Megasquirt ms2 manual

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DBC protocol files : Dash Broadcast DBC file or full Realtime Data Broadcast DBC file. Megasquirt patented 29bit CAN protocol PDF manuals Megasquirt-2, Microsquirt, MS2, DIYPNP, MSPNP2 and Microsquirt-module-based EPU (3.4.x firmware) The manuals are divided into three main parts: 1. Configure, 2. Hardware and 3. TunerStudio reference. Manuals can be downloaded as PDFs or viewed by page in your web browser. 1. The manual is set up with quickstart guide, installation, fine-tuning and background information. Megasquirt-2 Set manual PDF WWW Megasquirt-2 Mass on the go (FR) PDF WWW 2. Hardware These manuals include wires, fuel and ignition, as well as details of on-board assembly, which are specific to the exact ECU version. Select the ONE manual for the ECU. MS2/V3.0 Hardware manual PDF WWW MS2/V3.57 Hardware manual PDF WWW Microsquirt Hardware manual PDF WWW Microsquirt-Module Developers Guide PDF WWW Guide du développeur pour Microsquirt-Module (FR) PDF WWW 3. TunerStudio Reference This manual contains a reference to all tuning settings, datalog fields and general TunerStudio usage. Megasquirt-2 TunerStudio Manual PDF WWW Archive Manuals firmware 3.3.x here. Archive web manuals that contain the content of the outdated V2.2 motherboard are available here. Click on the menu buttons directly below to find MegaSquirt® information quickly: MicroSquirt® Module V1/V2 MicroSquirt® ImportantSafetyInformation MicroSquirt®SupportForum MSgpio™ MShift™ TCU MShift™ Intro GPIO Build Guide for 4L60E Base Circuits GPO1, GPO2, GPO3,GPO4 (transmission LEDs) VB1, VB2, VB3, VB4 PWM1, PWM2, PWM3, PWM4 GPI1, GPI2, GPI5(2/4WD, Input2, downshift) GPI3 (Temperature) GPI4 (Brake sense) EGT1, EGT2, EGT3,EGT4 (no CAN load, line pressure, Input3,Input1) VR1 (VehicleSpeed Sensor) VR2 (Upshift button) Finishing touches Testing yourGPIO TranStimStimulator In-Vehicle Testing External wiring guide for 4L60E power release code user settings βeta βeta Code archives purchase aGPIO kit The Shift Table SerialConnectionInfraverter CANbusSet-Up solution vssIssues ports, pins, circuits, connections MShift™ DiscussionForums Misc. MShift™There are MShift™ sitemap template Project Code GPIO Board Intro MShift™/GPIOSupport Forum Note: For V2.1 stim assembly instructions, BOM, etc., see the installation instructions here: www.megamanual.com/v21stim.htm These instructions are for building the V3 forum on standard B&c; Code G (megasquirt-i or megasquirt-ii). If you use a different code, please refer to the installation instructions that came with the code. When you purchase a MegaSquirt ®, the components are usually received individually, with component numbers. As a result, while you need to check that you have received all the items ordered, it is not necessary to identify each element by color, markings, etc. If you have questions about the specification or appearance of any item, first check the part number on the Digi-Key website (www.digikey.com). If you enter the part number in the search engine, you can access both catalog information and the manufacturer's data sheet. To assemble any of the electronic kits, you will need a soldering hook, some soldering hooks and some other useful accessories. The 15-watt pencil iron will work well, but a 25-watt iron will heat up faster. Bring some soldering. For example, you can use 0.75mm resin soldering (~0.030), which really helps to put just the right amount of soldering in just the right places. You do not need to use silver soldering hook MegaSquirt. Allow the soldering iron to heat up before use. The hotter tip allows for faster cleaner joints and less heat in the components because the lead temperature reaches the melting point of the soldering iron before the component has a lot of time to heat up (although the heat of the iron shortens the useful life of the tip for a while). Let it sit powered-up for 10-15 minutes before trying to use it. The soldering paste should melt almost immediately if it touches the tip. Never try to insert the soldering hook into a joint with unnecessary soldering on the tip. Keep the tip clean and heat the bandage (try to get the tip for the joint between lead and PCB) and hold the soldering stick on the other side of the bandage until it melts. Feed just enough soldering pads to get a little of the cone in the joint and ready. Get a soldering paste too – you'll be glad you didn't! Very useful for removing components. Before connecting the soldering hook, make sure you read and understand the installation instructions below. (Note that there is also an excellent tutorial on the assembly of generic electronic kits here: www.mtechnologies.com/building/atoz.htm.) Note: MegaSquirt® components are sensitive to electrostatic discharge (ESD). In order to reduce the possibility of damage caused by the ESD, some is needed. Interestingly, you don't even feel the ESD shock if the voltage exceeds 3000 Volts, much more more to destroy some MegaSquirt® components. ESD events do not always destroy an electronic component immediately after the first occurrence, so the possible failure of the MegaSquirt® very difficult troubleshooting. If possible, use antistatic controls and material handling techniques, i.e. hinge-grounding straps, antistatic foam and antistatic bags, grounded workbenches, antistatic mattes, etc. If you are not wearing a wristband grounding strap, empty yourself by touching the grounded metal before handling NC's and equipment. This is especially important in winter, after taking off or put on clothes such as sweaters and jackets. The material of the dress also has an impact, as materials such as silk and some artificial fibers produce a lot of static electricity. Most commercial carpets contain a high percentage of artificial fibers that are prone to producing static. Where possible, try to keep the room humidity at 50% or higher to reduce static problems, or use a product like Static Guard. Assembly Guide for MegaSquirt® Main Board Version V3.0 MegaSquirt uses a number of components. These components are installed on the silkscreen side of the PCB, and in most cases it will be easiest to solder them on the other side of the board. Electrically, the soldering works well on both sides, but as you get more parts on the board, it becomes harder to solder the components on the side, forcing you to use the other side of the soldering. There are three ways to be sure that you're putting the right parts in the right places with the right orientation. Most electronic components have a standardised identification system. There are several mysterious designations in the construction of megasquirt. Many of these are capital letters and then one or two digits. These indicate the components installed on MegaSquirt® motherboard (or stim, etc.) and are specific to individual PCBs. So R9 is resistance number 9 (R). Note that the main board is an R9, just like the stim, and they are different. Here are some examples: D1 = Diode 1, C1 = Capacitor 1, R1 = Resistance 1, U1 = IC (chip) 1, L1 = Inductor 1, F1 = Fuse 1, P1 = Connector 1, Q1 (sometimes T1) = Transistor 1, etc...... There are also a number of X jumper sites (X1, X2, etc.). They usually set a space on the board to solder a jumper, if you look at the board all the components installed you should see an X1, X2, etc... still visible. They may also have other designations, such as JS4 or JS1. Article 1 Note: The following connector pass-throughs are recommended for MS-II implementation: CPUConnectorDescription JS0IAC1AStepper engine signal 1A JS1IAC1BStepper engine signal 1B JS2IAC2AStepper motor signal 2A JS3IAC2BStepper motor signal 2B JS10IGN Incending output JS6SPR1/CANHCAN High JS8SPR2/CANLCAN Low A themselves, (a) (a) these are often the form or capital letters, and then the numbers. For example, IRFZ44 = a specific component - the injector leading fets. Finally, there is the part number that is used to order the component from the supplier, and this may be different again. For example, the injector leading to FET bank 1 is: Q1 - the component ID of the V3 motherboard, IRFIZ34GPBF-ND - the Digi-Key component number, the general term for this type of transistor is an FET, or field effect transistor. If you're not sure, searching for the manual and/or quickly reviewing the BOM can help you sort. Here are the parts used to assemble the V3.0 main board: Color Code Legend Basic Components Active Flyback VR sensor ignition trigger hall/coil(-) ignition trigger with high-current conductive power limiting sockets Spare cables Please note that some component values may be tweaked – especially in the VR input circuit, but possibly others as well. Follow digi-key BOM values for the specifications of the current component and use them at the values listed below. QTYNeededQTYOrderedMegaSquirt ReferencesDigi-KeyPart Num.Unit CostCircuitComponent Name 1010C1,C3,C13,C18,C19,C23,C26,C27, C28, C29399-4329-ND0.15Basic ComponentsCapacitor 0.1µF 50V 10% CER RADIAL - X7R 33C11,C21,C32399-4326-ND0.32Basic ComponentsCapacitor 0.01µF 50V 10% CER RADIAL 22C16,C17399-1420-ND or 399-3584-ND3.75Basic ComponentsCapacitor TANT 22µF 25V 10% RAD 45C2,C9, C10, C30399-4353-ND0.36Basic ComponentsCapacitor 0.22µF 50V 10% CER RADIAL - X7R 11C20399-4361-ND0.35Basic ComponentsCapacitor 0.033µF 50V 10% CER RADIAL 22C14,C22399-3559-ND1.46Basic ComponentsCapacitor TANT 4.7µF 25V 10% RAD 11C24399-4239-ND0.43Basic ComponentsCapacitor 47PF 200V 5% CER RADIAL 11C25399-4344-ND0.44Basic ComponentsCapacitor 22PF 200V 5% CER RADIAL 610C4,C6,C8,C12,C15,C31399-4202-ND0.218Basic ComponentsCapacitor 0.001µF 100V 10% CER RADIAL - X7R 22C5,C7399-4389-ND0.47Basic ComponentsCapacitor 1.0µF 50V 10% CER RADIAL - X7R 710D1-3,D9-11,D241N4001DICT-ND0.137Basic ComponentsDiode GPP 50V 1A DO-41 11D121727-4231-1-ND0.3Basic ComponentsDiode Zener 24V 1W 5% DO-41 11D131N4742AFS-ND0.22Basic ComponentsDiode Zener 12V 1W 5% DO-41 310D14 ,D15,D1667-1102-ND0.2888Basic ComponentsLED Red Translucent Round 22D17,D181N5819DICT-ND0.39Basic ComponentsDiode Schottky 40V 1A DO-41 11D191N4734AFSCT-ND0.23Basic ComponentsDiode Zener 5.6V 1W 5% DO-41 22D4,D81N4748A-ND0.22Basic ComponentsDiode Zener 22V 1W 5% DO-41 22D5,D7UF5401-E3/54GICT0.64Active flybackDiode FAST REC 100V 3A DO-201AD 33D6,D20,D211N4753A_T50ACT-ND0.23Basic ComponentsDiode Zener 36V 1W 5% DO-41 22F1, F2RXEF050HF-ND0.39SparesPolyswitch RXE Series 0.50A HOLD 22L1,L2495-5611-1-ND0.78Basic ComponentsChoke RF Varnished 1UH 20% 11MOV1P7315-ND1.62Basic ComponentsSurge absorber 20MM 22V 2000A ZNR 11P1A23305-ND/A32119-ND5.07/2.47Basic ComponentsConnector D-SUB RECPT R/A 9POS PCB AU 11P2A23289-ND or A32103-ND7.3/6.86Basic ComponentsConnector D-SUB PLUG R/A 37POS PCB AU N-CH 60V 20A TO-220FP 11Q16FGP3040G2_F085-ND2.17High-Current Ignition Driver IC DRIVER 340V 7.5A ISOWATT220 22Q2,Q4ZTX450-ND0.67Basic ComponentsTransistor NPN 45V 1000MA TO-92 22Q22,Q23ZTX553-ND0.66VR SensorTransistor PNP 100V 1000MA TO-92 22Q3,Q11TIP42CGOS-ND0.6Basic ComponentsTransistor PNP 6A 100V HI PWR TO220AB 99Q6,Q7,Q8,Q10,Q13,Q14,Q15,Q19,Q202N3904FS-ND0.174Basic ComponentsTransistor NPN SS GP 200MA TO-92 22Q9,Q12TIP125TU-ND0.62Active flybackTransistor PNP DARL -100V -5A TO-220 710R16,R19,R26,R27,R29,R42,R551.0KEBK-ND0.077Basic ComponentsResistor 1.0K Ohm 1/8W 5% Carbon Film 55R2,R9,R10,R32,R361.0KQBK-ND0.1Basic ComponentsResistor 1.0K Ohm ¼W 5% Carbon Film 910R1,R6,R14,R17,R21,R44,R48,R53,R5410KEBK-ND0.077Basic ComponentsResistor 10K Ohm 1/8W 5% Carbon Film 35R22,R49,R50100KEBK-ND0.1Basic ComponentsResistor 100K Ohm 1/8W 5% Carbon Film 25R11,R511.0MEBK-ND0.1Basic ComponentsResistor 1.0M Ohm 1/8W 5% Carbon Film 15R2310MEBK-ND0.1Basic ComponentsResistor 10M Ohm 1/8W 5% Carbon Film 25R15 ,R2022QBK-ND0.1Basic ComponentsResistor 22 Ohm ¼W 5% Carbon Film 25R4,R72.49KXBK-ND0.1Basic ComponentsResistor 2.49K Ohm ¼W 1% Metal Film 610R18,R30,R31,R33,R34,R35270QBK-ND0.06Basic ComponentsResistor 270

Ohm ¼W 5% Carbon Film 35R24,R25,R28330QBK-ND0.1Basic ComponentsResistor 330 Ohm ¼W 5% Carbon Film 15R12390H-ND0.1Basic ComponentsResistor 390 Ohm ½W 5% Carbon Film 15R134.7KEBK-ND0.1Hall/Coil(-SensorResistor 4.7K Ohm 1/8W 5% Carbon Film 15R351KEBK-ND0.1Basic ComponentsResistor 51K Ohm 1/8W 5% Carbon Film 22R37,R38TAH20PR050JE-ND9.62Current LimitingResistor .05 Ohm 20W TO220 25R39,R401.0H-ND0.1Basic ComponentsResistor 1.0 Ohm ½W 5% Carbon Film 11R4313FR010E-ND2.76High-Current Ignition DriverResistor Current Sense .010 Ohm 3W 25R45, R4610KQBK-ND0.1Basic ComponentsResistor 10K Ohm ¼W 5% Carbon Film 25R47, R5747KEBK-ND0.1Basic ComponentsResistor 47K Ohm 1/8W 5% Carbon Film 25R5,R82.2KQBK-ND0.1Basic ComponentsResistor 2.2K Ohm ¼W 5% Carbon Film 11R52CT94EW104-ND1.56VR SensorTrim Pot 100K Ohm TOP ADJ 11R56CT94EW103-ND1.56VR SensorTrim Pot 10K Ohm TOP ADJ 11U3160-1300-5-ND0.48Hall/Coil(-SensorOptoisolator w/base 6-DIP 11U4CLA360-ND1.89Basic ComponentsMOSFET Driver LS 4A DUAL 8DIP 11U5LM2937ET-5.0-ND1.83SparesRegulator LDO TO-220 11U6MAX232AEPE+-ND or LT1181ACN#PBF-ND6.31/4.65Basic ComponentsDVR/RCVR 5V RS232 16 DIP 11U7LM2904NFS-ND0.50VR SensorOpAmp Dual SGL SUPP HS 8DIP 11Y1300-1002-ND0.42SparesCrystal 32.768KHz CYL 12.5PF 12NA36-4724-ND2.13Active flybackMounting Hardver TO-220 11NAAE10018-ND2.12Basic ComponentsSocket géppin ST 40POS GOLD 11NAAE10013-ND0.91SocketsSocket géppin ST 16POS GOLD (Max232) 22NAE10011-ND0.50SocketsSocket géppin ST 8POS GOLD (IXDI404PI) 11NAAE10021-ND0.73SocketsSocket géppin ST 6POS GOLD (4N25) 35NA516-1394-ND0.61Basic ComponentsBezel LED Panel 5MM BK Nylon 2PC 11NA237FER-ND2.5CablesConnector DB-37 Nő; 11NA937GME-ND2.58CablesDB-37 Kapucni; 11NAAE1020-ND3.74CablesDB-9 Egyenes átmenő kábel (6,5 láb / 2 méter) Megjegyzés certain components required for optional circuits are included as part of the Basic components if they are the same as each component used in the basic assembly. Spare parts: these are essential components that you can get with a few extra parts in the event of assembly or tuning failure. The installation instructions include tables indicating standard schemes for identifying resistors and capacitors and finding positive wires for polarised components. Note that you can also use multimeters to measure resistances, and some may identify the orientation of the diodes. Finally, you can use the bags that the components come to identify them, the component is specifically, if sometimes a little mysteriously, labeled. The next step by step guide is the V3.0 PCB MEGaSquirt partial kit. First read all of these directions first. Be sure to check out every step as you complete it – so you can take a break and know where you left off. For the first time assembler average skill can expect spending 8-12 hours assembling and testing the MegaSquirt® V3.0 motherboard if you follow the instructions below. To assemble the MegaSquirt® EFI controller, you'll need: The MegaSquirt PCB and all related B&T; G and Digi-Key components from a MegaSquirt® manufacturer, a digital multimeter (DMM) or a voltmeter and Ohmmeter, A DB-9 serial cable that is straight (non-null-case modem, see step 22a). Most computer stores will have it. A male connector is required at one end and a male connector at the other end. If your computer does not have a serial port (many newer computers do not have a USB serial adapter). Windows 9x/ME/XP/Vista/7 PC tuning, TunerStudio - download and install on your computer. The MegaStimulator makes these checks and many other tasks much easier. Everyone should have one of these, especially the first build. General electronic kit assembly tools (screwdrivers, torsos, soldering rods, etc.). You might need a magnifying glass. Many parts of the V3 boards are small and tightly packed, and this requires much better vision than the V2.2 boards. Magnifying glass on the articulated arm can be comfortable, but expensive (although sometimes they can be under $20). Often a simple hand bottle is enough. Proper installation of larger heat-generating components requires the use of a heat-absorbing compound. You can find a small tube to your local electronics store for under $2. The drill, hack saw, file, and 1/4 and 1/8 drill bits are cutting the end plates and heatsink. However, many sellers sell stocks of the closing plates already cut - check with that seller. Don't let The MegaSquirt ® your first attempt to assemble an electronics kit. If you haven't assembled one of these kits before, go buy a simple kit (like Velleman) and practice or combine it with the MegaStim or relay board first. This will help your soldering skills skills assembly of the V3.0 main plate. First Questions To Answer If you have problems with assembly or testing, ask your questions: MegaSquirt Forum (you need to register to post) Be sure to mention the step number and be as specific as you are regarding components, voltages or resistance values, temperature, MegaTune/TunerStudio gauges measured, LED flashing prices or any other information that you think is related. If you have all the above items on hand and a few hours of leisure time, you can begin to put together a MegaSquirt. Assembly continues in functional blocks, tested after each block. These blocks are: Power Supply Construction and Testing (Steps 1 through 23) Construction and testing of serial communications (steps 24-26) Construction and testing of clock circuits (steps 27-41) Construction and testing of input phases (steps 42-55) Construction and testing of an output stage (steps 56-80), all of which, in turn, cover. A tip for those who are about to combine the MegaSquirt: whenever possible, orient the numbers on the components (such as diodes) so you can read the important part if it's all put together. For example, with a 1N4753 diode, make sure you can read part 4753 of the number when the diode is installed in the PCB. With luck it will never matter, but if a problem occurs, you'll be happy you did it. Also, if you are not sure of the resistance value (sometimes it is difficult to pick up the color with a resistance), you can use the Ohmmeter to determine resistance - remember that most of them are 10% tolerance devices, so the measured values are not exactly the designated. If this is your first soldering time, read the installation instructions carefully. This is a file called deploy_guide_DRAFT_040302.pdf in the Files section of the MegaSquirt® Forums list. Power supply construction and testing 1. Prepare to assemble the MegaSquirt. Plan to take 6-8 hours for the average person with average skills to perform assembly first. Familiarize yourself with PCB, Schematic, BOM, and this installation guide – make sure you have everything available to put together with the MegaSquirt. The above diagram can be a useful guide to finding components when assembling. To print, click components.gif and print it from your browser. Keep in mind that if you purchased a complete set from a distributor, the appearance or markings of certain components may be imitated, as listed in this guide. Note the additional instructions and clarifications included with the kit. Use an Ohmmeter (digital multimeter resistance) to check the resistance between the three voltage control holes. The voltage regulator U5, near the DB9 connector on the upper left side of the board (the heatsink). Between any of the three holes, the resistance must be infinite. If not, contact the vendor from whom the inventory is (This test ensures that the 12V power supply, the 5 Volt internal and the soil is not short-cut.) Trial fits the PCB in the casing before soldering anything to it. The printed circuit board (PCB) may be slightly too wide and too long to fit properly in the case. It is designed to be 6.00 long 4.00 wide (152.4 mm × 101.6 mm). The PCB manufacturer allows for some tolerance, so some boards don't quite fit in without a little announcement. First, check the width. Remember that you need to slide the board perfectly straight or bind, even if it is the right size. If you still can't slip on the board, ailing the box sometimes makes all the difference. The boards bind when the edges are sharp, but slide right when cleaned. If that still doesn't work, you can before soldering anything from the tables file side down a bit. Use 12 (30 cm) finishing files. Slide the board back and forth on both long sides for about 30 seconds. (If you don't already have your case yet, you can proceed and check the dimensions later, you'll just have a finer task). Note: you can also check the length of the board in the case. Slide the board into the case. The 37-pin sub D connector mounting surface should be on a plane to the back of the case, look at the other side of the board (DB9 connector side) and see how much should be filed down, so the lid can be mounted on a plane of the case. You may need to take the 0.025 (0.6mm) grading from this page, which can take up to 60 seconds with the file. When you're done with the board should fit nice and comfortable. Get the heatsink ready. You'll make it out of 1/8 (3mm) aluminum flat straps, 3/4 wide (19 mm) to 6.00 inches (152.4 mm) long. You drill 8 holes in it to match the area of the PCB heatsink. U5, Q12, Q11, Q5, Q9, Q3, Q1 and Q16 (no holes are required for R37 and R38) on the heatsink holder. The easiest way to get the hole spacing right through the holes in the PCB is by placing them together and using a felt pen to mark the hole location of the aluminum strip on the PCB. Be sure to have enough space in the aluminum strip to fit the case and allow enough space to not contact the component leads. Make sure that the heatsink is supported in the cover when it is installed so that it is between the heat line and the heatsink. Sand on both sides of the heatsink to make sure there is no line. The wider lip on the side of the house is close to the heatsink side of the board. This allows you to close the top cover case. Mock up by just sliding the board in case you end up with caps down, put it in the top case in half and slide the heatsink along the top, you'll see why you need a fatter lip on the side of the bottom case half the heatsink end. Aluminum should fit the case lip for a little extra heat transfer. 2. Now we install the two external connectors, DB9 and DB37. Install and solder the male DB-37 header (P2) {A23289-ND or A32103-ND} The connectors require a little force ,to snap them into place. Soldering all button to give the headers maximum physical strength. Make sure that the adjacent pins are not bridged with a solder. Also make sure you don't drop any debris under the connectors - once soldered in place, you'll never take it out. Be sure to use the correct connector for the stim and MegaSquirt. Don't mix them up. Do not use any changers to repair incorrectly installed connectors - it will not work! Then install and solder the female DB-9 header (P1) {A23305-ND or A32119-ND}. Note that there is no jumper on the current production tables to connect the +5V to #9 the serial connector. He was always five. It's usually ok, but megaview has a problem. Pin #9 a dead short on the MegaView forum. The quickest solution is to cut pin 9 off the connector or cut the wire pin 9 on the cable - it's not necessary for anything. In future reviews we will make a jumper to supply pin #9 bluetooth wireless devices. If you have that jumper on the main board, all you have to do is remove the jumper to use MegaView. 3. Then install the 40-pin DIP socket {AE10018-ND} for the processor - notice that the notch at the bottom of the board is the equivalent of the PCB silk screen. The socket must be installed at the top of the board and soldered from below. In order to ensure that the socket does not fall out while soldering the board upside down and soldering, you can use a small scotch tape through the socket to keep it in place (this works for many IC's and some other components). Carefully solder the socket and examine any soldering stick shorts (adjacent pins) or cold joints (solder applied to the joint is not hot enough to properly flow, usually there will be a nice cone for soldering). 4. Then install the components that make up the power supply and then check the operation. The first element in the installation is the Perry Metal Oxide Varistor MOV1 {P7315-ND}. It is a large flat plate, about an inch (~25mm) in diameter. It is soldered near the DB37 connector and has no polarity, it can be bypassed in both directions. This part protects the MegaSquirt® the surge of the 12 volt line. 5. Install capacitor C15 {399-4202-ND, 0.001 μF, 102 marking} It goes close to the MOV1 just installed, between it and grippo in the copyright notice. Remember that the 1 night covers the via. This component, and much of the rest of it, (such as resistors, capacitors and diodes) has long drives. In general, you want to install and solder the component so close to the PCB that it cuts the wires from the other side. Transistors are an exception, they should be about 1/8 of the PCB. Note: Many parts lead you need to bend to go into the holes, use round jaw pliers to do so. Part numbering followed by strict numerical numerical so there are gaps in numbers - don't worry about it. If you follow this step-by-step assembly guide, you won't even notice. As mentioned above, don't worry if you have extra resistors left after assembling a MegaSquirt. This is normal as digi-key minimum order quantity for some items. The capacitor identification capacitor can be directly marked with their condensation. If not, you can often marked numbers such as: 104 K50 or 152 K100 The first two numbers multiplied by ten are the power of the third number being the picofarad capacity. For example, since power 10 is 104 = 10 x 10 x 10 x 10 = 10 = 10,000, the first capacitor is 10*10,000 = 100,000pF = 0.1 μF, since 1,000,000pF = 1 μF. The second capacitor is 15 x 102 = 15 x 100 = 1500pF = .0015 μF. Uppercase indicates tolerance, M = 20%, K = 10%, J = 5%, H = 2,5% and F = ± 1pF. The last numbers are the nominal voltage, 50 and 100 Volts in these cases. 6. Install and solder C16 {399-1420-ND or 399-3584-ND, a tantalal capacitor, 22 microFarads (μF), 226 markings} - make sure polarity is observed. There's a little + near the positive lead. Longer lead is always the positive driver. Located next to the DB9 connector. 7. Install and solder c17 {399-1420-ND or 399-3584-ND, tantalus, 22 μF} - make sure polarity is observed. Longer lead is positive on all capacitors. It is located next to the C16 capacitor installed just now, near the DB9 connector. 8. Install and solder C18 {399-4329-ND, 0.1 μF, 104 markings}. This connects to the C17 capacitor near the DB9 connector, just above the heatsink area (closer), which you installed in the last step. 9. Install and solder C19 {399-4329-ND, 0.1 μF capacitor, 104 marking}. This cpu is #1 near the pin. 10. Install and solder c23 {399-4329-ND, 0.1 μF capacitor}. This is installed near the #21 of the processor. 11. Install and solder c22 {399-3559-ND, 4.7 μF electrolytic} - make sure polarity is observed. It's very close to C23. 12. Install and solder the D9 {1N4001DICT-ND} - make sure that the banded end is properly installed as a board. It installs near the DB9 connector, very close to U5's heatsink. To do this, be sure to end the diode of the band on it by going to the end of the silkscreen (the D9), which the band will next time as well. Capacitors: LEDs: Diodes: Longer lead of polarized capacitors (not all) are sometimes small + LEDs are marked with longer lead and against the flat wire of the case. If the LED is visible inside, the cathode (which is on the same side of the apartment would be) is the larger electrode (but it is not an official method of identification). In the end furthest the band (forward driving). 13. Install and solder the D10 {1N4001DICT-ND} - make sure that the banded end is properly mounted as a board. This is installed near the previously installed MOV1. 14. Install and solder D11 {1N4001DICT-ND} - make sure that the banded end properly as a board. This is installed near the previously installed MOV1. 15. Install and solder the D12 {1727-4231-1-ND, 24 volt Zener} - make sure that the banded end is properly mounted, as shown on the printed circuit board. It is very close to the D10 and D11. This installs very near D10 and D11. 16. Install and solder diode D13 {1N4742AFS-ND, 12 Volt Zener, 1N4742 marking} - make sure banded end is installed correctly as a board. In the copyright notice, it is located above the column of capacitors above the Grippo. 17. Install and solder the D19 {1N4734AFSCT-ND, 5.6 volt Zener, 1N4734 marking} diode - make sure that the banded end is properly mounted like the board. It is located at the top right of the board (near the DB37 and heatsink), under the Q14 and Q10 transistors and R32, R30 & R31 resistors. 18. Install and solder L1 {495-5611-1-ND, induktor, 1μH, small coil wire lead}. The CPU slot is installed near the notched end. Space the induktor about 1/8 (3mm) off the PCB to avoid shorts under the tracks. 19. Install and solder L2 {495-5611-1-ND, induktor, 1μH}. It is installed between the CPU socket and the DB9 connector. Space the induktor about 1/8 (3mm) off the PCB to avoid shorts under the tracks. Boot Header (H1) on a board near Q9 is used to reprogram megasquirt® (code that uses tuning parameters rather than tuning parameters). It is not used in megaSquirt-II. Leave it open, and I'm not supposed to transfer you in either case. In most cases, you don't have to touch it. Depending on what you want from the MegaSquirt® EFI controller, though, you'll end up using the boot header to eventually load customized code, such as MSnS-E, etc. to load the new code put a short curved wire between the two H1 holes. Some people have placed a momentary switch through the boot header and place the switch so that they can enter bootloader mode simply by pressing the switch while turning on without opening the case. (If you do this, make sure you can't accidentally press it.) Instructions for loading the ® megasquirt code (not MS-II) can be found here. 20. Installation and soldering of F1 and F2 (RXEF050HF-ND}). These are 1/2 Amp poly fuses (small yellow plates that resemble some capacitors) that act like a circuit breaker for the 5V supply of pcb to the regulator. F1 installs very close to the DB9, in the middle of some capacitors already installed. The F2 is close to the center of the DB37 connector, very close. 21. Install the U5 voltage regulator {LM2937ET-5.0-ND}. This section is located near the DB9 connector at the top of the board. Use the heatsink compound on the sheet and use the nylon screw and nut to fix the PCB. The wires go through the board and are soldered on the top side. 22. Now you have to make a decision on the optional component: if you are using an IAC step motor with megaSquirt-II, you must install a jumper from a hole labeled S12C on the hole labeled JS9 (+12C). These on the lower side of the table, on the DB9 side of the processor. Do not install this jumper is not MegaSquirt-II applications - it destroys the processor! If you are using a step style IAC (such as GM IAC), you must connect jumpers, to get the control signals out to the DB37: Connect (1A)JS0 (under the processor socket) to IAC1 A (near the DB37 connector) - this brings out IAC1A's DB37 pin #25 Connect (1B)JS1 (the processor socket) to the IAC1B (near the DB37 connector) - it brings out IA C1B's DB37 pin #27 Connect (2A)JS2 (under the processor socket) IAC2A (near the DB37 connector) - this brings the IAC2A out to the DB37 pin #29 Connect (2B)JS 3 (under the processor socket) to the IAC2B (the DB37 connector) - this brings out the IAC2B on the DB37 seems #31 If you will use an ignition output signal to control a coil or ignition module with MS-II, you will probably need to control jumper JS10 a : IGN, or IGBTIN, the IGBTOUT jumpered ign (Check the documentation for ignition setup!). If you are going to use can communication between tables (e.g. MS-II and GPIO), you need to transfer JS6 to SPR1/CANH and JS8 to SPR2/CANL S for MS-II implementation, we recommend the following connector signal gateways: CPUConnectorDescription JS0IAC1AStepper engine 1A JS1IAC1BStepper engine signal 1B JS2IAC2AStepper engine signal 2A JS3IAC2BStepper engine signal 2B JS10 IGN or IGBTIN (w/ IGBTOUT->IGN)Ignition output JS6SPR1/CANHCAN High JS8SPR2/CANLCAN Low (Note: If you are using a PWM-style idling controller instead of a stepper iAC, see #62 step.) 23. Now you have the power supply together. Before you go any further, you will check that the supply is working. For testing, install a battery in the stimulator and connect it to the DB-37 connector on the ECU motherboard. Then a DMM (digital multi-meter) with DC VOLTS setting, check the 5 Volts with the 40-pin processor socket installed in step #3 (which is empty) - there must be 5 Volt pins between 19 (ground) and 20 (+5), there should also be +5 pins 1 and 31 (check the ground 19) and the ground potential pins 2 and 32 (check against +5V for 2 pins 2 An easy way to probe it with the help of a component driver, they cut out one of the resistors and wrap around the DMM probe tip, then plugging it into the outlet. Note that the PCB is oriented, so the copyright notice at the bottom (and can be read right upwards), pin #1 to the 40-pin socket is at the bottom right (the same end of the notch) and then goes up to the 20 pins on that side and then across the other side at the top and then down - it traces in opposite directions to circle. Select the check box below while measuring the voltage between the earth pins at the top and the +5 pins on the left. In all cases, you should receive a voltage between 4.9 and 5.1 volts (if the multiple meters are accurate). Pull out the stimulator when you're done. Pin basis 2 19 32 1(5 Volt) ____ ____ ____ 20(5 Volt) ____ ____ ____ 31(5 Volt) ____ _____ ____ If you installed the S12C on the JS9 jumper (the step motor IAC control only MegaSquirt-II), you also need to stim voltage (typically ~ 9 Volts) to pin 16 to the processor socket. If you do not meet the tests above, check again all the assembly steps in this section to make sure that the correct components are installed in the correct orientation. If all is well, check the troubleshooting tips. Serial Communication Construction & Testing 24. It then assembles the serial port connection and checks the operation. First, install the capacitors C26, C27, C28, and C29, soldering them in {all 399-4329-ND, 0.1 μF, 104 markings} in the appropriate locations near the DB9 connector. 25. Then solder the MAX232, U6 {MAX232AEPE=-ND or LT118ACN#PBF-ND} serial communications - note the correct orientation of the silk filtering. If you purchased a socket u6 {AE7216-ND or AE10013-ND}, install it first, and then insert the chip into the slot. The notched end goes towards the DB9 connector, make sure it is mounted in the correct direction. Soldering in place on the back side. 26. Now it is enough to test the serial link. To verify functionality, follow these steps: Use Ohmmeter to verify that the DB-9 serial cable is indeed a pass-through, not null modem. All DB connectors with pin numbers are molded with plastic insulation around the pin holes at both male and female ends. The numbers are quite small and you may need a flashlight and magnifying glass to see them, but there they are. Make sure pin 1 at one end is connected to pin 1 at the other end, and then make the same check for pins 2, 3, 5 and 9. If all these check out, you can proceed, otherwise you need to make another cable. I repeat: The 2, 3, & 5 taps on the cable must all be connected and straight. The #1 and #9 pins are 5 volts; pin #1 5 Volt because it is the standard serial specification (but not used MegaSquirt), pin #9 5 I had the power of bluetooth wireless device. The 1, 2, 3, 5, & 9 pins are the only connected pins on the PCB. The DB9 pin features are: Pin 1 - VCC (5 volts) Pin 2 - Tx (OUT) Pin 3 - Rx (IN) Pin 5 - ground Pin 9 - 5 Volt (bluetooth device power supply) If your laptop has a DB-25 serial port rather than a DB-9, you can use a DB-9 DB-25 adapter, available in most computer stores. With the rare DB-25 PC port, a straight-through connection pins 2, 3 and 7 (two, three and seven) the DB-25 connects pins 3, 2 and 5 (three, two and five) to the DB-9, respectively. If you don't have a serial port (some newer laptops don't), you might be able to use a USB port. The USB port on your computer cannot be connected directly to a db-9 connector. You can buy a USB adapter that can work with MegaSquirt. This is more expensive than the simple adapter solution. There have been some reports of problems when using the USB RS232 adapter, although some people have managed to get them to work. Az that some people were it is: www.sewelldev.com/USBtoSerial.asp is only $20. Others found that the Keyspan USB serial adapter model number is USA-19 QWworks. You need to download the new driver and go to keyspan serial assistant. In it you need to change the baud rate to 9600 and com port 1. The default value is 6. You can buy a CompUSA for $49.99. If you are using a USB adapter, you may need to set the buffer size to NULL (0). You can change this in Control Panel in the System, Hardware, device management area. The default buffer size for these adapters is typically 14 bytes. If that's the case with yours and you left the default, you don't need to check the stream no matter what else you do. Connect the serial cable to your computer, but not the MegaSquirt® ECU yet. Use alligator clips or something like jumper pins 2 and 3 at the loose end of the cable. It provides a feedback circuit to check your computer's operation and cable without the MegaSquirt® hardware yet. Download the HyperTerminal configuration file (megaSquirt) click on the link (then go to step D), save it to your hard drive, then click the icon to start HyperTerminal (use this file MegaSquirt-II, set the baud rate to 115200). Note that the configuration is configured for the com port #1, you may need to change this. OR you can set hyperterminal yourself: i. On your computer, locate and run HyperTerminal (Hyperterminal is usually located under Start/Programs/Accessories/Communication, but if it's not there, look for a file called hyperterm.exe). If you don't have HyperTerminal installed, you can get it from Hilgraeve, who wrote the original for Microsoft Windows. HyperTerminal Private Edition (HTPE) is what you want and it's free for personal use. ii. When hyperterm appears, click on the red phone icon and enter a backup file name (whatever you want, say it, megasquirt). iii. When the Connect dialog box appears, under Use Connection, select the COM port to which the DB-9 cable is connected, com1 or COM2. Don't worry about the other settings. Click OK. iv. Then a dialog opens at the speed of transmission, stop bits, etc. Set the values according to the table below. Note the last one, Flow Control, is very important € be sure to set none. Click OK. Enter the character - it should be echoed back to the screen, ie you will see that once you do not have local echo enabled, twice if you do not. Note that the above configuration file is off to set local echo. If the character you type appears on the screen, the link works. If not, check the cable connections and try the different COM ports. Before you proceed, the characters must reverberate correctly. If the connection works with the cable feedback, time to connect the DB-9 cable to the Ecu. Remove the jumper at the loose end of the cable and connect the MegaSquirt® DB-9 connector. Jumper with pin 12 pin 13 to 40-pin processor socket [near R44], a depressed component driver (ie loose thread with a resistance or capacitor, smaller is better not to damage the socket). Be sure to count correctly jumper the right pins. Pin 1 is to the left of the notch on the chip (if the notch is up). Do not test the feedback, you need to apply energy first. Finally, connect the stimulator megaSquirt® power supply. This allows for a full feedback test, all data sent to pin 12 through the MAX232 chip and all related communication circuits on the board. Type any character again and you'll get it to echo it back to the screen. Again, if this is the case, you've tested the communication circuits. If not, you can check solderings for sockets and components, check voltage of the MAX232 chip connections and so on. Once you're done testing, disconnect the stimulator and remove the jumper from pins 12 and 13 on the processor socket. Clock Circuit Construction & Testing 27. It then assembles the clock circuit for the processor as well as the battery voltage sensor circuit. Install the C1 {399-4329-ND, 0.1 μF, 104} and soldering hook. It is located near pin #20 the CPU socket. 28. Install and solder c20 {399-4361-ND, 0.033 μF, 333 markings}. It is located in a row of three capacitors above the L1 inductor installed (above .info in the copyright notice) 29. Install and solder the C21 {399-4326-ND, 0.01 μF, 103 notation} installation and re-authentication. It is located next to C20. 30. Install and solder C24 {399-4239-ND, 47 pF, 470 marking}. This is installed next to the C21 {399-4344-ND, 22 pF, 220 markings}. It installs near the Y1 square silkscreen pad. 32. Install and solder R1 {10KEBK-ND, 10K, brown-black-orange}. This CPU socket is installed near #18 socket. The resistance has no polarity, so they can bypass it in both directions. Resistor Legends: Resistors can be identified by colored band markings: Resistance Band Color Reference Color Band 1 Band 2 Multiplier Tolerance Black 0 0 x 1 unused Brown 1 1 x 10 unused Red 2 2 x 100 unused Orange 3 3 x 1000 = 1K unused Yellow 4 4 x 10000 = 10K unused green 5 5 x 1000 00 = 100K unused Blue 6 x 1000000 = 1M not using Violet 7 unused unused Grey 8 8 unused White 9 9 unused Gold not used unused divide 10 ±5% Silver not used is distributed 100 ±10% Not used unused ±20% Example - this resistance: band1 band2 multiplier tolerance 4.7K Ohms, because band1 is yellow =4 , band 2 violet=7, and the multiplier is red = ×100, making it 47×100 = 4700 Ohm = 4.7K Ohm. The tolerance is ±10%. Remember to start just before the end and furthest from the gold or silver band, or, for 1% resistors, from the wide distance between the last two bands. 33. Install and solder R2 {1.0MEBK-ND, 1M, brown-black-green} this is near R1. 34. and solder R3 {51KEBK-ND, 51K, green-brown-orange-gold/silver}. This CPU socket is installed near pin 21. 35. and solder R21 {10KEBK-ND, 10K, brown-black-orange}. This supports installation between C20 and C25. 36. Install and solder R22 {100KEBK-ND, 100K, brown-black-yellow}. This installs between the Y1 keyboard and components that have already been installed nearby. 37. Install and solder R23 {10MEBK-ND, 10M, brown-black-blue}. This installs between the Y1 pad and the CPU socket. 38. Install and solder Y1 {300-1002-ND, 32768 Hz crystal, very small silver ones with two tiny wires}. Remember that Y1 is physically fragile, do not drop it. The crystal won't work if it touches other parts, so make sure they don't stop. Bend the wires at an angle of 90 degrees so that the crystal is parallel to the PCB. Note: You can glue the crystal to the printed circuit board with a silicone rubber adhesive (RTV) or hot glue. A small blob on the lower side of the crystal cushions the crystal and softens mechanical vibrations. A small metallic grounding plate is also available for this purpose. Insert the CPU U1 (the MegaSquirt® 68HC908 (MegaSquirt) processor has a notch facing down (lined up with a silk screen and socket notch). You may bend the lead inwards a little to put it in the socket - be careful not to break it off. In the case of MegaSquirt-II, the MegaSquirt-II daughter card, and the end closest to the 68 pin) is placed in the notched end of the socket (closest to the edge of the PCB). Keep in mind that bending CPU wires can be complicated. The goal is that the width of the CPU leads to exactly the same width as the socket pins, exactly 0.600 inches, before trying to firmly push the CPU into the slot. Ideally, you want to bend all the keytobs at the same time. One technique is to hold the CPU with your thumb and forefinger on each hand, so that on one side all pins against a rigid flat surface. Thumbs are at the top of the CPU at both ends, and your index finger is between the pins. By tilting the CPU firmly to the smooth surface, it bends all wires on one side of the CPU. Slowly, a mini bend a few degrees each time. Be careful not to bend the pins too much. Take more control to fit the socket as you go along. If you run into difficulty displaying the technique, place the CPU on a flat surface as if it were in the socket. Now turn the CPU up 90 degrees so the stand is on the table and the pins are on its flat side. The second method is to bend all cpu pins at once, take an extra long needle nose pliers and grab all the pins at once. The twisting motion applied with the hook bends all the pins at once. Carefully, it works even if the needle nose pliers are just long enough to grab half the pins. Just make the bend in two steps. 40. You are now ready to test the processor's operation. Connect the DB-9 serial cable to the tablet and computer, we will ensure that the software is in place, both the processor program the computer. Note that the 68HC908 processors (the standard MegaSquirt controllers) have the code loaded. Simply install MegaTune/TunerStudio with all the default settings and be ready to run. Note: If you are using a new MegaSquirt-II daughter card and have passed the feedback test, you may need to install the firmware. You won't be able to perform the TunerStudio tests until the CPU has the firmware loaded on it. (The MegaSquirt® with the boot jumper installed on two pins on the daughter card is usually not the firmware loaded, the MegaSquirt-II is the jumper with only one pin already firmware loaded – it doesn't hurt to reload.) Get the latest version of MegaSquirt-II code here: www.megamanual.com/ms2/code.htm Download the correct firmware and downloading (the downloader is here) of the chip. Install the downloader by clicking the file and following the instructions. Keep in mind that V2.0+ versions of the downloader can get the latest code and INI from the Internet and install them if your computer has Internet access. You can initiate this by using the File/Update menu item. To get the downloader work: Power down MegaSquirt® EFI controller, Put the boot jumper on both pins of the header marker BLD (the bootloader) to MegaSquirt® (not the main board). Power up MegaSquirt® (plug in stim). The LEDs on the MegaSquirt® flash very briefly (if installed), you can go out. This is the correct response to the LEDs when the MegaSquirt-II goes into bootload mode (ie when the bootload jumper is turned on). Start the download program. Select and select the appropriate COM port, select the appropriate one. S19 file and the downloader will read, write and check the code on the processor after about 10 seconds. The process ends with a message that the check succeeded, with a total of 999 records (4 skipped). Stop the downloading program. Remove the power from the MegaSquirt®, remove the boot jumper (or put only one pin in the BLD header storage), Start TunerStudio and set the COM port and speed if necessary. (If you've changed your code version (or loaded the code for the first time), you might need to change the INI file to match the new code. You can find the correct links through this link. File names are names such as megasquirt-II.ini, where 2.8 indicates the code to use. For icon details, see the readme file in the package. To perform tests in this step, you also need to install a TunerStudio version on your computer (this is also the program you will use to tune the fuel injection in your vehicle). To obtain TunerStudioMS (full) use the www.efianalytics.com/TunerStudio/ Run TunerStudioMS on your computer by clicking the icon on the desktop. Enter the Communication window and select the appropriate COM port control of the ECU operation does not work and should therefore not be fooled). Exit the screen (back to the main window). 41. Connect the stimulator to the ECU. On your computer, the Click the track gauge on the right in the opening screen, and then click the Clock gauge. This creates a new gauge instead of the previous one. (Note that if you have MS-II code 2.8+, you may need to set the world ECU Type under Fuel Setup/General, otherwise all other menu items will be grayed out.) The clock should be counted, increasing every second (it will roll over to a value of 255 for MS-I or of 65535 for MS-II™ controllers, and then go back to zero). If the number of seconds is there, it's running! If not, check the cable, check for electricity, and check the COM port. The only other value is the gauges that work properly at this stage of the Battery Voltage gauge - it is necessary to display the battery voltage (usually about 7.0-8.5 Volts, depending on the stim 9 volt battery status). All other gauges will have a way with the numbers. If you do not meet the tests above, check again all the assembly steps in this section to make sure that the correct components are installed in the correct orientation. If all is well, check the troubleshooting tips. Input Section Construction & Testing 42. Remove the processor from the 40-pin socket - use a thin screwdriver and pry it out of the socket, first one end, then the other - and place it back on the foam pad with which it was delivered. Now installs all input sensor components. 43. Install and solder c3 {399-4329-ND, 0.1 μF, 104 markings}. This is located at the lower right of the board (near the DB37, furthest from the heatsink) between the hole column V2 and the SPR2(CANL)/SPR1(CANH) holes. 44. Install and solder c2, C9 and C10 {399-4353-ND, 0.22 μF, 224 markings} They install the column of capacitors above the Grippo in the copyright notice of the silkscreen at the bottom of the board. 45. Install and solder the C4, C6 and C8 {399-4202-ND, 0.001 μF, 102 marking} The install the column of capacitors above the Grippo in the copyright notice of silkscreen at the bottom of the board. 46. Install and solder C5 and C7 {399-4389-ND, 1.0 μF, 105 markings}. They install the column of capacitors above the Grippo in the copyright notice of the silkscreen at the bottom of the forum. 47. Install and solder R2, R9 and R10 {1.0KQBK-ND, 1K, brown-black-red}. They install the column of resistances over & the copyright notice for silkscreen at the bottom of the forum. 48. Install and solder R5 and R8 {2.2KQBK-ND, 2.2K, red-red-red}. They install the column of resistances over & copyright notice for silkscreen at the bottom of the forum. 49. Install and solder R11 {4.7KEBK-ND, 4K, brown-black-green-gold}. It installs the column resistances at the bottom of the forum. 50. Install R11 and R10 are part of the EGO input circuit (with C10). It is very important that you do not install a capacitor on the R11 (C10 (C10 R10 and R11 and ok). Some people have suggested adding such a capacitor to the smoothness of the sensor input. This causes problems, especially with broadband analog outputs, as you can find out with Innovate LC-1. Also, if you have a broadband sensor/controller, be sure to land the controller at the same point as MegaSquirt! 50. You will then have to make a decision. There are two input circuits for the tach signal: the Hall/optical/etc. circuit takes over the square wave input of a Hall sensor, optical sensor or dots. It can also be used to trigger out the coil (but only if it is not checked for ignition timer). The VR circuit takes the shit signal from a variable reluctor sensor and converts it into a square wave used by the MegaSquirt. The Hall circuit can be built in two ways - for digital signal, such as Hall sensor or optical sensor (step 50.a) or coil negative terminal (50.b.): these are the same circuits, but different components. The VR circuit installation is on the 51st day. In most cases, you need to install both circuits and make the selection with jumpers between them. However, if you do not want to install the Hall/optical/points circuit, skip ahead to #51 step. If you're not sure what input circuit to use, make sure that the ignition is listed and follow the link instructions if it's as follows: To install and solder the Hall/optical input circuit (or no coil-connected points), R12 {390H-ND, 390 Ohm, 1/2 watt, orange-white-brown} This is installed between the currently installed resistors and the CPU socket. This resistance shall be mounted approximately 3 mm above the surface of the PCB. Also, the value of the resistance may need to be changed if the trigger on the negative side of the coil depending on application - starts with the included value, and if it gets hot while the engine is running, then increase the value in increments of up to 10K (like 470 Ohms, 560 Ohms, 680 Ohms, 1K, ...) or even some applications (contact the MegaSquirt Forums list for advice). However, do not adjust this resistance when assembling unless there is good reason to do so. Install and solder R13 {4.7KEBK-ND, 4.7k, yellow-purple-red}. It is located in 3 places close to the heatsink as R12 (which I just installed). Install and solder the markings C11 {399-4326-ND, 0.01μF, 103}. It installs at the top of the line of vertically oriented capacitors above bowling in the copyright notice. Leave C30 empty - DO NOT leave it. If you have a Hall sensor or optical sensor, do not install D1, but place a sweater in its place. It is located next to the R12, further from the heatsink. For most installations, the D2 {1N4001DICT-ND diode does not require the designation 1N4001}. Do not install D2, replace it with a jumper (made of pressed lead). It is located next to D1, closer to the heatsink. Note: this diode (D2) is only required if the ignition system distortion - most systems do not have such distortion. So, so, Start, you can either solder a jumper wire in this place, or, you can install the diode D2, and then install the jumper around the two leads to the diode - actually shorted it out. The latter allows you to later cut off the jumper, if necessary, by placing the diode back into the circuit. We solder the diode by observing the banded end, as on the board, then soldering a wire sweater through the diode. Installation/soldering-optic separator U3 {160-1300-5-ND, 4N25}. It is located near the pcb headquarters. If you have purchased a socket (AE7300-ND or AE10021-ND) for this part, you should instead solder it in place and then insert the U3 into the socket. Notice the correct orientation (the notch fits the PCB - towards the heatsink, or right to the faucet, which #1 is the PCB's square pillow at the notched end of the silk screen). If none of them are, hold the chip so that the writing is facing you and the right way. The #1 is in the lower left corner. Leave C12 empty - DO NOT leave it. This can be found above Bowling in the copyright notice. This capacitor may need to be installed and/or the value has increased if there are noise problems with the tach signal - values up to 0.1μF will work. A value of 0.001μF is a good starting point. If you later find that there is a intermitte tach signal in the vehicle, but it does not work at all speeds or all temperatures in the car, check the Hall circuit modifications here: Hall input circuit mods This input circuit is also used - during modifications - if you want to spend on the negative side of the coil, since the dots control the negative side of the coil primary circuit. However, you can only turn off the coil negative terminal if you do not try to check ignition timing. 50a or 50b, not both. To release the coil negative locks/dots: Install and solder R12 {390H-ND, 390 Ohm, 1/2 watt, orange-white-brown}. This is installed between the currently installed resistors and the CPU socket. This resistance shall be mounted approximately 3 mm above the surface of the PCB. Also, the value of the resistance may need to be changed if the trigger on the negative side of the coil depending on application - starts with the included value, and if it gets hot while the engine is running, then increase the value in increments of up to 10K (like 470 Ohms, 560 Ohms, 680 Ohms, 1K, ...) or even some applications (contact the MegaSquirt Forums list for advice). However, do not adjust this resistance when assembling unless there is good reason to do so. Install and solder R13 {4.7KEBK-ND, 4.7k, yellow-purple-red}. It is located in 3 places close to the heatsink as R12 (which I just installed). Install and solder D1 {1N4001DICT-ND}. This is the famous Wing Diode - then you want to start this on the negative side of the coil - for example, with dots (reduces the tach signal to false triggers). Instead of D2, install a 22V or 24V Zener diode {1N4748A-ND}, the indicted (ie that the band is at the other end rather than the indicated on the silk screen). Remember that the stim will not be able to send a signal through this diode. If you installed jumper that works on the stim. Later, when MegaSquirt® installed in the vehicle, you need to remove the jumper. If you find that the tach signal sometimes jumps too high (20,000 rpm or more), you can either replace the D2 Zener with a higher voltage hope (28, 32 or 36 Volts) or you can add one or more 5.6 Volts or higher Zener diodes in series to the input wire to the DB37 tap, #24 (banded end of the diode(s) must belong to the negative coil terminal). Installation/soldering-optic separator U3 {160-1300-5-ND, 4N25}. It is located near the pcb headquarters. If you have purchased a socket (AE10021-ND) for this part, solder it in its place and insert the U3 into the socket. Notice the correct orientation (the notch fits the PCB - towards the heatsink, or right to the faucet, which #1 is the PCB's square pillow at the notched end of the silk screen). If none of them are, hold the chip so that the writing is facing you and the right way. The #1 is in the lower left corner. Install and solder the markings C11 {399-4326-ND, 0.01μF, 103}. It installs at the top of the line of vertically oriented capacitors above bowling in the copyright notice. If you are using megasquirt® (i.e. you are not using a ignition timer), install and solder the C30 {399-4353-ND, 0.22μF, 224 marking} If you use the negative side of the coil with MegaSquirt® (i.e. no ignition timing control), install and solder C12, Ed capacitor (399-4202-ND, 0.001 μF, 102 markings}. This can be found above Bowling in the copyright notice. The value of this capacitor should be increased if there are noise problems with the tach signal - good values up to 0,1 μF up to 50μF work. A value of 0.001μF is a good starting point. 51. As is the case in Article 50(1) and (2), it is not in the case of a member of the European One takes the square wave input from a hall sensor, optical sensor, or points. In most cases, you need to install both circuits and make the selection with jumpers between them. However, if you don't want to install the variable reluctor (VR) circuit as well as the Hall circuit, skip ahead #52 step. Install and solder R42 and R55 {1.0KEBK-ND, 1K Ohm, brown-black-red}. R42 is located near the DB37 side of the Y1 pad. R55 is next to it, about 1 ins (25mm) above the 'dash' in copyright notice (the R55 label may be partially blurred by one via). Install and solder R44, R53, and R54 {10KEBK-ND ,10K Ohm, Brown-Black-Orange}. R44 is between U1 and U7 near the center of the board. The R53 is near L1, in the copyright notice above .info. The R54 is located directly above the instrument panel www.msefi.com/msefi - (C) 2005 notification. Install and solder R45, R46, and R48 {10KEBK-ND, 10K Ohm, Brown, R12 R12 located next to R45 high resistance to the PCB), closer to the heatsink. The R46 is located next to the R45, in the copyright notice above the 2005 text. R48 is located very close to the center of the PCB. Install and solder R47 {47KEBK-ND, 47K Ohm, yellow-purple-orange}. R47 is located very close to the center of the PCB. Install and solder R49, and R50 {100KEBK-ND, 100K Ohm, brown-black-yellow}. R50 besides R47, R49 is on the right side (and slight underneath - closer to MOV1), Install and solder R51 {1.0MEBK-ND, 1M Ohm, brown-black-green} in the middle of the PCB. Install and solder R52 {CT94EW104-ND} and R56 {CT94EW103-ND} r52. These are trimmer potentiometers used to tune the VR circuit. The longest lead (and/or one of the closest to the 1 readable case, depending on where the parts are) in each pot should go to the square pad closest to the heatsink. R52 is used to adjust hysteresis, R56 is used to set the zero-intersection point. For the operation of the VR sensor, the vessel on the base of the transistor (R56) must be turned to zero volts and the vessel on the op-amp feedback (R52) must be turned to maximise resistance (i.e. 100K feedback resistance must be provided). This must be turned counterclockwise with both screws. For more information on setting up VR pots, see this link. Install and solder C31 {399-4329-ND, 0.1μF, 104 or 399-4202-ND, 0.001μF}. This is found in the line of vertical capacitors as the fourth cap above the Bowling text in the copyright notice. Note: Capacitor 399-4202-ND 0,001 μF shall be replaced if MegaSquirt receives higher frequency tach inputs. A smaller capacitor helps maintain signal integrity and timing. This 0.001 μF capacitor is particularly useful for high-toothed wheels, including all crank wheels with more than one pulse per ignition, such as the popular 36-1 or 60-2 missing tooth rotation wheels. Install and solder the C32 {399-4326-ND, 0.01μF, 103 marking} This is below C31, away from the heatsink. (Keep in mind that in some cases, if you experience tach-related problems, you may try removing this capacitor.) Install and solder D24 {1N4001DICT-ND}. Note that this item was originally 1N4001. However, studies have shown that the 1N4148 switching diode has much faster reverse recovery time, which can help with high-speed high-voltage signals such as missing tooth wheels. Be sure to match the band of diodes to the band on the silkscreen. This can be found directly above 2005 in the copyright notice, next to the R56. Install and solder Q22 and Q23 {ZTX553-ND}. They are located next to D24 (which I just installed), closer to the heatsink. The side of Q22 & Q23 with rounded edge (i.e. the two the short side) is called a rounded side and for both Q22 and Q23, it will stop the CPU. If you imagined that the side boasting rounded corners was completely round, it would be the same as the PCB silk screen. Be very careful when soldering these, the pin spacing spacing very tight. This is a good idea to clear your soldering tip before attempting it. If you accidentally bridge the lead to soldering iron, you can use a piece of soldering paste (which is a fine braided copper ribbon) and a hot soldering iron to remove excess soldering iron. Note: if you have received the kit from a distributor, be sure to follow the instructions provided with these parts. Install and solder U7 {LM2904NFS-ND}. It is located next to the CPU socket, closer to the DB37 connector. If you purchased a socket for this component (AE10011-ND), install and solder it, and then insert the U7 into the socket. The notched end (or the end of a point in one corner), goes to the end closest to the heatsink. 52. Select the tach input circuit with jumpers: For the VR sensor: Jumper VRIN on the lower side of the PCB (near the DB37, opposite the heatsink) Jumper TSEL vrout (or VROUTINV if you want the VR input reversed) on the lower side of the PCB, near the center. OR (DO NOT install both adjusters, you chose one or the other!) The Hall sensor, optical sensor, coil negative terminals or dots: Jumper XG1 xG2 on the lower side of the PCB, close to the 40-pin socket, Jumper OPTOIN with TACHSELECT at the bottom of the PCB, near the DB37 connector, as opposed to the heatsink. Jumper TSEL for OPTOOUT on the lower side of the PCB near the center. You can use snipped down to lead to the resistance you have installed as jumpers. Note to hall/optical/point circuit: The LED inside the opto-isolator is emits a signal provided by the ignition system. Pulses on inflammation, especially if pulled directly from the primary coil, can rise to a very high voltage. The LED's return path leads to the XG1 bridging pad. This return path can either be directly routed to the deck (by placing the jumper from XG1 to XG2) or the return can be brought out of one of the jump openings of the DB-37 connector (such as the SPR4 to #6) and then grounded with a separate wire on the DB-37 connector, thus isolating the ground. Note: in order for the ECU to work on the stimulator, you need to make the XG1 terminal dependent on XG2, and now we are doing stimulator testing, so install a jumper from XG1 to XG2. When installing the ECU, if you need isolation because the tach signal resets the ECU (for those who touch it directly from the ignition reel (-) terminal), you can remove this jumper and connect the XG1 to the SPR4 and ground this pin (#6 SPR4) with a separate return wire. Note: if you are using tach output from an aftermarket or from many OEM settings, the tach signal is a nice +12V pulse - these work well with the XG1 terminal, which is used for XG2 in the installation. Again: to test with the stimulator, hang XG1 on XG2. Later, after you install this vehicle if you have reset problems, then remove this jumper and jumper XG1 SPR4 and make it out separate back ground wire from the ignition module/distributor distributor #6. This may also be necessary if the Hall sensor input is noisy in the vehicle. To reduce noise, run the ground from the Hall sensor to one of the jumper slots of the DB-37 connector (e.g. DB37 pin #6 SPR4), and then connect the SPR4 to XG1. Remove the jumper to XG2. (Remember that you need to ground XG1 with a jumper wire to run the stim.) Screw the signal wire (DB37 needle#24) and the ground wire (DB37 pin #6) all the way to the ignition module, further reducing the noise of the signal. 53. The MAP sensor (U2 {MPX4250AP}) follows. Mounted on the lower side of the PCB, the vacuum port faces towards the end of the PCB DB37 connector, and sensor markings move away from the PCB so you can read mpx4250AP when installing the sensor. The wires bend towards the PCB and are soldered on the upper side. Notching lead indicates that the pin is #1 - this corresponds to the square bench of the PCB. The MAP sensor is held to the PCB with two nylon screws - do not tighten the MAP sensor too tightly, this distorts the case and distorts the readings by bending the load cell inside the device. And yes, it solders the wires on the top side of the PCB. You need to develop a system to run a tube on the barbed wire MAP fitting to the intake manifold. 54. Install and solder R4 and R7 {2.49KXBK-ND, 2.49K, red-yellow-white-brown-brown}. These temperature sensor bias resistors. In the copyright notice, & over the top of the table. If you want to use other sensors, you can either: change the transmission function files in the MegaSquirt® 68HC908 processor using EasyTherm to change MegaSquirt's code to match the temperature sensors), or megaSquirt-II you can recalibrat the sensor board MegaTune or TunerStudioMS under Tools/Calibrate Thermistor tables..., OR turn off these bias resistors, which in some cases may be easier. Normally, you should use EasyTherm (with MS-I), usually more accurate, as the curve is based on three points, not on the resistance exchange point. SensorMakesResistor (ohms)AC Delco/GMDaewoo, Buick, Cadillac, Chevrolet, Oldsmobile, Pontiac, GMC2.49KFordFord, Lincoln, Mercury27KBosch and Nippon DensoAcura, Audi, BMW, Honda, Infiniti, Jaguar, Kia, Lexus, Mazda, Mitsubishi, Nissan, Suzuki, Toyota, Volkswagen, Volvo (96-up)2.2KMoparChrysler, Dodge, Plymouth9.31KIs it important to note that cross branding and cross licensing affect the type of sensor. For example, the Mercury Villager is actually a Nissan Quest. The Ford Probe is actually a Mazda. The Chevy Sprint was actually a Suzuki Swift. There are many other examples. If in doubt, measure the resistance. To avoid changing the tables of MegaSquirt® code with easyTherm, the value of distortion resistances at R4 and R7 should be the same as the sensor value of the thermistor, which you will use when 81 ° Fahrenheit, 27 ° Celsius. Az however, the preferred method is to calibrate the calibration of EasyTherm (with MS-I) or Thermistor tuning software (with MS-II) whenever possible. 55. It's time for some testing. Install the processor, connect the stimulator, connect the DB-9 to the board and computer, start the tuning software (TunerStudioMS or MegaTune) and create the Realtime Display window. You should see the answers when you move the buttons on the stimulator. First of all, look at the RPM - you need to change when moving the RPM vessels to the stimulator. Keep in mind that if you installed the VR input circuit jumper in step #52, the stim is not currently designed to put out the kind of signal (AC) the VR circuit expects. However, by adjusting the R52 and R56 dishes, you can get a usable signal into the MegaSquirt. The RPM may not be stable at both ends of the 1000-6500 domain, but must be functional at least through this range. Then you will know that the rpm input circuit works that you need. Keep in mind that if the speed does not exceed zero, you will not get an exhaust oxygen (EGO) sensor (O2) signal either. Oxygen sensor sampling is tied to the tach input timing, so if there are no tach signals, the EGO stays at the start value. If you have a tach signal the EGO will respond properly. However, even if you don't have a tach signal (and so you have a non-zero rpm), you can still make sure the MegaSquirt controller responds to the O2 sensor. To do this, check: The MegaSquirt® controller powered, note the O2 value, turn off the power to the MegaSquirt® controller/Stim, turn the O2 pot into the stim in a different position, turn the MegaSquirt® controller/Stim power back on, You should see another O2 value in the tuning software. All sensors must respond to the appropriate vessels of the stimulator. Before you do anything else, go to Calibrate Devices/AFR Table and select the sensor. Then, when you move the O2 vessel, the voltage O2 moves independently of the other settings (but the speed must be above zero, as mentioned above). On the other hand, the EGO correction word (or equivalent gauge on the tuning screen) does not move 100% if there is no EGO correction parameters properly, and MegaSquirt detects the right inputs to activate the EGO correction. Note that if you have not connected the TPS to the MegaSquirt® EFI controller (for example, for testing in the car), the TPS value will slowly creep to the maximum and the O2 correction will be disabled. Check that the tuning software displays approximately the correct atmospheric pressure if there is no vacuum. Below is a diagram of normal atmospheric pressure at different altitudes. MegaSquirt® usually must be within 4 or 5 kPa of the values below the height. Atmospheric pressure vs. Altitude Atmospheric pressure feet kiloPascal(kPa) 0 0 101.33 500 150 99.5 1000 300 97.6 1500 450 95.9 2000 600 94.0 2 2500 760 92.5 3000 920 90.8 3500 1070 89.2 4000 1200 87.5 4500 1400 85.9 5000 84.3 6000 1800 81.2If the sensor is low and does not respond to vacuum or pressure, probably backwards. Check that it is properly vesied. If not, solder it, turn it over and solder it back. It is necessary to bend the pins in the other direction - be careful not to break them. You may not have damaged any components if you install the MAP sensor backwards. If you do not meet the tests above, check again all the assembly steps in this section to make sure that the correct components are installed in the correct orientation. If all is well, check the troubleshooting tips at the end of the installation instructions. Now all input is wired up. Then we tie the outputs and machining the case panels. Hang the stimulator and DB-9 cable from the board and remove the processor again. Output Phase Construction & Testing 56. Install and solder R14 and R17 {10KEBK-ND, 10K Ohm, brown-black-orange}. They are located near the center of the PCB, the column components are roughly aligned with Q9's heatsink. 57. Install and solder R16, R19, R26, R27, and R29 {1.0KEBK-ND, 1K Ohm, Brown-Black-Red}. The R16 is close to the MOV1 (but a little further away from the DB37 connector). The R19 is on the right side of the resistances (R14 & R17) installed in the last step (R14 & R17) on the other side of the C13 and C14 (closer to the DB37 connector). R26, R27, & R29 are located near the LEDs at the end of the PCB DB9. 58. Install and solder D3 {1N4001DICT-ND}. It is located near the center of the PCB, near R14 and R17. Observe the correct polarity. 59. Install and solder D4 and D8 {1N4748A-ND} - observe the correct polarity. They are located next to the MOV1, a little further away from the DB37 connector. (Note: do not install the D8 if you are using a PWM idle valve.) 60. Install and solder R15 and R20 {22QBK-ND, 22 Ohm, red-red-black}. R15 is located below the Q1 location of the heatsink, R20 located under R38 location of the heatsink. 61. Install and solder R24, R25, and R28 {330QBK-ND, 330 Ohm, Orange-Orange-Brown). They are very close to the LEDs on the DB9 at the end of the PCB. 62. Install and solder the Q2 and Q4 transistors {ZTX450-ND}. These are to the left of MOV1. The white labeled side of the transistor faces the DB37 connector. If there is this transistor of a distributor (as part of a store) then they likely have special instructions for it (search the packaging or contact the distributor). Distributors sometimes make substitutions for various reasons, and so the notes are important. If Q2/Q4 is the standard Digi-Key part {ZTX450-ND}, but there is no white label, the page with rounded edge is the curved side closest to the DB37 connector. Be very careful about soldering these small transistors, clean the tip of the soldering stick and make sure not to bridge the tightly spaced pins. If the or uses a transistor other than the ZTX450-ND from the MegaSquirt/Digi-Key parts ordering side, you can the orientation of the pin, as the order may be different for seemingly identical parts! The PWM Idle Valve Users Only Note - if you are using a pwm idle valve (Ford or Bosch 2 wire valve - see this link for more information), these valves cannot be operated with relays. As a result, a higher capacity transistor must be installed. DO NOT install Q4 on PWM idle valves - you cannot directly handle the current of PWM idle valves. (The On/Off idle valves used with the relay correspond to the default Q4.) Instead, for a PWM idle valve, use a TIP120/121/122 transistor (for example, Digi-Key 497-2539-5-ND, 74¢ea.) for the heatsink (if there is a spare space) or position. Use a shimmer insulator (36-4724-ND, $2.13 ea.) with heatsink grease as well. Run the wires for Q4 connections as follows: Do not install Q20, do not install D8 and R39. You also need to make a 1N4001 diode across the PWM idling valve as well – the banded end goes to the 12 Volt supply, the non-banded end goes to the lead that goes to MegaSquirt® (this diode is the flyback for purposes of the idle valve). 63. Install the C13 {399-4329-ND, 0.1 µF, 104) - and soldering hook. It is located a little closer to the heatsink and a little closer to the DB9 than the Q4. 64. Install and solder C14 {399-3559-ND, 4.7 µF). It's just a little further from the heatsink than the C13 you installed in the last step. Notice the polarity. Recall that positive lead is a little + close to the capacitor's body. 65. It is election time again. In that case, you decide whether to charge the high-current ignition circuit. This circuit can be used to drive a coil with a distributor application. Along with the right input signal (VR, Hall or optical sensor, or even dots), it allows you to remove a separate ignition module, such as a GM HEI 7 or 8 pin module, and run the coil directly from MegaSquirt. If you are not sure what output circuit to use, check that the ignition is on the list and follow the instructions in the link if it is: The following instructions only apply to MS-™. If you plan to use MSnS-E, see the MSnS-E website for instructions on wiring a high-current circuit. If you use MS-I without lighting control, you can either complete this step as with MS-II™, or skip it (it doesn't matter which since the lighting won't be hooked up). If you don't use the IGBT high-current drive circuit, but want to use the MegaSquirt-II output to control the ignition module (7 or 8-pin HEI for example), jumper JS10 from IGN to get the signal out of DB37 pin #36. You don't need a pull up, the processor port one is already enabled (5 Volts). Go forward to move #66. To install the high-current drive circuit: Install and solder R43 (13FR010E-ND), 0.010 Ohm/3 Watt, brown-black-red} r43. It is located near the DB37 close to the heatsink. DO NOT install R57 R57 Ohms, 1/8W}. It causes problems with the VB921 (or BIP373) signal, so skip it. DO NOT install jumpers, simply let the site uninhabited. Install and solder Q16 {FGP3040G2_F085-ND}. This is a special VB921 (or BIP373) dedicated coil drive chip. This is connected to a heatsink near the DB37 connector. VB921 doesn't require an insulator, but it's essential for BIP373. The distributor purchased the kit to indicate which one you have, or follow this link: BIP373 for more information. Use a heat-transmitter compound between the component and the heatsink. VB921: BIP373: Install the appropriate jumpers: MS-II™, install jumpers: IGBTIN (near the heatsink side of the DB37 at the bottom of the board) on the JS10 (the 40-pin CPU socket at the bottom of the PCB) IGBTOUT on IGN - near the heatsink at the end of the DB37 at the bottom of the PCB (it puts the ignition controller ignition signal out of DB37 pin #36) the MSnS-E user MS-I, for more bridging connections and to enable the ignition output, visit the MSnS-E website. Note: If you use the high amperage drive circuit to control a ignition module directly instead of the coil (and you don't want to use the processor port directly - that is, you didn't jump the JS10 to IGN), you'll probably need to add a retractable resistance. This allows the signal to go both high and low rather than floating and low). IBGT also reverses the processor signal, so the Spark Output setting must be reversed. You can do this: Solder a 1K Ohm resistance to the hole marked S12 directly under the R57 (it gives a 12 Volt pullup) or solder a 330 Ohm resistance from a 5 V source in the proto area of the board for a 5 Volt pullup, Connecting jumper wires from the IGBTout jumper to the 1K resistance of the S12 hole, or 330 Ohm resistance to the 5V in the proto area (at the other end as we soldered the board), Do not remove the IBGT from the IGN jumper, just solder the new wire to it. For example, here's a 12v pull-up (red wires): The V2.1 stim (with 5 LEDs) displays the operating igbt circuit using an LED labeled IG. If you want the V2.0 stim (4 LEDs) to display the output of the IGBT circuit, you can change the stim with 330 Ohm resistance, LED and a small jumper wire. The LED flashes in any ignition event, although it can be hard to see at all, but with low rpm (~400 rpm for a V8). DO NOT modify the stim in this way if you use the processor port (if you jumpered JS10 to IGN) to control the ignition module - it can damage the processor! Soldering both sides of the lead that passes through the PCB, it will keep it in place. The resistance wire can be easily clamped into the + terminal block on one side and soldered to the long wire at the other end. This circuit is especially useful to ensure that the coil does not charge (the LED does not light up) when the speed drops very low. This prevents the coil from burning when the ignition key is switched on, but the engine editing parameters in the tuning software). 66. Install and solder U4 {CLA360-ND}, the FET driver. It is located near the Q3 location of the heatsink. If you purchased a {AE10011-ND} slot, solder it into place and insert the chip. Be sure to orient it correctly, the notch or dot on the chips goes to the notched end of the silk screen; this is the end closest to the heatsink. 67. Install D17 and D18 {1N5819DICT-ND}, Schottky diodes. They are located on both sides of the FET driver (U4) that you have just installed. Make sure that the tape on the diode matches the silk screen. 68. Install and solder D21 {1N4753A_T50ACT-ND}. It's just a little further from the heatsink than the D17. Make sure that the tape on the diode matches the silk screen. 69. Again, there is a choice to make sure to install certain components. In this case, you need to decide whether you want to install the PWM re-transfer circuit, as well as the standard flyback circuit. The PWM re-transfer circuit is primarily useful for those operating for pulse width modulation (PWM) with low impedance injections. However, it works well when you install it on high impedance injectors. To install only the standard return circuit, skip step#70: Install the PWM return circuit: Install R30, R31, R34, and R35 (270QBK-ND, red-purple-brown}. R30 and R31 near R37 with heatsink, R34 and R35 close to Q9. Install R32 and R36 {1.0KQBK-ND, 1K Ohm, Brown-Black-Red}. They are located next to the resistors installed in the last step. Install Q9 and Q12 (TIP125TU-ND}). Bend the wires to fit the holes so that the hole on the sheet is aligned with the hole in the heatsink. These transistors can be mounted on the heatsink, but must be insulated between the transistors and the heatsink. Use insulation kits for {36-4724-ND}. You might cut off the glitter insulator slightly to avoid hitting the transistor lead - use sharp scissors. Use a heat-transmitter compound between the component, the shimmer insulator and the heatsink. After assembly, check that there is a very high resistance between the metal ears of Q9 and Q12 and the heatsink. If you get less than about 60K Ohms (± 20K Ohms) resistance, you must correct it. Usually breaking the screw hole and grinding the heatsink slightly solves the problem. After ~ 60K Ohms or more resistance between the sheet and heatsink, solder the leads to the PCB. Install Q10 and Q13 {2N3904FS-ND}. The flat side of the transistors faces the heatsink. They are located near the Q9 and R37 heatsink. The pins are very close together, use a clean tip and be careful not to bridge the joints. There are no installers. Even if you have installed the PWM re-transfer samping circuit, you must install the flyback circuit too (step #70). 70. Installing the standard return circuit: Install the R18 and R33 (270QBK-ND, red-purple-brown} systems. Below these you will find R38 and Q1 in the heatsink. Heatsink. D6 and D20 {1N4753A_T50ACT-ND}. They are located next to the resistors (R18, R33) only installed. Make sure that the tape on the diode matches the silk screen. Install Q3 and Q11 (TIP42CGOS-ND}). These are the heatsinks. No insulation kit is required, the ear may come into contact with the heatsink. Use a heat-transmitter compound between the component and the heatsink. There are no installers. 71. Once again, it is election time. You must decide whether to install the current limit circuit to protect the driver FET. It clamps the current ~ 14 Amps and is recommended that most people install this. Installing the current protection circuit: Install R37 {TAH20PR050JE-ND}. It goes on the heatsink, but there's no mounting hole. You can use the double-sided heat-flowing tape {BER158-ND} to fix that heatsink, but it's quite expensive if you're just doing two resistors. Install R38 {TAH20PR050JE-ND}. It goes with the heatsink too, but there is no mounting hole. You can use the double-sided heat-flowing tape {BER246-ND} to fix that heatsink, but it's quite expensive if you're just doing two resistors. There are no installers. However, the circuit can be abandoned if protection is not necessary or desirable - in this case install jumpers instead of R37 and R38. 72. If you installed R37 and R38 in the previous step, install Q14 and Q15 {2N3904FS-ND} - otherwise you can skip it. It doesn't hurt to install them in any case, however. Use a clean tip and be careful not to bridge the tightly spaced pins. 73. Install D5 and D7 (UF5401-E3/54GICT}. These diodes should be mounted about 1/8 of 1/16 off the board. Make sure that the tape on the diode matches the silk screen. They are located near R38 and Q3. 74. Install Q19 and Q20 {2N3904FS-ND}. These existing transistors (Q2 and Q4) to the left of MOV1 are aligned. Be very careful when soldering, use a clean tip, as the needle distance is very tight. (Note - if you are using a PWM idle valve, do not install Q20.) 75.Install R39 and R40 {1.0H-ND, 1 Ohm, Brown-Black-Gold}. These transistors (Q19 & Q20) installed in the last step are located on both sides. (Note - if you are using a PWM idling valve, install a jumper in place of the R39). 76. Install Q1 and Q5 (IRFIZ34GPBF-ND}, fets (field effect transistors, used to drive the injectors). For these heatsinks, be sure to use heat-transmitter compound between FET and heatsink. They are insulated, so they can be mounted directly on the heatsink. If you have replaced the metal-ear TO-220 (IRFZ34G), you must use a glitter insulation setting to prevent the ear from touching the metal case. Use the diagram below as a guide. (Insulating kits that include glitter, insulating, aher, nut, and screws are available in electronics stores for about $2). Under no circumstances should you drill the larger hole. hole. damage other components. 77. Install and solder Q6, Q7, and Q8 ({2N3904FS-ND}). Follow the screen filter to navigate to the flat side of the transistors facing the DB9 end of the PCB. 78. Now everything is installed except the LEDs - these mounts in the case will end. We need to cut these out before we can continue the meeting. If you don't want to cut your own closing plates, you can get them from CNC made from Front Panel Express (. Download the Frontpanel design software: You can then use the following files: Front Panel: pcb3front.fpd Rear panel: pcb3back.fpd The Frontpanel Designer software lets you modify your files, get an accurate quote, and send them in order over the Internet. It's a very nice system. To trim the MegaSquirt ® do the following: Print the following template and use it as a cutting guide (Please note: *. PDFs do not maintain the integrity of the size. Check the printed dimensions before cutting!). Use the jigsaw puzzle to cut out the DB connector slots or drill several smaller connected holes and file them into a rectangle. Clean the sys and rough edges of a file. Also drill a hole in the MAP sensor vacuum wire. Place the print out with a double-sided tape at the end of the case (line them in front of a bright light so that you can center them accurately). Drill the LED (1/4) holes (make middle punch marks to start the drill). Drill a few holes in the DB connecting squares to cut. Get a piercing saw with a rough blade (used for modeling - it looks like a G clamp with a blade where the thread goes). Practice using piercing to see something else if it's your first time! Cut the print out around and leave a little extra material to grate later. Remove tape and glue with white distillate Clean the connector openings with files. (The cut probably wasn't clean enough to leave,,) Drill the hole required for the selected MAP sensor hose scheme. (Steps through d is a great start to the drill and file method as you will have a layout to follow. You can also drill several holes and proceed directly to the filing of the openings, if you will. Aluminum is very soft and the files are fast and easy). 79. Now make one case in half and install the PCB in the second down slot off the top. Note: The larger lip on the side of the house is close to the heatsink side of the board. This allows you to close the top cover case. Aluminum should fit the case lip for a little extra heat transfer. 80. Then mount the LEDs - D14, D15 and D16 {67-1102-ND} to the font of the case and bend the leads down on the board and solder it. The flats of the LEDs (the side with the short wire) face towards the DB9 connector. First install led holders on the front panel through the front panel. Then the LEDs push it into the back of the holder. Install the front panel of the housing party (which has pcb). Align flat on the led lip side (the side with the shorter wire) to the DB-9 socket (all LEDs). You will see that the PCB silk screen also has a dash above the LED circle symbol indicating the side of the apartment. Bend the LED leads down to enter the PCB holes for them - you'll have to do a trial fit and then cut the leads off a little bit. See illustrations below. Then we solder the LEDs to the top of the PCB. It's a bit tricky - take it on time. Congratulations! The MegaSquirt® is complete! Take a look at PCB to make sure you haven't missed any components (people often miss C1 in the #27 step). If everything looks complete, you are ready to test it all! Connect the MegaSquir® processor, DB-9 cable, and stimulator (with battery). On the stimulator, you need to see that the injector LEDs light up and follow the RPM. (Keep in mind that if you installed VR input circuit pass throughs in #52 steps, the stim is not currently designed to put away the kind of signal (AC) that the VR circuit expects. However, by adjusting the R52 and R56 dishes, you can get a usable signal into the MegaSquirt. The RPM may not be stable at both ends of the 1000-6500 domain, but must be functional at least through this range. You'll know that the speed input circuit works that you need.) Furthermore, the fuel pump light should be sweaty, and if you have 145 degree coolant temperature (adjust the stimulator), the fast idle LED will also light up. The MegaSquirt: D14 (closest to the DB9 connector) is lit each time an injector is fired. D15 (centre) is the warm-up enrichment (WUE). It lights up when in the warm-up position (i.e. when the coolant dish in the stim is set to a value where the warm-up enrichment is greater than 100%). The D16 (furthest from the DB9 connector) is accel enrichment (AE). This will briefly ignite when you turn your TPS pot into a stim of idle to full throttle. If you do not meet the tests above, check again all the assembly steps in this section to make sure that the correct components are installed in the correct orientation. If all is well, check the troubleshooting tips. Note: normal MAP measured kPa on the MegaSquirt controller when the engine is not running (or the stimulator) should be somewhere between 85-103, depending on the height. In the tuning section of the manual, you can observe in detail how the pressure changes from the height. This is a good time to clean the excess flux of the board. The common problem with boards is that they have worked and quit for no apparent reason with flux residue. Remove the processor. Wash the board: 99% isopropyl alcohol (isopropyl alcohol rubs alcohol, every pharmacy will have it - do not use 70% isopropyl alcohol, it is much less effective) or acetone. Lightly rub both pcb with an old toothbrush. When cleaning the flux, it is sometimes impossible to wash the whole thing off, part of it has to be scraped to remove it. Use a round toothpick broken in half scraping the hard parts. It gives you a little pointy end and big end to work with and reduces the chance of damaging your PCB. Be very careful not to damage the silk screen or traces. Rinse the PCB in hot water and let the PCB dry completely. There must be very little fog when it dries. Compressed air can speed up the drying process, but keep in mind that some commercial compressed air compressed air compressed materials with solvents that saturate the remaining flux and cause problems. If you want to seal the finished board, use a suitable coating. Wait until thoroughly tested on the forum though. If you don't think you're going to be doing a lot of repair work on the board, you won't be able to beat silicone conformation coating. It doesn't require some digging to get it down to repair, however. Avoid urethane coatings, as they are considered permanent and the pain is to try to rework. You can also purchase a spray with an acrylic varnish conformant coating from most local electronics suppliers for about $10.00. If you're going to be working on the forum, Krylon Krystal clean spray works very well. More coatings, preferably fried between 175-200 degrees. This slows down or prevents soldering flowering and other deterioration of PCB. Condensation is part of life for an outdoor component that has undergon a temperature change. You can solder all the way to the stuff, and the residue cleans well with pure grain of alcohol. Slide the completed PCB into the case. The wider lip on the side of the house is close to the heatsink side of the board. This allows you to close the top cover case. Put a small heatsink compound between the heatsink and the position to enhance the cooling components by using the housing itself as part of the heatsink. Your next task is to mount the unit in the car, tune in and go! The MegaSquirt® house 6.25 × 4.25 × 1.75 . Access is required at both ends, one of which is the engine and vehicle electrical system (DB37), to which the bonnet of the coupling is approximately 2.25 long. At the other end I have the DB9 to go to the laptop (~2). The MegaSquirt ® cannot be installed under the hood. Engine room temperature is too high. The recommended place to install the MegaSquirt ® box is in the cabin (like under the seat, kick panel, etc.), this is where there are many OEM boxes. In addition, you will need access to the RS-232 serial connector tuning, which is difficult to achieve under the hood. If you place the MegaSquirt box in the cabin, you will not have any heat problems (unless you install it directly in the way of the airflow of car heating). MegaSquirt should be connected to a permeable hole (and grommet) in the engine compartment of the wires of injector, sensors, fuel pump, etc. If you've put the MegaSquirt® together, but it doesn't work, don't panic, just follow the troubleshooting instructions. External cabling with V3.0 With megasquirt-ii's added step, ignition control, and PWM idle capabilities, the V3.0 motherboard is designed with these features in mind. As a result, five additional connections are established for the DB37 connector. They are shown below: Note that MegaSquirt® a bank fire injection system, you can connect half the injectors to the driver of one bank (pins 32/33), the other half the other driver (34/35) [4 appear]. See FAQ. You can connect them in any order. To make troubleshooting easier, being on a separate driver for each bank can help. However, you may want to separate them alternately from the firing order, which some people claimed is theoretically somewhat beneficial. For example, on V8s with a Bank fire system, manufacturers typically run a bank off a driver, regardless of the firing order. The advantage of doing so makes troubleshooting easier. All MegaSquirt ® shall have an input (tach) signal to determine the engine speed. This signal is coming from the DB37 #24 signal. The input shows a variable reluctor (VR) input (tach) sensor (above). To use a hall sensor, optical sensor, or point trigger, the signal must be connected to the same input pin (DB37 #24) as the VR sensor. The other VR cable on the sensor must also be grounded and the pin #7 shown (although the Pin #2 be used). However, the pin 7 is not a dedicated or special ground for the VR sensor, it's just a ground (the PCB's next review has separate ground aD for the DB37 pin #2 VR circuit, so use the pin #2 if you think you can upgrade at any time). The main reasons pins #8, 9, 10, 11 & 18 go to a spot on the engine block. Do not ground them in physically separated places or use a single fat wire to do so. Instead, run separate wires on the pins all the way to the ground spot. Pin #19 the sensor earth. If you have two wired CLT and IAT sensors, the causes (and the TPS earth) should lead back to the DB37 needle#19 to reduce the possibility of noise in the sensor signals. There can be no continuity between the grounding of the chassis and the DB37 harness pin, #19 if the controller is disconnected from the DB37. The DB37 pin #36 is an output used to control a ignition module or direct control of a coil (if the high-current ignition guide circuit is installed). You only need to connect when you are controlling ignition timing and residing. The DB37 pin#36 megaSquirt-II ignition controller symbol corresponds to the S5 relay pin of the 20-position terminal band. If you are using a step motor IAC on the relay board and connected the wires to the IAC db37 pins 25, 27, 29, and 31, then: 1A goes from S1 to 20-position terminal strip to relay board, 1B goes to S2 to 20-position terminal 2A goes to S3 on terminal tape in position 20, 2B goes to terminal tape in position 20. If you are using PWM idle control, you cannot use the relay on the relay board and you must push the relay. The jumper can be used to connect the relay socket closest to the CB1 polyfuse to the DB37 #4. This sends a direct signal to the MegaSquirt® to the PWM idling valve. Note that the transistor on the V3 motherboard is not sufficient to drive the Ford PWM idling valve (as well as many other makes) directly. You must use another transistor that controls the valve (e.g. TIP120/121/122). You can use the proto area to connect this circuit or it can be built from the outside. For the PWM idling valve, the Q20 shall also be removed and a wire bridge shall be used instead of the R39. MegaSquirt ® MicroSquirt® are experimental tools for educational purposes. MegaSquirt ® MicroSquirt® are not sold or used on pollution-reducing vehicles. Check the laws in your local area to determine whether megasquirt® or microsquirt ® controller is legal to use for your application. This document is intended solely for the support of MegaSquirt® boards bowling and grippo. Grippo, he's here.