

# VEMS GenBoard

www.vems-group.org

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## Basics

- Menu-mmm is the entry point in the menu, all commands start from here.
- Commands followed by **xx** (ex. `mttc xx`) expects a hexadecimal argument, most significant nibble first.
- Pressing **m** three times (in some cases less) will return to menu-mmm.
- A command that expects an argument can be cancelled by pressing ESC (ex. `mttc ESC`).
- When a command *sends* something, the GENBOARD sends data via. rs232 to the PC.

enter menu-mmm (PS2-menu are initially entered)  
leave menu-mmm (MegaTune compatibility mode)

Man  
bye

## Menu-mmm (Man / m)

switch runtime display left  
switch runtime display right  
goto tune-menu  
send lcd-cache

left arrow  
right arrow  
F3  
F11

## Intermediate Tune menu (mt)

fool MegaTune  
goto tune-menu

f  
t or F3

## Tune (mtt / F3)

return to menu-zero  
navigate table/config  
navigate table/config  
navigate table/config  
navigate table/config  
goto position  
goto current rpm/kpa position  
enable rpm/kpa follow mode  
bookmarks to config structure  
increase current ve/config element  
decrease current ve/config element  
increase current ignition element  
decrease current ignition element  
modify hardware map  
modify config  
modify ve table  
modify lambdacorr table  
modify ignition table  
modify rpm table  
modify kpa table  
revert change at current position, *experimental*  
display ve learn changes (diff table)  
show current rpm/kpa/temp bins

m  
up arrow  
down arrow  
left arrow  
right arrow  
g xx  
p  
f  
F1-F12  
q  
z  
w  
x  
h xx  
c xx  
j xx  
l xx  
n xx  
r xx  
k xx  
DEL  
d  
b

## Experiments (mx)

enable autodump of runtime variables  
disable autodump of runtime variables  
send rs232 test string  
initialize iac  
send lcd-cache, *deprecated*  
send menu\_ps2 structure  
send ps2 menu char  
send ps2 scan char  
simulate events with OCR0  
send rpm\_rx21 array  
send kpa\_rx21 array  
reset low/high rpm.p counters  
specify wbo2 heater dc  
activate first knock channel

A  
a  
c  
i  
l  
k  
d  
s  
o xx  
v  
w  
t  
h xx  
q

activate second knock channel	Q
read knock	z
send knock structure	Z

### Lcd (ml)

start address test	a
dirty all addresses in lcd-cache	d
send lcd-cache	l
initialize lcd display	i
select lcd page number	p xx
set display parameters (do twice)	s xx

### Debug (md)

disable features (see table)	d xx
enable features (see code)	e xx

bit	functionality
0	disable lcd
1	...

comm auto dump frequency (ff is oneshot)	f xx
comm auto dump mask (see table)	k xx

bit	functionality
0	lcd cache
1	ps2_stat_commbytes
2	h1
3	h2
4	pw2comm
5	benchstats
6	evqhistogram
7	ic3histogram

force ignition advance [0.25°]	a xx
force injector pulsewidth [4 us]	p xx
force iac position	i xx
test ignition sequence	n
test injection sequence	j
hardware test, state 1	h xx
send engine_t structure	r
send raw sensor readings	s
send firmware time/date of compilation	v

send firmware version number	V
send 32 bytes starting from address xx	x xx

### Config (mc)

enter bootloader	b xx
change baud rate	B xx
send config	d
send tables	t
send hardware serial number	i
save all variables	s

### VE autotune (mv)

reset learning (discards all changes)	r
copy learned ve table to reference ve table	s

### Simulation (ms)

stim_period [256 usec]	p xx
stim_tooth [bit 7:6 missing tooth, bit 5:0 tooth count]	t xx

### Config structure

address[array length], variable name, variable comment  
*address and array length are both hexadecimal.*

- 00, **primep**, Priming pulse at -40 F [100 usec]
- 01, **primep\_temp\_scaling**, Priming pulse scaling at 170 F (80=half, ff=same as cold)
- 02, **cw1**, Cranking pulsewidth [100 usec] at -40 F
- 03, **cwh**, Cranking pulsewidth [100 usec] at 170 F
- 04, **cranking\_thres**, Cranking threshold [100 rpm]
- 05, **awev**, Afterstart warmup enrichment (percent, added value)
- 06, **awev\_temp\_scaling**, Afterstart warmup scaling at 170F (80=half, ff=same as cold)
- 07, **awc**, Afterstart number of engine cycles
- 08[a], **warmup\_clt\_range**, Warmup temperature range of bins (+40 F offset)
- 12[a], **warmup\_clt**, Warmup enrichment bins(fn temp), biased at 100
- 1c[8], **warmup\_rpm**, Warmup enrichment bins(fn rpm), biased at 100

24, req\_fuel, Fuel constant (req\_fuel)  
 25, divider, IRQ divide factor for pulse  
 26, alternate, Alternate injector drivers  
 27, injopen, Injector open time at 13.2V [16 usec]  
 28, battfac, Battery gamma factor [16 usec based]  
 29, kpa\_fac, MAP range [2kPa] 0: use A/B lookup table  
 2a, kpaofs, MAP signal offset eg.0x52 [2.5mV]  
 2b, injocfuel, injector opening effective rampup time [24 usec]  
 2c, injrampup\_battfac, injector rampup slope battery dependence (FF)  
 2d, injpwm, Injector PWM duty cycle (when current limiting is active)  
 2e, injpwm\_t, Injected Injector PWM time at which to activate pwm [100 usec]  
 2f, injpwm6, Added Injector PWM duty cycle during low battery voltage (6V)  
 30[2], rpmk, Constant for calculating, rpm = 12,000/ncyl (0: high byte)  
 32, tpsdot\_kpadot\_conf, 0: TPSDOT, 1: MAPDOT acceleration enrichment  
 33[4], tpsdotrate, TPS/MAPDOT acceleration bins, dv/dt  
 37[4], tpsaq, TPS/MAPDOT acceleration amount (fn TPSDOT) [100 usec]  
 3b, tps\_thresh, Accel TPS/MAPDOT threshold (throttle sensitivity)  
 3c, tpsasync, Acceleration duration [0.1 sec]  
 3d, acmult, Acceleration cold multiplication factor, biased at 100  
 3e, tpsacold, Cold acceleration added amount (at -40 F degrees) [100 usec]  
 3f, tpsdq, Deceleration fuel cut, biased at 100  
 40, decel\_fuelcut\_thres, Decel fuelcut enabled above threshold [100 rpm]  
 41, overrun\_fuelcut, Overrun fuelcut, injectors disabled above this [100 rpm]  
 42, overrun\_fuelresume, Overrun fuelresume, injectors reenabled below this [100 rpm]  
 43, rev\_limit, Rev limit (hard) [100 rpm]  
 44, airden\_ignore, Fake airdensity low limit (low rpm only), 0==disable  
 45, config11, c11, bit0: 0:mpx4115/1:mpx4250 bit1: ...  
 46, config12, c12, bit0: ...  
 47, config13, c13, bit0: ...  
 48, batt\_cal, VBatt calibration appr.BC=default  
 49, fastidle, Fastidle valve off above this Temp[..F-40]  
 4a, baro, mean barometric pressure  
 4b, dbaro, max difference in barometric pressure  
 4c, tps\_low, tps, min adc-count  
 4d, tps\_high, tps, max adc-count  
 4e, fan\_temp, coolant fan, start temperature  
 4f, fan\_hyst, coolant fan, hysteresis  
 50, fan\_channel, coolant fan, output selection  
 51, iac\_step\_seq, iac, stepping sequence (define iac wiring)  
 52, iac\_conf, iac, configuration (stepper speed, power-off)  
 53, iac\_max\_steps, iac, max steps to extend  
 54, iac\_tps\_thres, iac, engine.tps value for idle threshold  
 55, iac\_cold\_idle\_temp, iac, max temperature for cold idle speed  
 56, iac\_warm\_idle\_temp, iac, min temperature for warm idle speed

57, iac\_cold\_rpm, iac, idle rpm (cold) [10 rpm]  
 58, iac\_warm\_rpm, iac, idle rpm (warm) [10 rpm]  
 59, iac\_cold\_start\_pos, iac, crank position at -40 F  
 5a, iac\_warm\_start\_pos, iac, crank position at 170 F  
 5b, iac\_afterstart\_rpm, iac, afterstart rpm [10 rpm], added to idle rpm  
 5c, iac\_afterstart\_duration, iac, duration of afterstart rpm [0.1 sec]  
 5d, iac\_afterstart\_steps, iac, afterstarts: steps per 160 rpm  
 5e, iac\_kp, iac, P-term  
 5f, iac\_ki, iac, I-term  
 60, iac\_kd, iac, D-term  
 61, iac\_integral\_speed, iac, integral time speed  
 62, iac\_integral\_limit\_dec, iac, integral decrease limit  
 63, iac\_integral\_limit\_inc, iac, integral increase limit  
 64, iac\_integral\_deadband, iac, integral deadband [1 rpm] (being tested for usefulness)  
 65, iac\_deadband, iac, deadband [1 rpm]  
 66, iac\_pid\_conf, iac, config, 0:asymmetric  
 67, iac\_overclose\_interval, iac, seconds between overclosing  
 68[a], iac\_ref\_pos, iac, reference position (fn temp)  
 72, iac\_sol\_channel, select HW channel, like =INJFETi.7 or INJFET.7  
 73, iac\_ign\_advance\_change, iac, ignition advance [0.25deg/256rpm]  
 74, iac\_ign\_retard\_change, iac, ignition retard [0.25deg/256rpm]  
 75, iac\_ign\_advance\_limit, iac, ignition advance limit [0.25deg]  
 76, iac\_ign\_retard\_limit, iac, ignition retard limit [0.25deg]  
 77, iac\_ign\_threshold, iac, threshold for activating air control [0.25deg]  
 78, ego\_conf, ego, bit5:NBO2\_adc7 bit0:PID  
 79, ego\_lag, ego, timeconstant (engine cycles) for changing correction factor  
 7a, ego\_coolant, ego, min coolant temperature for ego enabling[F]  
 7b, ego\_maxtps, ego, max tps position for ego correction  
 7c, ego\_maxmap, ego, max map for O2 correction[kPa]  
 7d, ego\_minrpm, ego, min rpm for ego enabling [100rpm]  
 7e, ego\_maxrpm, ego, max rpm for O2 correction [100rpm]  
 7f, ego\_warmup, ego, warmup time [sec]  
 80, ego\_lean\_limit, ego, max percent to lean afr[0.4%](in SINGLE\_TARGET mode rich too)  
 81, ego\_rich\_limit, ego, max percent to rich afr[0.4%]  
 82, ego\_pid\_kp, ego, incredible speed limit (or pid kp)  
 83, mt\_unused, Unused, megatune trashes it  
 84, ego\_delta, ego, step size (percent) [0.4%]  
 85, ego\_target, ego, target voltage (NBO2)  
 86, ego\_pid\_window, ego, minimum window for pid to react  
 87, wbo2\_warmup\_ramp, wbo2, warmup ramp speed [3f=0.2V/sec]  
 88, wbo2\_warmup\_target, wbo2, warmup target  
 89, wbo2\_abs\_limit, wbo2, heater absolute limit [2a=12V ff=30V]  
 8a, wbo2\_limit\_maxt, wbo2, max time spent at abs\_limit [262msec]

8b, **wbo2\_fallback**, wbo2, fallback V after maxt [1c=10V ff=30V]  
 8c, **wbo2\_retry\_t**, wbo2, retry control after [4sec]  
 8d, **wbo2\_edgetime\_corr**, wbo2, edgetime correction constant C/R  
 8e, **wbo2\_edgetime\_min**, wbo2, smaller edgetimes are neglected [0.5usec]  
 8f, **wbo2\_ri\_target**, wbo2, target Ri (pulse amplitude:C3)[5V/4096]  
 90, **wbo2\_nernstdc\_target**, wbo2, target nernstDC [5V/256]  
 91, **wbo2\_pump\_pw\_zero**, wbo2, pump zero dutycycle (default: 66) [5V/256]  
 92, **wbo2\_calibration**, wbo2, calibration constant  
 93, **wbo2\_heater\_pid\_kp**, wbo2, heater pid kp  
 94, **wbo2\_heater\_pid\_ki**, wbo2, heater pid ki  
 95, **wbo2\_heater\_pid\_kd**, wbo2, heater pid kd  
 96, **wbo2\_heater\_pid\_ilimit**, wbo2, heater pid integral limit  
 97, **wbo2\_pump\_pid\_kp**, wbo2, pump pid kp  
 98, **wbo2\_pump\_pid\_ki**, wbo2, pump pid ki  
 99, **wbo2\_pump\_pid\_kd**, wbo2, pump pid kd  
 9a, **wbo2\_pump\_pid\_ilimit**, wbo2, pump pid integral limit  
 9b, **wbo2\_ri\_confidence\_scale**, wbo2, Ri confidence scaling factor ( $s^2 < 255/\text{scale}$ )  
 9c, **knock\_conf**, knock, config. bit0 1:enable bit1: 0:channel0  
 9d, **knock\_sampling\_window**, knock, sampling window [4 degree] length:start(ATDC)  
 9e, **knock1\_frequency**, knock1, bandpass center frequency  
 9f, **knock1\_gain**, knock1, gain  
 a0, **knock1\_integrator**, knock1, integration time constant  
 a1, **knock2\_frequency**, knock2, bandpass center frequency  
 a2, **knock2\_gain**, knock2, gain  
 a3, **knock2\_integrator**, knock2, integration time constant  
 a4, **knock\_threshold**, knock, threshold  
 a5, **knock\_noise\_scale**, knock, noise scale factor  
 a6, **knock\_max\_retard**, knock, max ignition retard [1/4 degree]  
 a7, **knock\_default\_retard**, knock, default ignition retard [1/4 degree]  
 a8, **knock\_retard\_step**, knock, ignition retard step [1/4 degree]  
 a9, **knock\_retard\_delay**, knock, ignition retard delay [15ms]  
 aa, **knock\_advance\_step**, knock, ignition advance step [1/4 degree]  
 ab, **knock\_advance\_delay**, knock, ignition advance delay [15ms]  
 ac, **knock\_minrpm**, knock, min rpm [100rpm]  
 ad, **knock\_maxrpm**, knock, max rpm [100rpm]  
 ae, **ve\_learn\_coolant**, VE learn, min coolant for auto modification of VE entries  
 af, **ve\_learn\_max\_power**, VE learn, auto modification of VE entry only below power=map\*rpm/256  
 b0, **ve\_learn\_rpm\_scale**, VE learn, rpm scaling factor ( $s^2 < 255/\text{scale}$ )  
 b1, **ve\_learn\_kpa\_scale**, VE learn, kpa scaling factor ( $s^2 < 255/\text{scale}$ )  
 b2, **ve\_learn\_ego\_scale**, VE learn, ego scaling factor ( $s^2 < 255/\text{scale}$ )  
 b3, **ve\_learn\_min\_weight**, VE learn, minimum weight for modifying VE entry  
 b4, **ve\_learn\_speed**, VE learn, speed of changes to the VE table  
 b5, **ve\_learn\_limit**, VE learn, max deviation (+/- [0.4%]) from reference VE table  
 b6, **ve\_learn\_conf**, VE learn, config, bit0:enable bit1:simulate bit2: 2x2box

b7, **lcd\_c0**, LCD flags 3:reinit 2:phasesignoff 1:lcd\_easycgo 0:busypolled  
 b8, **lcd\_delay**, LCD-cablelength delays Higherhalf:beforeENable LowerHalf:ENable  
 b9, **lcd\_backlight**, LCD backlight: FF is fully on  
 ba[4], **lcd\_offs**, line addresses for LCD.ff=default  
 be, **lcd\_default\_view**, LCD, default runtime view  
 bf, **primary\_trigger**, trigger1, bit0 0:falling/1:rising, bit1 0:toothwheel/1:coil, bit2 0:no filtering/1:filtering  
 c0, **secondary\_trigger**, trigger2, bit0 0:falling/1:rising, bit1 0:enable/1:disable, bit2 0:no filtering/1:filtering, bit3 0:toothwheel/1:coil, bit4 0:alien advance/1:cam sync, bit5 0:single edge/1:both edges when cranking  
 c1, **tooth\_wheel**, tooth wheel, number of teeth on the wheel  
 c2, **trigger\_tooth**, tooth wheel, active trigger tooth (00:missing tooth)  
 c3, **another\_trigger\_tooth**, tooth wheel, define another trigger tooth  
 c4, **crank\_minper**, Cranktigger period minimum (\*16 usec)  
 c5, **tooth\_wheel\_twidth1**, tooth wheel, angular width of tooth  
 c6, **tooth\_wheel\_twidth2**, tooth wheel, angular width of missing tooth  
 c7, **cam\_sync\_r\_edge\_phase**, cam sync, rising edge, engine phase at next primary trigger  
 c8, **cam\_sync\_f\_edge\_phase**, cam sync, falling edge, engine phase at next primary trigger  
 c9, **reset\_engphase\_after**, engphase, when to reset  
 ca, **ign\_tdcdelay**, TDC after the trigger(0.5crankdeg)  
 cb, **ign\_dwell14**, dwell above 14V (64usec)  
 cc, **ign\_dwell16**, added dwell time at 6V (27usec)  
 cd, **ign\_crank\_advance**, ignition advance at cranking [0.25crankdeg]  
 ce, **ign\_out**, EDIS:0x0? dummy: 0x7? disable:0xff bit0: invertout  
 cf, **ignchmax**, h[2] maxindex for ignition channel lookup  
 d0, **engine\_off\_delay**, turn off fuelpump after inactivity time [262msec]  
 d1, **pump\_on\_mintime**, minimum time to leave fuelpump on at startup [262msec]  
 d2, **fuelpump\_channel**, output selection for fuelpump  
 d3, **inj\_stage2\_rate**, secondary injectors rate to calculated pw [0.4%]  
 d4, **inj\_stage2\_start\_tps**, secondary injectors open above given throttle  
 d5, **inj\_stage2\_start\_map**, secondary injectors open above given manifold pressure  
 d6, **als\_lowrpm**, als,auto-off below this rpm [100 rpm]  
 d7, **als\_maxtps**, als,maximum TPS position  
 d8, **als\_ignretard**, als,ignition retard [1/4 crankdegrees]  
 d9, **als\_rich**, als,mixture enrichment in percents [0.4%]  
 da, **misc1out\_minrpm**, misc1out,minimum rpm [100 rpm]  
 db, **misc1out\_maxrpm**, misc1out,maximum rpm [100 rpm]  
 dc, **misc1out\_mintps**, misc1out,minimum tps position  
 dd, **misc1out\_maxtps**, misc1out,maximum tps position  
 de, **misc1out\_minmap**, misc1out,minimum manifold pressure  
 df, **misc1out\_maxmap**, misc1out,maximum manifold pressure  
 e0, **misc1out\_channel**, misc1out,output channel selector  
 e1, **misc2out\_minrpm**, misc2out,minimum rpm [100 rpm]  
 e2, **misc2out\_maxrpm**, misc2out,maximum rpm [100 rpm]

e3, misc2out\_mintps, misc2out,minimum tps position  
e4, misc2out\_maxtps, misc2out,maximum tps position  
e5, misc2out\_minmap, misc2out,minimum manifold pressure  
e6, misc2out\_maxmap, misc2out,maximum manifold pressure  
e7, misc2out\_channel, misc2out,output channel selector  
e8, act\_wot\_rpm, WOT switch RPM threshold (FF=disable)  
e9, act\_wot\_channel, WOT switch output channel selector (P259\_0)  
ea, act\_rpm\_rpm, RPM switch RPM threshold (FF=disable)  
eb, act\_rpm\_channel, RPM switch output channel selector  
ec, egt1\_cal, EGT calibration multiplier  
ed, egt1\_offs, EGT offset (signed)  
ee, boost\_conf, boostcontrol flags bit0 0:boosttarget,1:MAPtarget  
ef, boost\_targetoffs, boostcontrol target offset applied after b[RPM]\*t[TPS]  
f0, boost\_minpressure, actuator OFF below this pressure  
f1, boost\_pid\_kp, boostcontrol pid kp  
f2, boost\_pid\_ki, boostcontrol pid ki  
f3, boost\_pid\_kd, boostcontrol pid kd  
f4, boost\_pid\_ilimit, boostcontrol pid integral limit  
f5, boost\_channel, boostcontrol solenoid  
f6, water\_pump\_temp, water pump, start temperature  
f7, water\_pump\_hyst, water pump, hysteresis  
f8, water\_pump\_channel, water pump, output selection

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