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Distributor Setup Instructions

MS1-Extra ONLY

Caution:

Turn the ignition off and disconnect the power from the HT coil before following these instructions!!

These instructions are for MSnS mode (Distributor based setups) MS1-Extra where the MegaSquirt ECU controls the timing of the spark.

Choose one code type	
Distributor (MSnS)	MSnS^
Neon/420A decoder	Off*^
Wheel decoder (e.g. 36-1)	Off*^
EDIS	Off*^
EDIS multispark	Off*^
TFI ignition	Off*^
HEI Ignition	Off*^

Choose input/output pins to use	
FIDLE function	Idle control*
LED17(D14) function	Spark output A
LED18(D15) function	IRQ trigger
LED19(D16) function	Acceleration*^
Multiplex ignition?	Normal*
X2 (JS0) function	Water inj
X4 (JS2) function	Output1*^
output3/Spark D	Output3
pin10 shift / Spark E	Shiftlight
knock in / Spark F	Knock input

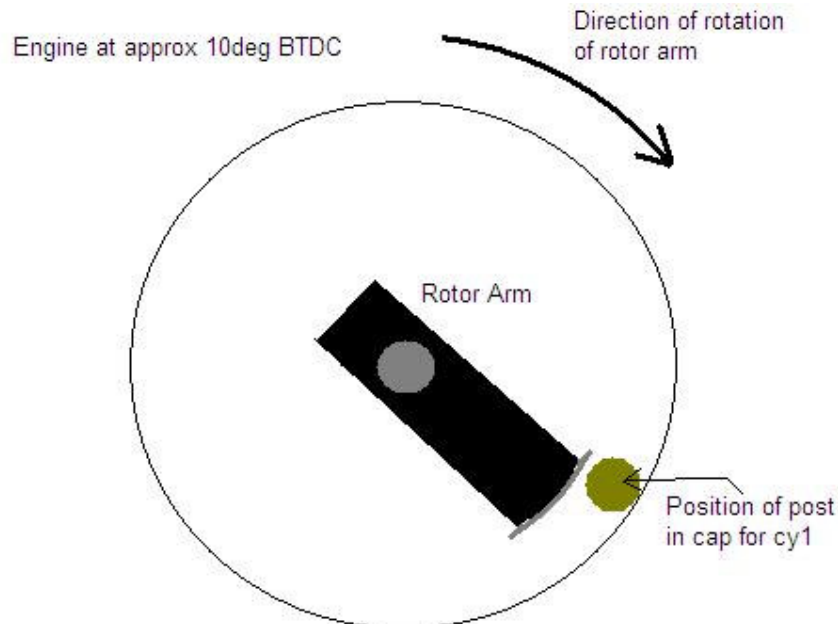
F1 Fetch From ECU Burn To ECU Close

There are basically two styles:

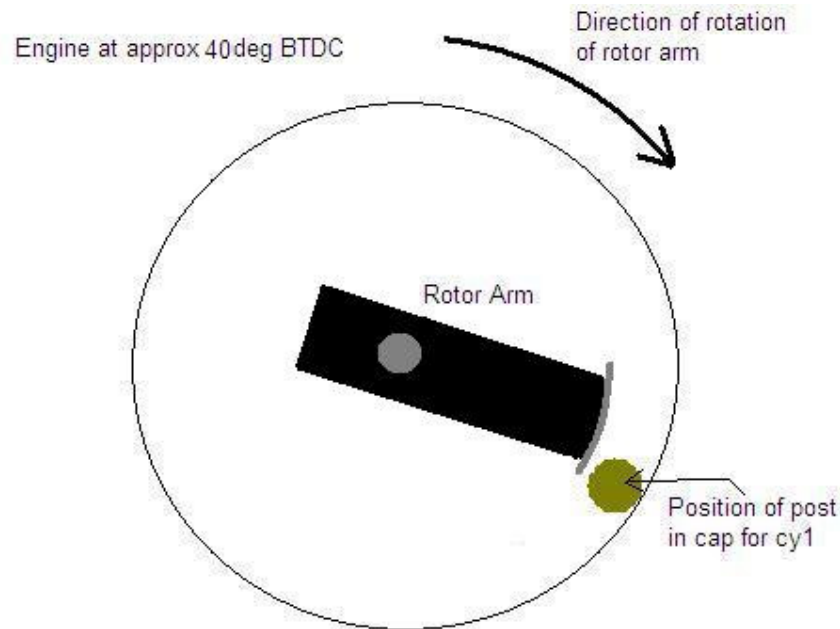
i) Movable triggering sensor. This style has a plate that the sensor/points is moved on with weights and a vacuum diaphragm. These weights open up against springs as the rotational inertia gets greater (increase in RPM) making the angle the sensor triggers at change. When the trigger occurs the coil will be fired either directly or via an amplifier, so the angle the spark occurs at is directly controlled by the weights and the vacuum advance. The fact that the angle changes all the time makes it impossible for an ECU to control the firing angle, because the trigger isn't happening at a known constant. So to use these with an ECU the mechanism would have to be locked into a fixed position.

ii) Fixed triggering sensor. These can have points/hall sensor within the distributor or a sensor that is triggered from the crank or even off a cam sensor, but they do not move around. The sensor is fixed so the angle that it fires at will never change. This means the ECU will have to control the spark angle. (Note: If using a movable triggering sensor then it must be fixed in order to get mappable ignition from a MegaSquirt ECU). The ECU can calculate the engine speed from the trigger inputs and it has a known angle when the sensor triggers so it can calculate how long to leave before it fires the coil, thus changing the firing angle. There will be an internal table that the ECU uses to look up what angle (delay) there needs to be at xxxRPM and engine load.

Most engines will be fired across the angles of 10deg BTDC to around 45deg BTDC, depending on load, etc, this is the firing window. So the rotor arm needs to be big enough to line up with the post in the distributor cap for around 30-35deg, otherwise the coil could fire when it's not lined up causing a cross fire to another cylinder.



So with the engine at 10deg BTDC the rotor arm will still be lined up with the post in the cap (e.g. cylinder #1) but it will be on the trailing part of it, as this is the most retarded angle it will probably be needed to fire at. Angles of 35-40 will be lined up with the same post by the leading edge of the rotor:



So you can see that the rotor has to be positioned correctly so the correct cylinder is fired across the used firing angle. Older distributor's have weights inside and a vacuum advance to change the angle mechanically. These weights may even alter the rotor arm against a spring. So if you lock it up to use the trigger as a fixed input to the MegaSquirt ECU you must carefully check that the rotor arm has a large enough contact area to cover the firing window. To line it up place the engine around 20-25deg BTDC (in the middle of the firing window) and line the centre of the rotor arm up to the correct post. You may have to phase the distributor to do this.

Ensure the LED18(D15) function is set to IRQ trigger, this sets the middle LED on the MS ECU so it indicates the state of the trigger input.

Before starting the setup procedure, ensure that your points / hall sensor, pickup device, etc, does NOT move on a plate within the distributor when a vacuum is applied to the port or with engine speed using counter weights on the plate. If it can move you MUST lock the mechanism, as the MegaSquirt ECU needs to have an input pulse from the sensor, pickup, at exactly the same angle at any speed. Locking the advance mechanism will ensure the MS ECU gets a fixed angle input regardless of engine speed or ported vacuum.

There are a few ways to set up the distributor, if your distributor is currently set up for a static timing of about 10° BTDC then Method 1 is the easiest to set up and get running.

If your distributor has a plate inside that can position the sensor then see Method 2

METHOD 1

With the distributor ignition input wired up to the MS ECU, coil disconnected and ignition on (MS ECU powered up):

1. Set the crank to 10° BTDC (cylinder #1). **Note: If you wish to have a minimum advance lower than 10° then turn the crank so its under the minimum required. e.g. 5°**
2. Rotate the distributor in the direction of normal shaft rotation until you find where the center LED on the MS ECU is just OFF and the rotor arm points to #1 cylinder spark plug tower on the distributor cap.
3. Rotate the distributor in the opposite direction just until the center LED on the MS ECU turns ON (this sets the **Trigger Angle & Cranking timing** to the angle the crank is now at i.e. 10°)
4. Make sure the rotor arm points towards the correct contact (#1 cylinder) in the distributor cap. This is very likely close to the position of your original distributor when correctly timed. **Note: you may have to re-phase the distributor so the rotor arm points to the correct cylinder.**
5. Fix/fasten the distributor.
6. Test the setting by turning the crank to about 20° BTDC the center LED should be OFF.
7. Rotate the crank in the direction of rotation and estimate the angle where the LED just turns ON. This should be about 10°.
8. Enter 10 (or the engine static timing) in **Trigger Angle**.
9. Enter 10 (or the engines static timing) in **Cranking advance Angle**
10. Enter 10 for **Fixed angle** (This forces the MS ECU to fire the spark at an advance of 10° BTDC)
11. Set **Cranking Timing to Trigger Return**
12. Turn off ignition and re-connect the ignition coil.
13. Start the engine **Note: If it doesn't start check the timing with a strobe and ensure it is firing at 10° BTDC during cranking. If it's not then rotate the distributor a little until it does.**
14. Once the engine is started, slightly loosen the distributor and adjust it a little until the timing light is at 10 degrees.
15. Tighten the distributor back up again.
16. Set **Fixed angle** to **-10** (Allows the ECU to run from the spark map)

METHOD 2

With the distributor ignition input wired up to the MS ECU, coil disconnected and ignition on (MS ECU powered up):

1. Set the crank at 20° BTDC at cylinder #1 (approx 18- 22° BTDC will do)
2. Rotate the distributor so the rotor arm points at the middle of the correct contact (#1 cylinder) in the distributor cap. Fasten the distributor. Alternately locate the distributor in its normal pre-MegaSquirt location to correctly align the rotor with the high voltage towers. (This is to align the post with the rotor arm so it fires on the correct cylinder)
3. Fix/fasten the distributor.
4. Set the crank at 60° BTDC for cylinder #1 (**Note: You may have to use timing tape to do this. If not measure the length of existing timing marks on the crank pulley, say 0 - 10° and then mark the crank at 6x this length from 0° TDC e.g. 10° = 8mm therefore 60° = 8mm x 6 = 48mm from TDC**)
5. Rotate the advance plate with the sensor in the direction of shaft rotation until the middle LED on the MS ECU just turns OFF.
6. Rotate the advance plate back in the opposite direction until the middle LED on the MS ECU just turns ON again.
7. Fix/fasten the advance plate. This fixes the **Trigger Angle** at about 60° BTDC
8. Test your handywork. Turn the crank from near 90° BTDC in the direction of rotation. The center LED should go ON at approximately 60° BTDC.
9. Enter 60° for **Trigger Angle**. This need only be an estimate. You will adjust this dynamically with a timing light later.
10. Enter 10° (or the engine static angle) in **Cranking advance Angle**
11. **Set Cranking Timing to Time Based and Cranking Advance Angle to 10**
12. Enter 10 for **Fixed angle** (This forces the MS ECU to fire the spark at an advance of 10° BTDC)
13. Turn the ignition off and re-connect the ignition coil
14. Start the engine **Note: If it doesn't start check the timing with a strobe and ensure it is firing at 10° BTDC during cranking.**
15. Once the engine is running adjust the **Trigger Angle** entry until the timing light is at 10 degrees (This calibrates the estimated Trigger angle)
16. Set **Fixed angle** to **-10** (Allows the ECU to run from the spark map)