

§ 1048.815**40 CFR Ch. I (7-1-04 Edition)**

TABLE 2 OF § 1048.810—SAE MATERIALS

Document number and name	Part 1048 reference
SAE J1930, Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms, May 1998	1048.135
SAE J2260, Nonmetallic Fuel System Tubing with One or More Layers, November 1996	1048.105

(c) *ISO material.* Table 3 of § 1048.810 lists material from the International Organization for Standardization that we have incorporated by reference. The first column lists the number and name of the material. The second column

lists the section of this part where we reference it. Anyone may purchase copies of these materials from the International Organization for Standardization, Case Postale 56, CH-1211 Geneva 20, Switzerland. Table 3 follows:

TABLE 3 OF § 1048.810—ISO MATERIALS

Document number and name	Part 1048 reference
ISO 9141-2 Road vehicles—Diagnostic systems—Part 2: CARB requirements for interchange of digital information, February 1994	1048.110
ISO 14230-4 Road vehicles—Diagnostic systems—Keyword Protocol 2000—Part 4: Requirements for emission-related systems, June 2000	1048.110

[67 FR 68347, Nov. 8, 2002, as amended at 69 FR 18803, Apr. 9, 2004]

§ 1048.815 How should I request EPA to keep my information confidential?

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§ 1048.820 How do I request a hearing?

See 40 CFR part 1068, subpart G, for information related to hearings.

APPENDIX I TO PART 1048—LARGE SPARK-IGNITION (SI) TRANSIENT CYCLE FOR CONSTANT-SPEED ENGINES

The following table shows the transient duty-cycle for constant-speed engines, as described in § 1048.510:

Time(s)	Normalized speed (percent)	Normalized torque (percent)
1	58	5
2	58	5
3	58	5
4	58	5
5	58	5
6	58	5
7	58	5
8	58	5
9	58	5
10	58	5
11	58	5
12	65	8
13	72	9
14	79	12
15	86	14
16	93	16
17	93	16
18	93	16
19	93	16
20	93	16
21	93	16
22	93	16
23	93	16
24	93	31
25	93	30
26	93	27
27	93	23
28	93	24
29	93	21
30	93	20

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
31	93	18	103	93	20
32	93	16	104	93	29
33	93	18	105	93	27
34	93	16	106	93	26
35	93	17	107	93	35
36	93	20	108	93	43
37	93	20	109	95	35
38	93	22	110	95	24
39	93	20	111	95	17
40	93	17	112	95	13
41	93	17	113	95	10
42	93	17	114	95	9
43	93	16	115	95	8
44	93	18	116	95	7
45	93	18	117	95	7
46	93	21	118	95	6
47	93	21	119	93	36
48	93	18	120	93	30
49	94	24	121	93	25
50	93	28	122	93	21
51	93	23	123	93	22
52	93	19	124	93	19
53	93	20	125	93	34
54	93	20	126	93	36
55	93	29	127	93	31
56	93	23	128	93	26
57	93	25	129	93	27
58	93	23	130	93	22
59	93	23	131	93	22
60	93	23	132	93	18
61	93	22	133	93	18
62	93	21	134	93	19
63	93	22	135	93	19
64	93	30	136	93	23
65	93	33	137	93	22
66	93	25	138	93	20
67	93	29	139	93	23
68	93	27	140	93	20
69	93	23	141	93	18
70	93	21	142	93	18
71	93	21	143	93	16
72	93	19	144	93	19
73	93	20	145	94	25
74	93	24	146	93	30
75	93	23	147	93	29
76	93	21	148	93	23
77	93	44	149	93	24
78	93	34	150	93	22
79	93	28	151	94	20
80	93	37	152	93	17
81	93	29	153	93	16
82	93	27	154	93	16
83	93	33	155	93	15
84	93	28	156	93	17
85	93	22	157	93	18
86	96	30	158	93	20
87	95	25	159	93	21
88	95	17	160	93	18
89	95	13	161	93	17
90	95	10	162	92	54
91	95	9	163	93	38
92	95	8	164	93	29
93	95	7	165	93	24
94	95	7	166	93	24
95	95	6	167	93	24
96	95	6	168	93	23
97	93	37	169	93	20
98	93	35	170	93	20
99	93	29	171	93	18
100	93	23	172	93	19
101	93	23	173	93	19
102	93	21	174	93	16

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Time(s)	Normalized speed (percent)	Normalized torque (percent)	Time(s)	Normalized speed (percent)	Normalized torque (percent)
175	93	16	247	95	16
176	93	16	248	95	12
177	93	18	249	95	10
178	93	21	250	95	9
179	93	20	251	95	8
180	93	20	252	96	7
181	93	17	253	95	7
182	93	19	254	95	6
183	93	17	255	92	42
184	93	18	256	93	36
185	93	16	257	93	33
186	93	16	258	92	60
187	93	16	259	93	48
188	93	17	260	93	36
189	93	16	261	93	30
190	93	17	262	93	28
191	93	18	263	93	24
192	93	17	264	93	24
193	93	16	265	93	23
194	93	17	266	93	23
195	93	17	267	93	25
196	93	22	268	93	27
197	93	19	269	93	29
198	93	19	270	93	26
199	95	21	271	93	26
200	95	16	272	93	21
201	95	12	273	93	23
202	95	10	274	93	23
203	96	8	275	94	23
204	96	7	276	93	40
205	95	7	277	94	67
206	96	7	278	93	46
207	95	6	279	93	38
208	96	6	280	93	29
209	96	6	281	93	28
210	88	6	282	93	27
211	89	48	283	93	29
212	93	34	284	93	28
213	93	27	285	94	34
214	93	26	286	93	31
215	93	25	287	93	30
216	93	22	288	94	42
217	93	23	289	93	31
218	93	21	290	93	29
219	93	21	291	93	27
220	93	23	292	93	23
221	93	23	293	93	23
222	93	23	294	93	20
223	93	23	295	93	20
224	93	23	296	93	23
225	93	22	297	93	23
226	93	22	298	93	24
227	93	24	299	93	25
228	93	23	300	93	20
229	93	23	301	93	25
230	93	21	302	93	23
231	93	20	303	93	23
232	93	20	304	93	24
233	93	20	305	93	28
234	93	22	306	93	23
235	93	26	307	93	24
236	93	22	308	93	34
237	93	20	309	93	31
238	93	18	310	93	35
239	93	22	311	93	31
240	93	20	312	93	32
241	94	27	313	93	31
242	93	22	314	93	30
243	93	23	315	93	23
244	93	21	316	93	23
245	93	22	317	93	36
246	95	22	318	93	32

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
319	93	25	391	93	20
320	93	31	392	93	19
321	93	33	393	93	24
322	93	31	394	93	20
323	93	27	395	93	18
324	93	24	396	93	21
325	93	19	397	95	22
326	96	21	398	96	16
327	96	16	399	96	12
328	95	12	400	95	10
329	95	10	401	96	9
330	95	8	402	95	8
331	95	8	403	96	7
332	95	7	404	96	7
333	95	7	405	96	6
334	95	6	406	96	6
335	95	6	407	95	6
336	95	6	408	91	6
337	87	6	409	58	6
338	57	6	410	58	6
339	58	6	411	58	6
340	58	6	412	58	6
341	58	6	413	58	6
342	58	6	414	58	6
343	58	6	415	58	6
344	58	6	416	58	6
345	58	6	417	58	6
346	58	6	418	58	6
347	58	6	419	58	6
348	58	6	420	58	6
349	58	6	421	58	6
350	58	6	422	58	6
351	58	6	423	58	6
352	95	73	424	58	6
353	93	65	425	58	6
354	93	52	426	58	6
355	93	38	427	58	6
356	93	30	428	58	6
357	93	31	429	58	6
358	93	26	430	58	6
359	93	21	431	58	6
360	93	22	432	58	6
361	93	26	433	58	6
362	93	23	434	58	6
363	93	19	435	58	6
364	93	27	436	58	6
365	93	42	437	58	6
366	93	29	438	58	6
367	94	25	439	58	6
368	94	26	440	58	6
369	94	29	441	58	6
370	93	28	442	58	6
371	93	23	443	93	66
372	93	21	444	93	48
373	93	26	445	93	40
374	93	23	446	93	34
375	93	20	447	93	28
376	94	23	448	93	23
377	93	18	449	93	28
378	93	19	450	93	27
379	93	23	451	93	23
380	93	19	452	93	19
381	93	16	453	93	25
382	93	25	454	93	24
383	93	22	455	93	22
384	93	20	456	93	31
385	93	25	457	93	36
386	94	28	458	93	28
387	93	23	459	93	25
388	93	23	460	93	35
389	93	25	461	93	34
390	93	23	462	93	29

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
463	93	37	535	93	15
464	93	36	536	93	14
465	93	38	537	93	15
466	93	31	538	93	16
467	93	29	539	94	15
468	93	34	540	93	45
469	93	36	541	93	45
470	93	34	542	93	41
471	93	31	543	93	33
472	93	26	544	93	26
473	93	21	545	93	21
474	94	16	546	93	20
475	96	19	547	93	17
476	96	15	548	93	16
477	95	11	549	93	17
478	96	10	550	93	16
479	95	8	551	93	14
480	95	7	552	93	16
481	95	7	553	93	15
482	96	7	554	93	14
483	96	6	555	93	16
484	96	6	556	93	15
485	95	6	557	93	14
486	85	6	558	93	13
487	56	74	559	93	14
488	93	52	560	93	14
489	93	42	561	93	15
490	93	36	562	93	17
491	93	35	563	93	17
492	93	33	564	93	22
493	93	38	565	93	22
494	93	40	566	93	19
495	93	29	567	93	19
496	93	23	568	93	20
497	93	23	569	93	18
498	93	24	570	93	20
499	93	24	571	93	20
500	93	20	572	93	42
501	93	19	573	93	32
502	93	16	574	93	25
503	93	21	575	93	26
504	93	23	576	93	23
505	93	24	577	93	21
506	93	22	578	93	23
507	93	18	579	93	19
508	93	21	580	93	21
509	95	18	581	93	20
510	95	20	582	93	20
511	95	15	583	93	20
512	96	11	584	93	18
513	95	10	585	93	18
514	96	8	586	93	21
515	95	7	587	93	19
516	95	7	588	93	21
517	95	7	589	93	19
518	95	6	590	93	19
519	96	6	591	93	18
520	96	6	592	93	18
521	83	6	593	93	17
522	56	6	594	93	16
523	58	6	595	93	16
524	72	54	596	93	15
525	94	51	597	93	16
526	93	42	598	93	19
527	93	42	599	93	52
528	93	31	600	93	45
529	93	25	601	95	39
530	93	21	602	95	39
531	93	17	603	95	39
532	93	15	604	95	39
533	93	15	605	94	30
534	93	16	606	95	30

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
607	95	29	679	98	19
608	95	24	680	98	14
609	94	30	681	98	11
610	95	28	682	98	9
611	94	25	683	98	8
612	94	29	684	98	7
613	95	32	685	98	6
614	95	33	686	98	6
615	95	44	687	98	6
616	99	37	688	98	6
617	98	27	689	98	5
618	98	19	690	81	5
619	98	13	691	49	5
620	98	11	692	78	48
621	98	9	693	95	37
622	98	7	694	95	31
623	98	7	695	94	32
624	98	6	696	94	34
625	98	6	697	95	29
626	98	6	698	95	25
627	98	5	699	94	26
628	69	6	700	95	28
629	49	5	701	95	27
630	51	5	702	94	28
631	51	5	703	95	30
632	51	5	704	95	27
633	51	6	705	95	26
634	51	6	706	95	27
635	51	6	707	95	25
636	51	6	708	95	26
637	51	5	709	95	25
638	51	5	710	95	23
639	51	5	711	95	20
640	51	5	712	95	23
641	51	6	713	95	20
642	51	6	714	95	18
643	51	6	715	94	22
644	51	6	716	95	19
645	51	5	717	95	23
646	51	6	718	95	27
647	51	5	719	95	26
648	51	6	720	95	23
649	51	5	721	95	20
650	96	35	722	99	23
651	95	29	723	98	20
652	95	26	724	98	14
653	95	31	725	98	11
654	95	34	726	98	9
655	95	29	727	98	8
656	95	29	728	98	7
657	95	30	729	98	6
658	95	24	730	98	6
659	95	19	731	98	6
660	95	23	732	98	5
661	95	21	733	98	5
662	95	22	734	73	6
663	95	19	735	49	5
664	95	18	736	50	77
665	95	20	737	95	39
666	94	60	738	95	30
667	95	48	739	95	28
668	95	39	740	94	31
669	95	36	741	95	36
670	95	27	742	95	36
671	95	22	743	95	30
672	95	19	744	95	26
673	95	22	745	95	27
674	95	19	746	95	22
675	94	17	747	95	18
676	95	27	748	95	19
677	95	24	749	95	25
678	98	19	750	94	25

Time(s)	Normalized speed (percent)	Normalized torque (percent)	Time(s)	Normalized speed (percent)	Normalized torque (percent)
751	95	21	823	95	18
752	95	22	824	95	17
753	95	27	825	95	19
754	95	27	826	95	19
755	95	27	827	95	19
756	95	24	828	94	19
757	94	20	829	94	21
758	94	23	830	94	19
759	94	26	831	94	17
760	95	25	832	94	18
761	95	25	833	94	21
762	95	21	834	94	19
763	95	28	835	95	18
764	94	39	836	95	19
765	95	32	837	95	17
766	95	24	838	94	15
767	95	19	839	94	17
768	98	20	840	95	19
769	98	17	841	94	22
770	98	12	842	94	21
771	98	10	843	94	18
772	98	8	844	94	16
773	98	7	845	95	14
774	98	6	846	95	14
775	98	6	847	94	19
776	95	61	848	95	20
777	94	51	849	95	23
778	95	40	850	98	23
779	94	35	851	98	22
780	94	36	852	98	16
781	94	32	853	98	12
782	95	24	854	98	9
783	94	19	855	98	8
784	94	19	856	98	7
785	95	19	857	98	6
786	95	19	858	98	6
787	94	18	859	98	6
788	94	20	860	98	5
789	94	23	861	98	5
790	94	22	862	80	5
791	95	23	863	49	5
792	94	20	864	51	5
793	94	18	865	51	5
794	95	16	866	51	6
795	95	17	867	51	6
796	94	16	868	51	6
797	94	16	869	51	6
798	94	17	870	51	5
799	94	18	871	51	6
800	94	21	872	51	7
801	95	21	873	96	45
802	94	19	874	94	44
803	95	18	875	94	34
804	94	19	876	94	41
805	95	22	877	95	44
806	95	21	878	94	32
807	95	19	879	95	26
808	94	20	880	94	20
809	94	22	881	95	29
810	94	22	882	95	27
811	94	22	883	95	21
812	95	23	884	95	34
813	94	22	885	95	31
814	95	22	886	94	26
815	95	19	887	95	22
816	95	16	888	95	23
817	95	14	889	95	19
818	95	18	890	94	18
819	95	18	891	94	20
820	94	20	892	94	26
821	94	22	893	95	29
822	94	19	894	94	32

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
895	95	26	967	98	6
896	95	34	968	98	6
897	95	30	969	98	6
898	95	24	970	98	5
899	95	19	971	98	5
900	94	17	972	82	5
901	94	16	973	49	5
902	98	19	974	51	6
903	98	17	975	51	6
904	98	12	976	51	6
905	98	10	977	51	5
906	98	8	978	51	6
907	98	7	979	72	58
908	98	6	980	94	36
909	98	6	981	95	28
910	98	6	982	95	24
911	98	5	983	95	25
912	98	5	984	95	26
913	98	5	985	94	30
914	69	5	986	94	26
915	49	5	987	95	34
916	51	5	988	95	57
917	51	6	989	95	45
918	51	6	990	94	37
919	69	75	991	95	34
920	95	70	992	95	27
921	95	57	993	95	27
922	94	49	994	95	29
923	94	38	995	98	22
924	95	43	996	94	84
925	94	51	997	94	74
926	94	41	998	95	62
927	98	42	999	94	51
928	95	89	1000	95	50
929	95	66	1001	95	81
930	94	52	1002	94	65
931	95	41	1003	95	49
932	95	34	1004	94	56
933	95	34	1005	95	65
934	94	30	1006	94	59
935	94	30	1007	99	58
936	95	29	1008	98	41
937	94	28	1009	98	27
938	95	24	1010	98	19
939	94	34	1011	98	13
940	95	26	1012	98	11
941	94	36	1013	98	9
942	95	27	1014	98	8
943	95	25	1015	98	7
944	95	26	1016	98	6
945	94	21	1017	98	6
946	94	19	1018	98	6
947	98	21	1019	71	6
948	93	53	1020	49	5
949	94	45	1021	51	6
950	94	35	1022	51	6
951	95	28	1023	51	6
952	95	23	1024	51	6
953	95	20	1025	51	6
954	95	17	1026	51	6
955	94	19	1027	51	6
956	94	18	1028	51	6
957	94	18	1029	51	6
958	94	18	1030	51	6
959	94	19	1031	51	5
960	97	17	1032	51	6
961	98	19	1033	51	5
962	98	14	1034	51	6
963	98	11	1035	51	6
964	98	9	1036	51	6
965	98	7	1037	51	5
966	98	7	1038	51	5

Time(s)	Normalized speed (percent)	Normalized torque (percent)	Time(s)	Normalized speed (percent)	Normalized torque (percent)
1039	51	6	1111	94	41
1040	51	6	1112	99	35
1041	69	59	1113	95	58
1042	94	48	1114	95	58
1043	95	34	1115	98	57
1044	95	29	1116	98	38
1045	95	26	1117	98	26
1046	94	27	1118	93	63
1047	95	31	1119	94	59
1048	95	26	1120	98	100
1049	95	34	1121	94	73
1050	95	29	1122	98	53
1051	95	31	1123	94	76
1052	95	29	1124	95	61
1053	95	35	1125	94	49
1054	95	38	1126	94	37
1055	94	41	1127	97	50
1056	95	28	1128	98	36
1057	95	36	1129	98	25
1058	94	30	1130	98	18
1059	94	26	1131	98	12
1060	94	33	1132	98	10
1061	95	34	1133	98	8
1062	95	27	1134	98	7
1063	98	26	1135	98	7
1064	98	19	1136	98	6
1065	98	13	1137	98	6
1066	98	11	1138	98	6
1067	98	9	1139	80	6
1068	98	7	1140	49	6
1069	98	7	1141	78	61
1070	98	6	1142	95	50
1071	98	6	1143	94	43
1072	98	6	1144	94	42
1073	98	5	1145	94	31
1074	89	6	1146	95	30
1075	49	5	1147	95	34
1076	51	6	1148	95	28
1077	51	6	1149	95	27
1078	51	6	1150	94	27
1079	51	6	1151	95	31
1080	51	6	1152	95	42
1081	51	6	1153	94	41
1082	51	6	1154	95	37
1083	50	6	1155	95	43
1084	51	6	1156	95	34
1085	51	6	1157	95	31
1086	51	6	1158	95	27
1087	51	6	1159	95	23
1088	51	6	1160	95	27
1089	51	6	1161	96	38
1090	51	6	1162	95	40
1091	56	74	1163	95	39
1092	95	56	1164	95	26
1093	94	49	1165	95	33
1094	95	47	1166	94	28
1095	94	43	1167	94	34
1096	94	33	1168	98	73
1097	95	50	1169	95	49
1098	94	40	1170	95	51
1099	95	33	1171	94	55
1100	95	24	1172	95	48
1101	94	22	1173	95	35
1102	94	22	1174	95	39
1103	94	25	1175	95	39
1104	95	27	1176	94	41
1105	95	32	1177	95	30
1106	94	29	1178	95	23
1107	94	26	1179	94	19
1108	94	26	1180	95	25
1109	94	24	1181	94	29
1110	98	52	1182	98	27

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Time(s)	Normalized speed (percent)	Normalized torque (percent)
1183	95	89
1184	95	74
1185	94	60
1186	94	48
1187	94	41
1188	94	29
1189	94	24
1190	95	19
1191	94	21
1192	95	29
1193	95	28
1194	95	27
1195	94	23
1196	95	25
1197	95	26
1198	94	22
1199	95	19
1200	94	17

APPENDIX II TO PART 1048—LARGE SPARK-IGNITION (SI) COMPOSITE TRANSIENT CYCLE

The following table shows the transient duty-cycle for engines that are not constant-speed engines, as described in § 1048.510:

Time(s)	Normalized speed (percent)	Normalized torque (percent)
0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	1	8
10	6	54
11	8	61
12	34	59
13	22	46
14	5	51
15	18	51
16	31	50
17	30	56
18	31	49
19	25	66
20	58	55
21	43	31
22	16	45
23	24	38
24	24	27
25	30	33
26	45	65
27	50	49
28	23	42
29	13	42
30	9	45
31	23	30
32	37	45
33	44	50
34	49	52
35	55	49
36	61	46
37	66	38
38	42	33
39	17	41

Time(s)	Normalized speed (percent)	Normalized torque (percent)
40	17	37
41	7	50
42	20	32
43	5	55
44	30	42
45	44	53
46	45	56
47	41	52
48	24	41
49	15	40
50	11	44
51	32	31
52	38	54
53	38	47
54	9	55
55	10	50
56	33	55
57	48	56
58	49	47
59	33	44
60	52	43
61	55	43
62	59	38
63	44	28
64	24	37
65	12	44
66	9	47
67	12	52
68	34	21
69	29	44
70	44	54
71	54	62
72	62	57
73	72	56
74	88	71
75	100	69
76	100	34
77	100	42
78	100	54
79	100	58
80	100	38
81	83	17
82	61	15
83	43	22
84	24	35
85	16	39
86	15	45
87	32	34
88	14	42
89	8	48
90	5	51
91	10	41
92	12	37
93	4	47
94	3	49
95	3	50
96	4	49
97	4	48
98	8	43
99	2	51
100	5	46
101	8	41
102	4	47
103	3	49
104	6	45
105	3	48
106	10	42
107	18	27
108	3	50
109	11	41
110	34	29
111	51	57

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
112	67	63	184	36	24
113	61	32	185	38	40
114	44	31	186	40	50
115	48	54	187	27	48
116	69	65	188	19	48
117	85	65	189	23	50
118	81	29	190	19	45
119	74	21	191	6	51
120	62	23	192	24	48
121	76	58	193	49	67
122	96	75	194	47	49
123	100	77	195	22	44
124	100	27	196	25	40
125	100	79	197	38	54
126	100	79	198	43	55
127	100	81	199	40	52
128	100	57	200	14	49
129	99	52	201	11	45
130	81	35	202	7	48
131	69	29	203	26	41
132	47	22	204	41	59
133	34	28	205	53	60
134	27	37	206	44	54
135	83	60	207	22	40
136	100	74	208	24	41
137	100	7	209	32	53
138	100	2	210	44	74
139	70	18	211	57	25
140	23	39	212	22	49
141	5	54	213	29	45
142	11	40	214	19	37
143	11	34	215	14	43
144	11	41	216	36	40
145	19	25	217	43	63
146	16	32	218	42	49
147	20	31	219	15	50
148	21	38	220	19	44
149	21	42	221	47	59
150	9	51	222	67	80
151	4	49	223	76	74
152	2	51	224	87	66
153	1	58	225	98	61
154	21	57	226	100	38
155	29	47	227	97	27
156	33	45	228	100	53
157	16	49	229	100	72
158	38	45	230	100	49
159	37	43	231	100	4
160	35	42	232	100	13
161	39	43	233	87	15
162	51	49	234	53	26
163	59	55	235	33	27
164	65	54	236	39	19
165	76	62	237	51	33
166	84	59	238	67	54
167	83	29	239	83	60
168	67	35	240	95	52
169	84	54	241	100	50
170	90	58	242	100	36
171	93	43	243	100	25
172	90	29	244	85	16
173	66	19	245	62	16
174	52	16	246	40	26
175	49	17	247	56	39
176	56	38	248	81	75
177	73	71	249	98	86
178	86	80	250	100	76
179	96	75	251	100	51
180	89	27	252	100	78
181	66	17	253	100	83
182	50	18	254	100	100
183	36	25	255	100	66

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
256	100	85	328	7	55
257	100	72	329	62	60
258	100	45	330	80	28
259	98	58	331	23	37
260	60	30	332	39	58
261	43	32	333	47	24
262	71	36	334	59	51
263	44	32	335	58	68
264	24	38	336	36	52
265	42	17	337	18	42
266	22	51	338	36	52
267	13	53	339	59	73
268	23	45	340	72	85
269	29	50	341	85	92
270	28	42	342	99	90
271	21	55	343	100	72
272	34	57	344	100	18
273	44	47	345	100	76
274	19	46	346	100	64
275	13	44	347	100	87
276	25	36	348	100	97
277	43	51	349	100	84
278	55	73	350	100	100
279	68	72	351	100	91
280	76	63	352	100	83
281	80	45	353	100	93
282	83	40	354	100	100
283	78	26	355	94	43
284	60	20	356	72	10
285	47	19	357	77	3
286	52	25	358	48	2
287	36	30	359	29	5
288	40	26	360	59	19
289	45	34	361	63	5
290	47	35	362	35	2
291	42	28	363	24	3
292	46	38	364	28	2
293	48	44	365	36	16
294	68	61	366	54	23
295	70	47	367	60	10
296	48	28	368	33	1
297	42	22	369	23	0
298	31	29	370	16	0
299	22	35	371	11	0
300	28	28	372	20	0
301	46	46	373	25	2
302	62	69	374	40	3
303	76	81	375	33	4
304	88	85	376	34	5
305	98	81	377	46	7
306	100	74	378	57	10
307	100	13	379	66	11
308	100	11	380	75	14
309	100	17	381	79	11
310	99	3	382	80	16
311	80	7	383	92	21
312	62	11	384	99	16
313	63	11	385	83	2
314	64	16	386	71	2
315	69	43	387	69	4
316	81	67	388	67	4
317	93	74	389	74	16
318	100	72	390	86	25
319	94	27	391	97	28
320	73	15	392	100	15
321	40	33	393	83	2
322	40	52	394	62	4
323	50	50	395	40	6
324	11	53	396	49	10
325	12	45	397	36	5
326	5	50	398	27	4
327	1	55	399	29	3

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Time(s)	Normalized speed (percent)	Normalized torque (percent)	Time(s)	Normalized speed (percent)	Normalized torque (percent)
400	22	2	472	61	79
401	13	3	473	29	70
402	37	36	474	15	53
403	90	26	475	15	60
404	41	2	476	52	40
405	25	2	477	50	61
406	29	2	478	13	74
407	38	7	479	46	51
408	50	13	480	60	73
409	55	10	481	33	84
410	29	3	482	31	63
411	24	7	483	41	42
412	51	16	484	26	69
413	62	15	485	23	65
414	72	35	486	48	49
415	91	74	487	28	57
416	100	73	488	16	67
417	100	8	489	39	48
418	98	11	490	47	73
419	100	59	491	35	87
420	100	98	492	26	73
421	100	99	493	30	61
422	100	75	494	34	49
423	100	95	495	35	66
424	100	100	496	56	47
425	100	97	497	49	64
426	100	90	498	59	64
427	100	86	499	42	69
428	100	82	500	6	77
429	97	43	501	5	59
430	70	16	502	17	59
431	50	20	503	45	53
432	42	33	504	21	62
433	89	64	505	31	60
434	89	77	506	53	68
435	99	95	507	48	79
436	100	41	508	45	61
437	77	12	509	51	47
438	29	37	510	41	48
439	16	41	511	26	58
440	16	38	512	21	62
441	15	36	513	50	52
442	18	44	514	39	65
443	4	55	515	23	65
444	24	26	516	42	62
445	26	35	517	57	80
446	15	45	518	66	81
447	21	39	519	64	62
448	29	52	520	45	42
449	26	46	521	33	42
450	27	50	522	27	57
451	13	43	523	31	59
452	25	36	524	41	53
453	37	57	525	45	72
454	29	46	526	48	73
455	17	39	527	46	90
456	13	41	528	56	76
457	19	38	529	64	76
458	28	35	530	69	64
459	8	51	531	72	59
460	14	36	532	73	58
461	17	47	533	71	56
462	34	39	534	66	48
463	34	57	535	61	50
464	11	70	536	55	56
465	13	51	537	52	52
466	13	68	538	54	49
467	38	44	539	61	50
468	53	67	540	64	54
469	29	69	541	67	54
470	19	65	542	68	52
471	52	45	543	60	53

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
544	52	50	616	14	53
545	45	49	617	13	64
546	38	45	618	23	56
547	32	45	619	21	63
548	26	53	620	18	67
549	23	56	621	20	54
550	30	49	622	16	67
551	33	55	623	26	56
552	35	59	624	41	65
553	33	65	625	28	62
554	30	67	626	19	60
555	28	59	627	33	56
556	25	58	628	37	70
557	23	56	629	24	79
558	22	57	630	28	57
559	19	63	631	40	57
560	14	63	632	40	58
561	31	61	633	28	44
562	35	62	634	25	41
563	21	80	635	29	53
564	28	65	636	31	55
565	7	74	637	26	64
566	23	54	638	20	50
567	38	54	639	16	53
568	14	78	640	11	54
569	38	58	641	13	53
570	52	75	642	23	50
571	59	81	643	32	59
572	66	69	644	36	63
573	54	44	645	33	59
574	48	34	646	24	52
575	44	33	647	20	52
576	40	40	648	22	55
577	28	58	649	30	53
578	27	63	650	37	59
579	35	45	651	41	58
580	20	66	652	36	54
581	15	60	653	29	49
582	10	52	654	24	53
583	22	56	655	14	57
584	30	62	656	10	54
585	21	67	657	9	55
586	29	53	658	10	57
587	41	56	659	13	55
588	15	67	660	15	64
589	24	56	661	31	57
590	42	69	662	19	69
591	39	83	663	14	59
592	40	73	664	33	57
593	35	67	665	41	65
594	32	61	666	39	64
595	30	65	667	39	59
596	30	72	668	39	51
597	48	51	669	28	41
598	66	58	670	19	49
599	62	71	671	27	54
600	36	63	672	37	63
601	17	59	673	32	74
602	16	50	674	16	70
603	16	62	675	12	67
604	34	48	676	13	60
605	51	66	677	17	56
606	35	74	678	15	62
607	15	56	679	25	47
608	19	54	680	27	64
609	43	65	681	14	71
610	52	80	682	5	65
611	52	83	683	6	57
612	49	57	684	6	57
613	48	46	685	15	52
614	37	36	686	22	61
615	25	44	687	14	77

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Time(s)	Normalized speed (per cent)	Normalized torque (per cent)	Time(s)	Normalized speed (per cent)	Normalized torque (per cent)
688	12	67	760	20	56
689	12	62	761	26	50
690	14	59	762	28	55
691	15	58	763	18	56
692	18	55	764	15	52
693	22	53	765	11	59
694	19	69	766	16	59
695	14	67	767	34	54
696	9	63	768	16	82
697	8	56	769	15	64
698	17	49	770	36	53
699	25	55	771	45	64
700	14	70	772	41	59
701	12	60	773	34	50
702	22	57	774	27	45
703	27	67	775	22	52
704	29	68	776	18	55
705	34	62	777	26	54
706	35	61	778	39	62
707	28	78	779	37	71
708	11	71	780	32	58
709	4	58	781	24	48
710	5	58	782	14	59
711	10	56	783	7	59
712	20	63	784	7	55
713	13	76	785	18	49
714	11	65	786	40	62
715	9	60	787	44	73
716	7	55	788	41	68
717	8	53	789	35	48
718	10	60	790	29	54
719	28	53	791	22	69
720	12	73	792	46	53
721	4	64	793	59	71
722	4	61	794	69	68
723	4	61	795	75	47
724	10	56	796	62	32
725	8	61	797	48	35
726	20	56	798	27	59
727	32	62	799	13	58
728	33	66	800	14	54
729	34	73	801	21	53
730	31	61	802	23	56
731	33	55	803	23	57
732	33	60	804	23	65
733	31	59	805	13	65
734	29	58	806	9	64
735	31	53	807	27	56
736	33	51	808	26	78
737	33	48	809	40	61
738	27	44	810	35	76
739	21	52	811	28	66
740	13	57	812	23	57
741	12	56	813	16	50
742	10	64	814	11	53
743	22	47	815	9	57
744	15	74	816	9	62
745	8	66	817	27	57
746	34	47	818	42	69
747	18	71	819	47	75
748	9	57	820	53	67
749	11	55	821	61	62
750	12	57	822	63	53
751	10	61	823	60	54
752	16	53	824	56	44
753	12	75	825	49	39
754	6	70	826	39	35
755	12	55	827	30	34
756	24	50	828	33	46
757	28	60	829	44	56
758	28	64	830	50	56
759	23	60	831	44	52

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
832	38	46	904	93	23
833	33	44	905	93	27
834	29	45	906	93	34
835	24	46	907	93	32
836	18	52	908	93	26
837	9	55	909	93	31
838	10	54	910	93	34
839	20	53	911	93	31
840	27	58	912	93	33
841	29	59	913	93	36
842	30	62	914	93	37
843	30	65	915	93	34
844	27	66	916	93	30
845	32	58	917	93	32
846	40	56	918	93	35
847	41	57	919	93	35
848	18	73	920	93	32
849	15	55	921	93	28
850	18	50	922	93	23
851	17	52	923	94	18
852	20	49	924	95	18
853	16	62	925	96	17
854	4	67	926	95	13
855	2	64	927	96	10
856	7	54	928	95	9
857	10	50	929	95	7
858	9	57	930	95	7
859	5	62	931	96	7
860	12	51	932	96	6
861	14	65	933	96	6
862	9	64	934	95	6
863	31	50	935	90	6
864	30	78	936	69	43
865	21	65	937	76	62
866	14	51	938	93	47
867	10	55	939	93	39
868	6	59	940	93	35
869	7	59	941	93	34
870	19	54	942	93	36
871	23	61	943	93	39
872	24	62	944	93	34
873	34	61	945	93	26
874	51	67	946	93	23
875	60	66	947	93	24
876	58	55	948	93	24
877	60	52	949	93	22
878	64	55	950	93	19
879	68	51	951	93	17
880	63	54	952	93	19
881	64	50	953	93	22
882	68	58	954	93	24
883	73	47	955	93	23
884	63	40	956	93	20
885	50	38	957	93	20
886	29	61	958	94	19
887	14	61	959	95	19
888	14	53	960	95	17
889	42	6	961	96	13
890	58	6	962	95	10
891	58	6	963	96	9
892	77	39	964	95	7
893	93	56	965	95	7
894	93	44	966	95	7
895	93	37	967	95	6
896	93	31	968	96	6
897	93	25	969	96	6
898	93	26	970	89	6
899	93	27	971	68	6
900	93	25	972	57	6
901	93	21	973	66	32
902	93	22	974	84	52
903	93	24	975	93	46

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Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
976	93	42	1048	93	37
977	93	36	1049	93	48
978	93	28	1050	93	38
979	93	23	1051	93	31
980	93	19	1052	93	26
981	93	16	1053	93	21
982	93	15	1054	93	18
983	93	16	1055	93	16
984	93	15	1056	93	17
985	93	14	1057	93	18
986	93	15	1058	93	19
987	93	16	1059	93	21
988	94	15	1060	93	20
989	93	32	1061	93	18
990	93	45	1062	93	17
991	93	43	1063	93	17
992	93	37	1064	93	18
993	93	29	1065	93	18
994	93	23	1066	93	18
995	93	20	1067	93	19
996	93	18	1068	93	18
997	93	16	1069	93	18
998	93	17	1070	93	20
999	93	16	1071	93	23
1000	93	15	1072	93	25
1001	93	15	1073	93	25
1002	93	15	1074	93	24
1003	93	14	1075	93	24
1004	93	15	1076	93	22
1005	93	15	1077	93	22
1006	93	14	1078	93	22
1007	93	13	1079	93	19
1008	93	14	1080	93	16
1009	93	14	1081	95	17
1010	93	15	1082	95	37
1011	93	16	1083	93	43
1012	93	17	1084	93	32
1013	93	20	1085	93	27
1014	93	22	1086	93	26
1015	93	20	1087	93	24
1016	93	19	1088	93	22
1017	93	20	1089	93	22
1018	93	19	1090	93	22
1019	93	19	1091	93	23
1020	93	20	1092	93	22
1021	93	32	1093	93	22
1022	93	37	1094	93	23
1023	93	28	1095	93	23
1024	93	26	1096	93	23
1025	93	24	1097	93	22
1026	93	22	1098	93	23
1027	93	22	1099	93	23
1028	93	21	1100	93	23
1029	93	20	1101	93	25
1030	93	20	1102	93	27
1031	93	20	1103	93	26
1032	93	20	1104	93	25
1033	93	19	1105	93	27
1034	93	18	1106	93	27
1035	93	20	1107	93	27
1036	93	20	1108	93	24
1037	93	20	1109	93	20
1038	93	20	1110	93	18
1039	93	19	1111	93	17
1040	93	18	1112	93	17
1041	93	18	1113	93	18
1042	93	17	1114	93	18
1043	93	16	1115	93	18
1044	93	16	1116	93	19
1045	93	15	1117	93	22
1046	93	16	1118	93	22
1047	93	18	1119	93	19

Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)	Time(s)	Normalized speed (per-cent)	Normalized torque (per-cent)
1120	93	17	1192	96	18
1121	93	17	1193	96	15
1122	93	18	1194	96	11
1123	93	18	1195	95	9
1124	93	19	1196	95	8
1125	93	19	1197	96	7
1126	93	20	1198	94	33
1127	93	19	1199	93	46
1128	93	20	1200	93	37
1129	93	25	1201	16	8
1130	93	30	1202	0	0
1131	93	31	1203	0	0
1132	93	26	1204	0	0
1133	93	21	1205	0	0
1134	93	18	1206	0	0
1135	93	20	1207	0	0
1136	93	25	1208	0	0
1137	93	24	1209	0	0
1138	93	21			
1139	93	21			
1140	93	22			
1141	93	22			
1142	93	28			
1143	93	29			
1144	93	23			
1145	93	21			
1146	93	18			
1147	93	16			
1148	93	16			
1149	93	16			
1150	93	17			
1151	93	17			
1152	93	17			
1153	93	17			
1154	93	23			
1155	93	26			
1156	93	22			
1157	93	18			
1158	93	16			
1159	93	16			
1160	93	17			
1161	93	19			
1162	93	18			
1163	93	16			
1164	93	19			
1165	93	22			
1166	93	25			
1167	93	29			
1168	93	27			
1169	93	22			
1170	93	18			
1171	93	16			
1172	93	19			
1173	93	19			
1174	93	17			
1175	93	17			
1176	93	17			
1177	93	16			
1178	93	16			
1179	93	15			
1180	93	16			
1181	93	15			
1182	93	17			
1183	93	21			
1184	93	30			
1185	93	53			
1186	93	54			
1187	93	38			
1188	93	30			
1189	93	24			
1190	93	20			
1191	95	20			

PART 1051—CONTROL OF EMISSIONS FROM RECREATIONAL ENGINES AND VEHICLES

Subpart A—Determining How To Follow This Part

Sec.

- 1051.1 Does this part apply to me?
- 1051.5 Which engines are excluded or exempted from this part's requirements?
- 1051.10 What main steps must I take to comply with this part?
- 1051.15 Do any other regulation parts affect me?
- 1051.20 May I certify a recreational engine instead of the vehicle?
- 1051.25 What requirements apply when installing certified engines in recreational vehicles?

Subpart B—Emission Standards and Related Requirements

- 1051.101 What emission standards and other requirements must my vehicles meet?
- 1051.103 What are the exhaust emission standards for snowmobiles?
- 1051.105 What are the exhaust emission standards for off-highway motorcycles?
- 1051.107 What are the exhaust emission standards for all-terrain vehicles (ATVs) and offroad utility vehicles?
- 1051.110 What evaporative emission standards must my vehicles meet?
- 1051.115 What other requirements must my vehicles meet?
- 1051.120 What warranty requirements apply to me?
- 1051.125 What maintenance instructions must I give to buyers?
- 1051.130 What installation instructions must I give to vehicle manufacturers?
- 1051.135 How must I label and identify the vehicles I produce?