

# Digital Tachometer

Digital Tachometer/ Elapsed timecounter/ Time width meter/ Flowmeter

#### Differential input series Standard input series )T-501X/DT-501F

Instruction Manual



Thank you for purchasing NIDEC DRIVE TECHNOLOGY's Digital Tachometer DT-501X/DT-501F. For instructions on how to use this product properly and optimally for a long period of time, please be sure to read this manual thoroughly before use.

When you purchase the product with optional equipment: Please refer to the operation manual of the optional equipment.

Before operation, maintenance and inspection, please carefully read this instruction manual and follow it for proper use.

After reading, be sure to store this manual in a safe, convenient place where operators can always refer to it easily.

	Electric Shock. Be sure to turn the power OFF when wiring as well as inspecting the unit. Failure to do so could result in electric shock.
$\bigcirc$	DO NOT block the ventilation holes on the side of the main unit. DO NOT put any foreign objects or materials inside the unit through these holes. Failure to follow this could result in abnormal heat generation and/or malfunctions.
$\oslash$	DO NOT touch the unit with wet (or sweaty) hands when inspecting or for wiring. Failure to do this could result in electric shock.
	Precautions before use
•Be sure - specifica •Inverter	to use the unit under the specified voltage (AC power tions: 85 - 264VAC / DC power specifications: 10.8 - 25.2VDC). power source cannot be used.
•Connecti	<b>gnal wire</b> ion wiring from sensors shall not be kept in the same or parallel conduit or

•Con conduit or cable as the power source, power or high voltage cables. If you fail to separate the wiring, noise may be superimposed on the signal wire, resulting in malfunctions. • Use shielded wire for input power connections with the shortest possible metal conduit.

#### Terminal

• Check that the screws have not come loose due to vibrations after a certain period of time.

#### **Operating environment**

- •Do not install the unit in the following places or conditions.
- · Places exposed to direct sunlight, or places where the ambient temperature exceeds a range of 0 -  $45^{\circ}$ C.
- Places where the relative humidity percentage exceeds a range of 35 85%, or places subject to condensation due to rapid change in humidity.
- · Places subject to corrosive and/or combustible gases.
- Places subject to a large amount of dust, salinity, and/or ferric substance.
- · Places susceptible to noise (including static electricity).

## Safety Requirements

#### Be sure to observe

Before operation, maintenance and inspection, please carefully read this instruction manual and follow it for proper use. Please carefully read all information related to this unit and safety, and precautions before use.

This instruction manual categorizes safety precautions as "DANGER", "WARNING", and "CAUTION". Each of them is an important description related to safety. Be sure to observe.



### Limited Warranty

- We are not responsible for damages resulting from negligence through failure to follow the instructions set out in this manual.
  We are not responsible for damages resulting from earthquake and/or fire unrelated to us, actions by third parties, or any other accidents, intentional or through customer negligence, as well as from accidents caused by misuse or improper use
- under abnormal conditions. For information regarding assurance provisions, please read the attached warranty certificate.

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#### . Installation to the Start of Operation

This unit is designed for use according to your measurement purposes. Before use, follow the procedures below from installation to the start of operation.





3. Sp	pecifications								
	Unit model		DT-501X /	∕ DT-501F					
	Action mode	Digital tachometer mode	Flowmeter mode	Elapsed timecounter mode	Time width meter mode				
Display	Display 1	0 - 99 6 di	9999 gits	0:00:00 - 9:59:59 (Hour:Minute:Second / base 60 display)	0:00:00 - 0:59:59 (Hour:Minute:Second / base 60 display)				
	Display 2	-		0:00 - (Hour:Minute:Seco	999:99 nd / base 10 display)				
			With zero supp	ression function					
Decir	mal point position	0 to 5 digits after the decima	al point(000000 $\sim$ 0.00000)		-				
Nu	umber indicator	Red	7 segment LED, Letter height	22mm, 6 digits, - display avail	lable				
	LED lamp		8 (SIG, LL, L, H, H)	H, MAX, MIN, TEA)					
(	Operation key	5 (	SET/SHIFT ,MEM/TEACH ,	/PARA , ► /FUNC ,ENT/MOI	DE)				
	Input range		$0.0067 \text{Hz} \sim 100 \text{kHz}$		10ms - 3600s				
Meas	urement accuracy		±0.008% ±1digit		±0.1% ±1digit				
	Filter	Switche Note that you can switch	es between 100kHz, 30kHz, 10k between only 10kHz and 0.02k	xHz, and 0.02kHz using the par Hz in a magnetic sensor, and it	rameter. is contact is only 0.02kHz.				
	Display cycle	0.2, 0.5, 1, 2, 5, 10, 15, 30, 60 sec. (changeable in the parameter settings) Dependent on the input si							
Pr	e-scale function	Parameter setting system u	sing the front panel keys. The t	teaching (combination) of displa	y values are also available.				
М	emory function	The maximum/m	inimum measurement values o (Switches the display	can be memorized and displayed v using the MEM key)	l in the indicator.				
Con	parator function	The settings of the high se be displayed on the LEI	et point 1, low set point 1, high D lamp. The hysteresis setting of	set point 2, and low set point 2, of the high and low set point 1 v	and judgment results can values are also available.				
A	uto zero time	0.1 - 15	50 sec.	0.1 - 36	300 sec.				
Pre-a	rithmetic function	Updates	the displayed value according	to the elapsed time after the pu	lse stops.				
Te	aching function	Performs scaling automatically by	setting the display value with a d	certain signal input. (only in the ta	achometer and flowmeter modes)				
Insu	lation resistance		10MΩ or more (a	at DC500V Mega)					
	Voltage proof		AC1500V or	r more 1min					
Opera	ating temperature		0 - 45°C(No d	condensation)					
Ope	erating humidity		35 - 85%RH (N	o condensation)					
Oper	ating atmosphere		No corrosive gas						
Cont	forming standard		Ro	HS					
Pro	tection function		Front panel: IP66 (or equivale	ent), Rear terminal block: IP20					
C	asing material		ABS	resin					
Exte	ernal dimensions		W $96 \times H 48 \times$	C D 92 mm (DIN)					
+001	Weight	· 11	Appro FVT、FVC、TRT、BD CPT options :	x. 200g C options : + approx. 50g + approx. 100g					

## 4. Component Part Names and Functions





N⁰	Name	Function						
1	SIG lamp	Lights up when the sensor signal is input						
2	LL lamp	Lights up when the low set point 2 is judged.						
3	L lamp	Lights up when the low set point 1 is judged.						
4	H lamp	Lights up when the high set point 1 is judged.						
5	HH lamp	Lights up when the high set point 2 is judged.						
6	MAX amp	Lights up when the maximum value is displayed						
1	MIN lamp	Lights up when the minimum value is displayed						
8	TEA lamp	Lights up when the teaching function is set						
9	PEAK lamp	Not used						
10	BTM lamp	Not used						
1	Unit label space	Space for attaching the supplied unit labels						
12	Main display	Displays the measurement value						
(13)	SET/SHIFT key	Finishes the setting in various setting modes Pressing this key with other keys switches to various setting modes						
14	MEM/TEACH key	Switches to the memory display Pressing this key with the SET key goes to the teaching setting mode						
(15)	▲(UP)/PARA key	Changes the selected items in various setting modes, or numerical values Pressing this key with the SET key switches to the parameter setting mode						
(16)	▶ (NEXT)/FUNC key	Changes the selected digit in various setting modes Pressing this key with the SET key switches to the function setting mode						
1	ENT/MODE key	Selects the changed item(s) in various setting modes Pressing this key with the SET key switches to the mode setting mode						
18	Terminal block							
19	Rear panel							
20	Terminal block cover							
21)	Mounting adapter							



Unit label										
公	20	۷ /	cm /	m'/	4	20	۷/	cm	m'/	FVT
73	10	/ h	∕min	/ h	73	10	/ h	∕min	/ h	CPT
刊	ŝ	L L L		۷/	私	°	L L L		۷/	TRT
የቃ	U.	KITZ	rpm	∕min	49	C	KHZ	rpm	∕min	FVC
咕. 厶. 孙				Li.e.	humana		min		L.	TRC
时:刀:作9	sec	min	rps	ΠZ	n.m.s	sec	min	rps	пг	BCD
山.动.秒	m /	mm⁄	۷ /	r /	S	m/	mm⁄	۷ /	r /	RMT
10	/ h	/ s	/ s	min	10	/ h	/ s	/ s	∕min	DRT
	04	m /	km 🖊	mm/		04	m/	km /	mm/	SDT
	70	/min	/ h	/min		70	/min	/ h	/min	SDC



## 6. Installation to the Panel

Mount this unit to the panel according to the following procedures. Check that the mounting panel is thick enough (1.0 - 5mm) before mounting operation.



## 7. Wiring to Power Source and Sensors (DT-501XA/DT-501XD)

#### Note)

In order to prevent electric shock, be sure to turn the power OFF. Be sure to use the unit under the rated voltage (AC power specifications: 85 - 264VAC / DC power specifications: 10.8 - 25.2VDC). The inverter output (output to connect a motor) cannot be used as power. Connection wiring from sensors shall not be kept in the same or parallel conduit or cable as the power source, power or high voltage cables. If you fail to separate the wiring, noise may be superimposed on the signal wire, resulting in malfunctions. Use shielded wire for input power connections with the shortest possible metal conduit.

#### For DT-501XA/DT-501XD

#### •Terminal block connection diagram



#### •Input specifications

Item		Description						
D	AC (DT-501XA)	85 - 264VAC(50/60)	Hz)					
Power	DC (DT-501XD)	10.8 - 25.2VDC						
Consumption power	10VA	10VA						
Sensor power output	DC+12V Max.100m	A						
	Open collector (NPI	N) input						
Open collector input		Load capacity 12mA	A or more					
	LO input	0 - 3V						
	HI input	Leakage current 0.5mA or less						
	Maximum frequency	100kHz(Minimum pulse width 5micro second)						
Contact input	For no-voltage contact. Short-circuit (5) and (6) to use.							
	Contact capacity	Voltage 12V, Current 15mA or more						
-	Maximum frequency	20Hz(Minimum pulse width 25micro second)						
	LO input	0 - 1.5V						
\$7.1	HI input	4.0 - 30V						
Voltage input	Input resistance	10kΩ						
	Maximum frequency	30kHz(Minimum pulse width 17micro second)						
	Input resistance	10kΩ						
Magnetic sensor input		1Hz ~ 100Hz	0.3 ~ 30Vp-p					
	Input voltage	∼ 1kHz	1.5 <b>~</b> 30Vр-р					
		∼ 10kHz	6 ~ 30Vp-p					
	Maximum frequency	10kHz(Minimum pulse v	vidth 50micro second)					

Note) Magnetic sensors cannot be used in the time wide meter mode (mode 3).

#### •Input circuit

Open collector sensor



Voltage output sensor



© Wiring requirements

- Use M3 crimp-style terminals with a width of 7 mm or less to connect wires to the terminal block.
- After wire connection to the terminal block is completed, be sure to attach the provided terminal block cover.



Be sure to connect the power wires to the 1st and 2nd terminals. Incorrect connection could result in damage and/or burns to the unit.

#### •Connection list with sensors

The table below shows the sensors and connection terminal No. to be applied according to the input signal type. Check using the connection diagram on the left.

Input signal type	Sensor	Our product model	Connection terminal
Contact signal	Relay switch	-	5-6-9
Open collector	Adjacent switch	SE-P12-1	4-6-9
	Adjacent switch	SE-P12	
Square wave	Rotary encoder	RE-1-□F	4-7-9
	Gear sensor	SE-G2	

Note 1)

Connect sensor wires to the specified terminals, and be sure to leave the other terminals empty. More than one sensor cannot be connected simultaneously. Note 2)

When one sensor is connected to more than one tachometer, supply the power for the sensor from one of them.

Relay switch



Magnetic sensor



## 8. Wiring to Power Source and Sensors (DT-501FA)

#### Note)

In order to prevent electric shock, be sure to turn the power OFF. Be sure to use the unit under the rated voltage (AC power specifications: 85 - 264VAC). The inverter output (output to connect a motor) cannot be used as power. Connection wiring from sensors shall not be kept in the same or parallel conduit or cable as the power source, power or high voltage cables. If you fail to separate the wiring, noise may be superimposed on the signal wire, resulting in malfunctions. Use shielded wire for input power connections with the shortest possible metal conduit.

#### For DT-501FA



#### •Terminal block connection diagram

Item	Description						
Power	AC (501FA)	85 - 264VAC(50/60Hz)					
Consumption power	10VA						
Sensor power output	DC+12V Max.100mA	Α					
	Connection to	Differential line driver AM26LS31 etc.					
Differential input	Differential input voltage	DIF-					
		Maximum voltage ±5.5V(15mA)					
		VDF Minimum voltage ±3.0V					
	Maximum frequency	$100 \mathrm{kHz}$ (Minimum pulse width 5micro second)					

#### © Wiring requirements

- Use M3 crimp-style terminals with a width of 7 mm or less to connect wires to the terminal block.
- After wire connection to the terminal block is completed, be sure to attach the provided terminal block cover.

## 

Be sure to connect the power wires to the 1st and 2nd terminals. Incorrect connection could result in damage and/or burns to the unit.

#### •Line driver input circuit



#### 9. Basic Setting Procedure

Conduct settings as indicated below based on the intended use.



Conduct the comparator function  $\rightarrow$  p.17 and memory function settings  $\rightarrow$  p.18, if necessary. This unit requires no complicated calculation, and implements the teaching function which enables optional changes of display values and error compensation. (Excluding the elapsed timecounter and time wide meter modes)

## 10. Keys to be Used for Various Settings and Their Applications

The front panel keys to be used for mode, parameter, and function settings, as well as various settings (teaching function / high and low set point 1 value setting / memory function) are described below.



## $\bullet$ Operation during the normal measurement display / memory display

N⁰	Name		Function							
1	SHIFT key	FT key Pressing this key with other keys switches to various setting modes								
0	MEM key	EM key Switches to the memory display								
	TEACH key	Pressir	ng and holding this key with the SHIFT key for 5 seconds switches to the teaching setting mode							
3	PARA key	Pressir	ng and holding this key with the SHIFT key for 5 seconds switches to the parameter setting mode							
4	FUNC key	C key Pressing and holding with the SHIFT key for 5 seconds switches to the function setting mode								
5	MODE key Pressing and holding this key with the SHIFT key for 5 seconds switches to the parameter setting mode									
•0	peration	in tl	he various setting modes							
Ng	Nam	ie	Function							
1	1) SET key Setting completion key in various setting modes									
2	② ▲ (UP) key Changes the selected items in various setting modes, or numerical values									
3	) 🕨 (NEXI	r) key	Changes the selected digit in various setting modes							
4	ENT key		Selects the changed item in various setting modes							

## **11.Teaching Function Settings**

When you can check (measure) the actual revolution speed, the following simple method (teaching function) can be used. The teaching function requires no complicated calculation.

- The teaching function is supported only in mode 1 and mode 4. Mode 2 and mode 3 have no teaching function.
- Setting method



When you press the  $[\underline{SHIFT} + \underline{MEM}]$  keys simultaneously during the normal measurement display, the main display blinks. (TEA lamp lights up)

(TEA lamp lights up)

The measurement value which was displayed before is displayed in the main display. In the initial status, the digit on the left blinks. Because the value in the blinking digit can be changed, use the  $\blacktriangleright$  key to select the digit in which you want to change the value.

Every time you press the ▶ key, the digit blinks in the order of "1st digit", "2nd digit", … "6th digit", and "decimal point", then back to "1st digit".

After selecting the digit you want to change, use the  $\blacktriangle$  key to change the value (0 - 9). When you select the decimal point, use the  $\blacktriangle$  key to change the decimal point position.

When the numerical value setting is complete, press the  $\overline{\text{SET}}$  key to finish the teaching setting.

The teaching setting result is reflected, and the display returns to the normal measurement display.

Returns to the normal measurement display

Use the SET key to

finish the setting

Use the 🔺 key to

1 0

select the value

#### ■ Teaching function details

Ω

1 0 0

#### •Mode 1

The teaching function can be used to automatically change the value of parameter items (P2, P3), and calculate the present measurement value from the teaching setting value as below.

During normal display				Whe	ted	
External input pulse (Hz) A				Input pulse (Hz) in the teaching setting		А
P1 Pulse count per revolution			Teaching function setting value		ting value	F
Parameter setting	P2 Setting revolution speed	a			P1 Pulse count per revolution	В
value	(detection section)	С	Parameter setting value	Parameter setting	P2 Setting revolution speed	C = A + co(II)/D
	P3 Value to be displayed	D		value	(detection section)	C = A * 60(Hz)/B
Display calculation	$\{(A,B) + (C)\} + (D,C)$				P3 Value to be displayed	D = F
formula ${(A/B) * 60} * (D/C)$				Display calculation	$\{(A, B), +, (D, C)\}$	
				formula	$\{(A/D) + 00\} + (D/C)$	

When the input revolution speed is outside the input revolution speed range, "EE-2" is displayed, and the teaching function cannot be used.

## Input revolution speed range : 1rpm $\leq$ Input revolution speed\* < 99999rpm

#### \*Input revolution speed = A × 60(Hz) / B

\* The P2 calculation value is maintained by rounding off fractions after the decimal point.

Depending on input and teaching setting values, the teaching setting value for the input at the time might not be displayed.

#### •Mode 4

The teaching function can be used to automatically change the value of parameter items (P3, P4), and calculate the present measurement value from the teaching setting value as below.

Mode 4 Display value calculation					Mode 4 Display value calculation			
External input pulse (Hz) A			Α		Input pulse (Hz) in the teaching setting			А
	D1	Number of blades per	D		Teaching function se	Teaching function setting value F		F
Parameter acting	P1	revolution	D			D1	Number of blade per	P
r arameter setting	P2	Capacity per sensor blade	С		Demonstern extrine	L T	revolution	Б
value	P3	Scaling	D		r arameter setting	P2	Capacity per sensor blade	С
	P4	Decimal point display	Е	value	P3	Scaling	$\mathbf{D} = \mathbf{F}/\left(\mathbf{A} * \mathbf{B} * \mathbf{C}\right)$	
Display calculation	( )	$\mathbf{P}$ + $\mathbf{C}$ + $\mathbf{D}$				P4	Decimal point display	Decimal point position of E = F
formula	(A *	B) * C * D		1	Display calculation	(A >	A * B) * C * D	
					formula	(A)	* B) * C * D	

When the input frequency is outside the input frequency range, "EE-2" is displayed, and the teaching function cannot be used.

#### Input frequency range $: 1Hz \leq A < 99999Hz$

\* The P3 scaling value maintains values after decimal point up to 7 digits inside. Note that because the number of digits after decimal point that can be maintained in the parameter setting is up to 5, values in 5 digits or more after decimal point will be rounded off when you enter the value in the parameter setting.

\* If the P3 calculation value exceeds 999999, the P3 value will be forced to be "9999999".

## 12. About Mode

DT-501X/DT-501F have five modes (functions) which can be selected according to the measurement purpose.

Mode No.	Mode description	Details	Page No. for the setting method
1	Digital Tachometer Mode*	Digital tachometer / used as speedometer Displays the proportional value to the input	p.8 - 9
2	Elapsed Timecounter Mode	Used as the elapsed time display in a certain period Displays the inversely proportional value to the input	p.10 - 11
3	Time Width Meter Mode	Measures time for the period when the signal is ON (or OFF) and displays it	p.12 - 13
4	Flowmeter Mode	Displays the instantaneous flow amount	p.14 - 15
99	Test Mode	Executes the self-diagnosis	p.19

\* The mode 1 (digital tachometer mode) is set in the factory setting.

## For the lists of parameters and functions to be set in each mode, refer to pages 20 and 21.

## 13. Setting Method When You Select Mode 1 (Digital Tachometer Mode) for Measurement Digital tachometer mode

Set each setting item for mode and parameter according to the following procedures. (For the setting method of functions, refer to pages 16 and 17.)





As in the figure on the left, the rotary encoder is connected to the feed roller via coupling in the paper manufacturing process. To display the peripheral speed (m/min.) of the feed roller in DT-501<sup>□</sup> under the following conditions:

[Conditions] • Servo motor (pulse input)

- Diameter of the feed roller
- Peripheral speed of the roller diameter of 90mm :
- $(0.09 \text{m} \times 3.14) \times 500 \text{rpm} = 141.3 \text{m/min}$
- Circumference Revolution
- Circumference Revoluti of the roller speed\*

\*Suppose that the revolution speed in the detection section is 500rpm because the revolution speed is not instructed.

#### Setting method

#### (1) Mode

• When you select mode 1 (digital tachometer mode) for measurement (The digital tachometer mode is set in the factory setting.)



Note) If you change the mode settings, each parameter and function setting value will return to the factory default setting value.

#### (2) Parameter

• Parameter setting items in mode 1 (digital tachometer mode) nd numerical values to be set according to the above example

NI-	Setting a item	Catting and and and	Default setting value		Numerical value to be set according to the above example		
INO.	Setting item	Setting range	Display	Description		Numerical value to be set according to the above example	
P1	Pulse count per revolution	1 - 9999p/r	0001	1p/r	600p/r	Enter the pulse count of the rotary encoder.	
P2	Revolution speed in the detection section	1 - 99999rpm	_01000	1000rpm	500rpm	Enter some numerical value as the revolution speed is not instructed.	
P3	Value to be displayed (with decimal point)	0.00001 - 999999	001000	1000	141.3	Refer to the above "Setting example".	
P4	Display cycle	0.2/0.5/1.0/2.0/ 5.0/10/15/30/60 sec.	_ 1.0 _	1 sec.	1 sec.	Measure using the default setting value as no special instruction is provided.	
P5	Auto zero time	0.1 - 150 sec.	006.0	6.0 sec.	6 sec.	Measure using the default setting value as no special instruction is provided.	
P6	Input filter	10/30/100/0.02kHz	_ 10_	10kHz	30kHz	As the rotary encoder is used as a sensor, select "30".	

\* For the description about the parameter functions, refer to page 20.

• Mode 1 (digital tachometer mode) Display value calculation equation

Mode 1 Display value calculation					
External input pulse (Hz)					
	P1	Pulse count per revolution	В		
Parameter setting	P2	Revolution speed in the detection section(rpm)	$\mathbf{C}$		
	P3	Value to be displayed	D		
Equation	((A	/B) * 60) * (D/C)			

•Start setting according to the setting example on the previous page.



\*If you enter a value outside the setting range, all the input values will blink, which indicates the setting is disabled. When this occurs, you cannot switch to other displays until you enter a value within the setting range.

(3) Function	(For	the	setting	method,	refer	to	pages	16	and	17.)
•Function se	tting	item	in mode	e 1 (digit	al tach	om	eter m	ode)	)	

No.	Setting item	Setting range	Input range	Default value
F1	High set point 1 value	Sets the high set point 1 value	000000 - 999999	0
F2	Low set point 1 value	Sets the high set point 1 value	000000 - 999999	0
F3	High set point 2 value	Sets the high set point 2 value	000000 - 999999	0
F4	Low set point 2 value	Sets the low set point 2 value	000000 - 999999	0
F5	Hysteresis of the high and low set point 1 values	Sets the hysteresis of the high and low set point 1 values	0 - 99	0
F6	Judgment output timer at startup	Sets the time when the comparator judgment is output at startup	0 - 99 sec.	0 sec.
F7	Minimum revolution speed	Sets the revolution speed to be displayed as zero	000000 - 999999	0
F8	Frequency of the moving average	Used when variation of the revolution speed is large and a stable display cannot be attained	0(disabled)/1(3 times)/2(10 times)	0(disabled)
F9	Pre-arithmetic function	Promptly performs the deceleration display when the signal is lost	0(disabled)/1(enabled)	0(disabled)

\* For the description of functions, refer to pages 21 and 22.

## 14. Setting Method When You Select Mode 2 (Elapsed Timecounter Mode) for Measurement Elapsed timecounter mode

Set each setting item for mode and parameter according to the following procedures. (For the setting method of functions, refer to pages 16 and 17.)

#### ■ Setting example (for the elapsed time display of oven)



As in the figure on the left, bread passes through the oven in a bread factory. The rotary encoder is attached to the motor of the conveyor belt. To display the time at which the bread passes through the oven in DT- $501\square$ , do so under the following conditions:

#### [Conditions]

- $\cdot$  Revolution speed of the rotary encoder :
- 1200rpm (rotary encoder 60p/r)
- Speed of the conveyor belt : 2.8m/min
- Length of the oven : 5m
  Passing time through the oven :
- $5\text{m} \div 2.8\text{m/min} = 1.786 \text{ minutes} \rightarrow \text{Approx. 1 minute 47 seconds}$

## ■Setting method

(1) Mode

•Set the mode 2 (elapsed timecounter mode).



Note) If you change the mode settings, each parameter, function, and high and low set point 1 setting value will return to the factory default setting value.

#### (2) Parameter

•Parameter setting items in mode 2 (elapsed timecounter mode) and numerical values to be set according to the above example.

NT.	T		Default setting value		Numerical solution to be not according to the above successful			
INO.	5	etting item	Setting range	Display	Description	INUMERICAL	value to be set according to the above example	
P1	Pulse count p	er revolution	1 - 9999p/r	0001	1p/r	60p/r	Enter the pulse count of the rotary encoder.	
P2	2 Revolution speed in the detection section		1000 - 99999rpm	_01000	1000rpm	1200rpm	Enter the revolution speed of the rotary encoder.	
P3	Value to be	Hour:Minute:Second display system	0:00:01 - 9:59:59	_010:00	10:00 sec.	Hour:Minute:Second display system	Refer to the above "Setting example".	
	displayed	Second display system	0:01 - 999:99			0:01:47		
P4	4 Display cycle		0.2/0.5/1.0/2.0/ 5.0/10/15/30/60 sec.	_ 1.0 _	1 sec.	1 sec.	Measure using the default setting value as no special instruction is provided.	
P5	75 Auto zero time		0.1 - 150 sec.	006.0	6.0 sec.	6 sec.	Measure using the default setting value as no special instruction is provided.	
P6	Input filter		10/30/100/0.02kHz	_ 10_	10kHz	30kHz	As the rotary encoder is used as a sensor, select "30".	

\* For the description about the parameter functions, refer to page 20.

#### • Mode 2 (elapsed timecounter mode) Display value calculation equation

Mode 2 Display value calculation						
External input pulse (Hz)						
	P1	Pulse count per revolution	В			
Parameter setting	P2	Revolution speed in the detection section(rpm)	С			
	P3	Value to be displayed	D			
Equation	(1/	(((A/B) * 60)/C)) * D				

•Start setting according to the setting example on the previous page.



\*If you enter a value outside the setting range, all the input values will blink, which indicates the setting is disabled. When this occurs, you cannot switch to other displays until you enter a value within the setting range.

	anotion botting from in mote 2 (chapter timotounior mote)								
No.	Setting item	Description	Input range	Default setting					
121	IT I and the I all of	Sets the high set point 1 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system					
r 1	High set point I value	Sets the high set point 1 value (Second display system)	0:00 - 999:99	0:00					
TO	T	Sets the low set point 1 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display					
F2	Low set point 1 value	Sets the low set point 1 value (Second display system)	0:00 - 999:99	0:00					
Eo		Sets the high set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display					
гз	High set point 2 value	Sets the high set point 2 value (Second display system)	0:00 - 999:99	0:00					
	I I I I I I I	Sets the low set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display					
<b>F</b> 4	Low set point 2 value	Sets the low set point 2 value (Second display system)	0:00 - 999:99	0:00					
F5	Hysteresis of the high and low set point 1 values	Sets the hysteresis of the high and low set point 1 values	0 - 99	0					
F6	Judgment output timer at startup	Sets the time when the comparator judgment is output at startup	0 - 99 sec.	0 sec.					
$\mathbf{F7}$	Minimum revolution speed	Sets the revolution speed to be displayed as zero	000000 - 9999999	0					
$\mathbf{F8}$	Frequency of the moving average	Used when variation of the revolution speed is large and a stable display cannot be attained	0(disabled)/1(3 times)/2(10 times)	0(disabled)					
F9	Pre-arithmetic function	Promptly performs the deceleration display when the signal is lost	0(disabled)/1(enabled)	0(disabled)					
		-							

## (3) Function (For the setting method, refer to pages 16 and 17.)•Function setting item in mode 2 (elapsed timecounter mode)

\* For the description of functions, refer to page 21.

Note) When the input signal stops in the elapsed timecounter mode, the display will overflow after the specified time set with the auto zero function. The overflow display "......" does not mean there is a malfunction. When the input signal is within the display range, the display returns to normal.

## 15. Setting Method When You Select Mode 3 (Time Width Meter Mode) for Measurement

Time wide meter mode

Set each setting item for mode and parameter according to the following procedures.

(For the setting method of functions, refer to pages 16 and 17.)

■ Setting example (for the operating time display of the press machine)



As in the figure on the left, when the press machine finishes operation and returns to the upper edge, the adjacent switch is activated. To display the operating time of the press machine (when the proximity switch is turned off)

## Setting method

(1) Mode

#### •Set mode 3 (Time Width Meter Mode).

Normal display	The main display shows "0".	0	
Mode setting	Press and hold the SHIFT + MODE keys for 5 seconds or more. The main display shows the current set mode No. after blinking. * When you are setting for the first time after the purchase of this unit, mode 1 (digital tachometer mode) in the factory default setting is displayed.	- 0 1>	Every time you press the $\triangle$ key, the display switches to the next mode No. $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$ $\bigcirc 99 \leftarrow 99$
Finish setting	Press the <u>SET</u> key. The display goes to mode 3 (time wide meter mode).	0: 0 0	

Note) If you change the mode settings, each parameter, function, and high and low set point 1 setting value will return to the factory default setting value.

#### (2) Parameter

• Parameter setting items in mode 3 (Time Width Meter Mode) and numerical values to be set according to the above example.

	-					
No.	Setting item	Setting range	Default s Display	etting value Description		Numerical value to be set according to the above example
P1	Switch between Hour: Minute: Second and 1/100 Second system	0:00:00/0:00	0:00	1/100 sec.	0:00	Select the 1/100 second display based on the operating time of the press machine.
P2	Measurement section	0(OFF)/1(ON)	_ 1_	ON	0	Select "0" because the adjacent switch of the open collector is OFF.
P3	Auto zero time	0.1 - 3600 sec.	_3600.0	3600 sec.	60.0 sec.	Set "60.0" because there is no time setting longer than 1 minute.
P4	Input filter	10/0.02kHz	_ 10_	10kHz	10kHz	Measure using the default setting value as no special instruction is provided.

\* For the description about the parameter functions, refer to page 20.

#### $\bigcirc$ About the measurement section (parameter 2)



•Start setting according to the setting example on the previous page.



\*If you enter a value outside the setting range, all the input values will blink, which indicates the setting is disabled. When this occurs, you cannot switch to other displays until you enter a value within the setting range.

(3) Function (For the setting method, refer to pages 16 and	17.)
Function setting item in mode 3 (Time Width Meter Mode)	

No.	Setting item	Description	Input range	Default setting
<b>F</b> 1	High get point 1 yelue	Sets the high set point 1 value (Hour:Minute:Second display system)		Second display system
F1	ringn set point i value	Sets the high set point 1 value (Second display system)	0:00 - 999:99	0:00
FO	I and an int 1 and her	Sets the low set point 1 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
FΖ	Low set point 1 value	Sets the low set point 1 value (Second display system)	0:00 - 999:99	0:00
Fo	High set point 2 value	Sets the high set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
гэ		Sets the high set point 2 value (Second display system)	0:00 - 999:99	0:00
E4	Low set point 2 value	Sets the low set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
г4		Sets the low set point 2 value (Second display system)	0:00 - 999:99	0:00
F5	Hysteresis of the high and low set point 1 values	Sets the hysteresis of the high and low set point 1 values	0 - 99	0
F6	Judgment output timer at startup	Sets the time when the comparator judgment is output at startup	0 - 99 sec.	0 sec.

 $\ast$  For the description of functions, refer to pages 21 and 22.

## 16. Setting Method When You Select Mode 4 (Flowmeter Mode) for Measurement

Set each setting item for mode and parameter according to the following procedures.

(For the setting method of functions, refer to pages 16 and 17.)

Setting example (For the flow display from the tank)



To display the flow ( $\ell$ /min) in DT-501 $\square$  under the following conditions when the flowmeter for which the number of blades is unknown as in the figure on the left:

[Conditions]

• Number of blades: Unknown

• Output of the flow sensor: 2.5cc/p \*p: Pulse

#### ■ Setting method

(1) Mode

•Set mode 4 (flowmeter mode).

Normal display	The main display shows "0".	0	
Mode setting	Press and hold the SHIFT + MODE keys for 5 seconds or more. The main display shows the current set mode No. after blinking. * When you are setting for the first time after the purchase of this unit, mode 1 (digital tachometer mode) in the factory default setting is displayed.	- 0 1 - · · · · ·	Every time you press the $\blacktriangle$ key, the display switches to the next mode No. $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$ $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$ $99 \leftarrow$ Select "4". $\boxed{-04-}$
Finish setting	Press the <u>SET</u> key. The display goes to mode 4 (flowmeter mode).	0. 0	

Note) If you change the mode settings, each parameter, function, and high and low set point 1 setting value will return to the factory default setting value.

(2) Parameter

#### •Parameter setting items in mode 4 (flowmeter mode) and numerical values to be set according to the above example.

NT.	C. H. L. M. L. M.	0	Default setting value			
INO.	Setting item	Setting range	Display	Description	Numerical value to be set according to the above example	
P1	Number of blades per revolution	1 - 99	01	1	1	Enter the number of blades of the flowmeter. If it is unknown, enter "1".
P2	Capacity per sensor blade (cc, ℓ, etc.)	0.0001 - 99999	_ 0001.0	1.0	2.5cc/p	Enter the capacity per blade that the sensor can read.
P3	Scaling	0.00000 - 999999	00001.0	1	0.06	Refer to "About scaling" below.
P4	Decimal point display	0.00000 - 00000.0	00000.0	Displays to one decimal place	00000.0	Displays to one decimal place.
P5	Display cycle	0.2/0.5/1.0/2.0/ 5.0/10/15/30/60 sec.	_1.0_	1 sec.	1 sec.	Measure using the default setting value as no special instruction is provided.
P6	Auto zero time	0.1 - 150 sec.	006.0	6 sec.	6 sec.	Measure using the default setting value as no special instruction is provided.
P7	Input filter	10/30/100/0.02kHz	_ 10_	10kHz	10kHz	Measure using the default setting value as no special instruction is provided.

\* For the description about the parameter functions, refer to page 20.

#### • Mode 4 (flowmeter mode) Display value calculation equation

Mode 4 Display value calculation				
External input pulse (Hz)				
	P1 Number of blades per revolution	В		
D	P2 Capacity per sensor blade	С		
Parameter setting	P3 Scaling	D		
	P4 Decimal point display	Е		
Equation	(A * B) * C * D			

#### © About scaling (parameter 3)

Assuming the flow per second to be represented in the parameter 2 flow unit (cc in the example) is a (cc/s), parameter 3 will be coefficient value when a multiplier is used to change the unit of a (cc/s) for display.

(1) To display the value as in the original unit (cc/s)

a(cc/s) \* 1 = a(cc/s)

Parameter 3

(2) To display the value in the unit ( $\ell$  /min) as in the above setting

 $a(\mathsf{cc/s}) * \underbrace{\mathbf{.60 \div 1000}}_{\downarrow} = \mathcal{A} (\ell / \mathsf{min})$ 

Parameter 3

\* 60 Multiply it by 60 as it is the flow per minute.

 $\div1000\,$  : Divide the value by 1000 as parameter is set in the unit of "cc".

•Start setting according to the setting example on the previous page.



\*If you enter a value outside the setting range, all the input values will blink, which indicates the setting is disabled. When this occurs, you cannot switch to other displays until you enter a value within the setting range.

No.	Setting item	Description	Input range	Default setting
F1	High set point 1 value	Sets the high set point 1 value	000000 - 999999	0
F2	Low set point 1 value	Sets the high set point 1 value	000000 - 999999	0
F3	High set point 2 value	Sets the high set point 2 value	000000 - 999999	0
F4	Low set point 2 value	Sets the low set point 2 value	000000 - 999999	0
F5	Hysteresis of the high and low set point 1 values	Sets the hysteresis of the high and low set point 1 values	0 - 99	0
F6	Judgment output timer at startup	Sets the time when the comparator judgment is output at startup	0 - 99 sec.	0 sec.
F7	Minimum flow(display value)	Sets the revolution speed to be displayed as zero	000000 - 999999	0
F8	Frequency of the moving average	Used when variation of the revolution speed is large and a stable display cannot be attained	0(disabled)/1(3 times)/2(10 times)	0(disabled)
F9	Pre-arithmetic function	Promptly performs the deceleration display when the signal is lost	0(disabled)/1(enabled)	0(disabled)
- T1	1 1 1 1 0 0 11			

## (3) Function (For the setting method, refer to pages 16 and 17.)Function setting item in mode 4 (flowmeter mode)

\* For the description of functions, refer to page 21.

## 17. Setting Method of Functions (Excluding in the Test Mode, Common in Each Mode)

The setting method of the functions is common in each mode excluding the test mode. For the lists of functions in each mode, refer to page 21.

•Function setting item <in 1<="" mode="" th=""><th>(digital tachometer mode)&gt;</th></in>	(digital tachometer mode)>
--	----------------------------

N.	Catting item	Catting and an	Default setting		Function description
10.	Setting item	Setting range	Display	Description	Function description
F1	High set point 1 value*	000000 - 999999	000000	0	Sets the high set point 1 value. The decimal point is not displayed.
F2	Low set point 1 value*	000000 - 999999	000000	0	Sets the low set point 1 value. The decimal point is not displayed.
F3	High set point 2 value*	000000 - 999999	000000	0	Sets the high set point 2 value. The decimal point is not displayed.
F4	Low set point 2 value*	000000 - 999999	000000	0	Sets the low set point 2 value. The decimal point is not displayed.
F5	Hysteresis of the high and low set point 1 values	0 - 99	00	0	Sets the hysteresis of the high and low set point 1 values. Used when the revolution variation is large. (For details, refer to "Comparator Function" on page 17.)
F6	Judgment output timer at startup	0 - 99 sec.	00	0 sec.	Sets the time when the comparator judgment is output at startup
F7	Minimum revolution speed	000000 - 999999	000000	0	Sets the revolution speed to be displayed as zero
F8	Frequency of the moving average	0(disabled)/1(3 times)/2(10 times)	_ 0 _	0(disabled)	Used when variation of the revolution speed is large and a stable display cannot be attained
F9	Pre-arithmetic function	0(disabled)/1(enabled)	0	0(disabled)	Promptly performs the deceleration display when the signal is lost

\*For the settings of the high set point 1 and 2 values, as well as the low set point 1 and 2 values, refer to "Comparator Function" on page 17.

#### •Setting method <in mode 1 (digital tachometer mode)>

For the setting methods in other modes than mode 1 (digital tachometer mode), also refer to the description below.



Continued on next page

#### Continued from previous page



\* If you enter a value outside the setting range, all the input values will blink, which indicates the setting is disabled.

When you press any of the numerical input key, the numerical value before entry is displayed, and you can redo the setting.

\* When the relationship among the setting values of F1 to F4 is not appropriate, "EE-4" is displayed before finishing the function setting by pressing the SET key. For details, refer to page 19.

#### **18. Comparator Function**

•Keys to be used for the high and low set point 1 value settings and their applications



The corresponding lamp lights up according to the judgment result.				
	Name	Function		
1	LL lamp	Lights up when the low set point 2 is judged.		
2	L lamp	Lights up when the low set point 1 is judged.		
3	H lamp	Lights up when the high set point 1 is judged.		
4	HH lamp	Lights up when the high set point 2 is judged.		

#### •Description

<ul> <li>Judgment conditions</li> </ul>	
Low set point 1 value $\leq$ Measurement value $\leq$ High set point 1 value AND Low set point 2 value $\leq$ Measurement value $\leq$ High set point 2 value	00:1
When either the high and low set point 1 value judgment or the high and low set point 2 value judgment is invalid, and the other is within the setting range	GO judgment
$ m Measurement \ value > \ High \ set \ point \ 2 \ value$	HH judgment
Measurement value > High set point 1 value	H judgment
Measurement value $\leq$ Low set point 2 value	LL judgment
Measurement value $<$ Low set point 1 value	L judgment

• Set the high set point 1, low set point 1, high set point 2, and low set point 2 values using the function items F01 to F04.

· Execute the judgment in the all measurement mode.

• The high and low set point 2 value judgment, as well as the high and low set point 1 value judgment, is executed independently.

• When both the high set point 2 and low set point 2 values are "0", the high and low set point 2 value judgment is not executed.

• When both the high set point 1 and low set point 1 values are "0", the high and low set point 1 value judgment is not executed.

• When both the high set point 2 and low set point 2 values, as well as the high set point 1 and low set point 1 values are "0", no judgment is executed.

#### •About hysteresis

When hysteresis is set in function F5, provide hysteresis between the judgment ON and OFF.

The hysteresis setting value is common to the high set point 1, low set point 1, high set point 2, and low set point 2 value judgment.



OFF display value ON display value

## **19. Memory Function**

#### •Key to be used for the memory function and display



- During measurement, the maximum display value (MAX value) and minimum display value (MIN value) per display update cycle is always maintained.
- Pressing the <u>MEM</u> key allows you to check the maximum and minimum values maintained during the measurement.



• Press and hold the  $\underline{MEM}$  key for 5 seconds during the normal measurement and memory display  $\rightarrow$  Clears the maintained MAX and MIN values.



•As in the figure below, the maintained values are cleared when the measurement is reset (when the mode and setting value are changed, and the power is turned ON).



## 20. Test Mode (Function to Check if the Unit is Operating Normally)



## 21. Error Display

When an error occurs during operation, the following error codes are displayed. Take appropriate countermeasures based on the displayed code.

	Display	Description	Countermeasure
1	-, -, -, -, -, -,	Mode 1, 4: Displayed when the display is overflowed (the display value exceeds the available number of display digits). Mode 2, 3: Displayed when the auto zero function is executed, or the input is less than the minimum revolution speed.	When the input signal becomes within the measurement range (available number of display digits), the measurement value is displayed.
2	E E - 1	Displayed when the input pulse width is 10ms or less in mode 3 (time wide meter mode).	Change the input pulse width to within the measurement range.
3	E E - 2	Displayed when the value is outside the teaching function range (when the input revolution speed is 99,999 or more). *For details, refer to page 7 (detailed teaching function).	Decrease the input revolution speed and execute the teaching function.
4	E E - 3	Displayed when an internal memory error occurs.	Press the ENT (MODE) key to release the error. Note that the setting values of modes, parameters, and functions are initialized.
5	E E - 4	Displayed when the setting value F01 is less than F02, or F03 is less than F04 in the function setting mode.	After the error code is displayed for 2 seconds, the display returns to the previous status before EE-4 is displayed. Change the settings.

## 22. Parameter List

#### The following parameters can be set in each mode.

#### Parameters in mode 1 (Digital Tachometer Mode)

No.	Setting item	Description	Input range	Default value
P1	Pulse count per revolution	Enter the pulse count per revolution for the rotary encoder, etc.	1 - 9999 P/r	1P/r
P2	Setting revolution speed (detection section)	Revolution speed in the detection section	1 - 99999rpm	1000rpm
P3	Value to be displayed (with decimal point)	Actual value to be displayed on the panel in the above revolution speed	0.00001 - 999999pm	1000rpm
P4	Display cycle	Sets the display update cycle	0.2/0.5/1.0/2.0/5.0/10/15/30/60 sec.	1.0
P5	Auto zero time <sup>*1</sup>	Sets the time from when the input pulse is gone to when the display becomes "0".	0.1 - 150 sec.	6.0 sec.
P6	Input filter $^{*2}$	Selects a minimum frequency that is larger than the maximum frequency of the input signal. 0.02kHz for the contact input	10/30/100/0.02kHz	10kHz

#### Parameters in mode 2 (Elapsed Timecounter Mode)

No.	Setting item	Description	Input range	Default value
P1	Pulse count per revolution	Enter the pulse count per revolution for the rotary encoder, etc.	1 - 9999 P/r	1P/r
P2	Setting revolution speed (detection section)	Revolution speed in the detection section	1 - 99999rpm	1000rpm
P3	Value to be displayed (Hour:Minute:Second display system)	Actual value to be displayed on the panel in the above	0:00:01 - 9:59:59	10:00 (second display
P3 Sy V (s	Value to be displayed (second display system)	revolution speed	0:01 - 999:99	system)
P4	Display cycle	Sets the display update cycle	0.2/0.5/1.0/2.0/5.0/10/15/30/60 sec.	1 sec.
P5	Auto zero time <sup>*1</sup>	Sets the time from when the input pulse is gone to when the display becomes "0".	0.1 - 150 sec.	6 sec.
P6	Input filter <sup>*2</sup>	Selects a minimum frequency that is larger than the maximum frequency of the input signal. 0.02kHz for the contact input	10/30/100/0.02kHz	10kHz

### Parameters in mode 3 (Time width meter Mode)

No.	Setting item	Description	Input range	Default value
P1	Hour/minute/second and 1/100 second display systems	Selects the time display method.	0:00:00(hour:minute:second display system) / 0:00(1/100 second display system)	1/100 second display system
P2	Measurement section	Selects the measurement time, i.e. during input signal ON or OFF.	0(when OFF)/1(when ON)	1 (ON)
P3	Auto zero time <sup>*1</sup>	Sets the time from when the input pulse is gone to when the display becomes "0".	0.1 - 3600 sec.	3600 sec.
P4	Input filter <sup>*2</sup>	Selects a minimum frequency that is larger than the maximum frequency of the input signal.	10/0.02kHz	10kHz

#### Parameters in mode 4 (Flowmeter Mode)

No.	Setting item	Description	Input range	Default value
P1	Number of blades per revolution	Sets the number of blades per revolution	1 - 99 (1 when the number is unknown)	1
P2	Capacity per sensor blade (cc, ℓ, etc.)	Enter the capacity per blade that the sensor can read.	0.0001 - 99999	1.0
P3	Scaling	Unit coefficient value	0.00000 - 999999	1
P4	Decimal point display	Designates the decimal point position	0.00000 - 00000.0	00000.0
P5	Display cycle	Sets the display update cycle	0.2/0.5/1.0/2.0/5.0/10/15/30/60 sec.	1 sec.
P6	Auto zero time <sup>*1</sup>	Sets the time from when the input pulse is gone to when the display becomes "0".	0.1 - 150 sec.	6 sec.
P7	Input filter <sup>*2</sup>	Selects a minimum frequency that is larger than the maximum frequency of the input signal. 0.02kHz for the contact input	10/30/100/0.02kHz	10kHz

#### \*1 About the auto zero time

When the input pulse becomes 0Hz during the measurement, and the auto zero time is elapsed, the display is reset to zero.





#### \*2 Input filter

Set the input filter with the larger value than the input signal frequency.

Example) When the 15kHz signal is input, set the 30kHz filter.

Note) When the duty of the input signal (proportion of the ON time in one cycle) is low, the signal may be attenuated and the pulse may not be received normally even if you set the filter with a larger value than the input frequency. When this occurs, set the filter with an even larger value.

## 23. Function List

## The following functions can be set in each mode.

#### Function in mode 1 (Digital Tachometer Mode)

No.	Setting item	Description	Input range	Default value
F1	High set point 1 value <sup>*1</sup>	Sets the high set point 1 value	000000 - 999999	0
F2	Low set point 1 value <sup>*1</sup>	Sets the low set point 1 value	000000 - 999999	0
F3	High set point 2 value <sup>*1</sup>	Sets the high set point 2 value	000000 - 999999	0
F4	Low set point 2 value <sup>*1</sup>	Sets the low set point 2 value	000000 - 999999	0
F5	Hysteresis of the high and low set point 1 values <sup>*1</sup>	Sets the hysteresis of the high and low set point 1 values	0 - 99	0
F6	Judgment output timer at startup <sup>*2</sup>	Sets the time when the comparator judgment is output at startup	0 - 99 sec.	0 sec.
F7	Minimum revolution speed	Sets the revolution speed to be displayed as zero	000000 - 999999	0
F8	Frequency of the moving average	Used when variation of the revolution speed is large and a stable display cannot be attained	0(disabled)/1(3 times)/2(10 times)	0(disabled)
F9	Pre-arithmetic function	Promptly performs the deceleration display when the signal is lost	0(disabled)/1(enabled)	0(disabled)

#### Function setting item in mode 2 (Elapsed Timecounter Mode)

No.	Setting item	Description	Input range	Default value
171	TT-1 1 *1	Sets the high set point 1 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
F1	High set point 1 value	Sets the high set point 1 value (Second display system)	0:00 - 999:99	0:00
Fo	I am act maint 1 malus <sup>*1</sup>	Sets the low set point 1 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
ΓZ	Low set point 1 value	Sets the low set point 1 value (Second display system)	0:00 - 999:99	0:00
Eo	IIi ah aat a aint 9 malua*1	Sets the high set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
гэ	high set point 2 value	Sets the high set point 2 value (Second display system)	0:00 - 999:99	0:00
E4	Low set point 2 value $^{*1}$	Sets the low set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
F 4		Sets the low set point 2 value (Second display system)	0:00 - 999:99	0:00
F5	Hysteresis of the high and low set point 1 values <sup>*1</sup>	Sets the hysteresis of the high and low set point 1 values	0 - 99	0
F6	Judgment output timer at startup <sup>*2</sup>	Sets the time when the comparator judgment is output at startup	0 - 99 sec.	0 sec.
F7	Minimum revolution speed	Sets the revolution speed to be displayed as zero	000000 - 999999	0
F8	Frequency of the moving average	Used when variation of the revolution speed is large and a stable display cannot be attained	0(disabled)/1(3 times)/2(10 times)	0(disabled)
F9	Pre-arithmetic function	Promptly performs the deceleration display when the signal is lost	0(disabled)/1(enabled)	0(disabled)

#### Function setting item in mode 3 (Time width meter Mode)

	0			
No.	Setting item	Description	Input range	Default value
11	TT-1 / 1 *1	Sets the high set point 1 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
F1	High set point 1 value	Sets the high set point 1 value (Second display system)	0:00 - 999:99	0:00
Fo	I am act maint 1 malus*1	Sets the low set point 1 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
ΓZ	Low set point 1 value	Sets the low set point 1 value (Second display system)	0:00 - 999:99	0:00
F3	High set point 2 value $^{*1}$	Sets the high set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
		Sets the high set point 2 value (Second display system)	0:00 - 999:99	0:00
F4	Low set point 2 value <sup>*1</sup>	Sets the low set point 2 value (Hour:Minute:Second display system)	0:00:00 - 9:59:59	Second display system
		Sets the low set point 2 value (Second display system)	0:00 - 999:99	0:00
٣s	Hysteresis of the high and	Sata the hystopools of the high and law set point 1 values	0 - 99	0
гэ	low set point 1 values <sup>*1</sup>	Sets the hysteresis of the high and low set point 1 values	0 - 99	0
FG	Judgment output timer	Sate the time when the comparator judgment is output at startup	0 - 99 502	0.500
го	at startup <sup>*2</sup>	bets the time when the comparator judgment is output at startup	0 33 800.	U SEC.

#### Function in mode 4 (Flowmeter Mode)

No.	Setting item	Description	Input range	Default value
F1	High set point 1 value <sup>*1</sup>	Sets the high set point 1 value	000000 - 999999	0
F2	Low set point 1 value <sup>*1</sup>	Sets the low set point 1 value	000000 - 999999	0
F3	High set point 2 value	Sets the high set point 2 value	000000 - 999999	0
F4	Low set point 2 value <sup>*1</sup>	Sets the low set point 2 value	000000 - 999999	0
F5	Hysteresis of the high and low set point 1 values <sup>*1</sup>	Sets the hysteresis of the high and low set point 1 values	0 - 99	0
F6	Judgment output timer at startup <sup>*2</sup>	Sets the time when the comparator judgment is output at startup	0 - 99 sec.	0 sec.
F7	Minimum flow (display value)	Sets the revolution speed to be displayed as zero	000000 - 999999	0
F8	Frequency of the moving average	Used when variation of the revolution speed is large and a stable display cannot be attained	0(disabled)/1(3 times)/2(10 times)	0(disabled)
F9	Pre-arithmetic function	Promptly performs the deceleration display when the signal is lost	0(disabled)/1(enabled)	0(disabled)

#### \*1 For details about the high set point 1 and 2 values, as well as the low set point 1 and 2 values, refer to "Comparator Function" on page 17.

#### \*2 About the judgment output timer at startup

When you set the value larger than 1 in the function item "F6 Judgment output timer at startup", the judgment output timer function can be used. After the power is turned on, judgment starts when the judgment output timer setting time has elapsed after the start of measurement.



Power ON Measurement start

Judgment start

#### \*3 About the minimum revolution speed (minimum flow)

When you set a value larger than 1 in the function item "F7 Minimum revolution speed (minimum flow)", the following functions can be used.

- In mode 1 and mode 2, the display value is "0" when the measurement revolution speed becomes less than the minimum revolution speed (In mode 2, the display shows "-.-..").
- In mode 4, the display value is "0" when the measurement display value becomes less than the minimum flow.

Mode 1: Judgment condition: (Input frequency/P1 setting value)\*60 < Minimum revolution speed  $\rightarrow$  Display value = "0" Mode 2: Judgment condition: (Input frequency/P1 setting value)\*60 < Minimum revolution speed  $\rightarrow$  Display value = "-----"." Mode 3: No judgment

Mode 4: Judgment condition: Display value < Minimum flow  $\rightarrow$  Display value = "0"



#### \*4 About the frequency of the moving average

When you select values other than "0" in the function item "F8 Frequency of moving average", the frequency of the moving average function can be used.

Displays the measurement value per display cycle averaged by the frequency of the moving average.

• When the moving average function is not set (F8 setting value "0")



• When the moving average function is set (F8 setting value "1", "2")

Displays the measurement value per display cycle averaged by the frequency of the moving average. The figure below shows the relationship between the display update in the F8 setting "0" (moving average: 3 times) and averaging.



#### \*5 About the pre-arithmetic function

When you select "1" in the function item "F9 Pre-arithmetic function", the pre-arithmetic function can be used. Promptly performs the deceleration display when the input signal is lost.



When the auto zero function is activated, the display becomes "0" ("-...." in mode 2 and mode 3).

## 24. Option -FVT/-FVC

When equipped with -FVT/-FVC option, analog signal output (voltage/current) is available according to the displayed data.

## 1. Specifications for -FVT/-FVC Option

Model	-FVT/-FVC			
	Current output	4 ~ 20mA		
		$0 \sim 10 V$	Select one of these	
Output	Voltage output	$1 \sim 5V$	four output options	
		$0 \sim 1V$		
Teed	Output current	below 500Ω		
Load	Output voltage	above 1kΩ		
Gammatan	Meter :PCS-E36L	MD		
(FVC)*	Attachment : [Plug] PCS-E36FS, [Cover] PCS-E36LA			
$(\mathbf{r} \vee \mathbf{C})^{n}$	(Both manufactured by HONDA TSUSHIN KOGYO CO., LTD.)			

\*Cables are to be connected by the user.

## 2. Connection for -FVT/-FVC Option

#### -FVT Option (Terminal block)



\*Select one out of these output options

#### -FVC Option (Connector)

Code	Pin number		Code
C+	1	19	C-
4 ∼ 20mA+	2	20	4 ∼ 20mA-
NC	3	21	NC
NC	4	22	NC
NC	5	23	NC
NC	6	24	NC
NC	7	25	NC
NC	8	26	NC
V10+	9	27	V10-
0 ~ 10V+	10	28	0 ~ 10V-
NC	11	29	NC
NC	12	30	NC
V5+	13	31	V5-
1 ~ 5V+	14	32	1 ~ 5V-
NC	15	33	NC
NC	16	34	NC
V1+	17	35	V1-
0 ~ 1V+	18	36	0 ~ 1V-

\*Select one out of these output options

\*1 and 2 are interconnected to each other. 9-10, 13-14, 17-18, 19-20, 27-28, 31-32, 35-36 are also interconnected respectively.

#### Connector numbering

(As the plug is viewed from wire connection side)



- The connector next to "1"marking is #2 terminal.
  Suggested wiring order is 1, 3, 5 ~ 20, 22, 24 ~ for the ease of finding the right numbering.
  Please use extra caution in soldering, as the clearance is small.

## 3. -FVT/-FVC Option Setting

No.	Setting item	Description		Input range	Default
		Set the displayed value which corresponds to the maximum value of each analog signal.	Mode 1	ſ000000 <b>↓~</b> [999999J	1000
	Maximum analog		Mada 9	Hour:Minute:Second [_0:00:00]~ [_9:59:59]	Displayed in Seconds
F11	signal displayed	• $4 \sim 20 \text{ mA}$ : Maximum value 20 mA	Mode 2	Displayed in Seconds $\lceil _000:00  floor \sim \lceil _999:99  floor$	10:00
	value	$1 \approx 5 \text{ V}$ : Maximum value $5 \text{ V}$	Modo 2	Hour:Minute:Second [_0:00:00]~ [_0:59:59]	Displayed in Seconds
		$\cdot 0 \sim 1 V$ : Maximum value 1 V	Mode 5	Displayed in Seconds $\lceil _000:00  floor \sim \lceil _999:99  floor$	10:00
			Mode 4	「000000」~「999999」	1000
		Set the displayed value which forces the output of the minimum value of each analog signal.	Mode 1	ا999999J <b>~</b> ا	1000
	Minimum analog signal displayed value	Minimum analog	M. J. 0	Hour:Minute:Second [_0:00:00]~ [_9:59:59]	Displayed in Seconds
F12		$\cdot 4 \sim 20 \text{ mA}$ : Minimum value 4 mA	Mode 2	Displayed in Seconds [_000:00]~ [_999:99]	10:00
		$\cdot 0 \sim 10^{\circ} \vee 10^{\circ}$ : Minimum value 0 V	M. J. 9	Hour:Minute:Second [_0:00:00]~ [_0:59:59]	Displayed in Seconds
		$1 \sim 5 \vee$ : Minimum value 1 V $0 \sim 1 \vee$ : Minimum value 0 V	Mode 5	Displayed in Seconds [_000:00]~ [_999:99]	10:00
			Mode 4	「000000」 <b>~</b> 「999999」	1000
F13	Analog signal output timing	Maximum speed when the period is zero. (10ms). When the period is 1, analog signal output is renewed at each display renewal cycle.	「_0_」 「_1_」	(Maximum speed )/ (In sync with display renewal)	0 (Maximum speed)
F14	Analog signal output offset	Set the output offset value as the percentage of the output range for each analog signal. $\cdot 4 \sim 20 \text{ mA}$ : Output range 16mA $\cdot 0 \sim 10 \text{ V}$ : Output range 10V $\cdot 1 \sim 5 \text{ V}$ : Output range 4V $\cdot 0 \sim 1 \text{ V}$ : Output range 1V	۲100.0J~۲_100.0J%		0%

When equipped with -FVT/-FVC option, following setting options are enabled from function setting feature.

#### • When offset is OFF (off set F14 = 0)



Condition	Analog output value
displayed value $\geq$ F11set value	Maximum value (20mA, 10V, 5V, 1V)
F12 < displayed value < F11	(Maximum value/ F11)× Measured value for analog output
displayed value $\leq$ F12 set value	Minimum value (4mA, 0V, 1V, 0V)

• When offset is ON (off set F14 > 0)



• When offset is ON (off set F14 < 0)



Condition	Analog output value
displayed value $\geq$ F11'	Maximum value (20mA, 10V, 5V, 1V)
F19 < displayed value < F11'	(Maximum value/ F11)×Measured value for analog output+
F12 < displayed value < F11 *	(Offset value)

displayed value  $\leq$  F12 set value Minimum value (4mA, 0V, 1V, 0V) +(offset value) % F11' is the displayed value when the analog output value, including F14 (%) of the output range, is equal to the MAX value.

Example) Assuming the output is 10V, F11= 200, F14 = 10(%), then F11'= 180,

therefore the output is 10V when the displayed value is above 180.

Condition	Analog output value
lisplayed value ≧ F11′	Maximum value (20mA, 10V, 5V, 1V)
F12 < displayed value < F11 $'_{*}$	(Maximum value/ F11)×Measured value for analog output- (Offset value)
displayed value $\leq$ F12 set value	Minimum value (4mA, 0V, 1V, 0V) - (Offset value)

% The minimum value for MIN-F14 (%) in the diagram above is 0mA, in the case of current output (4 ~ 20mA) Example) Assuming the output is 10V, F11= 200, F14 = 10(%), then F11'= 220,

therefore the output is  $10\mathrm{V}$  when the displayed value is above 220.

## 25. Option -BCD

When equipped with -BCD option, Binary Coded Decimal output is possible

## 1. Specifications for -BCD Option

Model	-BCD		
NPN Open collector output	Output capacity	30VDC 20mA	
	Open collector (NP	Open collector (NPN) input	
Onon collector innut	I O innut	Load capacity : minimum 5mA	
Open collector input	LO input	$0 \sim 1.5 V$	
	HI input	Leakage current : maximum 0.1mA	
Data output	6 digits BCD code		
Decimal point output	DP1 ~ 4 (1 ~ 4 digits after decimal point)		
	PLUS	When output data is positive, PLUS turns to LO	
Control output	DT OUT	When DATA OUT is HI, output signal is set	
*	OVR	When displayed value overflows, OVR turns to LO	
Control immet	HOLD	While HOLD is LO, output data does not renew	
Control input	ENABLE	While ENABLE is LO, output has high impedance	
G	Meter: PCS-E36LM	MD/ Accessory side: [Plug] PCS-E36FS, [Cover] PCS-E36LA	
Connector	(Both manufacture	ed by HONDA TSUSHIN KOGYO CO., LTD.)	
Positive-logic-negative-logic	available for BCD a	and decimal point output (opted at Function 10)	

% Cable connection is to be done by users.

#### Timing chart



## 2. Connection for -BCD Option

in/out	Code		Pin number		Code		in/out
	×10 <sup>0</sup>	1	1	19	1		Out put
		2	2	20	2	×10 <sup>3</sup>	
		4	3	21	4		
		8	4	22	8		
	×10 <sup>1</sup>	1	5	23	1	×104	
		2	6	24	2		
		4	7	25	4	^101	
Out put		8	8	26	8		
	×10 <sup>2</sup>	1	9	27	1	×105	
		2	10	28	2		
		4	11	29	4	×10 <sup>5</sup>	
		8	12	30	8		
	PLUS		13	31	DP1		
	DT OUT		14	32	DP2		
	OVR		15	33	DP3		
Input	HOLD		16	34	DP4		
	ENABLE		17	35	GND		
	GND		18	36	GND		

#### Connector numbering

(As the plug is viewed from wire connection side)





#### Output circuit



ENABLE input circuit



## 3. -BCD Option Setting

When equipped with BCD option, following setting options are enabled from function setting feature.

No.	Setting item	Description	Input range	Default
F10 BCD output logic	BCD output logic	Set as 0 for negative logic, set as 1 for positive logic	$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Negative logic
	· · · · · · · · · · · · · · · · ·	(decimal point output)	$\lceil 1_1 \rfloor$ (Positive logic)	

% F10 sets positive/negative logic for BCD output, Decimal point output, PLUS, OVR. Logic for DT OUT, HOLD, ENABLE signals cannot be set.

## • BCD output display specifications



## 26. Option -TRT

When equipped with -TRT option, comparison result output is possible. (LL,L,GO,H,HH,ZERO)

## 1. -TRT option specifications

Model	-TRT				
Output capacity	30VDC 20mA				
Residual voltage	Less than 1.5V				
	Measured value $<$ Low set point 2 value	LL signal is ON			
	Measured value $<$ Low set point 1 value	L signal is ON			
Output signal	Low set point 1 value $\leq$ Measured value $\leq$ High set point 1 value	GO signal is ON			
Output signal	High set point 1 value < Measured value	H signal is ON			
	High set point 2 value < Measured value	HH signal is ON			
	Measured value = 0	ZERO signal is ON			
Output is insulated from internal circuitry					
Negative logic open collector output					

## 2. -TRT option connection



## 27. Option -CPT

When equipped with -CPT option, comparison result output is possible. (L,GO,H)

## 1. -CPT option specifications

Model		-CPT			
Output contact		1C			
	Pasistanas load	250VAC 5A 100K operations			
D ( 11 1	Resistance load	30VDC 5A 100K operations			
Rated load	Induction load	250VAC 2.5A 100K operations			
	$\cos\phi = 0.4$	30VDC 2.5A 100K operations			
Output signal	Measured value < Low set point 1 value		L signal (B contact) is ON		
	Low set point 1 value $\leq$ Measured value $\leq$ High set point 1 value		GO signal (B contact) is ON		
	High set point 1 value < Measured value		H signal (B contact) is ON		

## 2. -CPT option connection



Output circuit



## 28. DT-501X / DT-501F series model list

This operation manual is applicable to following models.

Model						
Input spec	AC power type	DC power type	Option 1		Option 2	
Standard input	DT-501XA-FVT	DT-501XD-FVT	1.35 7/12	37.1		-
	DT-501XA-FVT-BCD	DT-501XD-FVT-BCD	-FVT	voltage output	-BCD	BCDoutput
	DT-501XA-TRT	DT-501XD-TRT		Transistor output		-
	DT-501XA-TRT-FVC	DT-501XD-TRT-FVC	-TRT		-FVC	Voltage output
	DT-501XA-TRT-BCD	DT-501XD-TRT-BCD			-BCD	BCDoutput
	DT-501XA-CPT	DT-501XD-CPT	-CPT			-
	DT-501XA-CPT-FVC	DT-501XD-CPT-FVC		Relay output	-FVC	Voltage output
	DT-501XA-CPT-BCD	DT-501XD-CPT-BCD			-BCD	BCD output
	DT-501XA-FVC	DT-501XD-FVC	-		-FVC	Voltage output
	DT-501XA-BCD	DT-501XD-BCD		-	-BCD	BCD output
	DT-501FA-FVT		135.771	Voltage output		-
	DT-501FA-FVT-BCD		-L A I		-BCD	BCD output
	DT-501FA-TRT		-TRT	Transistor output		-
	DT-501FA-TRT-FVC				-FVC	Voltage output
Differential input	DT-501FA-TRT-BCD				-BCD	BCD output
	DT-501FA-CPT	-	-CPT	Relay output		-
	DT-501FA-CPT-FVC				-FVC	Voltage output
	DT-501FA-CPT-BCD				-BCD	BCD output
	DT-501FA-FVC			-	-FVC	Voltage output
	DT-501FA-BCD			-	-BCD	BCD output

\*For the detail of standard input and differential input, please refer to following pages.

Standard input : P5 Input Specifications

Differential input : P6 Input Specifications

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