PRO-OILER

Operating Instructions v2.09 r7.2

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Quick Start - the basics

If you read nothing else, please just read the advice below!

It ***will*** make a difference to how your ***PRO-OILER*** performs...

- Select the ***table*** and ***setting*** that gives you ***stable lubrication*** in normal road conditions. This is where the chain always looks the same - it doesn't get wetter or drier as you ride.
- Aim to run on setting **3** in Calibration mode (= **S1** in Standard mode) - this way you keep maximum flexibilty to change your settings on the move.
- Running too rich (wet) does no harm, but just creates more fling off. Choose a "leaner" table.
- Running too lean (dry) ***damages the chain***. Choose a "richer" table, and run **Prime** to get the chain quickly to a properly lubricated condition.
- Tactics when you are on the move:
  - Your normal setting is ok, but you are currently on a dirty stretch of road. The chain will pick up dust and start to dry out. Run **Prime** a few times to get the chain back to normal.
  - The road is wet. Look at the water being thrown up by the tyres of the vehicle in front. This tells you how much your chain is being ***washed***
    - Don't hesitate to turn your delivery right up to **12** (= **S5**) if there is a lot of standing water. This is approx. ***6x*** the delivery, but it can prove necessary
    - If the road is wet, but not swimming, try **9** (= **S4**) - approx ***2x*** the delivery
- ***Play safe***, it's better to over-lubricate than to run dry
  - Start out with a ***richer table*** than you would think necessary, and then lean off steadily until you find the right table for you.
- As you gain experience with your ***PRO-OILER*** you will get a feel for how and when to change your settings to match the road conditions.
- On a typical dry conditions setting, you will be doing more than 6km per pump pulse. ***Small changes*** in your settings will not produce an immediately visible result - so give it a while (at least 50km) before coming to any conclusions
- On setting **12** (= **S5**) on a dry road, from completely dry chain to completely soaked is max. 25km. The chain should be ok at around 15km.
- Keep the plastified sheet with the tables and basic instructions under your saddle!

If any of these points or ideas are not clear, please read on for more detail.

Stable lubrication

Stable lubrication means the chain gets neither wetter nor drier - but will always look the same so long as the road conditions remain unchanged.

This is the Holy Grail of chain lubrication.

Under normal circumstances you want to select the table that gives you ***stable lubrication*** on setting **3** in Calibration mode (= **S1**in Standard mode)

When the chain runs ***too wet***, then the excess oil just flings off.
There is no ***benefit*** in running too rich, though of course it won't do any harm - other than creating more fling off.
If your chain is ***continuously*** running too wet on setting **3** or **S1**, you should select a ***"leaner" table*** - (See ***Tables and settings*** below)

When the chain runs ***too dry***, serious ***damage*** is being done to the chain - this must be fixed ***urgently!***

If your chain is continuously running too dry on setting **3** or **S1**, you should select a ***"richer" table*** (See ***Tables and settings*** below)

The reason it's best to change the ***table*** if you are running ***continuously*** too wet or too dry is this:

You leave yourself no room to compensate with more or less oil for **temporary** *changes in the chain's condition.*

How to find the best setting for your bike

When you first run with the ***PRO-OILER*** fitted:

- Select the setting recommended as starting point for your bike (see the fitting chart) - or if your bike is not listed, calculate it with the formula provided
- This will already get you close to a good setting, though it will be conservative - on the rich side.

The rule is ***play safe***
Run ***richer*** to start with and lean off ***steadily*** until you hit the sweet spot.

However, it's a common mistake to not find out where the leanest setting really is - the result is you may be running permanently richer than you need to.

So, when setting up the PRO-OILER for your own circumstances and preferences, ***don't be afraid to lean off the delivery***.
- When the chain dries out, it will do so ***quickly*** - within 50km you will already see this happening.
- So, when you see the chain is getting too dry, you will know you have already ***passed*** the leanest usable setting.

When doing this excercise, you should stop and check the chain ***frequently*** - say every 25 km.
Don't just jump on the bike and ride 250km non-stop - not only will you not be able to draw any conclusions, but you will also be harming your chain if it's too dry!

The ***PRO-OILER*** is so precise that you can detect differences in delivery down to 2-3%

It's important to remember that when you are ***close*** to your ideal setting, small differences in delivery may not be ***immediately*** visible - it may take a few hundered kms before you can be sure you have the right setting.

- For example, you are on setting **3** and you feel the chain is slightly dry, so you go to setting **4** (3.3% richer).
- Run for say 200km and check the chain again
- Why? Because the change is so small it will take a while to ***stabilize*** at the new level.

You will find that when you have the right setting, even ***one setting leaner*** will dry out the chain.
In other words:

The dividing line between lean but sufficient lubrication and a dry chain is very narrow

Once you have got to this point, consider going one setting richer as your everyday setting - ***play safe***

Tactics in daily use

The ***PRO-OILER*** is pretty much fit-and-forget, but you get the best results if you put a little thought into how you respond to changing road conditions

Example 1.
It just rained, you turned up the delivery... and now the roads are dry again - but you forgot to turn down the delivery back to **3** or **S1** (it happens!)
The chain is now too wet. This is just a ***temporary*** situation, so you could reduce the delivery to **1** or **2** for a while.

- Why not simply turn it ***off*** (**--**)? You ***could*** turn it off, but the risk is you may not "time" your return to normal setting **3** correctly, and you could run dry. This is as likely to happen as forgetting to turn the delivery back down after the rain!
- At least on setting **1** or **2**, the chain's condition will stabilize steadily.

Example 2.
You see the roads are getting dusty or dirty and the dirt is sticking to the chain, drying it out. Now you have a choice
- You could turn up the delivery a bit to **4** or **5** (= **S2** or **S3**) and see if this does the job.
- But if this is going to go on for a while (let's say it's a seasonal problem), then you could move to a ***richer table***, and go back to setting **3**.

Example 3.
You just drove along an unmade dusty road, and the dust has stuck to the chain, drying it out. Now you have a choice
- The obvious one is to run **Prime** a few times, and leave the settings as they are
- But, you could turn up the delivery to max for a short while - or both (don't forget to turn the delivery back down!)

Example 4.
You've just washed the bike with a power hose, (of course you wouldn't clean the chain like that, would you?) so you want to give the chain a quick shot. Run **Prime** a couple of times while on the move.

Modes

The ***PRO-OILER*** has 3 "Modes" - ***Calibration***, ***Standard*** and ***Emergency***.

1. ***Calibration Mode*** is the "normal" mode for those wanting ***full*** control over their settings (12 settings - **1**..**12**) [See ***Calibration + Standard Mode Tables***].
2. ***Standard Mode*** is limited to 5 settings (**S1**..**S5**) which are a ***subset*** of Calibration Mode settings.
   Standard mode **S1** is the same as **3** in Calibration mode
   S2 = **4**, **S3** = **5**, **S4** = **9**, **S5** = **12**

In Calibration and Standard modes you select your setting based on the ***distance traveled*** between pump strokes. These are the normal modes.

Q. Why have the two modes?
A. Standard mode has just 5 settings and is a bit easier to operate - but you have less fine control over your settings - the choice is yours!

3. ***Emergency Mode*** is used in case of no signal from reed switch (lost magnet, disconnected reed switch or speedo sensor). The pump then pulses at the selected ***time interval***. This allows lubrication even when there is no signal. You can switch to this mode when on a trip and you lose the signal. Emergency mode has 19 settings from **E1**..**E9**, **1E**..**9E**, **EE**

In Emergency mode you select your setting based on the ***time interval*** between pump strokes.

To change between modes
- Press and hold **[-]** for >5s to toggle change to the next mode.
  The system ***cycles*** between the 3 modes: Standard > Calibration > Emergency > Standard...
- You can also ***toggle*** between Calibration or Standard Mode and Emergency Mode - press both buttons together.

Tables and settings

The ***PRO-OILER*** has 15 "tables".
Each table has 12 settings in Calibration Mode and 5 in Standard Mode

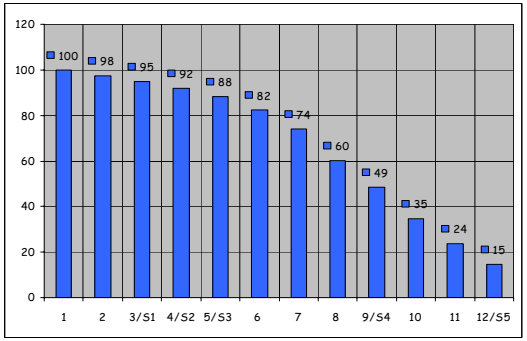
We use ***tables*** to keep the number of settings to a manageable level - rather than having hundreds of individual settings.

- Each type of bike has a
  - different chain size, eg. 530, 525, 520
  - different length of chain, eg. 106, 110, 112 links
  - different wheel circumference, eg 198cm for a 180/55-17 or 187cm for a 130/80-17

  The chain size/length has a major impact on ***how much oil*** the chain requires, and there is a good ***base setting*** for each type of bike

- Each table has a ***fixed relationship*** between the 12 settings (see chart below)

  Each table has a ***seed value*** - that's the number of ***wheel revolutions per pump stroke*** on setting **1**
  For example: the seed value for table **9** is **3039** wheel revolutions.



*Each table has the same **shape**: the diagramme shows the % of the seed value distance per setting.*

Once you have the right table for your bike, then you can just select the settings within your table to adjust for your everyday needs (weather, dust etc)

*In other words, getting to your best table is a **one-time excercise**.*

Calibration and Standard mode Tables v4.0

Example - setting **11:3** or **11:S1**
= Table **11**, setting **3** (=S1 in Standard mode)
= **3158** revolutions per pump stroke
= approx **6.2**km for a typical big-bike rear wheel

Tables

"Seed" values

Table Setting	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Calib Mode	Std Mode	% per Step
1	2648	2772	2903	3039	3182	3332	3488	3652	3824	4003	4204	4414	4635	4866	5110	100		
2	2583	2705	2832	2965	3104	3250	3403	3563	3731	3906	4101	4306	4521	4748	4985	98		2.5
3 S1	**2510**	**2628**	**2751**	**2881**	**3016**	**3158**	**3306**	**3462**	**3624**	**3795**	**3985**	**4184**	**4393**	**4613**	**4843**	95	**100**	2.9
4 S2	**2429**	**2544**	**2663**	**2788**	**2919**	**3057**	**3200**	**3351**	**3508**	**3673**	**3857**	**4049**	**4252**	**4464**	**4688**	92	**97**	3.3
5 S3	**2333**	**2443**	**2557**	**2678**	**2804**	**2935**	**3073**	**3218**	**3369**	**3527**	**3704**	**3889**	**4083**	**4287**	**4502**	88	**93**	4.1
6	2183	2286	2393	2506	2623	2747	2876	3011	3153	3301	3466	3639	3821	4012	4213	82		6.9
7	1965	2058	2155	2256	2362	2473	2589	2711	2838	2972	3120	3276	3440	3612	3792	74		11.1
8	1595	1670	1748	1830	1916	2006	2101	2199	2303	2411	2532	2658	2791	2931	3077	60		23.2
9 S4	**1286**	**1347**	**1410**	**1476**	**1546**	**1618**	**1694**	**1774**	**1857**	**1944**	**2042**	**2144**	**2251**	**2364**	**2482**	49	**51**	24.0
10	918	961	1006	1054	1103	1155	1209	1266	1326	1388	1457	1530	1607	1687	1771	35		40.1
11	624	653	684	716	749	785	821	860	901	943	990	1039	1091	1146	1203	24		47.2
12 S5	**390**	**408**	**427**	**447**	**468**	**490**	**513**	**537**	**563**	**589**	**619**	**649**	**682**	**716**	**752**	15	**16**	60.1
Delivery %	*100.0*	*95.5*	*91.2*	*87.1*	*83.2*	*79.5*	*75.9*	*72.5*	*69.3*	*66.1*	*63.0*	*60.0*	*57.1*	*54.4*	*51.8*			

Settings showing Standard mode S1..S5 and the equivalent Calibration mode settings

% oil delivery compared to table 1

Shows % of distance per pump stoke, with setting 1 as 100%, and setting 12 as 15% (so, nearly 7× as much)

% increment between settings

How to get to your base settings

You can get close to the base setting with the technique below.

However, please remember:
- The settings shown here are ***conservative = rich***. You may wish to lean off by 1 or even 2 tables when you've been running with the PRO-OILER for a little while.
- Aerodynamic turbulence plays an important role in deciding what setting your bike model needs. Where reliable information is available, PRO-OILER may recommend a different setting (usually leaner) for your model.

To do the base calculation, you need the following information:
- Chain size
- Chain length (number of links)
- Tyre size for the wheel with the speed sensor or reed switch
- And you'll need a pocket calculator...

As a point of reference, we'll take a typical big-bike setup (Blackbird, Bandit 1200, Thunderace etc)
- Chain size 530
- Chain length 110
- Tyre size 180/55-17

This is index 1.00

Step 1 Chain size:

- If you have a **530 - e**nter **1** in your calculator
- If you have a **525 - e**nter **1.4** in your calculator
- If you have a **520 - e**nter **1.65** in your calculator

Step 2 Chain length:

Take the result from *Step 1*

- Multiply by **110**
- Divide by your chain length

Step 3 Tyre circumference:

Take the result from *Step 2*

Multiply by **198**
Divide by the tyre size of the wheel where the reed switch is fitted

198 = 180/55-17
196 = 160/60-17
192 = 150/60-17
187 = 130/80-17
187 = 90/90-17
188 = 120/70-17
181 = 120/60-17

The formula to calculate the nominal tyre circumference in cm is:
((wheel dia x 2.54) + (tyre section/10 x tyre height% x 2)) x 3.142
Example: Size 180/55-17
((17 x 2.54) + (18.0 x 0.55 x 2)) x 3.142 = (43.18 + 19.8) x 3.142 = 198

Note: this gives the *nominal* circumference - in real life, factors such as tread wear, actual wheel width and even tyre manufacturer can lead to a few % difference either way. To know for sure, use the classic method of marking the tyre with chalk, move the bike so the wheel does one revolution, and measure the distance on the ground.

Step 4 Multiply the result of *Step 3* by **2800**

Now look at the tables and find the seed value (= Setting 1) with the value closest to your result. Select the table to the left (richer) - this is the one to use as your *starting* point.

Example:

Your bike has a 525 chain, 108 links and a 160/60-17 rear tyre

You would enter
1.4

x **110**
÷ **108**

x **198**
÷ **196**

x **2800**

= **4033**
= Table **15** (being the closest table with a seed value below of **4033**)

So, now select table **15** (See ***How to select a new table***)
Finally, select setting **3** (or **S1** if you want Standard mode)

Important: this is just a ***safe, conservative starting point***
You may well need select a leaner table.

See **FAQ** ***Finding the best setting for your bike*** for how to fine tune your selection

Emergency Mode

Emergency Mode works on ***time interval*** between pump strokes.

Emergency Mode is so-called because you would use this if you have a reed switch or magnet problem, and there's ***no signal***. Emergency mode allows you to continue lubrication - the clock is running as long as the *PRO-**OILER*** is powered **ON**.

v2.09 Setting	Seconds per drop	Delivery x compared E1
--	off	
E1	106	1.0
E2	97	1.1
E3	88	1.2
E4	80	1.3
E5	73	1.5
E6	66	1.6
E7	60	1.8
E8	54	2.0
E9	49	2.2
1E	44	2.4
2E	39	2.7
3E	35	3.0
4E	32	3.3
5E	29	3.7
6E	26	4.1
7E	22	4.8
8E	18	6.1
9E	11	9.3
EE	6	18.6

Note: this is calculated back from the pump's stroke. Actual times are approx 4.5x longer depending on nozzle cross-section...

These would be ok for dry road use, depending on speed - turn the delivery *down* at low speed and *up* for high speed

Warning
These settings are ***very*** rich. EE delivers >9ml/hr
For off-road use only!

Information and warning functions:

- The ***right-hand*** decimal point comes on when no signal has been received from the reed for 2s (normally when you come to a stop).
  - It should ***go out*** when you set off again after 5 wheel revolutions when in Calibration or Standard modes.
  - If it does not, this means ***there is no signal from the reed switch or speedo sensor***
- The ***left-hand*** decimal point only comes on when the pump pulses - it's a 2 second flash which you will not normally notice!

How to see your current settings

- Turn on the ignition, and the following info is displayed in sequence
  - **Pro-Oiler** message
  - Main version nr (eg **02**)
  - Sub version nr (eg **09**)
  - Currently selected Correction Factor - only the integer part (eg **00** or **17**)
  - Currently selected table (eg **09**)
  - Display ends up on current setting (eg **3.** or **S1.** - or **E6** if you are in Emergency mode)

Note: the Main + Sub version numbers are needed when contacting *PRO-**OILER*** with calibration or settings questions

How to activate Prime

- Press **[+]** for >2s
- The Prime cycle will run 20 pump pulses, which you see flashing up on the display.
  No need to ***hold*** the button down once Prime has started.
- To check that the pump is actually pumping, place a finger on the pump - you should feel a light tapping

See the FAQ for more information on ***Prime***

How to toggle the display on/off:

Press **[-]** for >2s to toggle the display on/off (**do** will be shown when display is on)
You may wish to set display off at night.
Note: the left and right hand decimal points come on whether the display is ***on or off***

How to change mode

- Press and hold **[-]** for >5s to change to the next mode.
- Release the button when you see the new mode's value appear.
  - if you release the button ***before*** 5s has passed, all that will happen is you have toggled the ***display*** on/off. Turn the dispay back on, and try again - this time holding the button down for >5s...

  The system cycles between 3 modes: **Standard > Calibration > Emergency > Standard**...
  You can also ***toggle*** between Calibration or Standard Mode and Emergency Mode - press both buttons together.

See ***Modes*** for more details

Programming the PRO-OILER

The ***PRO-OILER*** has a number of programming functions

There are 3 ways to press a button:
- Short press = up to 2 seconds (<2s)
- Long press = between 2 and 5 seconds (>2s)
- Very long press = more than 5 seconds (>5s)

Please bear in mind that the ***length*** of the button press is important when using and programming the ***PRO-OILER***!

See ***Summary of Programming Functions***

How to put the PRO-OILER into Programming Mode

To enter **Programming Mode**:
Turn off the ignition (or the lights, if you have taken the power-feed from the lights)
Press and hold **[+]** and **[-]** together, then turn on the power
oH is displayed

How to select a new table

- Turn off ignition
- Turn on ignition while holding both buttons down
  oH is displayed
- Press **[+]** to select **oC** and then hold **[-]** for >2s
  The currently selected table nr is displayed
- Find the table you want with **[+/-]**
- When done press **[+]** for >2s
  oC displayed again
- Press **[+]** repeatedly until **oA** is displayed
- Press and hold **[-]** for approx 6 secs total
  First **SA** is displayed (Saving)
  Then **St** in displayed (Save to EEPROM completed)
  When **oA** re-appears, switch off ignition - the changes are activated.

Note: to cancel the operation at any time before saving, just turn off the ignition

See ***Tables and settings*** for more details

How to check the speedometer or reed switch signal

Either:

- Put Pro-Oiler into **Programming mode** (hold both buttons down while turning on the power).
  oH is displayed
- Press **[+]** until you get to **ot**
- Press **[-]** for >2s to select Signal-counting/Test Mode.
  The display will count and display the number of reed switch signals until you exit Test Mode

Please see separate section **Configuring the Speedometer Signal**

or:

- Connect a multimeter to 1+2 in the junction box. When you turn the wheel, you will see/hear the signal as the speedo sensor generates a signal / the magnet closes the reed switch

How to configure the speedometer signal correction factor

Please refer to the separate section **Configuring the Speedometer Signal**

Summary of Programing Mode Functions