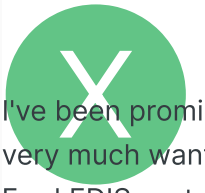
Wasted Spark Ignition, NO EDIS

By X64v,
April 19, 2010 in Megasquirt



Posted April 19, 2010

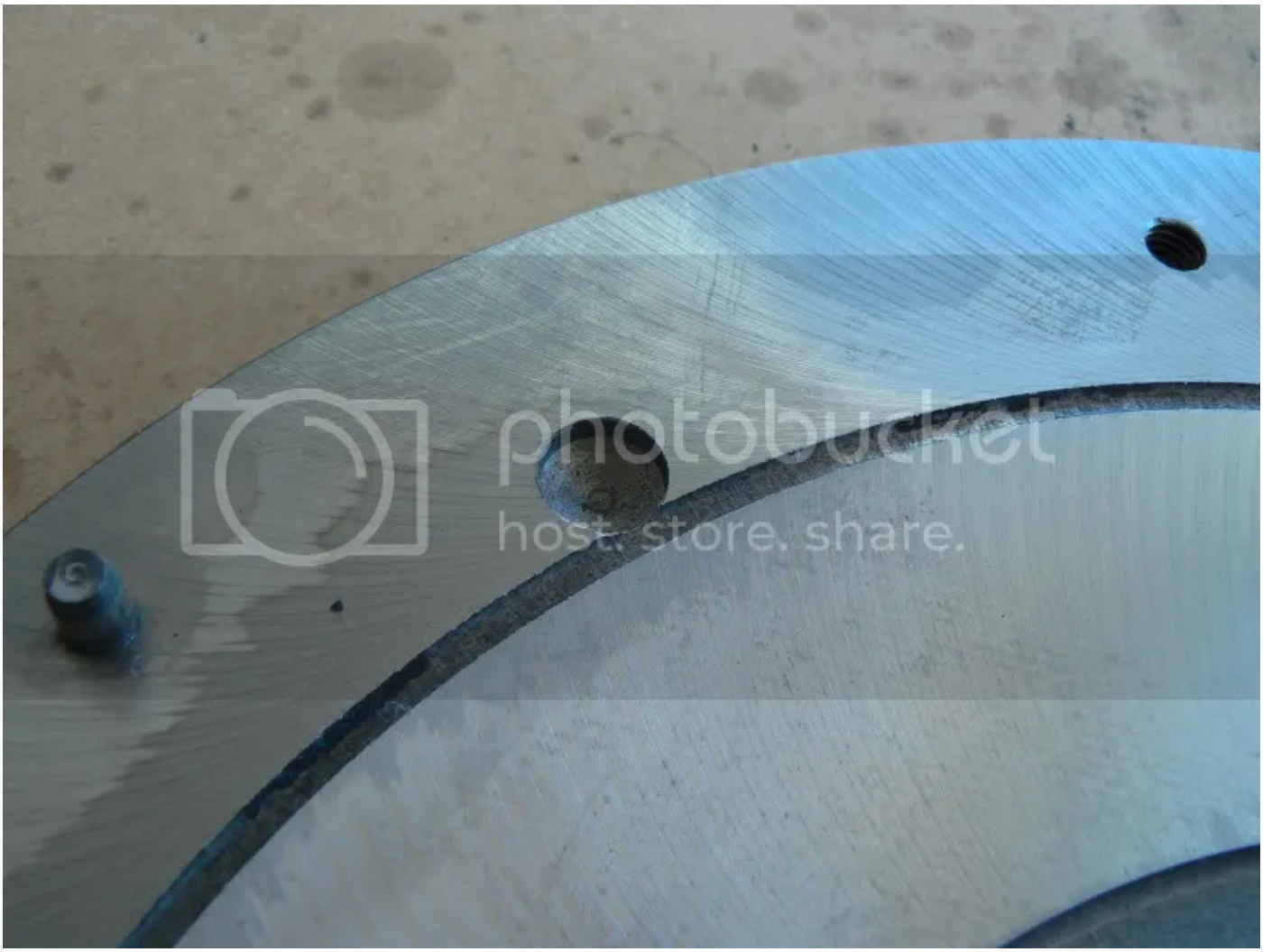
I've been promising this write-up for a while now, so here it is. On my (previously turbo, now N/A) L28, I very much wanted wasted spark, distributorless ignition, but disliked *everything* necessary to use the Ford EDIS system (bulky 36-1 wheel with an awkward VR sensor, sensitive PIP/SAW wires, very limited choice of coil packs, no dwell control, no spark cut for rev limiting, the list goes on). The last straw was when I realized the EDIS control module does nothing my already-installed MS-I V3.0 box couldn't do on its own with the 029y4 MSnS-E code, so I decided to build the entire system myself, out of whatever components I wanted. The following write-up details how I installed *my* choice of components on *my* specific engine, chosen for *my* specific needs, but the beauty of this is one can substitute one's choice of components in almost any part of this system to better suit one's own needs.

Part I: Trigger Input

I wanted something flywheel-based; simple, light, and dead accurate. I chose the Cherry GS100502 geartooth hall sensor for its ability to read a 'gear tooth' pattern. It doesn't need magnets, it simply switches based on the presence/absence of a ferrous material in front of its nose. That's perfect for simply drilling the pattern of your choice into the back of a stock steel flywheel. For wasted spark, the pattern must be based on an integer multiple of the number of cylinders. MS will accept either one or two missing holes, though I will cover only one missing hole here. For example, common patterns include 6-1 (6cyl x 1), 36-1 (EDIS pattern, 6cyl x 6), or someone adventurous could do something with the flywheel teeth, which are 120 count (6cyl x 20). I chose the 6-1 pattern for simplicity of machining; some say it will be less accurate at lower rpm, but in my opinion the difference in error between a 6-1 pattern and a 36-1 patten is going to be smaller than the error in the rest of the system anyways, so it's absolutely no matter. My flywheel, with a quote from my build thread regarding machining:

On 10/11/2009 at 11:10 PM, X64v said:

The arrow points up at TDC, and that tic mark on the 2 o'clock hole denotes the sensor's position (again, relative to when the motor is at TDC). Note that this will create a trigger angle of 90 degrees, give or take depending on exact sensor placement. It was easy to measure/mark precisely where the holes needed to be by using the fact that there are 120 teeth on the ring gear. Some careful work with a dial caliper and I was able to be sure the marks were right on the money. I made sure the hole depths were plus/minus .001" of eachother (to ensure the material removed from each hole was of equal weight), then drilled an identical hole (size, depth, radial position) where the 'missing tooth' would be, but on the opposite face of the flywheel, to keep it in balance while still providing the 6-1 pattern the computer needs.

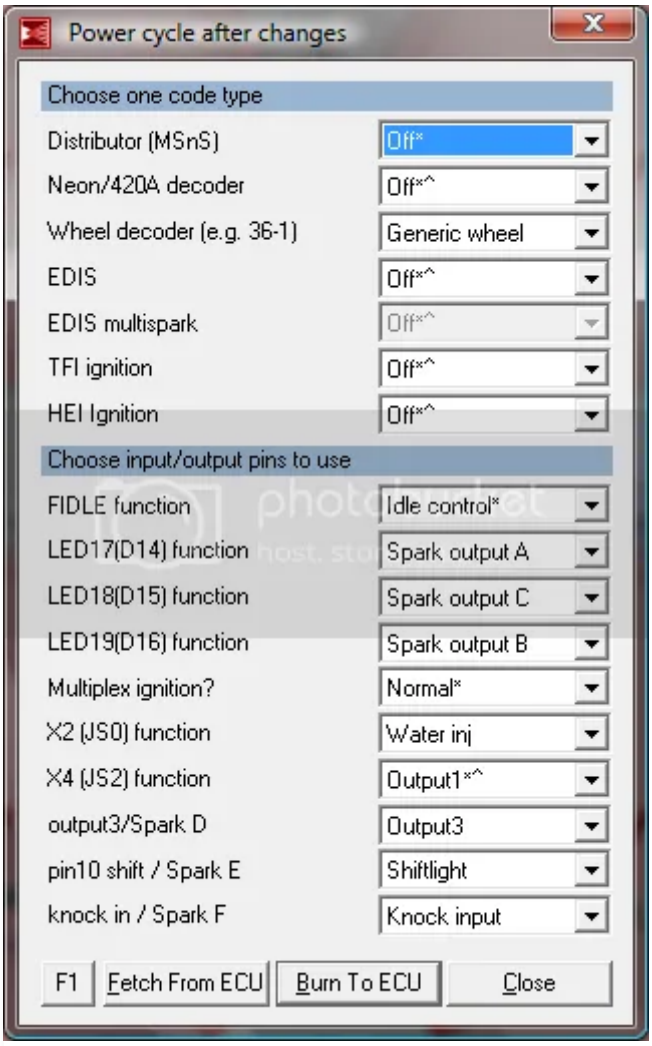


I found the correct M12×1.0 nut and tack-welded it over a hole drilled in the engine backing plate to place it over the flywheel holes. The sensor threads in here with a jam nut to hold it in position (be gentle on those fine aluminum threads). I screwed the sensor all the way in, then backed it out 1.25 turns for a 1.25mm (.050") air gap. This was a pure guess, but has worked flawlessly for the past six months.

The sensor wiring is simple. I gave the power wire +12v from S12 on the MS board, the signal goes to pin 24 on the MS board (tach wire in the DIYAutoTune harness), and the ground to pin 2 (tach wire shielding). Internally, wire it as a **Low to High** sensor (it will ground when the flywheel is in front of it, which is *not* a tooth, the hole is). I made these internal connections on my MS-I V3.0 board:

REMOVE C12
REMOVE C30
JUMP D1
JUMP D2
1K RESISTOR IN R12
OPTOIN TO S12
XG1 TO TACHSELECT
OPTOOUT TO TSEL

If you're copying my setup, use these settings (MSnS-E code 029y4):


Power cycle after changes
Choose one code type
Distributor (MSnS)
Off*
Neon/420A decoder
Off*^
Wheel decoder (e.g. 36-1)
Generic wheel
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
Spark output C
LED19(D16) function
Spark output B
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

Looking at my flywheel, the computer will 'see' the missing tooth, then number the 'teeth' 1-5, starting from the hole by "JAPAN" and numbering counterclockwise. The sensor is about half-way between 2 and 3 at TDC, giving it somewhere around a 90Â° trigger angle. The three equally-spaced triggers are holes 1, 3, and 5. If you need any more details/explanation why/how this works, the MSExtra site has good info, along with numerous other sources on the web.

Part II: Spark Output

There are two general types of coil packs: those with built-in ignitors (sometimes called 'smart' coil packs) and those without (sometimes called 'dumb' coil packs). I will only cover the slightly more complicated 'dumb' coil packs, which covers most dual-post, wasted-spark-only packs. If you want to run 'smart' and/or single post (e.g. LSx) packs, refer to an LSx pack write up for the wiring.

I chose to use three individual, dual post coil packs from a 3000GT, they're cheap on eBay and provide a very hot spark. I turned them into pseudo-smart packs by bonding Bosch BIP373 ignitors (easily found at DIYAutoTune) to the bottom of the pack, and making pigtails that included all the wiring. The right pin in the connector gives 12v to the coil's + terminal, the center pin connects MS to the 'gate' pin on the BIP373, and the left pin grounds the 'drain' pin of the BIP373. The coil - terminal is connected directly to the 'source' pin of the BIP373.

Each coil pack will have a 'name' - A, B, and C. I didn't physically label them, but if you have a hard time keeping them straight, it might be a good idea. MS will fire them in order, ABCABCABCABC. Remember that our firing order is 1-5-3-6-2-4. If you correspond ABCABC with 153624, you see that 1+6 need to be fired by pack A, 2+5 need to be fired by pack B, and 3+4 need to be fired by pack C. To wire up the coil packs, simply connect the 'gate' of the BIP373 controlling pack A to the top of R26 on the V3.0 board through a 330ohm resistor, pack B to the top of R29 (again with resistor), pack C to to the top of R27. When MS wants to fire a coil, it will light the LED corresponding to each of these resistors, activating the

ignitor. Provide each coil + with key-on 12v, provide the BIP373 'drain' pins with ground, and that's it. I chose to do this through terminal blocks on the firewall to keep the wiring neat.

I mounted these coil packs to the valve cover. A in front, B in the rear, C in the middle:

For plug wires, I took my regular NGK wires and just cut them to length, using these new distributor ends that fit nicely on the coil terminals.

My MS spark settings:

How to use the 240Z current-sensing tach

I have no info on using any other tachometers, but if you'd like to use the stock current-sensing tach in your 240Z, it's very simple. Wire the BW wire that powered your ballast resistor to the GW wire that came off the ballast resistor. Use the BW wire that connected to your coil + to power all three coil packs. If you're not sure which BW wire is which, disconnect all three wires, and turn the ignition key to the ON position. One BW wire will have +12v, the other will not. Wire the powered one to the GW wire; the unpowered BW wire will now be powered through the tach, use this one to power the coil packs. DO NOT use the stock ballast resistor in any way.

That's all you need to do, you should now have a crisp, accurate trigger signal, and hot spark as high as your motor can rev. I was able to do this very inexpensively, too. Including shipping, the major components were:

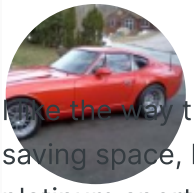
Sensor ($35) - Digikey
Coil Packs ($48) - eBay
BIP373 x3 ($27) - DIYAutoTune

I'll end with a screenshot of one of my datalogs. The yellow trace is the RPM signal, full throttle from 3500rpm to 7020rpm:

Perfectly smooth all the way up. The lumpiness off idle is from my .504" at 290Â° cam, not trigger inaccuracies. Compare that to my previous VR dizzy trigger on a pull to 6700rpm, vac/mech advance welded solid:

Much improved.
Edited April 19, 2010 by X64v

2 weeks later...



I like the way the you have positioned the coil packs on the valve cover, its a great location to set it up for saving space, I would like to know if I would be a able to used the same coil pack setup with my haltech platinum sport 2000 stand alone ecu and if so how would i configure the wiring setup for the coil packs, as for the trigger I would be using a electromotive type of tooth wheel on the crank pulley,
any info would greatly be appreciated.

Posted May 1, 2010

I don't know a single thing about Haltech systems. Might try posting in the Haltech forum.
Edited May 1, 2010 by X64v

Posted
May
1,
2010

3 weeks later...

This may be a stupid question, but what did you do about the distributor? Leave it, gut it, remove it completely, etc?

Posted
May
18,
2010

Very nice! Â Congrats on the excellent home brew!

Posted
May
18,
2010

> **On 5/18/2010 at 11:12 AM, cygnusx1 said:**
>
> Very nice! Â Congrats on the excellent home brew!

Thanks Dave!

Posted
May
18,
2010

> **On 5/18/2010 at 11:06 AM, DLSOpFor said:**
>
> This may be a stupid question, but what did you do about the distributor? Leave it, gut it, remove it completely, etc?

Remove it, it's now a paperweight. Make a block-off plate or use a 35mm brass core plug to fill the hole:

With the distributor missing, the quill shaft that drove the rotor will now be unsupported. In my opinion, it's a good idea to remove it, cutting it off after the bushing surface on the oil pump drive:

Ahhh! Thanks!

Posted
May
19,
2010

7 months later...

I really like this set-up compared to the VR sensor. It is clean and simple, but having a hard time finding info on where to drill holes on the crank. I am trying to wrap my head around the 90 degree trigger. Could you point me towards some articles or add to your explanation on the setting up the flywheel for this.

Posted
thanks
January
12,
2011

1 month later...

Great writeup X64v!

I am curious whether this direct driving of the coils would work if I were to retain my existing EDIS trigger wheel VR input setup. Wouldn't be too hard of a retrofit if so, and I'd gain my spark cut rev-limiter back. I don't think there would be any conflict of inputs/outputs if I were to use the three LED outputs, set it as trigger wheel and specify 36-1. Opinions?

Posted February 24, 2011

4 months later...

TR - Yeah that should work just fine. You should be able to drive those coils just like I drive these.

I've been gone from this site for a long time, but I can report zero problems with this set up over the past year.

Posted July 1, 2011

Edited July 1, 2011 by X64v

3 years later...

That is bad a**. What a great idea!

Posted September 19, 2014

Worked great for me - easy, cheap, less wires, less weight, etc....

Posted September

19,
2014

5 months later...

I'm looking for a map. Would you happen to have a running z? Running a very similar setup using lsx coils

Posted
February
26,
2015

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