TL-2824
USER`S MANUAL

TL elektronic
Airport, Building 125, Hradec Kralove
503 41, Czech Republic

Non TSO approved

Producer's address:
TL elektronic Inc.
Airport, Building 125,
503 41 Hradec Kralove, Czech Republic
Fax: +420 49 548 23 94 E-mail: info@tl-elektronic.com
Website Address: www.tl-elektronic.com

***Please, send your e-mail address to customer@tl-elektronic.com
to receive the latest information about the software upgrade.***

*Send your ideas to innovation@tl-elektronic.com.
We will evaluate your suggestion and provide an update.*

Record of revision

Revision	Revision date	Description	ECO#	Insertion date	By
A	1/6/03	Initial Release	---		
B	1/7/04	Language correction	0001		

TABLE OF CONTENTS

1. GENERAL DESCRIPTION

1.1. INTRODUCTION

This manual describes the physical, mechanical and electrical features and functions of the TL-2824 RPM & Engine Hours Meter.

1.2. INSTRUMENT DESCRIPTION

The TL-2824 is complete management for measuring the aircraft flight time and also the engine time.
The TL-2824_SAS incorporates, in addition, an internal indicator of air speed where the user can set the speed, at which the flight time measuring will be started.
The TL-2824 can prevent an unauthorized use of the aircraft by locking the engine starter or the magnetos. After entering the correct code, the instrument unlocks the magnetos or the starter.
The TL-2824 checks all measured values at two levels - for a warning and an alarm limit signalization. When the alarm warning has been activated, the instrument will display a Service message after the next turn-on to inform the user on the exceeded RPM.
The TL-2824 incorporates a 10,000-line long-term memory and SchecK memory (see page 7-1) for storing the measured values at 0.1 to 60 second sample rate.
The User button can be programmed in the main set-up for the quick display of the minimum and maximum RPM.
It is possible to download the measured values from the instrument via the serial cable RS-232c into your PC.

1.3. TECHNICAL SPECIFICATIONS

The producer guarantees all stated technical parameters only when the instrument is installed by an authorized service or an aircraft manufacturer.

1.3.1 Physical Characteristics

Width	71mm (2.795 inches)
Height	67mm (2.637 inches)
Depth	92mm (3.622 inches) including connectors with cover
Panel hole	57mm (2.244 inches) diameter
TL-2824 Weight	0.25 kg (0.55 lbs) / version SAS 0.30 kg (0.66 lbs)
TL-2824 Harness	0.05 kg (0.11 lbs)

1.3.2 General Specifications

Operating Temperature Range	**-20°C to +70°C**
Humidity	**95% non-condensing**
Altitude Range	**4600 meters max.**
Power Range	**10.0 to 32.0 Volts**
Max. Signalization	**30 Volts, 1 Ampere**
Power Consumption	**0.15 Ampere @ 14 VDC**
Backlight Consumption	**0.08 Ampere max when ext. power is used**
Vibration	**5 to 500 Hz**
Show Rate (LCD Refresh)	**1 second**

1.3.3 Long-term Memory and Communication

Storing Rate	**1 to 60 seconds user selectable**
Memory Capacity	**Scheck® method**
Stored Values	**rotation speed, (air speed - version SAS)**
Data Saved Endurance	**30 years**
Rolling Memory life-time	**250 000 hours @ 1 second storing rate**
Communication	**RS-232c**
Communication Speed	**38400 bps**

1.3.5 Instrument Measured Range / Resolution

RPM	**0 to 9999 rpm / 1 or 10 rpm**
Engine Time	**0 to 9999 hours / 1 min to 99 hours and 1/10 hour from 100 hours ±2 seconds @ 1 hour**
Flight Time	**0 to 9999 hours / 1 min to 99 hours and 1/10 hour from 100 hours ±2 seconds @ 1 hour**

1.3.6 Sensor Parameters / Instrument Measured Range / Accuracy

Low RPM Voltage	**~6 to ~50 VAC / 300 to 9999 rpm / ±1 rpm**
High RPM Voltage	**~25 to ~80 VAC / 300 to 9999 rpm / ±1 rpm**
Positive RPM Only	**+6 to +60 VDC / 300 to 9999 rpm / ±1 rpm (can be use VAC)**

1.4. LIMITED CONDITIONS

1.5. LIMITED WARRANTY

The TL elektronic company warrants this product to be free from defects in materials and manufacture for three years from the date of purchase. TL elektronic will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labour. The customer is, however, responsible for any transportation costs. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF ENCHANT ABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL TL ELEKTRONIC BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

To obtain warranty service, call the TL elektronic Customer Service (+420 49 548 23 92) for a returned merchandise tracking number. The unit should be securely packaged with the tracking number clearly marked on the outside of the package and sent freight prepaid and insured to a TL elektronic warranty service station. A copy of the original sales receipt is required as the proof of purchase for warranty repairs. TL elektronic retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion.

SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

1.6. LIMITED OPERATION

This product is not TSO approved as a flight instrument, therefore, the manufacturer will not be held responsible for any damage caused by its use.
Locking the starter or the magnetos is possible only with use of the original locking relay delivered by the company TL elektronic and after a profound test in your aircraft.
TL elektronic is not responsible for any consequences resulting from the use of locking the starter or the magnetos. The user can use this locking only at his/her own risk.

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2. INSTALLATION

2.1 INTRODUCTION

Careful planning and consideration of the suggestions in this section are required to achieve the desired performance and reliability from the TL-2824.

2.2 RACK CONSIDERATION

Plan a location that gives the pilot complete and comfortable access to the entire keypad and that is plainly visible from the pilot's perspective. Check that there is adequate depth for the rack in the instrument panel. A place away from heating vents or other sources of heat generation is optimal.

2.3 INSTALLATION INTO PANEL

⚠ **Connect the cables into the connector and use the connector cover. Secure the incoming leads to prevent their effect on the connector in the vertical direction.**

⚠ **Connect the static and dynamic pressure hose into the fitting in the SAS version. Secure the incoming leads to prevent their effect on the hose in the vertical and horizontal direction.**

Mounting Rack Dimension
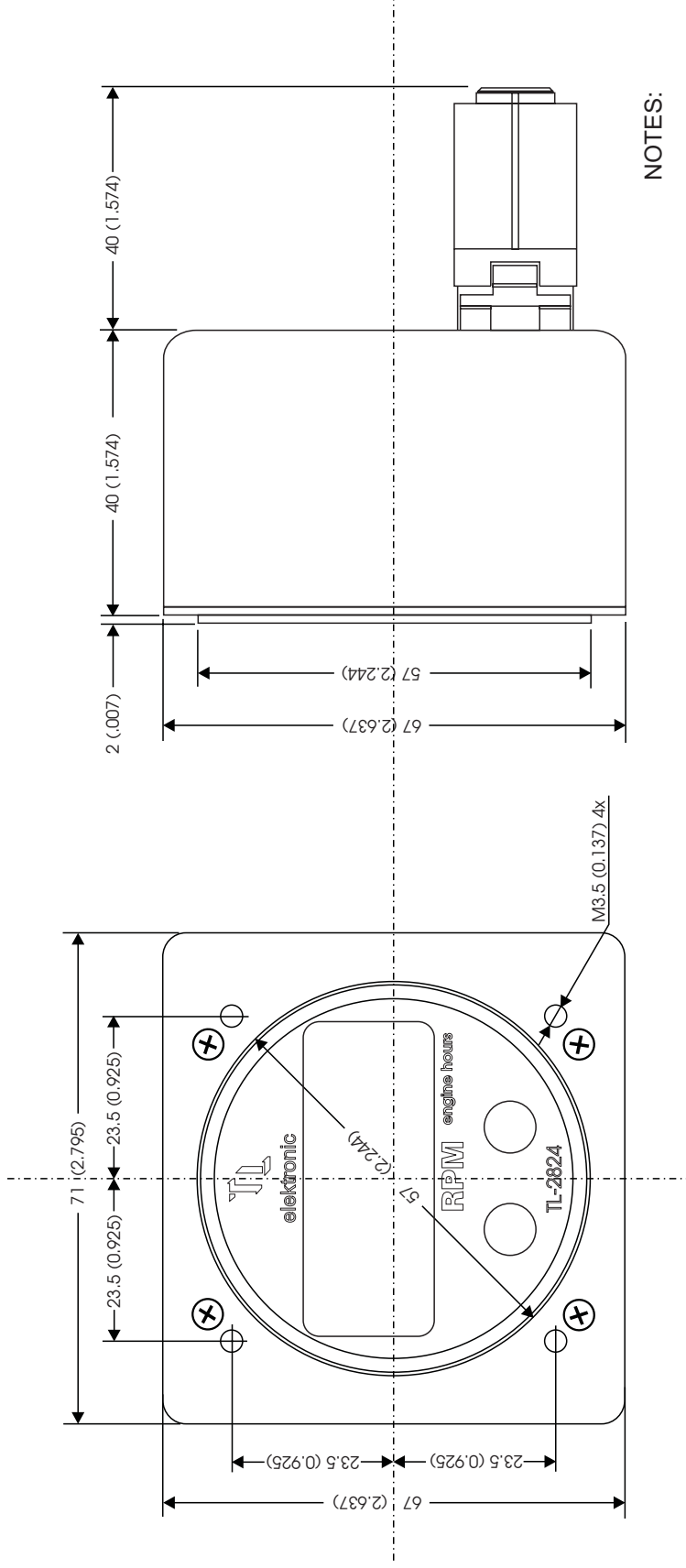
NOTES:

1. Dimension: mm (INCH)
2. Unit weight: 0.25 kg (0.55 lbs)
3. Mounting Rack & Hardware
   weight: 0.05 kg (0.11 lbs)

Figure 1. Rack Dimension

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Mounting Rack Dimension - Version SAS with internal Air Speed Sensor
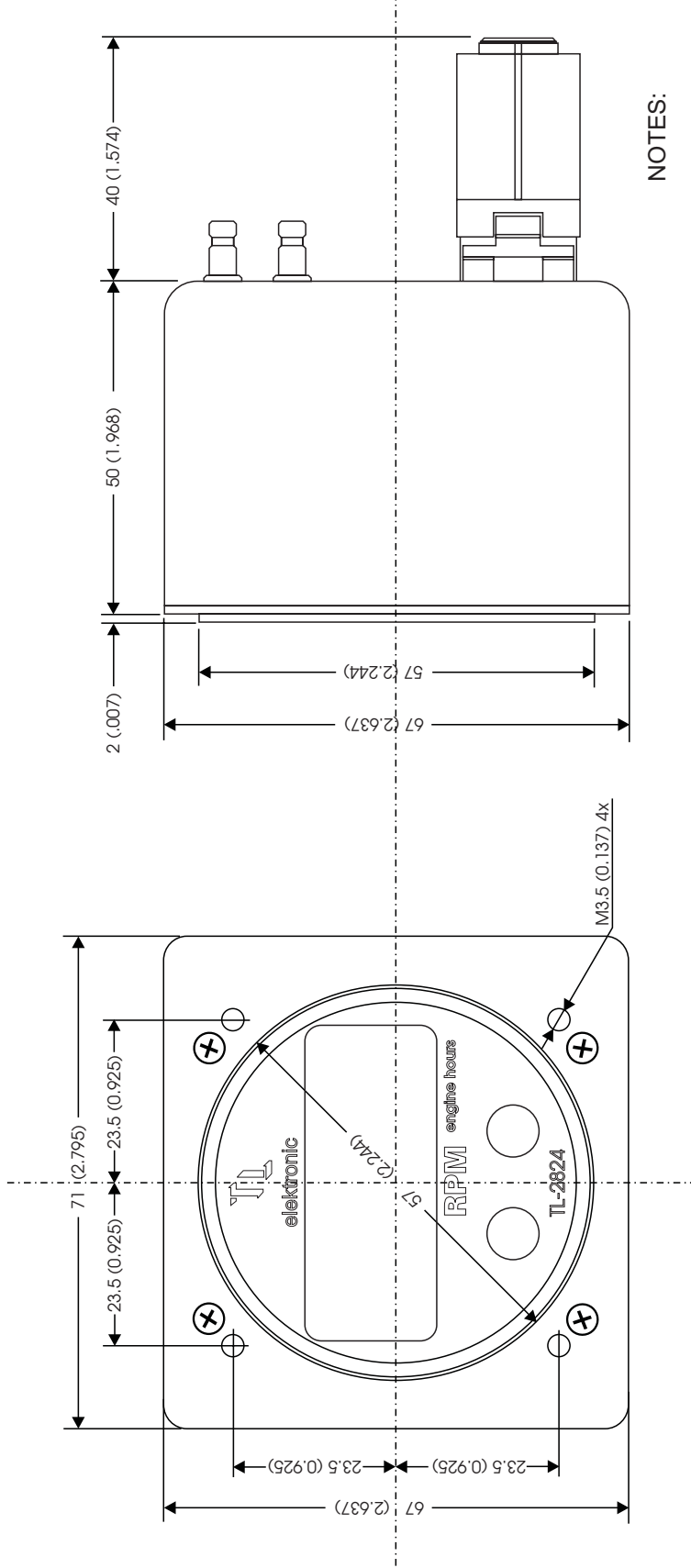
NOTES:

1. Dimension: mm (INCH)
2. Unit weight: 0.3 kg (0.66 lbs)
3. Mounting Rack & Hardware
   weight: 0.05 kg (0.11 lbs)

Figure 2. Rack Dimension

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3.1 PIN FUNCTION LIST

Pin	Pin Name	I/O
1	RPM High voltage input	In
2	RPM Positive voltage input	In
3	Starter lock signal	Out
4	Ground for starter lock signal	- -
5	RPM Low voltage input	In
6	Ground for RPM sensor	- -
7	Aircraft power	In
8	Aircraft ground	- -
9	Signal from magneto switch No.1	In
10	Ground for magneto switches	- -
11	Input for backlight	In
12	Internal source for backlight	Out
13	Signal from magneto switch No.2	In
14	Ground for active inductive sensor	- -
15	Input for User button	In
16	Ground for User button input	- -
17	Power +12 Volts for active inductive sensor	Out
18	Output signal from active inductive sensor	In
19	iFamily® communication ISCL	I/O
20	iFamily® communication ISDA	I/O
21	Signalization unit	Out
22	Ground for PC communication (RS-232)	- -
23	RXD from PC (RS-232)	In
24	TXD to PC (RS-232)	Out

Accessories Interconnect with passive inductive sensor

Accessories Interconnect with passive inductive sensor

QUICK PROGRAMMED USER BUTTON

TO LOCKING RELAY FOR STARTER OR MAGNETOS
P/N: TL-2824-06

AIRCRAFT POWER

(Note. 1)

Sign. unit

FUSE
1A
FUSE
1A

Engine with coils
COIL 1
COIL 2

Engine with magnetos
MAG1
MAG2

D-SUB 9 pins (female)
for communication with a PC

Connect other
TL elektronic instruments
via the iFamily® Bus

(Note. 2)

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Pin	Signal
15	USER BUTTON
16	GROUND FOR USER BUTTON
21	SIGNALIZATION UNIT
7	10-32V AIRCRAFT POWER
8	AICRAFT GROUND
3	CONTROL AND MARKER BUTTON
4	GROUND FOR CONTROL BUTTON
9	IGNITION 1
13	IGNITION 2
2	*PICK-UP SENSOR* POSITIVE PULSE ONLY
1	HIGH AMPLITUDE
5	LOW AMLITUDE
6	GROUND FOR SENSOR
11	DISPLAY BACKLIGHT
12	DISPLAY BACKLIGHT
24	RS 232 TX
23	RS 232 RX
22	GROUND
19	IFAMILY® ISCL
20	IFAMILY® ISDA

TL-2824
RPM&ENGINE HOURS

NOTES:

1. Signalization is connected to the aircraft ground when active.
2. Jumper for the backlight. For the backlight control install a resistor between the pins 11 and 12.
3. Use the shade cable only and connect it according to the connection scheme delivered with the sensor.

Figure 3. Accessories interconnect

Accessories Interconnect with active inductive sensor

QUICK PROGRAMMED
USER BUTTON

AIRCRAFT POWER

(Note. 1)

Sign.
unit

COIL 1
COIL 2

Engine with coils

FUSE
1A

FUSE
1A

TO LOCKING RELAY FOR
STARTER OR MAGNETOS
P/N: TL-2824-06

MAG2

MAG1

Engine with magnetos

NOTES:

1. Signalization is connected to the aircraft ground
   when active.
2. Jumper for the backlight. For the backlight control
   install a resistor between the pins 11 and 12.
3. Use the shade cable only and connect it according
   to the connection scheme delivered with the sensor.

(Note. 3)

SUPPLY +12V
OUTPUT
GROUND

(Note. 2)

D-SUB 9 pins (female)
for communication with a PC

Connect other
TL elektronic instruments
via the iFamily® Bus

ISCL
ISDA

Figure 4. Accessories interconnect
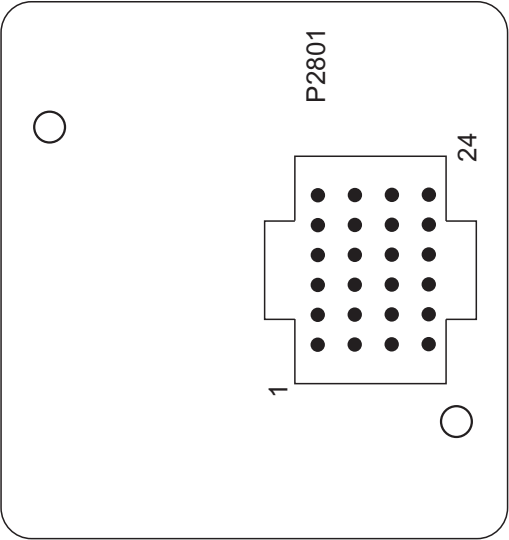
P2801		
USER BUTTON	15	
GROUND FOR USER BUTTON	16	
SIGNALIZATION UNIT	21	
10-32V AIRCRAFT POWER	7	
AICRAFT GROUND	8	
CONTROL AND MARKER BUTTON	3	
GROUND FOR CONTROL BUTTON	4	
IGNITION 1	9	
IGNITION 2	13	
PICK-UP SENSOR		
POWER FOR SENSOR	17	
OUTPUT SIGNAL FROM SENSOR	18	
GROUND FOR SENSOR	14	
DISPLAY BACKLIGHT	11	
DISPLAY BACKLIGHT	12	
RS 232 TX	24	
RS 232 RX	23	
GROUND	22	
IFAMILY® ISCL	19	
IFAMILY® ISDA	20	

TL-2824
RPM&ENGINE HOURS
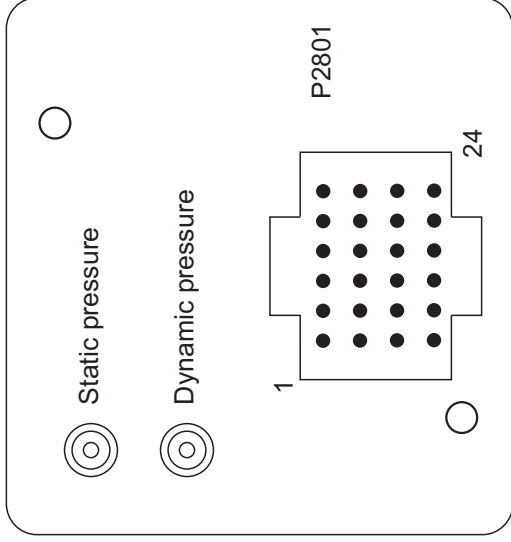
Rear view of connector plate

P2801

1

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NOTES:

1. Secure the incoming leads to prevent their effect on the connector in the vertical direction.

Figure 5. Connectors locate

Rear view of connector plate and pressure fitting - version SAS with Air Pressure Sensor

Static pressure

Dynamic pressure

P2801

1

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NOTES:

1. Secure the incoming leads to prevent their effect on the connector in the vertical direction.
2. Secure all leads of the static or the complete (pitot) pressure. Any leakage or untightness could cause incorrect indications of other instruments.

Figure 6. Connectors locate

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4. NAV-MENU DESCRIPTION

4.1 How to Control Instrument via NAV-MENU

There are black labels on the display. Each is affiliated to the left and the right button. Before pressing a button, read the information on the label. Its functions are different in every menu.
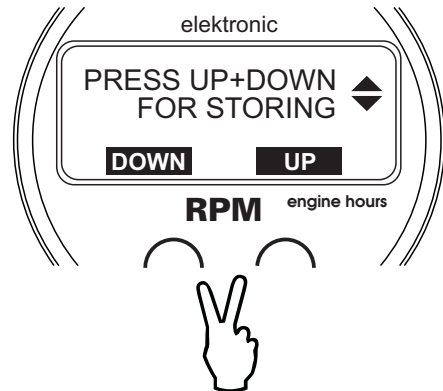
The left label is for the Left button.   The right label is for the Right button.
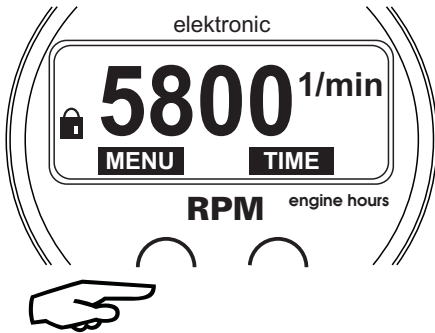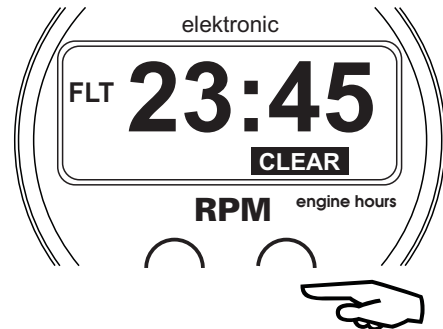
To store a value into the memory, press both buttons simultaneously. Release the buttons when the setting arrows vanish.

5 INSTRUMENT SETUP

5.1 First Instrument Turn-on
Before the RPM Meter starts to indicate, you must do the basic setting of language, contrast, units, etc. After the first turn-on of the instrument, the „FIRST SETUP" message will show on the display. This set-up must be completed to continue.
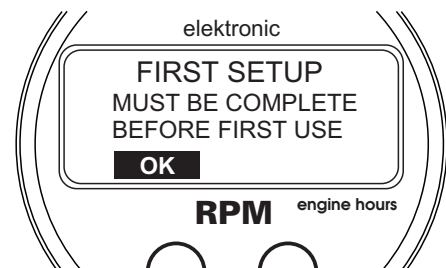
5.2 Main Setup Functions' Description

The table of the instrument configuration steps is shown below (Initial - firmware version 1.0).

| 0	LANGUAGE	Select your language for communication with the instrument.
1	DISPLAY CONTRAST	Select the contrast of the display.
2	PASSWORD	Select your password.
3	PULSE PER REV	Select pulse per revolution.
4	REDUCTION RATIO	Select the ratio between the place where rotation is measured and the rotation speed of the engine.
5	MINIMUM RPM	Select the minimum rotation speed for the engine hours and alert activation.
6	DISP. RESOLUTION	Select the resolution of rotation speed that will show on the display.
7	AIR SPEED UNIT	Select your local unit for air speed (only the SAS version).
8	ACTIVATED SPEED	Set the air speed that activates the flight time (only the SAS version; and note that the instrument hysteresis is +/- 3 km/h when the function Speed is used). That means that when 100 km/h has been set, the instrument will start increasing the flight time at 103 km/h and stop at 97 km/h
9	FL. TIME ACT. MODE	Select the mode of the flight time activation. **AIR SPEED ONLY** = the flight time is activated always after reaching the set air speed (only the SAS version), and deactivated when the air speed is lower than the set one. **AIR SPEED OR RPM** = the flight time is activated always after reaching the set air speed (only the SAS version) or after reaching the minimum rotation speed for the engine hours activation, and deactivated when the air speed is lower than the set one and, at the same time, the engine rotation speed is lower than the set minimum rotation speed for the engine hours activation.
10	LOCKING FUNCTION	Activates or deactivates the output for locking the starter or magnetos. **ON** = enable, **OFF** = disable.
11	IGNITION POLARITY	Set the polarity for detecting the turn-off of the magnetos.
12	USER EDIT	Entry into the set-up menu for editing users / instructors.
13	LEARNER EDIT	Entry into the set-up menu for editing students.
14	ALARM SETUP	Select the alarm limit for the max. and min. rotation speed.
15	WARNING SETUP	Select the warning limit for the max. and min. rotation speed.
16	DELETE ALL TOTALS	Delete all the measured values (engine hours, max. speed etc.).
17	USER BUTTON	Program your button for these functions: **SHOW MIN / MAX** = shows the minimum and maximum rotation speed when the button is pressed, **SHOW ENGINE HOURS** = shows the total engine hours when the button is pressed.
18	VOICE WARNING	Enable or disable voice warning into your headphones (only with use of our Intercom TL-2424 or Voice Module).
19	INST. ON-LINE	Check the connected instruments from the TL elektronic iFamily® that are On-Line.

⚠ **All information on this page is subject to change without prior notice. Download the latest version of the manual from www.tl-elektronic.com and compare it with your version of the firmware.**

5.3 How to Set Number of Pulses per Rotation

Set in this menu, how many pulses should correspond with one engine rotation. If the sensor is placed elsewhere than on some of the rotating parts of the engine (e.g. rotations are scanned from the propeller), set the number of pulses per a rotation at 1.
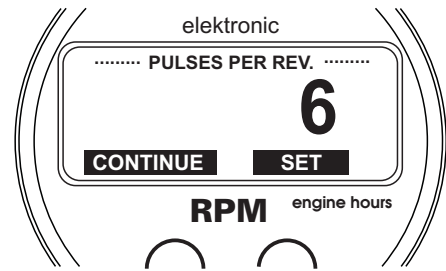
5.4 How to Set Ratio

If the rotation sensor is placed elsewhere than on some of the rotating parts of the engine (e.g. on the propeller), find out the rotation ratio between the engine and the place of measuring rotation and, after that, set the ratio in this menu.
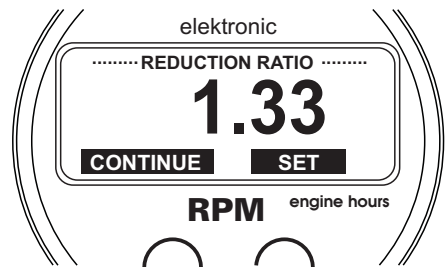
5.5 How to Set Minimum Rotation Speed for Engine Hours Activation

In this menu, it is possible to set the minimum rotation speed for the activation of engine hours and other functions.
If the instant rotation speed exceeds the rotation speed you have set, engine hours' measuring will be activated.
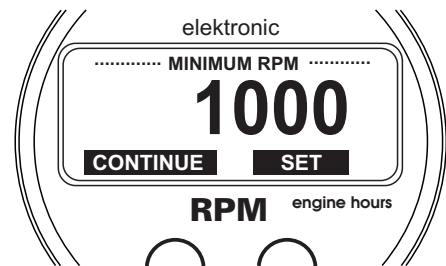
5.6 Displaying in Units and Tens

Select displaying the rotation speed either in units or in tens of RPM. It means that instead of the last figure 0 will always be displayed, in order to prevent disturbing the pilot's attention.
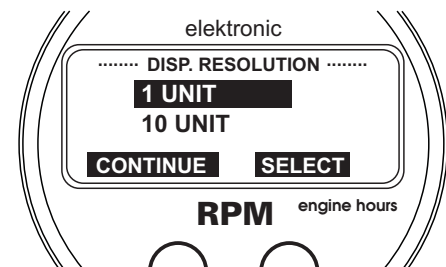
5.7 How to Set Speed for Flight Time Activation

If you have the version TL-2824_SAS, then you can set in this menu also the air speed, at which the flight time measuring will be activated. In this case, you will get the information about both the engine time and the flight time.
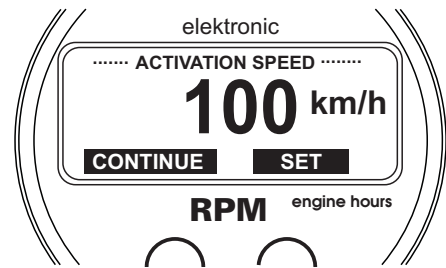
5.8 How to Select Mode of Flight Time Activation

TL-2824_SAS offers you two modes of the flight time activation. The first one is the flight time activation according to the set air speed or from the moment when the engine reaches the air speed as described above in the point 5.7.
As an example, two alternatives are presented: In case of the activation according to the airspeed, the flight time measuring will be activated at the moment when the air speed exceeds the air speed you have set and deactivated when the air speed is lower than the air speed you have set. In this case, the measured flight time value will not include taking-off, landing and rolling.
The second mode is the flight time activation after reaching the rotation speed you have set for the engine hours activation. Measuring the flight time is deactivated when the aircraft is not flying any longer, i.e. the air speed is lower than the air speed you have set, and also the rotation speed is lower than the rotation speed you have set in the point 5.5.
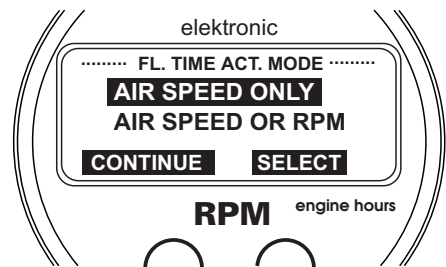
5.9 How to Activate Starter Locking

RPM Meter offers you the possibility of locking the starter by a code. In this way, you can prevent an unauthorized use of your aircraft; the engine can be started only after entering the correct code. If you want to use the function of starter locking, select „ON".
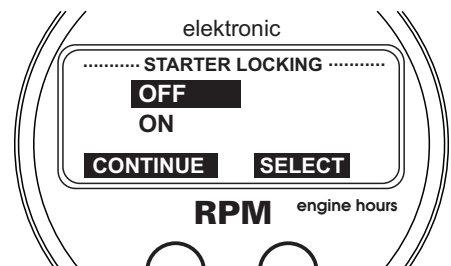
5.10 How to Set Minimum Rotation Speed Monitoring

RPM Meter offers you the possibility of monitoring the minimum air speed and recording it into the memory of the minimum rotation speed. Select in this menu, whether the outputs are connected with the power supply, the aircraft ground, or not. If you select one of the options, except „NONE", the instrument will record the minimum rotation speed until the magnetos are turned off. This measurement is suitable for detecting the RPM drop (e.g. when one ignition is turned off or in gyroplanes), monitoring the rotor speed etc.
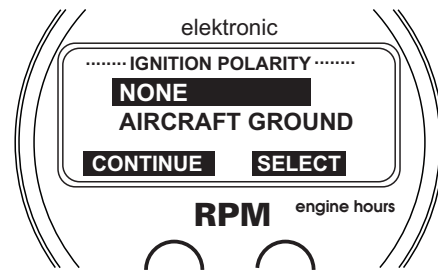
5.11 How to Edit Users and Students

The RPM Meter offers you the function of setting the number of users and students. This setting is suitable especially for air schools as it enables you to set e.g. the number of instructors, students, their names, etc.
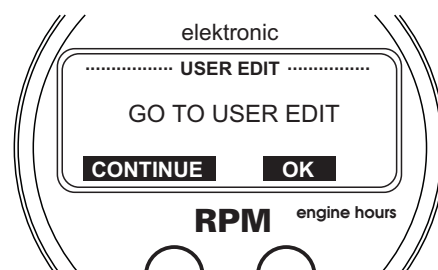
5.12 How to Set Number of Users and Students

In this menu, set the number of users/instructors who are going to use the aircraft. Having edited this number, you can, in the same way, set the number of students on the set-up line "GO TO STUDENT EDIT".
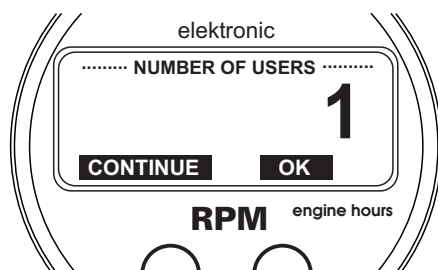
## 5.13 How to Set Password for Users

In this menu, you can allocate each user/instructor a password. The user/instructor enters his/her password before the flight and, in this way, unlocks the RPM Meter, which consequently measures the flight time of the particular users/instructors and students.
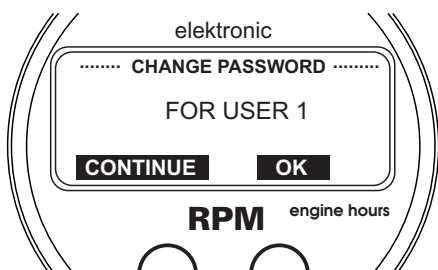
5.14 Warning and Alarm

The maximum and minimum limit values can be set at two levels in the Set-up menu. The „Warning" message informs about the first level exceeding. The „Alarm" message informs about exceeding the second limit and activates recording into the SchecK® drawer. You can download all exceeded values form the instrument and analyze them on your PC.
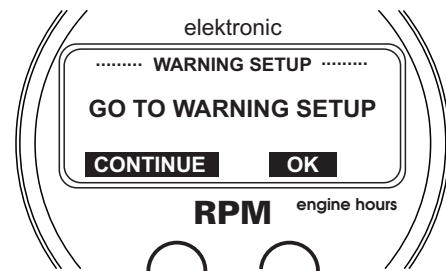
5.15 How to Set Warning and Alarm Limits

As soon as the set-up table is displayed, press the button „SET"; then you will be able to set the required limit on the inversely displayed position.

In RPM, it is also possible to set the minimum as well as the maximum RPM for signalization. If you set 0.0 RPM, „OFF" will show on the particular position of the display and the value will not be checked.
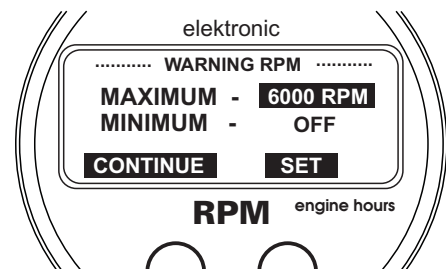
5.16 User Button

When pressed, the external User button offers you the possibility of programming to quick show or quick switch to the selected menu. After releasing the button, you will get back to the measured value indication.
For example - if you have set SHOW ENGINE HOURS, after pressing the button you can monitor the total engine hours.
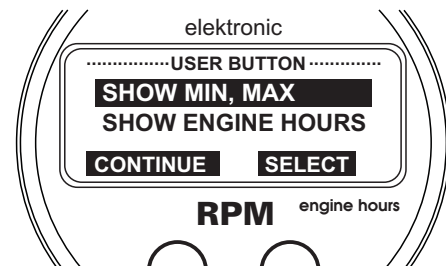
5.17 iFamily® and Other Connecting Devices

As the first of aircraft instruments, the TL-2824 enables you the connection with other instruments of the TL elektronic family in order to gain simultaneous recording of the measured values, the mass PC download of all connected instruments etc. via one cable.
If some other instruments or the GPS are connected to the reserved inputs, this menu shows each connected instrument. It also enables checking the connected instruments and devices.
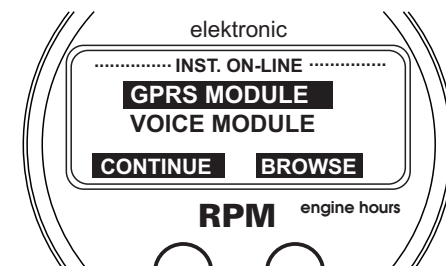
6. OPERATIONAL MANUAL

6.1. Left Menu Description

The left main menu shows the information about the total engine hours and flight time, the maximum and minimum rotation speed etc. according to the table below.
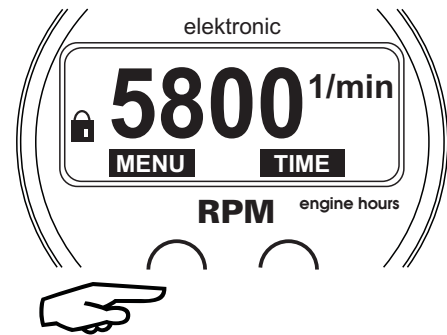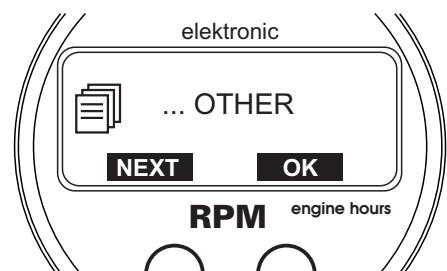
Left Menu (Initial firmware version 1.0)

First	Second	Description
LOCK		Locking and unlocking starter lock or ignition (magnetos)
TOT		Total engine hours
FLY		Total flight time (only in SAS version)
LEARNER		Selection of student, whose flight time will be measured
	MIN	Long-term memory of the minimum rotation speed
	MAX	Long-term memory of the maximum rotation speed
	DELETE	Delete the long-term memory of the min. and max. speed rotation
	EXIT	Exit from the second menu

⚠ **All information on this page is subject to change without prior notice. Download the latest version of the manual from www.tl-elektronic.com and compare it with your version of firmware.**
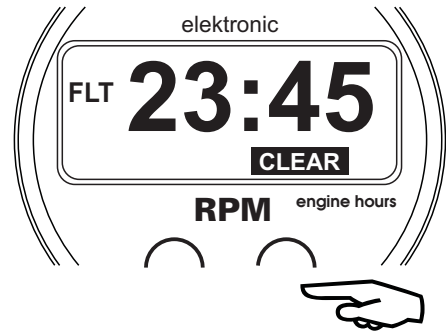
6.1.1 Second Menu

The „OTHER" dialog will show on the display after pressing the left button. If you press „YES" in this dialog, the instrument will go to the second menu where you can get the information about the total engine hours etc.

6.2 Right Menu Description

The right menu shows the information about the flight time according to the table below.

Right menu (Initial firmware version 1.0)

First	Second	Description
FL. TIME		Show short-time
CLEAR		Clear short-time

⚠ **All information on this page is subject to change without prior notice. Download the latest version of the manual from www.tl-elektronic.com and compare it with your version of firmware.**

6.2.1 Exit from Right Menu

Exit from the right menu is done automatically after a few seconds if there is no button being pressed.
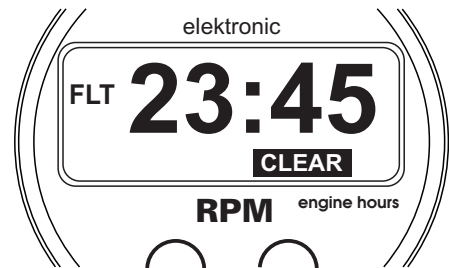
6.3 How to Change Configuration

If you want to change e.g. units or contrast, press and hold both buttons and turn the instrument on. The „Setup" message will show on the display. Press „OK" and go to the Instrument Setup.
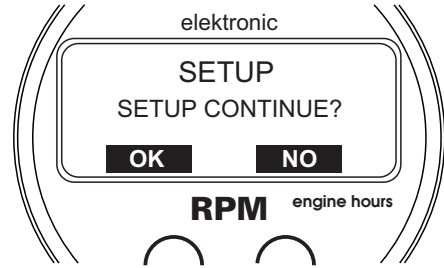
⚠ **Note, that any unauthorized change of values in the Setup can cause defect of the instrument. An incorrect change of the calibration could endanger your life and the lives of your passengers.**

6.4 How to Log in User and Unlock Starter or Magnetos

If there are more than one user set in the Set-up menu or if you use the function of locking the starter or magnetos, press the button „MENU" for so many times until you get into this menu. After pressing the button „OK", the menu for entering the code will show (see point 6.5).
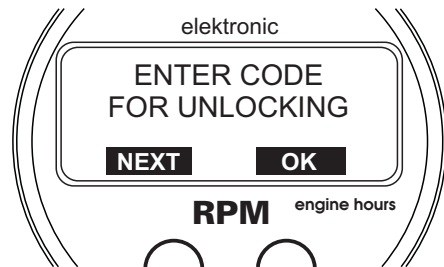
6.5 Entering Code for User's Logging in and Unlocking Starter or Magnetos

The code is entered with help of the button „UP", by which you enter the figure in the particular position.
In case of skipping by mistake the figure you are trying to enter, press the button „UP" for so many times until the required figure shows again. To shift to the next position, press the button „NEXT".
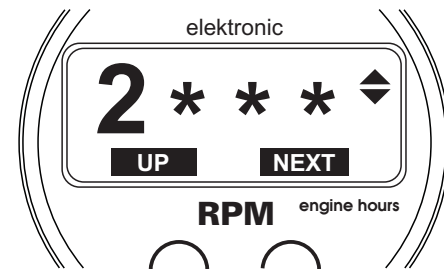
6.6 Current User and Re-locking Starter or Magnetos

After entering the correct code and also after pressing the button „MENU" repeatedly, this menu will show the current user, whose time (and in the SAS version also the flight time) is to be measured.
In this menu, it is also possible to log out and lock the starter or the magnetos if you use this function.

```
elektronic
UNLOCKED BY
USER 1
NEXT        LOCK
RPM    engine hours
```
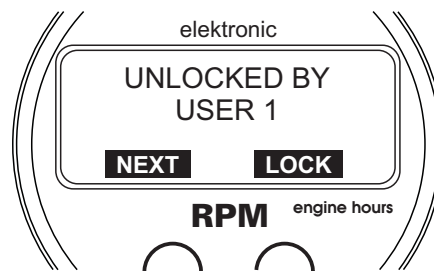
6.7 Delete Long-term Memory of Rotation Speed

The long-term memory of the minimum and maximum rotation speed reached can be deleted in this menu.

```
elektronic
?  DELETE MAX
VALUES?
NEXT    DELETE
RPM    engine hours
```
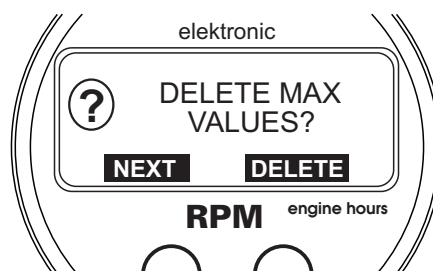
6.8 Measuring Rotation Speed out of Range

When the measured rotation speed of the sensor is out of range, the [----] message will show on the display.

```
elektronic
- - -  1/min
MENU      TIME
RPM    engine hours
```
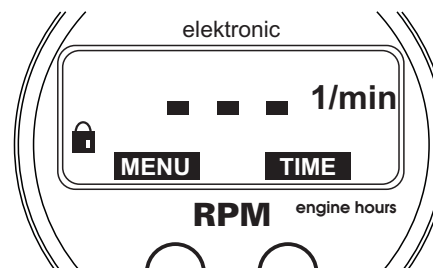
7.1 SchecK® Memory Description

The TL-2824 includes a 10,000 lines long-term memory and SchecK memory for storing measured values in the 0.1 to 60 second sample rate. You can download the measured data via standard PC serial cable RS-232 into Laptop or Personal Computer.

Each case (1 to 20) includes 60 lines memory space with 0.1 to 60 seconds samples rate of measured values

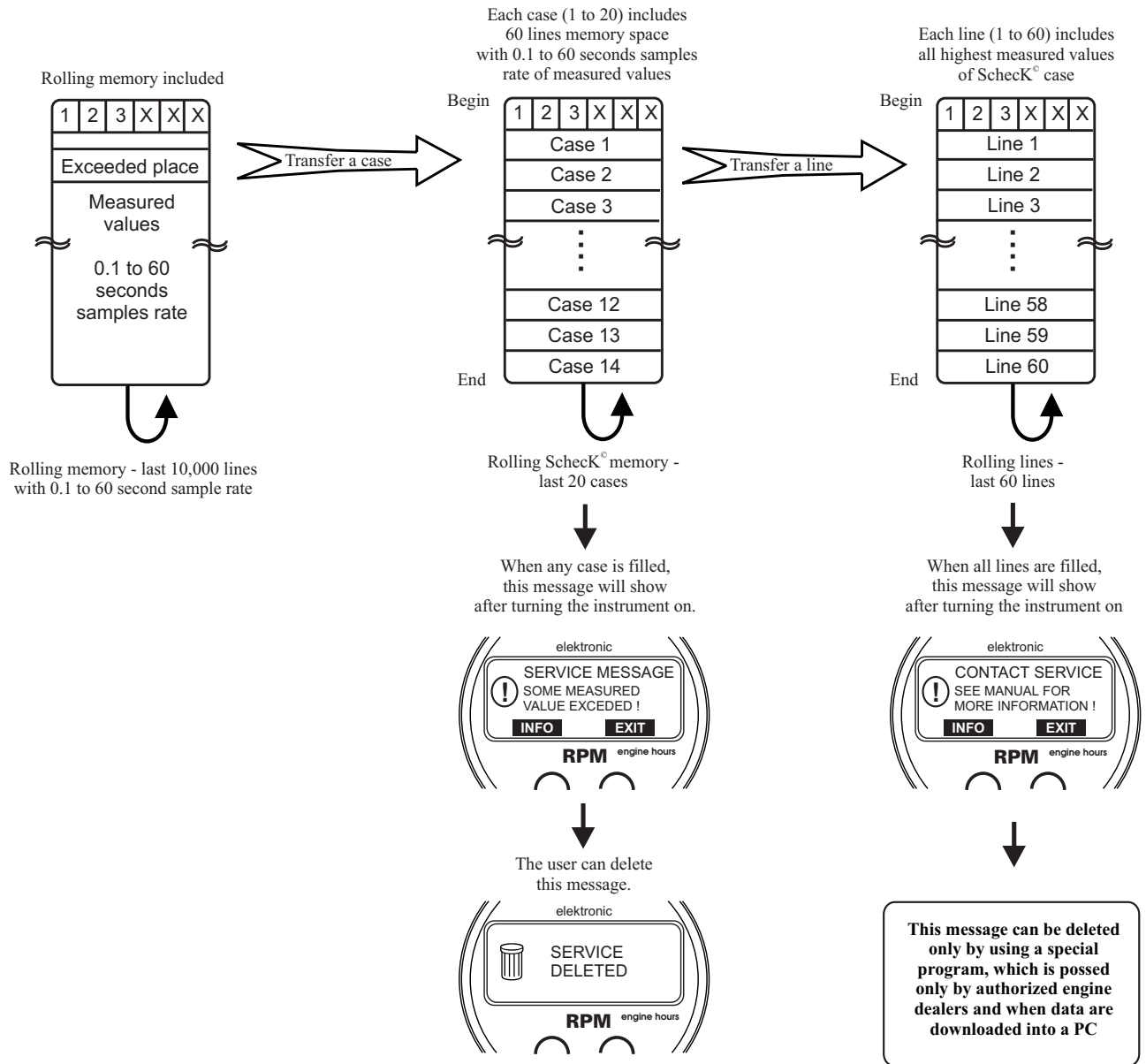Each line (1 to 60) includes all highest measured values of SchecK© case

Rolling memory included

1	2	3	X	X	X

Exceeded place

Measured values

0.1 to 60 seconds samples rate

Transfer a case

Begin

1	2	3	X	X	X

Case 1
Case 2
Case 3

Case 12
Case 13
Case 14

End

Transfer a line

Begin

1	2	3	X	X	X

Line 1
Line 2
Line 3

Line 58
Line 59
Line 60

End

Rolling memory - last 10,000 lines with 0.1 to 60 second sample rate

Rolling SchecK© memory - last 20 cases

Rolling lines - last 60 lines

When any case is filled, this message will show after turning the instrument on.

When all lines are filled, this message will show after turning the instrument on

elektronic

SERVICE MESSAGE
SOME MEASURED VALUE EXCEDED !

INFO   EXIT

RPM   engine hours

elektronic

CONTACT SERVICE
SEE MANUAL FOR MORE INFORMATION !

INFO   EXIT

RPM   engine hours

The user can delete this message.

elektronic

🗑 SERVICE DELETED

RPM   engine hours

This message can be deleted only by using a special program, which is possed only by authorized engine dealers and when data are downloaded into a PC

Cases 1 to 20 include the record of limit-exceeding values and engine hours, date and time referring to the moment of limit exceeding. Each case includes 60 lines.

30 lines before limit exceeding

≈

30 lines after limit exceeding

Limit exceeding values (centered in the middle position)
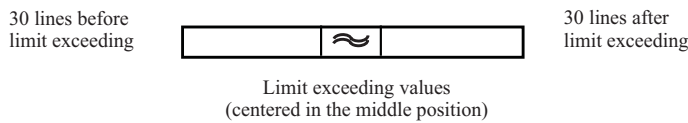
In this version it is possible to read the last 20 exceeded records at total operational time.

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