

CRANKSHAFT
THRUST



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

MAXIMUM THRUST ON CRANKSHAFT

Forward and Rearward

Eng. Series	Maximum External Crankshaft Thrust Loading	
	Intermittent	Continuous
V-71	1800 lbs	600 lbs
6-110	1500 lbs	500 lbs
71,53	1200 lbs	400 lbs
6V-53	900 lbs	300 lbs
V-149	3300 lbs	1100 lbs

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PIPE SIZE -
INTAKE & EXHAUST



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

RECOMMENDED EXHAUST AND AIR INTAKE PIPE SIZE

ENGINES	CONTINUOUS				INTERMITTENT				MAX. INTERMITTENT			
	Exhaust Pipe Size N. P. T. Inches		Air Intake Pipe Size O. D. Inches		Exhaust Pipe Size N. P. T. Inches		Air Intake Pipe Size O. D. Inches		Exhaust Pipe Size N. P. T. Inches		Air Intake Pipe Size O. D. Inches	
	Sing	Dbl	Sing	Dbl	Sing	Dbl	Sing	Dbl	Sing	Dbl	Sing	Dbl
2-71	2 1/2	-	3	-	2 1/2	-	3	-	2 1/2	-	3	-
3-71	3	-	3 1/2	-	3	-	4	-	3 1/2	-	4	-
4-71	3	-	4	-	3 1/2	-	4	-	4	-	5	-
6-71	4	-	5	-	4	-	5 1/2	-	5	-	5 1/2	-
4-71T	-	-	-	-	4	-	5	-	5	-	5 1/2	-
6-71T	-	-	-	-	5	-	5 1/2	-	6	-	6	4
4-71E	3	-	4	-	3 1/2	-	4	-	4	-	5	-
6-71E	4	-	5	-	4	-	5 1/2	-	5	-	5 1/2	-
6-110 (2 & 4)	5	-	5 1/2	4	6	-	6	4 1/2	6	-	6	4 1/2
6-110T	-	-	-	-	8	-	6	4 1/2	8	-	6	4 1/2
2-53	2	-	3	-	2 1/2	-	3	-	-	-	-	-
3-53 (2)	2 1/2	-	3 1/2	-	3	-	3 1/2	-	-	-	-	-
3-53 (4)	2 1/2	-	3 1/2	-	3	-	4	-	3	-	4	-
4-53 (2)	3	-	4	-	3	-	4	-	-	-	-	-
4-53 (4)	3	-	4	-	3	-	4	-	3 1/2	-	4	-
6V-53	5	3	5	-	5	3	5 1/2	-	5	3	5 1/2	-
6V-71	5	3	5	-	5	3	5 1/2	-	5	3 1/2	5 1/2	-
8V-71	5	3 1/2	5 1/2	-	5	3 1/2	6	4	6	4	6	4 1/2
12V-71	6	4	7	5	6	4	8	5 1/2	8	5	8	5 1/2
16V-71	8	5	8	5 1/2	8	5	8	5 1/2	8	6	8 1/2	5 1/2

Based on straight pipe lengths of 12 ft. for exhaust (dry-not water cooled) and 6 ft. for air intake. For longer lengths, or if bends, elbows or mufflers are used, size may have to be increased, as shown on E5-0000-00-1A, 1B, 1C, and 1D.

These exhaust pipe sizes at critical lengths may be affected by pressure waves. Therefore, any system should be checked for recommended back pressure limits.



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

MAXIMUM EQUIVALENT PIPE LENGTH FOR AIR INTAKE AND EXHAUST

ENGINE	RPM	EXHAUST						AIR					
		2 1/2	3	3 1/2	4	5	6	3	3 1/2	4	5	5 1/2	6
2-71	1200	13	32	75	130			13	27	45			
	1500	13	32	75	130			12	26	45			
	1800	12	31	70	125			11	25	40			
	2000	12	31	70	125			10	23	40			
3-71	1200		25	55	110				11	25			
	1500		25	55	110				11	24			
	1800		23	50	100				11	22			
	2100		20	45	90				9	17			
	2300		17	35	75				7	15			
4-71 & 4-71E	1200		14	30	60	150				12	30		
	1500		14	30	60	150				12	30		
	1800		13	28	55	150				12	30		
	2100		12	25	50	135				10	27		
	2300		10	21	40	115				8	23		
4-71T	1500				17	50					20	39	
	1800				16	45					20	36	
	2100				16	45					20	33	
	2300				14	40					17	27	
6-71 & 6-71E	1200			14	27	85	200				17	30	40
	1500			13	26	85	180				16	25	36
	1800			13	24	75	170				15	24	35
	2100			12	22	70	165				14	24	33
	2300			10	18	60	135				12	20	27
6-71T	1500					25	60				11	19	26
	1800					25	60				11	18	25
	2100					22	55				9	15	24
	2300					17	40				7	11	17

Note: An exhaust or air intake system usually includes mufflers or elbows, tees, etc. Therefore, deduct from these lengths the equivalent length shown on E5-0000-00-1D. If corrected length is less than 10 ft. for exhaust and 5 ft. for air intake, use next largest recommended size shown on E5-0000-00-1.



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

MAXIMUM EQUIVALENT PIPE LENGTH FOR AIR INTAKE AND EXHAUST

ENGINE	RPM	EXHAUST						AIR					
		3	3 1/2	4	5	6	8	5	5 1/2	6	7	8	8 1/2
110	1200				18	45	200		14	16	37		
	1500				18	45	200		12	16	37		
	1800				18	45	200		12	15	33		
	2000				18	45	200		12	14	33		
110T	1500					27	130			12	33		
	1800					30	120			13	25		
	2000					28	115			12	25		
6V-71	1200	25	55	110				16	30				
	1500	25	55	110				16	27				
	1800	23	50	100				16	26				
	2100	20	45	90				14	23				
	2300	17	35	75				13	19				
8V-	1200	14	30	60	150				15	24			
	1500	14	30	60	150				15	24			
	1800	13	28	55	150				14	24			
	2100	11	24	45	135				12	20			
	2300	9	20	40	115				10	16			
12V-	1200		14	25	80	180				10	22	39	
	1500		13	25	80	160				10	22	38	
	1800		13	23	70	150				10	22	37	
	2100		12	21	65	145				8	18	33	
	2300		10	17	55	115				7	15	27	
16V-	1200				40						12	25	34
	1500				40						12	25	33
	1800				40						12	25	32
	2100				36						10	21	27
	2300				31						8	17	23

Note: An exhaust or air intake system usually includes mufflers or elbows, tees, etc. Therefore, deduct from these lengths the equivalent length shown on E5-0000-00-1D. If corrected length is less than 10 ft. for exhaust and 5 ft. for air intake, use next largest recommended size shown on E5-0000-00-1.



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

MAXIMUM EQUIVALENT PIPE LENGTH FOR AIR INTAKE AND EXHAUST

ENGINE	RPM	EXHAUST						AIR					
		2	2 1/2	3	3 1/2	4		2 1/2	3	3 1/2	4	5	5 1/2
2-53	1200	19	60	150					17	37			
	1500	15	45	115					15	31			
	1800	12	35	90					14	29			
	2000	9	29	65					12	28			
3-53	1200		24	60	150					17	28		
	1500		18	50	100					13	24		
	1800		14	36	90					12	23		
	2200		12	30	70					11	22		
	2500		12	30	70					10	22		
	2800		10	24	55					9	17		
4-53	1200			33	75	150					17	50	
	1500			26	55	100					15	45	
	1800			20	45	90					14	40	
	2200			17	37	70					12	35	
	2500			17	37	70					12	35	
	2800			13	29	55					10	30	
6V-53	1200		24	60	150							22	35
	1500		18	50	100							18	30
	1800		14	36	90							17	28
	2200		12	30	70							17	27
	2500		12	30	70							17	27
	2800		10	24	55							14	21

Note: An exhaust or air intake system usually includes mufflers or elbows, tees, etc. Therefore, deduct from these lengths the equivalent length shown on E5-0000-00-1D. If corrected length is less than 10 ft. for exhaust and 5 ft. for air intake, use next largest recommended size shown on E5-0000-00-1.



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

EQUIVALENT PIPE LENGTH FOR ELBOWS, "T"'S, "Y"'S, AND MUFFLERS

EXHAUST PIPE

PIPE SIZE	90° ELBOW	45° ELBOW	TEE
2 1/2 in.	6 1/4 ft.	One-half the length required for 90° elbow	Twice the length required for 90° elbow
3	7 3/4		
3 1/2	9		
4	10 1/4		
5	12 3/4		
6	15 1/4		
8	20		

MUFFLERS OR COMBINATION MUFFLER MANIFOLDS

PIPE SIZE	EQUIVALENT PIPE LENGTH (FEET) FOR PRESSURE DROP						
	1/2 In Hg	1 In Hg	1 1/2 In Hg	2 In Hg	2 1/2 In Hg	3 In Hg	3 1/2 In Hg
2 1/2 in.	7 ft.	14	21	28	35	-	-
3	7	13 1/2	20	27	34	40	47
3 1/2	6 1/2	13	19	26	32	38	45
4	6	12	18	24	30	36	42
5	5 1/2	11	16	22	27	32	38
6	5	10	15	20	25	30	35
8	4 1/2	9	13	18	22	26	31

AIR INTAKE PIPE

PIPE DIA.	BENDS HAVING $\frac{Rad.}{Dia.}$ VALUES FROM 2 THRU 6	FORMED "Y"
2 in.	1 3/4 ft.	2 1/2 ft.
2 1/2	2	3
3	2 1/2	4
3 1/2	2 3/4	4 1/2
4	3	5
4 1/2	3 1/2	5 1/2
5	3 3/4	6
5 1/2	4 1/4	6 1/2
6	4 1/2	7
7	5 1/4	8 1/2
8	6	10
8 1/2	6 1/2	11 1/2

VIBRATION
DAMPER



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART I
SUPPLEMENTARY TABLE FOR ESTIMATING PULLEY WR^2
LB. IN.² PER GROOVE OF PULLEY
CAST IRON - MODERATELY HEAVY DESIGN

Outside Dia. of Pulley	1 Groove	2 Grooves	3 or More Grooves
5.00	14	10	9
5.25	15	11	10
5.50	17	12	11
5.75	19	14	13
6.00	21	15	14
6.25	23	18	16
6.50	26	20	18
6.75	30	23	20
7.00	35	27	23
7.25	41	31	27
7.50	48	36	31
7.75	55	42	36
8.00	64	49	42
8.25	73	56	48
8.50	84	64	55
8.75	95	72	62
9.00	107	83	71
9.25	121	93	80
9.50	135	105	89
9.75	151	118	99
10.00	169	131	111
10.25	187	147	123
10.50	210	162	137
10.75	238	180	152
11.00	266	200	168
11.25	277	210	187
11.50	315	240	206

NOTE (1) In certain pulley designs, the mass of the pulley may be isolated from the hub by a flexible medium such as rubber. The WR^2 of such a pulley is taken to be zero regardless of diameter or number of grooves.



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

VIBRATION DAMPER REQUIREMENTS

These damper specifications apply only to the protection of the engine crankshaft against failure by torsional fatigue. Assurance of safe operation of the entire system consisting of engine and attached driven members can be obtained only by a torsional vibration analysis of the particular case under consideration.

IN ANY CASE WHEN HEAVY MASSES OR SPECIAL EQUIPMENT ARE DRIVEN FROM EITHER END OF THE CRANKSHAFT TORSIONAL ANALYSIS IS REQUIRED TO DETERMINE THE NECESSITY OF FLEXIBLE COUPLINGS OR SPECIAL DAMPER REQUIREMENTS.

6V-71 No damper required. Solid crankshaft pulley up to 300 lbs. in.² can be used. Beyond this mass use rubber bushed pulley.

8V-71 No vibration damper is required. For pulley masses greater than 300 lbs. in.² rubber bushed pulleys are required for crankshaft protection.

For Generator Sets see C6-7085-12-1 showing Crankshaft Pulley Recommendations for optimum control of torsional vibration on constant speed generator sets.

12V-71 Use viscous damper (heavy) for all applications and speeds except for Generator Sets see C6-7125-12-1.

53 Series No damper required unless otherwise specified for all applications and speeds with production crankshaft pulley. See C6-5060-12-1 for 6V-53, and C6-5040-10-1 for 4-53 Pulley Recommendations.

FOR OTHER ENGINES, SEE THE FOLLOWING CHARTS:

ENGINE	RATING	Max. F. L. Gov. RPM	CHART NO.	Type of DAMPER
4-71	Continuous	2000	C6-1040-11-1	Rubber
	Intermittent	2300	C6-1040-11-1A	Viscous
6-71	Gen. Sets	1800	C6-1065-11-1	Rubber-Viscous*
	Continuous	2000	C6-1060-11-1	Rubber-Viscous*
	Intermittent	2100	C6-1063-11-1A	Rubber-Viscous*
	Continuous	2300	C6-1060-11-1A	Viscous
	Intermittent	2300	C6-1063-11-1	Viscous

* OPTIONAL

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DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART II SELECTION OF RUBBER VIBRATION DAMPERS FOR CONTINUOUS DUTY INDUSTRIAL ENGINES, MARINE ENGINES, AND GENERATOR SETS 4-71 ENGINE

Houde Viscous Dampers Optional See Chart III

Full Load Governed Speed of Engine - RPM	WR ² of Pulley - Lb. In. ²					
	0-50	51-100	101-150	151-200	201-250	251-300
1000 - 1400	None	None	None	None	None	None
1401 - 1500	None	None	None	None	Light † *	Light †
1501 - 1600	None	None	None	Light † *	Light †	Light †
1601 - 1700	None	None	Light † *	Light †	Light †	Light †
1701 - 1800	None	Light † *	Light †	Light †	Light †	Light †
1801 - 1900	Light *	Light	Light	Light	Light	Light
1901 - 2000	Light	Light	Light	Light	Light	Light
2001 - 2100	Light	Light	#	#	#	#

Houde Viscous Dampers Required See Chart III

† A rubber mounted pulley may be used to reduce the damper requirements where indicated.

* When light flywheel (7500 lb. in.² or less) is used the damper requirement may be reduced where indicated.

NOTE (1) Specifications in above table are based upon use of a "heavy" flywheel (WR² = 12,000 lb. in.²). Damper selection is based upon the maximum WR² and speed of each bracket. Where the flywheel is lighter than the above or where speed or pulley WR² fall near the bottom of the bracketed values, damper equipment determined by these tables will be in excess of that actually required.

NOTE (2) It is permissible to use a Light Damper where None is specified.

NOTE (3) Pulley WR² in excess of 300 lb. in.² is not recommended because of danger of failure of the driving keys.

SEE C6-0000-10-1

For Conditions Governing These Recommendations

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DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART III

SELECTION OF HOUE VISCOUS DAMPERS FOR INTERMITTENT DUTY INDUSTRIAL ENGINES, MARINE ENGINES, AND GENERATOR SETS 4-71 ENGINE

Full Load Governed Speed of Engine - RPM	WR ² of Pulley on Crankshaft - Lb. In. ²					
	0 - 50	51 - 100	101 - 150	151 - 200	201 - 250	251 - 300
1000 - 1400	None	None	None	None	None	None
1401 - 1500	None	None	None	None	Light †	Light †
1501 - 1600	None	None	None	Light †	Light †	Light †
1601 - 1700	None	None	Light †	Light †	Light †	Light †
1701 - 1800	None	Light †	Light †	Light †	Light †	Light †
1801 - 2000	Light	Light	Light	Light	Light	Light
2001 - 2100	Light	Light	Light	Light	Light	Light
2101 - 2300	Light	Light	Light	Light	XXX	XXX

Rubbers Dampers Optional See Chart II

† A rubber mounted pulley may be used to reduce the damper requirement where indicated.

NOTE (1) Specifications in above table are based upon use of a "heavy" flywheel (WR² = 12,000 lb. in. ²). Damper selection is based upon the maximum WR² and speed of each bracket. Where the flywheel is lighter than the above or where speed or pulley WR² fall near the bottom of the bracketed values, damper equipment determined by these tables will be in excess of that actually required.

NOTE (2) It is permissible to use a Light Damper where None is specified.

NOTE (3) Pulley WR² in excess of 300 lb. in. ² is not recommended because of danger of failure of the driving keys.

SEE C6-0000-10-1

For Conditions Governing These Recommendations

XXX Signifies operation not recommended with solid pulleys

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DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART V SELECTION OF RUBBER VIBRATION DAMPERS FOR CONTINUOUS DUTY INDUSTRIAL AND MARINE ENGINES 6-71 ENGINE

Full Load Governed Speed - RPM	WR ² of Pulley on Crankshaft - Lb. In. ²						
	0	1 - 50	51 - 100	101 - 150	151 - 200	201 - 250	251 - 300
Up to 1400	None	None	None	None	None	None	None
1401 - 1500	None	None	None	None	None	Heavy†*	Heavy†
1501 - 1600	None	None	None	Heavy†*	Heavy†	Heavy†	Heavy†
1601 - 1700	None	None	Heavy†	Heavy†	Heavy†	Heavy†	Double†*
1701 - 1800	None	Heavy†	Heavy†	Heavy†	Double†*	Double†	Double†
1801 - 1900	Heavy	Heavy	Heavy	Double†*	Double†	Double†	Double†
1901 - 2000	Heavy	Double*	Double	Double	Double	Double	Double
2001 - 2100	Double	Double	Double	#	#	#	#

Houde Viscous Dampers Optional See Chart VII

Houde Viscous Dampers Required

† A rubber mounted pulley may be used to reduce the damper requirements where indicated.

* When light flywheel (7500 lb. -in. ² or less) is used the damper requirement may be reduced where indicated.

NOTE (1) Specifications in above table are based upon use of a "heavy" flywheel (WR² 12,000 lb. -in. ²). Damper selection is based upon the maximum WR² and speed of each bracket. Where the flywheel is lighter than the above or where speed or pulley WR² fall near the bottom of the bracketed values, damper equipment determined by these tables will be in excess of that actually required.

NOTE (2) It is permissible to use a Heavy Damper where None is specified, or a Double Damper where Heavy or None is specified.

NOTE (3) Pulley WR² in excess of 300 lb. -in. ² is not recommended because of danger of failure of the driving keys.

SEE C6-0000-10-1

For Conditions Governing These Recommendations.

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DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART VII SELECTIONS OF HOUE VISCOUS DAMPERS FOR CONTINUOUS DUTY INDUSTRIAL AND MARINE ENGINES 6-71 ENGINE

Full Load Governed Speed - RPM	WR ² of Pulley on Crankshaft - Lb. In. ²						
	0	1 - 50	51 - 100	101 - 150	151 - 200	201 - 250	251 - 300
Up to 1400	None	None	None	None	None	None	None
1401 - 1500	None	None	None	None	None	† Heavy*	Heavy †
1501 - 1600	None	None	None	† Heavy*	Heavy †	Heavy †	Heavy †
1601 - 1700	None	None	Heavy †	Heavy †	Heavy †	Heavy †	Heavy †
1701 - 1800	None	Heavy †	Heavy †	Heavy †	Heavy †	Heavy †	Heavy †
1801 - 2000	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy
2001 - 2100	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy
2101 - 2300	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy

Rubber Dampers Optional See Chart V

† A rubber mounted pulley may be used to reduce the damper requirements where indicated.

* When light flywheel (7500 lb. - in. ² or less) is used the damper requirement may be reduced where indicated.

NOTE (1) Specifications in above table are based upon use of a "heavy" flywheel (WR² 12,000 lb. - in. ²). Damper selection is based upon the maximum WR² and speed of each bracket. Where the flywheel is lighter than the above or where speed or pulley WR² fall near the bottom of the bracketed values, damper equipment determined by these tables will be in excess of that actually required.

NOTE (2) It is permissible to use a Heavy Damper where None is specified, or a Double Damper where Heavy or None is specified.

NOTE (3) Pulley WR² in excess of 300 lb. - in. ² is not recommended because of danger of failure of the driving keys.

SEE C6-0000-10-1

For Conditions Governing These Recommendations.

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DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART VI

SELECTION OF RUBBER VIBRATION DAMPERS FOR INTERMITTENT DUTY AUTOMOTIVE ENGINES 6-71 ENGINE

Full Load Governed Speed of Engine - RPM	WR ² of Pulley on Crankshaft - Lb. In. ²					
	0-25	26-50	51-75	76-100	101-125	126-150
1500 - 1700	None	None	None	None	None	None
1701 - 1750	None	None	None	None	Heavy †	Heavy †
1751 - 1800	None	None	None	Heavy †	Heavy †	Heavy †
1801 - 1850	None	None	Heavy †	Heavy †	Heavy †	Heavy †
1851 - 1900	None	Heavy †	Heavy †	Heavy †	Heavy †	Heavy †
1901 - 1950	Heavy	Heavy	Heavy	Heavy	Double †	Double †
1951 - 2000	Heavy	Heavy	Heavy	Double †	Double †	Double †
2001 - 2050	Heavy	Heavy	Double †	Double †	Double †	Double †
2051 - 2100	Double	Double	Double	Double	#	#

Houde Viscous Dampers Optional See Chart VIII

Houde Viscous Dampers Required

† A rubber mounted pulley may be used to reduce the damper requirements where indicated.

NOTE: Above schedule is made on the allowance of an occasional overrun in speed of 150 rpm to no load under control of the governor. This speed limitation must be strictly observed.

In the case of any installation where the top speed may exceed this permissible overrun, additional damper capacity is required.

(Refer to Specification Table V for Industrial Engines.)

SEE C6-0000-10-1

For Conditions Governing These Recommendations

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DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART VIII SELECTION OF HOUE VISCOUS DAMPERS FOR INTERMITTENT DUTY AUTOMOTIVE ENGINES 6-71 ENGINE

Full Load Governed Speed of Engine - RPM	WR ² of Pulley on Crankshaft - WR ²					
	0-25	26-50	51-75	76-100	101-125	126-150
1500 - 1700	None	None	None	None	None	None
1701 - 1750	None	None	None	None	Heavy †	Heavy †
1751 - 1800	None	None	None	Heavy †	Heavy †	Heavy †
1801 - 1850	None	None	Heavy †	Heavy †	Heavy †	Heavy †
1851 - 1900	None	Heavy †	Heavy †	Heavy †	Heavy †	Heavy †
1901 - 2050	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy
2051 - 2100	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy
2101 - 2300	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy

Rubber Dampers Optional See Chart VI

† A rubber mounted pulley may be used to reduce the damper requirements where indicated.

NOTE: Above schedule is made on the allowance of an occasional overrun in speed of 150 rpm to no load under control of the governor. This speed limitation must be strictly observed.

In the case of any installation where the top speed may exceed this permissible overrun, additional damper capacity is required.

(Refer to Specification Table V for Industrial Engines.)

SEE C6-0000-10-1

For Conditions Governing These Recommendations

C6-1063-11-1A

3-2-61



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CHART IV SELECTION OF DAMPERS FOR GENERATOR SETS 6-71 ENGINE

HOUE VISCOUS DAMPERS						
Engine Speed RPM	WR ² of Pulley on Crankshaft - Lb. In. ²					
	0-50	51-100	101-150	151-200	201-250	251-300
1000	XXX	None	None	None	None	None
1200	None	None	None	XXX †	XXX †	None
1500	None	None	Heavy †	Heavy †	Heavy †	Heavy †
1800	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy

RUBBER VIBRATION DAMPERS						
1000	XXX	None	None	None	None	None
1200	None	None	None	XXX †	XXX †	None
1500	None	None	Heavy †	Heavy †	Heavy †	Heavy †
1800	Heavy	Heavy	Double †	Double †	Double †	Double†

Houe Viscous Dampers Optional See Above

† A rubber mounted pulley may be used to reduce the damper requirements where indicated, or when operation is not recommended.

XXX Signifies operation not recommended with solid pulley.

NOTE (1) Generator Sets represent a special application requiring Engineering approval of entire vibratory system in all cases where there is a departure from standard generator equipment.

SEE C6-0000-10-1

For Conditions Governing These Recommendations

C6-1065-11-1
Rev. 6-6-61



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CRANKSHAFT PULLEY RECOMMENDATIONS 4-53 AUTOMOTIVE, INDUSTRIAL, & MARINE APPLICATIONS

Full Load Governed Speed of Engine - RPM	WR ² of Pulley - Lb. In. ²				
	0 - 100	101 - 150	151 - 200	201 - 250	251 - 300
0 - 2100	Solid	Solid	Solid	Solid	Solid
2101 - 2300	Solid	Solid	Solid	Solid	Bushed
2301 - 2500	Solid	Solid	Solid	Bushed	Bushed
2501 - 2800	Solid	Solid	Bushed	Bushed	Bushed

Rubber bushed pulley recommendations are designed to avoid operation in 4th and 5th order critical speeds. These recommendations are based on the use of a light flywheel 3000 lb. in.². Rubber bushed pulleys may be used where solid pulleys are specified if desired.

Pulley WR² in excess of 300 lb. in.² is not recommended because of relatively high vibratory torques imposed on the front end of the crankshaft.

SEE C6-0000-10-1

For Conditions Governing These Recommendations

C6-5040-10-1
3-2-61



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CRANKSHAFT PULLEY RECOMMENDATIONS 6V-53 ENGINE - ALL APPLICATIONS

Full Load Governed Speed of Engine - RPM	WR ² of Pulley - Lb. In. ²				
	0 - 50	51 - 100	101 - 150	151 - 200	200 - 250
0 - 2000	Solid	Solid	Solid	Solid	Solid
2000 - 2300	Solid	Solid	Solid	Solid	Bushed
2300 - 2550	Solid	Solid	Solid	Bushed	Bushed
2550 - 2800	Solid	Solid	Bushed	Bushed	Bushed

Rubber bushed crankshaft pulley recommendations are designed to avoid any engine operation in a dangerous 6th order critical speed. These recommendations are based on the use of a 3700 Lb. In.² flywheel. Rubber bushed pulleys may be used in place of solid pulleys if desired.

SEE C6-0000-10-1

For Conditions Governing These Recommendations

C6-5060-12-1
3-2-61



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CRANKSHAFT PULLEY RECOMMENDATIONS 8V-71 GENERATOR APPLICATIONS

Full Load Governed Speed of Engine - RPM	WR ² of Pulley - Lb. In. ²					
	0 - 50	51 - 100	101 - 150	151 - 200	201 - 250	251 - 300
1000	Solid	Solid	Solid	Solid	Bushed	Bushed
1200	Solid	Bushed	Bushed	Bushed	Bushed	Bushed
1500	Solid	Solid	Solid	Solid	Bushed	Bushed
1800	Solid	Bushed	Bushed	Bushed	Bushed	Bushed

Rubber bushed crankshaft pulley recommendations for constant speed generator sets are designed to avoid continuous operation in minor 8th and 12th order critical speeds.

These recommendations are based on the use of a heavy 12700 Lb. In.² flywheel. Additional flywheel inertia or generator inertia will have little effect on these recommendations.

Rubber bushed pulleys may be used where solid pulleys are shown if desired.

Pulley WR² in excess of 300 Lb. In.² is not recommended because of danger of failures of the driving keys.

SEE C6-0000-10-1

For Conditions Governing These Recommendations

C6-7085-12-1
3-2-61



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CRANKSHAFT PULLEY RECOMMENDATIONS 12V-71 GENERATOR APPLICATIONS

Full Load Governed Speed of Engine - RPM	WR ² of Pulley - Lb. In. ²					
	0 - 50	51 - 100	101 - 150	151 - 200	201 - 250	251 - 300
1200	None	None	None	None	None	None
1500	None	None	None	†	†	†
1800	Heavy Viscous	Heavy Viscous	Heavy Viscous	Heavy Viscous	Heavy Viscous	Heavy Viscous

† No vibration damper is required if a rubber-bushed pulley is used. A heavy viscous damper (5177764) is required if solid-mounted pulleys of this size are used.

A heavy viscous damper (5177764) is optional for all conditions shown.

These recommendations are based on the use of a 9275 Lb. In.² flywheel. Additional flywheel inertia or generator inertia will have little effect on these recommendations.

Pulley WR² in excess of 300 Lb. In.² is not recommended because of danger of failures of the driving keys.

C6-7125-12-1
Rev. 8-6-69

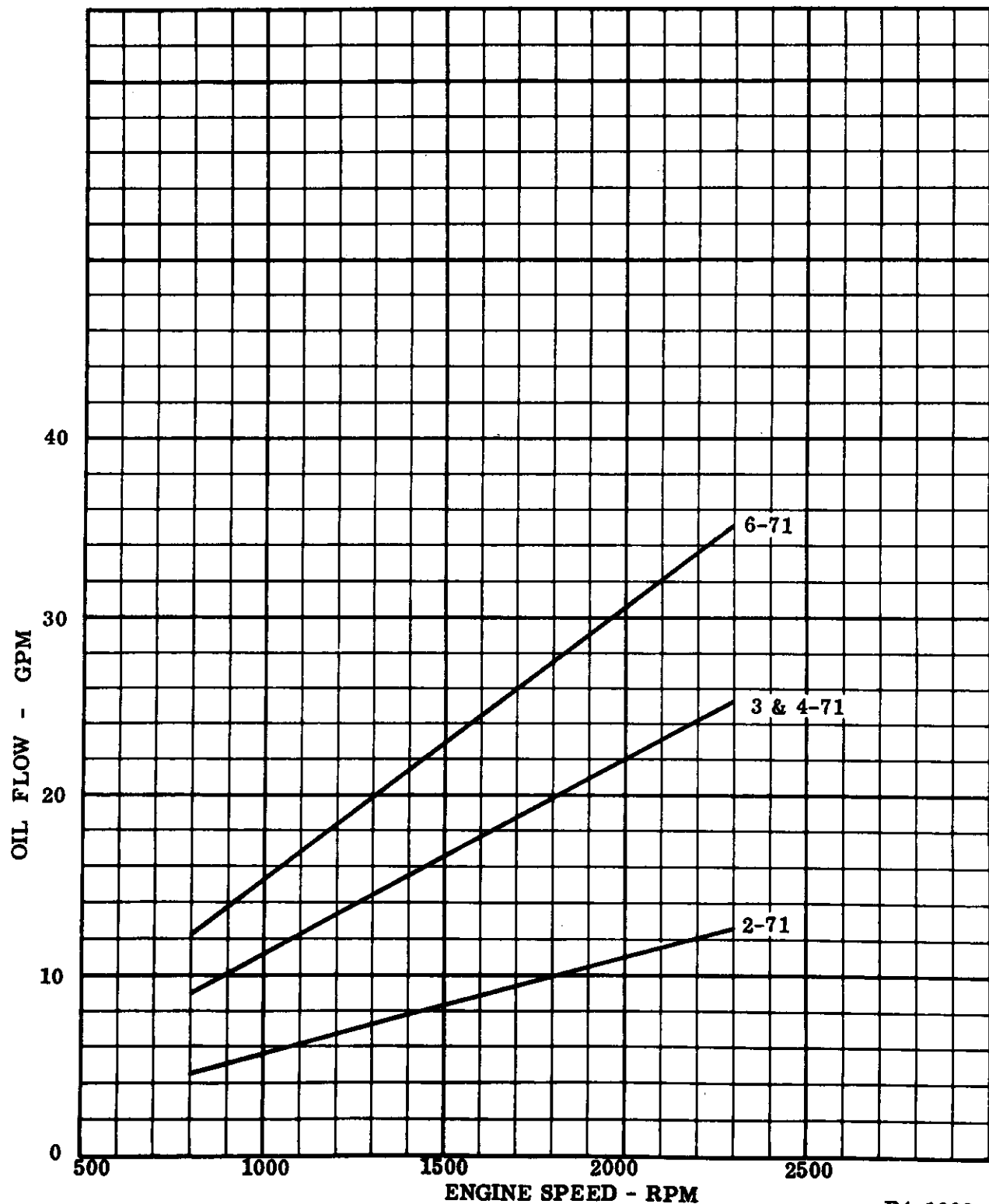
OIL FLOW



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

SERIES 71 ENGINES OIL FLOW THROUGH FULL FLOW FILTER AND OIL COOLER

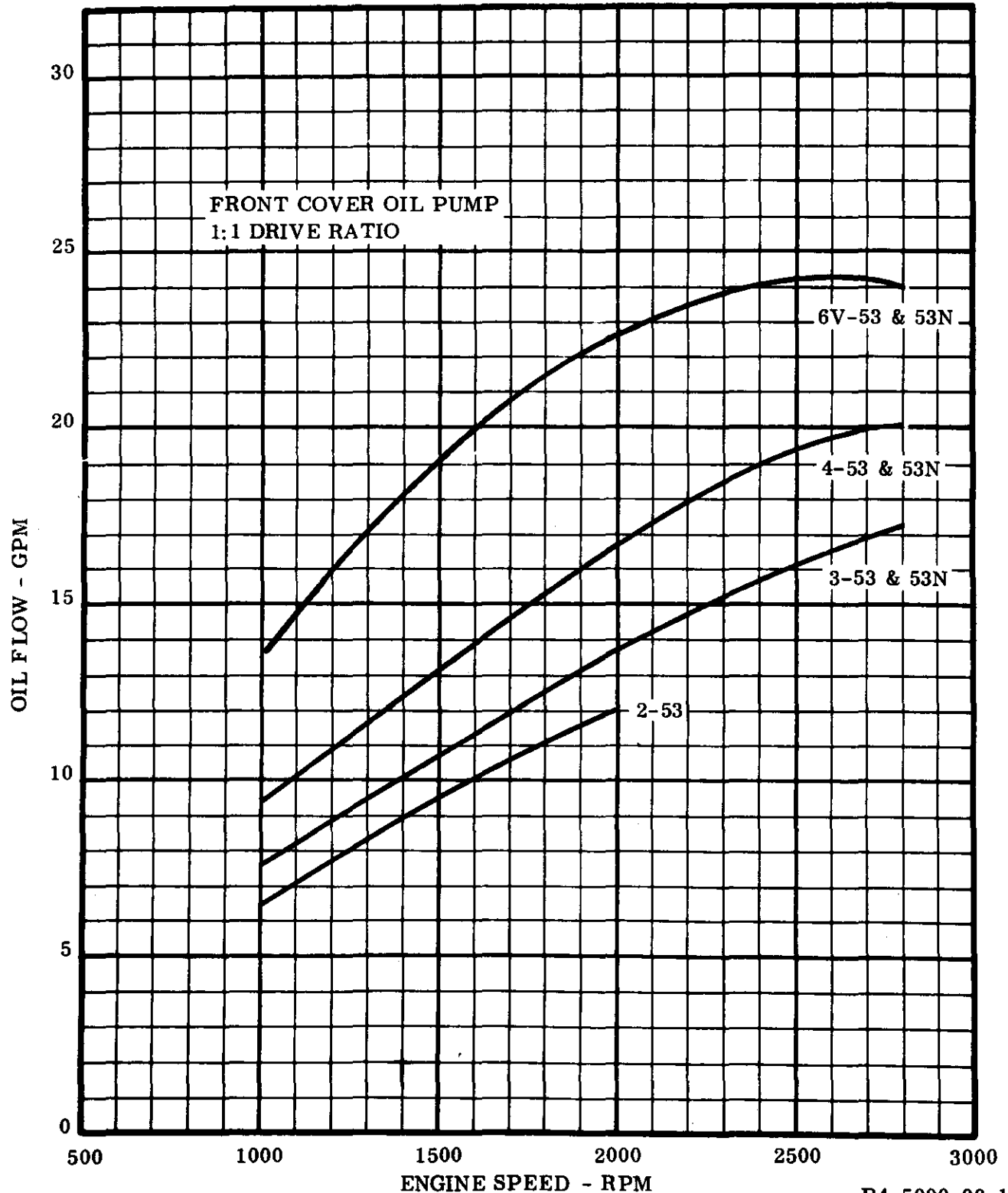




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

SERIES 53 & 53N ENGINE
OIL FLOW THROUGH FULL FLOW FILTER
AND OIL COOLER

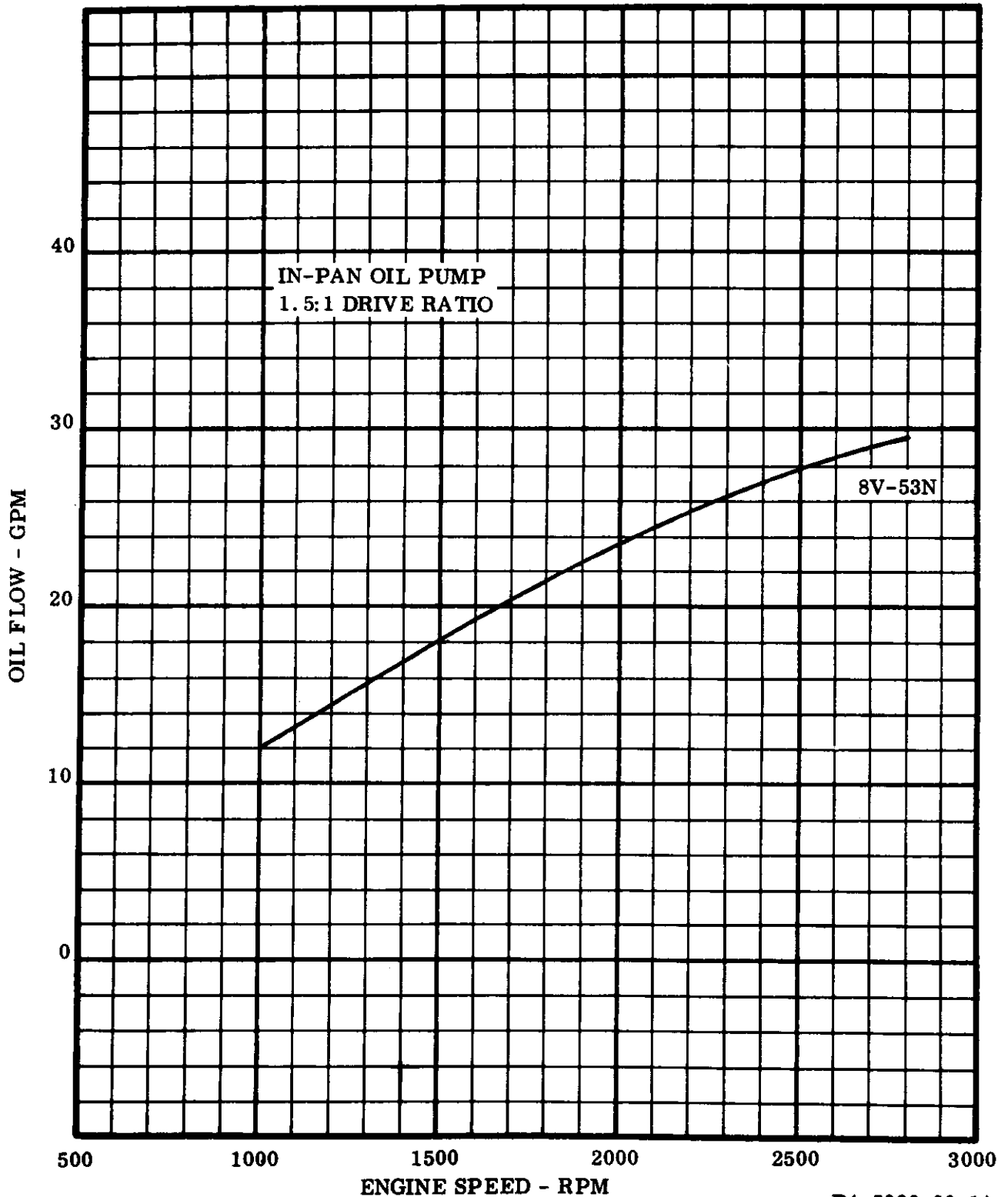




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

SERIES V-53N ENGINE
OIL FLOW THROUGH FULL FLOW FILTER
AND OIL COOLER

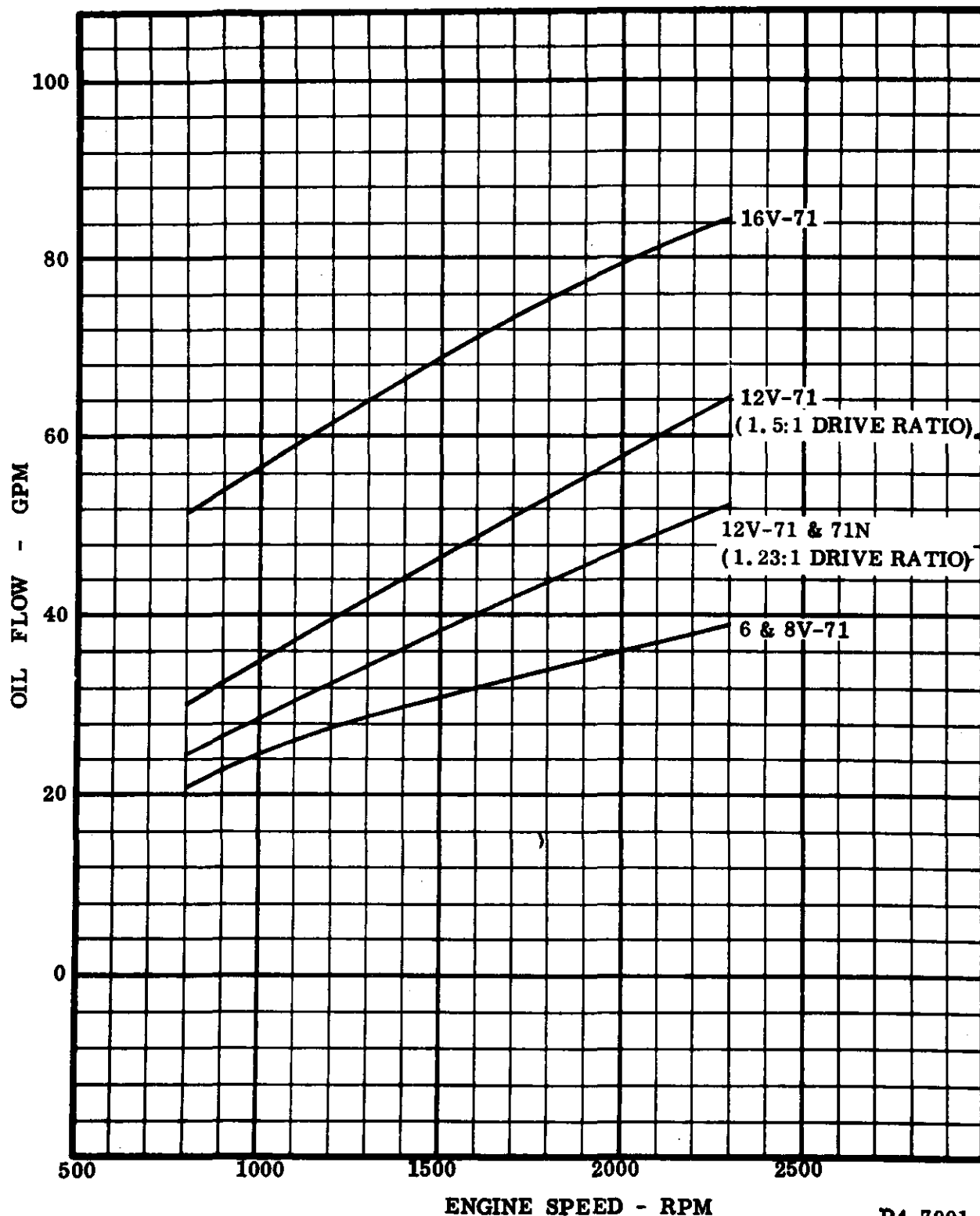




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

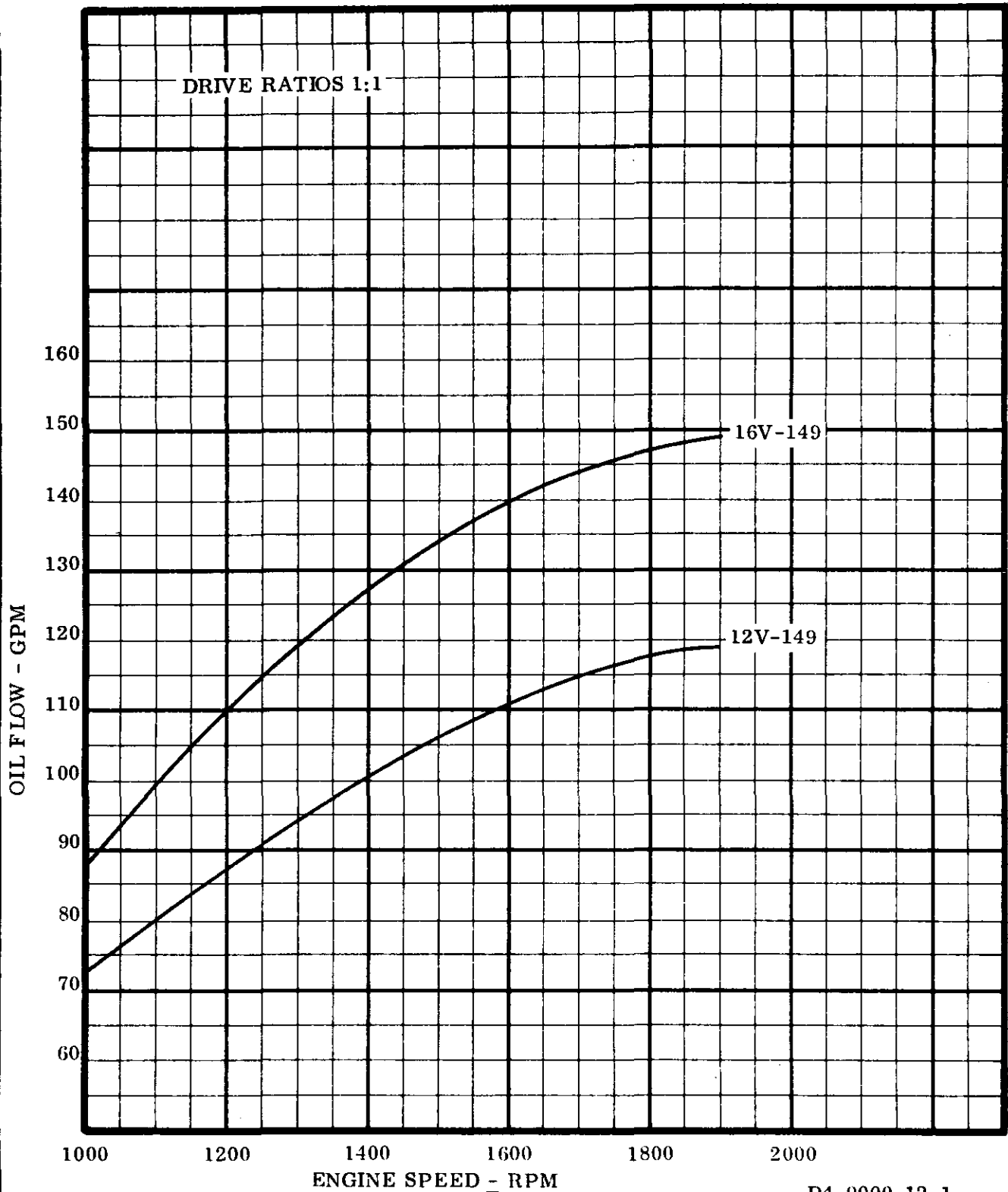
SERIES V-71 ENGINES OIL FLOW THROUGH FULL FLOW FILTER AND OIL COOLER





Detroit Diesel Allison
Division of General Motors Corporation

SERIES V149 ENGINE
OIL FLOW THROUGH FULL FLOW
OIL FILTER AND OIL COOLER



ENGINEERING-TECHNICAL DATA DEPT.

P4-9000-12-1
2-24-72

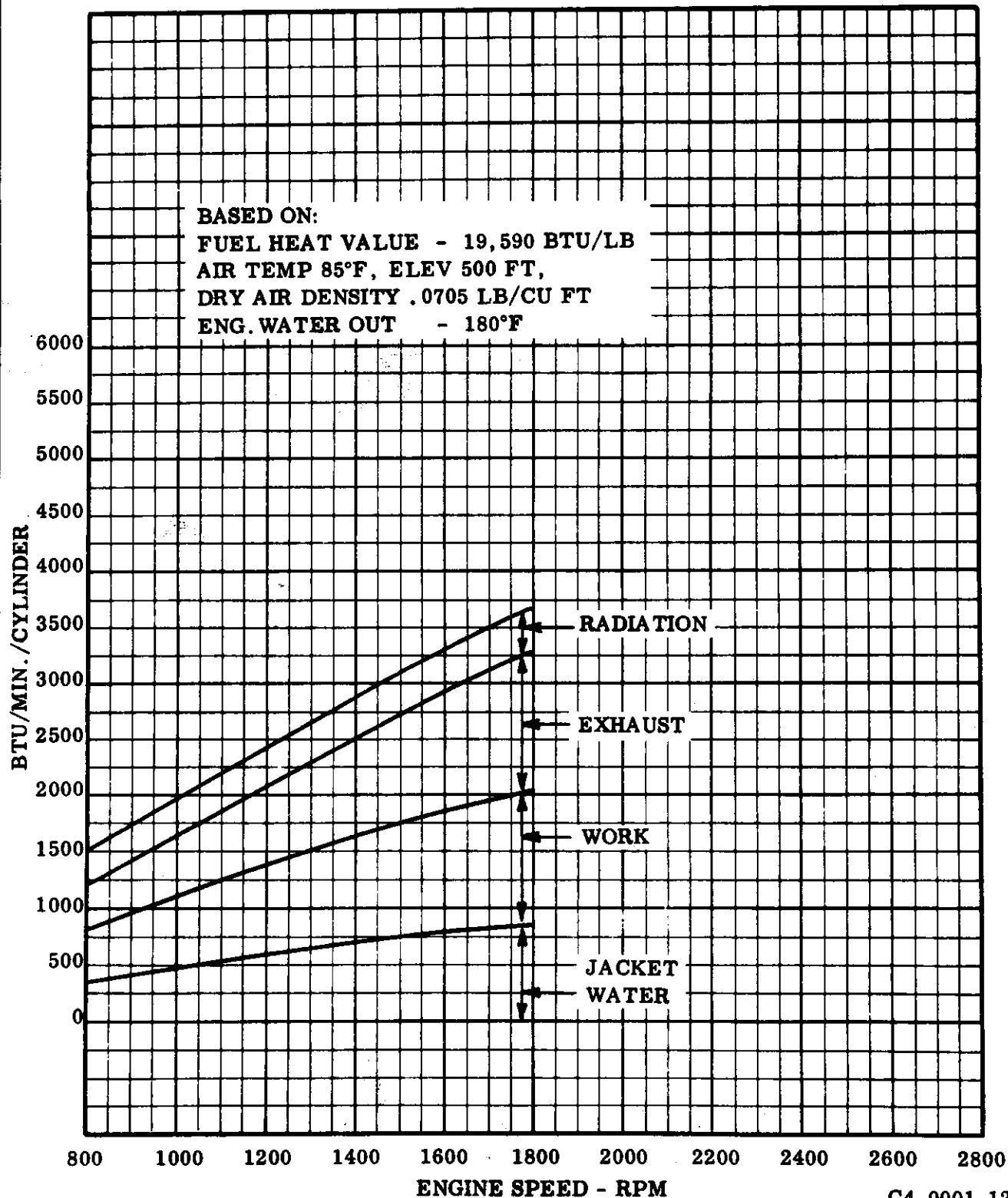
HEAT BALANCE



DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE
SERIES 71E & V71 ENGINES
CONTINUOUS RATED FUEL INPUT

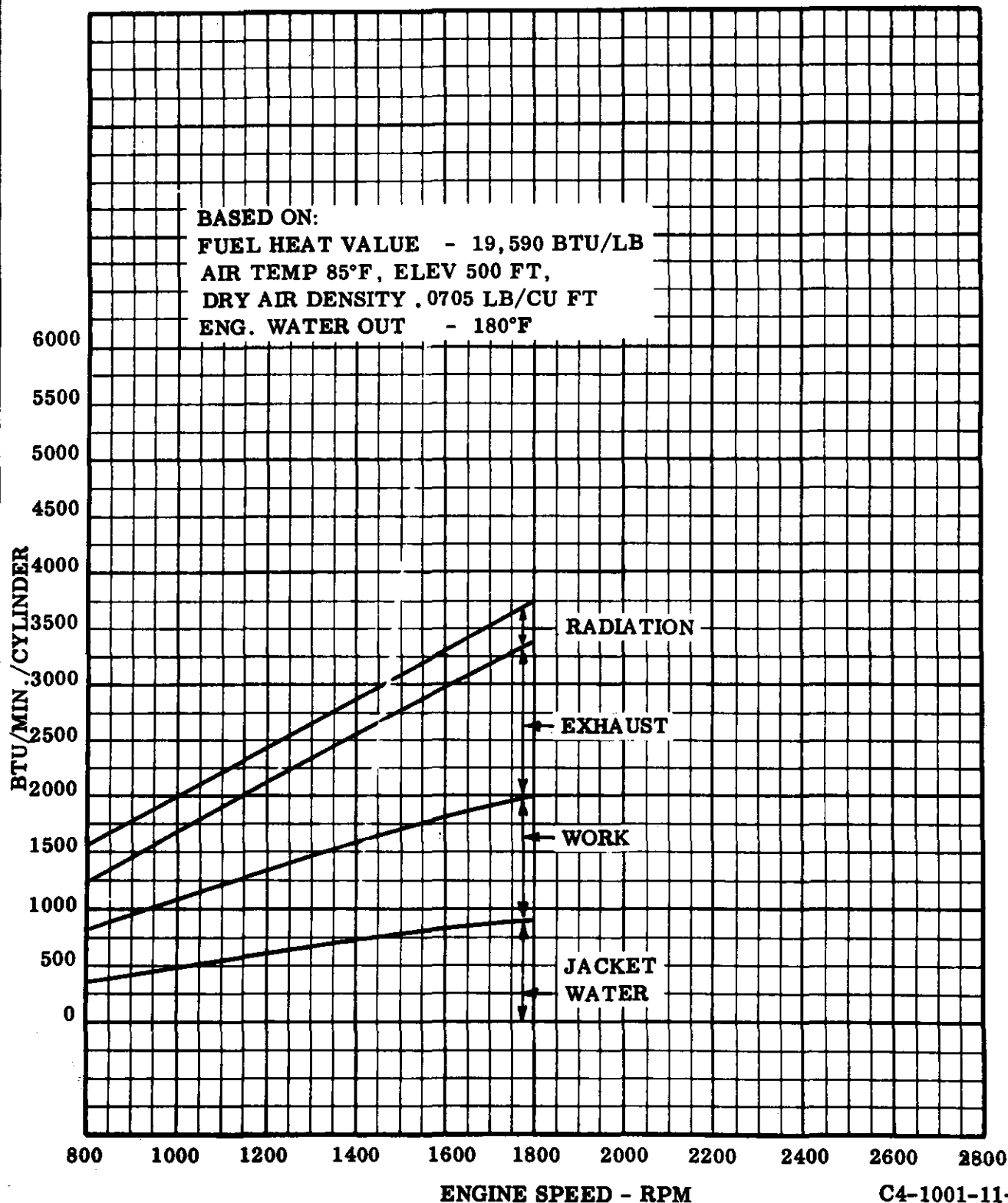




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE SERIES 71 ENGINES CONTINUOUS RATED FUEL INPUT

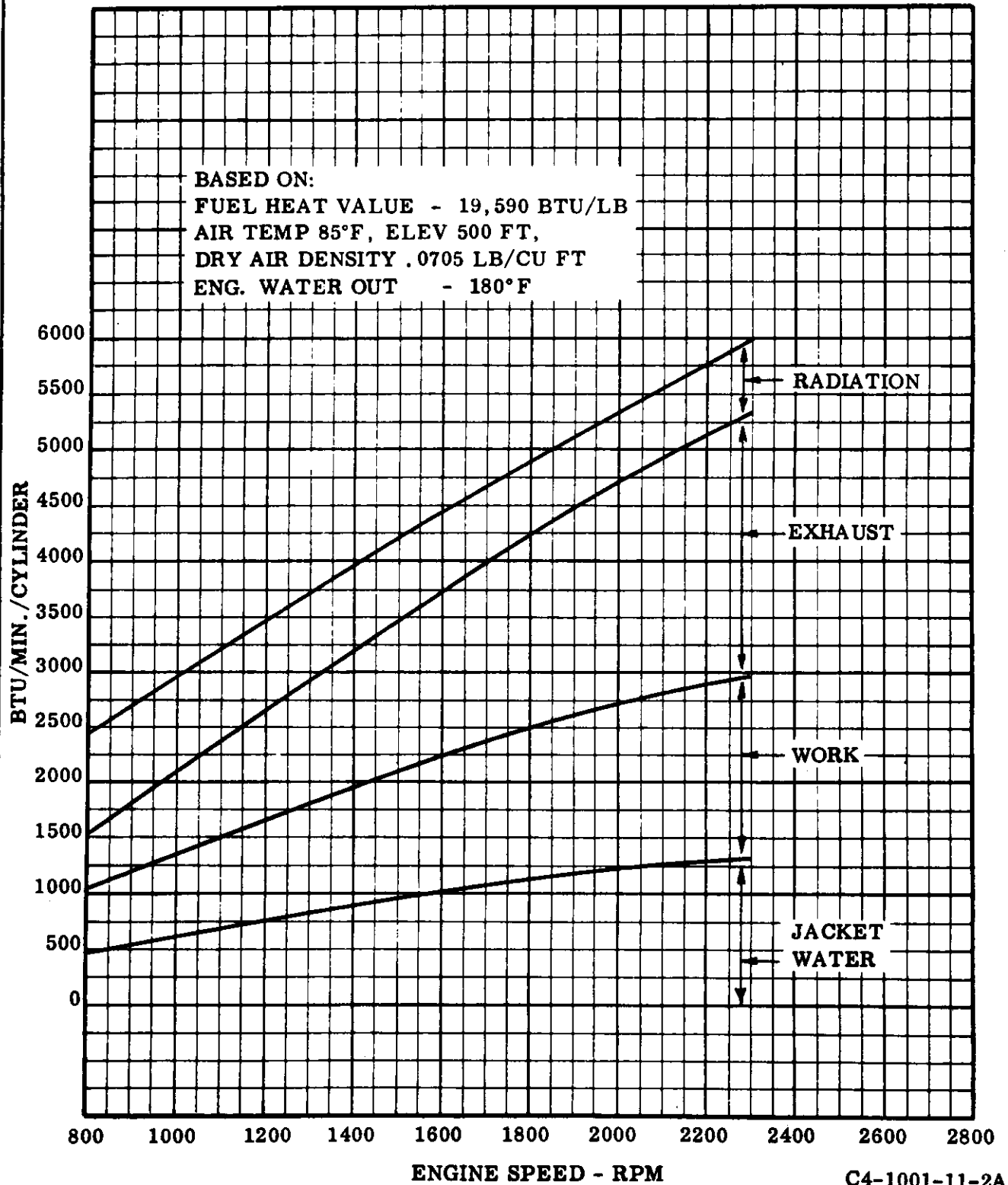




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE SERIES 71 ENGINES HV7 INJECTORS - FULL LOAD

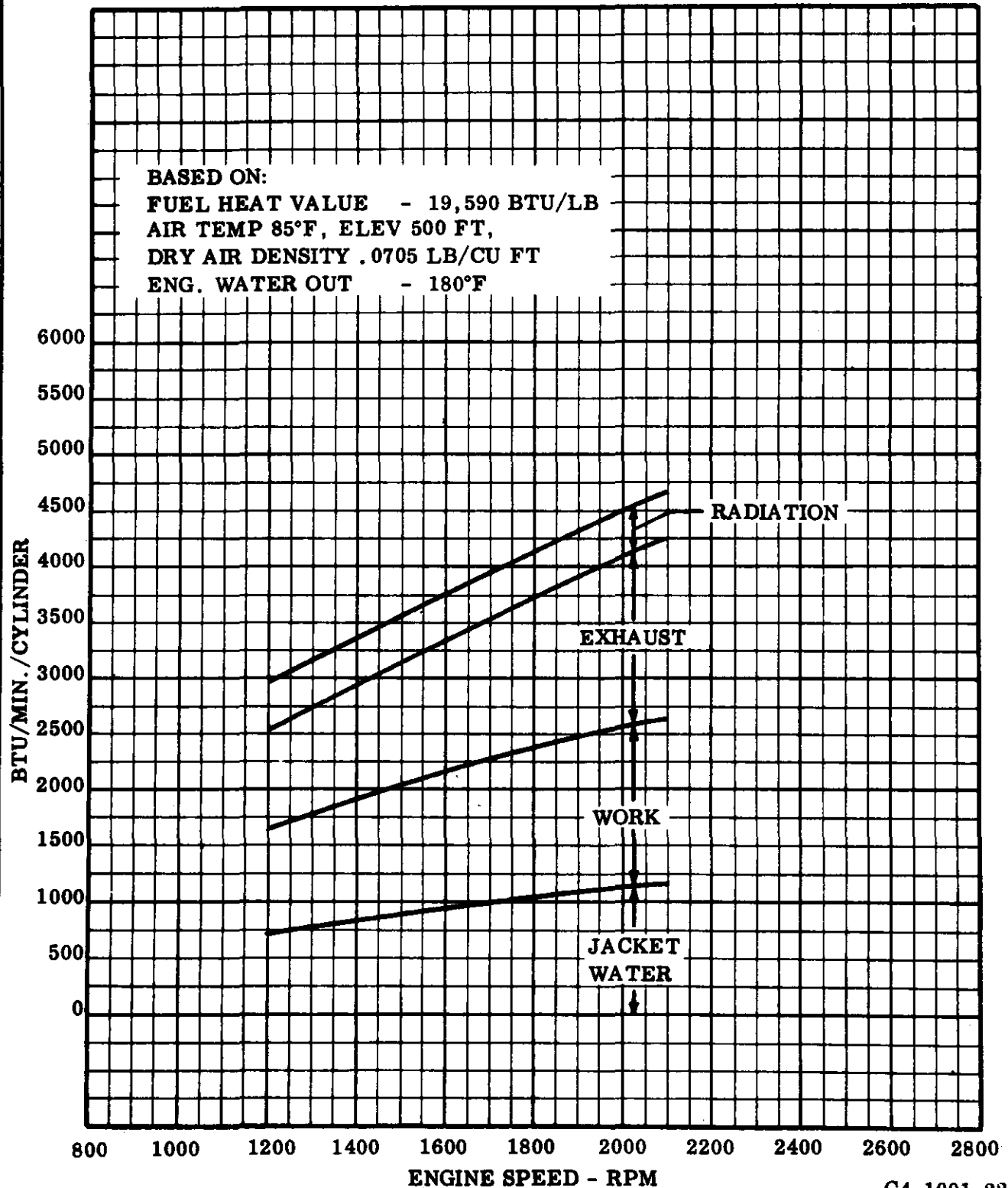




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE SERIES 71E ENGINES S60 INJECTORS - FULL LOAD

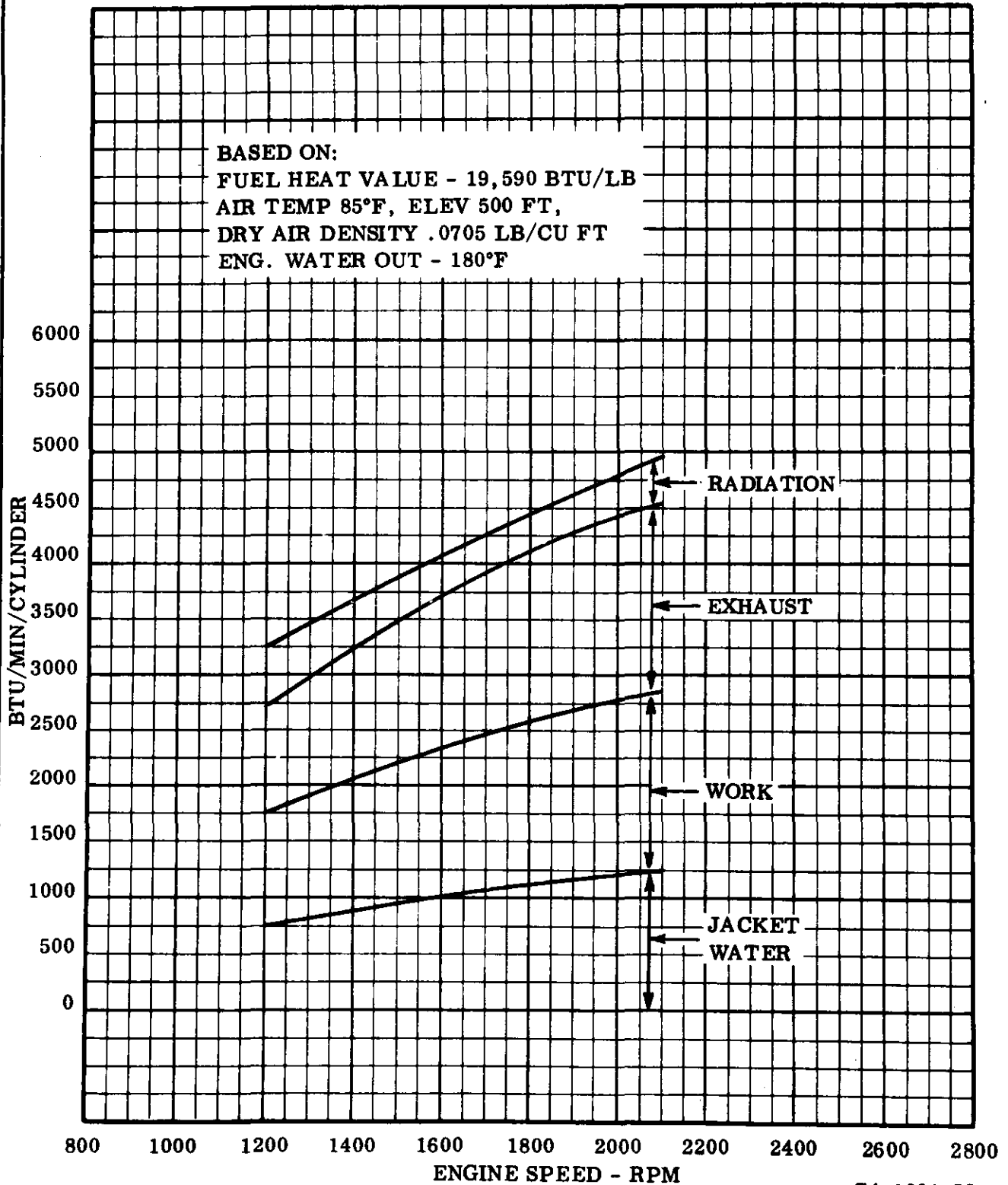




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE
SERIES 71N
N65 INJECTORS - FULL LOAD

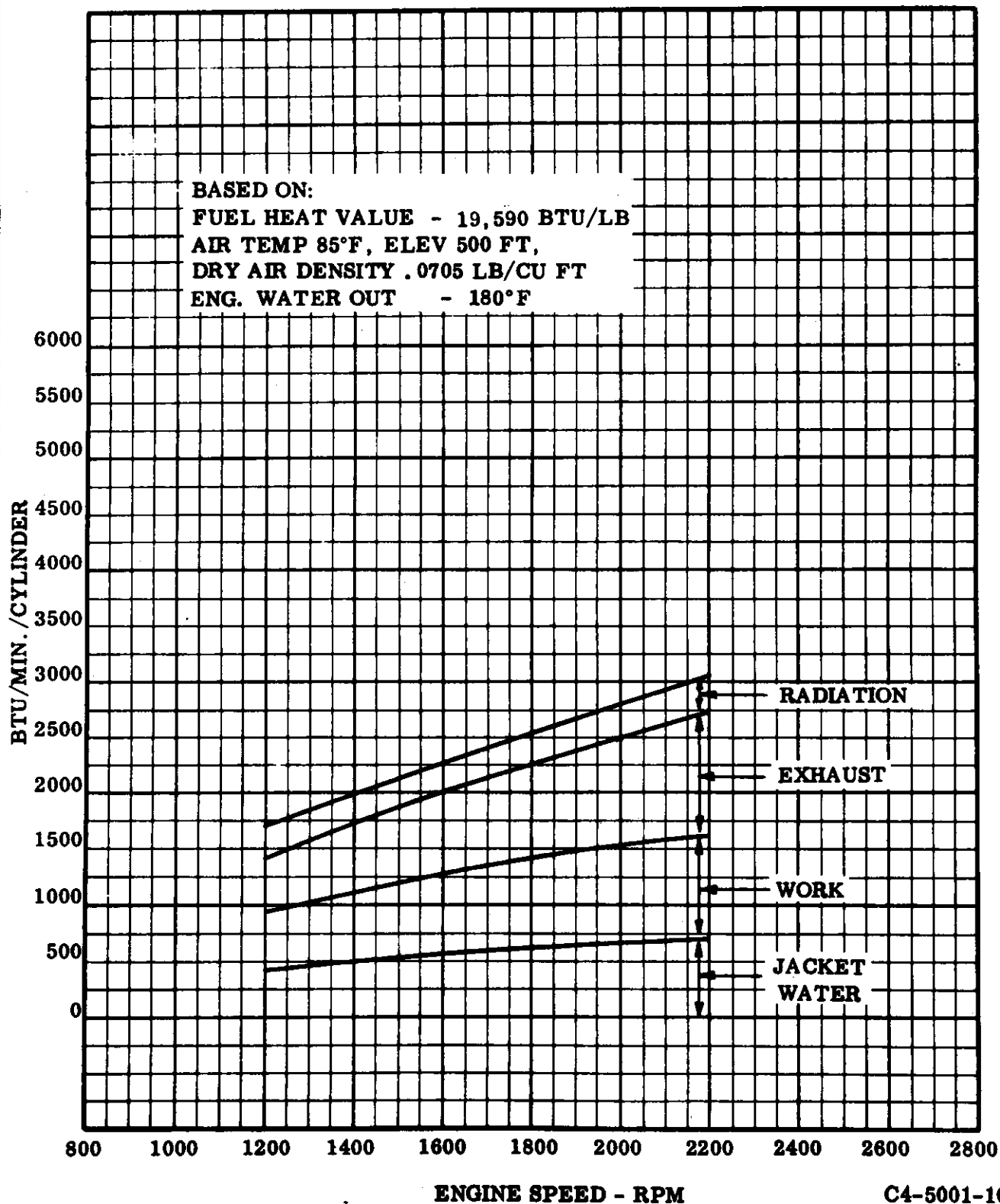




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE
SERIES 53 (2 & 4 VALVE HEAD)
CONTINUOUS RATED FUEL INPUT

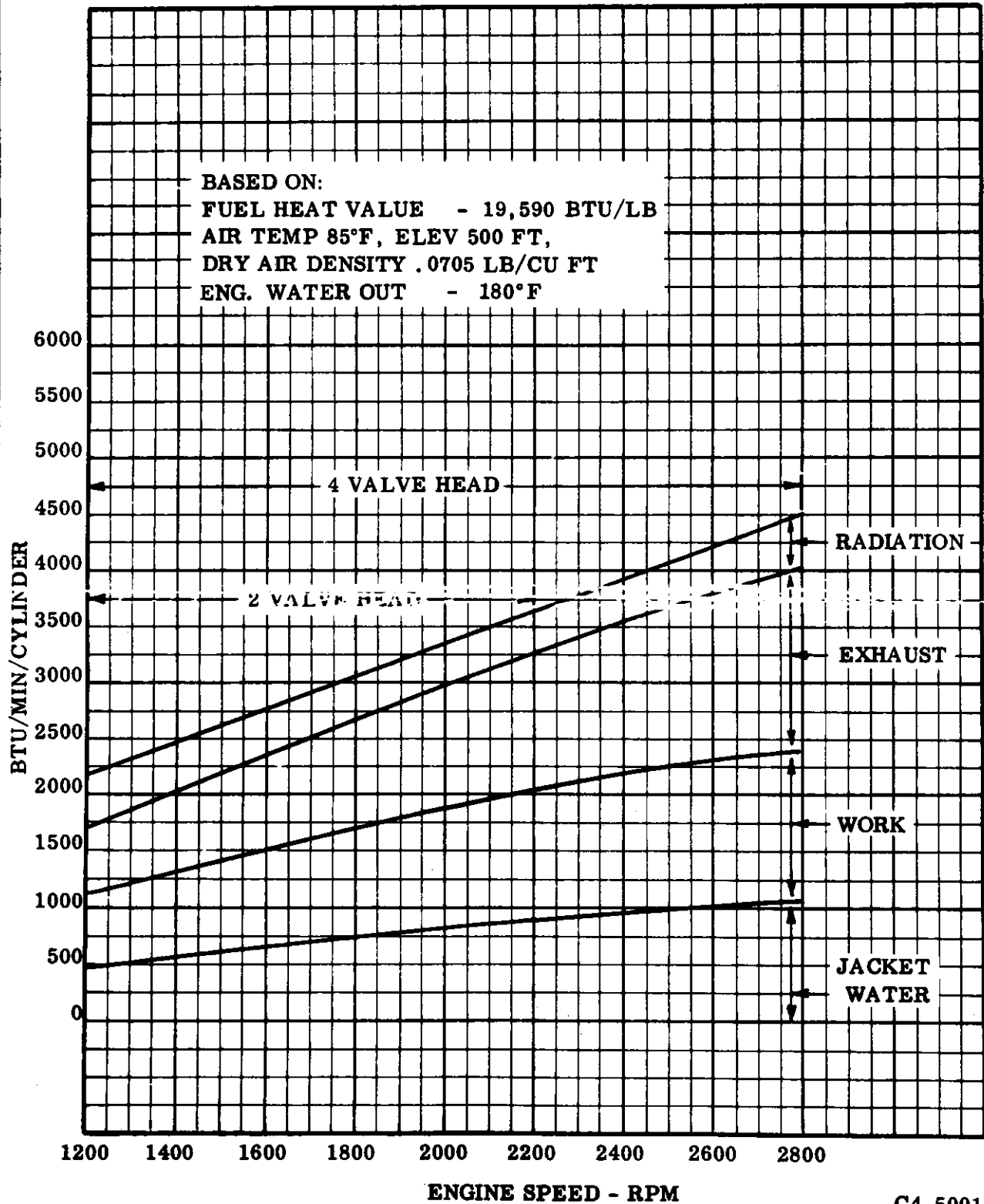




DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE
SERIES 53 (2 & 4 VALVE HEAD)
S45 INJECTORS - FULL LOAD





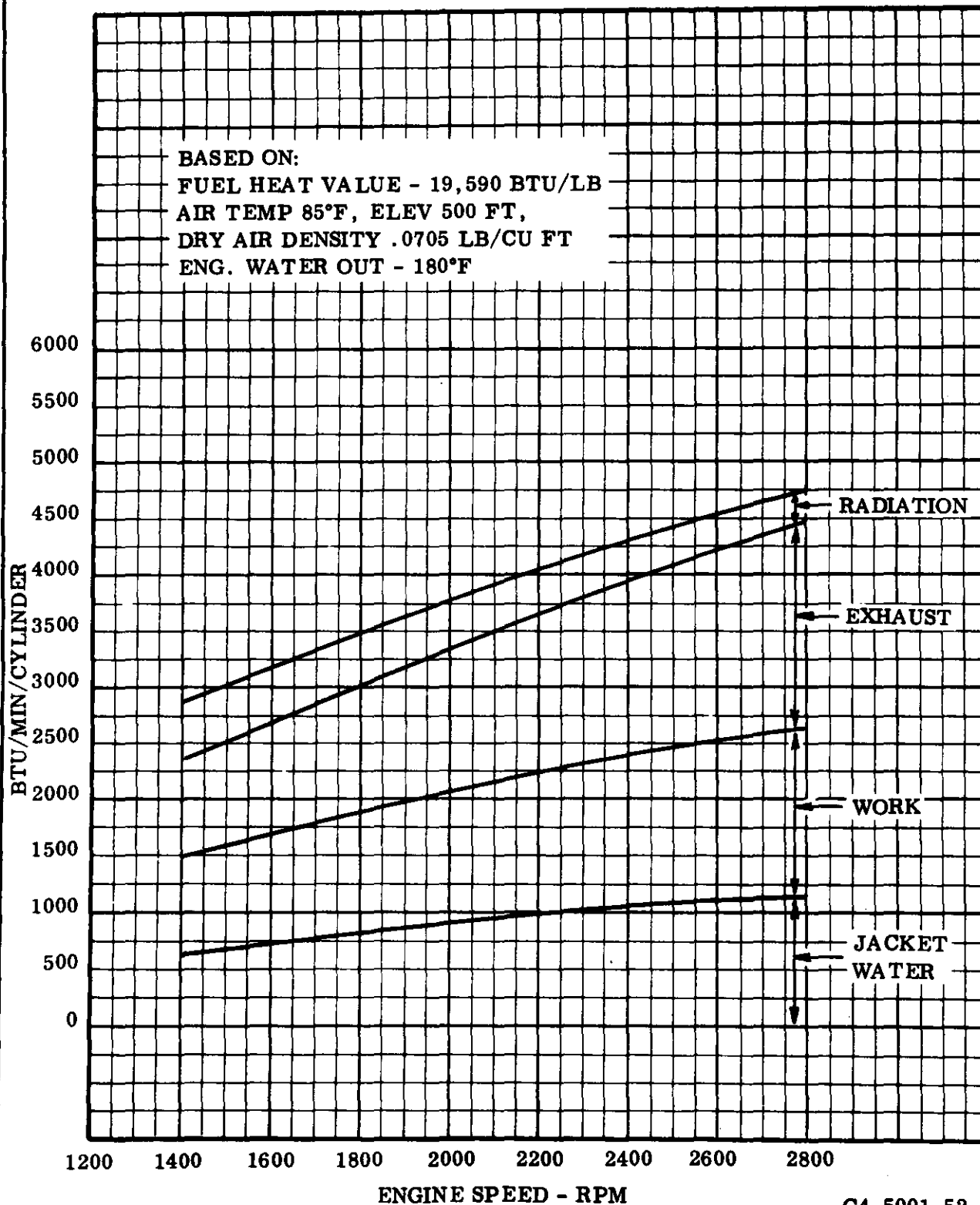
DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE

SERIES 53N

N50 INJECTORS - FULL LOAD





DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE

SERIES V71 ENGINES

S60 INJECTORS - FULL LOAD

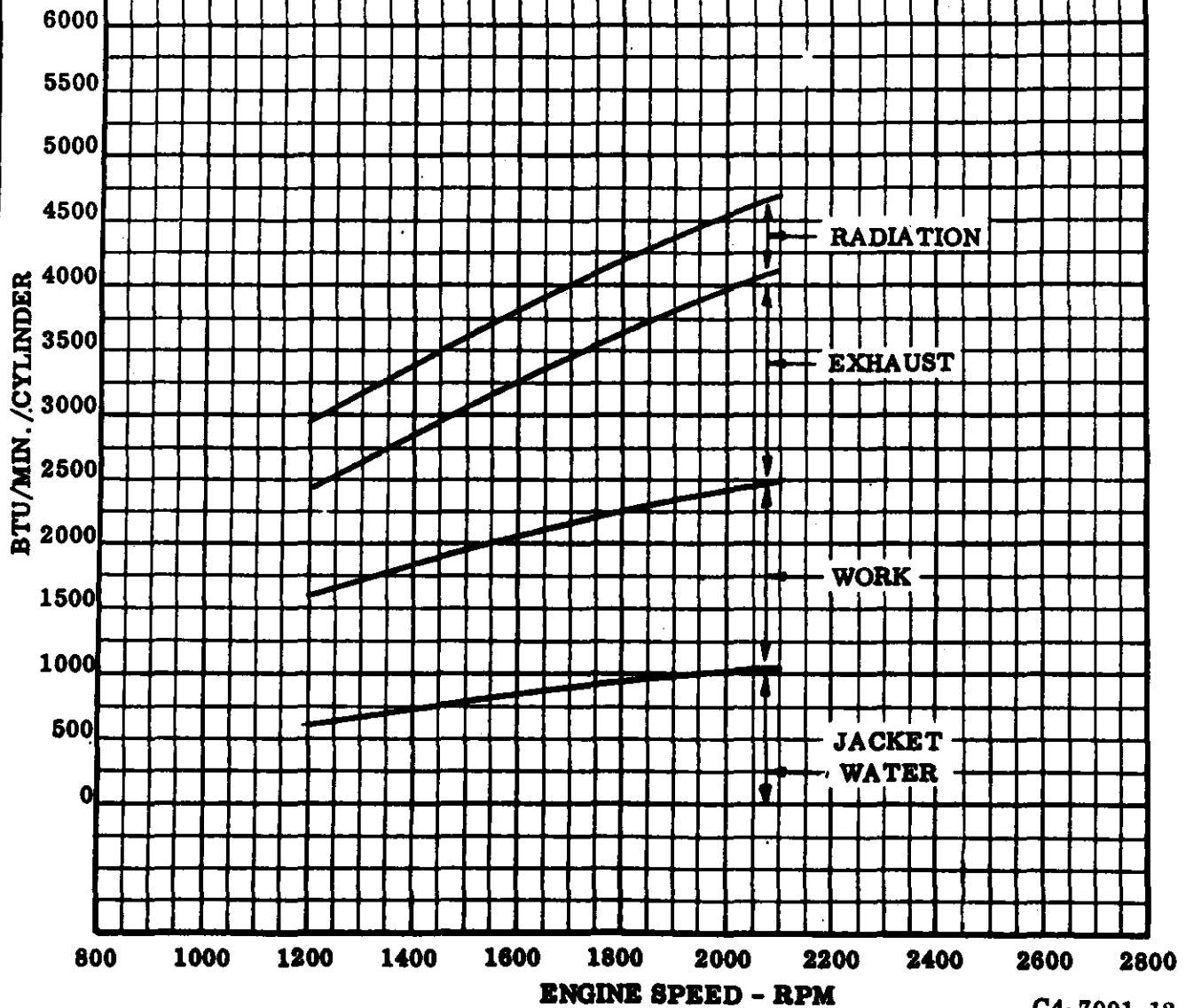
BASED ON:

FUEL HEAT VALUE - 19,590 BTU/LB

AIR TEMP 85°F, ELEV 500 FT,

DRY AIR DENSITY .0705 LB/CU FT

ENG. WATER OUT - 180°F





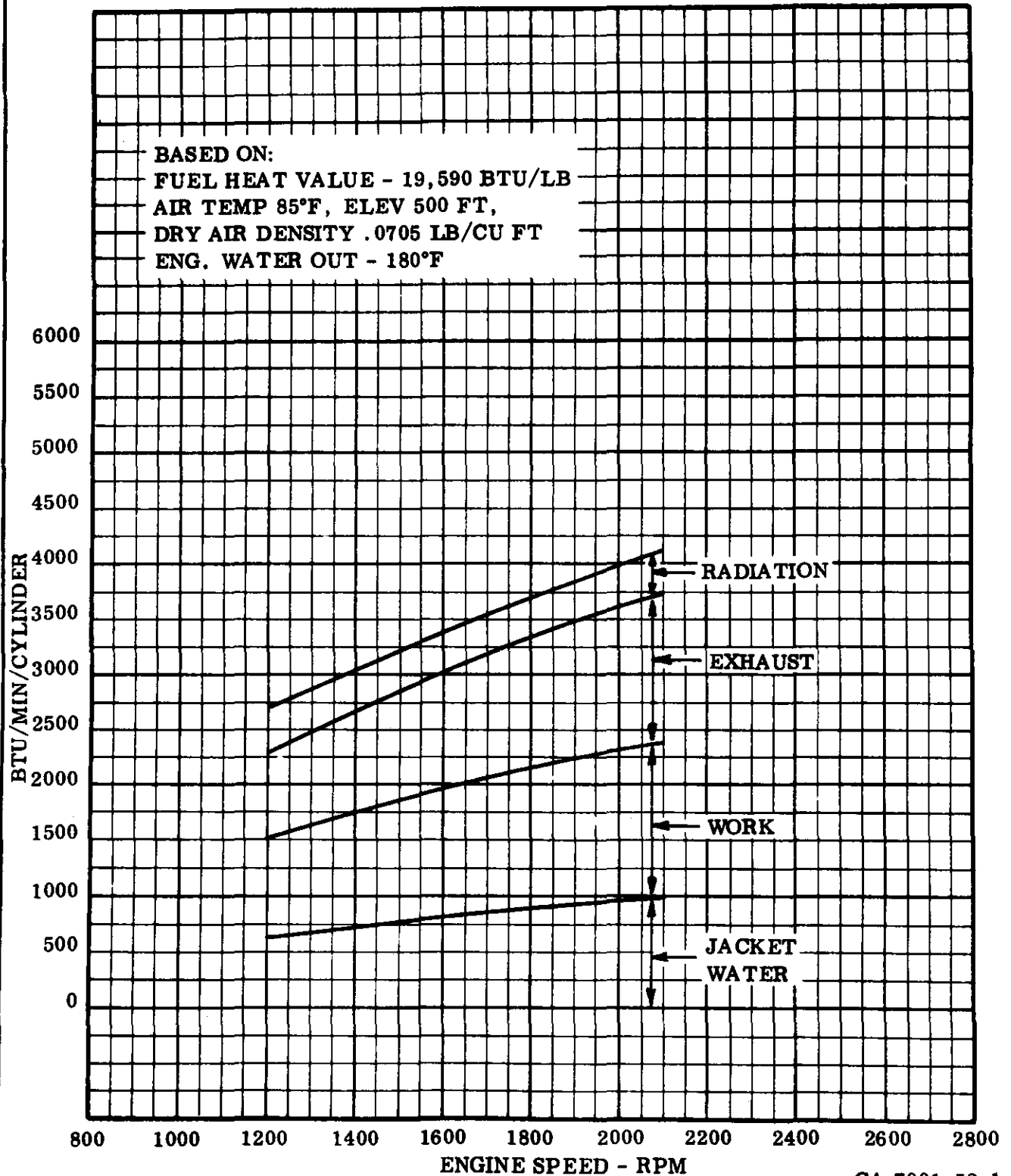
DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE

SERIES V-71N

N55 INJECTORS - FULL LOAD





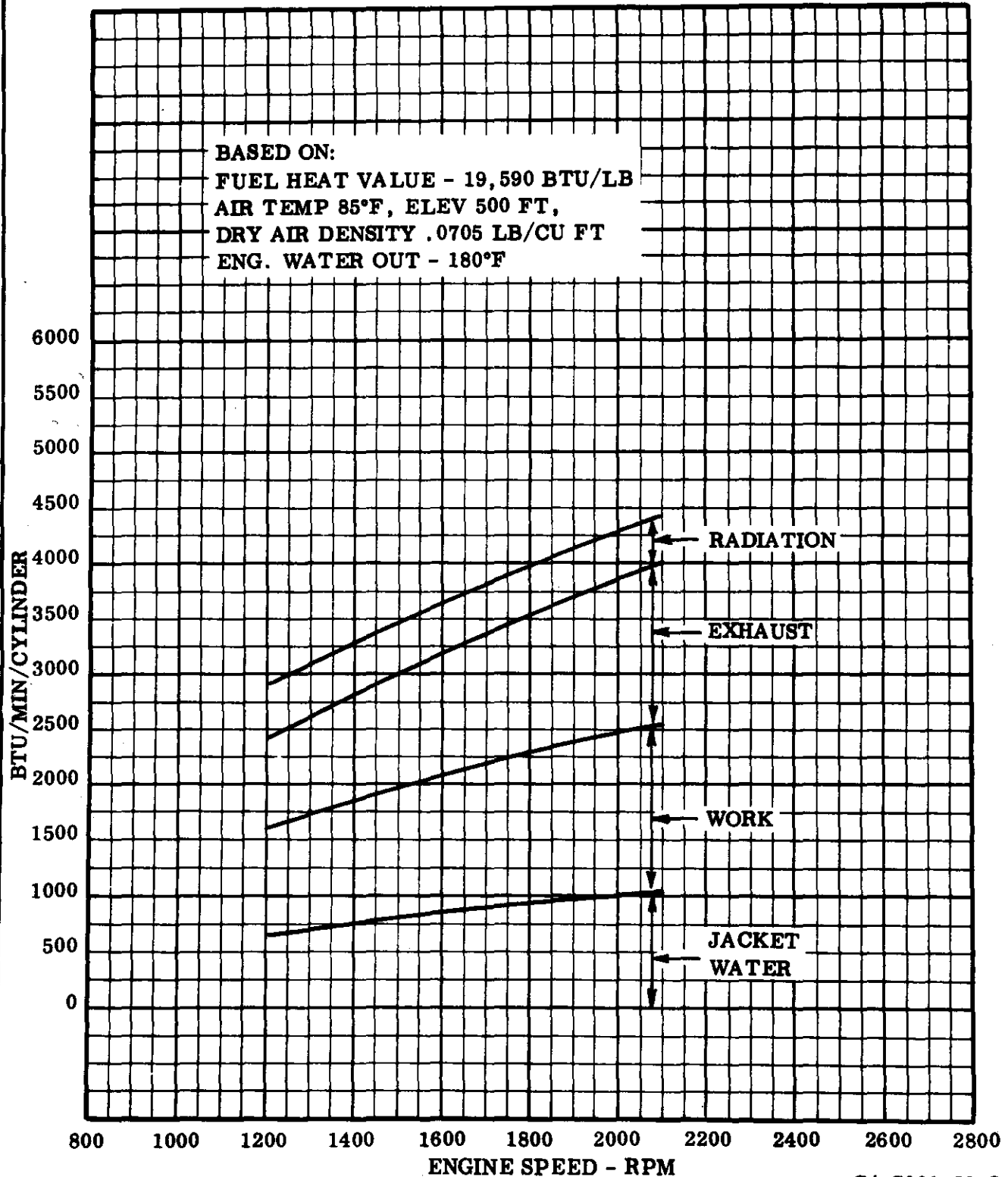
DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE

SERIES V-71N

N60 INJECTORS - FULL LOAD





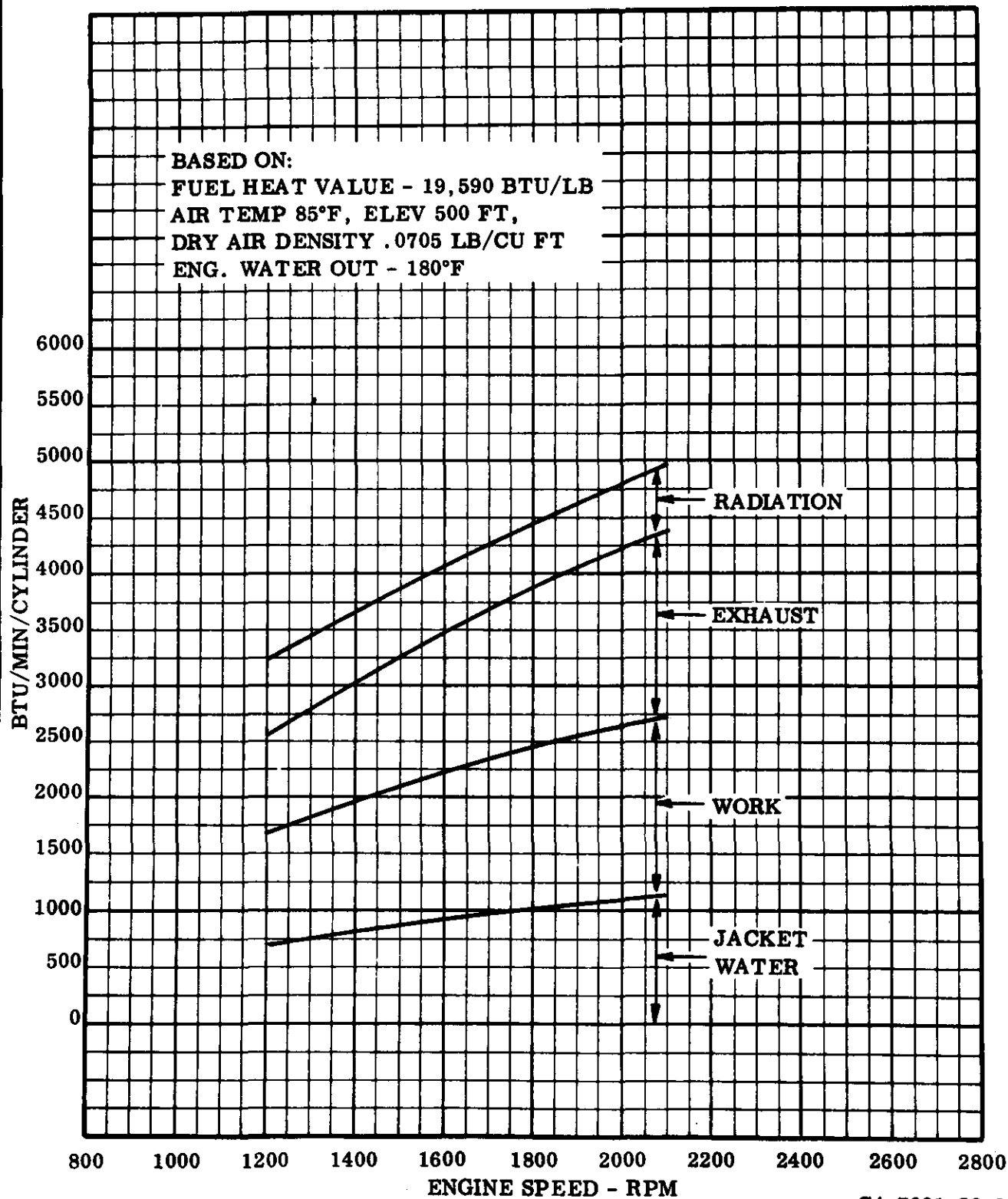
DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS CORPORATION

CALCULATED HEAT BALANCE

SERIES V-71N

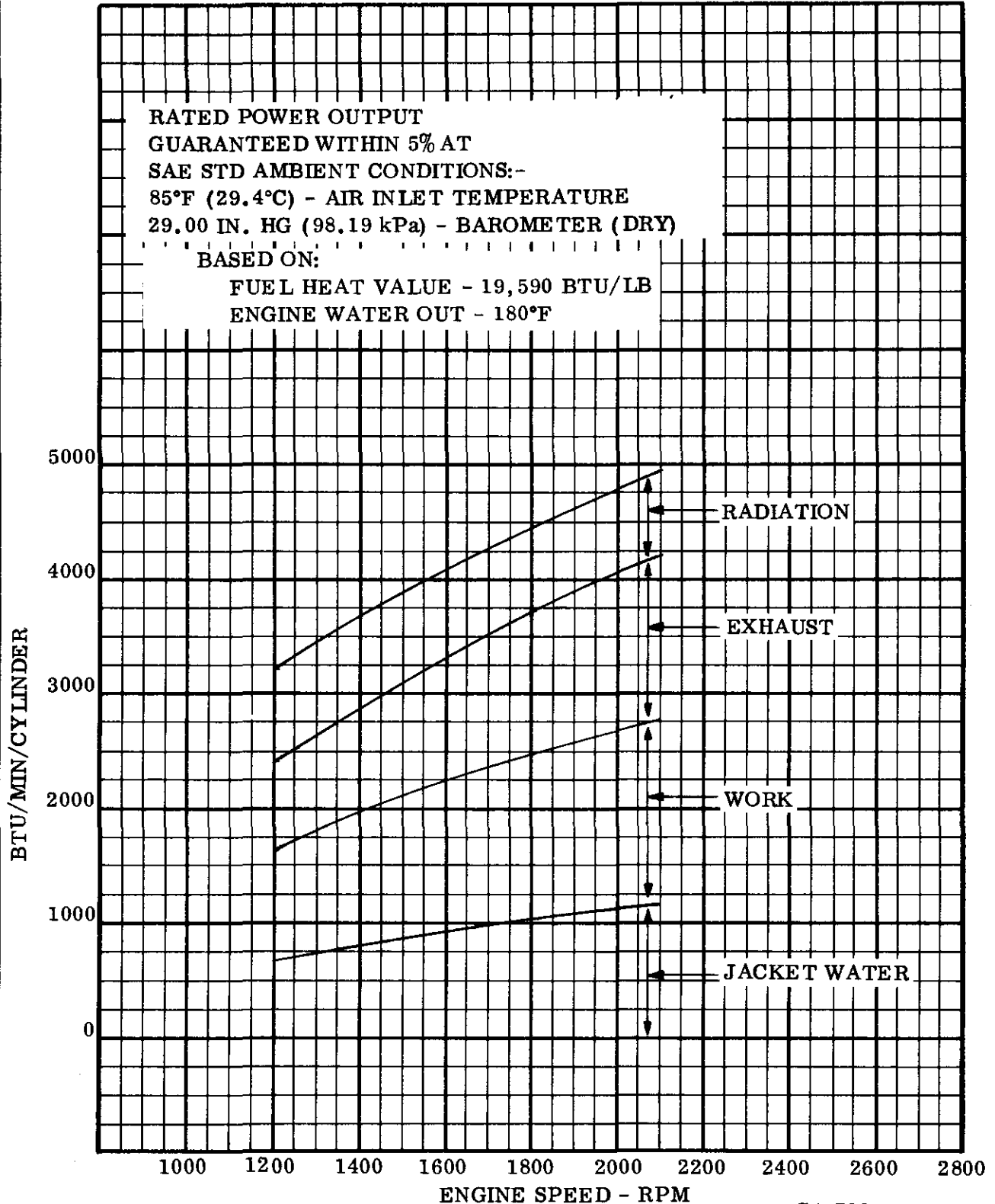
N65 INJECTORS - FULL LOAD





Detroit Diesel Allison
Division of General Motors Corporation

CALCULATED HEAT BALANCE
SERIES V-71N
C65 INJECTORS - FULL LOAD
ADVANCE CAMSHAFT TIMING



ENGINEERING-TECHNICAL DATA DEPT.

C4-7001-52-5
Rev. 1-28-74

EXHAUST
TEMPERATURES

APPROXIMATE FULL LOAD EXHAUST TEMPERATURES °F
(DRY MANIFOLD)

ET (1)

ENGINE	RPM							
	1200	1500	1800	2000	2100	2300	2500	2800
Series 53 (2 & 4 Valve Head)								
S40 Injectors	775	825	860	875	885	885	900	930
S45 Injectors	835	880	915	930	950	950	965	1000
Series 53N								
N40 & C40 Injectors	-	820	825	825	825	825	825	825
N45 & C45 Injectors	-	875	915	920	920	920	920	920
N50 & C50 Injectors	-	905	970	980	980	980	980	980
Series 71								
HV6 Injectors	780	815	830	845	855	885	-	-
HV7 Injectors	855	920	945	965	980	1020	-	-
HV8 Injectors	880	970	1020	1040	1055	1105	-	-
Series 71N & V71N								
71N5 & 71C5 Injectors	720	730	740	745	745	-	-	-
N55 & C55 Injectors	760	770	780	785	785	-	-	-
N60 & C60 Injectors	795	820	830	830	830	-	-	-
N65 & C65 Injectors	830	865	880	880	880	-	-	-
N70 & C70 Injectors	-	955	970	985	990	990	-	-
Series 71T & V71T (1)								
N65 & C65 Injectors	-	795	765	745	735	-	-	-
N70 Injectors	-	820	790	770	760	-	-	-
N75 Injectors	-	840	810	790	780	-	-	-
N80 Injectors	-	855	825	-	-	-	-	-
N90 Injectors	-	895	865	-	-	-	-	-
Series 71TI & V71TI (1)								
Jacket Water Intercooled N90 Injectors	-	865	825	795	785	-	-	-
Series 92								
70 Injectors	850	855	880	910	930	-	-	-
75 Injectors	930	930	945	970	990	-	-	-
80 Injectors	985	985	1000	1030	1045	-	-	-
85 Injectors	1040	1040	1055	1085	1100	1100	-	-
Series 92T (1)								
80 Injectors	790	780	785	790	795	-	-	-
85 Injectors	835	825	825	830	835	-	-	-
90 Injectors	880	870	865	870	875	-	-	-
95 Injectors	910	895	890	-	-	-	-	-
Series V-149								
120 Injectors	870	830	825	* 825	-	-	-	-
130 Injectors	1050	915	910	* 910	-	-	-	-
Series V-149T (1)								
130 Injectors	815	785	745	* 740	-	-	-	-
140 Injectors	845	815	775	* 770	-	-	-	-
150 Injectors	890	860	825	* 815	-	-	-	-
165 Injectors	925	895	860	-	-	-	-	-
Series V-149TI (1)								
Jacket Water Intercooled								
130 Injectors	700	670	640	* 635	-	-	-	-
140 Injectors	725	690	660	* 650	-	-	-	-
150 Injectors	765	730	690	* 680	-	-	-	-
165 Injectors	815	770	720	* 710	-	-	-	-
180 Injectors	845	795	745	* 735	-	-	-	-

(1) Temperature measured after turbocharger.

* Note: This temperature is at 1900 rpm engine speed.

THESE VALUES ARE NOT TO BE USED
FOR DETERMINING ENGINE OUTPUT.

C2-0000-00-9
Rev. 8-8-73

APPROXIMATE FULL LOAD EXHAUST TEMPERATURE °F
(WATER COOLED EXHAUST MANIFOLD)

ET (2)

ENGINE	RPM							
	1200	1500	1800	2000	2100	2300	2500	2800
Series 53 (2 & 4 Valve Head)								
S40 Injectors	675	725	760	775	785	785	800	830
S45 Injectors	735	780	815	830	850	850	865	900
Series 53N								
N40 Injectors	-	720	725	725	725	725	725	725
N45 Injectors	-	775	815	820	820	820	820	820
N50 Injectors	-	805	870	880	880	880	880	880
Series 71								
HV6 Injectors	750	770	780	790	795	825	-	-
HV7 Injectors	815	875	895	910	920	960	-	-
HV8 Injectors	840	925	970	985	995	1040	-	-
Series 71N and V71N								
71N5 & 71C5 Injectors	690	700	710	715	715	-	-	-
N55 & C55 Injectors	730	740	750	755	755	-	-	-
N60 & C60 Injectors	765	790	800	800	800	-	-	-
N65 & C65 Injectors	795	830	845	845	845	-	-	-
N70 & C70 Injectors	-	910	920	930	930	930	-	-
Series 71T & V71T (1)								
N65 & C65 Injectors	-	750	715	690	680	-	-	-
N70 Injectors	-	775	740	715	705	-	-	-
N75 Injectors	-	795	760	735	725	-	-	-
N80 Injectors	-	810	775	-	-	-	-	-
N90 Injectors	-	850	815	-	-	-	-	-
Series 71TI & V71TI (1)								
Jacket Water Intercooled								
N90 Injectors	-	840	790	755	740	-	-	-
Series 71T and V71TI (1)								
Raw Water Intercooled								
N70 Injectors	-	710	670	640	625	-	-	-
N75 Injectors	-	730	690	660	645	-	-	-
N80 Injectors	-	745	705	675	660	640	-	-
N90 Injectors	-	770	730	705	690	670	-	-
Series 92								
70 Injectors	810	810	830	855	870	-	-	-
75 Injectors	890	890	895	915	930	-	-	-
80 Injectors	945	945	950	975	985	-	-	-
85 Injectors	1000	1000	1005	1030	1040	1040	-	-
Series 92T (1)								
80 Injectors	745	730	735	735	740	-	-	-
85 Injectors	790	775	775	775	780	-	-	-
90 Injectors	835	820	815	815	820	-	-	-
95 Injectors	865	845	840	-	-	-	-	-
Series V-149								
120 Injectors	725	725	725	* 725	-	-	-	-
130 Injectors	805	810	810	* 810	-	-	-	-
Series V-149T (1)								
130 Injectors	775	745	705	* 705	-	-	-	-
140 Injectors	805	775	735	* 735	-	-	-	-
150 Injectors	850	820	785	* 780	-	-	-	-
165 Injectors	885	855	820	-	-	-	-	-
Series V-149TI (1)								
Jacket Water Intercooled								
130 Injectors	655	625	600	* 600	-	-	-	-
140 Injectors	690	655	620	* 615	-	-	-	-
150 Injectors	725	685	650	* 645	-	-	-	-
165 Injectors	775	725	680	* 675	-	-	-	-
180 Injectors	805	755	705	* 700	-	-	-	-

(1) Temperature measured after turbocharger.

* Note: This temperature is at 1900 rpm engine speed.

THESE VALUES ARE NOT TO BE USED
FOR DETERMINING ENGINE OUTPUT.



**APPROXIMATE FULL LOAD EXHAUST TEMPERATURES °F
(DRY MANIFOLD)**

ENGINE	RPM							
	1200	1500	1800	2000	2100	2300	2500	2800
SERIES 53 (2 & 4 Valve Head)								
S40 Injectors	775	825	860	875	885	885	900	930
S45 Injectors	835	880	915	930	950	950	965	1000
SERIES 53N								
N40 Injectors	-	820	825	825	825	825	825	825
N45 Injectors	-	875	915	920	920	920	920	920
N50 Injectors	-	905	970	980	980	980	980	980
SERIES 71								
HV6 Injectors	780	815	830	845	855	885	-	-
HV7 Injectors	855	920	945	965	980	1020	-	-
HV8 Injectors	880	970	1020	1040	1055	1105	-	-
SERIES 71E & V71								
S55 Injectors	815	845	860	870	870	-	-	-
S60 Injectors	865	905	920	925	930	-	-	-
SERIES 71N & V71N								
N55 Injectors	760	770	780	785	785	-	-	-
N60 Injectors	795	820	830	830	830	-	-	-
N65 Injectors	830	865	880	880	880	-	-	-
N70 Injectors	-	955	970	985	990	990	-	-
SERIES 71T & V71T (1)								
N65 Injectors	-	795	765	745	735	-	-	-
N70 Injectors	-	820	790	770	760	-	-	-
N75 Injectors	-	840	810	790	780	-	-	-
N80 Injectors	-	855	825	-	-	-	-	-
SERIES V-149								
120 Injectors	870	830	825	* 825	-	-	-	-
130 Injectors	1050	915	910	* 910	-	-	-	-
SERIES V-149T (1)								
140 Injectors	845	815	775	* 770	-	-	-	-
150 Injectors	890	860	825	* 815	-	-	-	-

(1) Temperature Measured after Turbocharger

* Note: This Temperature is at 1900 RPM Engine Speed.

THESE VALUES ARE NOT TO BE USED
FOR DETERMINING ENGINE OUTPUT.

C2-0000-00-9
Rev. 8-13-69