Rate Meter & Totalizer

DP21

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Normal Operating Mode

In the normal operating mode the display indicate either the rate or the counter. And 'r' on the left of the display signifies the rate. The display may be toggled by pressing the 'Select' (SEL) button.

Totalizer

Module **DP21** receives incoming pulses and multiplies them by the Count Scale Factor. The unit's counter (internal count value) keeps track of the scaled input pulse count which results in the desired reading value for the count display.

The Count(s) reset to zero when a manual reset is performed. At loss of power to the unit, the contents of the counter are saved. This allows counting over consecutive shifts, days, etc. The total count can accumulate to 99,999,999 (The counter value will roll over and flesh 'tot OVEr' when the count value exceeds 99,999,999 indicating an overflow condition.

Rate

Module **DP21** use a time interval method to calculate the rate value. The unit counts on the negative edge of the input pulses. After the programmed minimum update time elapses and the next negative edge occurs, the unit counts the number of edges that occurred during the elapsed time. The number of edges is multiplied by the rate scaling value to calculate the rate value.

At slower rates, averaging can be accomplished by programming the rate minimum update time for the desired response. Extensive scaling capabilities allow practically any desired reading at very slow count rates.

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Programming Mode

Programming or Normal Mode Selection

When power is applied to the **DP21**, it will be in Normal operating mode. To change to the Programming Mode press the 'Select' button and hold it for 5 seconds. To change back to the normal Operating Mode just do the same as Programming Mode.

Programming Description

Programming the **DP21** is done with front panel buttons. Although the unit has been programmed at the factory. The parameters generally have to be changed to meet the user's requirements, to enter the Programming Mode.

Pressing the select button scrolls through the menus. The display alternately flashes between the menu and the currently selected data. Pressing the 'Reset' button stops the display from flashing and enters the unit into Data Modification Mode.

In Data Modification Mode, a menu provides one of two types of parameter to program.

1. Selection Type – The operator presses the reset button to through the various parameter available for that menu or to toggle between 'YES' or 'NO' selection. Pressing the 'Select' button will exits from Data Modification Mode and advances to the next menu.

2. Numerical Type – The 'Reset' button increments the numerical value of the flashing digit. Momentarily pressing the 'Select' button advances to the next digit. To advance to the next menu first press the 'Select' button and without releasing it press the 'Reset' button.

All parameter value are saved when exiting the programming mode. To exit from Programming Mode press 'Select' button and hold for 5 seconds.

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Programming Menus

1. SECLECT ENABLE (dSPSEL)

The front panel Select button can be enabled (Yes) OR disabled (No) during normal operation. If 'No' is selected, the display remains either on the rate or counter display(s) depending on which was viewed when programming was entered.

2. RESET ENABLE (rSt Enb)

The front panel Reset button can be enabled (Yes) or disabled (No) during programming. The counter may not be reset via the front panel if disabled.

3. COUNTER A DECIMAL POINT (tot dP)

There are six decimal point locations available for the count display. The decimal point locations are used for the count display only and are independent of the rate display.

0
0.0
0.00
0.000
0.0000
0.00000
0.000000

4. COUNTER A SCALE FACOTR (SCLFAC)

The scale factor is prescaler, therefore changing the scale value does not change the existing internal count, and only effects the incoming pulse count. The count scale factor Value can range from 0.0001 to 99.9999.

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5. RATE ENABLE (rAtE Enb)

Selecting "Yes" enables the rate indicator function. If disabled (No), the rate programming steps will not appear. This affects the rate only.

Note: the precision of a counter application cannot be improved by using a scale factor greater than one. To accomplish greater precision, more pulse information must be generated per measuring unit.

6. RATE DECIMALPOINT (rAtE dP)

Select the desired decimal point position for the rate display, independent of the count display.

0
0.0
0.00
0.000
0.0000
0.00000

7. RATE DISPLAY (rAtE dSP)

Program the desired rate display value which corresponds to the programmed rate input (rate INP) value. The rate display value can be programmed from 000001 to 999999.

8. RATE INPUT (rAtE INP), (Hz)

Program the rate input value that should correspond to the rate display (rAtE dSP) value. The rate input value can be programmed from 00000.1 to 99999.9 and should correspond to the signal input frequency.

9. MINIMUM UPDATE TIME (Lo-Udt), (Seconds)

This is the minimum amount of the time between display updates for the rate display. This affects the rate display only. The low update time ranges from 00.1 to 99.9 seconds. To assist in stabilizing an erratic display, increase Lo-Udt for a display averaging effect.

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10. MAXIMUM UPDATE TIME (Hi-Udt), (Seconds)

This is the maximum amount of time before the rate display goes to zero. The rate display goes to zero if the time between successive pulses exceeds the high update (Hi-Udt) time. The high update time ranges from 00.1 to 99.9 seconds.

11. FACTORY SETTINGS (FACt SEt)

All of the parameters are restored to the factory default settings when YES is selected and the front panel select button is pressed. The DP21 displays 'LoAd' for several seconds and then returns to programming of Factory Settings parameter. Factory settings for all the programmable values are listed below.

dSPSEL	YES
rSt En	YES
tot dP	0
SCLFAC	01.0000
rAtE En	YES
rAtE dP	0.00000
rAtE dSP	0.00001
rAtE INP	01.0 (Hz)
Lo-Udt	01.0 (Seconds)
Hi-Udt	01.0 (Seconds)

12. ADDRESS (Addr)

Program the address of DP21.The address of DP21 can be programmed from 00 to 99.

13. BAUD RATE (bAUd)

Program the communication baud rate of DP21.

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Scaling for Count Indication

The DP21's scale factor is factory set to 1, to provide one count on the display for each pulse that is input to the unit. In many applications, there will not be a one-to-one correspondence between input pulses and display units. Therefore, it is necessary for the DP21 to scale or multiply the input pulses by scaling factor to achieve the desired display units (feet, meters, gallons, etc.).

The incoming pulses are multiplied by the count scale factor value and stored in the internal count register which results in the desired count display value. The scale factor is a prescaler, which means changing the scale factor does not changes the existing internal count, but only effects the incoming pulse count.

The Count Scale factor Value can range from 0.0001 to 99.9999. It is important to note that the precision of a counter application cannot be improved by using a scale factor greater than one. To accomplish greater precision, more pulse information must be generated per measuring unit. The following formula is use to calculate the scale factor.

$$\text{Scale Factor} = \frac{\text{Desired Display Units}}{\text{Number of pulse}} \times \text{Decimal point Position}$$

WHERE:

Desired display units : Count display unit acquired after pulse that occurred

Number of Pulses : Number of pulses required to ahieve the desired display units

Decimal Point position :

0	=	1
0.0	=	10
0.00	=	100
0.000	=	1000
0.0000	=	10000
0.00000	=	100000

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EXAMPLE: The counter display is used to indicate the total number of feet units to be displayed. The decimal point is selected to show the resolution in hundredths.

$$\text{Scale Factor} = \frac{\text{Desired Display Units}}{\text{Number of pulse}} \times \text{Decimal point Position}$$

Give that 128 pulses are equal to 1 foot, display total feet with a one hundredth resolution.

$$\text{Scale Factor} = \frac{1.00}{128} \times 100$$

$$= 0.007812 \times 100$$

$$= 0.7812$$

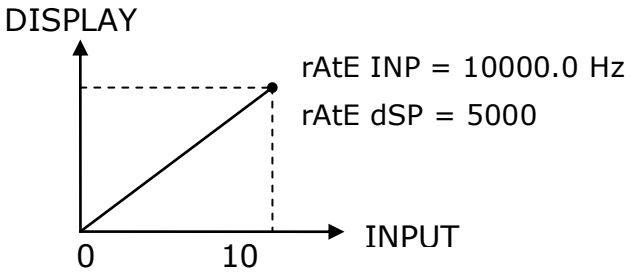
Scaling for Rate Indication

Scaling the Rate involves programming the DP21 so that input Frequency to the unit are scaled to the desired display units.

> ***Note :*** *It is not necessary to increase the pulse information to obtain higher resolution.*

The operator keys-in a display value and a corresponding rate value. The location of the scaling point should be near the process end limit for the best possible accuracy. Once these values are programmed, the indicator calculates the slope of the rate display automatically and scaling is complete after decimal point selection. Input frequency can be read directly if rate display and rate input value is programmed to '1' and '1.0'.

> ***Note :*** *The rate display will flesh "r OLOLOL" if the display exceeds 999,999 which means the unit must be re-scaled.*



NOTE: STARTING POINT OF SLOPE DIAGRAM IS ALWAYS ZERO (0)

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If the rate application is to display a specific display unit, it is only necessary to know the number of pulses per desired display unit/s (feet, revolutions, etc.) and in the desire time format, per second (1), per minute (60), or per hour (3600) to scale the rate display. Use the following formula to calculate the rate input value.

$$\text{rAtE INP (Hz)} = \text{rAtE dSP} \times \frac{\text{Pulses per unit}}{\text{desired time format}}$$

WHERE:

rAtE INP = Rate input Value (Hz)

rAtE dSP = Desired rate display value

Pulse per unit = Number of actual input pulses

Desired Time Format Select

- Per Seconds = 1
- Per Minute = 60
- Per Hour = 3600

EXAMPLE: Display is to indicate 1575 revolutions per minute (RPM). Input pulses are 39 pulses per revolution.

$$\text{rAtE INP (Hz)} = 1575 \text{ RPM} \times \frac{39\text{PPR}}{60}$$
$$= 1023.75$$

Since the rate input value can only be programmed in tenths, the value is recalculated by increasing the rate display value by a factor of ten. The display value is continually increased until one of the following is reached.

- The rAtE INP valuse's least significant digit is no similar than a tenth
- The rAtE dSP value exceeds 999,999
- The rAtE INP value exceeds 99,999.9

Note: For two and three, use the value that was calculated prior to exceeding that value.

$$\text{rAtE INP (Hz)} = 15750 \text{ RPM} \times \frac{39\text{PPR}}{60}$$
$$= 10237.5$$

15750 is entered for the rAtE dSP

10237.5 is enterd for the rAtE INP

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