1)>=(S2)				
207	OR<=	(OR(S1)<=(S2)	208	OR>=	(OR(S1)>=(S2)				
209	OR<=	(OR(S1)<=(S2)	210	OR>=	(OR(S1)>=(S2)				
211	OR<=	(OR(S1)<=(S2)	212	OR>=	(OR(S1)>=(S2)				
213	OR<=	(OR(S1)<=(S2)	214	OR>=	(OR(S1)>=(S2)				
215	OR<=	(OR(S1)<=(S2)	216	OR>=	(OR(S1)>=(S2)				
217	OR<=	(OR(S1)<=(S2)	218	OR>=	(OR(S1)>=(S2)				
219	OR<=	(OR(S1)<=(S2)	220	OR>=	(OR(S1)>=(S2)				
221	OR<=	(OR(S1)<=(S2)	222	OR>=	(OR(S1)>=(S2)				
223	OR<=	(OR(S1)<=(S2)	224	OR>=	(OR(S1)>=(S2)				
225	OR<=	(OR(S1)<=(S2)	226	OR>=	(OR(S1)>=(S2)				
227	OR<=	(OR(S1)<=(S2)	228	OR>=	(OR(S1)>=(S2)				
229	OR<=	(OR(S1)<=(S2)	230	OR>=	(OR(S1)>=(S2)				
231	OR<=	(OR(S1)<=(S2)	232	OR>=	(OR(S1)>=(S2)				
233	OR<=	(OR(S1)<=(S2)	234	OR>=	(OR(S1)>=(S2)				
235	OR<=	(OR(S1)<=(S2)	236	OR>=	(OR(S1)>=(S2)				
237	OR<=	(OR(S1)<=(S2)	238	OR>=	(OR(S1)>=(S2)				
239	OR<=	(OR(S1)<=(S2)	240	OR>=	(OR(S1)>=(S2)				
241	OR<=	(OR(S1)<=(S2)	242	OR>=	(OR(S1)>=(S2)				
243	OR<=	(OR(S1)<=(S2)	244	OR>=	(OR(S1)>=(S2)				
245	OR<=	(OR(S1)<=(S2)	246	OR>=	(OR(S1)>=(S2)				
247	OR<=	(OR(S1)<=(S2)	248	OR>=	(OR(S1)>=(S2)				
249	OR<=	(OR(S1)<=(S2)	250	OR>=	(OR(S1)>=(S2)				
251	OR<=	(OR(S1)<=(S2)	252	OR>=	(OR(S1)>=(S2)				
253	OR<=	(OR(S1)<=(S2)	254	OR>=	(OR(S1)>=(S2)				
255	OR<=	(OR(S1)<=(S2)	256	OR>=	(OR(S1)>=(S2)				
257	OR<=	(OR(S1)<=(S2)	258	OR>=	(OR(S1)>=(S2)				
259	OR<=	(OR(S1)<=(S2)	260	OR>=	(OR(S1)>=(S2)				
261	OR<=	(OR(S1)<=(S2)	262	OR>=	(OR(S1)>=(S2)				
263	OR<=	(OR(S1)<=(S2)	264	OR>=	(OR(S1)>=(S2)				
265	OR<=	(OR(S1)<=(S2)	266	OR>=	(OR(S1)>=(S2)				
267	OR<=	(OR(S1)<=(S2)	268	OR>=	(OR(S1)>=(S2)				
269	OR<=	(OR(S1)<=(S2)	270	OR>=	(OR(S1)>=(S2)				
271	OR<=	(OR(S1)<=(S2)	272	OR>=	(OR(S1)>=(S2)				
273	OR<=	(OR(S1)<=(S2)	274	OR>=	(OR(S1)>=(S2)				
275	OR<=	(OR(S1)<=(S2)	276	OR>=	(OR(S1)>=(S2)				
277	OR<=	(OR(S1)<=(S2)	278	OR>=	(OR(S1)>=(S2)				
279	OR<=	(OR(S1)<=(S2)	280	OR>=	(OR(S1)>=(S2)				
281	OR<=	(OR(S1)<=(S2)	282	OR>=	(OR(S1)>=(S2)				
283	OR<=	(OR(S1)<=(S2)	284	OR>=	(OR(S1)>=(S2)				
285	OR<=	(OR(S1)<=(S2)	286	OR>=	(OR(S1)>=(S2)				
287	OR<=	(OR(S1)<=(S2)	288	OR>=	(OR(S1)>=(S2)				
289	OR<=	(OR(S1)<=(S2)	290	OR>=	(OR(S1)>=(S2)				
291	OR<=	(OR(S1)<=(S2)	292	OR>=	(OR(S1)>=(S2)				
293	OR<=	(OR(S1)<=(S2)	294	OR>=	(OR(S1)>=(S2)				
295	OR<=	(OR(S1)<=(S2)	296	OR>=	(OR(S1)>=(S2)				
297	OR<=	(OR(S1)<=(S2)	298	OR>=	(OR(S1)>=(S2)				
299	OR<=	(OR(S1)<=(S2)	300	OR>=	(OR(S1)>=(S2)				
301	OR<=	(OR(S1)<=(S2)	302	OR>=	(OR(S1)>=(S2)				
303	OR<=	(OR(S1)<=(S2)	304	OR>=	(OR(S1)>=(S2)				
305	OR<=	(OR(S1)<=(S2)	306	OR>=	(OR(S1)>=(S2)				
307	OR<=	(OR(S1)<=(S2)	308	OR>=	(OR(S1)>=(S2)				
309	OR<=	(OR(S1)<=(S2)	310	OR>=	(OR(S1)>=(S2)				
311	OR<=	(OR(S1)<=(S2)	312	OR>=	(OR(S1)>=(S2)				
313	OR<=	(OR(S1)<=(S2)	314	OR>=	(OR(S1)>=(S2)				
315	OR<=	(OR(S1)<=(S2)	316	OR>=	(OR(S1)>=(S2)				
317	OR<=	(OR(S1)<=(S2)	318	OR>=	(OR(S1)>=(S2)				
319	OR<=	(OR(S1)<=(S2)	320	OR>=	(OR(S1)>=(S2)				
321	OR<=	(OR(S1)<=(S2)	322	OR>=	(OR(S1)>=(S2)				
323	OR<=	(OR(S1)<=(S2)	324	OR>=	(OR(S1)>=(S2)				
325	OR<=	(OR(S1)<=(S2)	326	OR>=	(OR(S1)>=(S2)				
327	OR<=	(OR(S1)<=(S2)	328	OR>=	(OR(S1)>=(S2)				
329	OR<=	(OR(S1)<=(S2)	330	OR>=	(OR(S1)>=(S2)				
331	OR<=	(OR(S1)<=(S2)	332	OR>=	(OR(S1)>=(S2)				
333	OR<=	(OR(S1)<=(S2)	334	OR>=	(OR(S1)>=(S2)				
335	OR<=	(OR(S1)<=(S2)	336	OR>=	(OR(S1)>=(S2)				
337	OR<=	(OR(S1)<=(S2)	338	OR>=	(OR(S1)>=(S2)				
339	OR<=	(OR(S1)<=(S2)	340	OR>=	(OR(S1)>=(S2)				
341	OR<=	(OR(S1)<=(S2)	342	OR>=	(OR(S1)>=(S2)				
343	OR<=	(OR(S1)<=(S2)	344	OR>=	(OR(S1)>=(S2)				
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347	OR<=	(OR(S1)<=(S2)	348	OR>=	(OR(S1)>=(S2)				
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383	OR<=	(OR(S1)<=(S2)	384	OR>=	(OR(S1)>=(S2)				
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387	OR<=	(OR(S1)<=(S2)	388	OR>=	(OR(S1)>=(S2)				
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397	OR<=	(OR(S1)<=(S2)	398	OR>=	(OR(S1)>=(S2)				
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427	OR<=	(OR(S1)<=(S2)	428	OR>=	(OR(S1)>=(S2)				
429	OR<=	(OR(S1)<=(S2)	43						