

RPM to TACH Counts Conversion

1 Preface

This application note provides look up tables for the calculation of RPM to TACH Counts for use with the EMC2103, EMC2104, EMC2105, EMC2106, EMC2112, EMC2113, EMC2301, EMC2302, EMC2303, and EMC2305.

2 Audience

This application note assumes that the reader is familiar with the basic controls and functionality of the automatic Fan Speed Control Algorithm (FSC) used in various SMSC fan controllers. Furthermore, it assumes that readers have configured at least one of these SMSC devices correctly to operate the specific fan in their systems.

3 Overview

The FSC Algorithm used by the referenced devices uses a sophisticated algorithm to determine the fan speed and maintain it at high accuracy. The relationship between the actual fan speed and the presented data contains scaling factors that are determined directly by the fan settings. This application note shows simple tables for each of the selectable ranges of fan speed operation so that fast and simple data manipulation can be accomplished.

4 References

The following documents should be referenced when using this application note:

- SMSC EMC2103 Datasheet
- SMSC EMC2104 Datasheet
- SMSC EMC2105 Datasheet
- SMSC EMC2106 Datasheet
- SMSC EMC2112 Datasheet
- SMSC EMC2113 Datasheet
- SMSC EMC2301 Datasheet
- SMSC EMC2302 Datasheet
- SMSC EMC2303 Datasheet
- SMSC EMC2305 Datasheet

5 RPM to TACH Count Conversion

The conversion from RPM to TACH Counts is calculated mathematically by [Equation \[1\]](#). The equation is simplified if the number of edges measured (n) is set based on the number of poles of the fan. This simplified equation is shown in [Equation \[2\]](#) and was used to generate [Table 7.2](#) through [Table 7.5](#) based on the programmed range setting “m”.

where:

$$\text{RPM}_R = \frac{(n-1)}{(\text{poles})} \times \frac{1}{\text{COUNT} \times \frac{1}{m}} \times f_{\text{TACH}} \times 60$$

poles = number of poles of the fan
(typically 2)

f_{TACH} = The frequency of the clock
(default = 32.768kHz) **[1]**

n = number of edges measured
(typically 5 for a 2 pole fan)

m = the multiplier defined by the
RANGE bits

$$\text{RPM}_R = \frac{3,932,160 \times m}{\text{COUNT}}$$

COUNT = TACH Reading Register
value (in decimal) **[2]**

RPM_R = Reported fan speed

The COUNT value represents the decimal weighting of all bits of interest. If only 8-bit data is used, then the resolution of COUNT will be as shown in [Table 7.2](#) through [Table 7.5](#). If 13-bit data is used, then the resolution will be 1 count which may represent < 1 RPM depending on fan speed and range.

The “m” term is determined based on the RANGE[1:0] settings selected and will vary from a value of “1” to a value of “8”. This term is independent of the actual fan operation. It affects the data presentation as well as the range and resolution of the measurement.

The RANGE[1:0] settings determine the lowest fan speed that the device can measure. For the best measurement range and resolution, the RANGE[1:0] settings should be set at the largest setting that is below any expected fan speed used by the fan. For example, if a fan is expected to operate from 1800RPM to 4000RPM, then the RANGE[1:0] settings should be set at 1000RPM.

[Equation \[2\]](#) is only valid when the number of edges measured (n) is equal to 2*poles + 1. If this condition is not met, then the reported fan speed and the actual fan speed will differ by a factor “y”. This relationship is shown in [Equation \[3\]](#).

For example, if a 2-pole fan is being measured using 7 edges then the “y” term will be equal to 1.5. The device will measure 7 edges to determine the fan speed instead of 5. For a 3000 RPM fan, the reported TACH Count will read 3936d (7Bh) which coincides with 2000 RPM using [Equation \[2\]](#) instead of the actual fan speed of 3000 RPM.

where:

$$\text{RPM}_A = \text{RPM}_R \times y$$

RPM_A = Actual fan speed **[3]**

RPM_R = Reported fan speed
calculated via Equations 1 or 2

$$y = \frac{(n-1)}{(2 \times \text{poles})}$$

n = number of edges measured **[4]**

poles = number poles of the fan

6 Calculation Examples

Both of the examples below assume that a perfect 32.768kHz clock is available and used such that the measurement will have no error. This is for example purposes only and may not be indicative of actual performance. For the EMC2103 and EMC2113 devices, there is no port for an external 32.768kHz clock; therefore, the accuracy portrayed in these examples will be reduced.

6.1 Example #1

A user using the EMC2106 decides that he wishes to operate the fan as close to 6275 RPM as possible. He knows that it is a 2-pole fan, so he set the EDGES[1:0] bits to measure 5 edges (which is the default setting and recommended for a 2-pole fan).

The user doesn't expect the fan to operate below 2200 RPM so sets the RANGE[1:0] bits to 2000 RPM.

The user has the following terms: $n = 5$; poles = 2; $m = 4$; $f_{TACH} = 32.768\text{Hz}$.

Putting these terms into [Equation \[1\]](#) collapses it down to [Equation \[2\]](#). In order to determine what the necessary COUNT value should be, he will solve this equation for COUNT resulting in:

$$\text{COUNT} = \frac{3,932,160 \times m}{\text{RPM_R}}$$

where:

RPM_R = Reported fan speed
calculated via Equations 1 or 2 [5]

COUNT = TACH Target Register
settings

Using [Equation \[3\]](#) and [Equation \[4\]](#) the user calculates that the “y” term is equal to 1 and that the reported RPM will be equal to the actual RPM so no further manipulation must be performed.

Then, substituting 6275 for RPM_R in [Equation \[5\]](#), the user calculates that the decimal equivalent COUNT value will be 2,506.556 rounded up to 2,507.

6.1.1 TACH Target High Byte (8-bit TACH)

By examining [Table 7.4](#) it is clear that the closest High Byte setting is 4Eh resulting in a target RPM of 6302. The mathematics behind this result are explained below.

Determining the High Byte value is done sequentially starting with the MSB. Take the target count and subtract the bit weighting of the highest bit (4096). If the result is positive (i.e. ≥ 0) then the corresponding bit should be set and the difference used for subsequent calculations. If the difference is negative, then the corresponding bit should be cleared and the previous value used for future calculations.

Bit 7 = 4096. $2507 - 4096 = -1589$. This is less than 0 therefore Bit 7 should be set to '0'. The new target count is equal to the previous target count = 2507.

Bit 6 = 2048. $2507 - 2048 = 459$. This is greater than 0 therefore Bit 6 should be set to '1'. Because the bit was set, the new target count is equal to the difference = 459.

Bit 5 = 1024. $459 - 1024 = -565$. This is less than 0 therefore Bit 5 should be set to '0'. The new target count is equal to the previous target count = 459.

Bit 4 = 512. $459 - 512 = -53$. This is less than 0 therefore Bit 4 should be set to '0'. The new target count is equal to the previous target count = 459.

Bit 3 = 256. $459 - 256 = 203$. This is greater than 0 therefore Bit 3 should be set to '1'. Because the bit was set, the new target count is equal to the difference = 203.

Bit 2 = 128. $203 - 128 = 75$. This is greater than 0 therefore Bit 2 should be set to '1'. Because the bit was set, the new target is equal to the difference = 75.

Bit 1 = 64. $75 - 64 = 11$. This is greater than 0 therefore Bit 1 should be set to '1'. Because the bit was set, the new target is equal the difference = 11.

Bit 0 = 32. $11 - 32 = -21$. This is less than 0 therefore Bit 0 should be set to 0.

Capturing which bits were set gives a High Byte setting of 0100_1110 (4Eh). Summing the bit weighting of the set bits gives a decimal Count value of 2496. From [Table 7.4](#), this coincides with 6,302 RPM. The programmed Count value is off of the target by 11 counts and the RPM value is off by 27 RPM. Moreover, the resolution of an 8-bit TACH Target (in that region of operation) is approximately 80 RPM so that the target cannot be reached or maintained but the resolution may be sufficiently close for the application.

6.1.2 TACH Target Low Byte (13-bit TACH)

If additional accuracy or resolution is required, then the Low Byte can be programmed. This will improve accuracy and resolution of the fan driver.

Determining the Low Byte value is done by extending the calculation used to determine the high byte. The sum of the High Byte was 2496. The difference between the target count and the High Byte is $2507 - 2496 = 11$. Bit 7 has a weighting of 16 and $11 - 16 = -5$ therefore the 7th bit of the Low Byte is '0'. Bit 6 has a weighting of 8 and $11 - 8 = 3$ therefore the 6th bit of the Low Byte is '1'. Bit 5 has a weighting of 4 and $3 - 4 = -1$ therefore the 5th bit of the Low Byte is '0'. Bit 4 has a weighting of 2 and $3 - 2 = 1$ therefore the 4th bit of the Low Byte is '1'. Finally Bit 3 has a weighting of 1 and $1 - 1 = 0$ therefore the 3rd bit is '1'. The lower three bits of the Low Byte are not used and are always '0'.

Capturing which bits are set gives a Low Byte setting of 0101_1000b (58h) which is equivalent to decimal 11. Summing the Low Byte and High Byte together makes the total TACH Target COUNT = 2507 which forces the fan driver to drive the tachometer reading to 6,273.9 RPM rounded up to 6,274 RPM (only 1 RPM from the target). Moreover, the resolution of the RPM is approximately 2.5 RPM which means that, with an ideal clock, the tachometer target can be maintained to within -3.5 to +1.5 RPM.

6.2 Example #2

Using the same fan parameters as Example #1, the user wants to make sure that the fan is spinning at the expected value of 8,080RPM.

6.2.1 TACH Reading High Byte (8-bit TACH)

First, the user reads only the high byte value and returns 0011_1100b (3Ch). Using this value, he determines that the fan speed is 8,192 RPM with a resolution of ~135 RPM. This means that the fan can be spinning anywhere from 8,326 RPM to 8,057 RPM without toggling the LSB of the high byte. Depending on the application this precision may not be sufficient.

6.2.2 TACH Reading Low Byte (13-bit TACH)

In order for the user to determine that the fan is spinning at the desired speed, he must read the full 13-bit tachometer value. Reading the TACH Reading Low Byte yields a value of 1101_0000b (D0h).

Applying the bit weighting as defined in the EMC2106 Datasheet, the decimal equivalent COUNT is:

High Byte = 0011_1100b = $1024 + 512 + 256 + 128 = 1,920$.

Low Byte = 1101_0000b = $16 + 8 + 2 = 26$.

COUNT = High Byte + Low Byte = 1,946.



Calculating the RPM using [Equation \[2\]](#) yields an RPM value of 8,082.54 RPM rounded up to 8,083 RPM with a resolution of +/- 4 RPM. Therefore, the user knows that the fan is spinning between 8,080 RPM and 8,086 RPM.

7 RPM to TACH Look Up Tables

Note that all of the following look up tables are built using only the High Byte of the TACH Reading. The TACH Reading Low Byte is assumed to be 00h for all entries.

All data points were calculated using [Equation \[2\]](#) shown above with the “m” term set as shown in [Table 7.1](#). It is assumed that the number of poles and the number of edges match such that the “y” term is equal to 1.

A value of FFh in the TACH Reading High Byte register is assumed to mean that the fan is not spinning and a Stalled Fan interrupt will be generated. Writing a value of FFh into the TACH Target High Byte register will cause the fan to be disabled and it will not flag any tachometer related interrupts.

Table 7.1 “m Factor

RANGE	“m” FACTOR
500 RPM	1
1000 RPM	2
2000 RPM	4
4000 RPM	8

7.1 500 RPM Range

Table 7.2 Tachometer Count to RPM Look Up Table (Range = 500 RPM)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
0	00	Disabled	4096	80	960
32	01	122880	4128	81	953
64	02	61440	4160	82	945
96	03	40960	4192	83	938
128	04	30720	4224	84	931
160	05	24576	4256	85	924
192	06	20480	4288	86	917
224	07	17554	4320	87	910
256	08	15360	4352	88	904
288	09	13653	4384	89	897
320	0A	12288	4416	8A	890
352	0B	11171	4448	8B	884
384	0C	10240	4480	8C	878
416	0D	9452	4512	8D	871
448	0E	8777	4544	8E	865
480	0F	8192	4576	8F	859
512	10	7680	4608	90	853
544	11	7228	4640	91	847
576	12	6827	4672	92	842
608	13	6467	4704	93	836
640	14	6144	4736	94	830
672	15	5851	4768	95	825
704	16	5585	4800	96	819
736	17	5343	4832	97	814
768	18	5120	4864	98	808
800	19	4915	4896	99	803
832	1A	4726	4928	9A	798
864	1B	4551	4960	9B	793
896	1C	4389	4992	9C	788
928	1D	4237	5024	9D	783
960	1E	4096	5056	9E	778
992	1F	3964	5088	9F	773
1024	20	3840	5120	A0	768
1056	21	3724	5152	A1	763

Table 7.2 Tachometer Count to RPM Look Up Table (Range = 500 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
1088	22	3614	5184	A2	759
1120	23	3511	5216	A3	754
1152	24	3413	5248	A4	749
1184	25	3321	5280	A5	745
1216	26	3234	5312	A6	740
1248	27	3151	5344	A7	736
1280	28	3072	5376	A8	731
1312	29	2997	5408	A9	727
1344	2A	2926	5440	AA	723
1376	2B	2858	5472	AB	719
1408	2C	2793	5504	AC	714
1440	2D	2731	5536	AD	710
1472	2E	2671	5568	AE	706
1504	2F	2614	5600	AF	702
1536	30	2560	5632	B0	698
1568	31	2508	5664	B1	694
1600	32	2458	5696	B2	690
1632	33	2409	5728	B3	686
1664	34	2363	5760	B4	683
1696	35	2318	5792	B5	679
1728	36	2276	5824	B6	675
1760	37	2234	5856	B7	671
1792	38	2194	5888	B8	668
1824	39	2156	5920	B9	664
1856	3A	2119	5952	BA	661
1888	3B	2083	5984	BB	657
1920	3C	2048	6016	BC	654
1952	3D	2014	6048	BD	650
1984	3E	1982	6080	BE	647
2016	3F	1950	6112	BF	643
2048	40	1920	6144	C0	640
2080	41	1890	6176	C1	637
2112	42	1862	6208	C2	633
2144	43	1834	6240	C3	630
2176	44	1807	6272	C4	627
2208	45	1781	6304	C5	624

Table 7.2 Tachometer Count to RPM Look Up Table (Range = 500 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
2240	46	1755	6336	C6	621
2272	47	1731	6368	C7	617
2304	48	1707	6400	C8	614
2336	49	1683	6432	C9	611
2368	4A	1661	6464	CA	608
2400	4B	1638	6496	CB	605
2432	4C	1617	6528	CC	602
2464	4D	1596	6560	CD	599
2496	4E	1575	6592	CE	597
2528	4F	1555	6624	CF	594
2560	50	1536	6656	D0	591
2592	51	1517	6688	D1	588
2624	52	1499	6720	D2	585
2656	53	1480	6752	D3	582
2688	54	1463	6784	D4	580
2720	55	1446	6816	D5	577
2752	56	1429	6848	D6	574
2784	57	1412	6880	D7	572
2816	58	1396	6912	D8	569
2848	59	1381	6944	D9	566
2880	5A	1365	6976	DA	564
2912	5B	1350	7008	DB	561
2944	5C	1336	7040	DC	559
2976	5D	1321	7072	DD	556
3008	5E	1307	7104	DE	554
3040	5F	1293	7136	DF	551
3072	60	1280	7168	E0	549
3104	61	1267	7200	E1	546
3136	62	1254	7232	E2	544
3168	63	1241	7264	E3	541
3200	64	1229	7296	E4	539
3232	65	1217	7328	E5	537
3264	66	1205	7360	E6	534
3296	67	1193	7392	E7	532
3328	68	1182	7424	E8	530
3360	69	1170	7456	E9	527

Table 7.2 Tachometer Count to RPM Look Up Table (Range = 500 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
3392	6A	1159	7488	EA	525
3424	6B	1148	7520	EB	523
3456	6C	1138	7552	EC	521
3488	6D	1127	7584	ED	518
3520	6E	1117	7616	EE	516
3552	6F	1107	7648	EF	514
3584	70	1097	7680	F0	512
3616	71	1087	7712	F1	510
3648	72	1078	7744	F2	508
3680	73	1069	7776	F3	506
3712	74	1059	7808	F4	504
3744	75	1050	7840	F5	502
3776	76	1041	7872	F6	500
3808	77	1033	7904	F7	497
3840	78	1024	7936	F8	495
3872	79	1016	7968	F9	493
3904	7A	1007	8000	FA	492
3936	7B	999	8032	FB	490
3968	7C	991	8064	FC	488
4000	7D	983	8096	FD	486
4032	7E	975	8128	FE	484
4064	7F	968	8160	FF	off / not spinning

7.2 1k RPM Range

Table 7.3 Tachometer Count to RPM Look Up Table (Range = 1000 RPM)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
0	00	Disabled	4096	80	1920
32	01	245760	4128	81	1905
64	02	122880	4160	82	1890
96	03	81920	4192	83	1876
128	04	61440	4224	84	1862
160	05	49152	4256	85	1848
192	06	40960	4288	86	1834
224	07	35109	4320	87	1820
256	08	30720	4352	88	1807
288	09	27307	4384	89	1794
320	0A	24576	4416	8A	1781
352	0B	22342	4448	8B	1768
384	0C	20480	4480	8C	1755
416	0D	18905	4512	8D	1743
448	0E	17554	4544	8E	1731
480	0F	16384	4576	8F	1719
512	10	15360	4608	90	1707
544	11	14456	4640	91	1695
576	12	13653	4672	92	1683
608	13	12935	4704	93	1672
640	14	12288	4736	94	1661
672	15	11703	4768	95	1649
704	16	11171	4800	96	1638
736	17	10685	4832	97	1628
768	18	10240	4864	98	1617
800	19	9830	4896	99	1606
832	1A	9452	4928	9A	1596
864	1B	9102	4960	9B	1586
896	1C	8777	4992	9C	1575
928	1D	8474	5024	9D	1565
960	1E	8192	5056	9E	1555
992	1F	7928	5088	9F	1546
1024	20	7680	5120	A0	1536
1056	21	7447	5152	A1	1526

Table 7.3 Tachometer Count to RPM Look Up Table (Range = 1000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
1088	22	7228	5184	A2	1517
1120	23	7022	5216	A3	1508
1152	24	6827	5248	A4	1499
1184	25	6642	5280	A5	1489
1216	26	6467	5312	A6	1480
1248	27	6302	5344	A7	1472
1280	28	6144	5376	A8	1463
1312	29	5994	5408	A9	1454
1344	2A	5851	5440	AA	1446
1376	2B	5715	5472	AB	1437
1408	2C	5585	5504	AC	1429
1440	2D	5461	5536	AD	1421
1472	2E	5343	5568	AE	1412
1504	2F	5229	5600	AF	1404
1536	30	5120	5632	B0	1396
1568	31	5016	5664	B1	1388
1600	32	4915	5696	B2	1381
1632	33	4819	5728	B3	1373
1664	34	4726	5760	B4	1365
1696	35	4637	5792	B5	1358
1728	36	4551	5824	B6	1350
1760	37	4468	5856	B7	1343
1792	38	4389	5888	B8	1336
1824	39	4312	5920	B9	1328
1856	3A	4237	5952	BA	1321
1888	3B	4165	5984	BB	1314
1920	3C	4096	6016	BC	1307
1952	3D	4029	6048	BD	1300
1984	3E	3964	6080	BE	1293
2016	3F	3901	6112	BF	1287
2048	40	3840	6144	C0	1280
2080	41	3781	6176	C1	1273
2112	42	3724	6208	C2	1267
2144	43	3668	6240	C3	1260
2176	44	3614	6272	C4	1254
2208	45	3562	6304	C5	1248

Table 7.3 Tachometer Count to RPM Look Up Table (Range = 1000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
2240	46	3511	6336	C6	1241
2272	47	3461	6368	C7	1235
2304	48	3413	6400	C8	1229
2336	49	3367	6432	C9	1223
2368	4A	3321	6464	CA	1217
2400	4B	3277	6496	CB	1211
2432	4C	3234	6528	CC	1205
2464	4D	3192	6560	CD	1199
2496	4E	3151	6592	CE	1193
2528	4F	3111	6624	CF	1187
2560	50	3072	6656	D0	1182
2592	51	3034	6688	D1	1176
2624	52	2997	6720	D2	1170
2656	53	2961	6752	D3	1165
2688	54	2926	6784	D4	1159
2720	55	2891	6816	D5	1154
2752	56	2858	6848	D6	1148
2784	57	2825	6880	D7	1143
2816	58	2793	6912	D8	1138
2848	59	2761	6944	D9	1133
2880	5A	2731	6976	DA	1127
2912	5B	2701	7008	DB	1122
2944	5C	2671	7040	DC	1117
2976	5D	2643	7072	DD	1112
3008	5E	2614	7104	DE	1107
3040	5F	2587	7136	DF	1102
3072	60	2560	7168	E0	1097
3104	61	2534	7200	E1	1092
3136	62	2508	7232	E2	1087
3168	63	2482	7264	E3	1083
3200	64	2458	7296	E4	1078
3232	65	2433	7328	E5	1073
3264	66	2409	7360	E6	1069
3296	67	2386	7392	E7	1064
3328	68	2363	7424	E8	1059
3360	69	2341	7456	E9	1055

Table 7.3 Tachometer Count to RPM Look Up Table (Range = 1000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
3392	6A	2318	7488	EA	1050
3424	6B	2297	7520	EB	1046
3456	6C	2276	7552	EC	1041
3488	6D	2255	7584	ED	1037
3520	6E	2234	7616	EE	1033
3552	6F	2214	7648	EF	1028
3584	70	2194	7680	F0	1024
3616	71	2175	7712	F1	1020
3648	72	2156	7744	F2	1016
3680	73	2137	7776	F3	1011
3712	74	2119	7808	F4	1007
3744	75	2101	7840	F5	1003
3776	76	2083	7872	F6	999
3808	77	2065	7904	F7	995
3840	78	2048	7936	F8	991
3872	79	2031	7968	F9	987
3904	7A	2014	8000	FA	983
3936	7B	1998	8032	FB	979
3968	7C	1982	8064	FC	975
4000	7D	1966	8096	FD	971
4032	7E	1950	8128	FE	968
4064	7F	1935	8160	FF	off / not spinning

7.3 2k RPM Range

Table 7.4 Tachometer Count to RPM Look Up Table (Range = 2000 RPM)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
0	00	Disabled	4096	80	3840
32	01	491520	4128	81	3810
64	02	245760	4160	82	3781
96	03	163840	4192	83	3752
128	04	122880	4224	84	3724
160	05	98304	4256	85	3696
192	06	81920	4288	86	3668
224	07	70217	4320	87	3641
256	08	61440	4352	88	3614
288	09	54613	4384	89	3588
320	0A	49152	4416	8A	3562
352	0B	44684	4448	8B	3536
384	0C	40960	4480	8C	3511
416	0D	37809	4512	8D	3486
448	0E	35109	4544	8E	3461
480	0F	32768	4576	8F	3437
512	10	30720	4608	90	3413
544	11	28913	4640	91	3390
576	12	27307	4672	92	3367
608	13	25869	4704	93	3344
640	14	24576	4736	94	3321
672	15	23406	4768	95	3299
704	16	22342	4800	96	3277
736	17	21370	4832	97	3255
768	18	20480	4864	98	3234
800	19	19661	4896	99	3213
832	1A	18905	4928	9A	3192
864	1B	18204	4960	9B	3171
896	1C	17554	4992	9C	3151
928	1D	16949	5024	9D	3131
960	1E	16384	5056	9E	3111
992	1F	15855	5088	9F	3091
1024	20	15360	5120	A0	3072
1056	21	14895	5152	A1	3053

Table 7.4 Tachometer Count to RPM Look Up Table (Range = 2000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
1088	22	14456	5184	A2	3034
1120	23	14043	5216	A3	3015
1152	24	13653	5248	A4	2997
1184	25	13284	5280	A5	2979
1216	26	12935	5312	A6	2961
1248	27	12603	5344	A7	2943
1280	28	12288	5376	A8	2926
1312	29	11988	5408	A9	2908
1344	2A	11703	5440	AA	2891
1376	2B	11431	5472	AB	2874
1408	2C	11171	5504	AC	2858
1440	2D	10923	5536	AD	2841
1472	2E	10685	5568	AE	2825
1504	2F	10458	5600	AF	2809
1536	30	10240	5632	B0	2793
1568	31	10031	5664	B1	2777
1600	32	9830	5696	B2	2761
1632	33	9638	5728	B3	2746
1664	34	9452	5760	B4	2731
1696	35	9274	5792	B5	2716
1728	36	9102	5824	B6	2701
1760	37	8937	5856	B7	2686
1792	38	8777	5888	B8	2671
1824	39	8623	5920	B9	2657
1856	3A	8474	5952	BA	2643
1888	3B	8331	5984	BB	2628
1920	3C	8192	6016	BC	2614
1952	3D	8058	6048	BD	2601
1984	3E	7928	6080	BE	2587
2016	3F	7802	6112	BF	2573
2048	40	7680	6144	C0	2560
2080	41	7562	6176	C1	2547
2112	42	7447	6208	C2	2534
2144	43	7336	6240	C3	2521
2176	44	7228	6272	C4	2508
2208	45	7123	6304	C5	2495

Table 7.4 Tachometer Count to RPM Look Up Table (Range = 2000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
2240	46	7022	6336	C6	2482
2272	47	6923	6368	C7	2470
2304	48	6827	6400	C8	2458
2336	49	6733	6432	C9	2445
2368	4A	6642	6464	CA	2433
2400	4B	6554	6496	CB	2421
2432	4C	6467	6528	CC	2409
2464	4D	6383	6560	CD	2398
2496	4E	6302	6592	CE	2386
2528	4F	6222	6624	CF	2374
2560	50	6144	6656	D0	2363
2592	51	6068	6688	D1	2352
2624	52	5994	6720	D2	2341
2656	53	5922	6752	D3	2329
2688	54	5851	6784	D4	2318
2720	55	5783	6816	D5	2308
2752	56	5715	6848	D6	2297
2784	57	5650	6880	D7	2286
2816	58	5585	6912	D8	2276
2848	59	5523	6944	D9	2265
2880	5A	5461	6976	DA	2255
2912	5B	5401	7008	DB	2244
2944	5C	5343	7040	DC	2234
2976	5D	5285	7072	DD	2224
3008	5E	5229	7104	DE	2214
3040	5F	5174	7136	DF	2204
3072	60	5120	7168	E0	2194
3104	61	5067	7200	E1	2185
3136	62	5016	7232	E2	2175
3168	63	4965	7264	E3	2165
3200	64	4915	7296	E4	2156
3232	65	4867	7328	E5	2146
3264	66	4819	7360	E6	2137
3296	67	4772	7392	E7	2128
3328	68	4726	7424	E8	2119
3360	69	4681	7456	E9	2110

Table 7.4 Tachometer Count to RPM Look Up Table (Range = 2000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
3392	6A	4637	7488	EA	2101
3424	6B	4594	7520	EB	2092
3456	6C	4551	7552	EC	2083
3488	6D	4509	7584	ED	2074
3520	6E	4468	7616	EE	2065
3552	6F	4428	7648	EF	2057
3584	70	4389	7680	F0	2048
3616	71	4350	7712	F1	2040
3648	72	4312	7744	F2	2031
3680	73	4274	7776	F3	2023
3712	74	4237	7808	F4	2014
3744	75	4201	7840	F5	2006
3776	76	4165	7872	F6	1998
3808	77	4130	7904	F7	1990
3840	78	4096	7936	F8	1982
3872	79	4062	7968	F9	1974
3904	7A	4029	8000	FA	1966
3936	7B	3996	8032	FB	1958
3968	7C	3964	8064	FC	1950
4000	7D	3932	8096	FD	1943
4032	7E	3901	8128	FE	1935
4064	7F	3870	8160	FF	off / not spinning

7.4 4k RPM Range

Table 7.5 Tachometer Count to RPM Look Up Table (Range = 4000 RPM)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
0	00	Disabled	4096	80	7680
32	01	983040	4128	81	7620
64	02	491520	4160	82	7562
96	03	327680	4192	83	7504
128	04	245760	4224	84	7447
160	05	196608	4256	85	7391
192	06	163840	4288	86	7336
224	07	140434	4320	87	7282
256	08	122880	4352	88	7228
288	09	109227	4384	89	7175
320	0A	98304	4416	8A	7123
352	0B	89367	4448	8B	7072
384	0C	81920	4480	8C	7022
416	0D	75618	4512	8D	6972
448	0E	70217	4544	8E	6923
480	0F	65536	4576	8F	6874
512	10	61440	4608	90	6827
544	11	57826	4640	91	6780
576	12	54613	4672	92	6733
608	13	51739	4704	93	6687
640	14	49152	4736	94	6642
672	15	46811	4768	95	6598
704	16	44684	4800	96	6554
736	17	42741	4832	97	6510
768	18	40960	4864	98	6467
800	19	39322	4896	99	6425
832	1A	37809	4928	9A	6383
864	1B	36409	4960	9B	6342
896	1C	35109	4992	9C	6302
928	1D	33898	5024	9D	6261
960	1E	32768	5056	9E	6222
992	1F	31711	5088	9F	6183
1024	20	30720	5120	A0	6144
1056	21	29789	5152	A1	6106

Table 7.5 Tachometer Count to RPM Look Up Table (Range = 4000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
1088	22	28913	5184	A2	6068
1120	23	28087	5216	A3	6031
1152	24	27307	5248	A4	5994
1184	25	26569	5280	A5	5958
1216	26	25869	5312	A6	5922
1248	27	25206	5344	A7	5886
1280	28	24576	5376	A8	5851
1312	29	23977	5408	A9	5817
1344	2A	23406	5440	AA	5783
1376	2B	22861	5472	AB	5749
1408	2C	22342	5504	AC	5715
1440	2D	21845	5536	AD	5682
1472	2E	21370	5568	AE	5650
1504	2F	20916	5600	AF	5617
1536	30	20480	5632	B0	5585
1568	31	20062	5664	B1	5554
1600	32	19661	5696	B2	5523
1632	33	19275	5728	B3	5492
1664	34	18905	5760	B4	5461
1696	35	18548	5792	B5	5431
1728	36	18204	5824	B6	5401
1760	37	17873	5856	B7	5372
1792	38	17554	5888	B8	5343
1824	39	17246	5920	B9	5314
1856	3A	16949	5952	BA	5285
1888	3B	16662	5984	BB	5257
1920	3C	16384	6016	BC	5229
1952	3D	16115	6048	BD	5201
1984	3E	15855	6080	BE	5174
2016	3F	15604	6112	BF	5147
2048	40	15360	6144	C0	5120
2080	41	15124	6176	C1	5093
2112	42	14895	6208	C2	5067
2144	43	14672	6240	C3	5041
2176	44	14456	6272	C4	5016
2208	45	14247	6304	C5	4990

Table 7.5 Tachometer Count to RPM Look Up Table (Range = 4000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
2240	46	14043	6336	C6	4965
2272	47	13846	6368	C7	4940
2304	48	13653	6400	C8	4915
2336	49	13466	6432	C9	4891
2368	4A	13284	6464	CA	4867
2400	4B	13107	6496	CB	4843
2432	4C	12935	6528	CC	4819
2464	4D	12767	6560	CD	4795
2496	4E	12603	6592	CE	4772
2528	4F	12444	6624	CF	4749
2560	50	12288	6656	D0	4726
2592	51	12136	6688	D1	4704
2624	52	11988	6720	D2	4681
2656	53	11844	6752	D3	4659
2688	54	11703	6784	D4	4637
2720	55	11565	6816	D5	4615
2752	56	11431	6848	D6	4594
2784	57	11299	6880	D7	4572
2816	58	11171	6912	D8	4551
2848	59	11045	6944	D9	4530
2880	5A	10923	6976	DA	4509
2912	5B	10803	7008	DB	4489
2944	5C	10685	7040	DC	4468
2976	5D	10570	7072	DD	4448
3008	5E	10458	7104	DE	4428
3040	5F	10348	7136	DF	4408
3072	60	10240	7168	E0	4389
3104	61	10134	7200	E1	4369
3136	62	10031	7232	E2	4350
3168	63	9930	7264	E3	4331
3200	64	9830	7296	E4	4312
3232	65	9733	7328	E5	4293
3264	66	9638	7360	E6	4274
3296	67	9544	7392	E7	4256
3328	68	9452	7424	E8	4237
3360	69	9362	7456	E9	4219

Table 7.5 Tachometer Count to RPM Look Up Table (Range = 4000 RPM) (continued)

TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)	TACH COUNT (DECIMAL)	TACH HIGH BYTE (HEX)	FAN SPEED (RPM)
3392	6A	9274	7488	EA	4201
3424	6B	9187	7520	EB	4183
3456	6C	9102	7552	EC	4165
3488	6D	9019	7584	ED	4148
3520	6E	8937	7616	EE	4130
3552	6F	8856	7648	EF	4113
3584	70	8777	7680	F0	4096
3616	71	8699	7712	F1	4079
3648	72	8623	7744	F2	4062
3680	73	8548	7776	F3	4045
3712	74	8474	7808	F4	4029
3744	75	8402	7840	F5	4012
3776	76	8331	7872	F6	3996
3808	77	8261	7904	F7	3980
3840	78	8192	7936	F8	3964
3872	79	8124	7968	F9	3948
3904	7A	8058	8000	FA	3932
3936	7B	7992	8032	FB	3916
3968	7C	7928	8064	FC	3901
4000	7D	7864	8096	FD	3886
4032	7E	7802	8128	FE	3870
4064	7F	7740	8160	FF	off / not spinning



8 Revision History

Table 8.1 Customer Revision History

REVISION LEVEL & DATE	SECTION/FIGURE/ENTRY	CORRECTION
Rev. 0.40 (05-04-09)	Document	Added additional devices: EMC2112, EMC2113, EMC2301, EMC2302, EMC2303, and EMC2305. Updated title from "Fan Control Device Look Up Tables" to "RPM TACH Counts Conversion".
Rev. 0.39 (10-25-07)	Initial Release	



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