Megasquirt-2 and Megasquirt-3 CAN realtime data broadcasting format

Dated : 2016-02-17

CAN broadcasting is supported on:

Megasquirt-2, Microsquirt, MSPNP2, Microsquirt-module based ECUs with firmware MS2/Extra 3.4.x only

Megasquirt-3, MS3-Pro, MS3-Gold, MSPNP-Pro, MS3-Pro-module based ECUs with firmware MS3 1.4.x only.

Not supported in earlier firmwares or earlier hardware. Above firmware is free upgrade for Megasquirt customers at www.msextra.com

Contents

Please report any errors or omissions to contact@megasquirt.co.uk

1 Simplified Dash Broadcasting

The Dash Broadcasting facility allows reduced set of engine data to be broadcast over the CAN bus. This is intended as a default pre-defined "Megasquirt" data-set for third party dash manufacturers to support and should allow the simplest end-user configuration.

The broadcast concept is the same as the full dataset covered in section 2. The CANid are packet contents are detailed below.

11bit CAN headers are used at 500kbps with sequential addressing. Big-endian. **The default base identifier is 1512 decimal** (0x5e8).

1.1 Field List

Default ID	Offset in group	Total offset	Size	Sign?	Name	Function	Units	Multiply	Divide	Add	MS2?
1512	0	0	2	Y	map	Manifold air pressure	kPa	1	10	0	Y
1512	2	2	2	-	rpm	Engine RPM	RPM	1	1	0	Y
1512	4	4	2	Y	clt	Coolant temperature	deg F	1	10	0	Y
1512	6	6	2	Y	tps	Throttle position	%	1	10	0	Y
1513	0	8	2	-	pw1	Main pulsewidth bank 1	ms	1	1000	0	Y
1513	2	10	2	-	pw2	Main pulsewidth bank 2	ms	1	1000	0	Y
1513	4	12	2	Y	mat	Manifold air temperature	deg F	1	10	0	Y
1513	6	14	2	Y	adv_deg	Final ignition spark advance	deg BTDC	1	10	0	Y
1514	0	16	1	-	afrtgt1	Bank 1 AFR target	AFR	1	10	0	Y
1514	1	17	1	-	AFR1	AFR cyl#1	AFR	1	10	0	(Y)
1514	2	18	2	Y	EGOcor1	EGO correction cyl#1	%	1	10	0	(Y)
1514	4	20	2	Y	egt1	EGT 1	deg F	1	10	0	-
1514	6	22	2	Y	pwseq1	Sequential Pulsewidth for cyl#1	ms	1	1000	0	Y
1515	0	24	2	Y	batt	Battery voltage	V	1	10	0	Y
1515	2	26	2	Y	sensors1	Generic sensor input 1 (gpioadc0 on MS2)	-	1	10	0	Y

1515	4	28	2	Y	sensors2	Generic sensor input 2 (gpioadc1 on MS2)	-	1	10	0	Y
1515	6	30	1	-	knk_rtd	Knock retard	deg	1	10	0	Y
1516	0	32	2	-	VSS1	Vehicle Speed 1	ms-1	1	10	0	-
1516	2	34	2	Y	tc_retard	Traction control retard	deg	1	10	0	-
1516	4	36	2	Y	launch_timing	Launch control timing	deg	1	10	0	-
1516	6	38	2	-	-	not used	-	-	-	-	-

Notes:

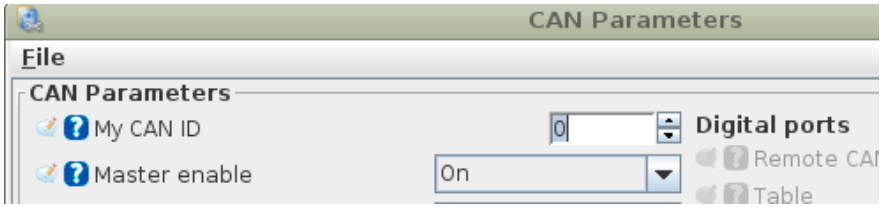
- EGT, VSS and knock may require additional hardware.
- Megasquirt-2 based ECUs (MS2, Microsquirt, DIYPNP, MSPNP2 etc.) use a subset of these fields.

Example: message id 1514 (0x5ea)

Data 0								Data 1								Data 2								Data 3								Data 4								Data 5								Data 6								Data 7							
7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8	23	22	21	20	19	18	17	16	31	30	29	28	27	26	25	24	39	38	37	36	35	34	33	32	47	46	45	44	43	42	41	40	55	54	53	52	51	50	49	48	63	62	61	60	59	58	57	56
Bank 1 AFR target								AFR cyl#1								Engine RPM																EGT 1																Seq. PW cyl #1															

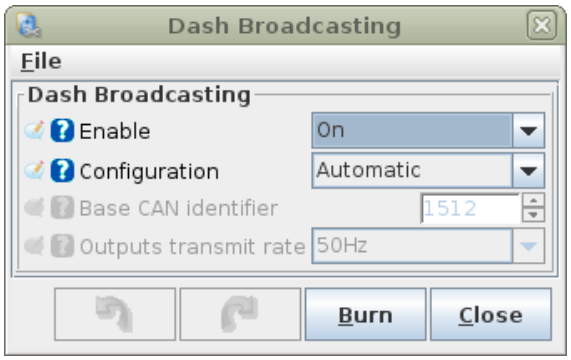
1.2 User configuration in Megasquirt-3, MS3-Pro, MS3-Gold and other MS3 based ECUs

The settings are on the CAN-Bus/Testmodes menu:



CAN-Bus/Testmodes -> CAN Parameters

Set Master enable to "On"



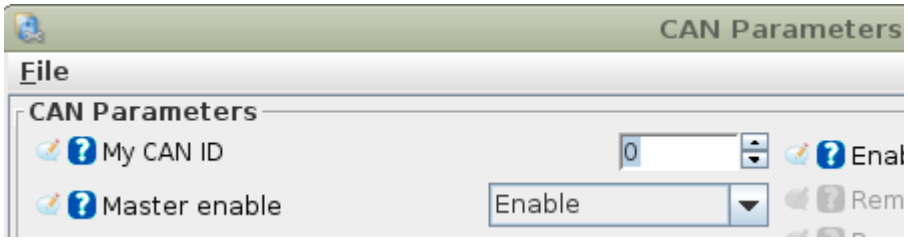
CAN-Bus/Testmodes -> Dash Broadcasting

Set Enable to "On"

Most users will use the 'Automatic' setting, this locks the CAN identifier to 1512 and broadcasts 50 times per second.
Selecting 'Advanced' allows the identifier and transmit rate to be changed.

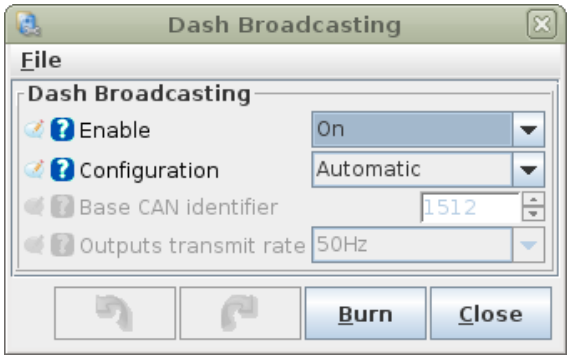
1.3 User configuration in Megasquirt-2, Microsquirt and other MS2 based ECUs

The settings are on the CAN-Bus/Testmodes menu:



CAN-Bus/Testmodes -> CAN Parameters

Set Master enable to "Enable"



CAN-Bus/Testmodes -> Dash Broadcasting

Set Enable to "On"

Most users will use the 'Automatic' setting, this locks the CAN identifier to 1512 and broadcasts 20 times per second.
Selecting 'Advanced' allows the identifier and transmit rate to be changed.

2 Advanced Real-Time Data broadcast

The Real Time Data Broadcasting facility allows a large range of internal engine data to be broadcast over the CAN bus. The set of fields is fixed, but the user can select the broadcast rate. The data is then available for third party dashes or loggers etc. For many devices this will require manual configuration to select the desired field groups.

11bit CAN headers are used with sequential addressing. All data is big-endian. 500kbit baud rate.

The user can select base identifier, the default is 1520 decimal. Each subsequent 'Group' of data is transmitted at the base identifier + group number.

i.e. 'group 17' is transmitted at base identifier + 17. (1537 or 0x601)

User can enable/disable groups of 8 bytes of data. Offsets do not change.

For dashes treating the data as one single message, the 'Group' and 'Offset in group' columns can be ignored.

For dashes handling each message discretely, ignore the total offset column.

For a more detailed description of the data fields (channels) see the Datalog fields section of Megasquirt TunerStudio Reference Manual.

Note that the offsets here are specific to the CAN broadcast method and are grouped here for more logical selection by the user. (Serial data is ordered differently.)

2.1 Field list

Group	Offset in group	Total offset	Size	Sign?	Name	Function	Units	Multiply	Divide	Add	MS2?
0	0	0	2	-	seconds	Seconds ECU has been on	s	1	1	0	Y
0	2	2	2	-	pw1	Main pulsewidth bank 1	ms	1	1000	0	Y
0	4	4	2	-	pw2	Main pulsewidth bank 2	ms	1	1000	0	Y
0	6	6	2	-	rpm	Engine RPM	RPM	1	1	0	Y
1	0	8	2	Y	adv_deg	Final ignition spark advance	deg BTDC	1	10	0	Y
1	2	10	1	-	squirt	Bitfield of batch fire injector events	-	1	1	0	Y
1	3	11	1	-	engine	Bitfield of engine status	-	1	1	0	Y
1	4	12	1	-	afrtgt1	Bank 1 AFR target	AFR	1	10	0	Y
1	5	13	1	-	afrtgt2	Bank 2 AFR targer	AFR	1	10	0	Y
1	6	14	1	-	wbo2_en1	not used	-	1	1	0	Y
1	7	15	1	-	wbo2_en2	not used	-	1	1	0	Y
2	0	16	2	Y	baro	Barometric pressure	kPa	1	10	0	Y
2	2	18	2	Y	map	Manifold air pressure	kPa	1	10	0	Y
2	4	20	2	Y	mat	Manifold air temperature	deg F	1	10	0	Y
2	6	22	2	Y	clt	Coolant temperature	deg F	1	10	0	Y
3	0	24	2	Y	tps	Throttle position	%	1	10	0	Y
3	2	26	2	Y	batt	Battery voltage	V	1	10	0	Y
3	4	28	2	Y	afr1_old	AFR1 (Deprecated on MS3)	AFR	1	10	0	Y
3	6	30	2	Y	afr2_old	AFR2 (Deprecated on MS3)	AFR	1	10	0	Y
4	0	32	2	Y	knock	Indication of knock input	%	1	10	0	Y
4	2	34	2	Y	egocor1	EGO bank 1 correction	%	1	10	0	Y
4	4	36	2	Y	egocor2	EGO bank2 correction	%	1	10	0	Y

4	6	38	2	Y	aircor	Air density correction	%	1	10	0	Y
5	0	40	2	Y	warmcor	Warmup correction	%	1	10	0	Y
5	2	42	2	Y	tpsaccel	TPS-based acceleration	%	1	10	0	Y
5	4	44	2	Y	tpsfuelcut	TPS-based fuel cut	%	1	10	0	Y
5	6	46	2	Y	barocor	Barometric fuel correction	%	1	10	0	Y
6	0	48	2	Y	totalcor	Total fuel correction	%	1	10	0	Y
6	2	50	2	Y	ve1	VE value table/bank 1	%	1	10	0	Y
6	4	52	2	Y	ve2	VE value table/bank 2	%	1	10	0	Y
6	6	54	2	Y	iacstep	Stepper idle step number or PWM idle value duty	step duty%	1 392	1 1000	0 0	Y
7	0	56	2	Y	cold_adv_deg	Cold advance	deg	1	10	0	Y
7	2	58	2	Y	TPSdot	Rate of change of TPS	%/s	1	10	0	Y
7	4	60	2	Y	MAPdot	Rate of change of MAP	kPa/s	1	1	0	Y
7	6	62	2	Y	RPMdot	Rate of change of RPM	RPM/s	10	1	0	Y
8	0	64	2	Y	MAFload	Synthetic 'load' from MAF	%	1	10	0	Y
8	2	66	2	Y	fuelload	'Load' used for fuel table lookup e.g. equals MAP in Speed-Density	%	1	10	0	Y
8	4	68	2	Y	fuelcor	Adjustment to fuel from Flex	%	1	10	0	Y
8	6	70	2	Y	MAF	Mass Air Flow (Scaling depend on range, 650g/s shown)	g/s	1	100	0	Y
9	0	72	2	Y	egoV1	Voltage from O2#1 (Deprecated on MS3)	V	1	100	0	Y
9	2	74	2	Y	egoV2	Voltage from O2#2 (Deprecated on MS3)	V	1	100	0	Y
9	4	76	2	-	dwell	Main ignition dwell	ms	1	10	0	Y
9	6	78	2	-	dwell_trl	Trailing ignition dwell	ms	1	10	0	Y
10	0	80	1	-	status1	ECU status bitfield	-	1	1	0	Y
10	1	81	1	-	status2	ECU status bitfield	-	1	1	0	Y
10	2	82	1	-	status3	ECU status bitfield	-	1	1	0	Y

10	3	83	1	-	status4	Not typically used	-	1	1	0	Y
10	4	84	2	Y	status5	Not typically used	-	1	1	0	Y
10	6	86	1	-	status6	ECU status bitfield	-	1	1	0	-
10	7	87	1	-	status7	ECU status bitfield	-	1	1	0	-
11	0	88	2	Y	fuelload2	'Load' used for fuelling on modified table	%	1	10	0	Y
11	2	90	2	Y	ignload	'Load' used for ignition table lookup	%	1	10	0	Y
11	4	92	2	Y	ignload2	'Load' used for modifier ignition table lookup	%	1	10	0	Y
11	6	94	2	Y	airtemp	Estimated intake air temperature	deg F	1	10	0	Y
12	0	96	4	Y	wallfuel1	Calculated volume of fuel on intake walls from EAE (in injector pulsewidth units)	us	1	100	0	Y
12	4	100	4	Y	wallfuel2	Second channel of same	us	1	100	0	Y
13	0	104	2	Y	sensors1	Generic sensor input 1 (gpioadc0 on MS2)	-	1	10	0	Y
13	2	106	2	Y	sensors2	Generic sensor input 2 (gpioadc1 on MS2)	-	1	10	0	Y
13	4	108	2	Y	sensors3	Generic sensor input 3 (gpioadc2 on MS2)	-	1	10	0	Y
13	6	110	2	Y	sensors4	Generic sensor input 4 (gpioadc3 on MS2)	-	1	10	0	Y
14	0	112	2	Y	sensors5	Generic sensor input 5 (gpioadc4 on MS2)	-	1	10	0	Y
14	2	114	2	Y	sensors6	Generic sensor input 6 (gpioadc5 on MS2)	-	1	10	0	Y
14	4	116	2	Y	sensors7	Generic sensor input 7 (gpioadc6 on MS2)	-	1	10	0	Y
14	6	118	2	Y	sensors8	Generic sensor input 8 (gpioadc7 on MS2)	-	1	10	0	Y
15	0	120	2	Y	sensors9	Generic sensor input 9 (adc6 on MS2)	-	1	10	0	Y
15	2	122	2	Y	sensors10	Generic sensor input 10 (adc7 on MS2)	-	1	10	0	Y
15	4	124	2	Y	sensors11	Generic sensor input 11	-	1	10	0	-
15	6	126	2	Y	sensors12	Generic sensor input 12	-	1	10	0	-
16	0	128	2	Y	sensors13	Generic sensor input 13	-	1	10	0	-
16	2	130	2	Y	sensors14	Generic sensor input 14	-	1	10	0	-
16	4	132	2	Y	sensors15	Generic sensor input 15	-	1	10	0	-

16	6	134	2	Y	sensors16	Generic sensor input 16	-	1	10	0	-
17	0	136	2	Y	boost_targ_1	Target boost - channel 1	kPa	1	10	0	Y
17	2	138	2	Y	boost_targ_2	Target boost - channel 2	kPa	1	10	0	-
17	4	140	1	-	boostduty	Duty cycle on boost solenoid 1	%	1	1	0	Y
17	5	141	1	-	boostduty2	Duty cycle on boost solenoid 2	%	1	1	0	-
17	6	142	2	Y	maf_volts	MAF voltage (synthesised for frequency MAFs)	V	1	1000	0	Y
18	0	144	2	Y	pwseq1	Sequential Pulsewidth for cyl#1	ms	1	1000	0	Y
18	2	146	2	Y	pwseq2	Sequential Pulsewidth for cyl#2	ms	1	1000	0	Y
18	4	148	2	Y	pwseq3	Sequential Pulsewidth for cyl#3	ms	1	1000	0	Y
18	6	150	2	Y	pwseq4	Sequential Pulsewidth for cyl#4	ms	1	1000	0	Y
19	0	152	2	Y	pwseq5	Sequential Pulsewidth for cyl#5	ms	1	1000	0	-
19	2	154	2	Y	pwseq6	Sequential Pulsewidth for cyl#6	ms	1	1000	0	-
19	4	156	2	Y	pwseq7	Sequential Pulsewidth for cyl#7	ms	1	1000	0	-
19	6	158	2	Y	pwseq8	Sequential Pulsewidth for cyl#8	ms	1	1000	0	-
20	0	160	2	Y	pwseq9	Sequential Pulsewidth for cyl#9	ms	1	1000	0	-
20	2	162	2	Y	pwseq10	Sequential Pulsewidth for cyl#10	ms	1	1000	0	-
20	4	164	2	Y	pwseq11	Sequential Pulsewidth for cyl#11	ms	1	1000	0	-
20	6	166	2	Y	pwseq12	Sequential Pulsewidth for cyl#12	ms	1	1000	0	-
21	0	168	2	Y	pwseq13	Sequential Pulsewidth for cyl#13	ms	1	1000	0	-
21	2	170	2	Y	pwseq14	Sequential Pulsewidth for cyl#14	ms	1	1000	0	-
21	4	172	2	Y	pwseq15	Sequential Pulsewidth for cyl#15	ms	1	1000	0	-
21	6	174	2	Y	pwseq16	Sequential Pulsewidth for cyl#16	ms	1	1000	0	-
22	0	176	2	Y	egt1	EGT 1	deg F	1	10	0	-
22	2	178	2	Y	egt2	EGT 2	deg F	1	10	0	-
22	4	180	2	Y	egt3	EGT 3	deg F	1	10	0	-

22	6	182	2	Y	egt4	EGT 4	deg F	1	10	0	-
23	0	184	2	Y	egt5	EGT 5	deg F	1	10	0	-
23	2	186	2	Y	egt6	EGT 6	deg F	1	10	0	-
23	4	188	2	Y	egt7	EGT 7	deg F	1	10	0	-
23	6	190	2	Y	egt8	EGT 8	deg F	1	10	0	-
24	0	192	2	Y	egt9	EGT 9	deg F	1	10	0	-
24	2	194	2	Y	egt10	EGT 10	deg F	1	10	0	-
24	4	196	2	Y	egt11	EGT 11	deg F	1	10	0	-
24	6	198	2	Y	egt12	EGT 12	deg F	1	10	0	-
25	0	200	2	Y	egt13	EGT 13	deg F	1	10	0	-
25	2	202	2	Y	egt14	EGT 14	deg F	1	10	0	-
25	4	204	2	Y	egt15	EGT 15	deg F	1	10	0	-
25	6	206	2	Y	egt16	EGT 16	deg F	1	10	0	-
26	0	208	1	-	nitrous1_duty	Duty cycle to nitrous solenoid 1	%	1	1	0	-
26	1	209	1	-	nitrous2_duty	Duty cycle to nitrous solenoid 2	%	1	1	0	-
26	2	210	2	-	nitrous_timer_out	Timer used internally for nitrous system	s	1	1000	0	-
26	4	212	2	Y	n2o_addfuel	Fuel pulsewidth added due to nitrous system	ms	1	1000	0	Y
26	6	214	2	Y	n2o_retard	Timing retard due to nitrous system	deg	1	10	0	Y
27	0	216	2	Y	canpwmin1	PWM period 1 from remote board	-	1	1	0	Y
27	2	218	2	Y	canpwmin2	PWM period 2 from remote board	-	1	1	0	Y
27	4	220	2	Y	canpwmin3	PWM period 3 from remote board	-	1	1	0	Y
27	6	222	2	Y	canpwmin4	PWM period 4 from remote board	-	1	1	0	Y
28	0	224	2	-	cl_idle_targ_rpm	Closed-loop idle target RPM	RPM	1	1	0	Y
28	2	226	2	Y	tpsadc	ADC count from TPS	-	1	1	0	Y
28	4	228	2	Y	eaeload	'Load' used for EAE calc	%	1	10	0	Y

28	6	230	2	Y	afrload	'Load' used for AFR table lookups	%	1	10	0	Y
29	0	232	2	-	EAEfcor1	Fuel correction from EAE - channel 1	%	1	10	0	Y
29	2	234	2	-	EAEfcor2	Fuel correction from EAE - channel 2	%	1	10	0	Y
29	4	236	2	Y	VSS1dot	Rate of change of VSS1	ms-2	1	10	0	-
29	6	238	2	Y	VSS2dot	Rate of change of VSS2	ms-2	1	10	0	-
30	0	240	2	Y	accelx	External accelerometer X	ms-2	1	1000	0	-
30	2	242	2	Y	accely	External accelerometer Y	ms-2	1	1000	0	-
30	4	244	2	Y	accelz	External accelerometer Z	ms-2	1	1000	0	-
30	6	246	1	-	stream_level	Volume level on audio input	-	1	1	0	-
30	7	247	1	-	water_duty	Duty cycle to water injection solenoid	%	1	1	0	-
31	0	248	1	-	AFR1	AFR cyl#1	AFR	1	10	0	-
31	1	249	1	-	AFR2	AFR cyl#2	AFR	1	10	0	-
31	2	250	1	-	AFR3	AFR cyl#3	AFR	1	10	0	-
31	3	251	1	-	AFR4	AFR cyl#4	AFR	1	10	0	-
31	4	252	1	-	AFR5	AFR cyl#5	AFR	1	10	0	-
31	5	253	1	-	AFR6	AFR cyl#6	AFR	1	10	0	-
31	6	254	1	-	AFR7	AFR cyl#7	AFR	1	10	0	-
31	7	255	1	-	AFR8	AFR cyl#8	AFR	1	10	0	-
32	0	256	1	-	AFR9	AFR cyl#9	AFR	1	10	0	-
32	1	257	1	-	AFR10	AFR cyl#10	AFR	1	10	0	-
32	2	258	1	-	AFR11	AFR cyl#11	AFR	1	10	0	-
32	3	259	1	-	AFR12	AFR cyl#12	AFR	1	10	0	-
32	4	260	1	-	AFR13	AFR cyl#13	AFR	1	10	0	-
32	5	261	1	-	AFR14	AFR cyl#14	AFR	1	10	0	-
32	6	262	1	-	AFR15	AFR cyl#15	AFR	1	10	0	-
32	7	263	1	-	AFR16	AFR cyl#16	AFR	1	10	0	-

33	0	264	1	-	duty_pwm 1	Generic PWM duty 1	%	1	1	0	-
33	1	265	1	-	duty_pwm 2	Generic PWM duty 2	%	1	1	0	-
33	2	266	1	-	duty_pwm 3	Generic PWM duty 3	%	1	1	0	-
33	3	267	1	-	duty_pwm 4	Generic PWM duty 4	%	1	1	0	-
33	4	268	1	-	duty_pwm 5	Generic PWM duty 5	%	1	1	0	-
33	5	269	1	-	duty_pwm 6	Generic PWM duty 6	%	1	1	0	-
33	6	270	1	Y	gear	Current gear selected	-	1	1	0	-
33	7	271	1	-	status8	Engine status bitfield	-	1	1	0	-
34	0	272	2	Y	EGOv1	Voltage from O2 cyl#1	V	489	100000	0	-
34	2	274	2	Y	EGOv2	Voltage from O2 cyl#2	V	489	100000	0	-
34	4	276	2	Y	EGOv3	Voltage from O2 cyl#3	V	489	100000	0	-
34	6	278	2	Y	EGOv4	Voltage from O2 cyl#4	V	489	100000	0	-
35	0	280	2	Y	EGOv5	Voltage from O2 cyl#5	V	489	100000	0	-
35	2	282	2	Y	EGOv6	Voltage from O2 cyl#6	V	489	100000	0	-
35	4	284	2	Y	EGOv7	Voltage from O2 cyl#7	V	489	100000	0	-
35	6	286	2	Y	EGOv8	Voltage from O2 cyl#8	V	489	100000	0	-
36	0	288	2	Y	EGOv9	Voltage from O2 cyl#9	V	489	100000	0	-
36	2	290	2	Y	EGOv10	Voltage from O2 cyl#10	V	489	100000	0	-
36	4	292	2	Y	EGOv11	Voltage from O2 cyl#11	V	489	100000	0	-
36	6	294	2	Y	EGOv12	Voltage from O2 cyl#12	V	489	100000	0	-
37	0	296	2	Y	EGOv13	Voltage from O2 cyl#13	V	489	100000	0	-
37	2	298	2	Y	EGOv14	Voltage from O2 cyl#14	V	489	100000	0	-
37	4	300	2	Y	EGOv15	Voltage from O2 cyl#15	V	489	100000	0	-
37	6	302	2	Y	EGOv16	Voltage from O2 cyl#16	V	489	100000	0	-
38	0	304	2	Y	EGOcor1	EGO correction cyl#1	%	1	10	0	-
38	2	306	2	Y	EGOcor2	EGO correction cyl#2	%	1	10	0	-

38	4	308	2	Y	EGOcor3	EGO correction cyl#3	%	1	10	0	-
38	6	310	2	Y	EGOcor4	EGO correction cyl#4	%	1	10	0	-
39	0	312	2	Y	EGOcor5	EGO correction cyl#5	%	1	10	0	-
39	2	314	2	Y	EGOcor6	EGO correction cyl#6	%	1	10	0	-
39	4	316	2	Y	EGOcor7	EGO correction cyl#7	%	1	10	0	-
39	6	318	2	Y	EGOcor8	EGO correction cyl#8	%	1	10	0	-
40	0	320	2	Y	EGOcor9	EGO correction cyl#9	%	1	10	0	-
40	2	322	2	Y	EGOcor10	EGO correction cyl#10	%	1	10	0	-
40	4	324	2	Y	EGOcor11	EGO correction cyl#11	%	1	10	0	-
40	6	326	2	Y	EGOcor12	EGO correction cyl#12	%	1	10	0	-
41	0	328	2	Y	EGOcor13	EGO correction cyl#13	%	1	10	0	-
41	2	330	2	Y	EGOcor14	EGO correction cyl#14	%	1	10	0	-
41	4	332	2	Y	EGOcor15	EGO correction cyl#15	%	1	10	0	-
41	6	334	2	Y	EGOcor16	EGO correction cyl#16	%	1	10	0	-
42	0	336	2	-	VSS1	Vehicle Speed 1	ms-1	1	10	0	-
42	2	338	2	-	VSS2	Vehicle Speed 2	ms-1	1	10	0	-
42	4	340	2	-	VSS3	Vehicle Speed 3	ms-1	1	10	0	-
42	6	342	2	-	VSS4	Vehicle Speed 4	ms-1	1	10	0	-
43	0	344	1	-	synccnt	Sync-loss counter	-	1	1	0	Y
43	1	345	1	-	syncreason	Sync-loss reason code	-	1	1	0	Y
43	2	346	2	-	sd_filenum	SDcard file number	-	1	1	0	-
43	4	348	1	-	sd_error	SDcard error number	-	1	1	0	-
43	5	349	1	-	sd_phase	SDcard internal code	-	1	1	0	-
43	6	350	1	-	sd_status	SDcard status bitfield	-	1	1	0	-
43	7	351	1	Y	timing_err	Calculated error in ignition timing	%	1	1	0	Y
44	0	352	2	Y	vvt_ang1	VVT actual angle 1	deg	1	10	0	-

44	2	354	2	Y	vvt_ang2	VVT actual angle 2	deg	1	10	0	-
44	4	356	2	Y	vvt_ang3	VVT actual angle 3	deg	1	10	0	-
44	6	358	2	Y	vvt_ang4	VVT actual angle 4	deg	1	10	0	-
45	0	360	2	Y	vvt_target1	VVT target angle 1	deg	1	10	0	-
45	2	362	2	Y	vvt_target2	VVT target angle 2	deg	1	10	0	-
45	4	364	2	Y	vvt_target3	VVT target angle 3	deg	1	10	0	-
45	6	366	2	Y	vvt_target4	VVT target angle 4	deg	1	10	0	-
46	0	368	1	-	vvt_duty1	VVT solenoid 1 duty cycle	%	392	1000	0	-
46	1	369	1	-	vvt_duty2	VVT solenoid 2 duty cycle	%	392	1000	0	-
46	2	370	1	-	vvt_duty3	VVT solenoid 3 duty cycle	%	392	1000	0	-
46	3	371	1	-	vvt_duty4	VVT solenoid 4 duty cycle	%	392	1000	0	-
46	4	372	2	Y	inj_timing_pri	Injection Timing Angle (primary)	deg BTDC	1	10	0	Y
46	6	374	2	Y	inj_timing_sec	Injection Timing Angle (secondary)	deg BTDC	1	10	0	Y
47	0	376	2	Y	fuel_pct	Ethanol content of fuel from Flex sensor	%	1	10	0	Y
47	2	378	2	Y	tps_accel	TPSdot based accel	%	1	10	0	-
47	4	380	2	-	SS1	Shaft speed 1	RPM	10	1	0	-
47	6	382	2	-	SS2	Shaft speed 2	RPM	10	1	0	-
48	0	384	1	-	knock_cyl1	Knock % cyl #1	%	4	10	0	-
48	1	385	1	-	knock_cyl2	Knock % cyl #2	%	4	10	0	-
48	2	386	1	-	knock_cyl3	Knock % cyl #3	%	4	10	0	-
48	3	387	1	-	knock_cyl4	Knock % cyl #4	%	4	10	0	-
48	4	388	1	-	knock_cyl5	Knock % cyl #5	%	4	10	0	-
48	5	389	1	-	knock_cyl6	Knock % cyl #6	%	4	10	0	-
48	6	390	1	-	knock_cyl7	Knock % cyl #7	%	4	10	0	-
48	7	391	1	-	knock_cyl8	Knock % cyl #8	%	4	10	0	-
49	0	392	1	-	knock_cyl9	Knock % cyl #9	%	4	10	0	-

49	1	393	1	-	knock_cyl10	Knock % cyl #10	%	4	10	0	-
49	2	394	1	-	knock_cyl11	Knock % cyl #11	%	4	10	0	-
49	3	395	1	-	knock_cyl12	Knock % cyl #12	%	4	10	0	-
49	4	396	1	-	knock_cyl13	Knock % cyl #13	%	4	10	0	-
49	5	397	1	-	knock_cyl14	Knock % cyl #14	%	4	10	0	-
49	6	398	1	-	knock_cyl15	Knock % cyl #15	%	4	10	0	-
49	7	399	1	-	knock_cyl16	Knock % cyl #16	%	4	10	0	-
50	0	400	2	Y	map_accel	MAPdot based accel	%	1	10	0	-
50	2	402	2	Y	total_accel	Total accel	%	1	10	0	-
50	5	404	2	-	launch_timer	Timer for timed-launch retard	s	1	1000	0	-
50	6	406	2	Y	launch_retard	Launch retard	deg	1	10	0	-
51	0	408	1	-	porta	CPU portA bitfield	-	1	1	0	Y
51	1	409	1	-	portb	CPU portB bitfield	-	1	1	0	Y
51	2	410	1	-	porteh	CPU portE/portH bitfield	-	1	1	0	Y
51	3	411	1	-	portk	CPU portK bitfield	-	1	1	0	-
51	4	412	1	-	portmj	CPU portM/portJ bitfield	-	1	1	0	Y
51	5	413	1	-	portp	CPU portP bitfield	-	1	1	0	-
51	6	414	1	-	portt	CPU portT bitfield	-	1	1	0	Y
51	7	415	1	-	cel_errorcode	CEL error code	-	1	1	0	-
52	0	416	1	-	canin1	CAN input 1 bitfield (CAN port 1 on MS2)	-	1	1	0	Y
52	1	417	1	-	canin2	CAN input 2 bitfield (CAN port 2 on MS2)	-	1	1	0	Y
52	2	418	1	-	canout	CAN output 1 bitfield (CAN port 3 on MS2)	-	1	1	0	Y
52	3	419	1	-	knk_rtd	Knock retard	deg	1	10	0	Y
52	4	420	2	-	fuelflow	Average fuel flow	cc/min	1	1	0	-
52	6	422	2	-	fuelcons	Average fuel consumption	l/km	1	1	0	-
53	0	424	2	Y	fuel_press1	Fuel pressure 1	kPa	1	10	0	-

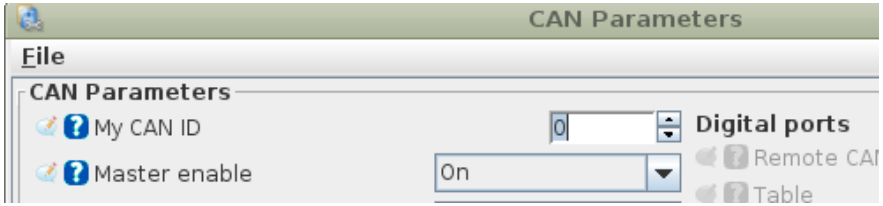
53	2	426	2	Y	fuel_press2	Fuel pressure 2	kPa	1	10	0	-
53	4	428	2	Y	fuel_temp1	Fuel temperature 1	deg F	1	10	0	-
53	6	430	2	Y	fuel_temp2	Fuel temperature 2	deg F	1	10	0	-
54	0	432	2	Y	batt_cur	Battery current (alternator system)	A	1	10	0	-
54	2	434	2	-	cel_status	CEL status bitfield	-	1	1	0	-
54	4	436	1	-	fp_duty	Fuel pump output duty	%	392	1000	0	-
54	5	437	1	-	alt_duty	Alternator field output duty	%	1	1	0	-
54	6	438	1	-	load_duty	Alternator measured load-sense duty	%	1	1	0	-
54	7	439	1	-	alt_targv	Alternator target voltage	V	1	10	0	-
55	0	440	2	-	looptime	Main code loop execution time	us	1	1	0	Y
55	2	442	2	-	fueltemp_cor	Fuel temperature correction	%	1	10	0	-
55	4	444	2	-	fuelpress_cor	Fuel pressure correction	%	1	10	0	-
55	6	446	1	Y	ltt_cor	Long term trim correction	%	1	10	0	-
55	7	447	1	-	sp1	Unused	-				-
56	0	448	2	Y	tc_retard	Traction control retard	deg	1	10	0	-
56	2	450	2	Y	cel_retard	CEL retard	deg	1	10	0	-
56	4	452	2	Y	fc_retard	Fuel-cut (overrun) retard	deg	1	10	0	-
56	6	454	2	Y	als_addfuel	ALS added fuel	ms	1	1000	0	-
57	0	456	2	Y	base_advance	Base timing from tables	deg	1	10	0	Y
57	2	458	2	Y	idle_cor_advance	Idle correction advance	deg	1	10	0	Y
57	4	460	2	Y	mat_retard	MAT retard	deg	1	10	0	Y
57	6	462	2	Y	flex_advance	Flex advance	deg	1	10	0	Y
58	0	464	2	Y	adv1	Timing lookup from table 1	deg	1	10	0	Y
58	2	466	2	Y	adv2	Timing lookup from table 2	deg	1	10	0	Y
58	4	468	2	Y	adv3	Timing lookup from table 3	deg	1	10	0	Y
58	6	470	2	Y	adv4	Timing lookup from table 4	deg	1	10	0	-

59	0	472	2	Y	revlim_retard	Revlimiter 'soft' retard	deg	1	10	0	Y
59	2	474	2	Y	als_timing	ALS timing change	deg	1	10	0	-
59	4	476	2	Y	ext_advance	External advance (e.g. trans)	deg	1	10	0	Y
59	6	478	2	Y	deadtime1	Injector deadtime in use (#1)	ms	1	1000	0	Y
60	0	480	2	Y	launch_timing	Launch control timing	deg	1	10	0	-
60	2	482	2	Y	step3_timing	3-step timing	deg	1	10	0	-
60	4	484	2	Y	vsslaunch_retard	Wheel-speed based launch retard	deg	1	10	0	-
60	6	486	2	-	cel_status2	CEL status 2	-	1	1	0	-
61	0	488	1	Y	gps_latdeg	External GPS latitude deg	deg	1	1	0	-
61	1	489	1	-	gps_latmin	GPS latitude minutes	min	1	1	0	-
61	2	490	2	-	gps_latmmin	GPS latitude milli-minutes	mmin	1	1	0	-
61	4	492	1	-	gps_londeg	GPS longitude degree	deg	1	1	0	-
61	5	493	1	-	gps_lonmin	GPS longitude minute	min	1	1	0	-
61	6	494	2	-	gps_lonmmin	GPS longitude milli-minutes	mmin	1	1	0	-
62	0	496	1	-	gps_outstatus	GPS status byte (bit 0 = E/W)	-	1	1	0	-
62	1	497	1	Y	gps_altk	GPS altitude km	km	1	1	0	-
62	2	498	2	-	gps_altm	GPS altitude m	m	1	1	0	-
62	4	500	2	-	gps_speed	GPS speed	ms-1	1	10	0	-
62	6	502	2	-	gps_course	GPS course	deg	1	10	0	-
63	0	504	1	-	generic_pid_duty 1	Generic closed-loop duty 1	%	392	1000	0	-
63	1	505	1	-	generic_pid_duty 2	Generic closed-loop duty 2	%	392	1000	0	-
63	2	506	6	-	-	Unused	-	-	-	-	-

This data format is available as a .dbc file from www.msextra.com/doc/pdf

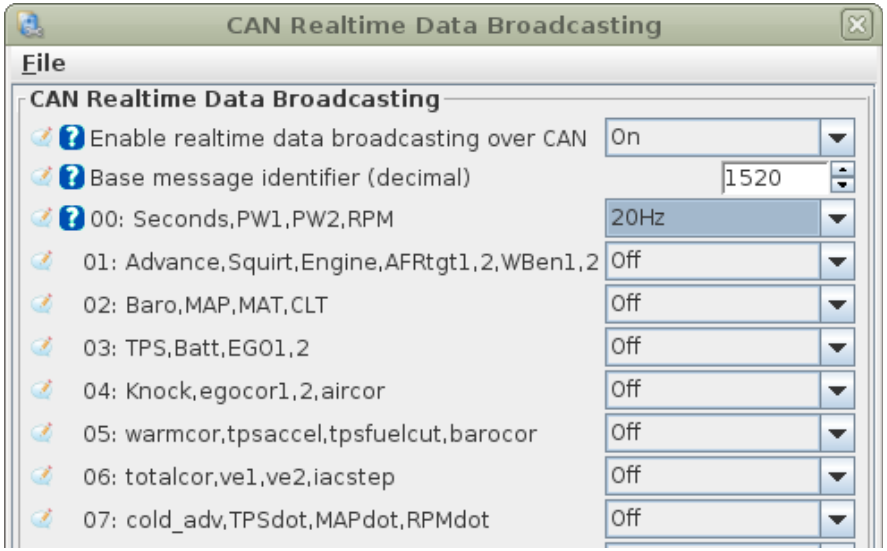
2.2 User configuration in Megasquirt-3, MS3-Pro, MS3-Gold and other MS3 based ECUs

The settings are on the CAN-Bus/Testmodes menu:



CAN-Bus/Testmodes -> CAN Parameters

Set Master enable to "On"



CAN-Bus/Testmodes -> CAN Realtime Data Broadcasting

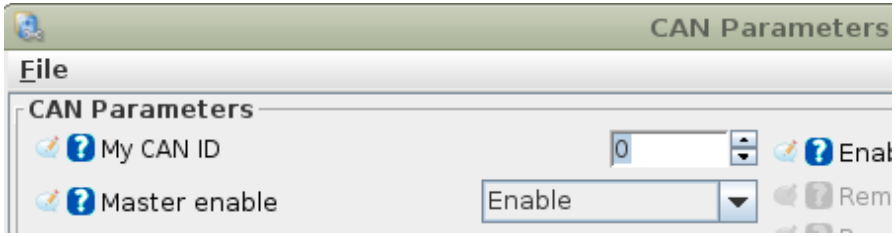
Set Enable realtime data broadcasting over CAN to "On"

The base message identifier can be changed if required.

For each group of channels required, the broadcast frequency should be set to enable that group.

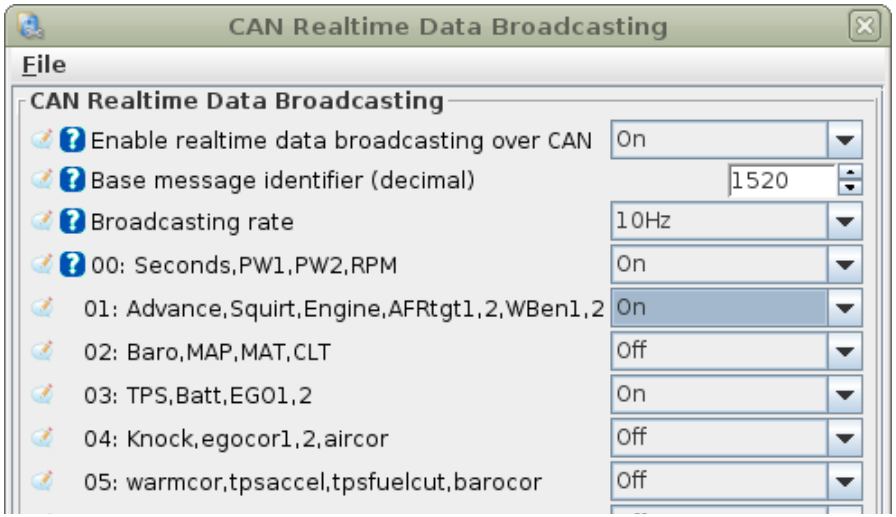
2.3 User configuration in Megasquirt-2, Microsquirt and other MS2 based ECUs

The settings are on the CAN-Bus/Testmodes menu:



CAN-Bus/Testmodes -> CAN Parameters

Set Master enable to "Enable"



CAN-Bus/Testmodes -> CAN Realtime Data Broadcasting

Set Enable realtime data broadcasting over CAN to "On"

The base message identifier can be changed if required.

For each group of channels required, the broadcast frequency should be set to enable that group.

3 DBW control messages - provisional

This is a work-in-progress messaging protocol for use with the MS3 1.5.x firmware. (Not supported on MS2.) The MS3 listens for a pedal position message and broadcasts a target throttle position based on a the throttle target table and modifiers. It is required that an external safety-critical throttle controller be used.

Important safety note:

T**he MS3 control code is not implemented in a safety critical manner**. We make no promises that the target throttle position will be timely or accurate. We take no responsibility for loss or damage that results from the use of this feature.

It is essential that any drive-by-wire controller that operates the primary throttle on a motor vehicle is designed to be safe and is implemented to comply with safety critical standards. Amongst other controls, such a system must tolerate and reject any out of range commands from the MS3.

11bit CAN headers are used at 500kbps with sequential addressing. Big-endian. **The default base identifier is 256 decimal** (0x100).

3.1 Field List (from MS3 to DBW)

Default ID	Offset in group	Total offset	Size	Sign?	Function	Units	Multiply	Divide	Add	MS2?
260	0	0	2	-	Throttle target 1 (typ 0-1023)	raw	1	1	0	-
260	2	2	2	-	Engine RPM	RPM	1	1	0	-
260	4	4	1	Y	Current gear	raw	1	1	0	-
260	5	5	1	-	-	-	-	-	-	-
260	6	6	1	-	Status word 0 - not yet defined	raw	1	1	0	-
260	7	7	1	-	Protocol number (0)	raw	1	1	0	-
261	0	8	2	-	Throttle target 2 (typ 0-1023)	raw	1	1	0	-

261	2	10	2	-	Throttle target 3 (typ 0-1023)	raw	1	1	0	-
261	4	12	2	-	Throttle target 4 (typ 0-1023)	raw	1	1	0	-
261	6	14	1	-	-	-	-	-	-	-
261	7	15	1	-	Protocol number (0)	raw	1	1	0	-

3.2 Field List (from DBW to MS3)

Default ID	Offset in group	Total offset	Size	Sign?	Function	Units	Multiply	Divide	Add	MS2?
256	0	0	2	-	Pedal position (typ 0-1023)	raw	1	1	0	-
256	2	2	2	-	Throttle 1 Position (typ 0-1023)	raw	1	1	0	-
256	2	2	2	-	Throttle 2 Position (typ 0-1023)	raw	1	1	0	-
256	6	6	1	-	Status word 0 - not yet defined	raw	1	1	0	-
256	7	7	1	-	Protocol number (0)	raw	1	1	0	-
257	0	8	2	-	-	-	-	-	-	-
257	2	10	2	-	Throttle 3 Position (typ 0-1023)	raw	1	1	0	-
257	4	12	2	-	Throttle 4 Position (typ 0-1023)	raw	1	1	0	-
257	6	14	1	-	Status word 1 - not yet defined	raw	1	1	0	-
257	7	15	1	-	Protocol number (0)	raw	1	1	0	-