

**T21**

***TORGOEN***

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**Instruction Manual**

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*ENGLISH*

## Instructions for Using your flight Computer Watch

Your flight computer can serve as a regular circular slide rule or as a *Flight Computer*. Those features are really simple to use – *so don't be intimidated*.

With just a little practice, some calculations can be performed more quickly than with a hand-held calculator, currency conversions, for example

The terms *Flight Computer* and slide rule are related. The slide rule is a normal calculator able to perform any multiplication or division. Your watch uses the calculation abilities of the slide rule to easily perform problems of **time**, **speed** and **distance**, **fuel consumption** and useful conversions such as statute miles to nautical miles, metric units to English units, or US Dollars to British Pounds.

To get started, rotate the ring until "60" on the outer scale is aligned with the red 60 (or red arrow, depending upon watch model you have) in the middle scale. Note that all numbers in the middle and outer scales match up. Before we explain the details, let's do a calculation -- you'll be amazed at how easy it is.

**IMPORTANT:** *In the following examples we use nautical miles and knots as our units. You can change the terms of knots into kilometers per hour or miles per hour and nautical miles into kilometers or miles, respectively. The RATE indicator can indicate a rate of anything per hour. It can even be units of shoes manufactured in an hour in a certain production line. The distance in this case would be the number of shoes produced in a given amount of time.*

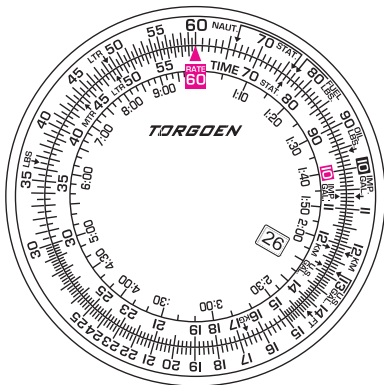


Figure 1

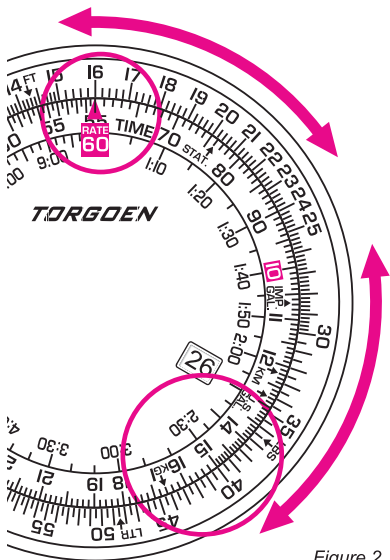


Figure 2

## ***Time En Route***

Suppose your plane flies at 160 knots (nautical miles per hour). Rotate the outer ring so that 16 (representing 160) aligns with the RATE arrow (see fig. 2). Note that on the inner scale (or the stationary scale), the number 60 is replaced with the RATE ARROW. When 16 (which represents 160 knots) on the outer scale (most models have only two scales which have exactly the same numbers. The T1 models have an additional scale, the inner most one, which translates minutes to hours is aligned with the RATE arrow on the inner scale (or the stationary scale), you have now set the RATE of 160 knots on the *Flight Computer*. Now you can choose any distance – say 400 nautical miles – and see the time it will take to travel at that RATE you've just set: if you look at the number 40 representing a distance of 400 nautical miles in this case on the outer scale. It is aligned with 15 which represents 150 minutes in this case on the inner scale. So at this RATE or speed, it will take 150 minutes to travel 400 nautical miles. On the T1 models there is an additional scale which would also translate 150 minutes to 2 hours and 30 minutes, displaying it as 2:30. You can now choose any other *distance* at that RATE setting of 160 knots and easily find the *time* it will take to travel. Just look at any other distance on the outer scale and the time will be displayed against that on the inner scale.

## ***Time, Speed and Distance***

The outer scale in *time/speed/distance* problems will always be ***distance*** and ***speed*** (i.e. RATE). The inner scale will always be *time (minutes)*. There are 3 types of problems in this section. In two of them the RATE is known and in one of them, the RATE is sought.

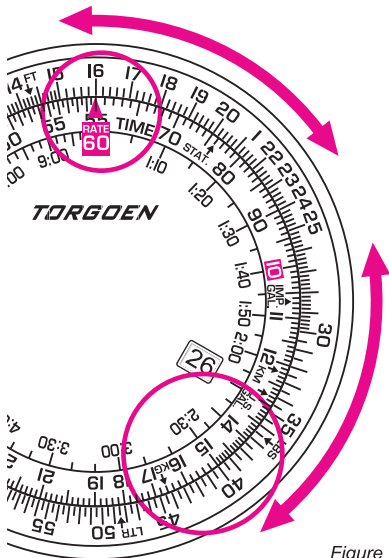


Figure 3



## ***The Hour Scale***

Look at the inner scale. This is a conversion of the middle scale from minutes to hours, so for the calculation above, 15 on the middle scale aligns with 2:30 on the inner scale. That means that 150 minutes equals 2 hours, 30 minutes. How easy!

## ***Speed***

To find your speed, knowing your distance and time, rotate the outer ring until you align the distance (shown on the outer ring) with the time (in minutes shown on the middle ring or in hours shown on the inner ring). Read the speed against the RATE ARROW.

## ***Distance***

To find your distance, when you know *time* and *speed*(or RATE), rotate the outer scale until your *speed* aligns with the RATE ARROW. Find your *distance* on the outer scale against the *time* in minutes on the inner scale. From the example above, if your *speed* is 160 knots (the number 16 is aligned with the RATE indicator which is also the number 60), the *distance* traveled (shown on the outer scale) will be aligned with the *time* traveled (shown on the inner scale in minutes and for the T1 models also in hours in the inner most scale.) At a speed of 160 knots , if you want to know how far you will travel in 15 minutes, find 15 minutes on the inner scale and see that it is aligned with 40 nautical miles on the outer scale. You know that at this speed, you will travel 40 nautical miles in 15 minutes, or 400 nautical miles in 150 minutes.

## ***Decimal Point***

The numbers 10 on both scales are printed in red as well, because you will need to use them to perform regular calculations and conversions that are not marked on the scales such as currencies. You will have to decide whether to read it as 1, 10, 100 or 1000. This depends on the context of the problem you are trying to solve. Assuming it is 10, the calibrations between 10 and 11 are each 0.1. So 2 calibrations after the 10 will be read as 10.2. If the number 10 is 100 units – pounds for instance, 2 calibrations above the 10 will be read as 102 pounds. Look now at the calibrations between the 15 and 16. Note that there are only 5 calibrations between them. It means that 2 calibrations above the 15 will be read as 15.4, 1.54, 154, 1,540 or more zeroes after that, all depending on the context of your problem. This should be easy to determine since you would know more or less how fast your plane is flying or how many minutes between two points. You will know if you have to decide between 20 minutes, 2 minutes or 200 minutes.

## Fuel Consumption Problems

Fuel consumption calculations are very similar to time/distance/speed problems. The *distance* measurement (in the calculations above) becomes *gallons* here.

**Example:** Your fuel consumption is 5 gallons per hour at the desired engine power setting. Your usable fuel capacity is 40 gallons. You want to know your **endurance**.

1. Set the outer scale with 50 (5 gallons) over the RATE ARROW.
2. Find 40 gallons (your useable fuel capacity) on the outer scale.
3. Opposite 40, find 8:00 on the inner scale and 48 (representing 480 minutes) on the middle scale. That's your *endurance*.
4. Ask yourself, "How in the world did I live without this wonderful tool for so long?"

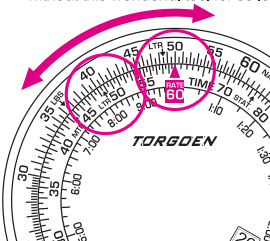


Figure 4

*Example:* To top your tank after flying 4 hours and 20 minutes you needed 22.6 gallons. What was your fuel-burning rate?

1. Set 22.6 (outer scale) over 4:20 (inner scale or 260 minutes on the middle scale).
2. Find your burning rate above the RATE ARROW, which is 5.2 gallons per hour.

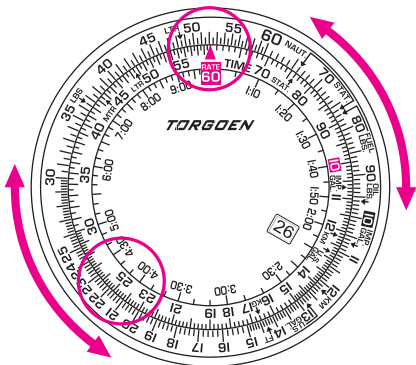


Figure 5

## Multiplication and Division

Multiplication Example –  $32 \times 4 = 128$

1. Set 32 on the outer scale opposite **10** in the middle scale.
2. Read the result on the outer scale opposite 40 in the middle scale.

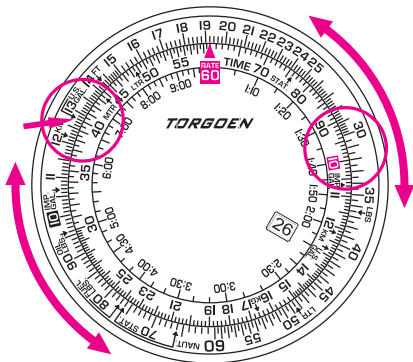
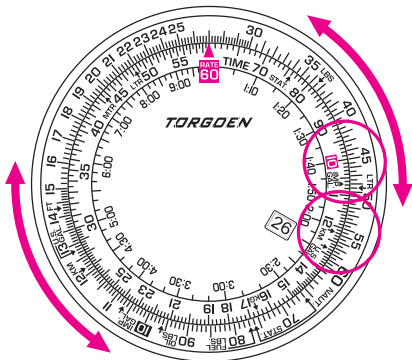


Figure 6

*Division Example -  $540 : 12 = 45$*

1. Set 54 on the outer scale over 12 on the middle scale.
2. Read the result on the outer scale opposite the **10** in the middle scale.



*Figure 7*

## ***Ratios and conversions***

When the numbers on the outer scale and the middle scale match, the ratio between the two scales is 1:1. Now rotate the outer scale so that the number 20 on the outer scale will be above the number 10. Note that all the numbers on the outer scale are positioned against numbers in the middle scale with half their value. The ratio is 2:1. This feature is useful to convert any linear conversion like currencies or metric to imperial measurements of length or weight. Simply find how many units of one measurement against one unit of the other. Match up that number, with the number 10 (in red), in that case it should read 1.

*Example:* If you know that 1 ounce = 28.35 grams, rotate the outer scale until the number 28.35 is above the number 10 (see fig.1). Now all the numbers in the outer scale became grams and all the numbers in the middle scale became ounces. Of course you need to figure out decimal position. You can see that the number 85 is very close above the number 30, so this indicates that 3 ounces are almost 85 grams. In fact 3 ounces are 85.05 grams ( $28.35 \times 3$ ) and you can see that roughly on the scale (see fig.1) but an accuracy of 85 as opposed to 85.05 is 99.94%. 99.94% accuracy in less time than it takes to run it on a hand-held calculator!

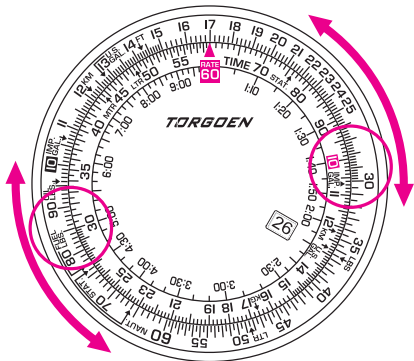


Figure 8



### Currency Conversion

Suppose the conversions rate for Swiss Franc is SFR1.60 to \$1.00. Rotate the outer scale to match 16 over 10, the outer scale becomes Swiss Francs and the middle scale becomes US dollars. You can leave the scales like that until the exchange rate changes. If you want to convert SFR 4.00 to dollars you look at the number in the middle scale opposite the 40 on the outer scale. The number is 25. You can deduct that SFR4.00 are \$2.50.

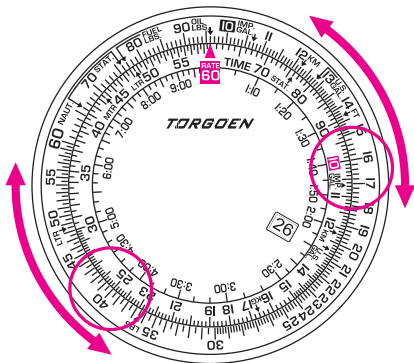


Figure 9



### ***Nautical to Statute Miles***

Find the two connected arrows on the outer scale between the numbers 66 and 76. Next to one of them "NAUT" is printed and next to the other "STAT". To convert between them just put the figure you want to convert next to the matching arrow and read the conversion next to the other.

Example: You want to convert 120 nautical miles to statute miles.

1. Rotate the outer scale until the arrow reading "NAUT" is above 120 (in this case, above the figure 12).
2. Read the conversion underneath the arrow reading "STAT" which is about 138.5 statute miles.

Reverse the procedures to convert from statute miles to nautical miles.

### ***Miles to Kilometers***

To convert miles to Km, rotate the outer scale until the "STAT" arrow is aligned with the number of miles you want to convert to Km, Read the corresponding Km value on the middle scale, which is aligned with KM arrow (between the 12 and 13 on the outer scale).

To convert from Km to Miles do the reverse.

### ***Other Conversions***

Feet to Meters – match the FT arrow on the scale with the MTR arrow on the middle scale. The outer represents feet and the middle scale represents meters. Match any two numbers opposite each other.

### ***Imperial Gallons to US Gallons***

Set the US GAL arrow in the middle scale opposite IMP Gal on the outer scale. The outer scale represents Imperial Gallons and the middle scale represents US Gallons.

## Conversion Table

As previously mentioned you can convert any linear values from one unit to another. For your convenience we are providing here a table with some values.

Description	Ratio	Match this number opposite 10 (in red) on the inner scale	Outer scale represent	Middle scale represents
<b>Length</b>				
Centimeter / Inch	2.54	2.54	Centimeters	Inches
Feet / Meter	3.28	3.28	Feet	Meters
Yard / Meter	1.09	1.09	Yards	Meter
Kilometer / Mile	1.61	1.61	Kilometers	Miles
Acre / Hectare	2.47	2.47	Acres	Hectares
<b>Weight</b>				
Gram / Ounce	28.35	28.35	Grams	Ounces
Pound / Kilogram	2.21	2.21	Pounds	Kilograms
Kilogram / US Ton	907	907	Kilograms	US Tons
<b>Volume</b>				
Liter / Imp. Gallon	4.55	4.55	Liters	Imp. Gallons
Liter / US Gallon	3.79	3.79	Liters	US Gallons
US Gallon / Imp. Gallon	1.2	1.2	US Gallons	Imp. Gallons

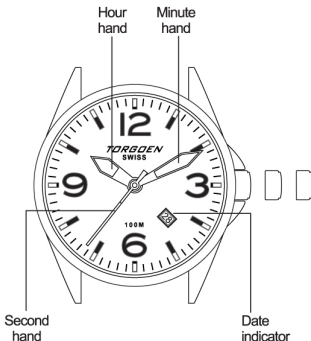
# Setting Instruction for 3 hands, date

**Crown position I — Normal function**

**Crown position II — Date setting (quick mode)**

**Crown position III — Time setting**

## *Watch hands*



# GMT

## Setting Instruction for GMT(A Type)

To set the time – pull out the crown 2 steps and turn.

To set a different time zone – pull out the crown one step only. Turn to one direction to change the date and the other to set the 24-hour hand to indicate a different time zone of your choice. The hand will complete a circle once every 24 hours as opposed to the regular hour hand, which completes a circle every 12 hours.

**Example:** if you are in New York City, at noon, and wish to track the time in Rock Springs, Wyoming (2 hours behind New York), turn the crown until the red 24h-hour hand points to 10:00 on the 24-hour scale (5:00 on the 12-hour scale).

