

## Introduction

30/7/01

This document describes the data protocol implemented in the MoTeC M800 ECU as Telemetry data set 3. This format is published for use by third party systems that need to receive data from a MoTeC ECU.

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## **Protocol Description**

Byte	Name	Value / Scaling
0	Header 0	\$82
1	Header 1	\$81
2	Header 2	\$80
3	Data Length	1 – 255 Channels (currently 84)
4:5	RPM	1RPM
6:7	Throttle Position	0.1%
8:9	Manifold Pressure	0.1kPa
10:11	Air Temperature	0.1C
12:13	Engine Temperature	0.1C
14:15	Lambda 1	0.001La
16:17	Lambda 2	0.001La
18:19	Exhaust Manifold Pressure	0.1kPa
20:21	Mass Air Flow	0.1*
22:23	Fuel Temperature	0.1C
24:25	Fuel Pressure	0.1kPa
26:27	Oil Temperature	0.1C
28:29	Oil Pressure	0.1kPa
30:31	Gear Voltage	0.01V
32:33	Knock Voltage	0.01V
34:35	Gear Shift Force	0.1kg
36:37	Exhaust Temperature 1	1C
38:39	Exhaust Temperature 2	1C
40:41	User Channel 1	0.1*
42:43	User Channel 2	0.1*
44:45	User Channel 3	0.1*
46:47	User Channel 4	0.1*
48:49	Battery Voltage	0.01V
50:51	ECU Temperature	0.1C
52:53	Digital Input 1 Speed	0.1km/h
54:55	Digital Input 2 Speed	0.1km/h
56:57	Digital Input 3 Speed	0.1km/h
58:59	Digital Input 4 Speed	0.1km/h
60:61	Drive Speed	0.1km/h
62:63	Ground Speed	0.1km/h
64:65	Slip	0.1km/h
66:67	Aim Slip	0.1km/h
68:69	Launch RPM	1RPM
70:71	Lambda 1 short term trim	0.1%
72:73	Lambda 2 short term trim	0.1%
74:75	Lambda 1 long term trim	0.1%
76:77	Lambda 2 long term trim	0.1%

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80.81	PSAU00			
82.83   Fuel Cut Level	78:79	Aim Lambda 1	0.001La	
84:85   Ignition Cut Level				
86.87				
88.89				
90-91 Efficiency Point				
92-93   Fuel Used   1*   94-95   Auxiliary O/P 1 Duty Cycle   1%     94-95   Auxiliary O/P 2 Duty Cycle   1%     98-99   Auxiliary O/P 3 Duty Cycle   1%     100:101   Auxiliary O/P 5 Duty Cycle   1%     101:103   Auxiliary O/P 5 Duty Cycle   1%     104:105   Auxiliary O/P 6 Duty Cycle   1%     106:107   Auxiliary O/P 6 Duty Cycle   1%     108:109   Auxiliary O/P 8 Duty Cycle   1%     108:109   Auxiliary O/P 8 Duty Cycle   1%     108:109   Auxiliary O/P 8 Duty Cycle   1%     110:111   Fuel Effective Pulse Width   0.5 µs     112:113   Fuel Effective Pulse Width   0.5 µs     114:115   Fuel Injector Duty Cycle   0.1%     116:117   Gear   710 = gear     118:119   Sync Position   0.1%     120:121   Fuel Comp 1   0.1%     122:123   Fuel Comp 2   0.1%     124:125   Diagnostic Error Group 1   TP_ERR   1     AP_ERR   2     AT_ERR   4     ET_ERR   64     EMAP_ERR   128     128:129   Diagnostic Error Group 3   GEAR_VERR   1     ET_ERR   4     ET_ERR   4     ET_ERR   4     ET_ERR   4     ET_ERR   4     ET_ERR   4     ET_ERR   64     E				
94:95 Auxiliary O/P 1 Duty Cycle 11% 96:97 Auxiliary O/P 2 Duty Cycle 11% 100:101 Auxiliary O/P 4 Duty Cycle 11% 100:101 Auxiliary O/P 4 Duty Cycle 11% 101:103 Auxiliary O/P 5 Duty Cycle 11% 104:105 Auxiliary O/P 5 Duty Cycle 11% 106:107 Auxiliary O/P 5 Duty Cycle 11% 106:107 Auxiliary O/P 7 Duty Cycle 11% 108:109 Auxiliary O/P 8 Duty Cycle 11% 110:111 Fuel Actual Pulse Width 0.5 µs 112:113 Fuel Effective Pulse Width 0.5 µs 114:115 Fuel Injector Duty Cycle 0.1% 116:117 Gaar //10 = gear 118:119 Sync Position 0.1% 120:121 Fuel Comp 1 0.1% 122:123 Fuel Comp 2 0.1% 124:125 Diagnostic Error Group 1 TP_ERR 1 AT_ERR 4 ET_ERR 8 LA1_ERR 166 LA2_ERR 2 EMAP_ERR 64 MAF_ERR 128 126:127 Diagnostic Error Group 2 BARO_ERR 1 1 FT_ERR 1 4 ET_ERR 1 6 LA2_ERR 1 6 EMAP_ERR 1 1				
96:97   Auxiliary O/P 2 Duty Cycle   1%     98:99   Auxiliary O/P 3 Duty Cycle   1%     100:101   Auxiliary O/P 5 Duty Cycle   1%     102:103   Auxiliary O/P 5 Duty Cycle   1%     104:105   Auxiliary O/P 6 Duty Cycle   1%     106:107   Auxiliary O/P 6 Duty Cycle   1%     108:109   Auxiliary O/P 8 Duty Cycle   1%     108:109   Auxiliary O/P 8 Duty Cycle   1%     110:111   Fuel Actual Pulse Width   0.5 µs     112:113   Fuel Effective Pulse Width   0.5 µs     114:115   Fuel Injector Duty Cycle   0.1%     116:177   Gear			1	
98:99   Auxiliary O/P 3 Duty Cycle   1%				
100:101   Auxiliary O/P 4 Duty Cycle   1%     102:103   Auxiliary O/P 5 Duty Cycle   1%     106:107   Auxiliary O/P 7 Duty Cycle   1%     106:107   Auxiliary O/P 7 Duty Cycle   1%     108:109   Auxiliary O/P 8 Duty Cycle   1%     110:111   Fuel Actual Pulse Width   0.5 μs     112:113   Fuel Effective Pulse Width   0.5 μs     114:115   Fuel Injector Duty Cycle   0.1%     116:117   Gaar	96:97			
102:103   Auxiliary O/P 5 Duty Cycle   196     104:105   Auxiliary O/P 6 Duty Cycle   196     108:109   Auxiliary O/P 8 Duty Cycle   196     110:111   Fuel Actual Pulse Width   0.5 μs     112:113   Fuel Effective Pulse Width   0.5 μs     114:115   Fuel Injector Duty Cycle   0.1%     116:117   Gear	98:99			
104:105   Auxiliary O/P 6 Duty Cycle   19%	100:101			
106:107   Auxiliary O/P 7 Duty Cycle   19%     108:109   Auxiliary O/P 8 Duty Cycle   19%     110:111   Fuel Actual Pulse Width   0.5 μs     112:113   Fuel Effective Pulse Width   0.5 μs     114:115   Fuel Injector Duty Cycle   0.19%     116:117   Gear	102:103	Auxiliary O/P 5 Duty Cycle	1%	
108:109   Auxiliary O/P 8 Duty Cycle   19%	104:105	Auxiliary O/P 6 Duty Cycle	1%	
10:111   Fuel Actual Pulse Width   0.5 µs     112:113   Fuel Effective Pulse Width   0.5 µs     114:115   Fuel Injector Duty Cycle   0.1%     116:177   Gear   710 = gear     118:119   Sync Position   0.1%     120:121   Fuel Comp 1   0.1%     122:123   Fuel Comp 2   0.1%     124:125   Diagnostic Error Group 1   TP_ERR   1	106:107	Auxiliary O/P 7 Duty Cycle	1%	
112:113   Fuel Effective Pulse Width   0.5 µs     114:115   Fuel Injector Duty Cycle   0.19%     116:177   Gear	108:109	Auxiliary O/P 8 Duty Cycle	1%	
112:113   Fuel Effective Pulse Width   0.5 µs     114:115   Fuel Injector Duty Cycle   0.1%     116:177   Gear   710 = gear     118:119   Sync Position   0.1%     120:121   Fuel Comp 1   0.1%     122:123   Fuel Comp 2   0.1%     124:125   Diagnostic Error Group 1   TP_ERR   1	110:111	Fuel Actual Pulse Width	0.5 μs	
114:115	112:113	Fuel Effective Pulse Width	i ·	
116:177   Gear		Fuel Injector Duty Cycle	·	
118:119   Sync Position   120:121   Fuel Comp 1   0.1%     122:123   Fuel Comp 2   0.1%     124:125   Diagnostic Error Group 1   TP_ERR				
120:121   Fuel Comp 1   0.1%     122:123   Fuel Comp 2   0.1%     124:125   Diagnostic Error Group 1   TP_ERR			<u> </u>	
122:123   Fuel Comp 2   0.1%     124:125   Diagnostic Error Group 1   TP_ERR   1     MAP_ERR   2     AT_ERR   4     ET_ERR   8     LA1_ERR   16     LA2_ERR   32     EMAP_ERR   128     MAF_ERR   128     EMAP_ERR   128     MAF_ERR   128     EMAP_ERR   128     ERR   128     EMAP_ERR   128     EMAP_				
124:125				
MAP_ERR   2		1		1
AT_ERR	121.123	Diagnostic Error Group 1	<u> </u>	
ET_ERR				
LAI_ERR   16     LA2_ERR   32     EMAP_ERR   64     MAF ERR   128     126:127			_	
LA2_ERR   32     EMAP_ERR   64     MAF ERR   128     126:127   Diagnostic Error Group 2   BARO_ERR   1     FT_ERR   2     FP_ERR   4     OT_ERR   8     OP_ERR   16     LAT_G_ERR   32     LONG_G_ERR   64     SLIP_V_ERR   128     128:129   Diagnostic Error Group 3   GEAR_V_ERR   1     EGT1_ERR   4     EGT2_ERR   4     EGT2_ERR   32     USER3_ERR   16     USER3_ERR   16     USER4_ERR   128     130:131   Diagnostic Error Group 4   BATV_ERR   1     ECUT_ERR   2     VERT_G_ERR   4     GEAR_FORCE_ERR   8     DBW_CONT   16     DBW_ERR   32     DBW_AIM   64     DBW_FB   128			_	
EMAP_ERR   64   128   126:127   Diagnostic Error Group 2   BARO_ERR   1   FT_ERR   2   FP_ERR   4   OT_ERR   8   OP_ERR   16   LAT_G_ERR   128   128   128:129   Diagnostic Error Group 3   GEAR_V_ERR   1   EGT2_ERR   4   EGT2_ERR   4   EGT2_ERR   16   USER1_ERR   16   USER2_ERR   32   USER3_ERR   64   USER3_ERR   64   USER4_ERR   128   130:131   Diagnostic Error Group 4   BATV_ERR   1   ECUT_ERR   2   VERT_G_ERR   4   EGT2_ERR   64   USER4_ERR   128   130:131   Diagnostic Error Group 4   BATV_ERR   1   ECUT_ERR   2   VERT_G_ERR   4   GEAR_FORCE_ERR   8   DBW_CONT   16   DBW_ERR   32   DBW_AIM   64   DBW_FB   128   1				
MAF ERR   128			_	64
FT_ERR   2				128
FT_ERR   2	126:127	Diagnostic Error Group 2	BARO ERR	1
OT_ERR				2
OP_ERR			FP ERR	4
OP_ERR				8
LAT_G_ERR   32     LONG_G_ERR   64     SLIP_V_ERR   128     128:129   Diagnostic Error Group 3   GEAR_V_ERR   2     EGT1_ERR   4     EGT2_ERR   8     USER1_ERR   16     USER3_ERR   128     130:131   Diagnostic Error Group 4   BATV_ERR   1     ECUT_ERR   2     VERT_G_ERR   4     GEAR_FORCE_ERR   8     DBW_CONT   16     DBW_ERR   32     DBW_AIM   64     DBW_FB   128				16
SLIP V ERR   128			_	32
SLIP V ERR   128				64
KNOCK_ERR   2   EGT1_ERR   4   EGT2_ERR   8   USER1_ERR   16   USER2_ERR   32   USER3_ERR   64   USER4_ERR   128   130:131   Diagnostic Error Group 4   BATV_ERR   1   ECUT_ERR   2   VERT_G_ERR   4   GEAR_FORCE_ERR   8   DBW_CONT   16   DBW_ERR   32   DBW_AIM   DBW_FB   128				128
KNOCK_ERR   2   EGT1_ERR   4   EGT2_ERR   8   USER1_ERR   16   USER2_ERR   32   USER3_ERR   128   USER4_ERR   128   130:131   Diagnostic Error Group 4   BATV_ERR   1   ECUT_ERR   2   VERT_G_ERR   4   GEAR_FORCE_ERR   8   DBW_CONT   16   DBW_ERR   32   DBW_AIM   64   DBW_FB   128	128:129	Diagnostic Error Group 3		1
EGT1_ERR		<u> </u>		2
EGT2_ERR   8   USER1_ERR   16   USER2_ERR   32   USER3_ERR   64   USER4_ERR   128				4
USER1_ERR   16     USER2_ERR   32     USER3_ERR   64     USER4_ERR   128     130:131   Diagnostic Error Group 4   BATV_ERR     ECUT_ERR   2     VERT_G_ERR   4     GEAR_FORCE_ERR   8     DBW_CONT   16     DBW_ERR   32     DBW_AIM   64     DBW_FB   128				8
USER2_ERR				16
USER4_ERR   128				
130:131   Diagnostic Error Group 4   BATV_ERR   2   VERT_G_ERR   4   GEAR_FORCE_ERR   8   DBW_CONT   16   DBW_ERR   32   DBW_AIM   64   DBW_FB   128			USER3_ERR	
ECUT_ERR 2 VERT_G_ERR 4 GEAR_FORCE_ERR 8 DBW_CONT 16 DBW_ERR 32 DBW_AIM 64 DBW_FB 128			USER4_ERR	128
VERT_G_ERR       4         GEAR_FORCE_ERR       8         DBW_CONT       16         DBW_ERR       32         DBW_AIM       64         DBW_FB       128	130:131	Diagnostic Error Group 4	BATV_ERR	1
GEAR_FORCE_ERR 8 DBW_CONT 16 DBW_ERR 32 DBW_AIM 64 DBW_FB 128		<u>-</u>	ECUT_ERR	
DBW_CONT 16 DBW_ERR 32 DBW_AIM 64 DBW_FB 128			VERT_G_ERR	
DBW_CONT				8
DBW_AIM 64 DBW_FB 128			DBW_CONT	16
DBW_AIM 64 DBW_FB 128			DBW_ERR	32
DBW_FB 128				64
132:133 Diagnostic Error Group 5				128
υ <u></u>	132:133	Diagnostic Error Group 5	-	

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PSAU00	13		
134:135	Diagnostic Error Group 6	LOW_BAT_ERR	1
		OVER_BOOST_ERR	2
		NO_SYNC_ERR	4
		SYNC_ERR	8
		NO_REF_ERR	16
		REF ERR	32
		RPM OVER ERR	64
		F MAX DTY ERR	128
136:137	Diagnostic Error Group 7	MEM ERR	1
		DELTA BAT	2
		LA1 HEATER ERR	4
		LA2 HEATER ERR	8
		LA1 OT	16
		LA2 OT	32
		LA1_SENS_ERR	64
		LA2 SENS ERR	128
138:139	Diagnostic Error Group 8	LAZ_SENS_ERR	120
140:141	Diagnostic Error Group 9	RESET_TESTMOD	1
140.141	Diagnostic Error Group 9	RESET_TESTIMOD RESET_SYS	2
		RESET_SYS RESET NOXTAL	4
		RESEI_NUATAL	8
		DECET HALTMON	
		RESET_HALTMON	16
		<del>-</del>	32
		DECET EVT	64
142:142	Diagnastia Eman Crass 10	RESET_EXT	128
142:143	Diagnostic Error Group 10	INJ1_ERR	1
		INJ2_ERR	2
		INJ3_ERR	4
		INJ4_ERR	8
		INJ5_ERR	16
		INJ6_ERR	32
		INJ7_ERR	64
11111	P:	INJ8_ERR	128
144:145	Diagnostic Error Group 11	INJ1_SHORT	1
		INJ2_SHORT	2
		INJ3_SHORT	4
		INJ4_SHORT	8
		INJ5_SHORT	16
		INJ6_SHORT	32
		INJ7_SHORT	64
		INJ8_SHORT	128
146:147	Diagnostic Error Group 12	INJ1_OPEN	1
		INJ2_OPEN	2
		INJ3_OPEN	4
		INJ4_OPEN	8
		INJ5_OPEN	16
		INJ6_OPEN	32
		INJ7_OPEN	64
		INJ8_OPEN	128
148:149	Diagnostic Error Group 13	INJ1 PEAK	1
		INJ2 PEAK	2
		INJ3 PEAK	4
		INJ4 PEAK	8
		INJ5 PEAK	16
		INJ6_PEAK	32
		INJ7 PEAK	64
		INJ8 PEAK	128
		11 10 0_1 12/111	120

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PSAU00		GERLIG T. GETT	
150:151	Diagnostic Error Group 14	SYNC_LOW	1
		SYNC RNT	2
		SYNC TRIG	4
		SYNC_ARM	8
		REF LOW	16
		REF RNT	32
		_	l I
		REF_TRIG	64
		REF_ARM	128
152:153	Diagnostic Error Group 15	_	
154:155	Diagnostic Error Group 16	_	
156:157	Status Flags Group 1	RPM Limit Exceeded	1
		Launch Control	2
		Gear Change Ign Cut	4
		REF/SYNC Synched	8
		Closed Loop La 2	16
		Closed Loop La 1	32
		Lambda 2 Cold	64
		Lambda 1 Cold	128
158:159	Status Flags Group 2	Overrun Boost	1
		Alternator Off	2
		Overrun Fuel Cut	4
		-	8
		_	16
			32
		-	l I
		-	64
		-	128
160:161	Status Flags Group 3	Digital Input 1	1
100.101	Status I lags Gloup 3		_
		Digital Input 2	2
		Digital Input 3	4
		Digital Input 4	8
		2 igitai input i	16
		Nitrous	32
		Air Con Request	64
		Dual RPM Limit	128
162:163	Status Flags Crown 4	Traction Ctrl Disable	1
102.103	Status Flags Group 4		
		Clutch	2
		Logging Enable	4
		Beacon Mark	8
		Overrun Boost Enable	16
		Gear Chg Cut Request	32
		Ignition Switch	64
		Brake	128
164:165	Status Elogs Crown 5	Diano	
104:103	Status Flags Group 5	-	1
		-	2
		Spray Bar	4
			8
			l I
			16
		Telemetry Control	32
		Power Steer OvLd	64
		Ground Speed Limit	128
166 167	Status Flags Co	Ground Speed Ellillt	120
166:167	Status Flags Group 6	-	
168:169	Status Flags Group 7	Digital Input 5	1
	_	Digital Input 6	2
		Digital Input 7	4
		Digital Input 8	8
		D:-:4-1 I4 0	16
		Digital Input 9	10
		Digital Input 9	
		Digital Input 9 Digital Input 10	32
			32 64
			32
170:171	Status Flags Group 8		32 64
170:171 172	Status Flags Group 8 CRC byte 1 (HI Byte)		32 64

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173	CRC byte 2	
174	CRC byte 3	
175	CRC byte 4 (LO Byte)	

## NOTE:

- 1. Error Checking is a CRC32 of the header and data bytes
- 2. All units specified assume the ECU is calibrated in the recommended default units (metric). Changes to the ECU units will be reflected in the values transmitted
- 3. For channels marked '\*' there are no default units the units are dependent on ECU configuration
- 4. All channel values are signed quantities
  5. For compatibility with later versions, do not assume the number of data bytes is a constant.
- 6. Data channels are in 16 bit Motorola byte order, high byte first, then low byte.
- 7. Data can be received at nominal baud rates of 19200, 8N1 (actual rate 19231) or 38400 (actual rate 38461)
- 8. the M800 transmits data at RS232 levels.