

MARK-3[®]

SERIES

185cc DIS Digital Ignition Solution

A Digital Ignition Solution (DIS) conversion kit is available to upgrade a MARK-3[®] from breaker points and mechanical cut-out switch to an improved electronic ignition (CDI) and a digital overspeed switch (DOS) system.



**DIS MARK-3 Conversion Kit
(600556)**

Benefits

Upgrading the MARK-3 with the DIS will provide a multitude of benefits:

Easier to start

The electronic ignition's variable timing effectively eliminates the risk of kick-back during starting.

Improved reliability

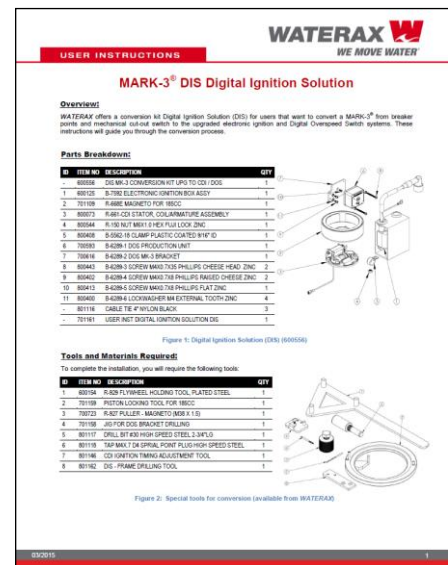
The ignition system has been proven and tested worldwide for over a decade. The variable timing is specifically designed to reduce the risk of detonation, thus protecting the engine while maintaining overall great performance. Furthermore, the DOS provides accurate and reliable engine shut down in the event of a loss of prime, protecting the pump end and engine from severe damage.

Maintenance free / Lower repair cost

The CDI and DOS do not require any maintenance, significantly reducing repair costs and equipment downtime.

Simplicity

The DOS incorporates a momentary kill switch, reducing the number of wires and eliminating the ON/OFF toggle switch.



User Instructions

Overview

The MARK-3[®], introduced in 1964 by WAJAX, has become the standard high pressure centrifugal pump used by forestry agencies around the world. Powered by a 185cc 2-stroke engine, the MARK-3[®] has always been recognised as a workhorse by forest fire fighters.

Over the years, the MARK-3[®] has evolved to include the latest technologies that make it easier to start, more reliable and improve fuel efficiency.

The two most significant improvements made on the MARK-3[®] 185cc engine over the last decade are the following:

1. In 2004, ROTAX partnered with DUCATI to develop a new electronic ignition system (CDI) for the 185cc engine. This CDI featuring variable timing makes the unit easier to start and safer by preventing kick-backs. It prolongs the life of the engine and also improves its fuel consumption.
2. In 2009, Wildfire introduced a digital overspeed switch (DOS) to replace the mechanical cut out switch that had a tendency to fail due to wear and dirt.

In this paper, we provide:

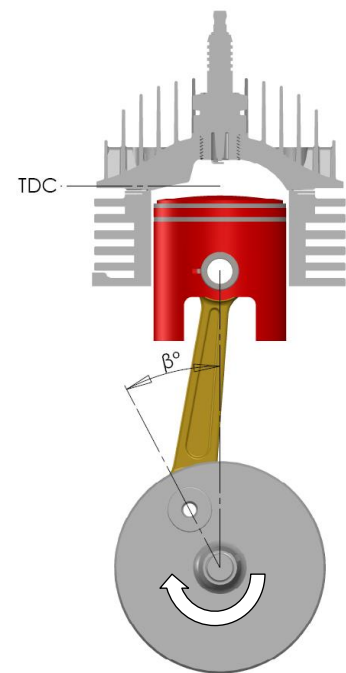
- an overview of ignition timing
- a comparison between breaker points ignition and electronic ignition



Ignition timing

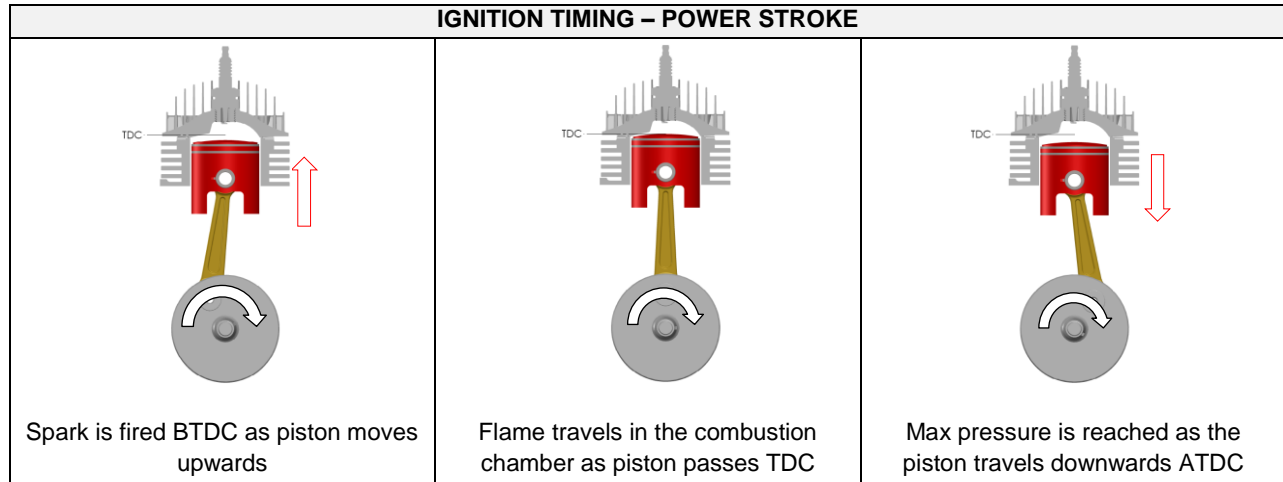
Ignition timing is the process of setting the moment at which the spark will occur relative to piston position and engine speed. The timing is generally described as the crankshaft *rotation angle* (β°) before *Top Dead Center* (TDC).

Accurate ignition timing is crucial; it will allow the engine to develop high and reliable performance. It will also affect ease of start, fuel consumption, and exhaust emissions. Improper ignition timing can lead to catastrophic engine failure, backfires, and poor performance.



TECH-NOTE

Because the combustion process is not instantaneous and the flame takes time to consume the fuel inside the combustion chamber, the spark must occur *Before Top Dead Center* (BTDC). This will allow for maximum pressure (engine power stroke) to occur slightly *After Top Dead Center* (ATDC), typically +15-20° as the piston is on its way down.



Several interdependent factors must be considered when setting the ignition timing:

- Engine speed (crankshaft angular velocity)
- Combustion chamber temperature
- Engine loading
- Engine compression ratio
- Octane fuel rating
- Air-fuel ratio
- Emissions and fuel consumption
- Performance
- Reliability and durability

Variable timing allows for advancing or retarding the timing based on the RPM of the engine.

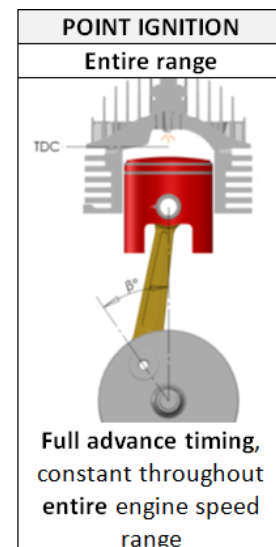
Advancing can be defined as changing the timing so that the fuel ignition occurs sooner in the power cycle.

Retarding can be defined as changing the timing so that the spark occurs later, but always BTDC.

Breaker Points Ignition vs. Electronic Ignition

Breaker Points Ignition

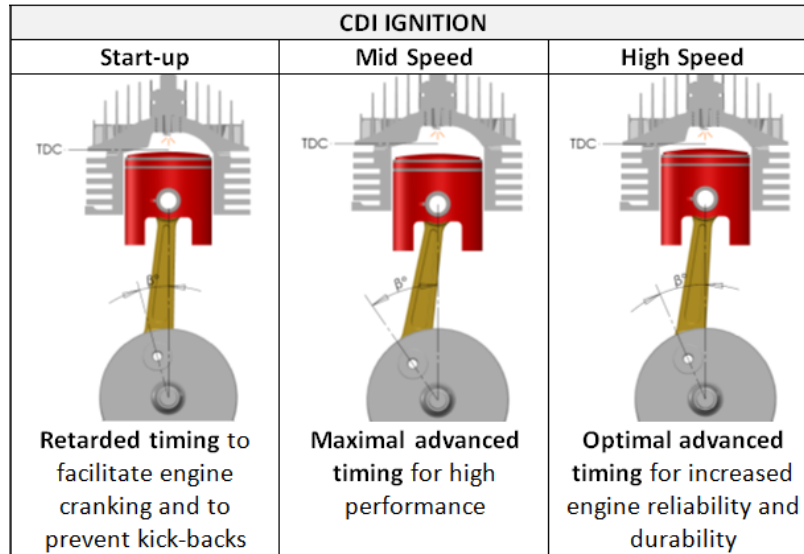
All MARK-3® pumps manufactured prior to 2004 were equipped with pointed ignition. The breaker points ignition system is an old technology. Timing is mechanically controlled through a contact breaker, which requires constant adjustment, is prone to wear, and can be costly to replace. Moreover, the point system does not provide variable timing. This can cause issues during start-up (kick-backs) due to the full advance timing.



Electronic Ignition System (CDI)

In 2004, the Capacitive Discharge Ignition (CDI) module was installed on every new MARK-3[®] pump.

The CDI provides variable timing. It allows for **retarded timing** during start-up, **maximal advanced timing** at mid speed, and **optimal advanced timing** at high speed. The CDI doesn't require any adjustment and is reliable.



DIS compatibility

The DIS is compatible on all engines with serial number 2776900 and higher. For older engines, the magneto housing (flywheel) must be replaced by a more current model. Item number for the magneto housing: 701108.