Adapting a Tri-Spark FireBox Pro to a Silk 700s Mk. 2

Overview

This article describes the customisations required to fit a Tri-Spark FireBox Pro (for a British Twin) to a Silk 700S engine number 700s/2/78. The fitting instructions supplied by Tri-Spark for a British Twin are very good and should be used in conjunction with this article:

https://tri-spark.neto.com.au/assets/files/FireBox%20British%20Twin%20V1.pdf

Background

The bike was fitted with a working Lumenition ignition V12 in what appeared to be good order. However, the bike had a tendency to kick-back and run backward on occasion. Also, the performance of the bike was lack-lustre. Whilst some adjustment may have improved the situation it requires removal of the oil pump to make timing adjustments. The Tri-Spark ignition is software programmable in-situ and offers a wider range of adjustment and improved performance in general. This is useful as during the lifetime of Silk production some machines require full advance at 0.2” BTDC and some 0.3” BTDC. It seems there is no easy way to determine the correct settings which are dependent on engine porting.

Customisation Detail

The physical fitment requires four customisations:

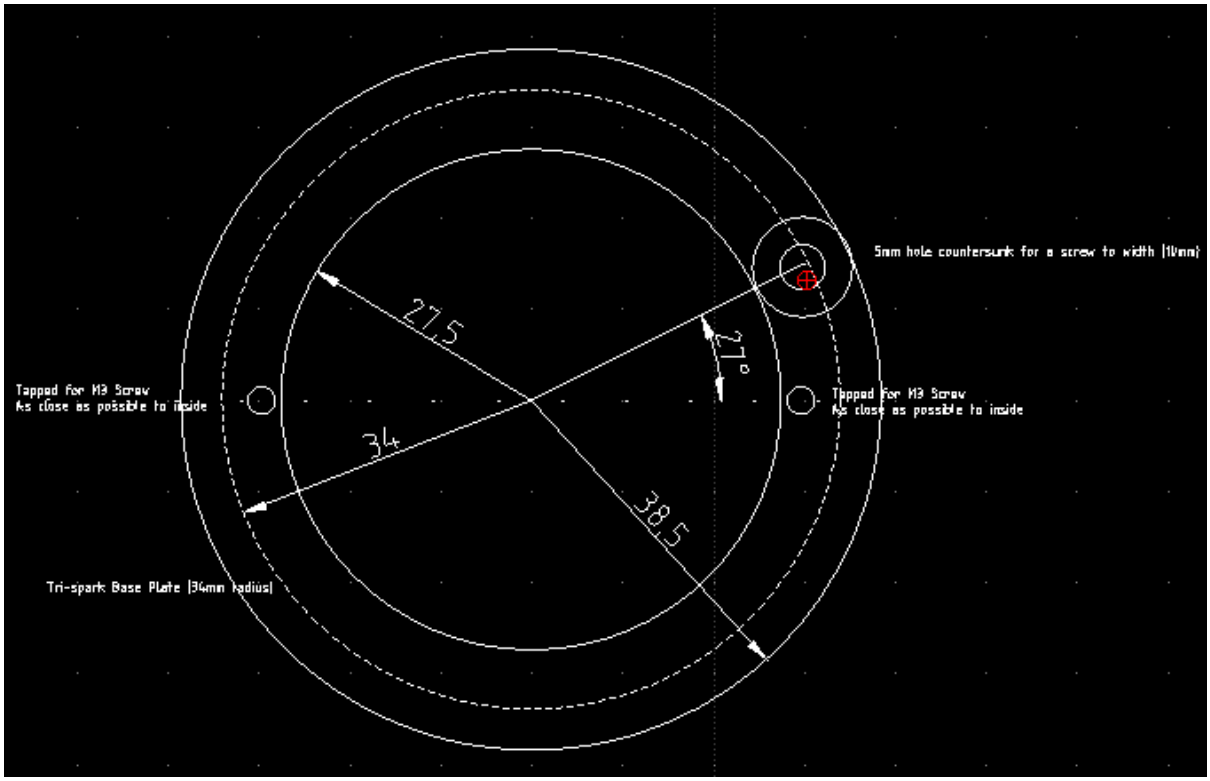
(1) Rotor

The Rotor supplied by Tri-Spark is shown below. The modifications involve:
(1.1) Boring a 13mm hole through the centre (supplied pre-drilled by Tri-Spark with pilot)
(1.2) Removing the material from the bottom of the assembly as close as practicable to the magnet. The final assembly is then approximately 13.75 mm in length.

As supplied by Tri-Spark	After Machining
	

(2) Sensor Plate Carrier

An annular sensor plate carrier needs to be fabricated that fastens to the engine using the existing counter-sunk screw that retained the aluminium mounting plate for the Lumenition sensor.



The annular carrier should be 15.5mm thick. The final assembly is shown here:

(3) Modify the existing Auto Advance Unit (AAU) back-plate
For the avoidance of doubt this is the part that needs modification:

Side View	Bottom View	Top View
		

There are two approaches when fitting the Tri-Spark unit:

(3.1) Remove the four posts on the AAU that are used as the pivots and spring retainers for the AAU bob-weights.
(3.2) Fabricate a complete new assembly (less the 4 mounting posts)

I chose to fabricate a new part so that I could re-install the Lumenition unit should it be required.

(4) Wiring Harness
The sensor assembly supplied by Tri-Spark includes a decent length of flying lead cable to connect to the drive electronics:

However, some additional wiring is required to complete the wiring to the coils (new Lucas style coils also supplied in the Tri-Spark Kit). Tri-Spark supply crimp connectors and cable.

Installation

The Tri-Spark sensor assembly fits comfortably in the cavity vacated by the Lumenition sensor. There is provision for static timing by observing the LED on the Tri-Spark control box. It requires a bit of fiddling to ensure the gap between the rotor and the sensor is maintained at 0.4mm but the final (angular) position was close to the centre of the slots provided in the Tri-Spark backplate. I mounted the control box (its small) with industrial Velcro on the oil tank on the righthand side of the bike under the side panel cover.

One issue I did encounter was that tightening the nut on the end of the crank caused the slot for the oil pump drive to close making it difficult to insert the drive pinion. I gently opened the slot and shimmed behind the nut to try to stop this happening.

I also made a cut-out in the mounting plate for the ignition coils so that the Tri-Spark coils could be moved a bit further back so the HT lead cap wasn't pressed up against the frame cross-member.

Starting the Bike

The following is what I have understood from various data sources on ignition timing:

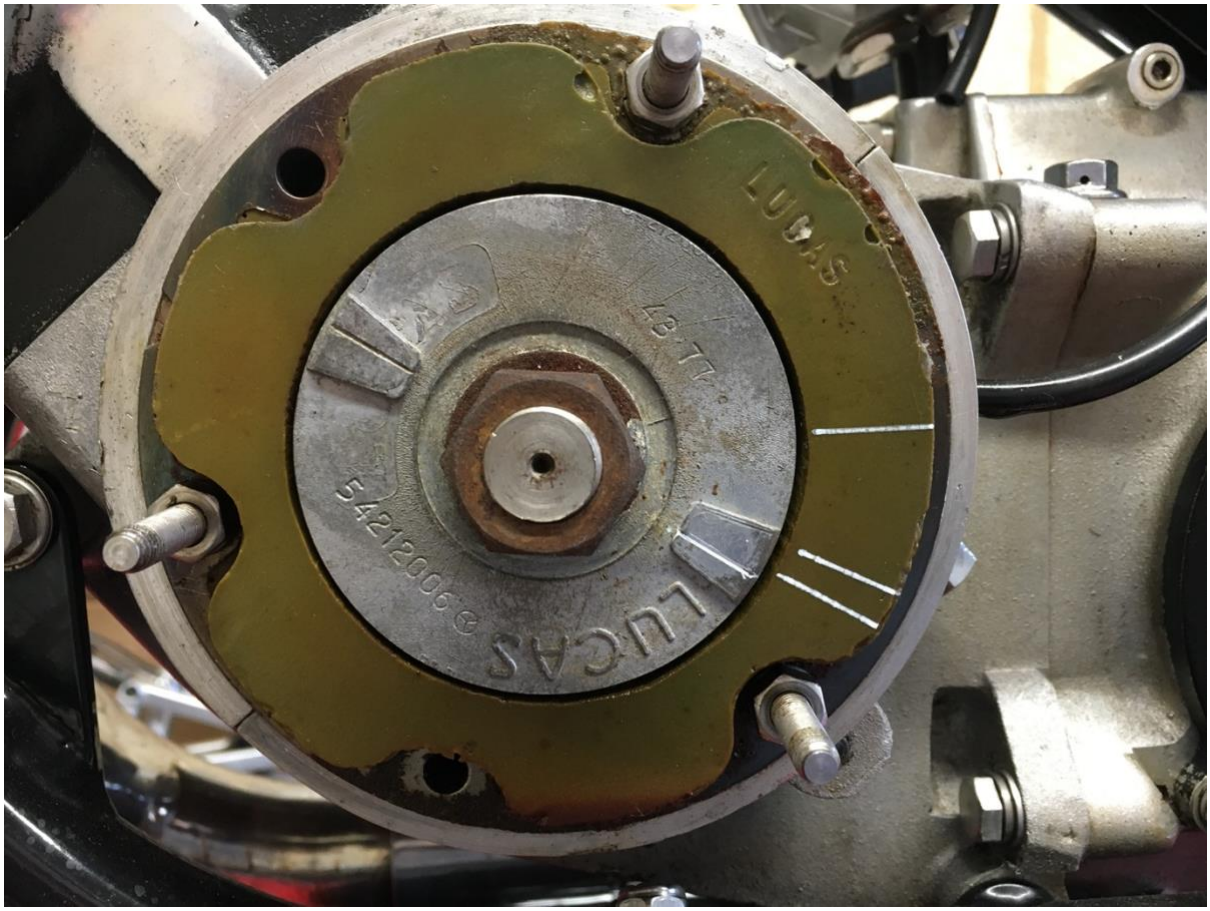
Carb	Mk.	BTDC	Degrees BTDC	Source
34mm	Mk. 1	0.27" (7mm)	37.5Deg 34Deg 31Deg	My Manual (degrees look wrong) Calculated* Measured on a photo with protractor
36mm	Mk. 2	0.2" (5mm)**	27Deg 25Deg	Calculated* Measured on a photo with protractor
38mm	Late Mk. 2	0.3" (7.6mm)	37.5Deg 34Deg 31Deg	My Manual (degrees look wrong) Calculated* Measured on a photo with protractor

* Calculations were done using http://torqsoft.net/piston-position.html#measure (stroke=72mm and Conrod length=130.5mm)

** Various sources on Silk user group

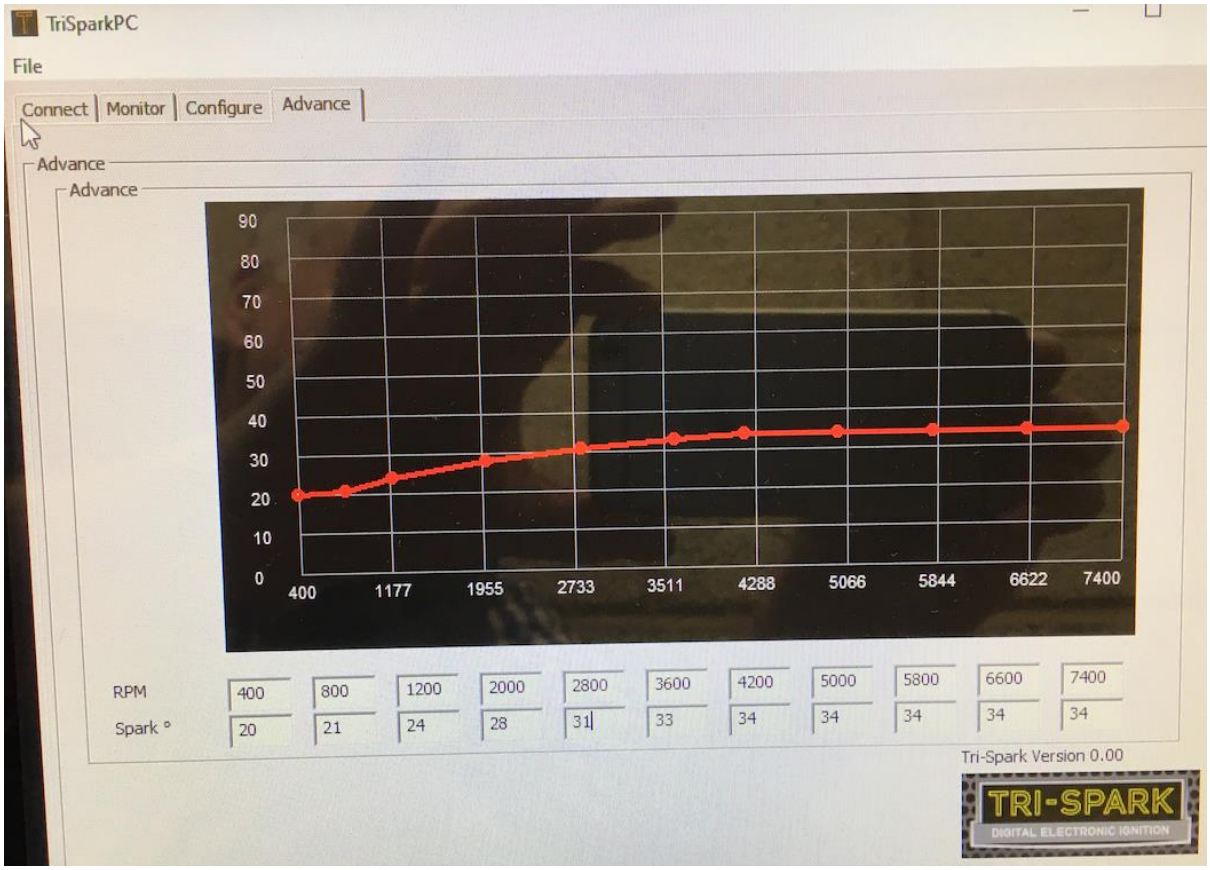
My measurements with a protractor suggest that my TDC marking may have been a couple of degrees out.

I marked the alternator as shown here for TDC and 0.3" (34Deg) and 0.2"(27Deg) BTDC (measured using a digital dial gauge to the piston crown):



My bike is fitted with a 38MM carb (possible factory upgrade based on the bikes documentation). It is not known if the bike has Peter Green porting. The Lumenition ignition was strobed at an estimated 33Deg BTDC prior to dismantling based on these markings.

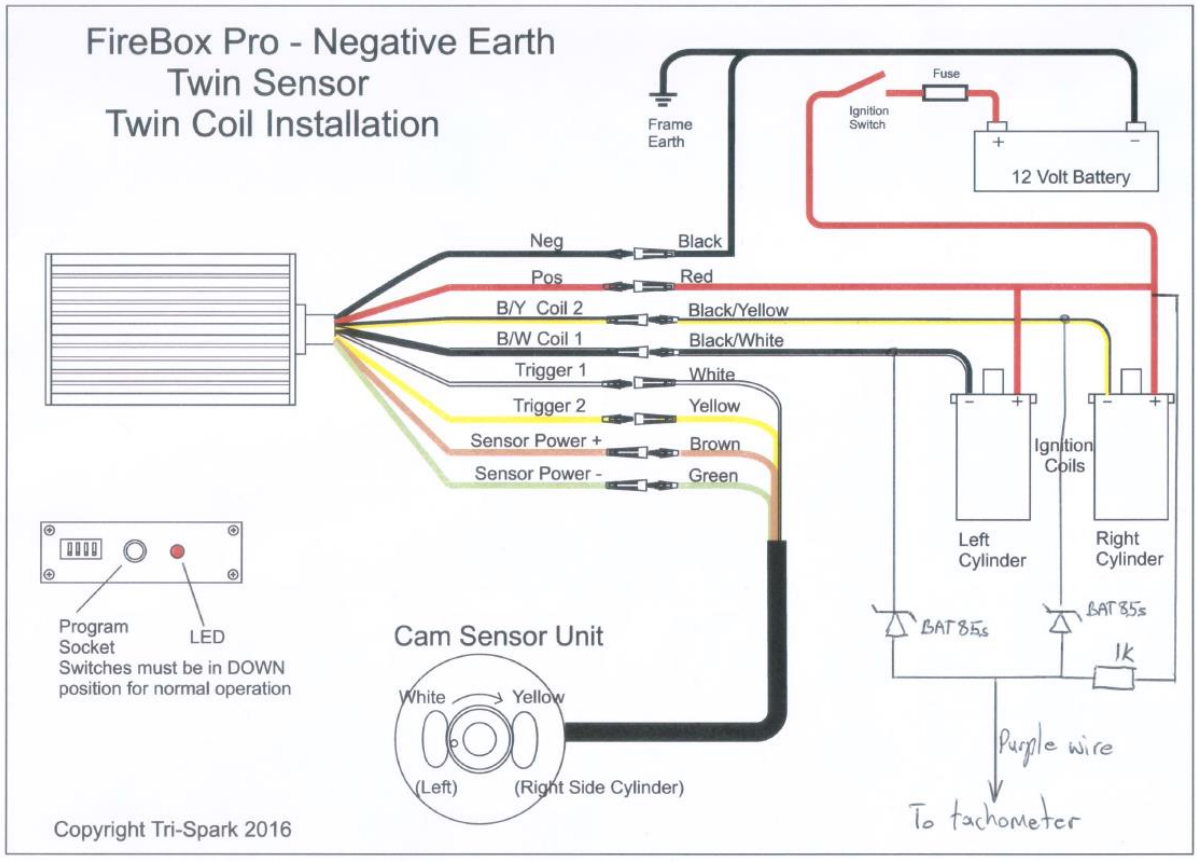
The bike started second kick with the newly installed Tri-Spark ignition. The static timing proved to be surprisingly accurate and the strobe showed the position to be close to the 34Deg BTDC mark. The initial advance map programmed in the Tri-Spark memory for the ignition timing was:



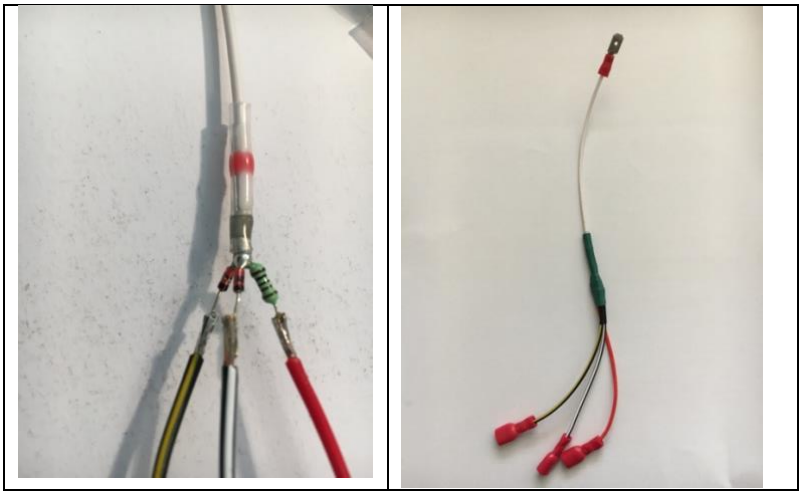
This proved to be a good starting point and the engine revved cleanly with stable tick-over and no propensity to kick-back.

Other Considerations

The Tri-Spark can be set through its software interface for wasted spark operation (or not). If a non-wasted spark is preferred then the cable to the tachometer will need a couple of Schottky diodes and a resistor added (to create a logical AND) as shown below. Else it will read half the actual RPM. This is what I did (unconfirmed “fix” at this time):



Physically this is how I implemented the modification:



Solid State rectifier/regulator

I also fitted a Tri-Spark Solid State MOSFET regulator. I mounted this in the space vacated by the Lumenition control box that is behind the coils. This wasn't required to fit the electronic ignition but provides more stable voltage regulation.

Conclusion

The custom machining described above was around £80 at a local machine shop. I anticipate some experimentation will be required in the software advance/retard timing to fine tune

the initial setup (you need to connect a Windows PC to the Firebox for this). I propose to do this by trial-and-error by making small adjustments based on the engines responsiveness/behaviour when riding the bike.

Whilst the Firebox is expensive, it is well made and documented. Also, there is great support from the manufacturer.