
Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/22/2009 17:58

Attached is my current .bin for my turbo 3.8 with DIS. Bear in mind I have done considerable tuning of the spark table so the numbers will not add up exactly to what I started with! This is basically a copy of an e-mail to another member so here goes:

When I plugged the 1227749 / Code\$59 ECM into my Buick engine, it would start fine, then it would get an "old tractor" sound, and "chutter along" weakly for about 3 seconds..... and stall. The timing was so far retarded the engine could not run. By disconnecting the EST Bypass wire, the engine would run OK but would not have any spark advance.

The distributor HEI module gives a reference signal when the trigger points in the pickup coil are in alignment. This is very close to TDC. The ECM returns a pulse to the HEI module when it is ready for the module to spark.

Electrically, the DIS is the same. Just like the HEI module, it gives a reference pulse and waits for a return pulse before firing the spark plug. BUT the DIS sends its reference pulse about 33 degrees LATER than the distributor!

By converting from distributor to DIS, I effectively "retarded" the reference signal by 33°. To counteract this effect, the ECM's programmed timing had to be advanced by 33° across the board.

This is what I determined through tuning with real-time, and if there are any errors, or an easier way to do it, please feel free to correct me. The attached BIN does run very well though, so it can't be too far off! :)

The member I was talking to us setting up a different DIS system which has a 60° retarded reference angle, so the numbers are based on 60° here:

The following values will ADVANCE the timing when they are REDUCED. Set them to 0:

Spark Reference Angle is already 0

Coolant Advance Bias (this advances it 20.04)

Boost Advance Bias (this brings it up to 41.84 - but still not 60 yet)

We're out of "bias" settings, and still need to add 18.16° of advance!

Open the Coolant Advance Correction table (F2). RAISING these values will ADVANCE the timing. Select (highlight) ALL cells in the table. Open table editor and select the Offset +- function. Put 18.16 in the editor and hit "execute." This raised all values by 18.16° across the board! Add this to the 41.84 gained by reducing the bias values, and you have 60°!!!

Now that the "60° of retard" has been corrected you have to give the ECM "head room" to operate without hitting the limit. Do this by raising the Max Spark Advance relative to Reference:

Max Spark (ADD 60) results in 106.76° for your engine.

So far this is what's been done:

- Installed DIS system (or moved ECM to a DIS-equipped engine) which RETARDED timing by 60°.
- Eliminated the unwanted RETARD by causing ECM to advance timing by an additional 60° (above the engine's timing curve) under all conditions.
- Raised the limit on maximum advance, to give the ECM room to calculate the high degree of advance from reference pulse to ignition event.

Since you know your DIS has a 60° retarded reference pulse, you can still use the Tuner Pro data to analyse the engine. Just look at the "spark advance relative to reference," which will show 60° more than the actual advance. Don't pay attention to the "spark advance relative to TDC" because that only applies to the distributor motor.

Before doing any hard driving, VERIFY WITH A TIMING LIGHT that the ECM is accurately controlling the timing.

Thanks,

David http://www.code59.org/images/fbfiles/files/_59_V18_60Lb_3i8I_DIS_EGR_WG.zip

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Lucky - 02/22/2009 18:32

Does a 90 degree V6 fire every 60 degrees of distributor rotation ? If it does couldn't you have just switched which coil was firing which plug to make up the 60 degrees of delay or am I missing something ? Maybe on a 3.1 60 degree V6 ?

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/23/2009 03:44

Does a 90 degree V6 fire every 60 degrees of distributor rotation ? If it does couldn't you have just switched which coil was firing which plug to make up the 60 degrees of delay or am I missing something ? Maybe on a 3.1 60 degree V6 ?

Ok - All modern 4-stroke 6 cylinder engines fire once every 120 degrees of crank rotation. There are 3 sparks per crank rotation. This holds true for the 60° V6, the Buick 90° V6, and even the old Chevy inline 6.

Where the confusion starts with DIS ignition is what happens when the ignition switches over from "cranking" mode, to "ECM controlled" mode. During the time while the engine is turning with the starter (and for a few moments after it fires) the distributor, or DIS system is calculating its own "fixed" timing advance. This advance is based on the position of the crank trigger sensor, or the distributor pickup coil position.

After the engine starts, the ECM takes over, and at that point the timing numbers in the .BIN are in effect.

One might be tempted to reposition the crank trigger wheel or re-wire the coil pack so that the timing is no longer offset by 60°. This could allow you to use the stock .BIN settings. BUT during startup conditions, when the ignition module is controlling the timing in Bypass mode, the start-up timing would be WAY OFF and the engine would not ever start.

The ignition trigger wheel and DIS wiring needs to be set up so that the engine can start and run in bypass mode, and the ECM calibration adjusted for the reference offset of the ignition system.

Hope that makes sense! Got to leave it at that and get to work!
David

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Lucky - 02/23/2009 07:20

Makes perfect sense. You must work with the cranking settings once the ECU takes over. Never thought of that. I was thinking of going to a DIS system on my 4 cyl. - now I'm thinking it might be a PITA LOL

How does one determine how many degrees your selected DIS is lagging the signal from the distributor ?

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/23/2009 18:02

Makes perfect sense. You must work with the cranking settings once the ECU takes over. Never thought of that. I was thinking of going to a DIS system on my 4 cyl. - now I'm thinking it might be a PITA LOL

Nah - it's not hard at all. The store WOT-TECH sells an external crank trigger system that has the 6+1 notch trigger wheel, and a bracket to mount the sensor. This is made for the 60 degree V6 engines but you could surely adapt to your engine. Worth looking at. See http://wot-tech.com/shop/all/external-crank-trigger/prod_42.html

How does one determine how many degrees your selected DIS is lagging the signal from the distributor ?

It's documented in DIY-EFI archives:

33° for Buick DIS. Both the 3.8 SFI (DIS requires single crank sensor and cam ref signal), AND 3800 fast-start (18X dual crank triggers and cam ref not used for ignition) both have same characteristics to the ECM.

60° for the 6+1 notch system used on Chevy 60 degree engines AND the Iron Duke 4 cylinder engine. Believe it or not both these units have the same reluctor wheel and same timing offset according to what is in the archives.

That is a starting point but you will have to fine-tune the system after installation. As always - be sure to verify the timing is working correctly before doing and hard driving after modding the ignition system. If the numbers in the ECM or the

position of the trigger wheel are wrong, there can be extreme detonation leading to engine failure.

Thanks,
David

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Lucky - 02/23/2009 21:21

:) Well at least that was fairly complicated . I was afraid it would be something obvious like "use a timing light stupid" lol

Thanks for the info. I am going to try and research what system the Quad 4 uses since that is the DIS package I'm hoping to pick up and it will match my Memcal. 4 coils would be bitchin' B)

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Six_Shooter - 02/24/2009 05:41

Lucky wrote:

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Thanks for the info. I am going to try and research what system the Quad 4 uses since that is the DIS package I'm hoping to pick up and it will match my Memcal. 4 coils would be bitchin' B)

It would likely be easier to use the 2.0L/2.2L OHV ignition system, since it is an easily retrofittable system, physically. The Quad4 DIS is part of the IDI cover and slips down into the head itself to have the spings contact the plugs. The OHV DIS ignition is much like the 660 DIS, it even uses the same 7x trigger wheel.

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/24/2009 05:53

Lucky wrote:

:) Well at least that was fairly complicated . I was afraid it would be something obvious like "use a timing light stupid" lol

Thanks for the info. I am going to try and research what system the Quad 4 uses since that is the DIS package I'm hoping to pick up and it will match my Memcal. 4 coils would be bitchin' B)

Don't know about the trigger wheel config with the quad-4 system, and as Six-Shooter said, it might be hard to get the coil towers to line up with your spark plugs.

You can use any of the DIS modules to drive coil-on-plug ignition coils. You are simply keeping the DIS module (the aluminum 'base' of the system)and routing wires from the 2 coil outputs to your coil-on-plug coils. It is still a waste-spark system and each output will drive 2 COP coils in series, attached to the appropriate cylinders that the DIS coil for that output would fire.

I DO understand wanting to customize things and realize maybe you are doing it for the look of having COP coils on the engine. No problem there! I just think it would be simplest to just get a complete DIS coilpack/module assembly and use a set of high quality spiral core plug wires to get the fire to the cylinders!

If you're running a distributor now, I don't beleive any of the DIS units will match your MEMCAL until the programming is changed, unless I misunderstood that?!?

Would love to see some pictures of your setup, do you have a site or page with the writeup of the Toyota EFI conversion?

Thanks!
David

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Lucky - 02/24/2009 07:20

:P The more I read the more amazed I am that my engine even runs ! I think Six's advice is responsible for that. Thanks.

My ECM is from a DIS system (3.4 DOHC), my MEMCAL is from a COP system (2.3 QUAD 4) and I'm running it off a distributor signal, through an 8 wire HEI controller (4.3 TBI) then back through the distributor with a regular coil. It seems the ignition is very forgiving and "standardized" Much more so than with the different injector types and firing methods combos.

There are some pics attached to my profile or I think you can get into here;
<http://www.facebook.com/album.php?aid=2010486&id=1079325711&l=8b44b>

There are lots of QUAD 4 enthusiast sites on the net but they don't seem to deal much with tuning. No one is hacking the code just doing bolt ons. Found out they are 28# or 32# low Z injectors up to '96 and not much else. Looks like another trip to the wreckers. Come on warm weather !

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/24/2009 07:35

Lucky wrote:

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My ECM is from a DIS system (3.4 DOHC), my MEMCAL is from a COP system (2.3 QUAD 4) and I'm running it off a distributor signal, through an 8 wire HEI controller (4.3 TBI) then back through the distributor with a regular coil. It seems the ignition is very forgiving and "standardized" Much more so than with the different injector types and firing methods combos.

Lol! :woohoo: that is just the type of project we need here! It's amazing how adaptable these ECMs are.

There are some pics attached to my profile or I think you can get into here;
<http://www.facebook.com/album.php?aid=2010486&id=1079325711&l=8b44b>

There are lots of QUAD 4 enthusiast sites on the net but they don't seem to deal much with tuning. No one is hacking the code just doing bolt ons. Found out they are 28# or 32# low Z injectors up to '96 and not much else. Looks like another trip to the wreckers. Come on warm weather !

NEAT truck! Love it! Especially like the round 'floorboard heater' setup. Haven't seen one of them in a long while!

You might be able to make some brackets that would hold COP coils on that engine, but it would put them right over the 'zaust manifold. Whatever you do it will surely work out well seeing how you've done the rest of the engine setup.

Thanks,
David

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Lucky - 02/25/2009 07:02

:silly: yes the heater is amusing. And that's about all. It's like trying to boil water with a cigarette lighter. The 1958 parts Rover had a HUGE unit that started in the fender near the headlight and came all the way back and across the dash - but it didn't do much more heating so I went back to the original round box. Not a good Canadian vehicle - esp. for window defrosting.

So the Quad 4 uses the same 6+1 trigger wheel setup from what I am reading. Does the wheel have magnets or any special properties to it or does it just have air gaps cut into the outer edge ? What is the alignment of the notches relative

to TDC ?

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/25/2009 18:06

Wheel does not have magnets. It is made of iron or steel (a magnet is attracted to it). Wheel has notches cut out of it, or it can be fabricated with STEEL pins protruding from it.

The sensor is a VR sensor (variable reluctance). It is composed of a permanent magnetized steel pin, with a coil winding around it. When metal is moved towards or away from the tip of the sensor, it generates a voltage. The gaps of the trigger wheel pass the tip of the sensor and produce voltage pulses that the DIS module can interpret.

The wheel has one "double notch" (hence the 6+1 or '7 notch' name) that must be oriented correctly for the engine to run. I'm not sure what position it has to be in because my engine has a different system and the crank trigger came with the engine already.

Did you look at the external trigger setup listed on WOT-TECH site? It will give an idea of what you will need. I bet there is some info on the www.60degreev6.com board that you can find about the 6+1 trigger wheel timing.

Thanks!
David

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbodig - 02/26/2009 08:28

turbokinetic wrote:

Does a 90 degree V6 fire every 60 degrees of distributor rotation ? If it does couldn't you have just switched which coil was firing which plug to make up the 60 degrees of delay or am I missing something ? Maybe on a 3.1 60 degree V6 ?

Ok - All modern 4-stroke 6 cylinder engines fire once every 120 degrees of crank rotation. There are 3 sparks per crank rotation. This holds true for the 60° V6, the Buick 90° V6, and even the old Chevy inline 6.

'cept the Odd-fire v6. :)

Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbodig - 02/26/2009 08:59

Couple things that hit me, reading through this all.

First, are you editing the Min, Max, and Reference timing values using the XDF, or doing it manually in hex? If you're using an XDF, you'll likely need a later release file to make this work. The 1.3 doesn't have the correct ranges.

I'm in the process of trying to determine the exact effects of these timing parameters on actual spark, but my logic analyzer isn't up to the task, so it looks like I'll have to hunt down a 'scope.

Shannen's paper on this covers the general operation:

<http://www.diy-efi.org/twiki/bin/view/Gmecm/DISdist>

Here's a discussion a while back of 58/59 running on a GN, which should be the same ignition system as you have:

http://www.code59.org/index.php?option=com_fireboard&Itemid=38&func=view&id=4036&catid=12#4036

Hopefully that'll put you on the right track until I can get some real data from the actual DIS system.

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Paul - 02/26/2009 17:36

turbodig wrote:

First, are you editing the Min, Max, and Reference timing values using the XDF, or doing it manually in hex? If you're using an XDF, you'll likely need a later release file to make this work. The 1.3 doesn't have the correct ranges.

What should the ranges be for this in the XDF? I looked and the GM Document you gave me and everything looks correct in the 1.5 XDF I have in dev forum but you still get all of these whacky numbers in the reference angle. So it must be something I have wrong.. any ideas?

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/26/2009 17:56

Dig; I edited it with the XDF, version 1.3.18 Did it using real time emulation until the engine ran right. The .bin I posted runs perfectly. I've driven the car on two 7 hours (Each way) road trips and got nothing but extreme :woohoo: and tire smoke from it!!!

With the EGR turned on it gets about 30 MPG (until I put foot in it!)

I know the timing is close because of the performance of the car, and the fact that it gets only a couple degrees KR under full boost.

Yes I've read Shannen's DIS to Dist article, but since the XDF showed the reference to already be at 0° other measures had to be taken to make it work.

I'll get the 1.5 XDF and see what things look like, though!

Thanks!
David

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/26/2009 17:59

I'm having trouble navigating the new forum. Where can the 1.5 XDF be found?

Thanks,
David

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Paul - 02/26/2009 21:23

turbokinetic wrote:

I'm having trouble navigating the new forum. Where can the 1.5 XDF be found?

Thanks,
David

It hasn't been released yet.... I have a few issues in it to fix and then I will release it.....

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/27/2009 03:48

turbodig wrote:

.... If you're using an XDF, you'll likely need a later release file to make this work. The 1.3 doesn't have the correct ranges.

....

OK just looked at the XDF. The reference angle, and both of the bias values show to be 8 bit values, with a range of 0 to 255. How could this be given greater range?

Guess I may be misunderstood exactly what you meant by 'range' here?

Basically, I'm trying to understand this without getting further confused or confusing anyone else.

Thanks again for all the help, the car is running great.

Later,
David

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Paul - 02/27/2009 11:00

Well looking at the code, KREFANGL is an 8 bit number. With the formula GM has in their document, that would give it a 0 - 90 degrees. I don't have the doc in front of me so I am not sure if it is a SIGNED number which would give it a range of -45 to 45 degrees. I will look at it tonight when I get home.

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbokinetic - 02/27/2009 18:05

Paul wrote:

Well looking at the code, KREFANGL is an 8 bit number. With the formula GM has in their document, that would give it a 0 - 90 degrees. I don't have the doc in front of me so I am not sure if it is a SIGNED number which would give it a range of -45 to 45 degrees. I will look at it tonight when I get home.

Will be interested to hear what you find. I plan to experiment more with a timing light and some different numbers in the ECM. That way I can learn exactly what is going on.

The only thing not 100% right is the displayed timing advance in the ALDL data. The "timing relative to ref pulse" is correct; however the "timing relative to TDC" is WAY off, indicating nearly 100° advance at times.

I work a 14 day hitch schedule and will not be home until end of next week. When I get home I'll use the timing light and try to post what I find.

Later,
David

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbodig - 03/02/2009 12:31

KREFANGL is 256/90, a 0-90 range.

The other two are 2's complement 16-bit #s.

The valid raw range is -256 to +256, or -90 to +90 degrees. The actual numbers go to 32767 and -32768, but the code limits the values.

Paul, I think just adding a formula of $.3515625 * X + 0.000000$ to these will work, with the sign bit box checked. It doesn't seem to acknowledge the limits, though, might be something you want to run past Mark.

Using the formula above will allow you to get the right numbers in there, provided you have the signed box checked.

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by Paul - 03/02/2009 16:54

Ok cool that is what I needed to know. I will check with Mark on the limits. I know I have that information correct in the 1.5 xdf rev 3 that is in DEV forum. I think I am close to releasing it.

Just going to check one thing and see if I can get the Column values for the F56 table and then it should be 99% error free.

The notes I have on it are:

Cold Engine AFR -vs- Coolant Temp and MAP (F56) (0561) - Uses \$3E variable and has a floor of \$20 and upper limit of \$80. - Need to redo the Map Headings

What should the new MAP Headings be in 3 BAR? 32 - 128?

Thoughts?

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by turbodig - 03/04/2009 16:07

I'm pretty sure this is right. It uses the same scale as F77x, just with different range limiters.

- 68
- 84
- 100
- 116
- 132
- 148
- 164
- 180
- 196

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Re:Buick DIS Ignition configuration - explanation and working .bin...

Posted by scott0999 - 03/23/2009 21:03

just need to clarify from the original 1st post here..

so you ended up giving info to setup for a 60* reference DIS not the 33* buick v6 DIS right?

might want to clarify that. I've had to read this like 20x now lol

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