

TRANSARCTIC

PARTS AND SERVICE MANUAL

For KPP11043

DIESEL POWER PACK

INDEPENDENT TRANSIT COMPRESSOR SYSTEM

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SUMMARY

Transarctic KPP11043 Diesel Power Pack

Caterpillar C1.1 EPA Tier 4 Final

- Producing 24.7 bhp (18.4 kW) and 46.3 lb/ft (63 Nm) of torque at 2800 rpm
- Meets existing Tier 4 and Stage 5 emission standards for North America and Europe

FEATURES

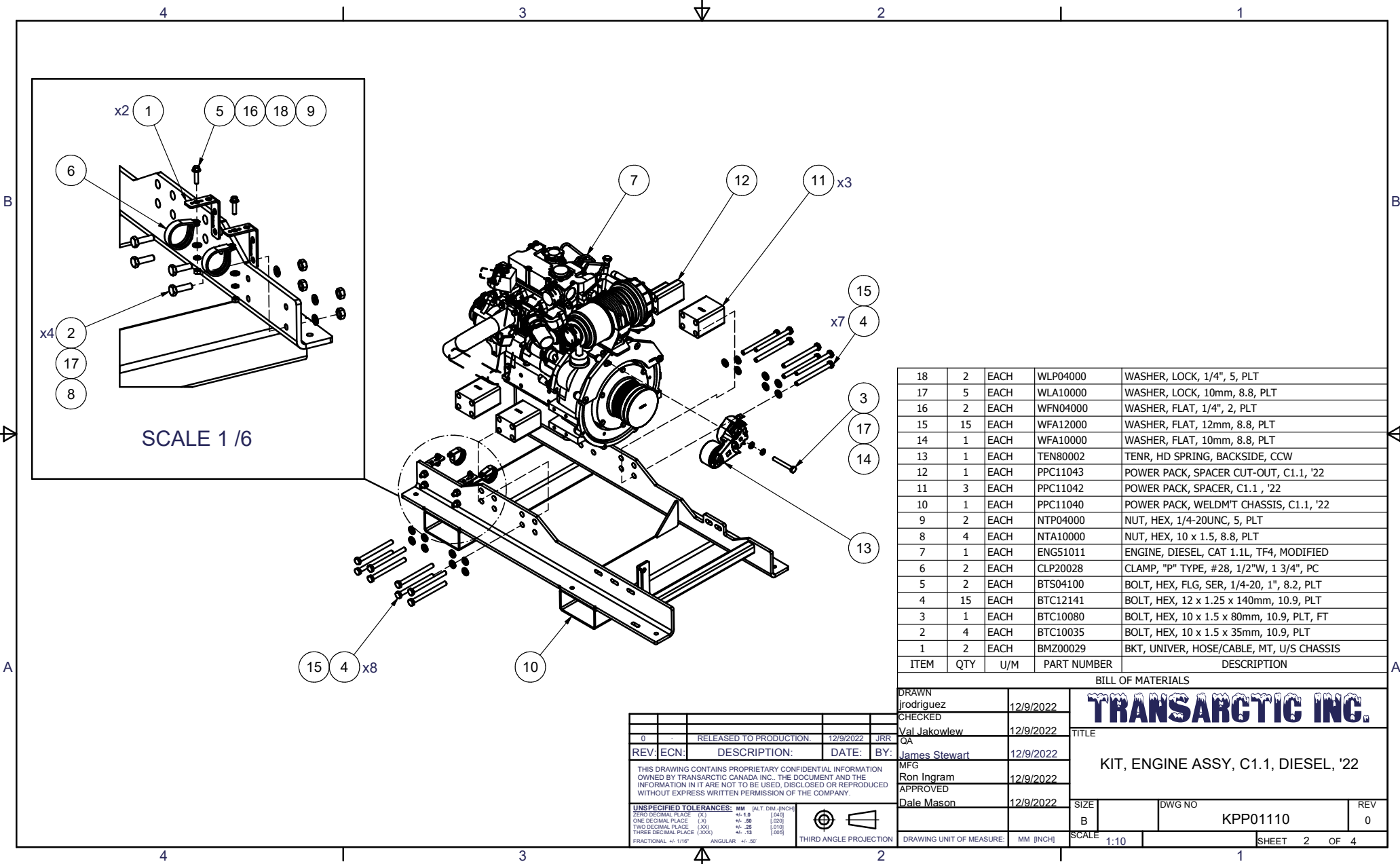
- Operation Independent of Vehicle - Only Requires Fuel from Fuel Tank
- Caterpillar – Reliability, Service and Warranty
- Dash Mounted Electronic Drivers Control with Hour Meter and Fail-Safe
- Remote Operation from Drivers Seat
- Improved Service Accessibility
- Service Hatch for Routine Maintenance
- Removable from bus for Specialized Maintenance
- Low Profile Design (~ 22.7" High)

COMPONENTS

- VDO Tachometer
- LOFA MC704 Engine Controller Panel
- Leece Neville 24V/ 150A (8SC3200V) Alternator
- Valeo Compressor (Z0015838A)
- CAT 1.1L Diesel Engine

NOT AVAILABLE

AT THIS TIME



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
18	2	EACH	WLP04000	WASHER, LOCK, 1/4", 5, PLT
17	5	EACH	WLA10000	WASHER, LOCK, 10mm, 8.8, PLT
16	2	EACH	WFN04000	WASHER, FLAT, 1/4", 2, PLT
15	15	EACH	WFA12000	WASHER, FLAT, 12mm, 8.8, PLT
14	1	EACH	WFA10000	WASHER, FLAT, 10mm, 8.8, PLT
13	1	EACH	TEN80002	TENR, HD SPRING, BACKSIDE, CCW
12	1	EACH	PPC11043	POWER PACK, SPACER CUT-OUT, C1.1, '22
11	3	EACH	PPC11042	POWER PACK, SPACER, C1.1, '22
10	1	EACH	PPC11040	POWER PACK, WELDMT CHASSIS, C1.1, '22
9	2	EACH	NTP04000	NUT, HEX, 1/4-20UNC, 5, PLT
8	4	EACH	NTA10000	NUT, HEX, 10 x 1.5, 8.8, PLT
7	1	EACH	ENG51011	ENGINE, DIESEL, CAT 1.1L, TF4, MODIFIED
6	2	EACH	CLP20028	CLAMP, "P" TYPE, #28, 1/2"W, 1 3/4", PC
5	2	EACH	BTS04100	BOLT, HEX, FLG, SER, 1/4-20, 1", 8.2, PLT
4	15	EACH	BTC12141	BOLT, HEX, 12 x 1.25 x 140mm, 10.9, PLT
3	1	EACH	BTC10080	BOLT, HEX, 10 x 1.5 x 80mm, 10.9, PLT, FT
2	4	EACH	BTC10035	BOLT, HEX, 10 x 1.5 x 35mm, 10.9, PLT
1	2	EACH	BMZ00029	BKT, UNIVER, HOSE/CABLE, MT, U/S CHASSIS

BILL OF MATERIALS

DRAWN	Jrodriguez	12/9/2022
CHECKED	Val Jakowlew	12/9/2022
QA	James Stewart	12/9/2022
MFG	Ron Ingram	12/9/2022
APPROVED	Dale Mason	12/9/2022

TITLE
KIT, ENGINE ASSY, C1.1, DIESEL, '22

REV	ECN	DESCRIPTION	DATE	BY
0		RELEASED TO PRODUCTION.	12/9/2022	JRR

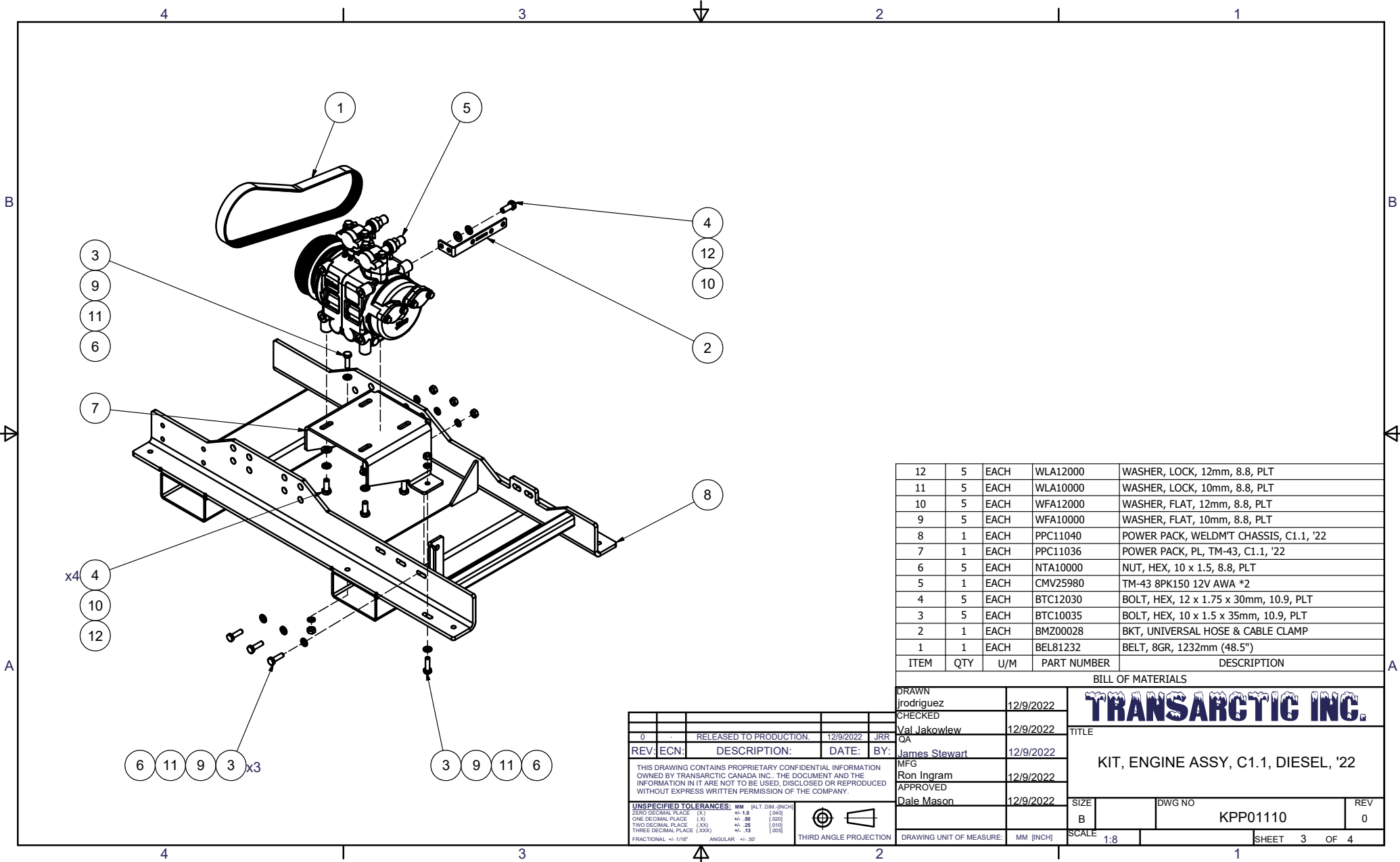
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UNSPECIFIED TOLERANCES:	MM	(ALT. DIM. (INCH))
ZERO DECIMAL PLACE (X)	+/- 1.0	[.040]
ONE DECIMAL PLACE (XX)	+/- .50	[.020]
TWO DECIMAL PLACE (XXX)	+/- .25	[.010]
THREE DECIMAL PLACE (XXXX)	+/- .13	[.005]

FRACTIONAL +/- 1/16" ANGULAR +/- .50°



DRAWING UNIT OF MEASURE:	MM [INCH]	SCALE	1:10	DWG NO	KPP01110	REV	0
				SHEET	2	OF	4



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
12	5	EACH	WLA12000	WASHER, LOCK, 12mm, 8.8, PLT
11	5	EACH	WLA10000	WASHER, LOCK, 10mm, 8.8, PLT
10	5	EACH	WFA12000	WASHER, FLAT, 12mm, 8.8, PLT
9	5	EACH	WFA10000	WASHER, FLAT, 10mm, 8.8, PLT
8	1	EACH	PPC11040	POWER PACK, WELDMT CHASSIS, C1.1, '22
7	1	EACH	PPC11036	POWER PACK, PL, TM-43, C1.1, '22
6	5	EACH	NTA10000	NUT, HEX, 10 x 1.5, 8.8, PLT
5	1	EACH	CMV25980	TM-43 8PK150 12V AWA *2
4	5	EACH	BTC12030	BOLT, HEX, 12 x 1.75 x 30mm, 10.9, PLT
3	5	EACH	BTC10035	BOLT, HEX, 10 x 1.5 x 35mm, 10.9, PLT
2	1	EACH	BMZ00028	BKT, UNIVERSAL HOSE & CABLE CLAMP
1	1	EACH	BEL81232	BELT, 8GR, 1232mm (48.5")

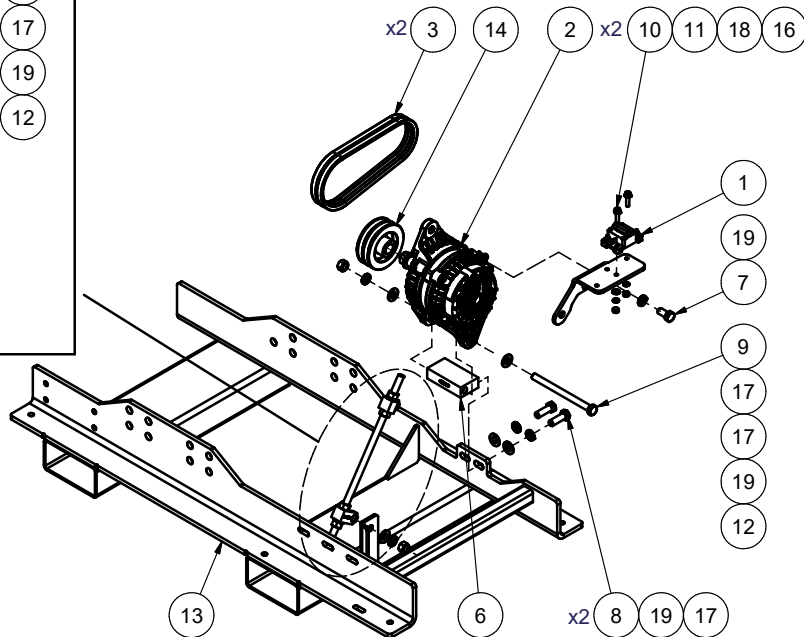
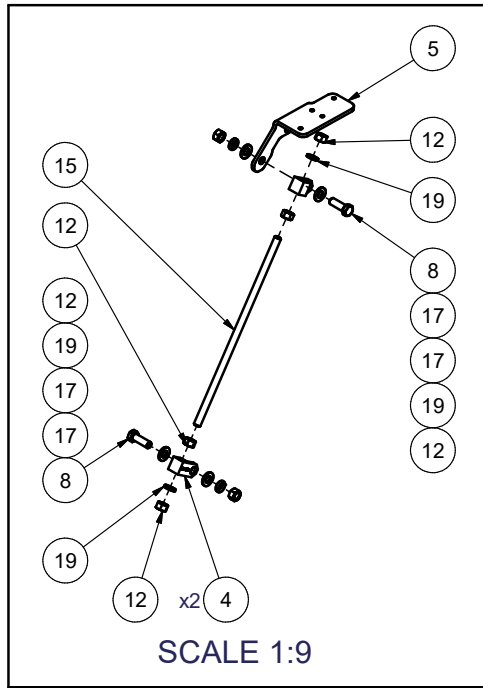


TITLE
KIT, ENGINE ASSY, C1.1, DIESEL, '22

0	RELEASED TO PRODUCTION:	12/9/2022	JRR
REV	ECN:	DESCRIPTION:	DATE: BY:
			James Stewart
MFG			
Ron Ingram			
12/9/2022			
APPROVED			
Dale Mason			
12/9/2022			
UNSPECIFIED TOLERANCES: MM (ALT. DIM. (INCH))			
ZERO DECIMAL PLACE (X)	+/- 1.0	(.040)	
ONE DECIMAL PLACE (XX)	+/- .50	(.020)	
TWO DECIMAL PLACE (XXX)	+/- .25	(.010)	
THREE DECIMAL PLACE (XXXX)	+/- .13	(.005)	
FRACTIONAL +/- 1/16"	ANGULAR +/- .50°		



DRAWN		12/9/2022	
Jrodriguez			
CHECKED			
Val Jakowlew		12/9/2022	
QA			
James Stewart		12/9/2022	
MFG			
Ron Ingram		12/9/2022	
APPROVED			
Dale Mason		12/9/2022	
SIZE	DWG NO		REV
B	KPP01110		0
DRAWING UNIT OF MEASURE:	MM [INCH]	SCALE	1:8
SHEET 3		OF 4	



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
19	8	EACH	WLQ08000	WASHER, LOCK, 1/2", 8, PLT
18	2	EACH	WLP04000	WASHER, LOCK, 1/4", 5, PLT
17	8	EACH	WFO08000	WASHER, FLAT, 1/2", 8, PLT
16	2	EACH	WFO04000	WASHER, FLAT, 1/4", 2, PLT
15	1	EACH	TRD08150	THREADED, ROD, 1/2-13UNC x 15", 5 PLT
14	1	EACH	PUL04022	PULLEY, ALT, IDLER, 4.0"o.d, 2A, '22
13	1	EACH	PPC11040	POWER PACK, WELDMT CHASSIS, C1.1, '22
12	7	EACH	NTQ08000	NUT, HEX, 1/2-13UNC, 8, PLT
11	2	EACH	NTP04000	NUT, HEX, 1/4-20UNC, 5, PLT
10	2	EACH	BTS04100	BOLT, HEX, FLG, SER, 1/4-20, 1", 8.2, PLT
9	1	EACH	BTQ08653	BOLT, HEX, 1/2-13UNC x 6.50, 8, PLT
8	4	EACH	BTQ08150	BOLT, HEX, 1/2-13UNC x 1.50, 8, PLT
7	1	EACH	BTQ08100	BOLT, HEX, 1/2-13UNC x 1.00, 8, PLT
6	1	EACH	BMZ01063	BKT, ALT, PIVOT, SPACER BLOCK, '14
5	1	EACH	BMZ01062	BKT, PL, ALT, TENSION ADJUSTER, '14
4	2	EACH	BMT10011	BKT, TENR, BLOCK, OFFSET, 3mm
3	2	EACH	BEL10686	BELT, A GR, 686mm (27")
2	1	EACH	ALT12200	ALTERNATOR, DELCO, REMY, 12V, 200A
1	1	EACH	46989	CIRCUIT BREAKER, HI AMP, 150A, MANUAL

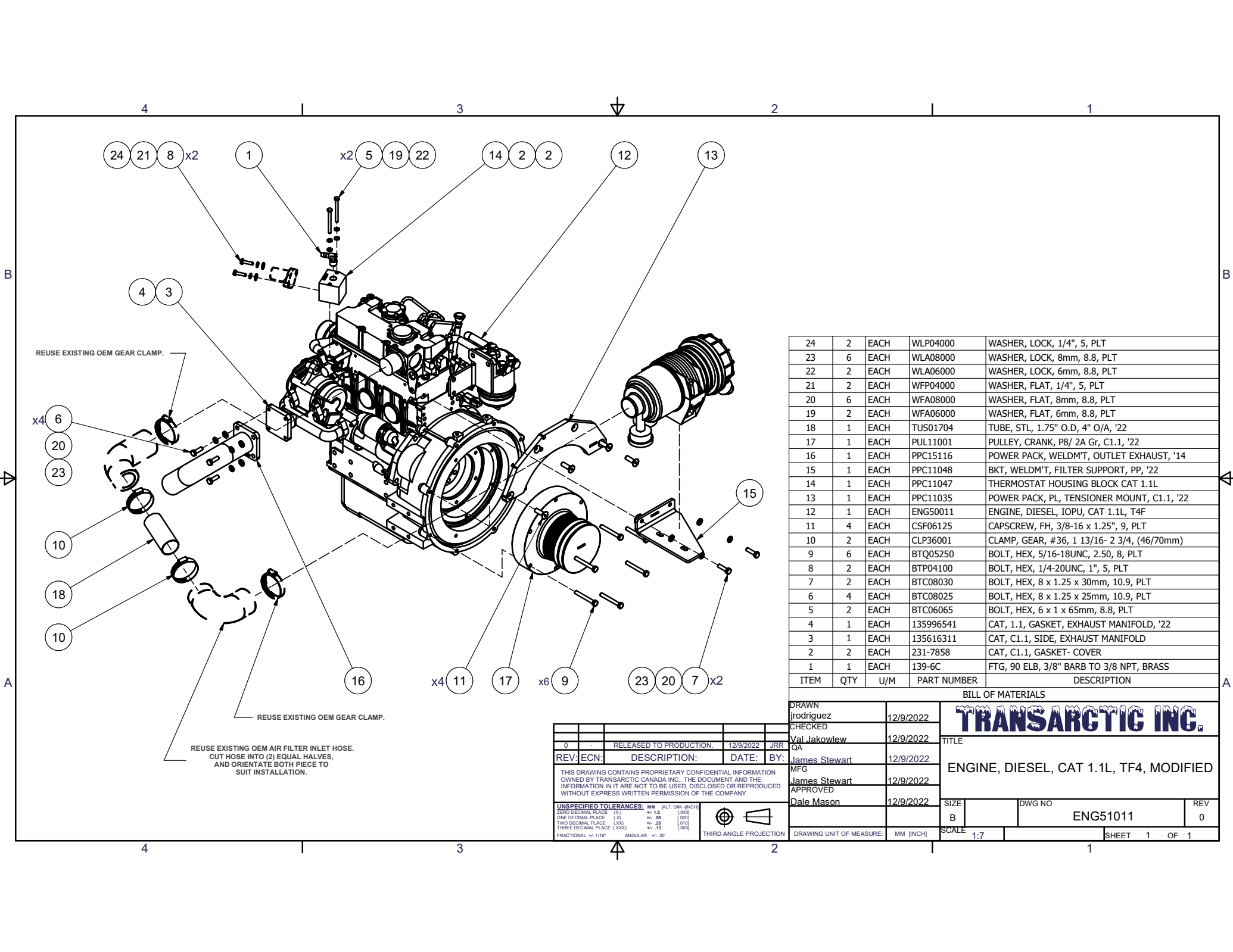
BILL OF MATERIALS			
DRAWN	Jrodriguez	12/9/2022	
CHECKED	Val Jakowlew	12/9/2022	
REV: ECN:	DESCRIPTION:	DATE: BY:	
0	RELEASED TO PRODUCTION:	12/9/2022 JRR	
MFG	Ron Ingram	12/9/2022	KIT, ENGINE ASSY, C1.1, DIESEL, '22
APPROVED	Dale Mason	12/9/2022	
SIZE	B	DWG NO	KPP01110
SCALE	1:10	REV	0
DRAWING UNIT OF MEASURE:	MM [INCH]	SHEET	4 OF 4

REV	ECN	DESCRIPTION	DATE	BY
0		RELEASED TO PRODUCTION:	12/9/2022	JRR

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UNSPECIFIED TOLERANCES:	MM	(ALT. DIM. (INCH))
ZERO DECIMAL PLACE (X)	+/- 1.0	[.040]
ONE DECIMAL PLACE (.X)	+/- .50	[.020]
TWO DECIMAL PLACE (.XX)	+/- .25	[.010]
THREE DECIMAL PLACE (.XXX)	+/- .13	[.005]
FRACTIONAL +/- 1/16"	ANGULAR +/- .50°	

THIRD ANGLE PROJECTION



ITEM	QTY	U/M	PART NUMBER	DESCRIPTION
24	2	EACH	WLP04000	WASHER, LOCK, 1/4", 5, PLT
23	6	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
22	2	EACH	WLA06000	WASHER, LOCK, 6mm, 8.8, PLT
21	2	EACH	WFP04000	WASHER, FLAT, 1/4", 5, PLT
20	6	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
19	2	EACH	WFA06000	WASHER, FLAT, 6mm, 8.8, PLT
18	1	EACH	TUS01704	TUBE, STL, 1.75" O.D, 4" O/A, '22
17	1	EACH	PUL11001	PULLEY, CRANK, P8/ 2A Gr, C1.1, '22
16	1	EACH	PPC15116	POWER PACK, WELDM'T, OUTLET EXHAUST, '14
15	1	EACH	PPC11048	BKT, WELDM'T, FILTER SUPPORT, PP, '22
14	1	EACH	PPC11047	THERMOSTAT HOUSING BLOCK CAT 1.1L
13	1	EACH	PPC11035	POWER PACK, PL, TENSIONER MOUNT, C1.1, '22
12	1	EACH	ENG50011	ENGINE, DIESEL, IOPU, CAT 1.1L, T4F
11	4	EACH	CSF06125	CAPSCREW, FH, 3/8-16 x 1.25", 9, PLT
10	2	EACH	CLP36001	CLAMP, GEAR, #36, 1 13/16- 2 3/4, (46/70mm)
9	6	EACH	BTQ05250	BOLT, HEX, 5/16-18UNC, 2.50, 8, PLT
8	2	EACH	BTP04100	BOLT, HEX, 1/4-20UNC, 1", 5, PLT
7	2	EACH	BTC08030	BOLT, HEX, 8 x 1.25 x 30mm, 10.9, PLT
6	4	EACH	BTC08025	BOLT, HEX, 8 x 1.25 x 25mm, 10.9, PLT
5	2	EACH	BTC06065	BOLT, HEX, 6 x 1 x 65mm, 8.8, PLT
4	1	EACH	135996541	CAT, 1.1, GASKET, EXHAUST MANIFOLD, '22
3	1	EACH	135616311	CAT, C1.1, SIDE, EXHAUST MANIFOLD
2	2	EACH	231-7858	CAT, C1.1, GASKET- COVER
1	1	EACH	139-6C	FTG, 90 ELB, 3/8" BARB TO 3/8 NPT, BRASS

BILL OF MATERIALS

TRANSARCTIC INC.

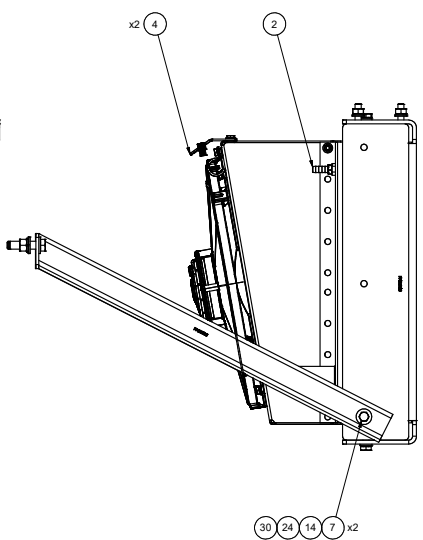
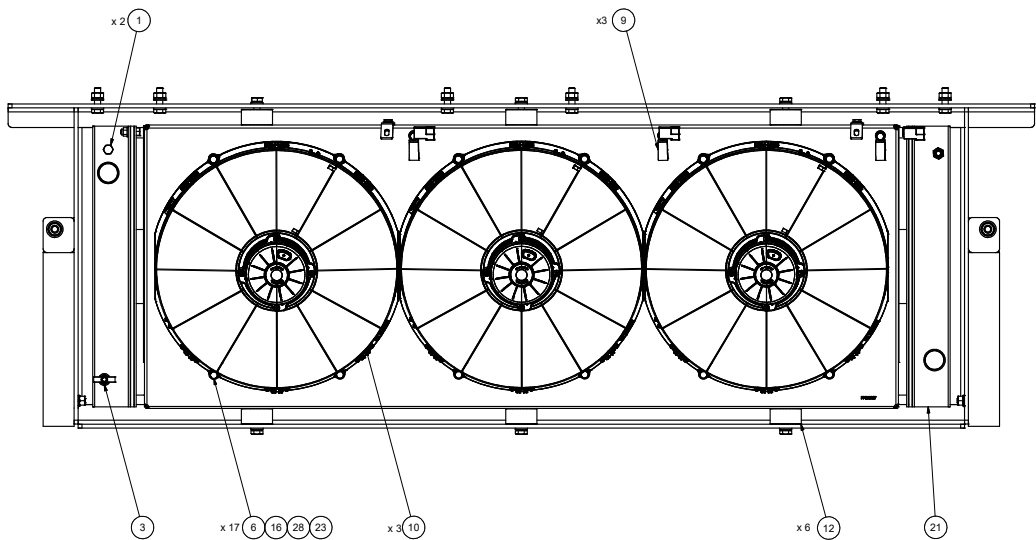
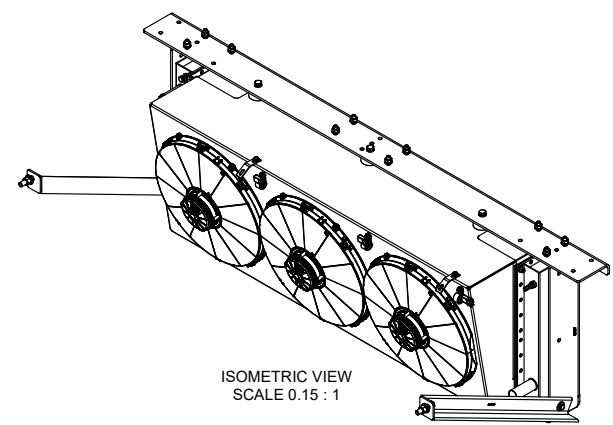
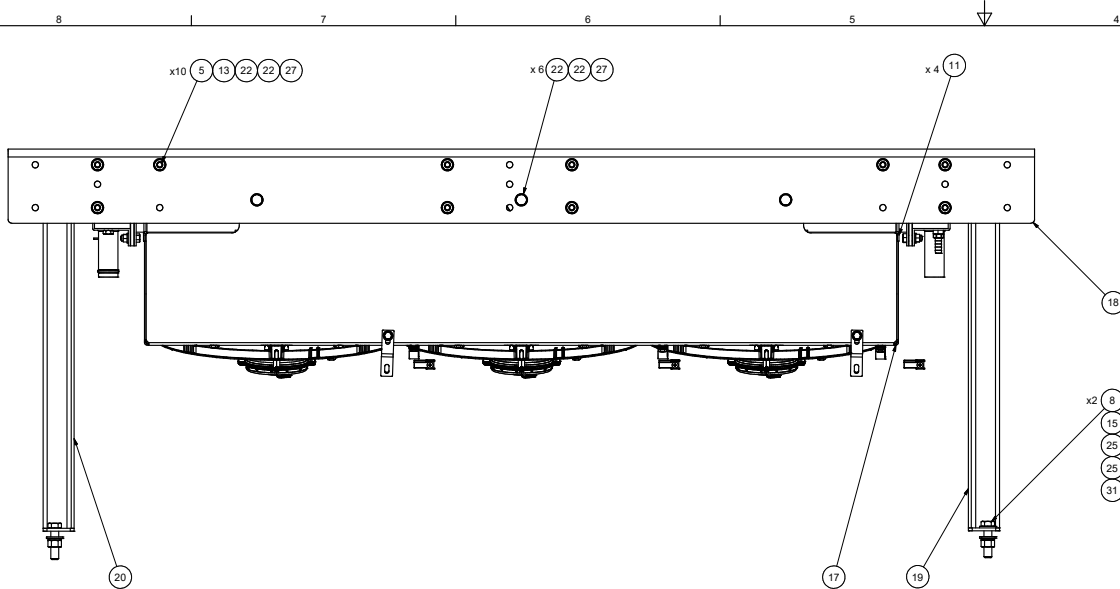
DRAWN	JRodriguez	12/9/2022			
CHECKED	Val Jakowlew	12/9/2022			
REV	ECN	DESCRIPTION	DATE	BY	
0		RELEASED TO PRODUCTION	12/9/2022	JRR	
				James Stewart	12/9/2022
				James Stewart	12/9/2022
				Dale Mason	12/9/2022

TITLE
ENGINE, DIESEL, CAT 1.1L, TF4, MODIFIED

UNSPECIFIED TOLERANCES:		MM	(ALT DIM (INCH))
ZERO DECIMAL PLACE (X)		+/- 1.0	(.040)
ONE DECIMAL PLACE (XX)		+/- .50	(.020)
TWO DECIMAL PLACE (XXX)		+/- .25	(.010)
THREE DECIMAL PLACE (XXXX)		+/- .13	(.005)
FRACTIONAL +/- 1/16"	ANGULAR +/- .50°		



DRAWING UNIT OF MEASURE:	MM [INCH]	SCALE	1:7	SHEET	1 OF 1
DWG NO	ENG51011	REV	0		



32	6	EACH	BTC10020	BOLT, HEX, 10 x 1.5 x 20mm, 10.9, PLT
31	2	EACH	WLQ08000	WASHER, LOCK, 1/2", 8, PLT
30	2	EACH	WLQ06000	WASHER, LOCK, 3/8", 8, PLT
28	17	EACH	WLP04000	WASHER, LOCK, 1/4", 5, PLT
27	16	EACH	WLA10000	WASHER, LOCK, 10mm, 8.8, PLT
25	4	EACH	WF030000	WASHER, FLAT, 1/2", 8, PLT
24	2	EACH	WFN06000	WASHER, FLAT, 3/8", 2, PLT
23	17	EACH	WFN04000	WASHER, FLAT, 1/4", 2, PLT
22	26	EACH	WFA10000	WASHER, FLAT, 10mm, 8.8, PLT
21	1	EACH	RAD11010	RADIATOR, POWER PACK, C1.5L, 50x18x4
20	1	EACH	PPC15215	PP, WELDMT, R/S, RAD BRACE, '14
19	1	EACH	PPC15213	PP, WELDMT, L/S, RAD BRACE, '14
18	1	EACH	PPC11046	BKT, WELDMT, RAD FRAME, CAT 1-1L, '22
17	1	EACH	PPC15207	RAD SHRROUD WELDMENT CAT 1-5L
16	17	EACH	NTS04001	NUT, RIV, 1/4-20 UNC
15	2	EACH	NTQ08000	NUT, HEX, 1/2-13UNC, 8, PLT
14	2	EACH	NTQ06000	NUT, HEX, 3/8-16UNC, 8, PLT
13	10	EACH	NTA10000	NUT, HEX, 10 x 1.5, 8.8, PLT
12	6	EACH	VMB-5025B	RAD, SANDWICH MOUNT, TYPE 2, M10x1.25
11	4.5	FT	IRE10B34	TRIM, 9/16" x 1/8" x 15.14", BLACK, PEBBLE, ALUM
10	3	EACH	FAN60003	FAN, COND, 12V, 2490 M3/HR, (1469 CFM)
9	3	EACH	CLP20016	CLAMP, "P" TYPE, #16, 1/2"W, 1" PC
8	2	EACH	BTO08000	BOLT, HEX, 1/2-13UNC x 2.00, 8, PLT
7	2	EACH	BTO08100	BOLT, HEX, 3/8-16UNC, 1", 8, PLT
6	17	EACH	BTP04100	BOLT, HEX, 1/4-20UNC, 1", 5, PLT
5	10	EACH	BTC10035	BOLT, HEX, 10 x 1.5 x 35mm, 10.9, PLT
4	2	EACH	BM201064	BKT, PL, "P" CLAMP, SUPPORT, '14
3	1	EACH	240-B	FTG, DRAIN COCK, 1/4" MPT, BRASS
2	1	EACH	125-6B	FTG, STR, 3/8" BARB TO 1/4" NPT, BRASS
1	2	EACH	121-B	FTG, PIPE, PLUG, HEX HD, 1/4 MPT, BRASS
ITEM	QTY	U/M	PART NUMBER	DESCRIPTION

BILL OF MATERIALS			
0	RELEASED TO PRODUCTION	12/5/2022	KREV
1	PROVIDE FASTENERS COUNT	3/27/2014	JRC
A	RELEASED TO PROTOTYPE	3/27/2014	REV
REV	ECN	DESCRIPTION	DATE
			BY
			JRodriguez
			3/27/2014
			MPG
			V.Lakshminarayanan
			APPROVED
			3/27/2014
			Dale Mason
			3/27/2014

TRANSARCTIC INC.

TITLE: KIT, RAD, ASS'Y, 3 FAN, 12V, PP

DATE: 3/27/2014

BY: JRodriguez

APPROVED: Dale Mason

SIZE: DWG NO. KPP01120

SCALE: 1:4

SHEET 1 OF 1

UNSPECIFIED TOLERANCES: ALL DIM. FINISH

ONE DECIMAL PLACE (X1) 1/16 FRACTION

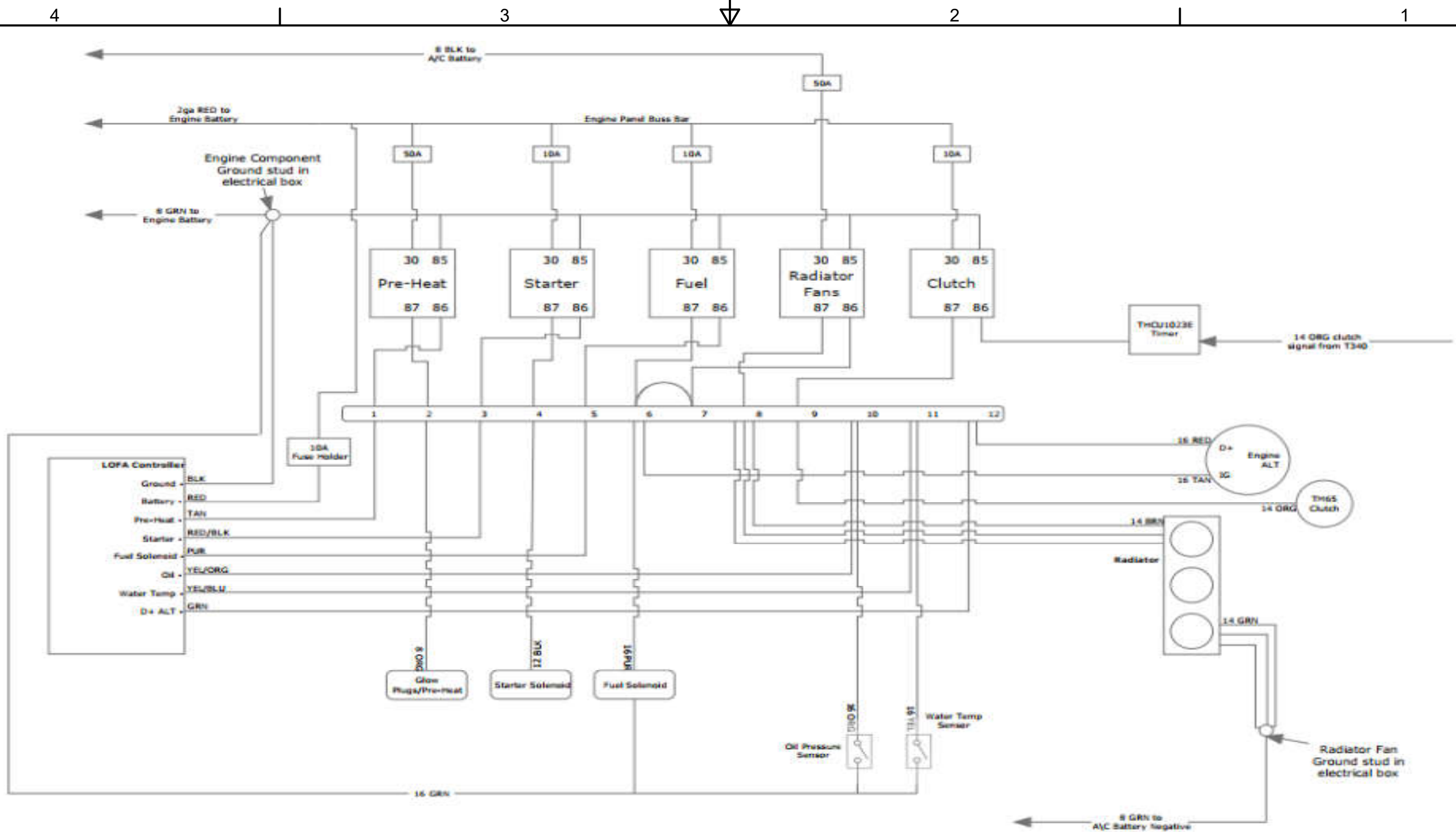
TWO DECIMAL PLACE (X10) 1/32 FRACTION

THREE DECIMAL PLACE (X30) 1/128 FRACTION

FOUR DECIMAL PLACE (X125) 1/1024 FRACTION

THIRD ANGLE PROJECTION

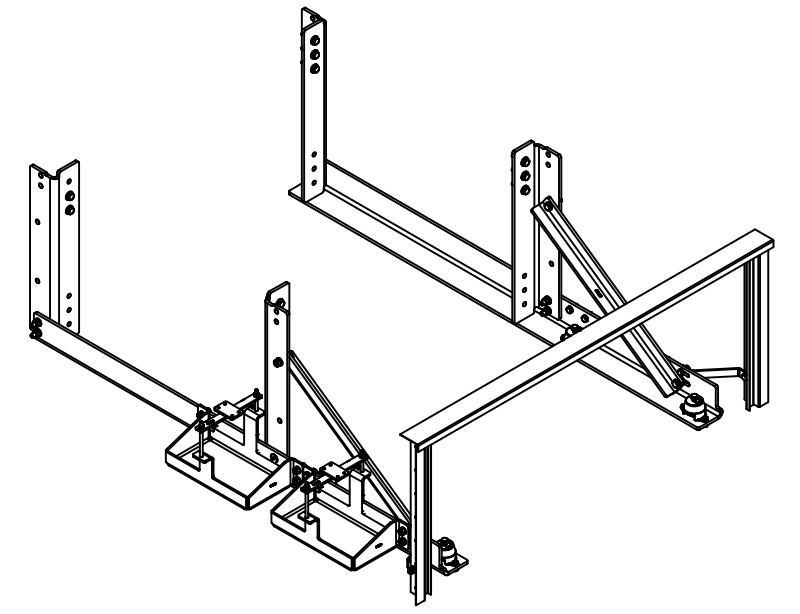
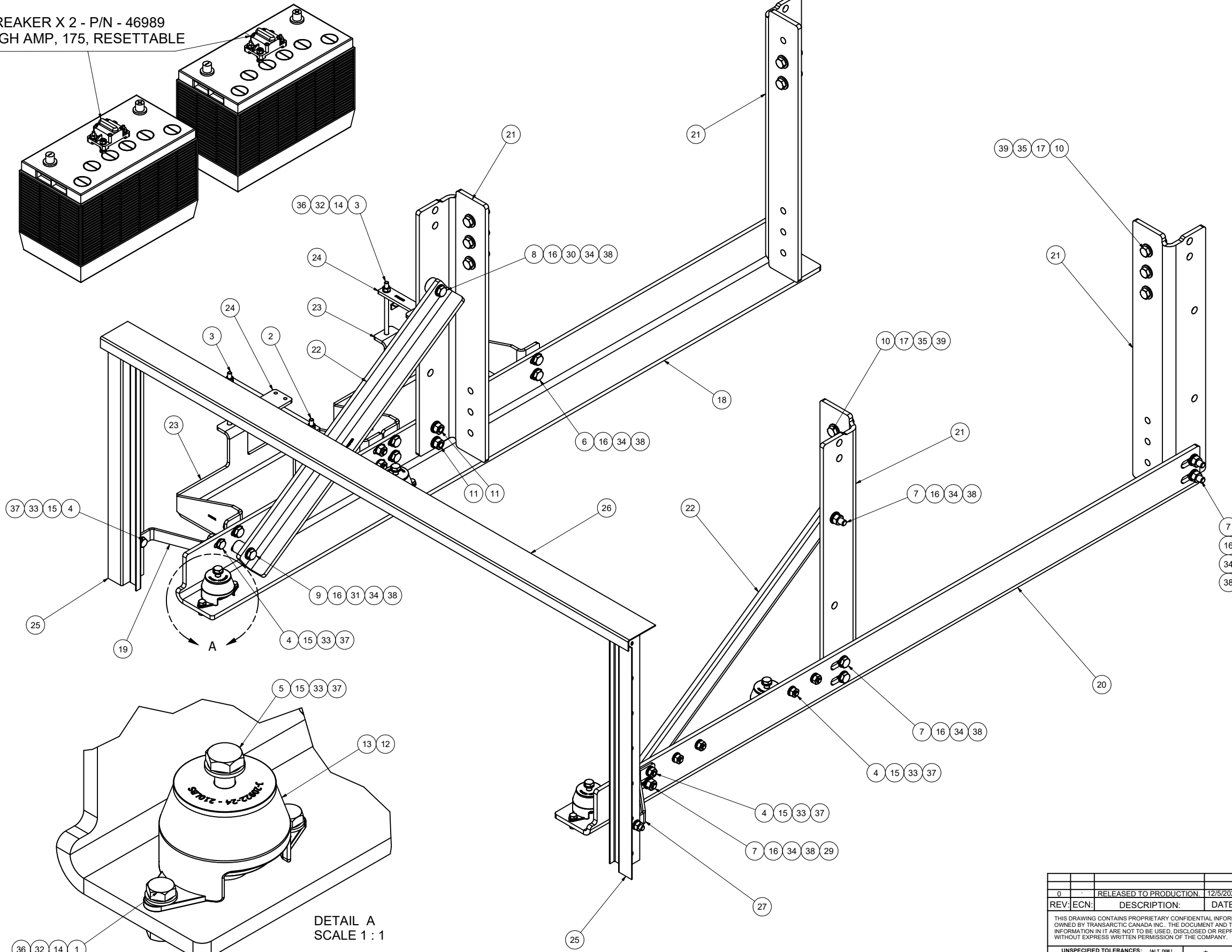
DRAWING UNIT OF MEASURE: MM (INCH)



				TRANSARCTIC INC. TITLE KPP11043 POWER PACK ELECTRICAL DIAGRAM
0	RELEASED TO PRODUCTION	12/6/2022	KEY	QA
REV:	ECN:	DESCRIPTION:	DATE:	BY:
				Val Jakowlew
				MFG
				James Stewart
				APPROVED
				Dale Mason
UNSPECIFIED TOLERANCES: MM [ALT. DIM. - [INCH]] ZERO DECIMAL PLACE (X) +/- 1.0 [040] ONE DECIMAL PLACE (.X) +/- .50 [020] TWO DECIMAL PLACE (.XX) +/- .25 [010] THREE DECIMAL PLACE (.XXX) +/- .13 [005] FRACTIONAL +/- 1/16" ANGULAR +/- .50°				THIRD ANGLE PROJECTION
DRAWING UNIT OF MEASURE: MM [INCH]				SCALE 1:1
SHEET 1 OF 1			DWG NO	REV
			KEL01130	0

BATTERY X 2 - P/N - 115-2422
1000 C.C.A. - 90AMP.

BREAKER X 2 - P/N - 46989
HIGH AMP, 175, RESETTABLE

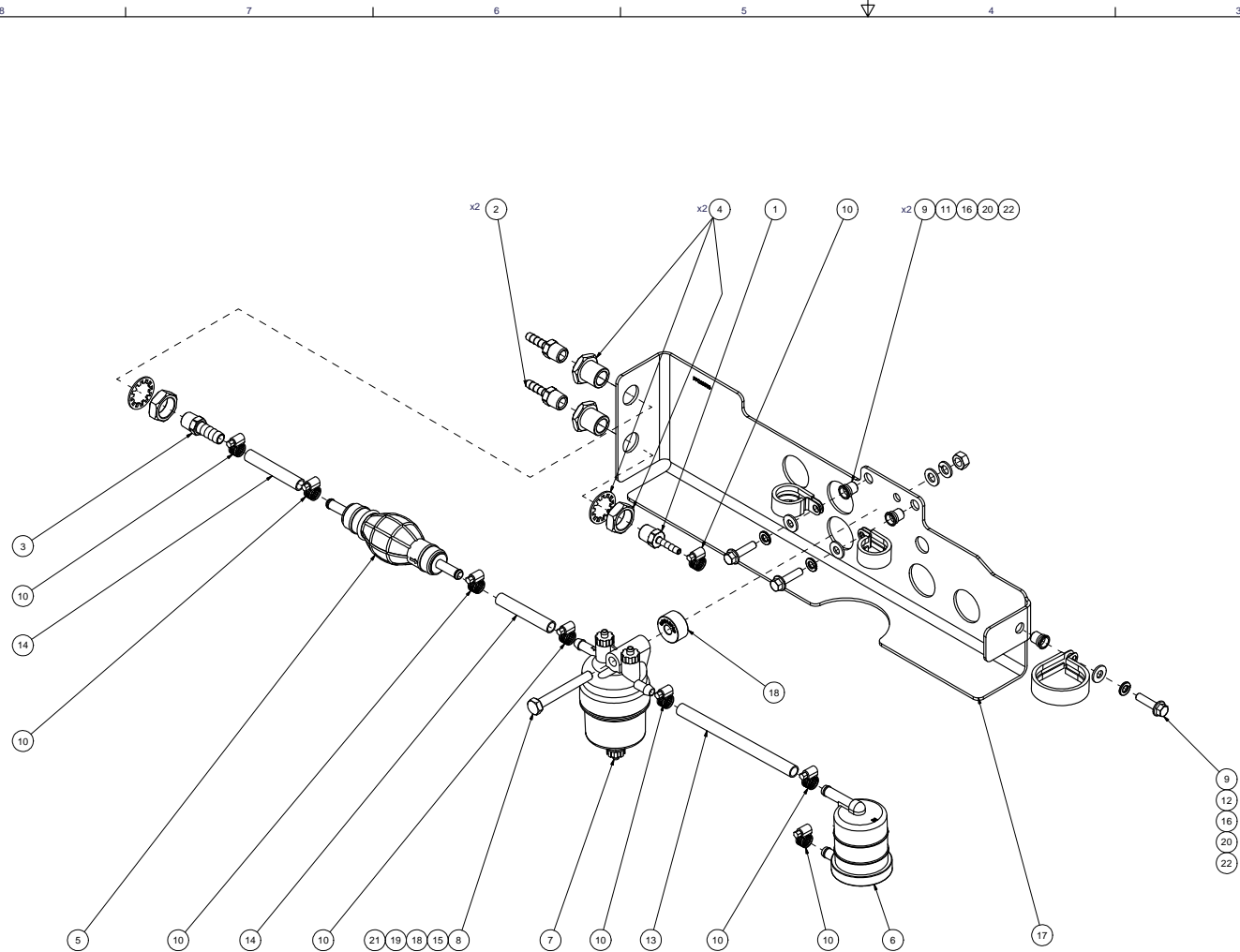


39	11	EACH	WLQ08000	WASHER, LOCK, 1/2", 8, PLT
38	19	EACH	WLA12000	WASHER, LOCK, 12mm, 8.8, PLT
37	12	EACH	WLA10000	WASHER, LOCK, 10mm, 8.8, PLT
36	12	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
35	22	EACH	WFQ08000	WASHER, FLAT, 1/2", 8, PLT
34	28	EACH	WFA12000	WASHER, FLAT, 12mm, 8.8, PLT
33	20	EACH	WFA10000	WASHER, FLAT, 10mm, 8.8, PLT
32	16	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
31	1	EACH	SCD25412	SPACER, COL, DRL, 25.4mm x 25.4o x 12.3i
30	1	EACH	SCD16012	SPACER, COL, DRL, 16 mm x 31.8o x 12.0i
29	1	EACH	SCD09512	SPACER, COL, DRL, 9.53mm x 25.4o x 12.32i
28	1	EACH	PPC15511	POWER PACK, BB DOOR PARTS, T3RE, 2014
27	1	EACH	PPC15510	POWER PACK, DOOR SKIRT, BRACE, '14
26	1	EACH	PPC15509	POWER PACK, TRIM, TOP, LUGGAGE DOOR, '14
25	2	EACH	PPC15508	POWER PACK, TRIM, SIDE, LUGGAGE DOOR, '14
24	2	EACH	PPC15502	BKT, WELDM'T, BATTERY TIE DOWN
23	2	EACH	PPC15501	BKT, BATTERY TRAY, KPP15055
22	2	EACH	PPC15108	POWER PACK, DIAGONAL BRACE, C1.5, '14
21	4	EACH	PPC15105	POWER PACK, VERT. FRAME RAIL, C1.5, '14
20	1	EACH	PPC15104	POWER PACK, R/S FRAME RAIL, C1.5, '14
19	1	EACH	PPC11050	POWER PACK, DOOR SKIRT, BRACE, '22
18	1	EACH	PPC11049	POWER PACK, L/S FRAME RAIL, C1.1, '22
17	11	EACH	NTQ08000	NUT, HEX, 1/2-13UNC, 8, PLT
16	19	EACH	NTA12000	NUT, HEX, 12 x 1.75, 8.8, PLT
15	12	EACH	NTA10000	NUT, HEX, 10 x 1.5, 8.8, PLT
14	12	EACH	NTA08000	NUT, HEX, 8 x 1.25, 8.8, PLT
13	4	EACH	J-20922-24	ISOLATOR, VIBRATION, SMALL ENGINE, 210LBS
12	4	EACH	J-2049-3	WASHER, SNUBBER, VIBRATION ISOLATOR
11	2	EACH	CSF12036	CAPSCREW, FH, 12 x 1.75 x 35mm, 10.9, PLT
10	11	EACH	BTQ08200	BOLT, HEX, 1/2-13UNC x 2.00, 8, PLT
9	1	EACH	BTC12070	BOLT, HEX, 12 x 1.75 x 70mm, 10.9, PLT
8	1	EACH	BTC12055	BOLT, HEX, 12 x 1.75 x 55mm, 10.9, PLT
7	8	EACH	BTC12050	BOLT, HEX, 12 x 1.75 x 50mm, 10.9, PLT
6	7	EACH	BTC12035	BOLT, HEX, 12 x 1.75 x 35mm, 10.9, PLT
5	4	EACH	BTC10060	BOLT, HEX, 10 x 1.5 x 60mm, 10.9, PLT
4	8	EACH	BTC10030	BOLT, HEX, 10 x 1.5 x 30mm, 10.9, PLT
3	2	EACH	BTC08130	BOLT, HEX, 8 x 1.25 x 130mm, 10.9, PLT
2	2	EACH	BTC08080	BOLT, HEX, 8 x 1.25 x 80mm, 10.9, PLT
1	8	EACH	BTC08025	BOLT, HEX, 8 x 1.25 x 25mm, 10.9, PLT
ITEM	QTY	U/M	PART NUMBER	DESCRIPTION

DETAIL A
SCALE 1 : 1

0	RELEASED TO PRODUCTION.	12/5/2022	KEY	Val Jakowlew	12/5/2022	
REV:	ECN:	DESCRIPTION:	DATE:	BY:	JRodriguez	12/5/2022
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UNSPECIFIED TOLERANCES: (ALT. DIM) (INCH)						
ONE DECIMAL PLACE (X)	50	(.020)				
TWO DECIMAL PLACE (XX)	25	(.010)				
THREE DECIMAL PLACE (XXX)	10	(.005)				
FRACTIONAL (1/16")		(.001)				
ANGULAR (1/32")		(.005)				
DRAWING UNIT OF MEASURE: MM (INCH)						
THIRD ANGLE PROJECTION						

BILL OF MATERIALS			
DRAWN	2/19/2014	TRANSARGTIC INC.	TITLE
CHECKED			
Val Jakowlew	12/5/2022	KIT, FRAME AND DOOR ASSY, PP, T3RE, '21	REV 0
JRodriguez	12/5/2022		
James Stewart	12/5/2022		
Dale Mason	12/5/2022		
MFG APPROVED		SIZE	DWG NO
		D	KPP01150
		SCALE	1 : 4
		SHEET	1 OF 1



NOTES:
 1) USE SERVICABLE THREADLOCKER ON ALL FASTENERS TO ENGINE COMPONENTS AND TORQUE ALL BOLTS TO CAT AND/OR S.A.E. SPECIFICATIONS.

ITEM	QTY	UM	PART NUMBER	DESCRIPTION
22	3	EACH	WLP04000	WASHER, LOCK, 1/4", 5, PLT
21	1	EACH	WLA08000	WASHER, LOCK, 8mm, 8.8, PLT
20	3	EACH	WFN04000	WASHER, FLAT, 1/4", 2, PLT
19	1	EACH	WFA08000	WASHER, FLAT, 8mm, 8.8, PLT
18	1	EACH	SCD12708	SPACER, COL, DRL, 12.7mm x 25.4o x 8.33i
17	1	EACH	PPC15600	BKT, FUEL SYSTEM KPP15055
16	3	EACH	NTS04001	NUT, RIV, 1/4-20 UNC
15	1	EACH	NTA08000	NUT, HEX, 8 x 1.25, 8.8 PLT
14	2	EACH	HOF03100	HOSE, FUEL, 5/16", DAYCO x 2.25"L
13	1	EACH	HOF03100	HOSE, FUEL, 5/16", DAYCO x 6.00"L
12	1	EACH	CLP20028	CLAMP, "P" TYPE, #28, 1/2"W, 1 3/4", PC
11	2	EACH	CLP20016	CLAMP, "P" TYPE, #16, 1/2"W, 1", PC
10	8	EACH	CLP06001	CLAMP, GEAR, #6, 3/8-3/4 (10-20mm), S
9	3	EACH	BTS04100	BOLT, HEX, FLG, SER, 1/4-20, 1", 8.2, PLT
8	1	EACH	BTC08065	BOLT, HEX, 8 x 1.25 x 65mm, 10.9, PLT
7	1	EACH	276-1804	CAT, C1.1, FILTER, WATER SEPARATOR
6	1	EACH	243-6411	COARSE OIL FILTER
5	1	EACH	197-8540	CAT, C1.1, PRIME BULB
4	2	EACH	1495-SB	FTG, TERMINAL BOLT, 1/4" FPT ENDS, BRASS
3	1	EACH	125-SB	FTG, STR, 3/16" BARB TO 1/4" MPT, BRASS
2	2	EACH	125-AB	FTG, STR, 1/4" BARB TO 1/4" MPT, BRASS
1	1	EACH	125-3B	FTG, STR, 3/16" BARB TO 1/4" MPT, BRASS

TRANSARGTIG INC.

DRAWN	Klarin	3/24/2014
CHECKED	James Stewart	3/24/2014
RELEASED TO PRODUCTION	JRR	3/24/2014
REVISION	DESCRIPTION	DATE
	BY: JRodriguez	3/24/2014
	BY: MFG	3/24/2014
	BY: V.Jakowlew	3/24/2014
	DATE	3/24/2014
	DATE	3/24/2014

BILL OF MATERIALS			
ITEM	QTY	UM	DESCRIPTION
22	3	EACH	WLP04000 WASHER, LOCK, 1/4", 5, PLT
21	1	EACH	WLA08000 WASHER, LOCK, 8mm, 8.8, PLT
20	3	EACH	WFN04000 WASHER, FLAT, 1/4", 2, PLT
19	1	EACH	WFA08000 WASHER, FLAT, 8mm, 8.8, PLT
18	1	EACH	SCD12708 SPACER, COL, DRL, 12.7mm x 25.4o x 8.33i
17	1	EACH	PPC15600 BKT, FUEL SYSTEM KPP15055
16	3	EACH	NTS04001 NUT, RIV, 1/4-20 UNC
15	1	EACH	NTA08000 NUT, HEX, 8 x 1.25, 8.8 PLT
14	2	EACH	HOF03100 HOSE, FUEL, 5/16", DAYCO x 2.25"L
13	1	EACH	HOF03100 HOSE, FUEL, 5/16", DAYCO x 6.00"L
12	1	EACH	CLP20028 CLAMP, "P" TYPE, #28, 1/2"W, 1 3/4", PC
11	2	EACH	CLP20016 CLAMP, "P" TYPE, #16, 1/2"W, 1", PC
10	8	EACH	CLP06001 CLAMP, GEAR, #6, 3/8-3/4 (10-20mm), S
9	3	EACH	BTS04100 BOLT, HEX, FLG, SER, 1/4-20, 1", 8.2, PLT
8	1	EACH	BTC08065 BOLT, HEX, 8 x 1.25 x 65mm, 10.9, PLT
7	1	EACH	276-1804 CAT, C1.1, FILTER, WATER SEPARATOR
6	1	EACH	243-6411 COARSE OIL FILTER
5	1	EACH	197-8540 CAT, C1.1, PRIME BULB
4	2	EACH	1495-SB FTG, TERMINAL BOLT, 1/4" FPT ENDS, BRASS
3	1	EACH	125-SB FTG, STR, 3/16" BARB TO 1/4" MPT, BRASS
2	2	EACH	125-AB FTG, STR, 1/4" BARB TO 1/4" MPT, BRASS
1	1	EACH	125-3B FTG, STR, 3/16" BARB TO 1/4" MPT, BRASS
REV	0		

UNSPECIFIED TOLERANCES: H & L DIM. ±.004
 ONE DECIMAL PLACE (X.0) ±.005
 TWO DECIMAL PLACE (X.00) ±.002
 THREE DECIMAL PLACE (X.000) ±.001
 FRACTIONAL (X.125) ±.002



DRAWING UNIT OF MEASURE: MM (INCH)
 SCALE: 1:2
 SHEET 1 OF 1

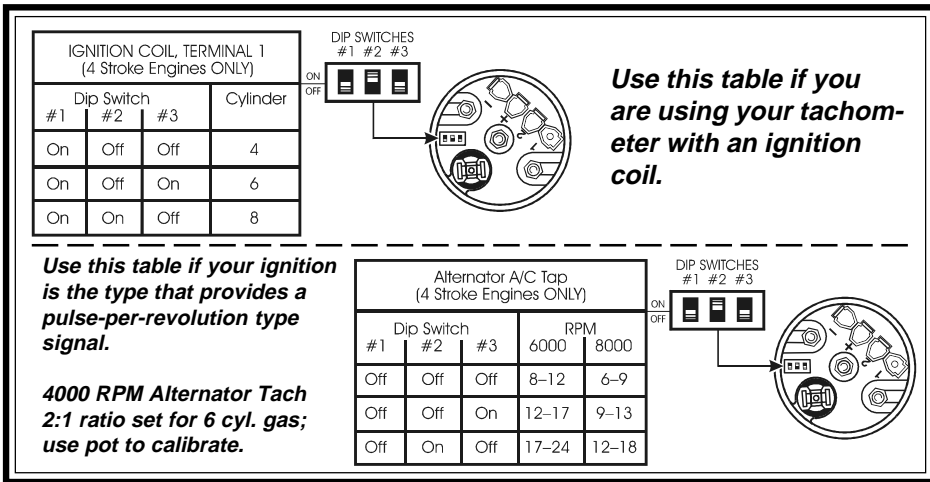


Diagram D

Tachometer configuration for use with ignition coil (top); alternator (bottom)

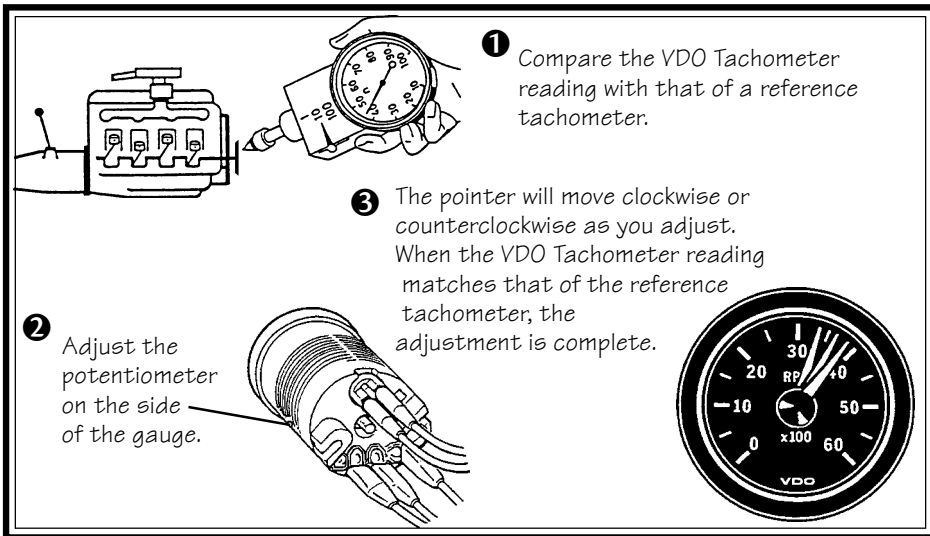


Diagram E

Fine tachometer adjustment needed when using a pulse-per-revolution signal

Merchandise warranted against defects in factory workmanship and materials for a period of 24 months after purchase. This warranty applies to the first retail purchaser and covers only those products exposed to normal use or service. Provisions of this warranty shall not apply to a VDO product used for a purpose for which it is not designed, or which has been altered in any way that would be detrimental to the performance or life of the product, or misapplication, misuse, negligence or accident. On any VDO part or VDO product found to be defective after examination by manufacturer, manufacturer will only repair or replace the merchandise through the original selling dealer. Manufacturer assumes no responsibility for diagnosis, removal and/or installation labor, loss of vehicle use, loss of time, inconvenience or any other consequential expenses. The warranties herein are in lieu of any other expressed or implied warranties, including any implied warranty of merchantability of fitness, and any other obligation on the part of manufacturer, or selling dealer.

(NOTE: This is a "Limited Warranty" as defined by the Magnuson-Moss Warranty Act of 1975.)

1 BEGIN HERE

CAUTION: Read these instructions thoroughly before making installation. Do not deviate from assembly or wiring instructions. Always disconnect battery ground before making any electrical connections. If in doubt, please contact your dealer or VDO Instruments at (800) 265-1818.

Tachometer Installation:

1. Select the location where you will mount the gauge, and cut a 2 1/16" hole as shown in Diagram A.
2. Slip the VDO Spin-Lok™ Mounting

CAUTION!!!

The bezel diameter is only a few millimeters larger than the gauge itself. With that in mind, measure and precisely mark the gauge location before cutting any holes!

Tools and Materials Needed For Installation:

- 16 Gauge stranded, insulated wire
- Non-insulated 1/4" spade connectors
- 2 1/16" hole saw
- Drill and drill bit set
- Half-round file
- Tape measure or ruler
- Small tools: wrench or nut driver, utility knife, pliers, etc.

Clamp over the back of the instrument. It's direction depends on the thickness of the panel (Diagram B). Tighten the clamp until the gauge can no longer be rotated by hand.

DO NOT OVERTIGHTEN.

Tachometer Wiring:

1. Run wires from the tachometer location to:
 - a) A +12 volt power terminal. (This positive power source **MUST BE SWITCHED**, and should be protected with a fuse);
 - b) the light switch (also after the fuse in the fuse box);
 - c) a good ground location;

[text continues at #2] ➔

Parts List		
Item	Description	Quantity
1.	Tachometer (2 1/16" [52 mm] diameter)	1
2.	Lamp Socket (Push in, wedge-type)	1
3.	Light Bulb (12-volt / G.E. #158 or equivalent)	1
4.	VDO Spin-Lok™ Clamp	1
5.	Installation Instructions	1



Tachometer Installation Instructions

Instruction Sheet #0 515 012 044
Rev. 10/09

INSTRUCTIONS FOR THE INSTALLATION OF THE TACHOMETER ARE CONTAINED HEREIN. USE IS RESTRICTED TO 12-VOLT NEGATIVE GROUND ELECTRICAL SYSTEMS. LIGHT BULB, IF SUPPLIED, IS 12 VOLT.

To Begin, go to #1

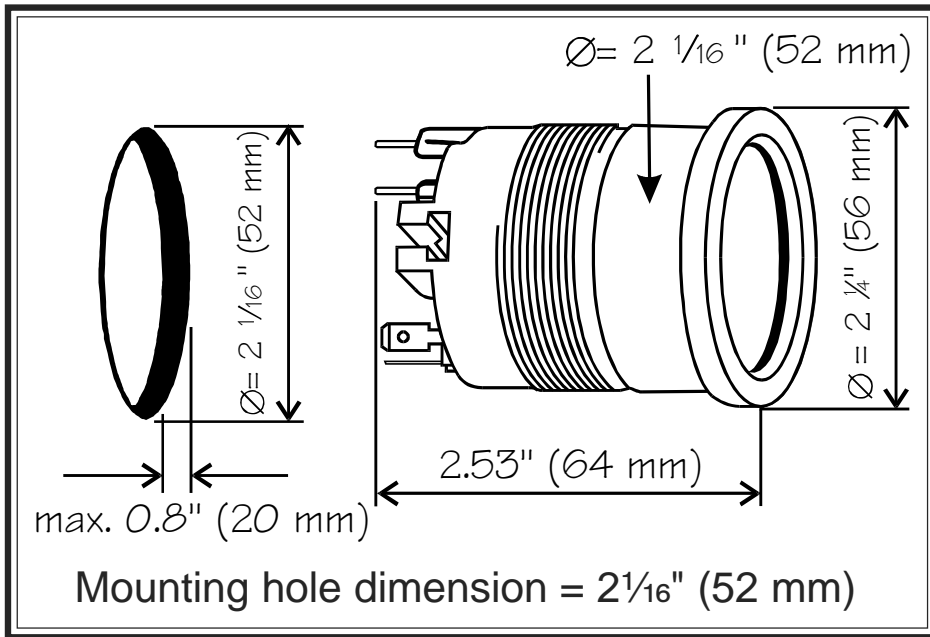


Diagram A
Gauge dimensions

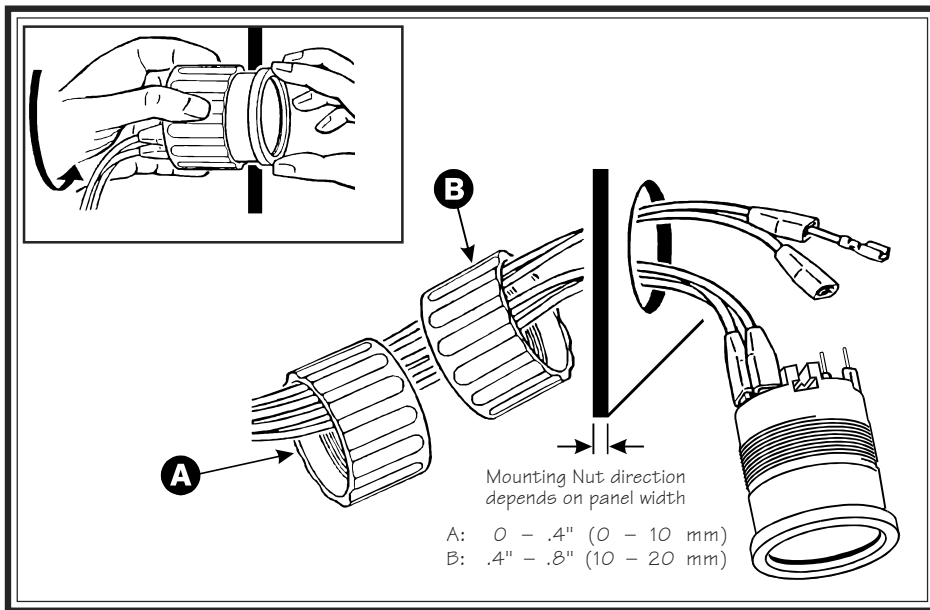


Diagram B
Proper mounting using VDO's Spin-Lok™ Mounting Clamp

2 CONTINUE HERE

d) the location of the signal source (alternator, coil or other ignition signal source).

2. Connect the wiring to the appropriate tachometer terminals as shown in Diagram C.

Configuring the Tachometer:

Before your VDO Tachometer will function properly with your engine, you will need to configure it as shown in Diagram D.

The table at the top of Diagram D shows how to set the DIP switches for use with an ignition coil; the table at the bottom shows how to set the DIP switches when using the tachometer with an alternator.

When using the VDO Tachometer with

another type of ignition system, determine the number of pulses per revolution the ignition signal provides, and set the DIP switches as shown in the bottom table.

Adjusting the Tachometer Pointer:

Use of the VDO Tachometer with an alternator or other type of ignition that provides a signal in pulses per revolution may require calibration of the pointer.

This can be done as show in Diagram E. Please note that this calibration is designed to adjust the reading between 30% and 100% of the RPM range.

At this point, the installation and wiring of your new VDO Tachometer is complete. Turn on the ignition and the lights in the car and check to see that the instrument and light work properly. If they don't, re-check your wiring, referring to the wiring description in Diagram C.

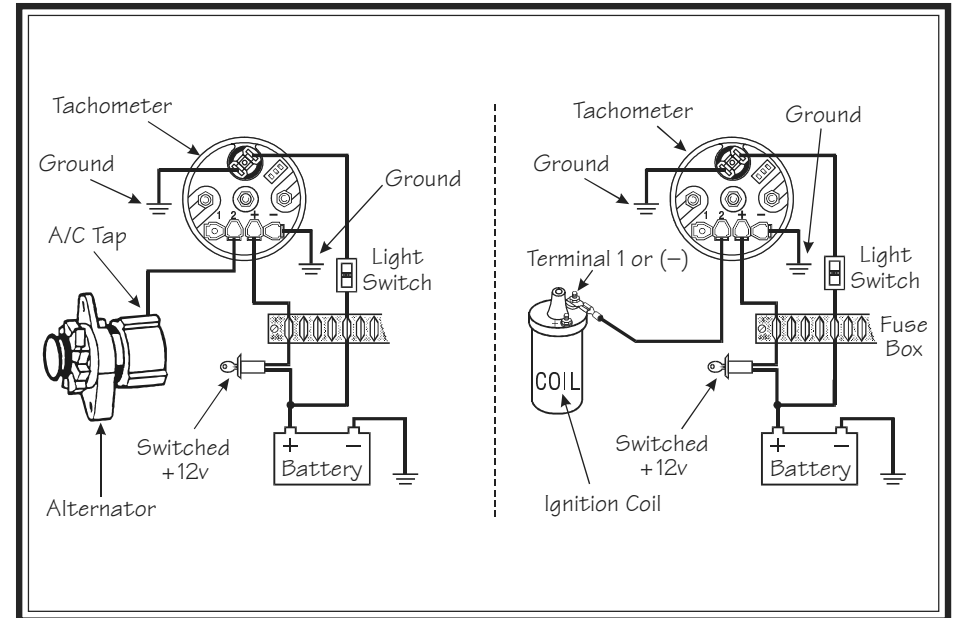


Diagram C
Tachometer wiring with Alternator AC Tap (left); and with Ignition Coil (right)

Product: Tachometer	Description ERRATIC OPERATION	Date Aug 03
Type: Electrical		Issue 1

To Reduce or Eliminate Erratic Operation in Tachometers

1. Purchase diode #1N4005 from your local electronics store.
2. Cut both ends of the diode so each is approx. 3/ 4" long.
3. Crimp a 1/ 4" female spade connector on the end of the diode with the silver band.
4. Crimp a butt-splice connector on the other end of the diode.
5. Crimp the opposite end of the butt-splice connector to the wire connected to ignition signal source.
6. Connect 1/ 4" female spade connector used in step # 3 above to terminal # 4 on the back of the tachometer.
7. Connect a ground (-) wire to terminal # 3.
8. Connect a switched 12-volt power wire to terminal # 2.
9. Set switches for the appropriate number of cylinders.

MC704 SERIES MICRO CONTROL PANEL

FOR MECHANICALLY GOVERNED ENGINES

The LOFA MC704 Series is a compact micro panel that controls, monitors and protects mechanically governed diesel engines.

MC704 FEATURES

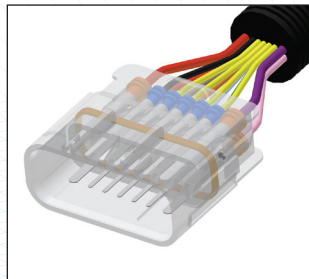
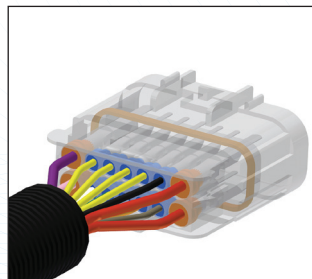
- Rugged powder-coated aluminum housing
- Automatic shutdown bypass during starting
- Hour meter (on MC704HP)
- Microprocessor-based control designed with high power semiconductors
- First-Fault Diagnostic (FFD) LED pinpoints initial failure
 - OK/Preheat
 - Alternator charge failure
 - Low oil pressure
 - High coolant temperature
 - AUX switch
- Thru-panel or threaded inserts mounting
- Reverse polarity protection
- Heavy-duty IP64 key switch with booted key
- Key switch features mechanical lock-out to prevent re-start attempts when engine is running
- 12" connection pigtail terminating at a Delphi GT connector



MC704 HP Micro Panel With Hour Meter



MC704 LCP Micro Panel Without Hour Meter



Delphi GT weather-proof connector on standard 12" wiring harness.
Other electrical connections available on request.

LOFA™

INDUSTRIES INC.

250 Hembree Park Drive, Suite 122

Roswell GA 30076

Phone: 770 569 9828

Fax: 770 569 9829

www.LOFA.net

Advanced Engine Control Technology

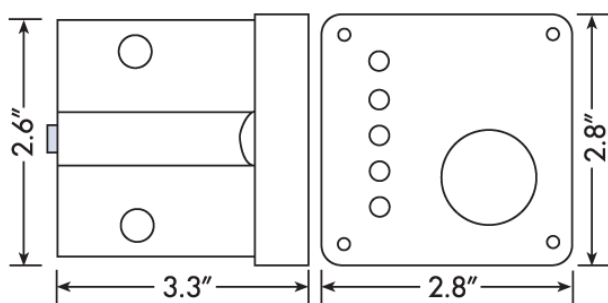
MC704 OPTIONS

- Plug-and-play harnesses
- Flip-down key switch cover
- Alarm or preheat control output (active high)

MC704 WARRANTY

- 2 Year Limited Warranty

MC704 DIMENSIONS



MC704 SPECIFICATIONS

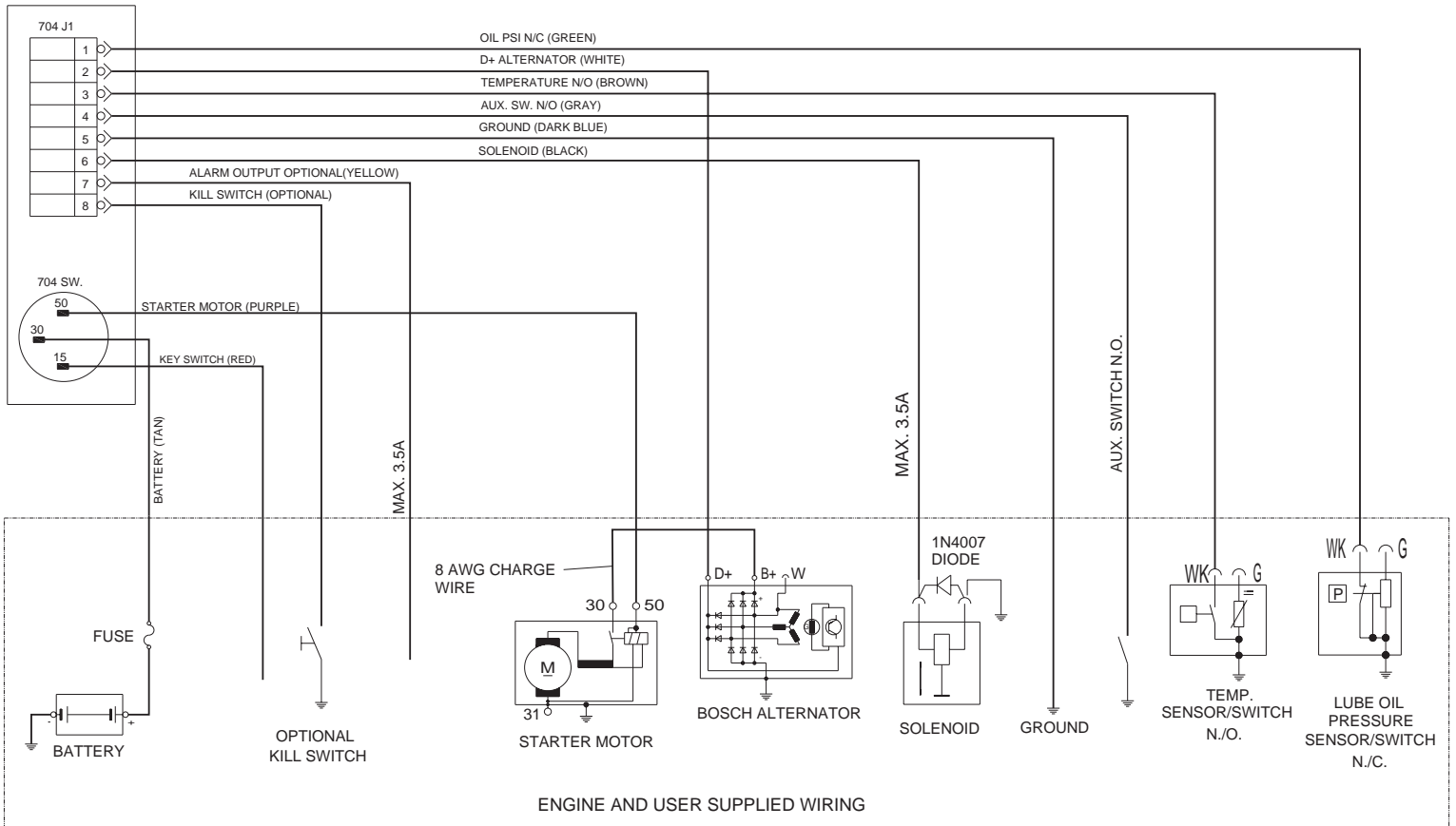
Voltage - System Nominal	10-28 VDC
Operating Temperature	-20F to 185F (-30C to 85C)
Reverse Polarity Protection	Yes
Starter Relay	Suggested
Solid State I/O:	
Fuel Solenoid	20A
Switched Battery	15A
Starter	50A@1sec; 12A
Alarm Output	3.5A



Advanced Engine Control Technology

MC-704 SERIES SCHEMATIC WITHOUT PREHEAT

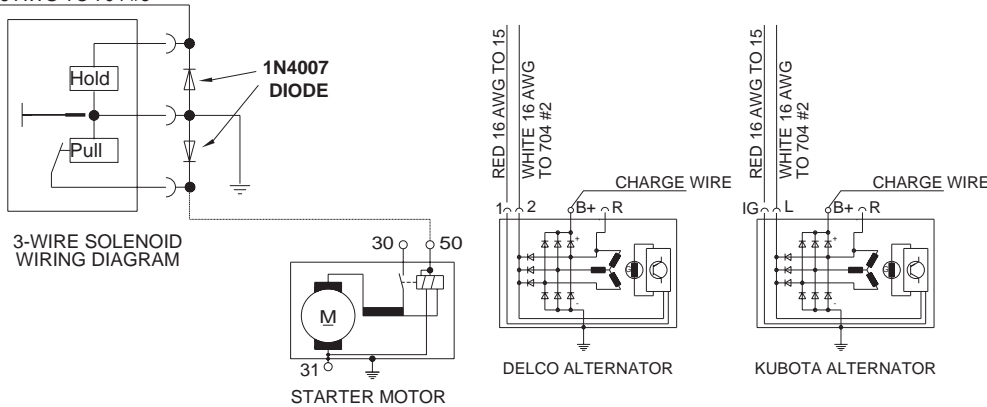
MC 704 - LC / H



REDUCING VOLTAGE SPIKES

High Voltage spikes up to 1000V or more can occur momentarily when a relay or solenoid is switched off. Relay contacts, electronics, etc. can be damaged or malfunctions can occur if these spikes reach the electrical network without suppression. A **1N4007** diode should be used when using any of LOFA's products. Please install this diode as close as possible to the solenoid. Please note installing the diode incorrectly or reversing the polarity of the battery will damage the diode.

BLACK 16 AWG TO 704 #6



POS.	0	I	II	CURRENT
30 - 83	█			2 A
30 - 75		█		20 A
30 - 15		█	█	25 A
30 - 50		█	█	50 A 12 A



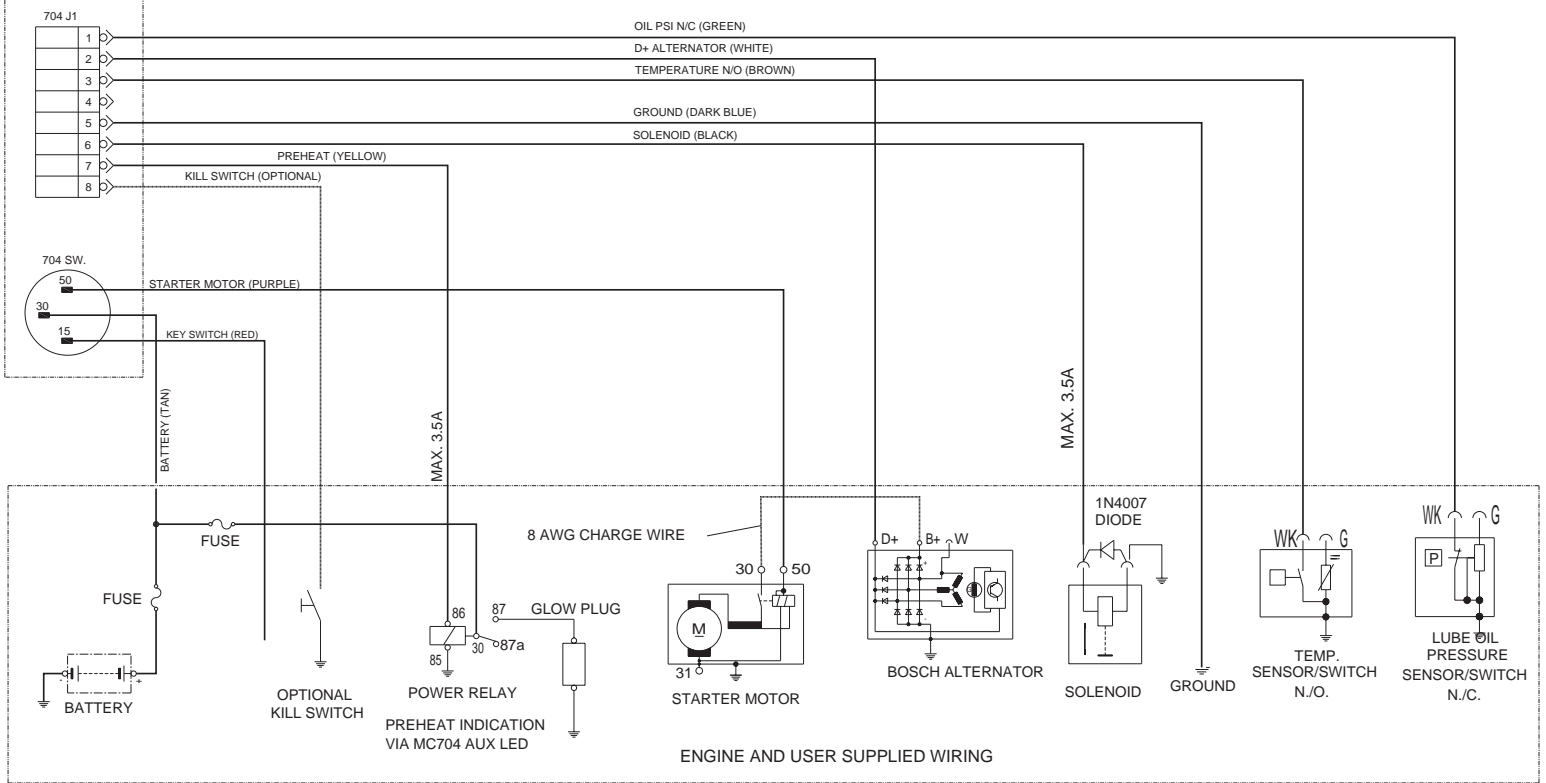
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MC-704 SERIES SCHEMATIC WITH PREHEAT

MC 704 - LC / H

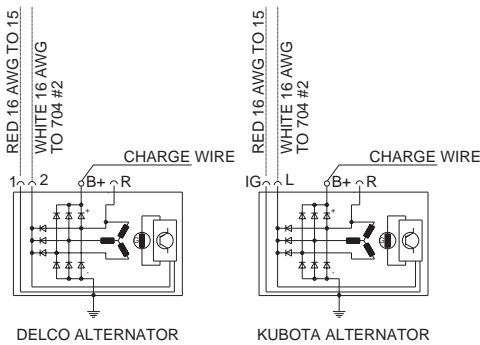
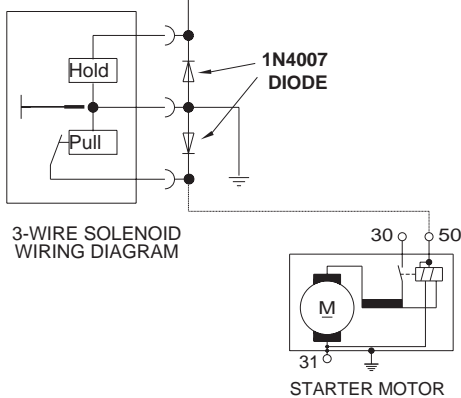


REDUCING VOLTAGE SPIKES

High Voltage spikes up to 1000V or more can occur momentarily when a relay or solenoid is switched off. Relay contacts, electronics, etc. can be damaged or malfunctions can occur if these spikes reach the electrical network without suppression. A **1N4007** diode should be used when using any of LOFA's products. Please install this diode as close as possible to the solenoid. Please note installing the diode incorrectly or reversing the polarity of the battery will damage the diode.

KEY SWITCH ELECTRICAL DIAGRAM				
POS.	0	I	II	CURRENT
30 - 83	█			2 A
30 - 75		█		20 A
30 - 15		█	█	25 A
30 - 50		█	█	50 A 12 A

BLACK 16 AWG TO 704 #6



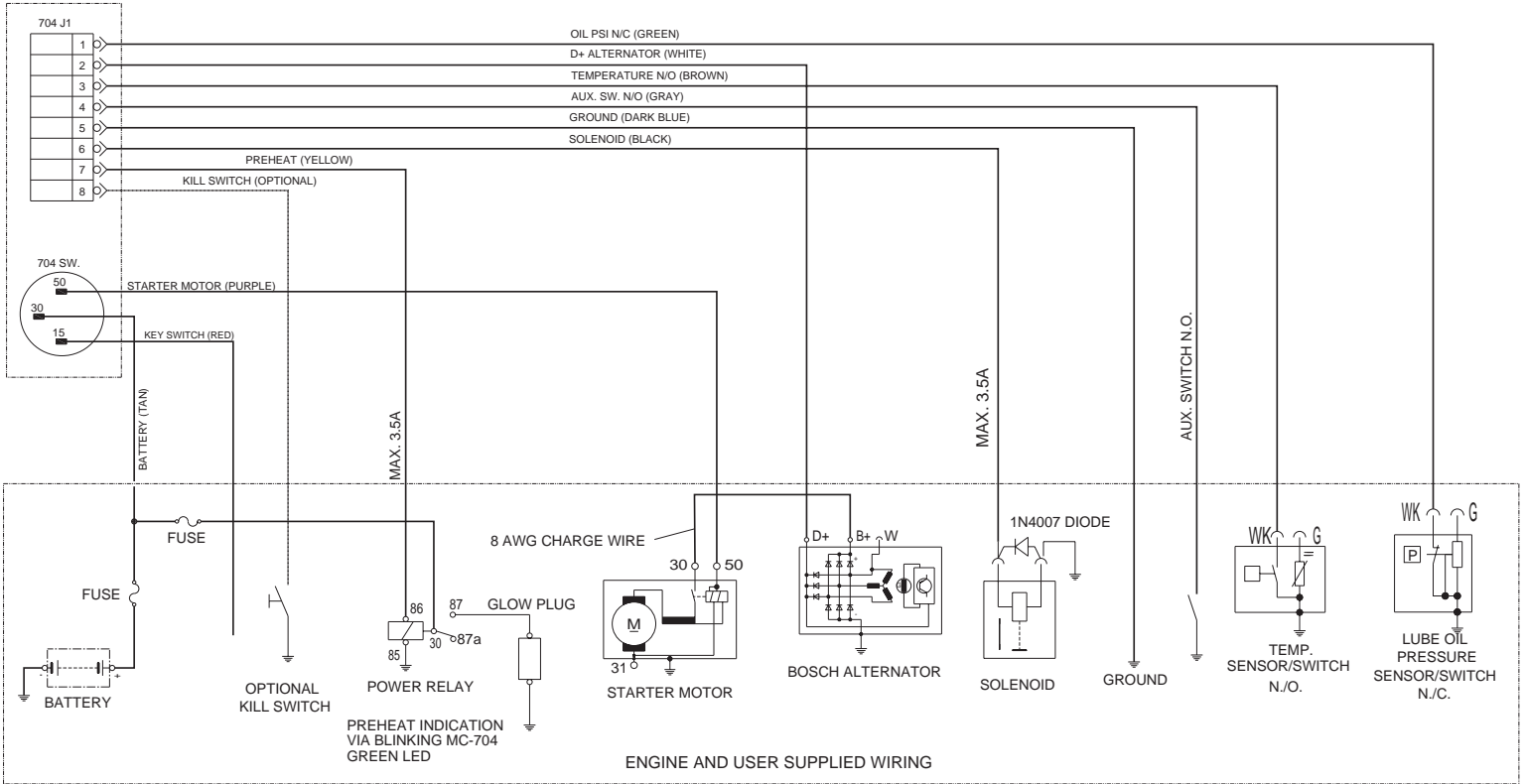
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MC-704 SERIES SCHEMATIC WITH PREHEAT AND AUXILIARY SHUTDOWN

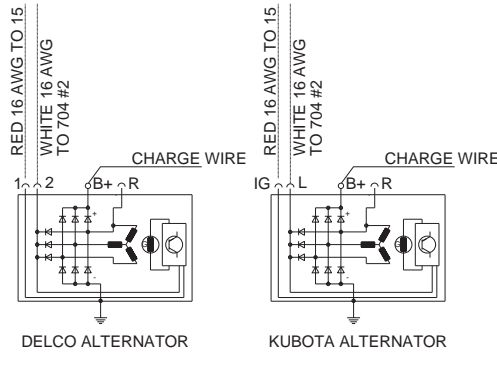
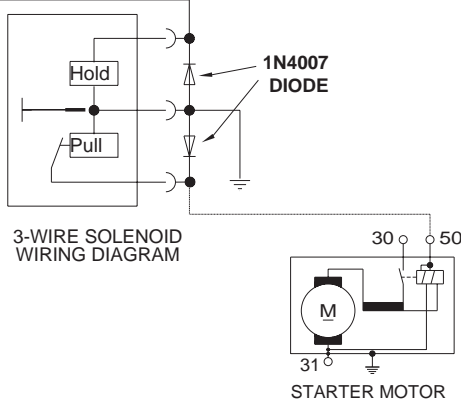
MC 704 - LC / H



REDUCING VOLTAGE SPIKES

High Voltage spikes up to 1000V or more can occur momentarily when a relay or solenoid is switched off. Relay contacts, electronics, etc. can be damaged or malfunctions can occur if these spikes reach the electrical network without suppression. A **1N4007** diode should be used when using any of LOFA's products. Please install this diode as close as possible to the solenoid. Please note installing the diode incorrectly or reversing the polarity of the battery will damage the diode.

BLACK 16 AWG TO 704 #6



KEY SWITCH ELECTRICAL DIAGRAM				
POS.	0	I	II	CURRENT
30 - 83	█			2 A
30 - 75		█		20 A
30 - 15		← █		25 A
30 - 50		← █	← █	50 A 12 A



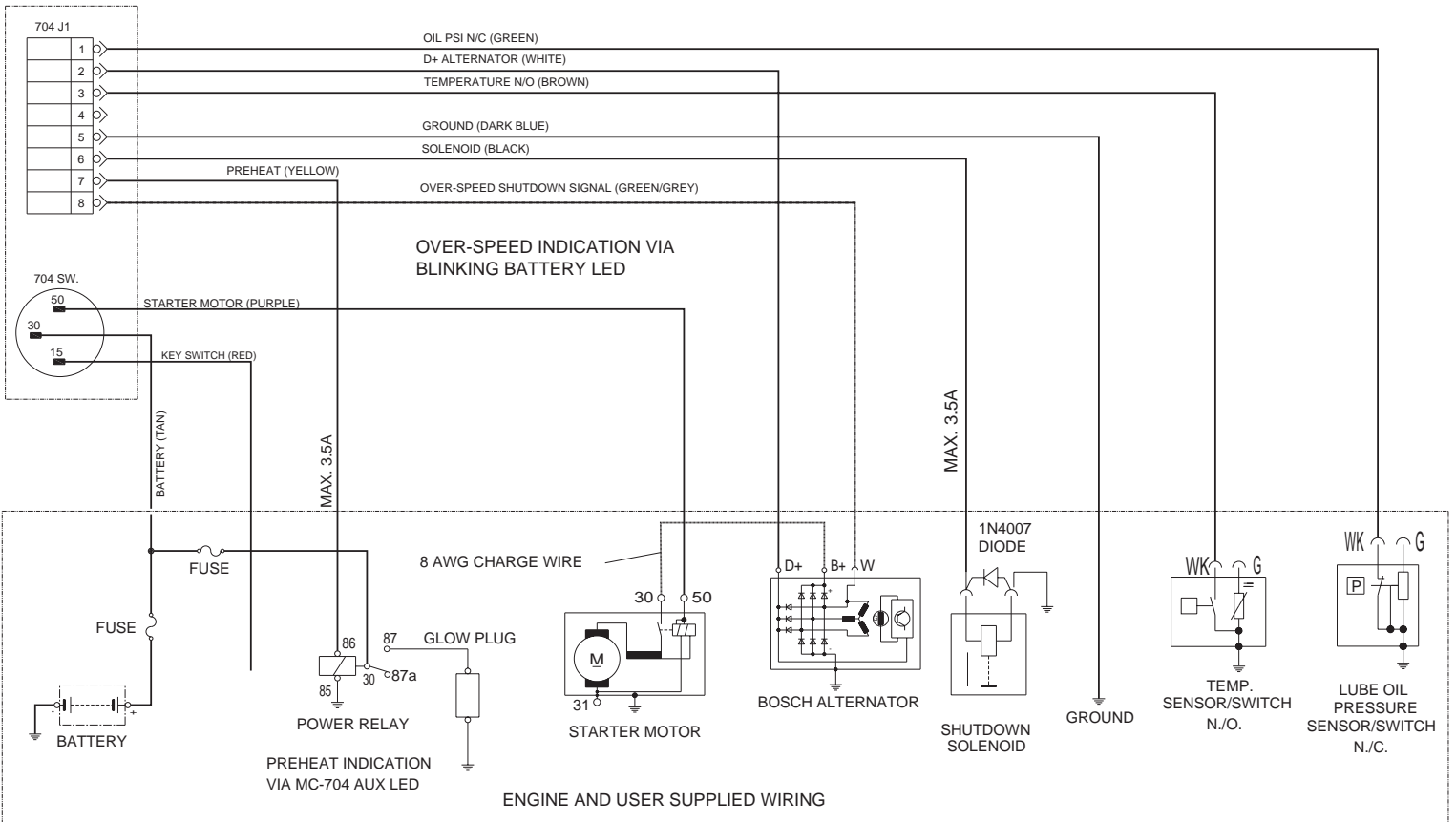
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MC-704 SERIES SCHEMATIC WITH PREHEAT AND OVER-SPEED

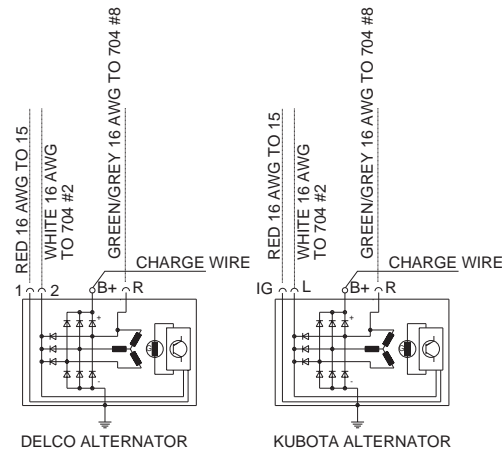
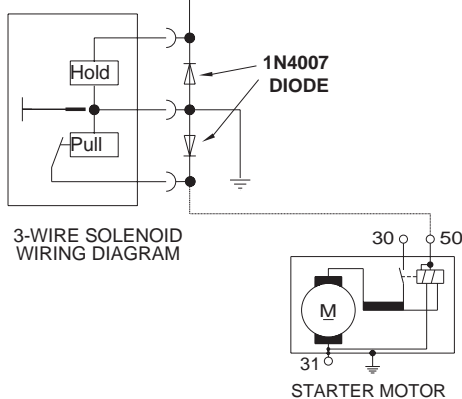
MC 704 - LC / H



REDUCING VOLTAGE SPIKES

High Voltage spikes up to 1000V or more can occur momentarily when a relay or solenoid is switched off. Relay contacts, electronics, etc. can be damaged or malfunctions can occur if these spikes reach the electrical network without suppression. A **1N4007** diode should be used when using any of LOFA's products. Please install this diode as close as possible to the solenoid. Please note installing the diode incorrectly or reversing the polarity of the battery will damage the diode.

BLACK 16 AWG TO 704 #6



POS.	0	I	II	CURRENT
30 - 83	█			2 A
30 - 75		█		20 A
30 - 15		█	←	25 A
30 - 50			←	50 A 12 A



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LOFA™ MC704

Panel Operation and Troubleshooting Manual

9M02-3000-A001-EN



CONNECT. CONTROL. PROTECT.






Revision History

VERSION	DATE	NOTES
	2006	Initial Release
A	05/2006	Corrected typographical errors
B	10/2006	Added symbols to Indicators, corrected typographical errors
C	01/2007	Updated schematics, removed Power Box information
C.1	02/2007	Added part numbers
D	06/2014	Updated format, added schematics, removed Power Box information
A	05/2015	
B	10/2016	
D	12/2020	Document rebranded and contact information updated

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1 Introduction

This document provides general information on LOFA™ MC704 panel operation and troubleshooting. MC704 panels are a flexible platform for diesel engine control, monitoring and protection, featuring LOFA™'s powerful **First Fault Diagnostics** (FFD). After pinpointing the initial failure, FFD stores it in memory and alerts the end user via a single bright LED. FFD monitors battery charge, low oil pressure, high temperature and one additional contact closure input. The microprocessor-based solid-state design uses high-power semiconductors instead of outdated electromechanical relays to ensure reliable high-current switching.


The MC704 panels are offered in two versions. The MC704HP has a built-in tamperproof LED hourmeter while the reduced cost MC704LCP eliminates the hourmeter. Both versions can be factory configured with specific preheat and afterglow requirements. If preheat is not required, this output can function as an alarm.

All standard panels feature a 12-inch wiring harness terminating into a sealed weather-proof plug. This robust universal wiring connection performs well in harsh environments and allows interchanging a number of different panels and harnesses. This design allows for simplified installation as well as a flexible means to incorporate custom plug-and-play engine wiring harnesses and standard harness extensions.

Note: The engine harness is not included with the panel.

A number of standard engine harnesses are available, or Cattron can develop a custom harness for your exact needs.

Generic harnesses in various lengths are available for field customization.

	WARNING
	WHEN REPLACEMENT PARTS ARE REQUIRED, CATTRON RECOMMENDS USING REPLACEMENT PARTS SUPPLIED BY CATTRON OR PARTS WITH EQUIVALENT SPECIFICATIONS. FAILURE TO HEED THIS WARNING CAN LEAD TO PREMATURE FAILURE, PRODUCT DAMAGE, PERSONAL INJURY OR DEATH.



2 Important Safety Information

Please note the following important safety information:

- The warnings in this publication are not all inclusive
- Cattron cannot anticipate every potential hazard
- Appropriate safety rules and precautions should be followed with any tool, work method or operating procedure
- Improper procedures, tools and materials may cause damage or make the equipment unsafe to operate
- Only persons with appropriate training, skills and tools should perform these functions
- Improper operation, maintenance or repair of this product can be dangerous and may result in injury or death
- Do not operate or perform any maintenance or repair on this product until all operation, maintenance and repair information is read and understood
- The information, specifications and illustrations in this publication are based on information available at the time of publication
- All items are subject to change at any time without notice



3 Operation

Turning the panel key to the run position starts a self-test which causes all LEDs to flash three times, activates the alarm output (if preheat is not used) for one second and enables the fuel run/stop solenoid output. After self-test, the LEDs indicate the state of the inputs they monitor. The normal indications are battery charge and oil pressure on most applications. If these LEDs are not illuminated at this time, it may indicate the inputs are not properly connected.

The Preheat/OK LED begins to blink when the key switch is turned to the run position if automatic preheat is configured (see the [Preheat Options](#) section). Preheat time varies from application to application. After waiting for the Preheat/OK LED to become solid, the engine is cranked by turning and holding the key switch in the start position until the engine starts. The key switch is spring loaded to return automatically to the run position when released.

Note: The key switch is equipped with a mechanical start locking device.

An attempt to crank the engine again can only be made by turning the key switch to the off position to reset the start locking mechanism.

If the engine is not started within 30 seconds of turning on the panel, the fuel run/stop solenoid output is turned off to prevent battery discharge when the key switch is left in the run position. The fuel run/stop solenoid output is turned off after 30 seconds even if preheating. As soon as the key switch is turned to the start position, the solenoid output is enabled. The afterglow cycle begins when the key switch returns to the run position.

Note: If conditions do not warrant preheat, the engine may be started by turning the key to the start position without waiting for the preheat time to expire.

Panel instrument power, including the hourmeter and voltmeter, is provided by the fuel run/stop solenoid output. If the instruments do not power up when the key is turned to the run position, this indicates a problem with the solenoid circuit (see the [Fuel Run/Stop Solenoid Troubleshooting](#) section).

After the engine starts, the panel electronics ignore all shutdown conditions for the first 10 seconds. This delay eliminates the requirement to hold a by-pass override button during starting and allows the engine conditions such as oil pressure to normalize. The 10-second timer starts when the key switch returns to the run position.

Note: Starter input is required for correct panel operation. If the starter motor input is not activated (connected to battery positive) and the engine is started through another means (i.e., air starter) the engine will shutdown 30 seconds after the key switch is turned to the run position.

To prevent unintentional engine shutdowns caused by intermittent conditions (for example, pressure spikes or coolant movement), the panel requires a constant 1/3-second fault input to cause engine shutdown.



WARNING

WHEN USED IN COMBINATION WITH MECHANICAL FLOAT TYPE SWITCHES, ENGINE VIBRATIONS MAY PREVENT CONSTANT CONTACT CLOSURE.



3.1 Preheat Options

3.1.1 Preheat Output

Preheat is a 3 A positive output for control of an external power relay with predetermined preheat and afterglow times. A relay should be selected with appropriate amperage capacity for the installed cold starting aid (glowplug, intake air heater, etc.). Applications using multiple cold starting aids may require multiple relays.

Note: Consult engine documentation when selecting cold starting aid, power relay and heating specifications.


3.2 Indicators

3.2.1 Battery LED (Red)

A solidly illuminated Battery LED indicates a battery charge failure. A battery charge failure may be caused by a faulty alternator, broken drive belt or the alternator not excited. A battery voltage reading of approximately 14 V on 12 V systems (28 V on 24 V systems) while the engine is running indicates the battery is charging properly. Irregular blinking of the Battery LED may indicate a failing charge circuit. The panel can be factory configured to indicate only battery charge failure.

3.2.2 Oil Pressure LED (Red)

A solidly illuminated Oil Pressure LED indicates low oil pressure failure. The panel typically senses low oil pressure from a ground contact switch on the engine. When a sender/switch combination is used on the engine, the marking **WK** generally indicates the switch terminal. This input typically expects a normally closed switch (ground contact when oil pressure is low). A defective switch or shorting the shutdown input to ground can cause low pressure fault indication. Additionally, when using sender/ switch combinations, swapping the **WK** and **G** terminal can cause unintended shutdowns. The panel can be factory configured to indicate only oil pressure failure.


	WARNING
	LOW OIL PRESSURE IS NOT AN INDICATION OF LOW OIL LEVEL. FOR THE BEST POSSIBLE PROTECTION, CATTRON RECOMMENDS USING OUR SOLID-STATE OIL LEVEL SHUTDOWN SWITCH.

Note: Most shutdown switches are grounded through the switch body.
Do not use insulating sealant (i.e., Teflon tape) when installing switches.



3.2.3 Temperature LED (Red)

A solidly illuminated Temperature LED indicates high engine temperature failure. The panel typically senses high temperature from a ground contact switch on the engine. When a sender/switch combination is used on the engine, the marking *WK* or *W* generally indicates the switch terminal. This input typically expects a normally open switch (ground contact when engine temperature is too high). A defective switch or shorting the shutdown input to ground can cause an over temperature fault indication. Additionally, when using sender/switch combinations, swapping the *WK* or *W* and *G* terminal can cause unintended shutdowns. The panel can be factory configured to indicate only temperature failure.

	WARNING
	IF THE TEMPERATURE SWITCH IS NOT IN CONTACT WITH COOLANT DUE TO COOLANT LOSS, THE ENGINE IS NOT PROTECTED FROM OVERHEATING. FOR THE BEST POSSIBLE PROTECTION, CATTRON RECOMMENDS USING OUR SOLID-STATE COOLANT LEVEL SHUTDOWN SWITCH.

Note: Most shutdown switches are grounded through the switch body.
Do not use insulating sealant (i.e., Teflon tape) when installing switches.
Some thermostat housings are composites and do not provide ground for the switch.

3.2.4 AUX LED (Red)

A solidly illuminated AUX LED indicates auxiliary failure (i.e., coolant level, oil level, belt breakage, hydraulic pressure, etc.). The panel typically senses failure using a ground contact switch. Auxiliary inputs are equipment specific and determined by the equipment manufacturer. A defective switch or shorting the shutdown input to ground can cause fault indications. The panel can be factory configured to indicate only AUX failure.

3.2.5 Preheat/OK LED (Green)


A blinking green Preheat/OK LED is the panel preheat indication. When the LED changes to solid, the preheat period is complete and the engine may be cranked. The LED changes to solid illumination when the engine starts. There is no indication of afterglow.



3.3 Harness


3.3.1 Sealed Connectors

The provided sealed weather-proof plug includes a grey locking device which must be released to separate the connectors. Press the tab on the connector housing to release the connectors.

	WARNING
	CATTRON DOES NOT RECOMMEND USING DIELECTRIC GREASE OR SEALANT WITH SEALED CONNECTORS. THESE CHEMICALS MAY CAUSE SEAL DAMAGE AND ALLOW WATER ENTRY. USE CATTRON PROVIDED CAVITY PLUGS TO SEAL THE CONNECTOR IF WIRES ARE REMOVED.

3.3.2 Unsealed Connectors

For unsealed connectors exposed to the elements, Cattron recommends using dielectric grease to protect contacts.

	WARNING
	CATTRON DOES NOT RECOMMEND USING SEALANT WITH UNSEALED CONNECTORS. SEALANT TRAPS MOISTURE IN THE CONNECTOR AND ENCOURAGES CORROSION.

3.3.3 Harness Routing

The minimum routing radius of the wiring harnesses should be at least two times the diameter of the wiring harness. Bends should be avoided within 1 inch (25 mm) of any connector in order to avoid seal distortion and potentially allowing moisture to enter the connector.

Note: For a harness length in excess of 10 ft, a relay must be added to the start solenoid circuit.
A relay may also be required for the fuel run/stop solenoid.
Cattron offers starter relay kits for mounting near the engine.




3.4 Battery Circuit Requirements

3.4.1 Battery Positive Connection


The electronic panel operates on either 12 VDC or 24 VDC electrical systems. The unswitched battery positive connection to the panel is made at the weather-proof connector. The panel provides switched positive battery.

Protection for the unswitched battery positive circuit is dependent on specific equipment configuration. The overload protection should not exceed 125% of the sum of all output currents plus 5 A for the panel. Powering the panel through dedicated circuits with appropriate overload protection reduces the possibility of panel damage.

Circuit breakers are preferred over in-line fuses for circuit protection. Overcurrent protection devices should ideally be located in a central location. If automatic reset circuit breakers are used, consideration of the environment of the breaker is critical and may affect the trip point. The trip point of some circuit breakers can be significantly reduced below the rated trip point if the circuit breaker is exposed to high temperatures.

	WARNING
	<p>DISCONNECTING THE BATTERY WHILE THE ENGINE IS RUNNING MAY DAMAGE ELECTRICAL COMPONENTS.</p> <p>WHEN USING A BATTERY DISCONNECT SWITCH, CATTRON RECOMMENDS USING A 2-POLE SWITCH TO DISCONNECT BOTH THE BATTERY AND ALTERNATOR OUTPUT.</p>

3.4.2 Battery Negative Connection (Grounding)

	WARNING
	<p>IMPROPER GROUNDING CAN CAUSE ELECTRICAL NOISE OR UNRELIABLE OPERATION AND MAY DAMAGE THE PANEL OR OTHER COMPONENTS. ALL GROUND CONNECTIONS MUST BE FREE FROM FOREIGN MATERIALS, INCLUDING PAINT, WHICH MAY INTERFERE WITH PROPER GROUNDING.</p>
	<p>A RELIABLE GROUND MUST BE PROVIDED FOR THE PANEL. CATTRON RECOMMENDS THE GROUND CONNECTION BE MADE DIRECTLY TO THE BATTERY NEGATIVE. GROUNDING THROUGH FRAME MEMBERS IS NOT RECOMMENDED.</p>
	<p>ALL GROUND PATHS MUST BE CAPABLE OF CARRYING ANY LIKELY FAULT CURRENTS.</p> <p>DO NOT REVERSE THE BATTERY POLARITY. ATTEMPTING TO CRANK THE ENGINE WHEN THE POLARITY OF THE BATTERY CONNECTIONS IS REVERSED MAY DAMAGE THE PANEL.</p>


Note: A maximum of three ring terminals should be connected to a ground stud to ensure integrity of the ground connection. The use of more than three terminals can cause the connection to become loose.



3.4.3 Voltage Drop

If panel voltage drops below 6 V for more than 0.1 seconds, the panel may reset, causing the self-test to reactivate and the engine to shut down after 30 seconds. Resetting the panel is equivalent to quickly turning the key switch to off and back to run without starting the engine. Since the panel did not sense a start signal, the fuel run/stop solenoid deactivates after 30 seconds. Voltage drops can be caused by external equipment inrush current, improper wire sizes or faulty wiring. Relays may be needed for long wire runs.

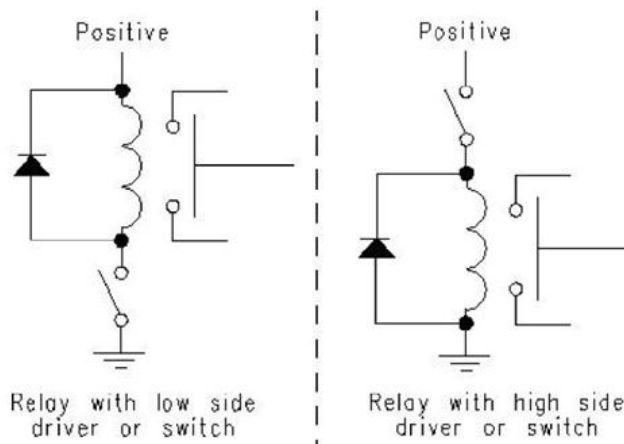
3.5 Suppression of Voltage Transients (Spikes)

	WARNING
	THE INSTALLATION OF VOLTAGE TRANSIENT SUPPRESSION AT THE TRANSIENT SOURCE IS REQUIRED.
	CATTRON FOLLOWS SAE RECOMMENDED ELECTRICAL ENVIRONMENT PRACTICES.

Inductive devices such as relays, solenoids and motors generate voltage transients and noise in electrical circuits. Unsuppressed voltage transients can exceed SAE specifications and damage electronic controls.

Relays and solenoids with built-in voltage transient suppression diodes are recommended whenever possible. Refer to the illustration below for proper installation of diodes when built-in voltage transient suppression is not available.

Locate inductive devices as far as possible from the components of the electronic panel. When using electric motors, it may also be necessary to add isolation relays to eliminate voltage transients and noise and to prevent back feed.




Note: Cattron harness assemblies typically include all required engine control suppression devices. Added equipment will require additional protection.



3.6 Welding on Equipment with Electronic Controls

Proper welding procedures are required to avoid damage to electronic controls, sensors and associated components. The component should be removed for welding if possible.

The following procedure must be followed if the component must be welded while installed on equipment with electronic controls. This procedure will minimize the risk of component damage.

	WARNING
	<p>DO NOT GROUND THE WELDER TO ELECTRICAL COMPONENTS SUCH AS THE CONTROL GROUND OR SENSORS. IMPROPER GROUNDING CAN CAUSE DAMAGE TO ELECTRICAL COMPONENTS.</p> <p>CLAMP THE GROUND CABLE FROM THE WELDER TO THE COMPONENT BEING WELDED. PLACE THE CLAMP AS CLOSE AS POSSIBLE TO THE WELD TO REDUCE THE POSSIBILITY OF DAMAGE.</p>

1. Stop the engine. Turn the key switch to the OFF position.
2. Disconnect the negative battery cable from the battery.
3. Open any installed battery disconnect switch.
4. Unplug the panel if possible.
5. Connect the welding ground cable as close as possible to the area to be welded.
6. Protect the wiring harness from welding debris and spatter.
7. Use standard welding methods to weld the materials.



4 Troubleshooting

4.1 General Troubleshooting

For additional information, refer to the engine manufacturer troubleshooting guide.

No response from starter motor

Possible Cause	Possible Remedy
No battery voltage to starter	Verify wiring and battery connection (power and ground)
Battery discharged	Charge or replace battery; verify alternator charging
Tripped overcurrent protection	Correct fault; replace or reset overcurrent protection
No signal from panel	No power to panel (see Panel Troubleshooting section)
Defective starter solenoid	Replace starter solenoid
Defective starter motor	Replace starter motor

Engine will crank but not start

Possible Cause	Possible Remedy
Engine not getting fuel	Check fuel level, filter, fuel pump; verify no air in fuel lines
Fuel run/stop solenoid not engaged	See Fuel Run/Stop Solenoid Troubleshooting section
Tripped overcurrent protection	Correct fault, replace or reset overcurrent protection
No preheat (cold condition)	See Preheat Troubleshooting section

Engine runs for 10 seconds and shuts down

Possible Cause	Possible Remedy
Shutdown switch input active	Verify shutdown source exists; correct condition or correct faulty circuit
Battery not charging	Verify alternator charging (see Alternator not charging battery table)
Control board did not sense start signal	Engine started through alternate method (i.e., manual air start, push start, etc.)
Defective panel	See Panel Troubleshooting section

Engine runs longer than 10 seconds and shuts down

Possible Cause	Possible Remedy
Shutdown switch input active	Correct engine fault; verify shutdown switch wiring
Circuit overload protection tripped	Correct overload; keep panel from overheating (over 185°F/85°C)
Voltage transients (spikes)	Add suppressor diodes; protect from nearby lightning strikes; shield induced spikes from other equipment; add electric motor control relay push start, etc.
Defective panel	See Panel Troubleshooting section



Alternator not charging battery

Possible Cause	Possible Remedy
Broken or slipping alternator drive belt	Adjust or replace alternator drive belt
Alternator not excited	Verify excitation circuit connected; replace faulty regulator; add additional excitation resistor
Alternator output not connected	Install charge wire
Alternator not grounded	Clean or add ground connection
Alternator faulty	Replace faulty alternator

4.2 Fuel Run/Stop Solenoid Troubleshooting

Engine does not stop immediately

Possible Cause	Possible Remedy
Back feed from motor (i.e., cooling fan)	Add relay or blocking diode
Sticking solenoid linkage	Repair or replace solenoid linkage
Fuel valve without check valve	Install or repair check valve

Fuel run/stop solenoid does not engage

Possible Cause	Possible Remedy
No power to solenoid	Locate reason for lack of power and correct (Circuit overloaded? Failed suppressor diode? Faulty wiring?)
No power to solenoid pull coil	Correct faulty wiring; check pull control circuit
Incorrect linkage adjustment	Adjust solenoid linkage
Faulty solenoid	Replace solenoid
Failed suppressor diode	Correct wiring (diode reversed?); replace suppressor diode
Optional e-stop engaged	Disengage e-stop

Engine not getting fuel

Possible Cause	Possible Remedy
Empty fuel tank	Fuel engine
Clogged filter	Replace filter
Air in fuel lines	Bleed fuel lines
Low fuel pressure	Replace faulty fuel pump and/or clogged filter
Faulty fuel pump	Replace fuel pump; correct wiring fault (electric fuel pump)



4.3 Preheat Troubleshooting

Engine is hard to start in cold conditions

Possible Cause	Possible Remedy
Start attempt before preheat complete	Wait for preheat time to elapse, and crank as soon as time elapses
Incorrect preheat specification	Correct panel configuration; install correct panel
Heater faulty	Replace heater
Heater relay faulty	Replace relay
Preheat control not functioning	Correct wiring; correct panel configuration
Faulty panel	See Panel Troubleshooting section

Engine produces excessive white smoke after starting

Possible Cause	Possible Remedy
Afterglow not enabled	Reconfigure panel
Heater faulty	Replace heater
Heater relay faulty	Replace relay
Preheat control not functioning	Correct wiring; correct panel configuration
Faulty panel	See Panel Troubleshooting section

4.4 Panel Troubleshooting

Panel does not perform self-test

Possible Cause	Possible Remedy
Tripped overcurrent protection	Correct fault; replace or reset overcurrent protection
Faulty connection to battery	Correct battery connections (see Battery Circuit Requirements section)

Panel performs normal self-test, engine cranks, runs and shuts down

Possible Cause	Possible Remedy
Only Battery LED Illuminated	Correct battery charge failure (see Battery not charging item)
Only Oil Pressure LED Illuminated	Correct low oil pressure condition or faulty switch; correct wiring fault
Only Temperature LED Illuminated	Correct overheating condition or faulty switch; correct wiring fault
Only Aux LED Illuminated	Correct fault condition (i.e., v-belt, coolant level) or faulty switch; correct wiring fault
All normally closed shutdowns illuminate for one second (panel reset)	Add suppressor diodes; protect from nearby lightning strikes; shield induced spikes from other equipment; add electric motor control relay



4.4.1 Testing Shutdown Inputs

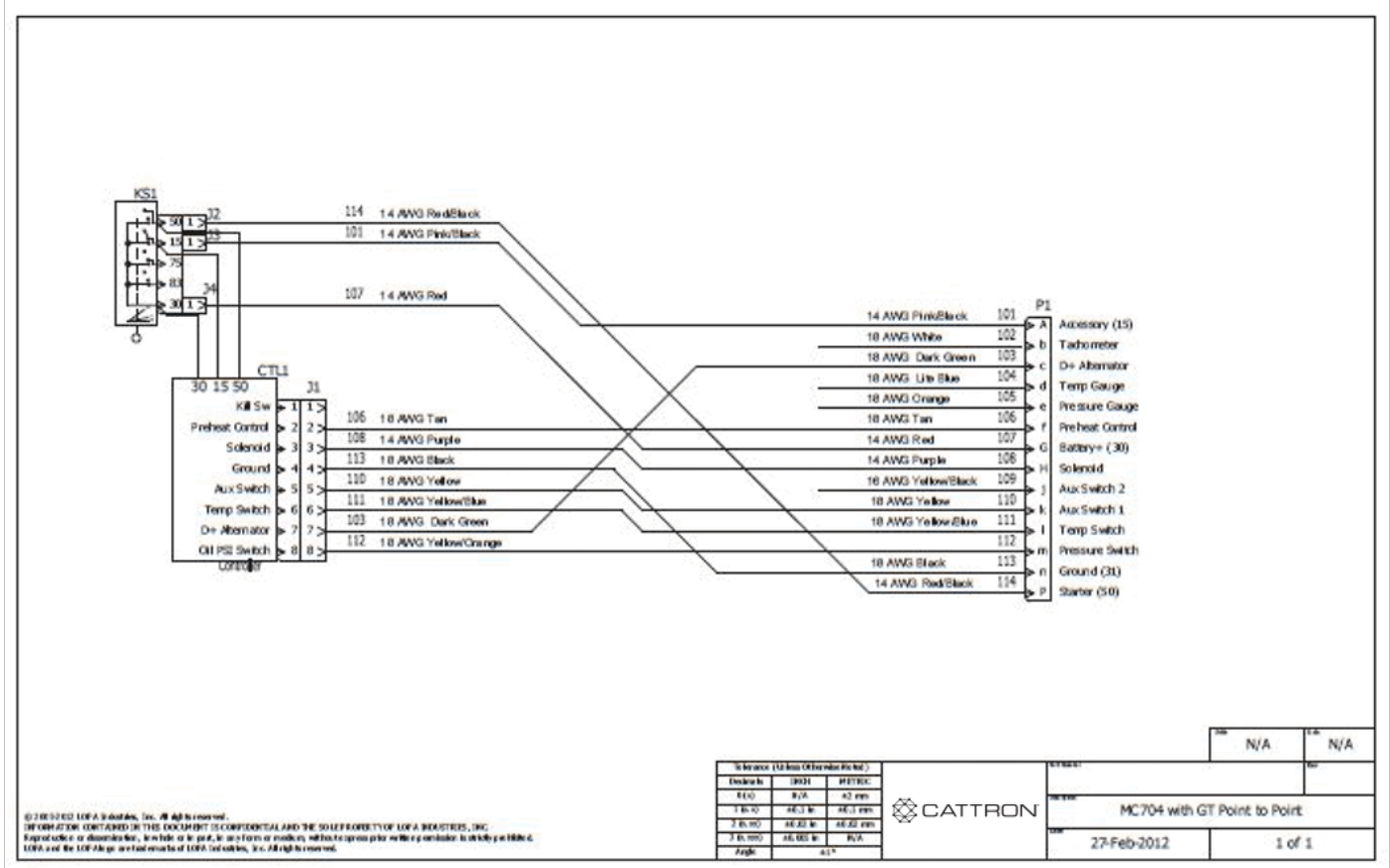
Shutdown switches signal a fault by ground contact in most systems. Shutdown operation can be verified by grounding the shutdown inputs individually. It may be necessary to remove the wire from the shutdown switch to perform this test.

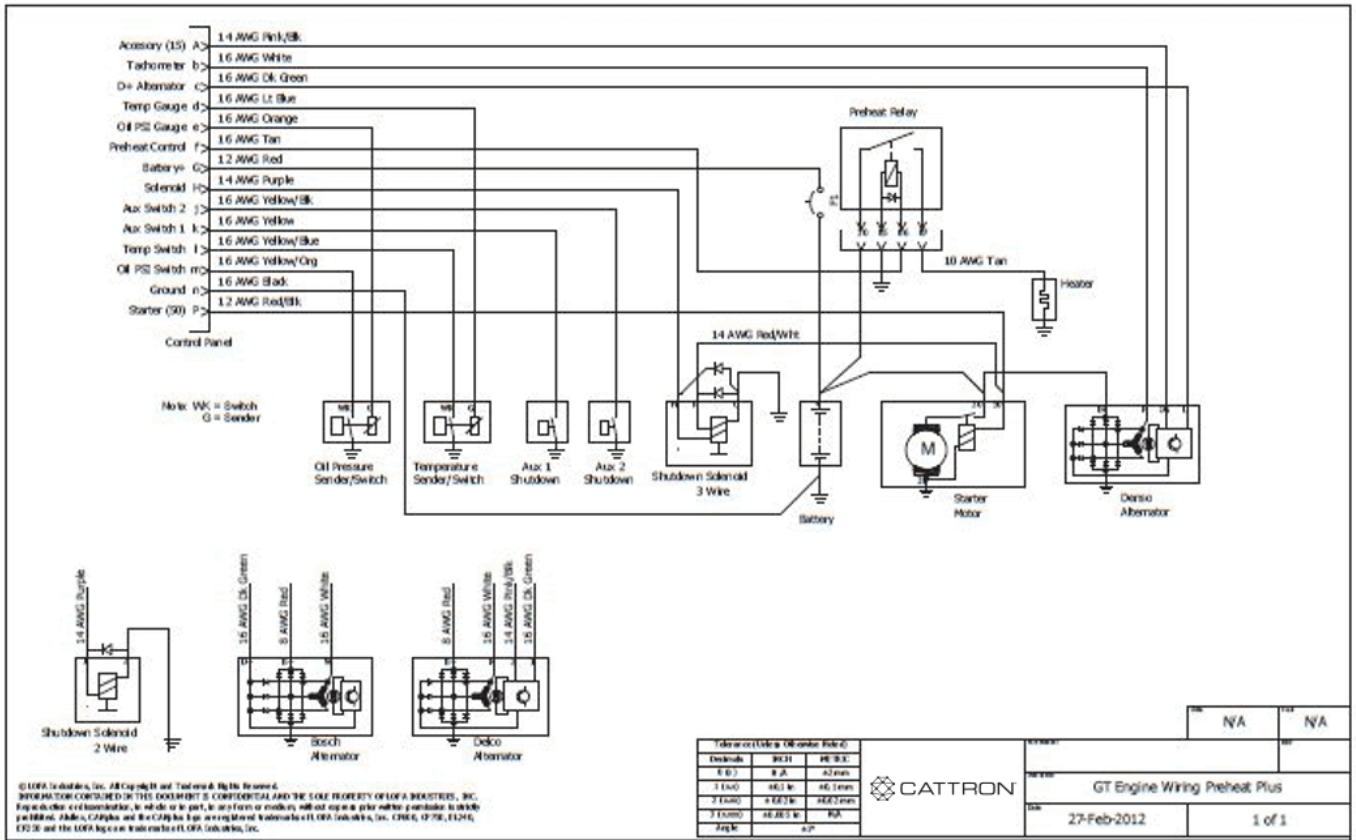
-
- Note:** Most shutdown switches are grounded through the switch body.
Do not use insulating sealant (i.e., Teflon tape) when installing switches.
Some thermostat housings are composites and do not provide ground for the switch.
-



5 Typical Schematics

The following figures show typical schematics. The details will vary from installation to installation. Please see the specific schematics for the particular installation for details.





6 Additional Information

6.1 Products/Deliverables

Licensed Product Information

- Software codes with product numeric values equal to 001-xxxx-yyyy-zzz; where xxxx, yyyy, and zzz equal (0000...9999)
- Software codes qualified under the same numeric regimen detailed above or including the verbal description of “CANPlus™” products and/or the “CANPlus Suite” of products



7 Technical Support

For remote and communication control systems support, parts and repair, or technical support, visit us online at: www.cattron.com/contact.



Due to continuous product improvement, the information provided in this document is subject to change without notice.

Cattron Support

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www.cattron.com/contact

Cattron North America Inc., 655 N River Rd NW, Suite A, Warren, OH 44483

Leece-Neville Alternator

12 Volt, 185 Amps

24 Volt, 100, 150 & 175 Amps

The 8SC series is ideally suited for applications with extra heavy electrical loads and high charge at idle. These alternators have integral charging systems for heavy belt loads and extremely high electrical loads on large diesel or gasoline engines.

Features & Benefits

- Simplified wiring - insulated three wire system
- Built-in "Load Dump" protected regulator with solid state circuitry and external adjustment
- Varnished stator
- 7/8" heavy-duty shaft
- SAE double lug mount with adjustable steel bushing and steel insert
- Heavy-duty 5/16" output stud for superior electrical connections
- Special AC terminal for connection of tachometers and other instruments. Also "R" terminal for indicator lamp hook-up
- Long life copper graphite brushes enclosed in a dirt resistant chamber to extend brush life.
- The dynamically balanced rotor and shaft assembly utilizes a 25 mm ball bearing at the drive end and a 20 mm roller bearing. Both have grease reservoirs and protective seals to provide long life and smooth operations.
- Internal and external capacitors to suppress radio frequency interference
- 12 volt units have a trash screen for protection against foreign particles

8SC Series

24 Volt, 100, 150 & 175 Amps



8SC Series

12 Volt, 185 Amps with trash screen

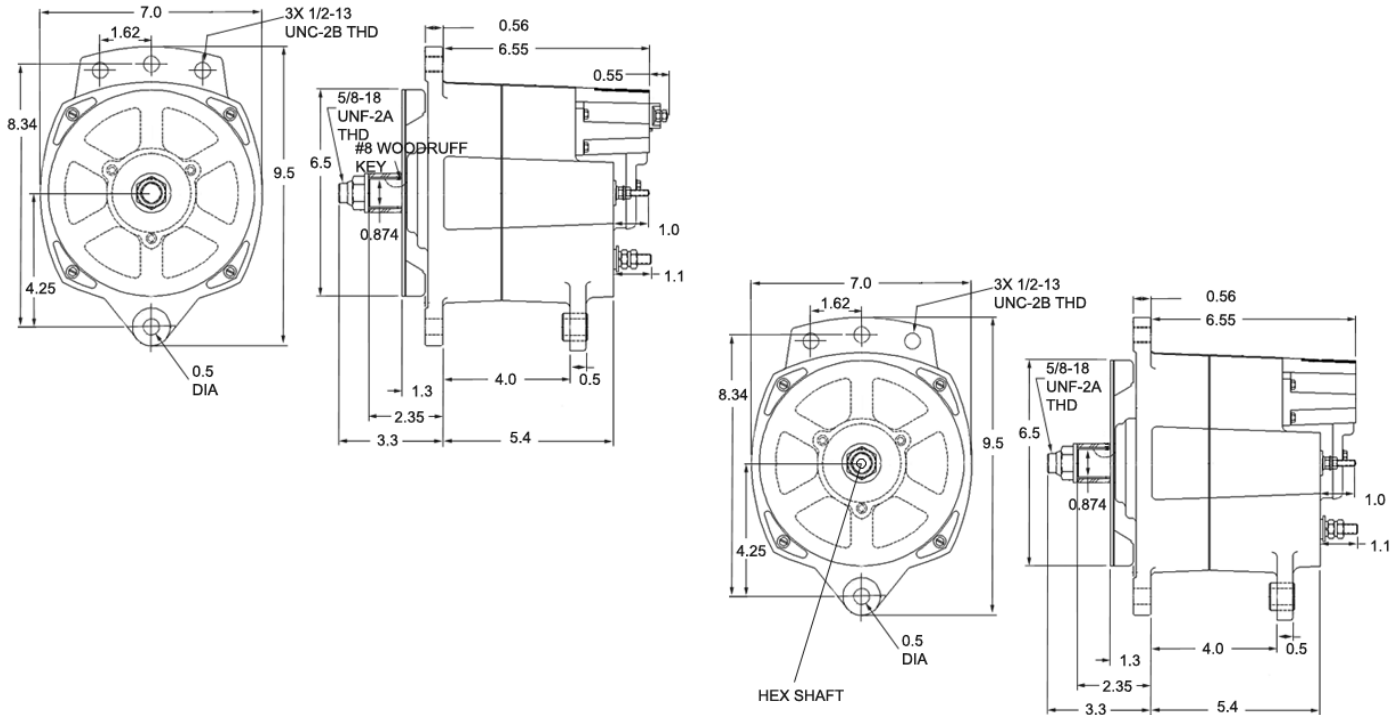


Applications

- Off-Highway
- Agriculture
- Emergency Vehicles
- Heavy Duty Trucks
- Transit Buses

Dimensions

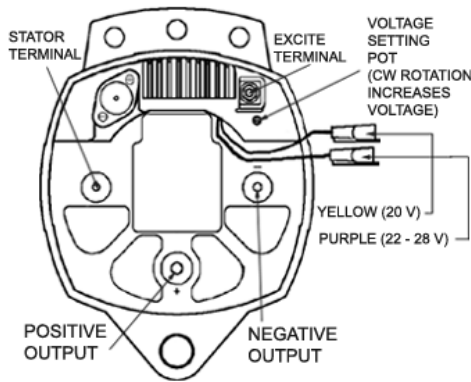
(dimensions in inches)



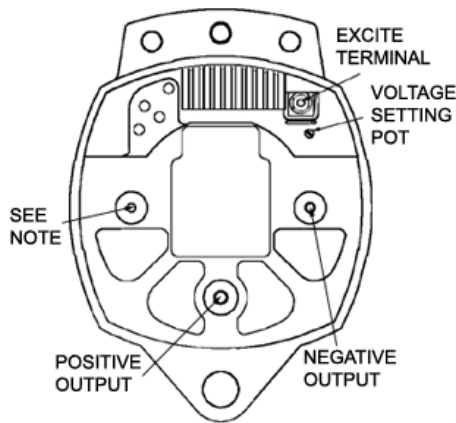
Specifications

		12 VOLT		24 VOLT		
Dual Foot	Model No.	8SC2020Z	8SC2023Z	8SC3014U	8SC3015U	8SC3019U
J-180 Mount	Sales No.	110-563	110-565	110-298	110-302	110-316
Output, Stabilized:						
5000 RPM		185	185	100	100	100
2500 RPM		153	153	78	84	84
Temperature Range		-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C
Rotation Direction		Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional
Max. Speed RPM		8000	8000	8000	8000	8000
Excitation Type		Self	Self	Ignition	Ignition	Ignition
Lamp Circuit		-	.25 Amps	-	-	-
Ground		Isolated	Isolated	Isolated	Isolated	Isolated
Regulator Set Point Voltage		14.2	14.0	28.0	28.0	28.0
Voltage Adjustment		-	-	+/-1.0v	+/-1.0v	+/-1.0v
Regulator Part #		8RL2104	8RL2105	8RL3022	8RL3021	8RL3021
Weight (lbs/Kg)		27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6
Terminal Size: B+		5/16"-24	5/16"-24	M8-1.25	5/16"-24	5/16"-24
B-		1/4"-28	1/4"-28	M6-1.25	1/4"-28	1/4"-28
AC		10-24	10-24	10-24	10-24	10-24
"l" Lamp		-	10-24	-	-	-
Ignition		-	-	M5-.8	10-24	10-24
Notes:			Lamp Driver			

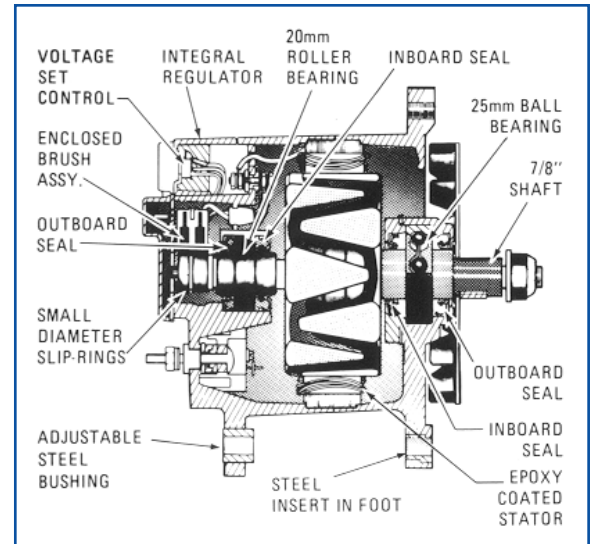
Wire Diagrams



8SC3017VA,
8SC3018VA &
8SC3110V



8SC2020Z, 8SC2023Z,
8SC3014U, 8SC3009ZA,
8SC3068V & 8SC3029Z



Note:

8SC2020Z & 8SC2023Z = Stator Terminal

8SC3029Z, 8SC3068V &
8SC3009ZA = Indicator Light Terminal

8SC3014U = D+ Terminal

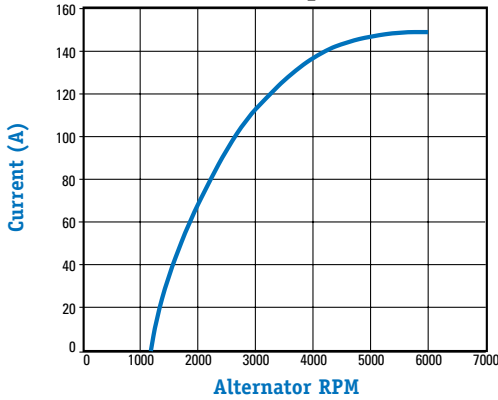
8SC3029ZA = Has Stator Lead

Specifications

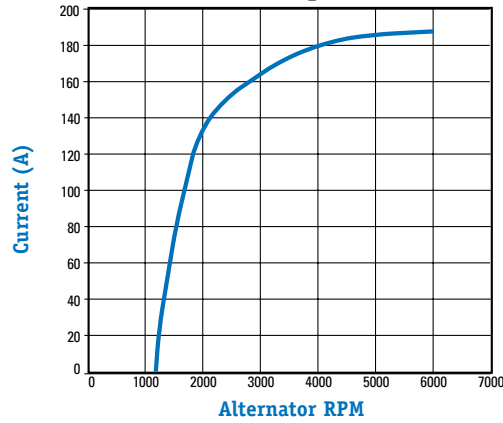
		24 VOLT					
Dual Foot	Model No.	8SC3017VA	8SC3018VA	8SC3068V	8SC3110V	8SC3009ZA	8SC3029Z
J-180 Mount	Sales No.	110-575	110-579	110-431	110-568	110-258	110-569
Output, Stabilized:		150	150	150	150	175	175
5000 RPM		98	98	97	120	54	80
2500 RPM		-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C	-40 C to 93 C
Temperature Range		Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional	Bi- Directional
Rotation Direction		8000	8000	8000	8000	8000	8000
Max. Speed RPM		Ignition	Ignition	Ignition	Ignition	Ignition	Ignition
Excitation Type		-	-	-	-	-	-
Lamp Circuit		Isolated	Isolated	Isolated	Isolated	Isolated	Isolated
Ground		28.0	28.0	28.0	28.0	28.0	28.0
Regulator Set Point Voltage		+1.0v	+1.0v	+1.0v	+1.0v	+1.0v	+1.0v
Voltage Adjustment		8RL3013	8RL3013	8RL3021	8RL3013	8RL3021	8RL3021
Regulator Part #		27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6	27.75/12.6
Weight (lbs/Kg)		B+	B+	B+	B+	B+	B+
Terminal Size:		B-	B-	B-	B-	B-	B-
		AC	AC	AC	AC	AC	AC
		"I" Lamp	"I" Lamp	"I" Lamp	"I" Lamp	"I" Lamp	"I" Lamp
		Ignition	Ignition	Ignition	Ignition	Ignition	Ignition
Notes:		Remote Sense Batteryless	Remote Sense Batteryless		Remote Sense Batteryless		

Product Performance Stabilized Performance @ 25°

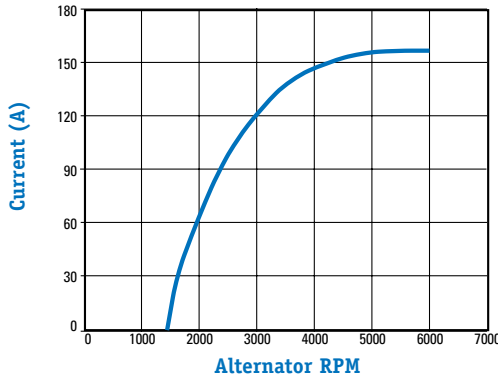
24 Volt, 150 Amps 8SC3017VA & 8SC3018VA



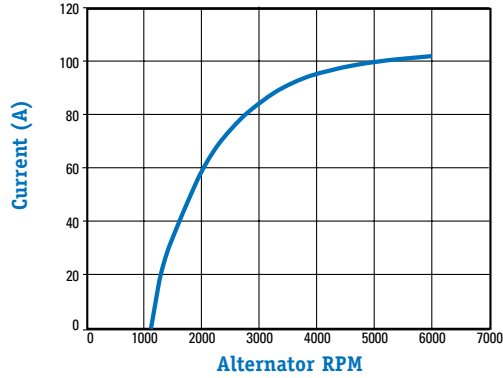
12 Volt, 185 Amps 8SC2020Z & 8SC2023Z



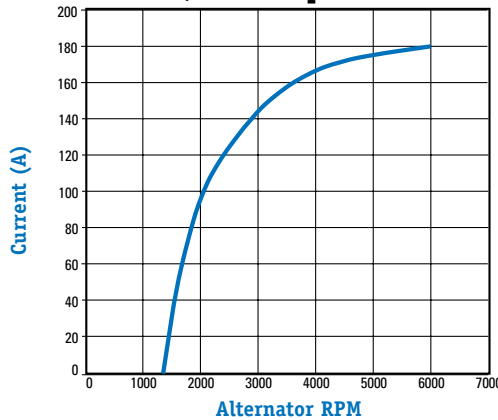
24 Volt, 150 Amps 8SC3068V



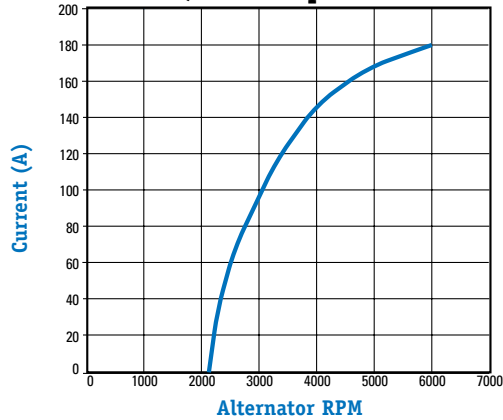
24 Volt, 100 Amps 8SC3014U



24 Volt, 150 Amps 8SC3110V



24 Volt, 175 Amps 8SC3009Z



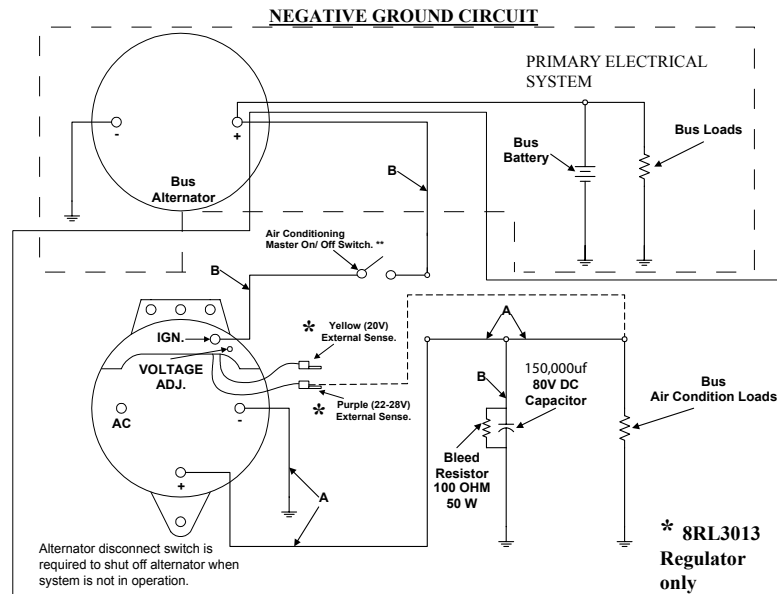
Source: Leece-Neville Heavy Duty Systems Division - Arcade, NY USA
 Date: March 25, 2008
 Bulletin No: TSB-1031
 Models: 8SC Series Batteryless Alternators
 Subject: Batteryless Alternator System

One of the Batteryless alternator's uses is to power a bus air conditioning system. The alternator gets its field current from the vehicle primary electrical sytem. No batteries are needed in this circuit. It is recommended to operate it at 3500 RPM minimum.

Because this alternator was designed for the batteryless sytem, Leece-Neville technical services recommends **NOT** connecting it to a battery. Connecting two alternators together is **NOT** recommended, due to the difficulty of the two alternators to share the load.

For further information regarding this system, or for information on other recommendations, please contact the technical service representative in your area or call our technical service call center at the number listed below. Other technical bulletins, as well as a technical region map, are available on our website at www.prestolite.com.

GENERIC WIRING DIAGRAM FOR BATTERYLESS SYSTEMS



** Switch must be open when AC unit is turned off and closed when AC unit is turned on.

RECOMMENDED MIN. WIRE SIZES

SYSTEM RATING	TOTAL LENGTH OF CHARGING CIRCUIT	A	B
65 A	12 FEET OR LESS	#8	#16
	12-20 FEET	#6	#14
85A	15 FEET OR LESS	#6	#16
	15-20 FEET	#4	#14
105A	12 FEET OR LESS	#6	#16
	12-20 FEET	#4	#14
130A	15 FEET OR LESS	#4	#16
	15-25 FEET	#2	#14

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Date: July 18, 2008

Bulletin No: TSB-1105

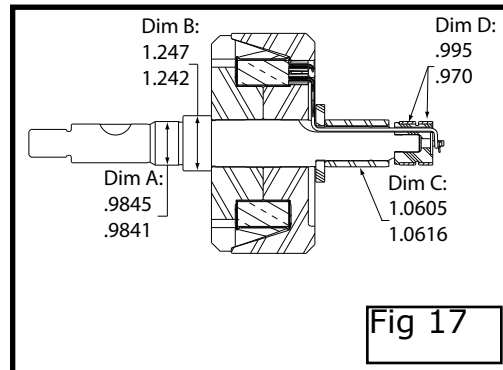
Slip ring/ rear bearing inner race change:

Inspect rotor and measure key items in Fig 17.

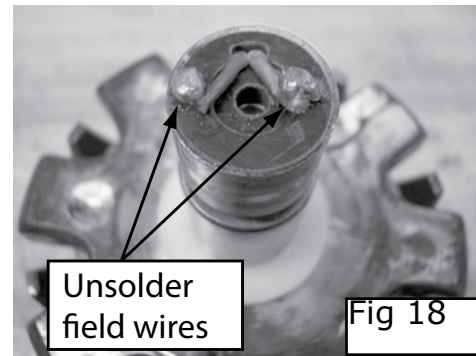
If Dim A or B is out of tolerance a new rotor will need to be purchased. Refer to SP-1017 to determine correct replacement part number.

If Dim C or D is out of tolerance or excessive wear is present then proceed with this procedure.

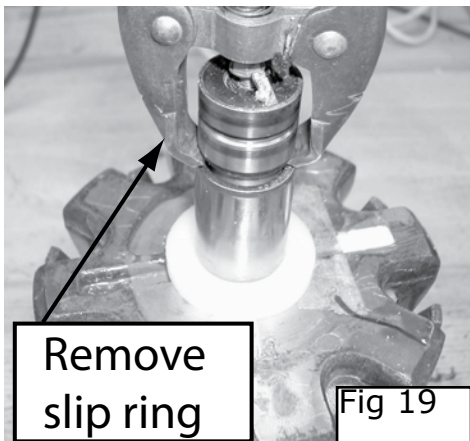
Note: Use caution not to damage field wires during the following procedures.



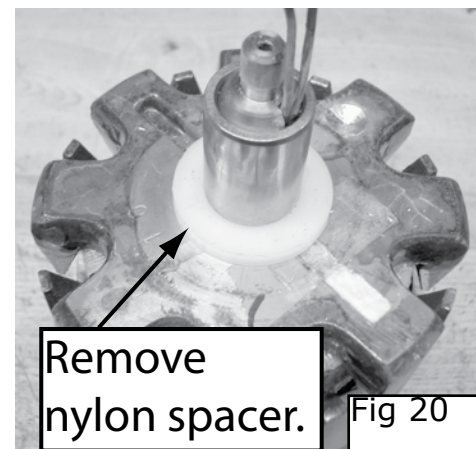
Step 15: Unsolder field wires from slip ring.
(Fig 18)



Step 16: Remove slip ring from shaft. (Fig 19)
Note: Use caution not to damage end of shaft during slip ring removal.



Step 17: Cut nylon spacer off shaft and discard.
(Fig 20)



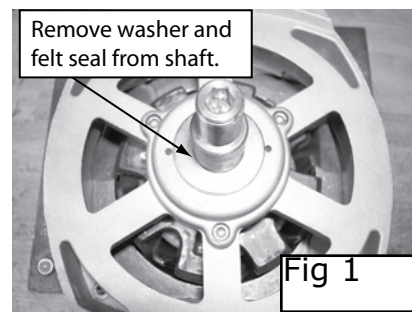
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Source: Leece-Neville Heavy Duty Systems Division - Arcade, NY USA
Date: July 18, 2008
Bulletin No: TSB-1105
Models: All 8SC/ SCJ
Subject: K183103997S Overhaul Kit Procedure.

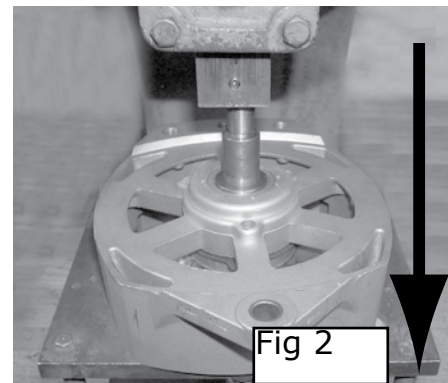
This procedure will show you how to install items supplied with K183103997S overhaul kit. Use procedure TSB-1068 to properly disassemble and assemble the alternator.

Front bearing change:

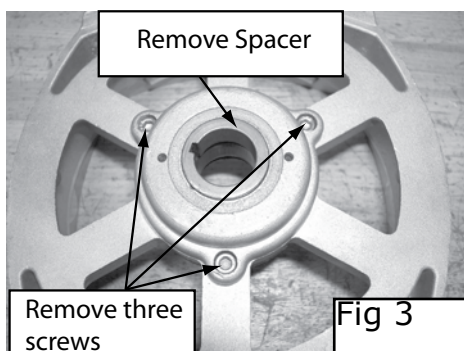
Step 1: Remove steel washer and felt seal from shaft. (Fig 1)



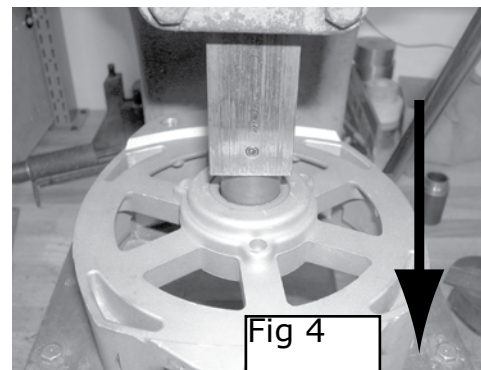
Step 2: Press rotor from front housing. (Fig 2)



Step 3: Remove spacer and three front bearing retaining screws. (Fig 3)



Step 4: Press front bearing and seals from front housing. (Fig 4)



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Date: July 18, 2008

Bulletin No: TSB-1105

Step 5: Remove seal from front housing.
(Fig 5)

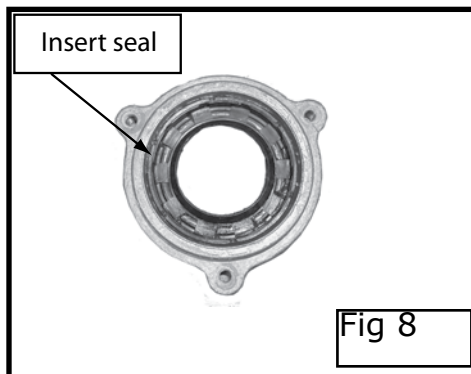
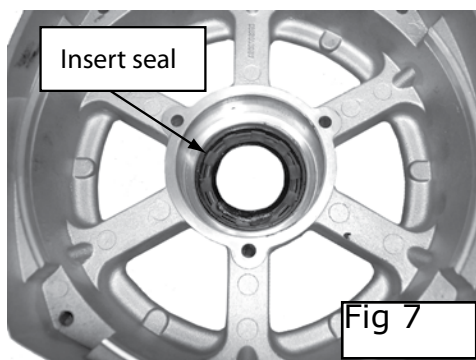
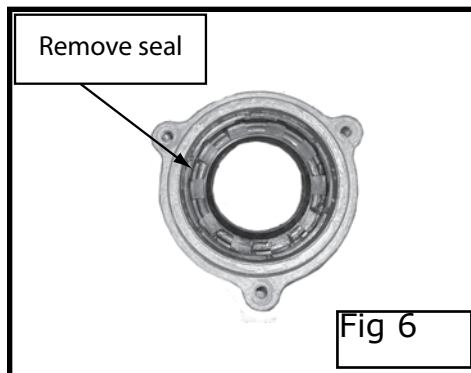
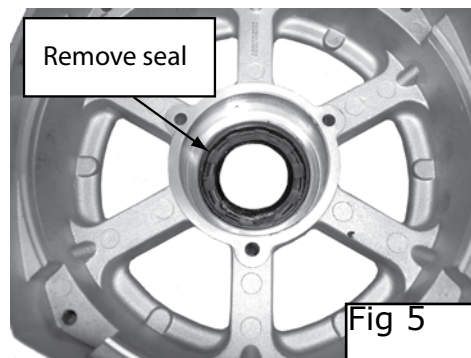
Step 6: Remove seal from front bearing
retainer. (Fig 6)

Note: On opposite sides of the front housing
and bearing retainer are two holes. Insert a
punch into these holes and tap with a ham-
mer to remove the seals.

Step 7: Insert front housing seal. (Fig 7)

Step 8: Insert front bearing retainer seal.
(Fig 8)

Note: When installing seals, press on the
outer diameter. Failure to do this can cause
damage to the seals.



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Date: July 18, 2008
Bulletin No: TSB-1105

Step 9: Press bearing into front housing. (Fig 9)

Note: When installing bearings, press on the outer diameter. Failure to do this can cause damage to the bearing.

Step 10: Install front bearing retainer. (Fig 10)

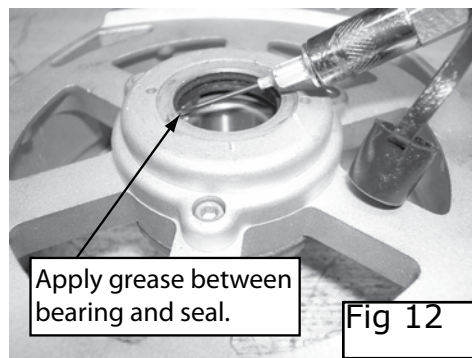
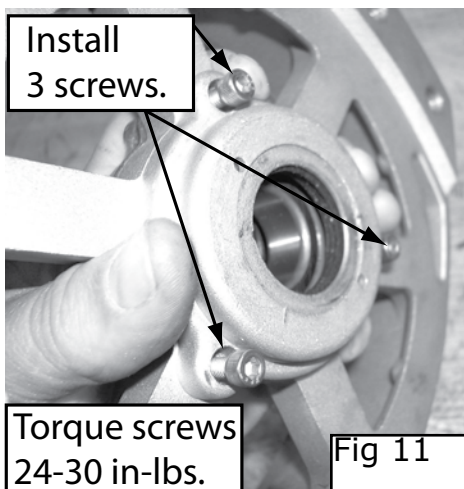
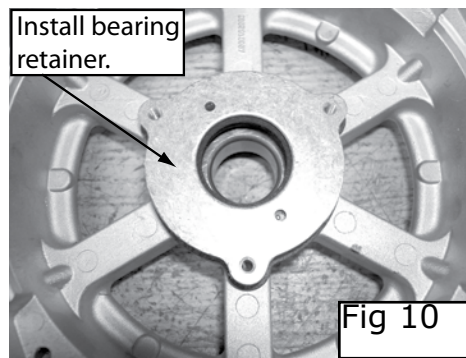
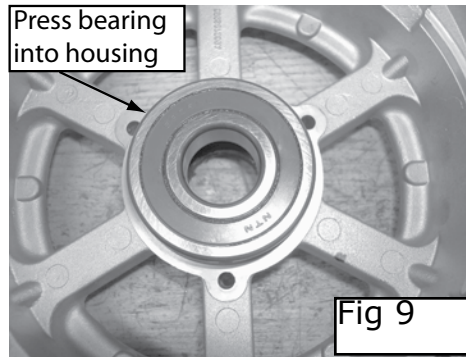
Step 11: While holding front bearing retainer in place, turn over housing. Apply blue locktite to three mounting screws and install into front housing. (Fig 11)

Step 12: With a grease needle, inject grease between the seal and the bearing.

Note: Grease needle can be purchased at any auto parts store.

Recommended grease:

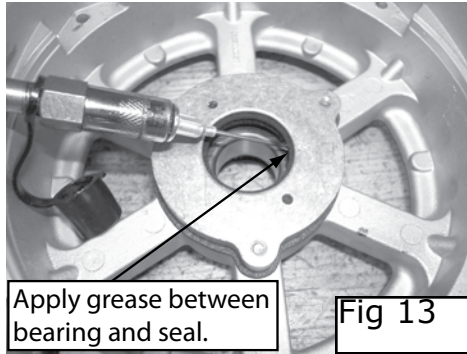
High temperature synthetic bearing grease.



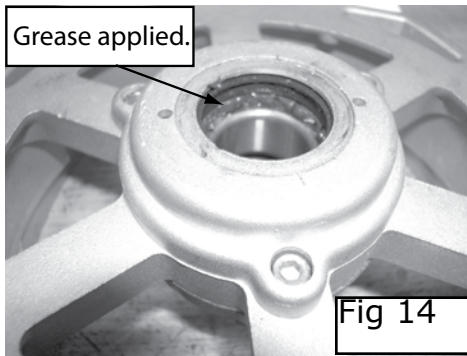
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Bulletin No: TSB-1105

Step 13: Turn housing over and with the grease needle inject grease between the seal and the bearing. (Fig 13)

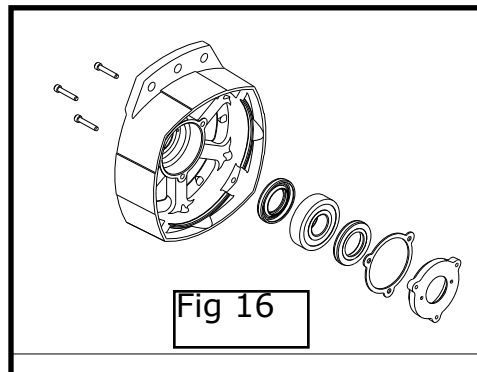
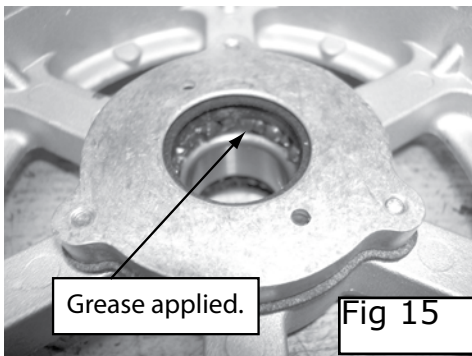


Step 14: Figure 14 and 15 shows the proper amount of grease that needs to be applied.



Note: The grease added between the bearing and the seals adds an additional protective measure in preventing dust from penetrating the bearing. This grease provides no lubricating properties to the front bearing.

Figure 16 shows you the proper arrangements of components in the front housing.



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Bulletin No: TSB-1105

Step 18: Clamp on bearing separator and press bearing inner race off shaft. (Fig 21)

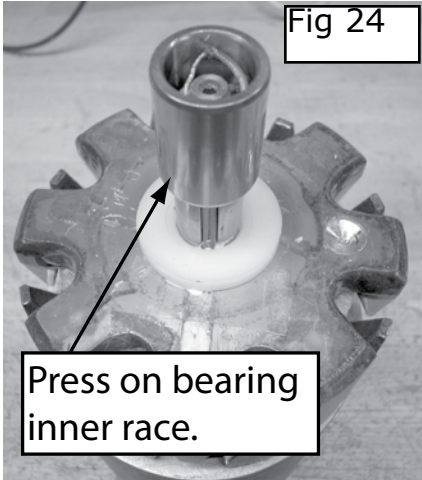
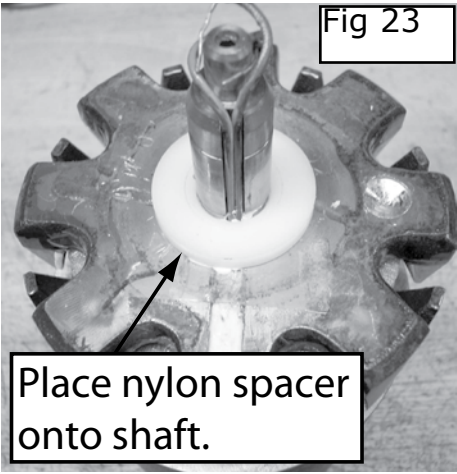
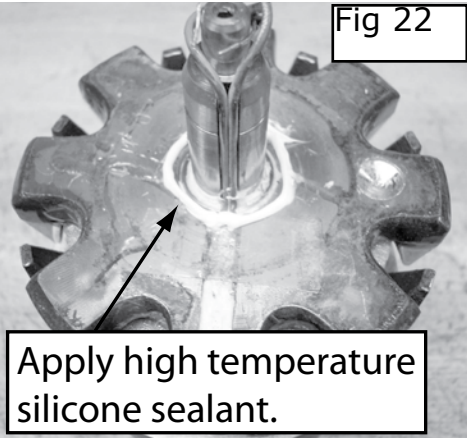
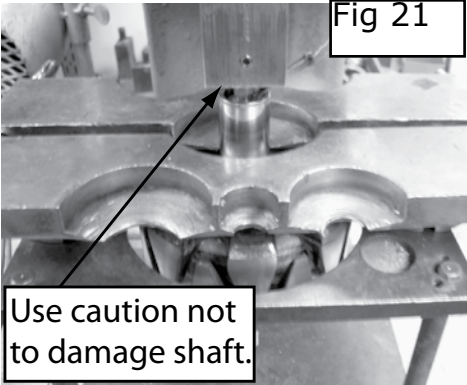
Note: Use caution not to damage shaft or field wires.

Step 19: Apply high temperature silicone sealant on rotor. (Fig 22)

Step 20: Place new nylon spacer on shaft. (Fig 23)

Step 21: Press bearing inner race onto shaft. (Fig 24)

Note: Use caution not to damage field wires during installation.

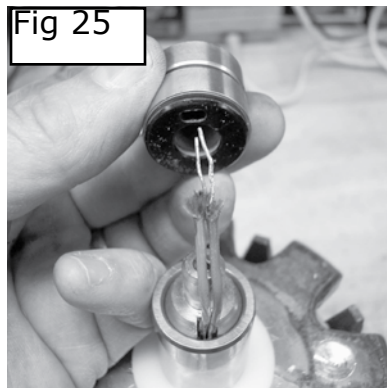


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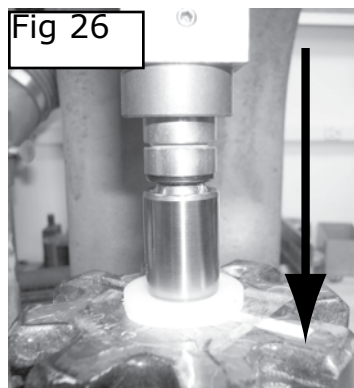
Step 22: Insert field wires through slip ring.
(Fig 25)



Step 23: Press slip ring onto shaft. (Fig 26)

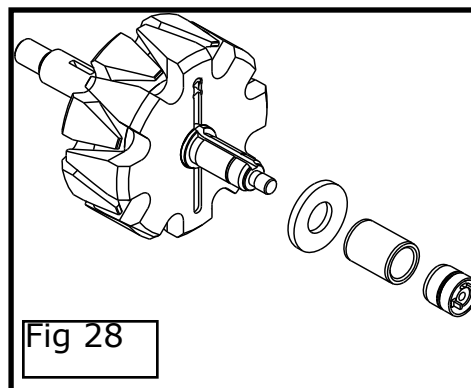
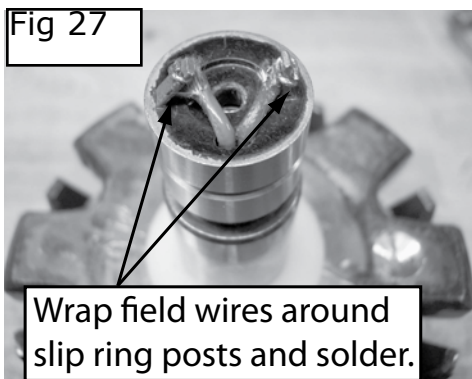
Note: Use caution not to damage field wires while performing Step 23 and press on slip ring outer diameter to prevent damage.

Step 24: Wrap field wires around slip ring posts and solder.



Recommended solder: SN15PB85

Figure 28 shows you the proper arrangements of components in the rotor.



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Bulletin No: TSB-1105

Rear bearing change:

Step 25: Remove snap ring from rear housing.
(Fig 29)

Step 26: Press old seals and bearing from rear housing. (Fig 30)

Step 27: Pack new bearing and seal cavities with grease. (Fig 31)

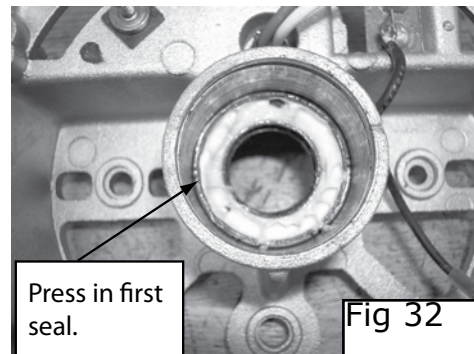
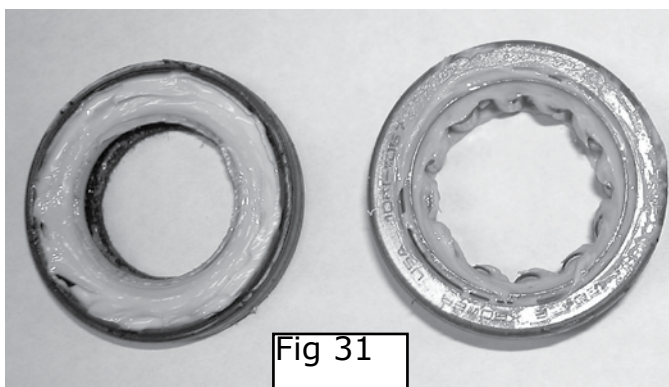
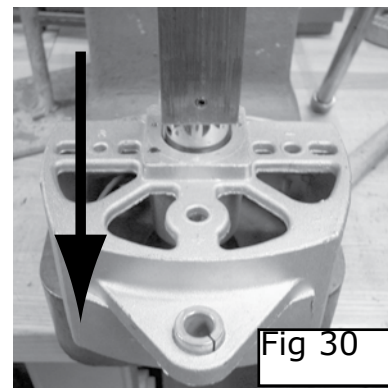
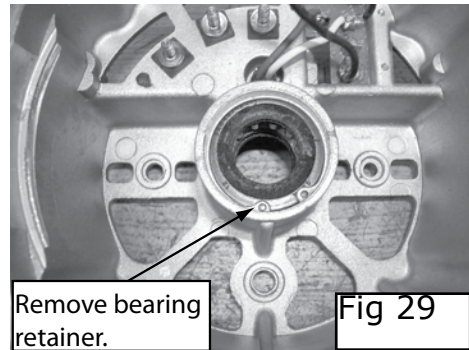
Recommended grease:

High temperature synthetic bearing grease.

Step 28: Press seal into rear housing. (Fig 32)

Note: When installing seals, press on the outer diameter. Failure to do this can cause damage to the seals.

Use caution not to contaminate grease.



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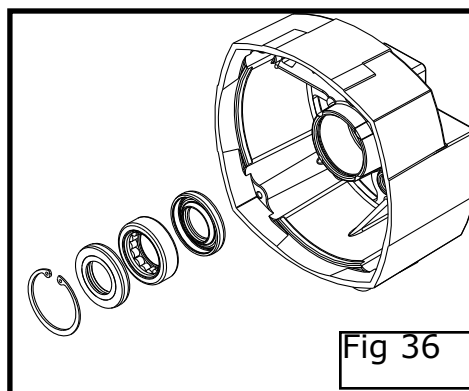
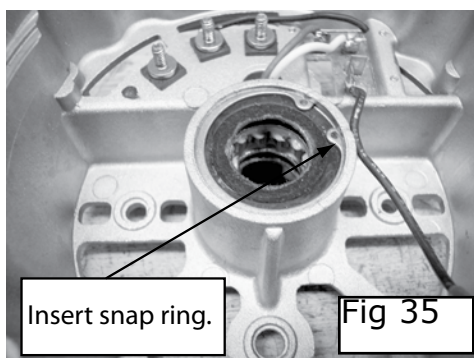
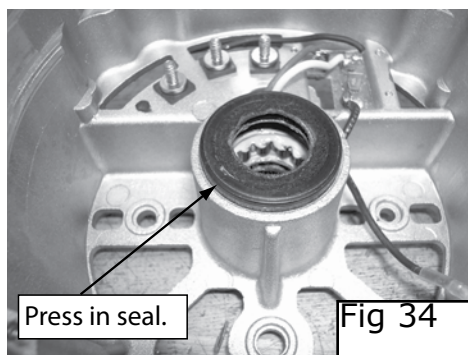
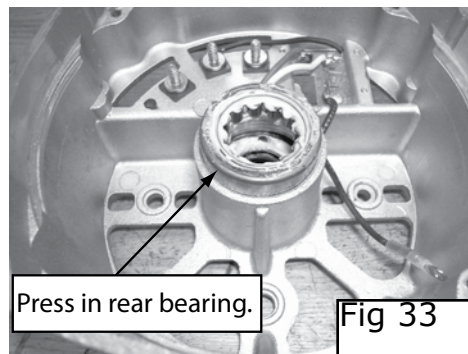
Step 29: Press bearing into rear housing.
(Fig 33)

Note: When installing bearings, press on the outer diameter. Failure to do this can cause damage to the bearing.

Step 30: Press seal into rear housing. (Fig 34)

Step 31: Install snap ring into rear housing.
(Fig 35)

Figure 36 shows you the proper arrangements of components in the rear housing.



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Installing rotor into front housing:

Step 32: Press rotor into front housing. (Fig 37)

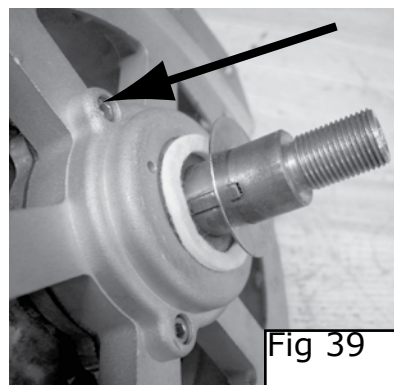
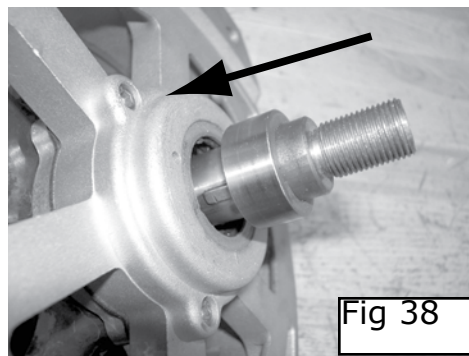
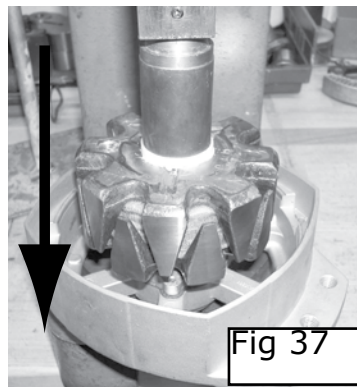
Note: When pressing rotor support front housing as close to the bearing as possible to prevent damage to the front housing.

Use caution not to damage slip ring when pressing rotor into front housing.

Step 33: Slide spacer onto shaft. (Fig 38)

Step 34: Slide felt and steel washer on shaft. (Fig 39)

To assemble the alternator please refer to TSB-1068.



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Technical specifications: TM55 / TM65



Benefits for Bus and Coach Operators

- Best efficiency
- Reliability & durability
- High cooling capacity

Benefits for Bus Makers

- Lightweight and compact
- Balanced 14 cylinders design
- Excellent performance-cost ratio

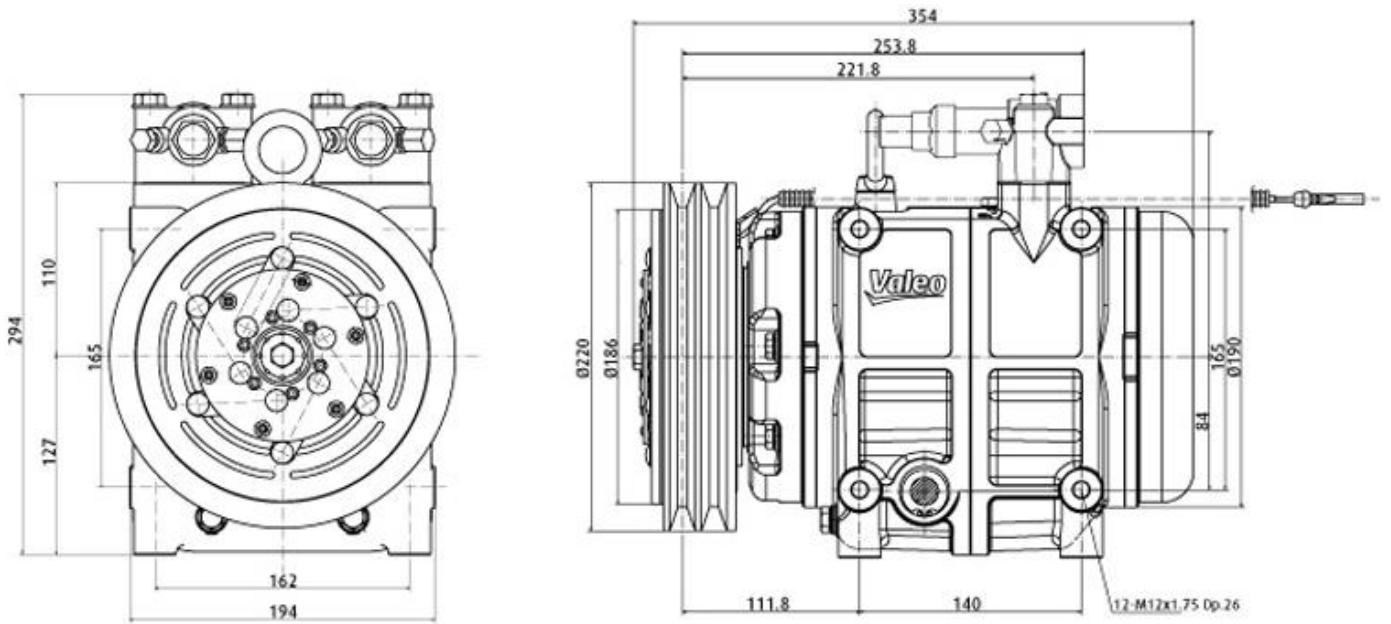
Benefits for A/C System Makers

- Perfect compatibility
- Premium quality product
- Valeo warranty and competitive pricing

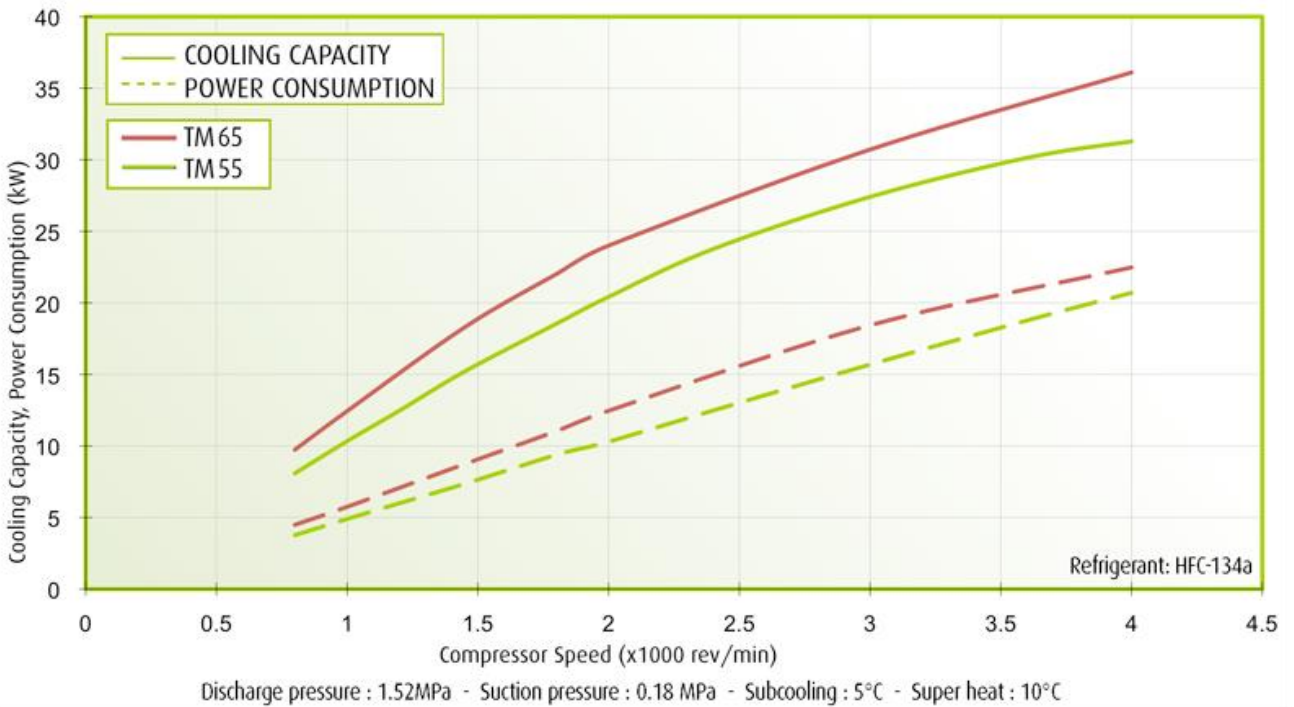


Model	TM55	TM65
Technology	Heavy Duty Swash Plate	Heavy Duty Swash Plate
Displacement	550 cm ³ / rev	635 cm ³ / rev
Number of cylinders	14 (7 double-headed pistons)	14 (7 double-headed pistons)
Revolution range	600 – 4000 rpm	600 – 4000 rpm
Direction of rotation	Clockwise (viewed from clutch)	Clockwise (viewed from clutch)
Refrigerant	HFC-134a	HFC-134a
Bore	38.5 mm	38.5 mm
Stroke	33.7 mm	38.9 mm
Lubrication system	Gear pump	Gear pump
Shaft seal	Lip seal type	Lip seal type
Oil	ZXL100PG PAG OIL (1500 cm ³) or POE option	ZXL100PG PAG OIL (1500 cm ³) or POE option
Weight	18.1 kg (w/o clutch)	18.1 kg (w/o clutch)
Dimensions	354 – 194 – 294 mm (w/ clutch)	354 – 194 – 294 mm (w/ clutch)
Mounting	Direct (side or base)	Direct (side or base)

TECHNICAL DRAWINGS

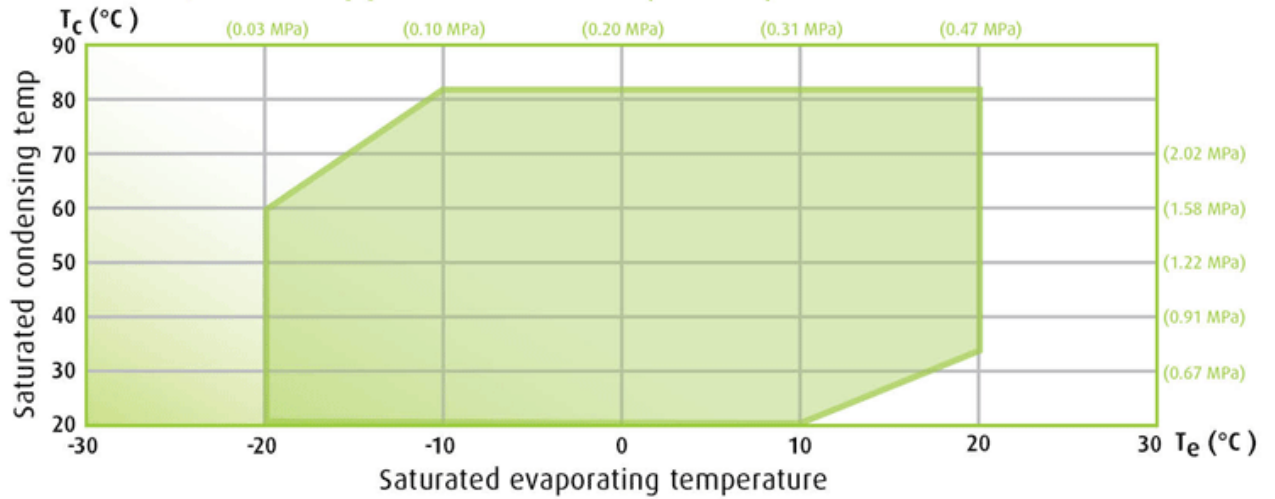


PERFORMANCE CURVES



OPERATION MAP

Valeo **TM55 / TM65** Application limits (R134a)

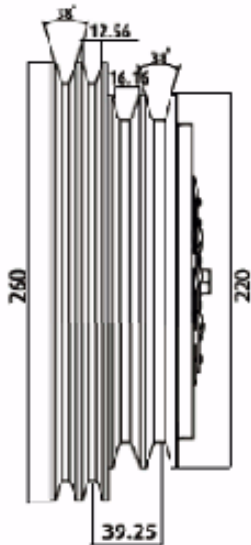


T_c : Saturated condensing temperature (°C)
 T_e : Saturated evaporating temperature (°C)

MAGNETIC CLUTCH VARIATIONS

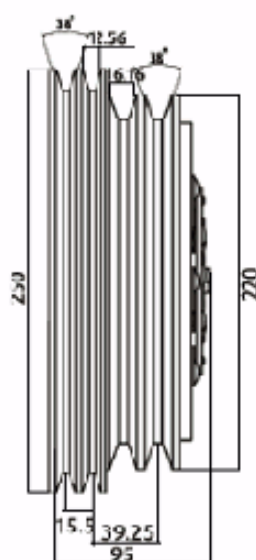
BW220 AW260

4 grooves



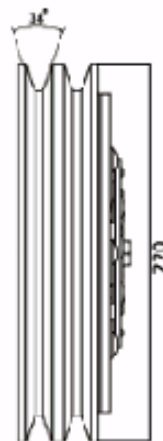
BW220 AW250

4 grooves



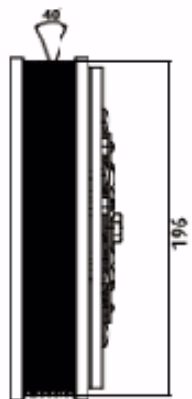
BW220

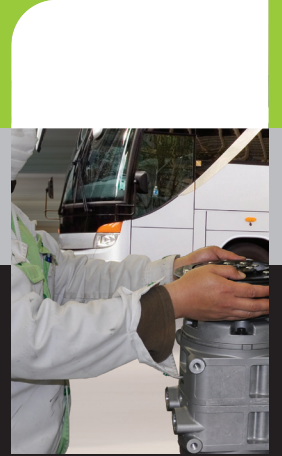
2 grooves



PK196

8 grooves





SERVICE MANUAL

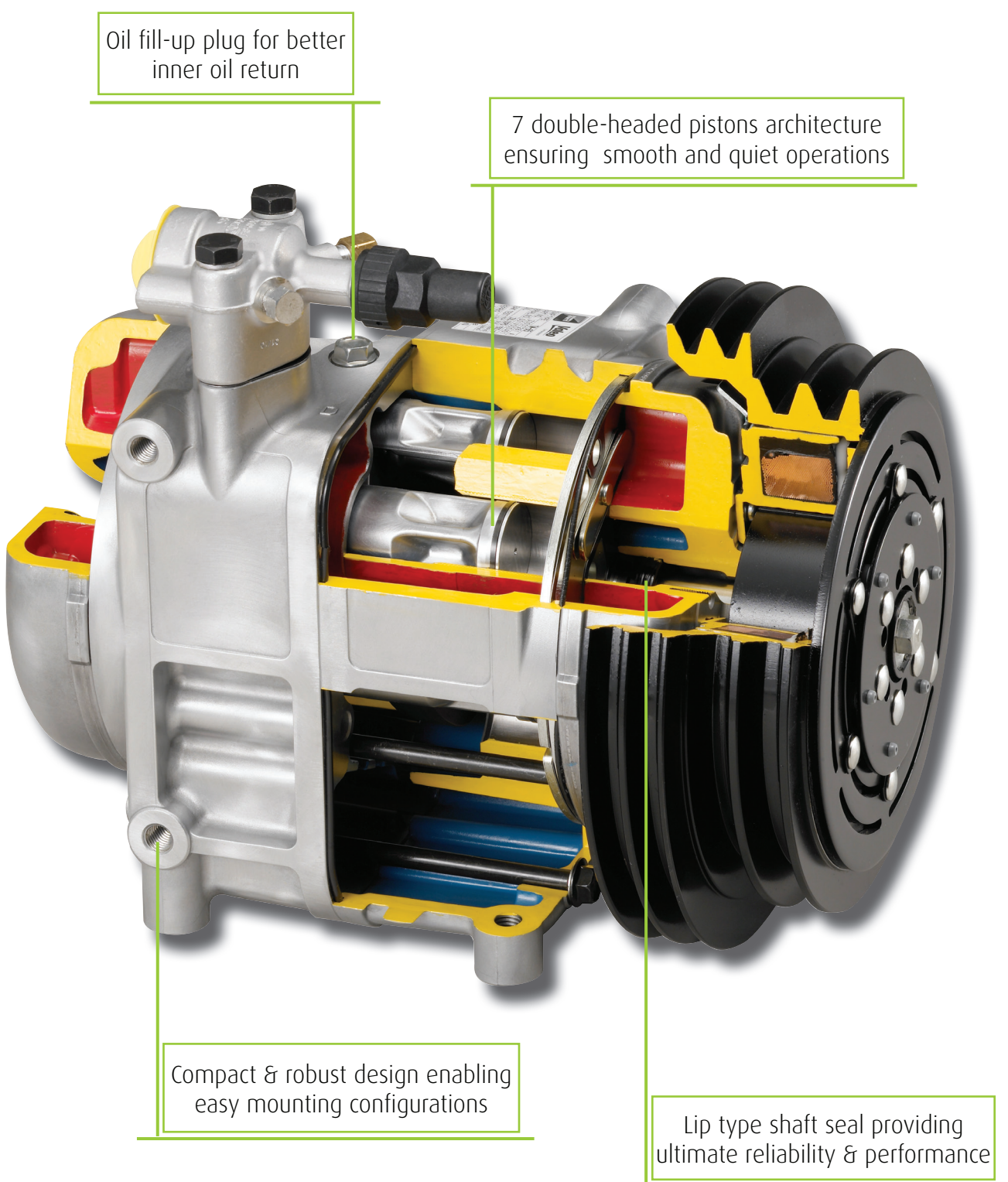
Valeo TM55 & TM65 Compressors



valeo added 

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Valeo
Automotive technology, naturally



Oil fill-up plug for better inner oil return

7 double-headed pistons architecture ensuring smooth and quiet operations

Compact & robust design enabling easy mounting configurations

Lip type shaft seal providing ultimate reliability & performance

Light & Compact, Ultimate Reliability, Highest Performance

valeo added ■■■■■■

Foreword

This service manual has been elaborated to help service personnel to provide efficient and correct service and maintenance on the Valeo **TM55** and **TM65** compressors for bus air conditioning.

This manual includes the operation specifications, procedures for disassembly, reassembly, and inspection of the compressor.

The contents of the manual, including illustrations, drawings and specifications were the latest available at the time of printing.

The right is reserved to make changes in specifications and procedures at any time without notice.

VALEO JAPAN CO., LTD.

WARNINGS

The following warning signs are used in this service manual. These are extremely important to ensure safe operation and to prevent body injuries and property damage. They must be fully understood before starting the air conditioner maintenance.

WARNING! Maintenance must be properly done to avoid serious injury risks.

CAUTION! Improper maintenance can result in injury or proper damage.

MEANING OF MARKS

The following marks are used in this service manual to facilitate correct air conditioner maintenance.

Advice Procedures necessary to ensure the best air conditioner maintenance.

Note Information to optimize the air conditioning maintenance.

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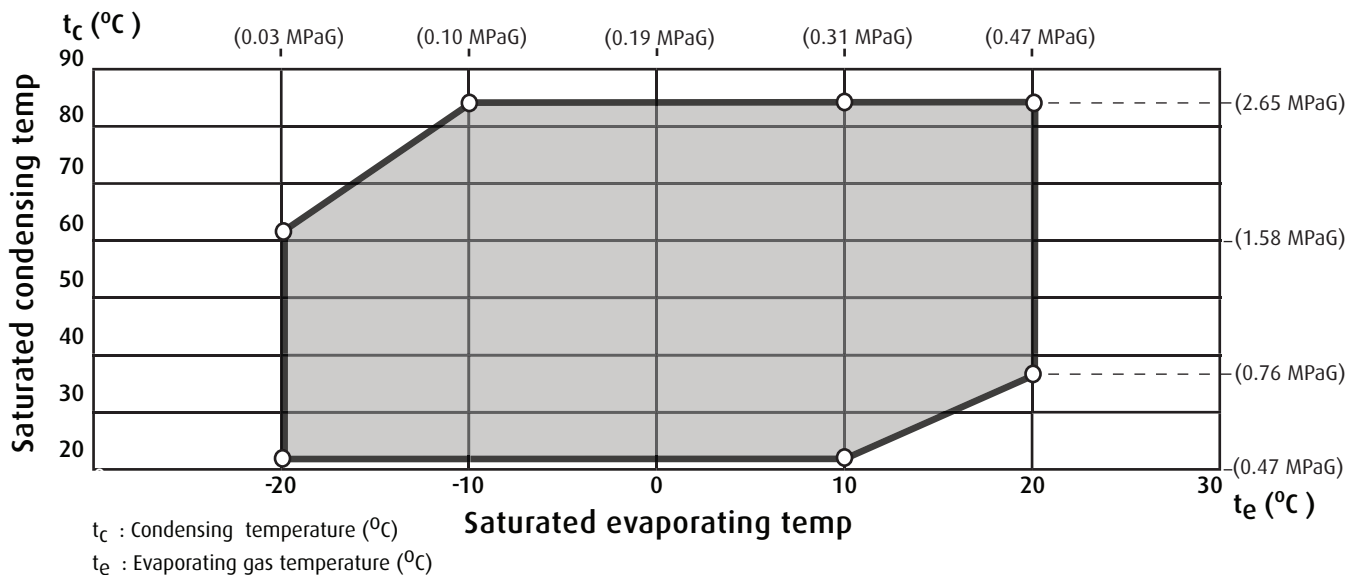
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1- Product description - Compressor

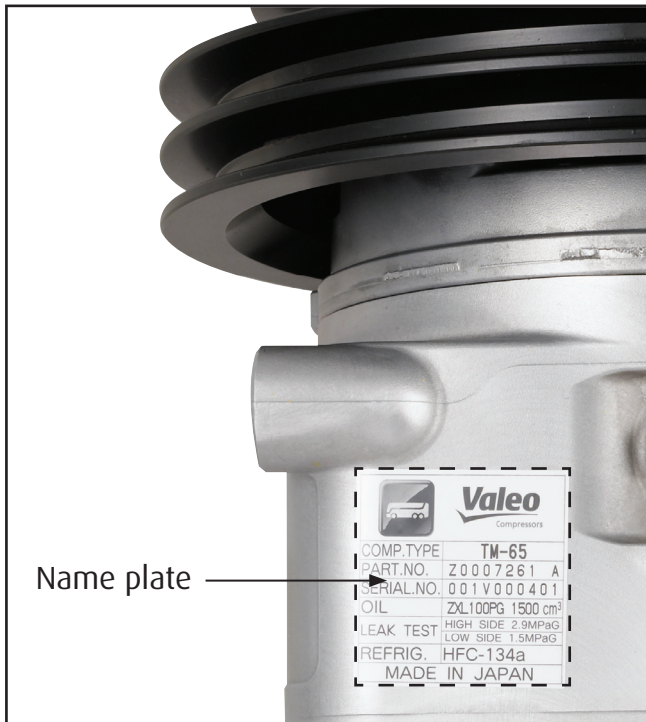
Compressor

MODEL	TM55	TM65
TECHNOLOGY	Heavy Duty Swash Plate	
DISPLACEMENT	550 cc / 33.56 in ³ per rev.	635cc / 38.75 in ³ per rev.
NUMBER OF CYLINDERS	14 (7 double-headed pistons)	
REVOLUTION RANGE	600-4000 rpm	
DIRECTION OF ROTATION	Clockwise viewed from clutch	
BORE	38.5 mm (1.52 in)	
STROKE	33.7 mm (1.30 in)	38.9 mm (1.53 in)
SHAFT SEAL	Lip seal type	
LUBRICATION SYSTEM	Lubrication by gear pump	
REFRIGERANT	HFC-134a	
OIL (QUANTITY)	ZXL 100PG PAG OIL (1500 cc/0.40 gal) or POE option	
CONNECTIONS Internal Hose Diameter	Suction: 35 mm (1-3/8 in) Discharge: 28 mm (1-1/8 in)	Suction: 35 mm (1-3/8 in) Discharge: 35 mm (1-3/8 in)
WEIGHT	18.1kg / 39.9 lbs (w/o Clutch)	
DIMENSIONS Length - Width - Height	341 - 194 - 294 (mm) 13.4 - 7.64 - 9.33 (in)	
MOUNTING	Direct (side or base)	

Valeo **TM55 & TM65** Application limits




1- Product description - Compressor



Name plate

To ensure that the compressor operates smoothly, be careful to respect the indications written on the name plate located on top of the compressor body.

	
COMP. TYPE	TM-XX
PART NO.	ZXXXXXXXX X
SERIAL NO.	XXXXXXXXXXX
OIL	ZXL 100PG 1500 cm ³
LEAK TEST	HIGH SIDE 2.9MPaG LOW SIDE 1.5MPaG
REFRIG.	HFC-134a
MADE IN JAPAN	

Tip

As **TM55 & TM65** compressors have the same dimensions, the best way to differentiate them quickly is by referring to the name plate.

1- Product description - Magnetic clutch

Magnetic clutch

VALEO **TM55 & TM65** are available either as a compressor and magnetic clutch assembly or as a compressor body that customers can fit with compatible magnetic clutches. The magnetic clutch design Valeo has been promoting for more than 20 years is now gradually adopted by major market actors.

Our compressors and magnetic clutches have successfully passed the thousand hours of long validation tests in Valeo Compressors research center laboratory. Operational excellence was demonstrated during hot season testing on field under challenging climates in the most stressful conditions.

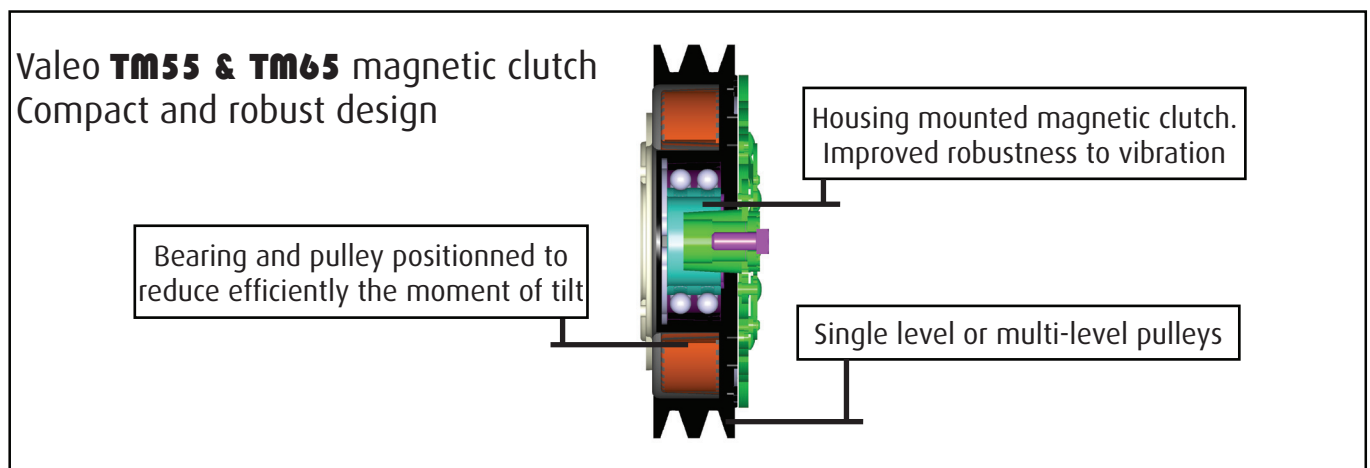
Being able to rely on our robust magnetic clutch provides the best way to reduce fuel consumption without using additional unloading devices that decrease significantly the efficiency and durability of the compressor. The range of Valeo magnetic clutches ensures an unmatched reliability and the longest durability that perfectly matches the Valeo **TM55 & TM65** compressor qualities.

Specifications*

TECHNOLOGY	Electromagnetic single-plate dry clutch
RATED VOLTAGE	24V DC or 12V DC
CURRENT CONSUMPTION	50 W maximum
STATIC TORQUE	250 N·m {25.5 kgf·m, 184 lbf·ft}
DIRECTION OF ROTATION	Clockwise viewed from clutch
WEIGHT	Approx 10~12 kg {22-27 lbs}
V-BELT TYPE	V-groove (A or B) or V-ribbed (PK)

*The specifications may vary with the compressor.

Please also note that the maintenance procedures introduced in this service manual apply only to magnetic clutches provided by Valeo.



1- Product description - Connectors

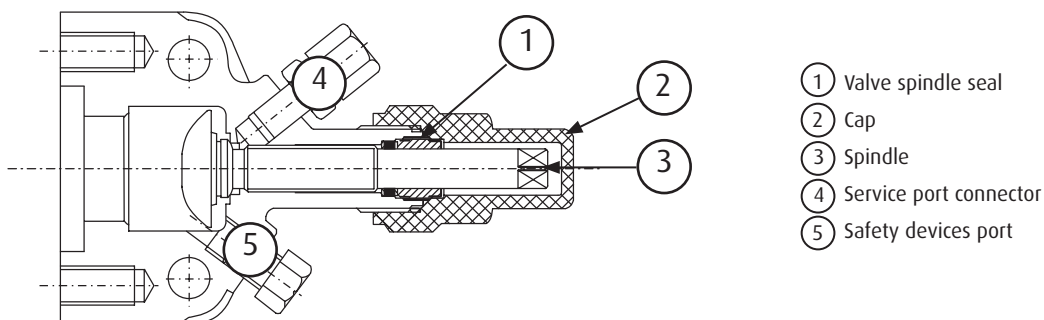
Connectors

1. Fully open the shut-off valve when operating the compressor

- Unscrew the cap.
- Loose the valve spindle seal by $\frac{1}{4}$ turn.
- Turn the spindle in the counterclockwise direction until it stops.

The shut-off valve is now fully opened and the service port connector is closed.

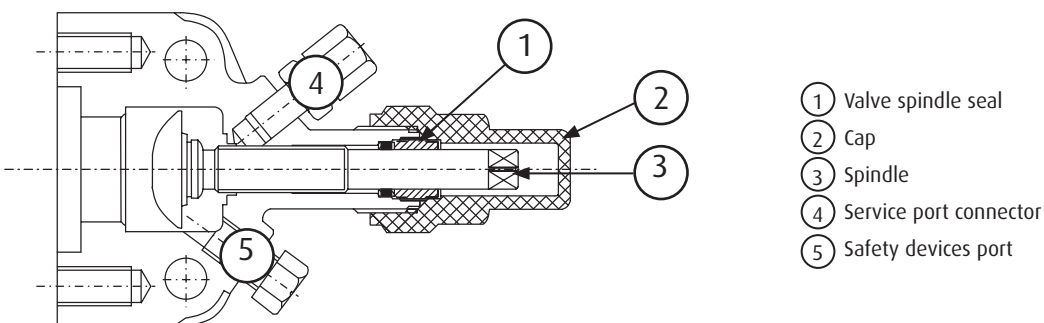
- When finished, tighten the valve spindle seal carefully and screw the cap.



2. Open the service port connector when using a gauge manifold

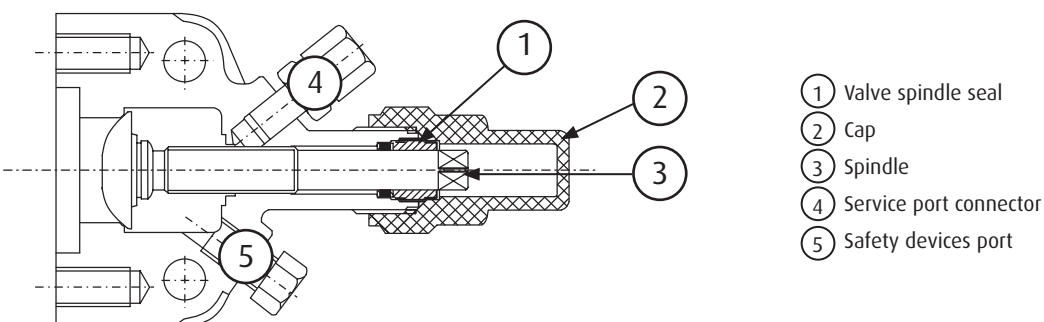
- Turn the spindle in the clockwise direction by $\frac{1}{2}$ turn to 1 turn.

The shut-off valve and the service port connector are now opened.



3. Fully close the shut-off valve when removing the compressor

- Turn the spindle in the clockwise direction until it stops.



1- Product description - Performance

The performance data below were measured under the following conditions:

- Compressor speed: 1450 rpm
- Suction gas temperature: 20°C

Valeo **TM-55** performance data (R134a)

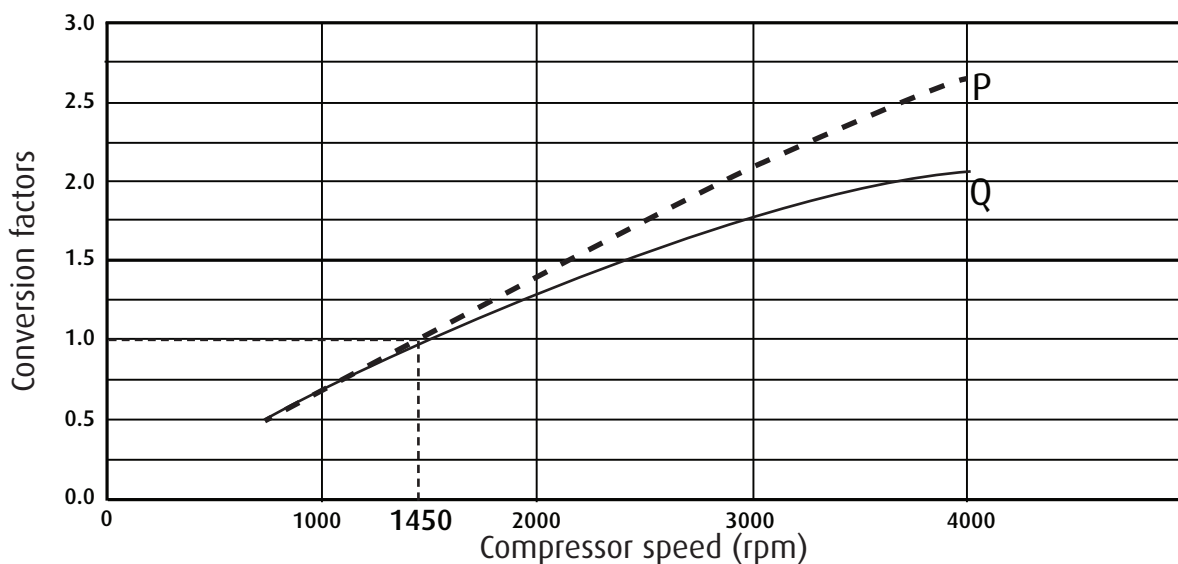
Conditions			Cooling Capacity Q and Power Consumption P					
Cond. temp (°C)	Pd (MPaG)	Evap temp (°C)	-10	-5	0	5	10	12.5
		Ps (MPaG)	0.10	0.15	0.19	0.24	0.32	0.35
40	0.91	Q (kW)	14.73	19.68	23.88	29.30	37.23	40.31
		P (kW)	5.31	5.96	6.39	6.77	7.21	7.36
50	1.21	Q (kW)	12.75	17.52	21.06	25.58	32.97	35.54
		P (kW)	5.80	6.59	7.09	7.63	8.32	8.48
60	1.58	Q (kW)	10.53	14.42	17.60	21.39	28.16	30.65
		P (kW)	6.28	7.21	7.84	8.52	9.38	9.63

Valeo **TM-65** performance data (R134a)

Conditions			Cooling Capacity Q and Power Consumption P					
Cond. temp (°C)	Pd (MPaG)	Evap temp (°C)	-10	-5	0	5	10	12.5
		Ps (MPaG)	0.10	0.15	0.19	0.24	0.32	0.35
40	0.91	Q (kW)	17.29	22.96	28.21	33.92	42.18	45.71
		P (kW)	6.30	7.02	7.53	8.10	8.68	8.90
50	1.21	Q (kW)	15.16	20.21	24.24	29.31	37.58	40.37
		P (kW)	6.83	7.76	8.39	9.06	9.90	10.11
60	1.58	Q (kW)	12.66	17.30	20.80	25.28	32.10	34.56
		P (kW)	7.35	8.43	9.17	9.95	11.02	11.35

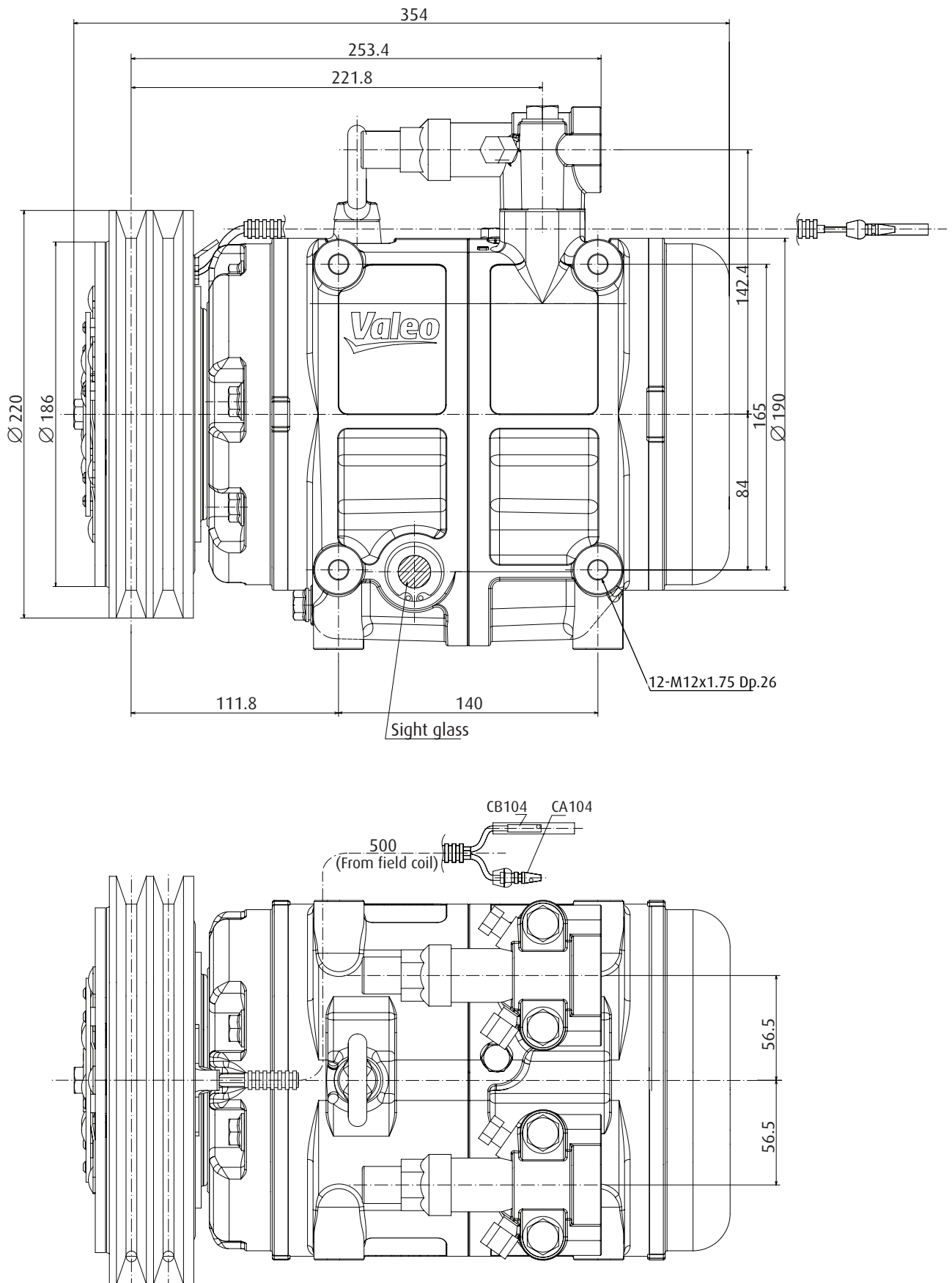
Valeo **TM55 & TM65** conversion factors

The performance data at different rotation speed can be approximated with the conversion factors below.



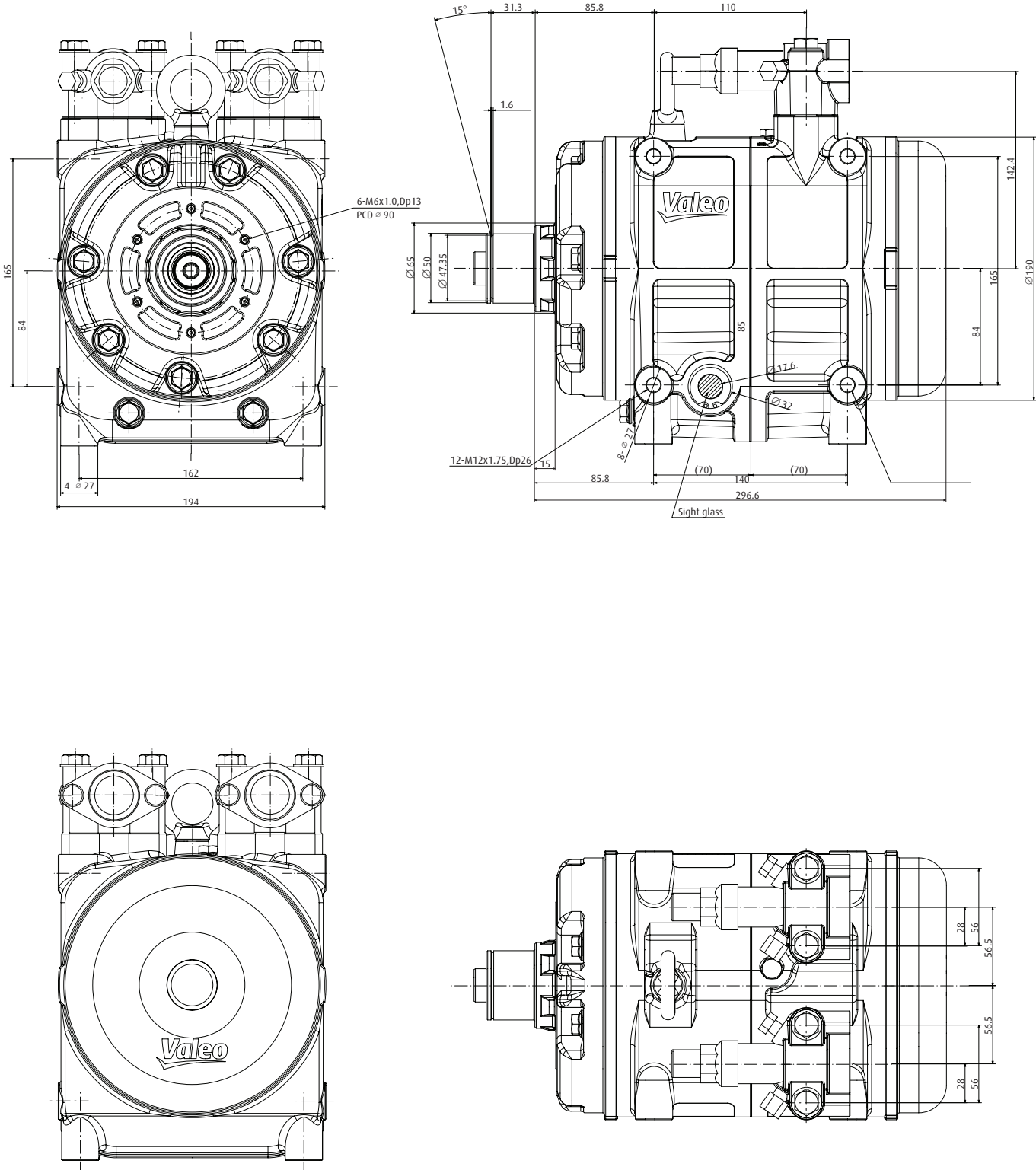
1- Product description - Dimensions

TM55 & TM65 compressors with magnetic clutch

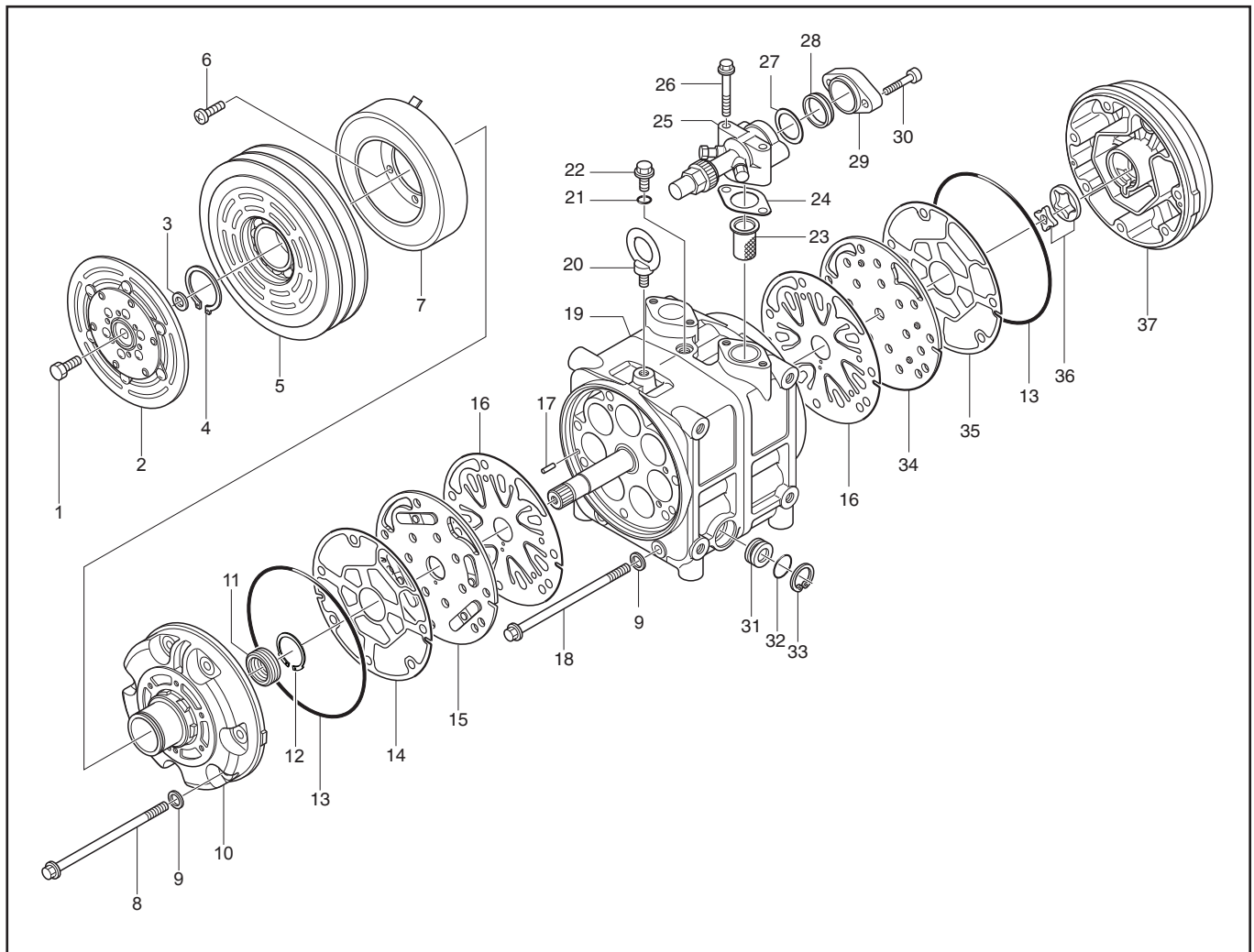


1-Product description - Dimensions

TM55 & TM65 compressors without magnetic clutch



1- Product description - Exploded view



1. Center bolt
2. Armature assembly
3. Adjusting shim
4. Snap ring
5. Pulley assembly
6. Screw
7. Field coil
8. Bolt
9. Gasket
10. Front cylinder head
11. Shaft seal assembly
12. Snap ring
13. O-Ring
14. Gasket
15. Valve plate assembly
16. Suction valve
17. Pin
18. Bolt
19. Cylinder shaft assembly

20. Eye bolt
21. O-Ring
22. Oil filler plug
23. Strainer
24. Gasket
25. Connector
26. Bolt
27. Gasket
28. Plate
29. Plate
30. Bolt
31. Sight glass
32. O-ring
33. Snap ring
34. Valve plate assembly
35. Gasket
36. Gear pump
37. Rear cylinder head

1- Product description - Swash plate system

Valeo **TM55 & TM65** are 14 cylinder swash plate type compressors. With this type of compressor, the cylinders and pistons are arranged axially along the drive shaft.

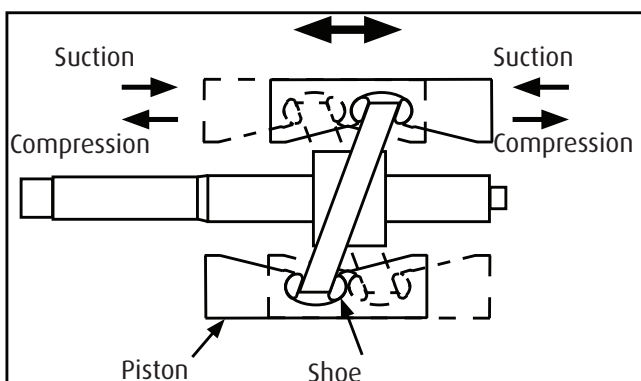
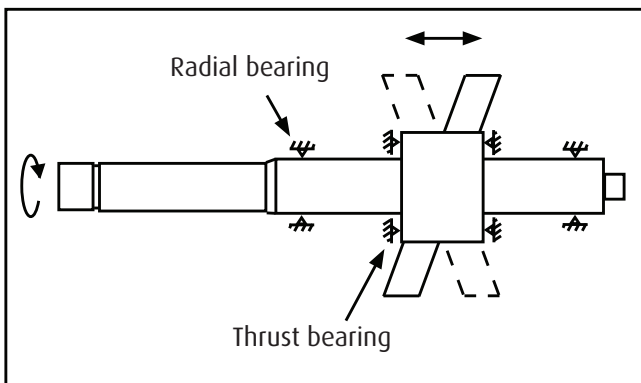
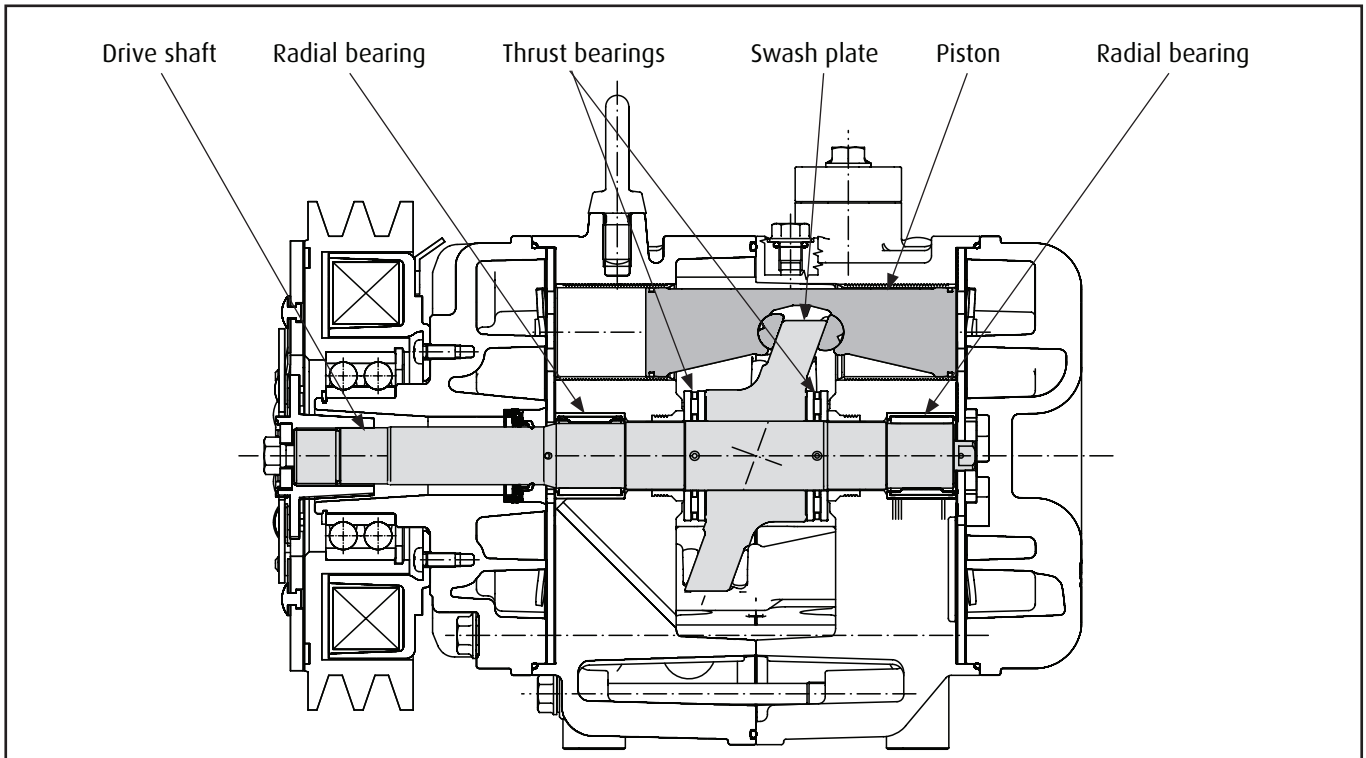
The pistons operate within the cylinders and are driven by a swash plate to perform suction, compression and discharge.

Swash plate system

The drive shaft, which is driven by the engine through the magnetic clutch, is equipped with a swash plate.

The drive shaft is supported by two radial bearings and two thrust bearings.

The swash plate is rotated by the drive shaft, and moves the pistons back and forth.



Piston Drive System

The pistons in the cylinders are mounted on the swash plate through hemispherical shoes.

Each piston has a compression head at each end. Swash plate rotation results in a reciprocating piston movement horizontal to the drive shaft.

The cylinders, which are arranged at 51.4° intervals around the drive shaft, are each divided into 2 chambers, providing 7 front and 7 rear bores.

As each piston performs suction and compression at either end, the compressor operates as a 14 cylinder compressor.

1- Product description - Lubrication

The gear pump situated at the end of the drive shaft draws oil from the oil reservoir and lubricates the parts of the compressor.

Oil flow

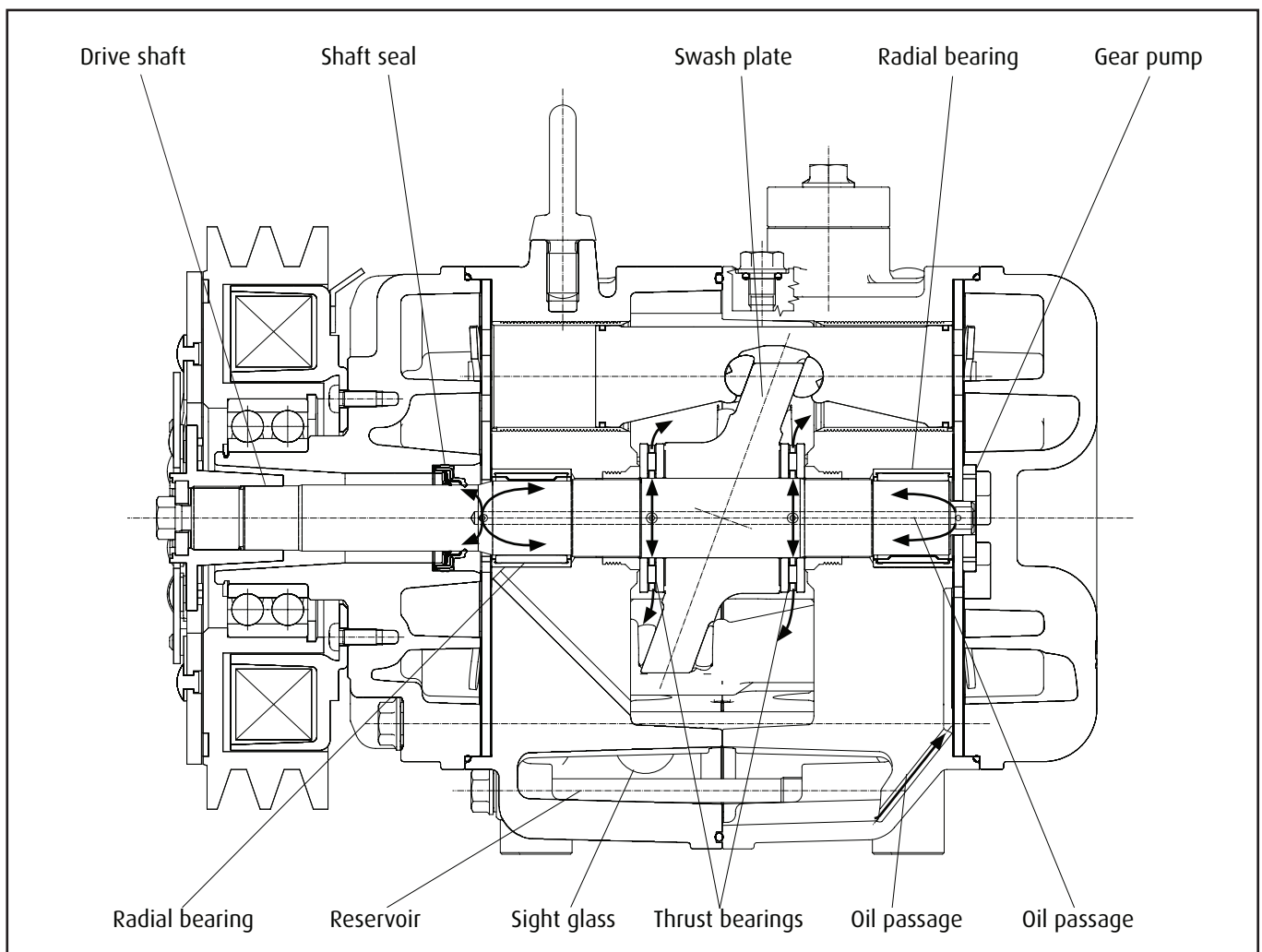
When the compressors start operating, the gear pump draws oil from the reservoir and pumps it through an oil passage in the shaft.

The oil then flows through ports in the shaft to lubricate the bearings and the shaft seal.

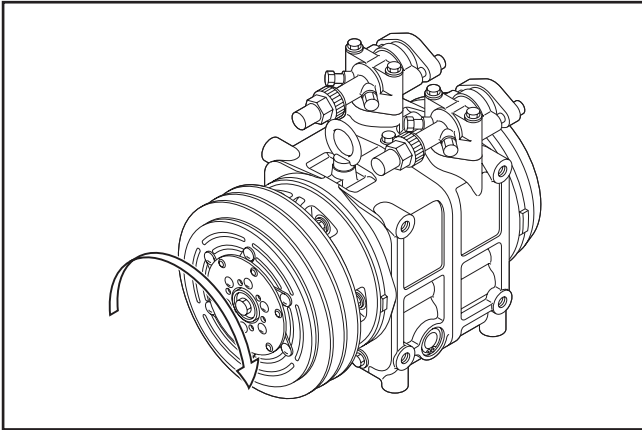
The area between the swash plate and the shoes is lubricated by the splashing action of the oil flowing through the thrust bearings.

The compressor remains constantly lubricated thanks to the oil circulating together with the refrigerant. Valeo compressor innovative internal design ensures that almost no oil remains mixed with the refrigerant that is flushed into the air conditioning system.

Refrigerant itself plays a lubricant role to prevent the compressor to be damaged in case of oil shortage.



1- Product description



Compressor

1. The direction of rotation is clockwise as viewed from the clutch side.
2. The standard compressor oil charge is specified for bus air conditioners. The oil quantity may differ depending on the type and use of compressor. Please refer to the label on the compressor.

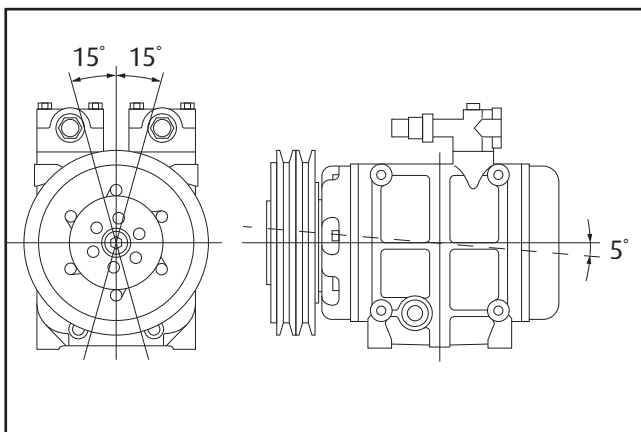
Operation condition table

Item	Condition
Surrounding temperature	Under 120°C (248°F)
Speed	Minimum: 600 r/min Maximum: 4500 r/min Continuous: 4000 r/min
Pressure	Maximum: 2.65 MPaG {28kgf/cm ² , 385 psig}

3. The compressor must be operated under the conditions shown in the operation condition table shown at left.

CAUTION!

The A/C cycle components must be designed so that the pressure in the cycle does not exceed 2.65 MPaG {28 kgf/cm², 385 psig}



4. Inclination limit at installation
The compressor must be installed on the vehicle within the range shown at left.
Front head forward leaning is prohibited.

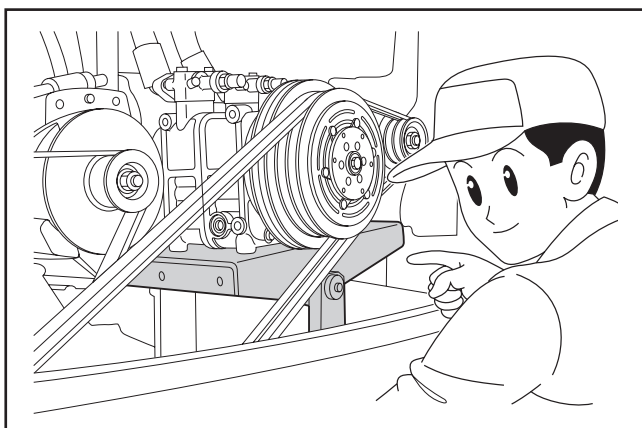
Compressor mounting points

The compressor's mounting points should be tightened to the specified torque:

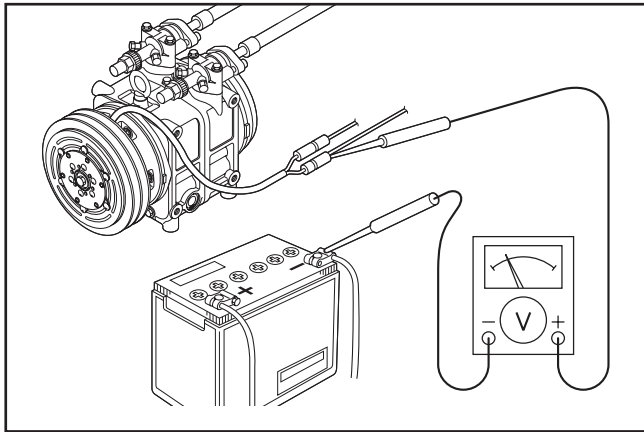
Specified torque: 45 - 50 N·m
{4.6 - 5.1 kgf·m, 33.2 - 36.9 lbf·ft}

Compressor bracket

1. Install the bracket securely on the chassis frame or engine body. As the engine vibrations may be severe, the bracket and mounting bolts must be installed securely.
2. Vibration resistance
There must not be any resonance under 250 HZ.



1- Product description



Magnetic clutch

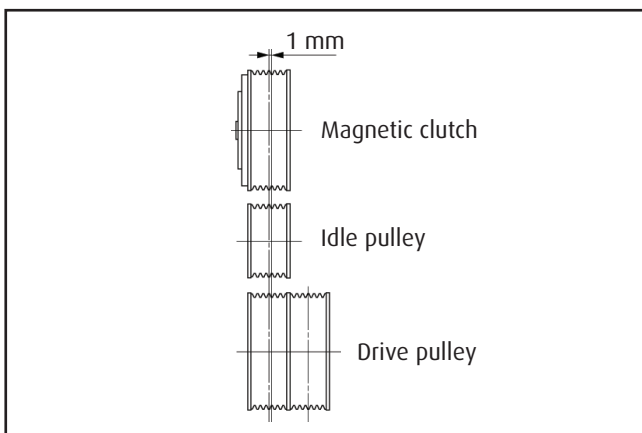
1. Voltage

DC 24 V

The terminal voltage of the magnetic clutch must exceed 21 V.

DC 12 V

The terminal voltage of the magnetic clutch must exceed 10.5 V.



2. Ratio of magnetic Clutch to drive pulley

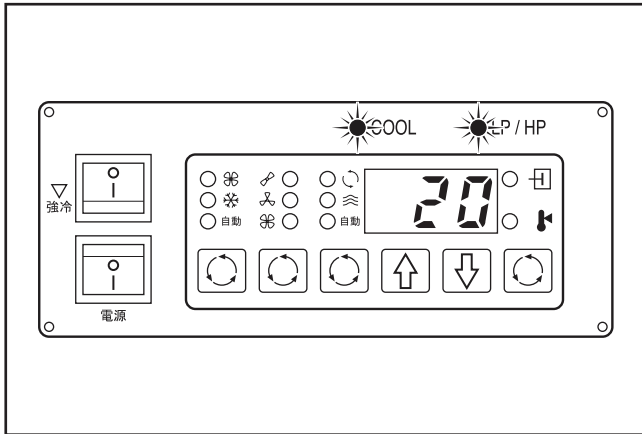
- When the compressor is driven from the pulley drive of the vehicle, the magnetic clutch to drive pulley ratio should avoid the range 1: 0.92~1.08 to limit vibration and resonance.
- Compressor speed must not exceed the specified speed.

CAUTION!

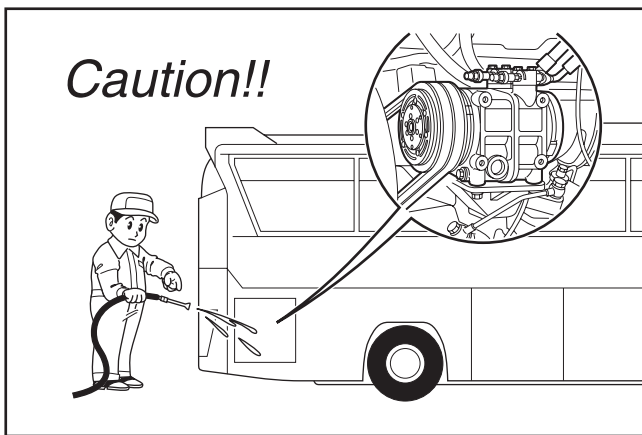
Pulley ratio is the ratio of the magnetic clutch diameter to the drive pulley diameter.

3. Pulley alignment tolerance is less than 1mm (0.04 in).
4. Pulley groove: V-groove or V-ribbed.
5. The V-belt tension must be adjusted to the tension specified by the belt maker.

2- Operation precautions

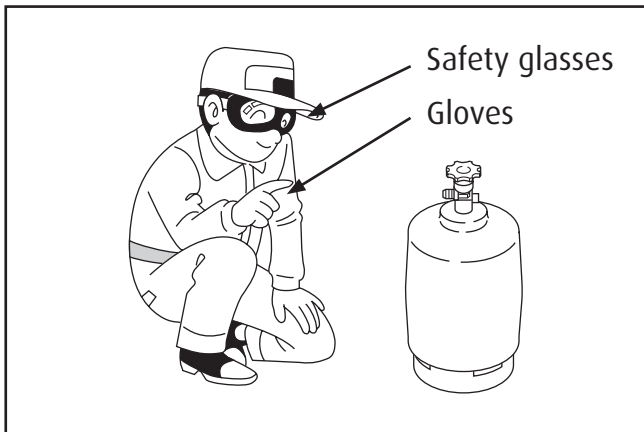
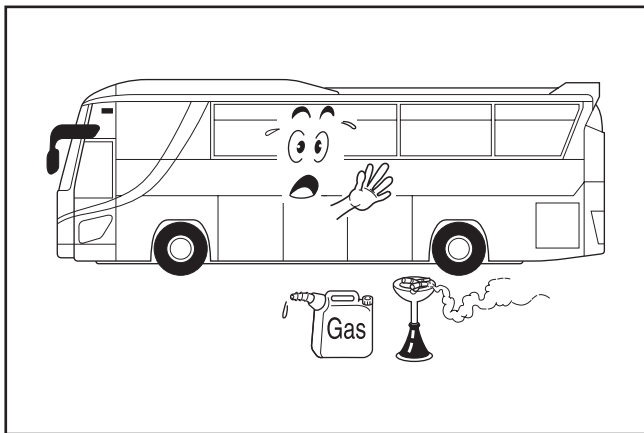
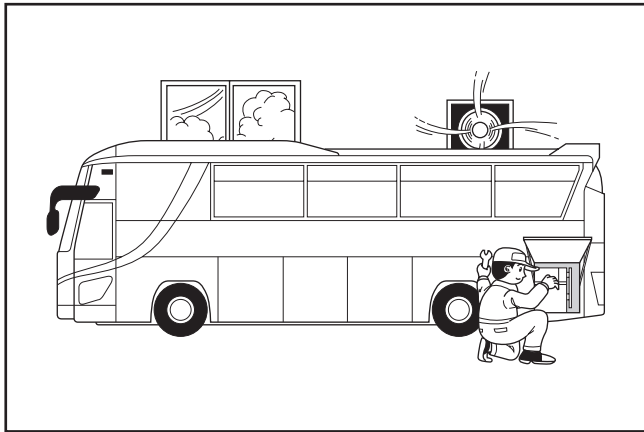


1. In the off season of air conditioner, operate the compressor for a few minutes from time to time.
2. Do not drive through water. Water may damage the magnetic clutch, thus preventing normal operation.
3. Always charge the A/C system with the specified quantity of refrigerant.



4. Keep the compressor clear of water projection while cleaning the vehicle.

3- Handling instructions



Maintenance precautions

Work area

Because the components of air conditioners are especially sensitive to moisture, dirt and rust, always observe the following:

- Work indoors whenever possible
- Select a flat ground work area
- Keep the work area clean
- Select a work area with adequate ventilation.

CAUTION!

Refrigerant itself is not harmful, but excessive accumulation in a closed area can cause oxygen deficiency.

- Keep naked flame and inflammable away from the vehicle in which the air conditioner is being installed.
(Fire is especially dangerous during the gas leak inspection following installation)

WARNING!

Contact with flame and high temperatures can generate toxic gases.

Refrigerant handling

WARNING!

Direct contact with refrigerant can cause frostbite or blindness.

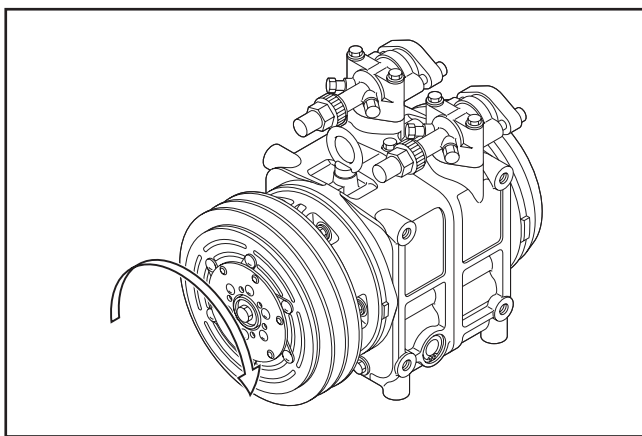
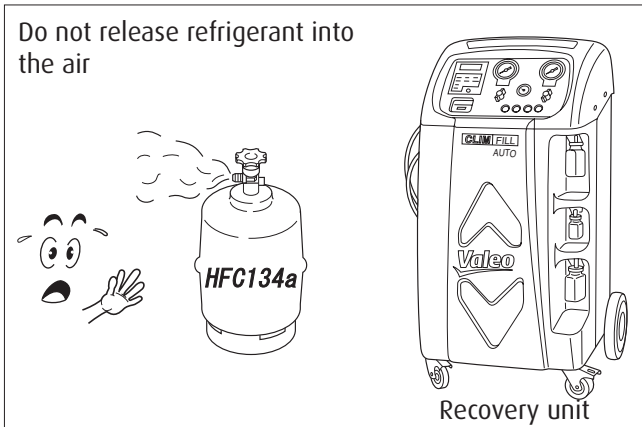
Always wear safety glasses and protective gloves.

Do not work with refrigerant close to your face.

1. Do not mistake refrigerants

If an HFC-134a air conditioning system is mistakenly charged with another refrigerant, serious problems such as compressor seizing may occur. Therefore, confirm before charging with refrigerant that the type of air conditioning system is an HFC-134a system.

3- Handling instructions



2. Do not release refrigerant into the air

Although HFC-134a is not subject to CFC regulations, it can have effect on global warming and so should not be released into the air. When removing refrigerant from the air conditioner system, always use a refrigerant recovery unit made especially for HFC-134a.

Compressor handling

Do not strike or unnecessarily turn the compressor upside down. If the compressor is knocked over or turned upside down during handling or installation, rotate the armature plate 5 or 6 times by hand to circulate the oil.

Otherwise, oil in the cylinder during compressor start-up will cause valve damage and reduce durability.

Compressor removal

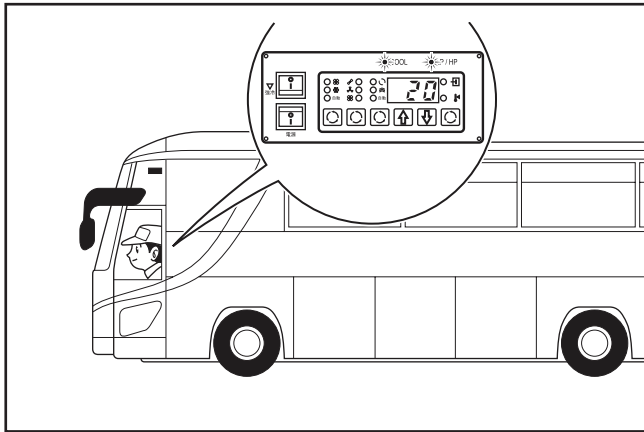
When the compressor is operational

1. Perform the oil return operation (see p.18).
2. Recover the refrigerant from the system using a refrigerant recovery unit.
3. Remove the compressor.
4. Drain the oil from the compressor and close all open connections immediately.
5. Check the oil quantity and the degree of contamination (see p.19).

When the compressor is inoperable

1. Recover the refrigerant from the system using a refrigerant recovery unit if the shut-off valves are removed with the compressor.
2. Remove the compressor.
3. Drain the oil from the compressor and close all open connections immediately.
4. Check the oil quantity and the degree of contamination (see p.19).

3- Handling instructions



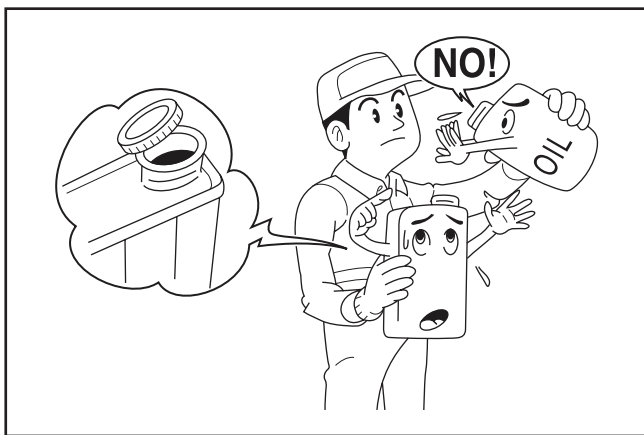
Oil return operation

Compressor oil mixed with refrigerant is circulating in the air conditioning system.

Perform the oil return operation to return this oil to the compressor before removing components from the system.

1. Open the doors and windows and operate the blower motor at maximum speed.
2. Operate the vehicle engine at idling during at least 20 minutes.

Note: The maximum amount of oil cannot be recovered at higher speeds. This operation also requires a warm ambient temperature.



Oil handling

Oil specification

Use only ZXL 100PG (DH-PS) or POE oil.

Handling precautions

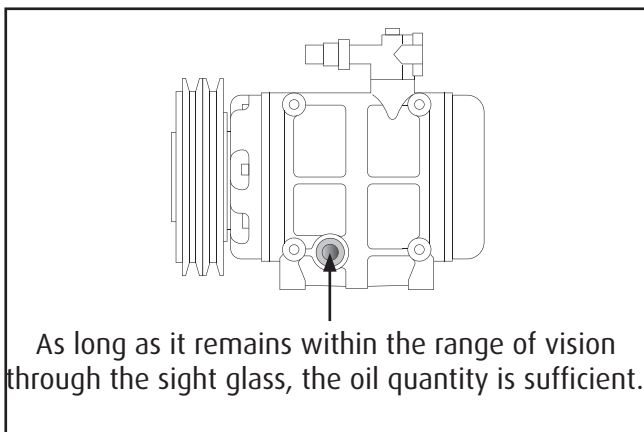
1. The oil must be free from dust, metal filings, etc.
2. Do not mix oils.
3. The moisture content must not exceed 1,000 ppm. (PAG oil only)
4. The oil easily absorbs moisture when the container is open. Therefore always seal the container immediately after use.

Oil quantity inspection

There is no particular need for frequent inspection or replacement, although it is recommended to check operating refrigerant pressures and oil levels at the start of the season.

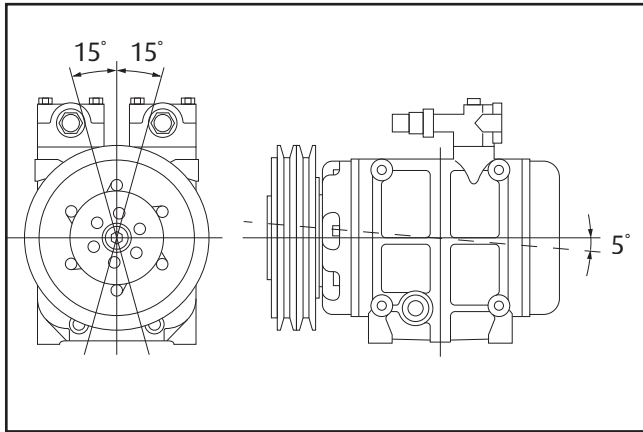
Please replace the refrigerant and restore the system oil and refrigerant charge to factory specifications if:

- the AC system is opened for repair or replacement of any component (e.g.: evaporator, condenser or receiver drier)
- any loss of charge - refrigerant or oil - is detected.



Oil level can be read through the sight glass of the compressor (see on the left).

3- Handling instructions



Oil level at inclination conditions

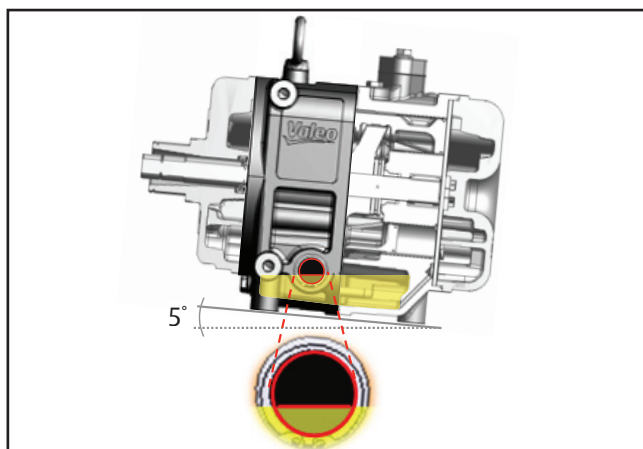
Compressor lateral inclination and front lifting at the same time are allowed so consider this factor during sight glass inspection (distorted indication).

Oil level inspection should be conducted at low compressor speed or compressor stopped. Sight glass cannot be used at high compressor speed because oil surface is not visible and a mixture of refrigerant and oil is formed.

A Flashlight can be helpful to expose oil surface: light up one of the sight glasses to read oil level at the opposite one.

CAUTION!

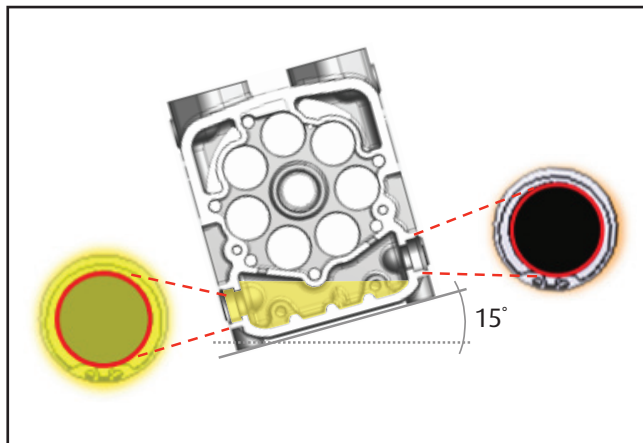
Be careful on rotating parts and high temperature parts.



Front Lifting

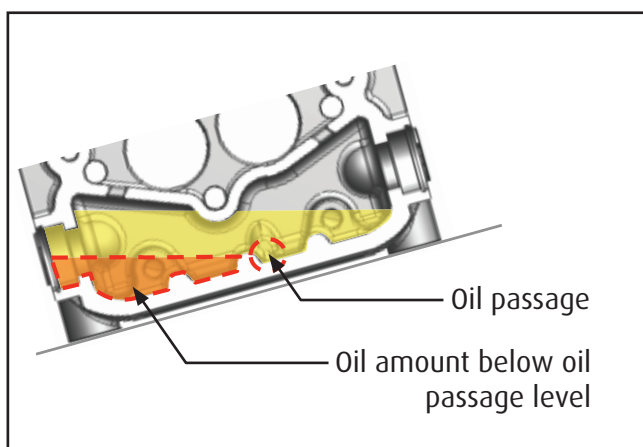
In most of bus rear application, the front end of the compressor is lifted to fit the inclination of the engine.

1. Oil level at sight glass: oil level is distorted.
2. Oil amount: quantity appears lower than recommended but the level is actually correct, you do not need to add more oil.

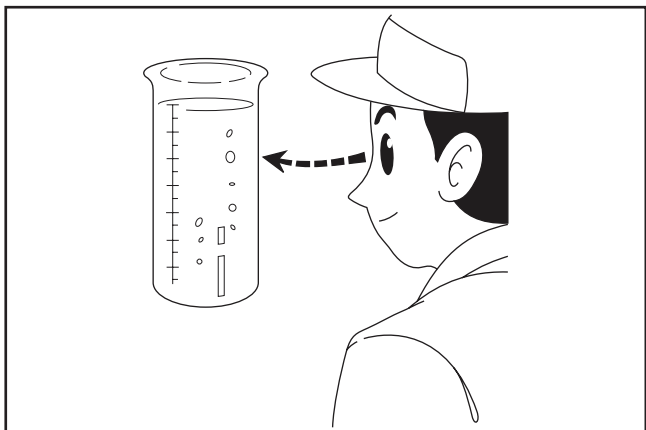


Lateral Inclination

1. Oil level at sight glass: one sight glass will look completely covered with oil while the other will look inferior to recommendation or even empty.
2. Oil amount: in this case, some of the oil is below oil passage level, therefore you should consider adding some oil to fill in the dead volume that appears in the illustration on the left.



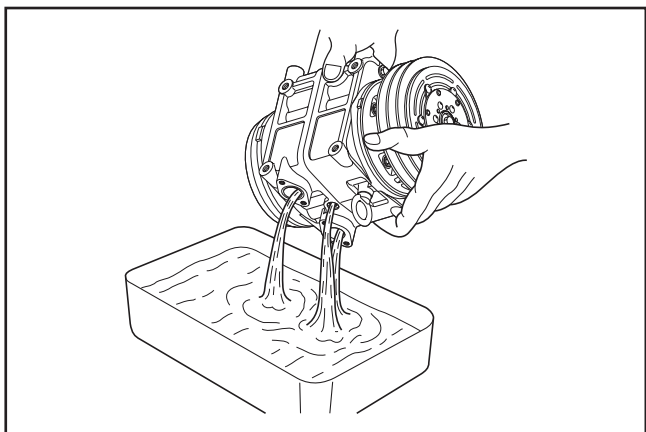
3- Handling instructions



Oil contamination

Unlike engine oil, no cleaning agent is added to the compressor oil. Even if the compressor is run for a long time, the oil never becomes turbid as long as there is nothing wrong with the compressor or its method of use. Inspect the extracted oil for any of the following.

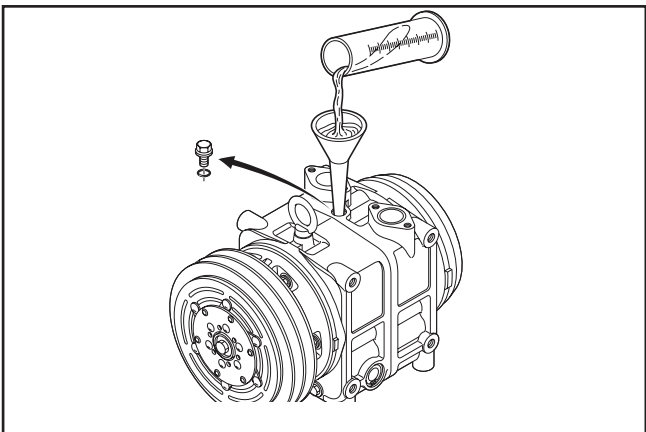
- Increased opacity of the oil.
- Color change to red
- Presence of foreign matter, metal filings, etc.



Oil check

The compressor oil must be checked as follows when being charged into a used system.

1. Perform the oil return operation (p.18).
2. Remove the compressor from the vehicle.
3. Remove the oil filler plug and drain the oil through the oil filler plug and the high and low pressure connectors.
4. Check the oil for contamination.
5. Fill the compressor with the specified amount of oil (p.20)



3- Handling instructions

unit: cm³ & cc

		Current Compressor is kept	Compressor is replaced
Factory oil charge	Amount recovered	Charging amount	Amount to remove from new compressor
1500	1000 or more	Same as recovered	1500 - (amount recovered)
	Under 1000	1000	500

unit: cu in

		Current Compressor is kept	Compressor is replaced
Factory oil charge	Amount recovered	Charging amount	Amount to remove from new compressor
91.5	61 or more	Same as recovered	61 - (amount recovered)
	Under 61	61	30.5

CAUTION!

The specified oil quantity differs, depending on the type of air conditioner system. A label describing the specified quantity is attached to the compressor. Additionally, all of the oil cannot be removed when draining the compressor as some remains as an oil film on the inside of the compressor and the system components. Therefore, refer to the table at left when recharging the compressor with oil. Excess oil adversely affects the cooling capacity and the compressor.

- Install the oil filler plug and tighten it to the specified torque.

Specified torque: 15 - 18 N·m
{1.5 - 1.8 kgf·m, 11 - 13 lbf·ft}

CAUTION!

The oil filler plug O-ring must be replaced with a new one.

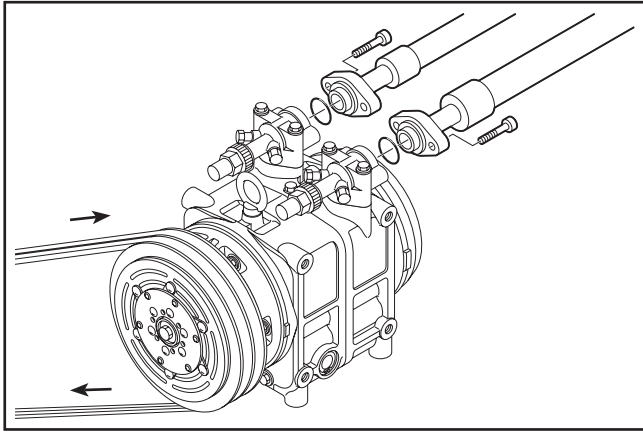
Replacement of components

When replacing the component parts of the system, supply the following amount of oil to the compressor.

Component mounted	Amount of oil
Evaporator	300 cm ³ (18.3 cu in)
Condenser	200 cm ³ (12.2 cu in)
Receiver drier	100 cm ³ (6.1 cu in)
Pipe or hose	100 cm ³ (6.1 cu in)

After installing these component parts, check the compressor oil. Refer to page 18.

3- Handling instructions



Running-in operation

Whenever moving parts have been replaced, it is necessary to run-in both the compressor and the magnetic clutch.

Compressor running-in

Reassembled compressors must be run-in after the leak test (see next page).

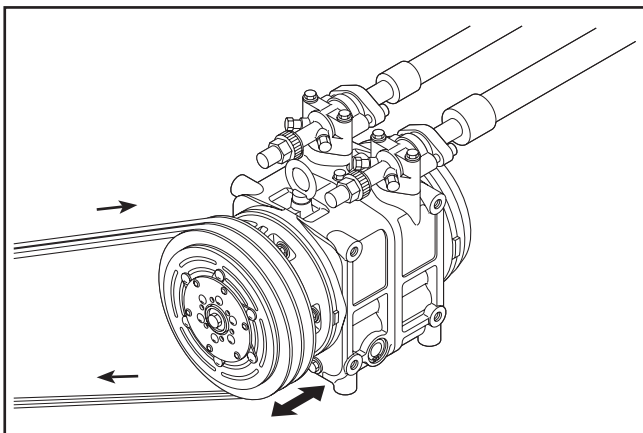
1. Check that the compressor contains the specific amount of oil.
2. Install the compressor on the test bench.
3. Install the high pressure connector and the low pressure connector to the ports and tighten the bolts to the specified torque.

**Specified torque: 25 - 32 N·m
{2.5 - 3.3 kgf·m, 18 - 24 lbf·ft}**

4. Connect the two connector ports using a flexible hose.
5. Run the compressor at 1,000 rpm for at least 30 minutes.
6. Replace the oil.
7. Repeat the leak test.

CAUTION!

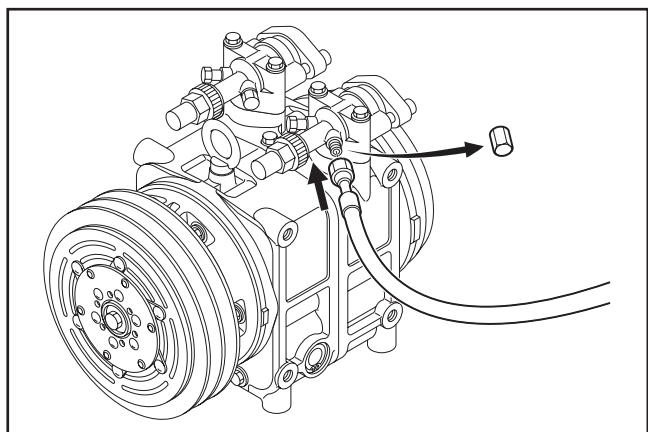
While the compressor is being run-in in step 5 above, check the outside temperature of the front head. If the temperature exceeds 80°C (176°F), stop the running-in operation. Resume the operation when the head has cooled.



Magnetic clutch running-in

1. Install the clutch on the compressor.
2. Install the compressor on the test bench, and operate the compressor by running the system.
3. Maintain the compressor speed at 700 rpm. Operate the A/C switch through the ON/OFF cycle at least 50 times ("ON" for 10 seconds and "OFF" for 10 seconds).

3- Handling instructions



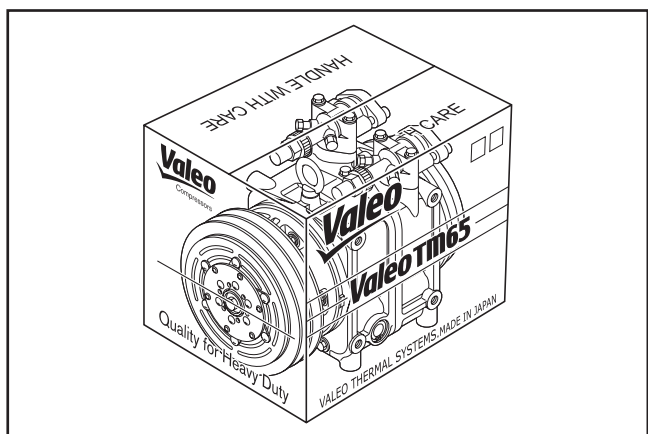
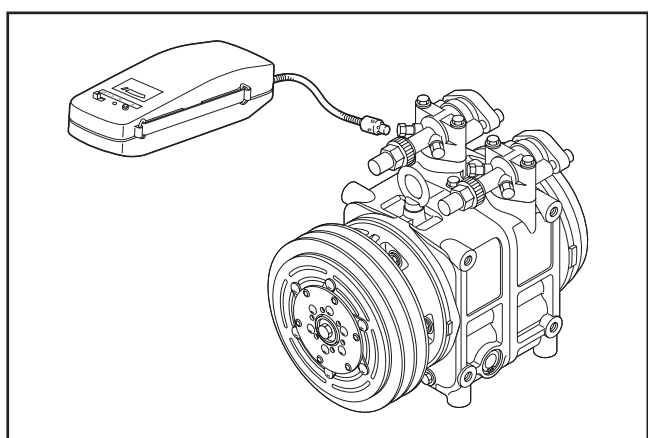
Leak test

The compressor must be checked for refrigerant leaks after it is repaired. The procedure is as follows.

1. Fit the connectors to the suction and discharge connections, and tighten it to the specified torque.

**Specified torque: 25 - 32 N·m
{2.5 - 3.3 kgf·m, 18 - 24 lbf·ft}**

2. Fill the compressor with refrigerant through the suction side, raising the refrigerant pressure to at least 0.39 MPaG {5 kgf/cm², 56.3 psig}.
3. Check the compressor for leaks using a leak detector.



Storing a repaired compressor

If it is necessary to store a repaired compressor for some time before installation, evacuate the compressor and fill it with dry nitrogen gas through the suction fitting to raise the pressure to 30 ~ 100 kPa {0.3 - 1.0 kgf/cm², 4.4 - 14.5 psi}.

4- Troubleshooting

Compressor troubleshooting

When a trouble occurs during the compressor operation, it is often difficult to pinpoint exactly the cause of the malfunction.

As long as the compressor maintenance is done correctly, there should not be any problem throughout the whole vehicle life, but in case it ever happens, we hope this troubleshooting can help you solve the issue efficiently.

Below are listed most of the troubles you may encounter while the A/C is ON.

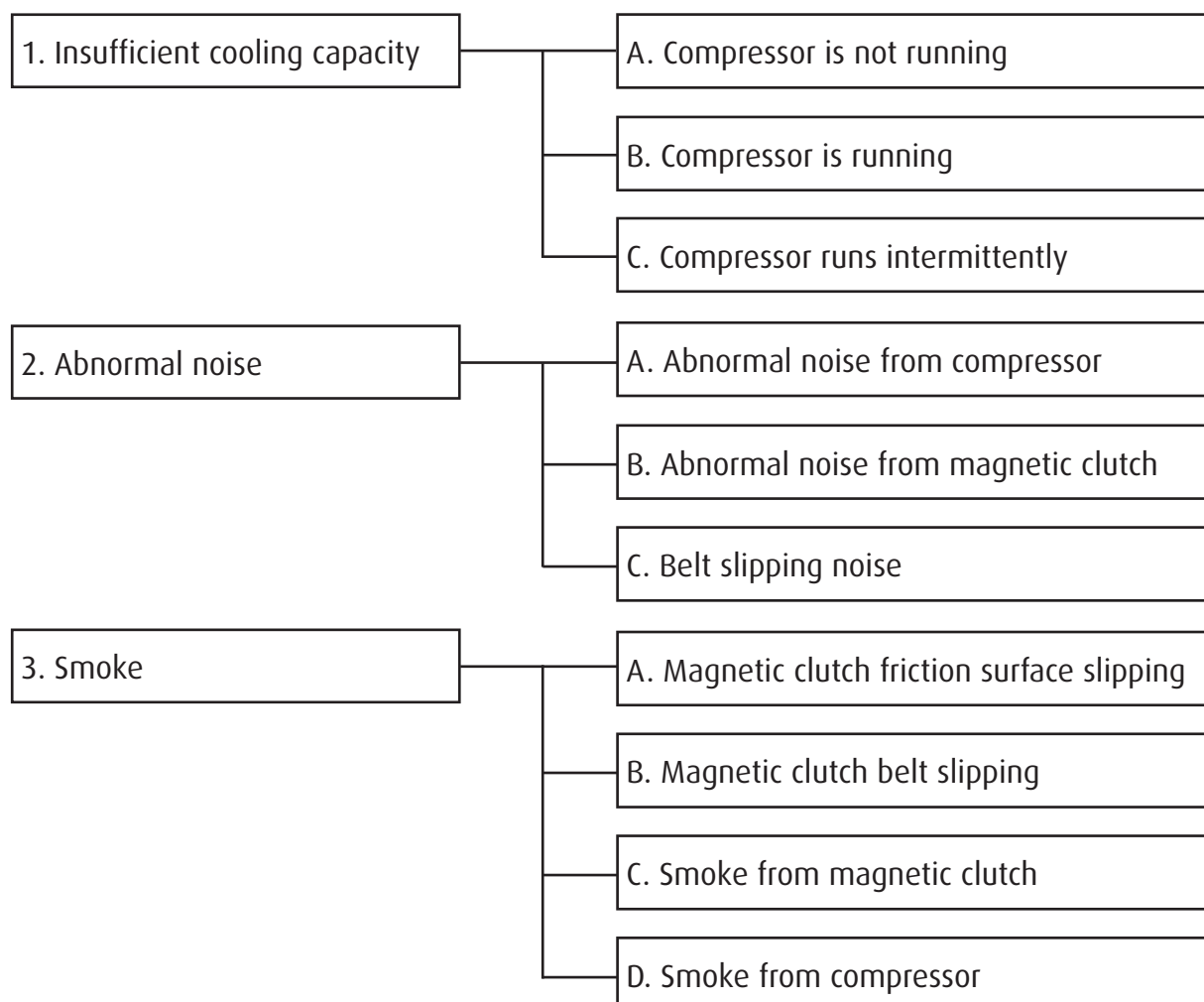
Please refer to the compressor troubleshooting tree to localize the malfunction symptom, then look at the table (p.24 - 25) for the appropriate measure.

Most of the malfunction symptoms can be classified in the following categories:

1. Insufficient cooling capacity
2. Abnormal noise
3. Smoke

In case of insufficient cooling capacity, we recommend that you prepare a gauge manifold to measure the pressure of both discharge and suction sides (for a detailed diagnosis by gauge pressure, see p.26 - 27).

Compressor troubleshooting tree



4- Troubleshooting

1. Insufficient cooling capacity

	Trouble	Symptom	Possible cause	Measure
A	Compressor is not running (No cool blow coming out)	Magnetic clutch slips when turning on the A/C switch	Compressor internal part damage	Replace the compressor
		Low pressure cut switch operate (see p.26 - 27)	Refrigerant shortage	Fix the refrigerant leakage then fill with refrigerant until having the right amount
		The magnetic clutch slips or does not engage when the compressor runs	Lead wire short circuit or wiring connector not seated properly	Replace the lead wire if it is defective
			Magnetic clutch damage	Repair or replace the magnetic clutch
			Magnetic clutch air gap too wide	Adjust air gap or replace magnetic clutch
			Low magnetic clutch voltage	Charge battery
		The magnetic clutch engages but the armature does not rotate	Belt slipping	Replace the compressor if it is locked
		Belt run off the pulley	Compressor internal part damage or magnetic clutch damage	Replace the compressor or the magnetic clutch
Center bolt is loose / Center bolt is missing	Bolt drop off/ Armature drop off	Replace magnetic clutch		
B	Compressor is running (No cool blow coming out)	Compressor is running normally	Poor compression	Replace the compressor
		No difference of temperature between discharge side and suction side (see p.26 - 27)	Refrigerant shortage	Fix the refrigerant leakage then fill with refrigerant until having the right amount
		The magnetic clutch slips or does not engage when the compressor is running	Magnetic clutch friction surface slipping	Charge the battery or replace the magnetic clutch
			Loose connection of the magnetic clutch electrical circuit	Replace the magnetic clutch after making sure it is defective
		Belt slipping	Magnetic clutch belt slipping	Belt tension readjustment
		The magnetic clutch does not engage	Defective sensor	Replace the sensor after making sure it is defective
C	Compressor runs intermittently (Cool blow comes out only from time to time)	Both discharge and suction pressures are high	Excess of refrigerant	Reduce the refrigerant charge until reaching the right amount
			Condenser fan failure	Replace the condenser after making sure it is defective
		The magnetic clutch slips or does not engage when the compressor is running	Loose connection of the magnetic clutch electrical circuit	Replace the magnetic clutch after making sure it is defective
		The magnetic clutch does not engage	Defective sensor	Replace the sensor after making sure it is defective

4- Troubleshooting

2. Abnormal noise

	Trouble	Symptom	Possible cause	Measure
A	Abnormal noise from the compressor	Abnormal vibration after turning on the A/C switch	Compressor installation bolt is loose	Increase tightening torque of the loose bolts
			Wide gap at the attaching portion between the compressor and the bracket	Improve the compressor attaching portion
		Abnormal noise from the compressor body	Compressor body internal component damage	Replace the compressor
B	Abnormal noise from the magnetic clutch	The magnetic clutch has a backlash and slips	Magnetic clutch damage	Replace the magnetic clutch
		Strange noise when the magnetic clutch engages	Air gap too wide	Adjust air gap or replace magnetic clutch
		Armature slips / does not engage when the compressor is running	Magnetic clutch friction surface slipping	Charge battery or replace magnetic clutch
C	Abnormal noise from the magnetic clutch	Armature does not rotate when magnetic clutch engages	Belt slipping	Replace the compressor if locked. Readjust the belt tension if the belt is loose

3. Smoke

	Trouble	Symptom	Possible cause	Measure
A	Magnetic clutch friction surface slipping	The magnetic clutch slips / does not engage when the compressor is running	Magnetic clutch air gap too wide	Adjust air gap or replace magnetic clutch
			Low magnetic clutch voltage	Charge battery
			Magnetic clutch friction surface is greasy	Clean friction surface or replace magnetic clutch
B	Magnetic clutch belt slipping	The magnetic clutch slips / does not engage when the compressor is running	Belt alignment is not correct	Adjust the compressor installation position
			Magnetic clutch belt is greasy	Clean or replace the belt
			Magnetic clutch belt tension is loose	Adjust belt tension
C	Smoke from the magnetic clutch	The magnetic clutch does not engage	Coil open or shorted	Replace the magnetic clutch
D	Smoke from the compressor	Refrigerant / oil is billowing out	Refrigerant leaking, uncoupled piping or piping burst	Fix the refrigerant leakage then fill with refrigerant until having the right amount

4- Troubleshooting

A/C cycle diagnosis by gauge pressure

Following is a diagnosis procedure to connect gauge manifold to A/C cycle, measure suction and discharge pressures and analyze the defects of the cycle.

Operation conditions of the A/C cycle for pressure measuring:

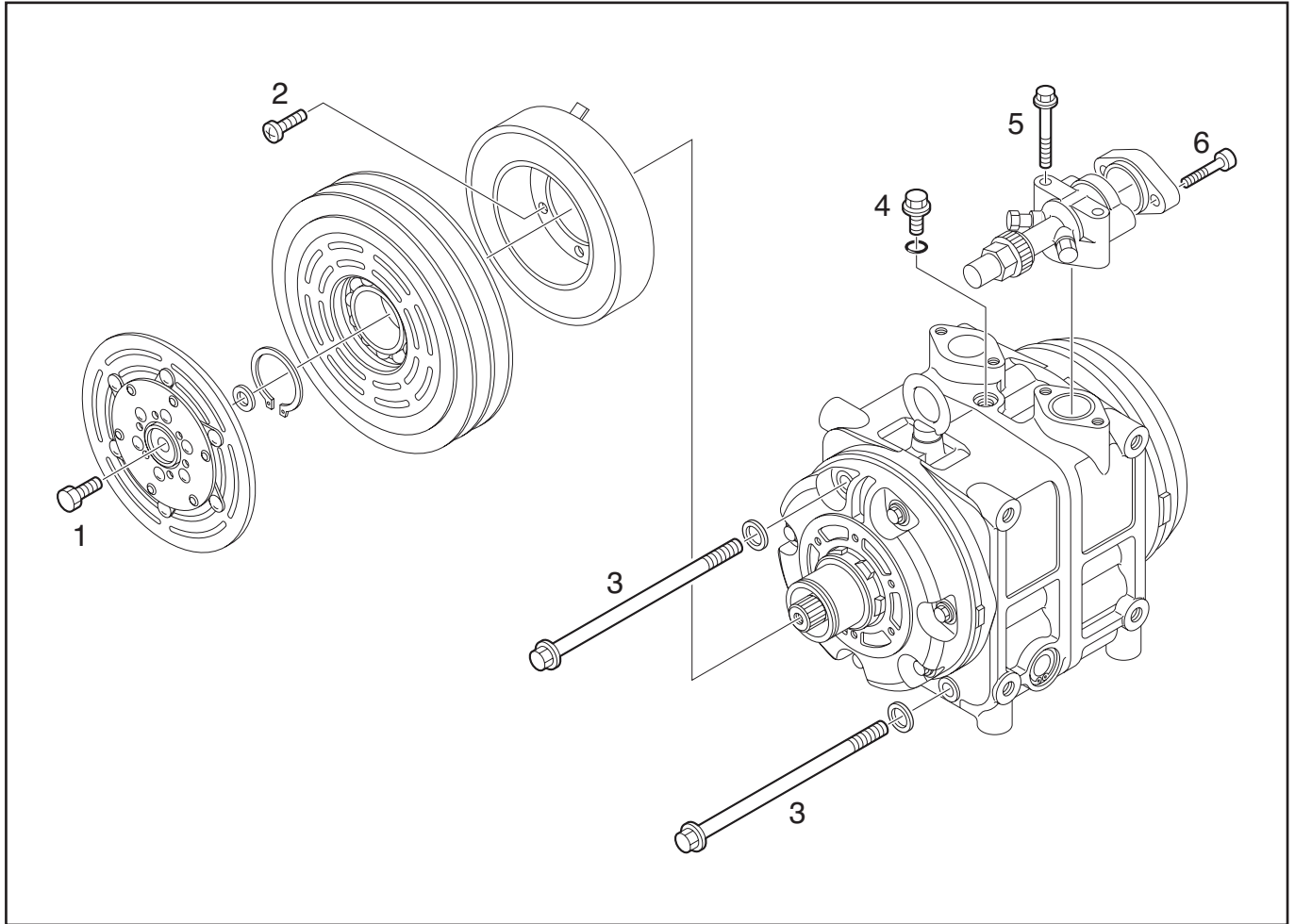
1. Ambient temperature: 30 - 35 °C
2. Engine speed: 1.500 rpm
3. A/C switch: ON
4. Blower speed: high
5. Temperature control: full cold

Gauge pressure indication	Cause	Confirmation method	Action to take
Pressure is normal	A/C cycle operates normally. If there is any defect (poor cooling performance), there shall be another cause <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> Discharge pressure: around 0.9 - 1.6 MPaG (10 - 17 kgf/cm²) Suction pressure: around 0.03 - 0.10 MPaG (1.3 - 2.0 kgf/cm²) </div>		
Both discharge and suction pressures are low <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> Suction pressure becomes vacuum </div>	Refrigerant shortage	Connect gauge manifold to cycle	Recover refrigerant, then refill with the right amount of refrigerant
	Receiver dryer is clogged	Temperature difference between inlet and outlet pipes happens. Dryer is covered with frost	Replace parts
	Expansion valve is clogged	Expansion valve was covered with frost	Clean or replace part
	Enclosure leakage from TXV temperature sensing tube. (TXV operates to close the valve opening)	Outlet side of TXV is not cooling. (Low side of gauge indicates vacuum)	Replace part
	Temperature sensing device at outlet air is defective	Evaporator becomes frozen up	Adjust or replace the part
	Refrigerant piping is clogged or crashed	If any part between the dryer and the compressor is clogged or crashed, the low side pressure becomes vacuum	Adjust or replace the part

4- Troubleshooting

Gauge pressure indication	Cause	Confirmation method	Action to take
Both discharge and suction pressures are high	Excess of refrigerant	Connect gauge manifold to cycle	Recover refrigerant, then refill with the right amount of refrigerant
	Condenser cooling malfunction	Condenser becomes muddy and fins are clogged and collapsed. Defect of cooling fan rotation. Malfunction of fan motor for condenser.	Clean up, hand repair of fin and replacement
	Misaligned TXV or thermal sensing tube of TXV is not fit on regularly. (Excess opening of TXV)	Defective refrigerant flow control, the thermal sensing tube is not closely in contact with the evaporator pipe	Adjustment or replacement
	Air mixed in refrigeration cycle	Just after compressor stops, discharge pressure will come down immediately to 0.19 - 0.29 MPaG (3 - 4 kgf/cm ²)	Evacuate air from cycle, the charge with the adequate amount of refrigerant.
Discharge pressure is high and suction pressure is low	Refrigerant cycle is clogged between compressor and condenser	Appreciable temperature difference at the clogged location	Clean up inside the cycle or replace the part
Discharge pressure is low and suction pressure is high	Defect of the compressor valve or gasket	Discharge and suction pressures balance immediately after the compressor stops. (Defective compression of compressor)	Replace the compressor

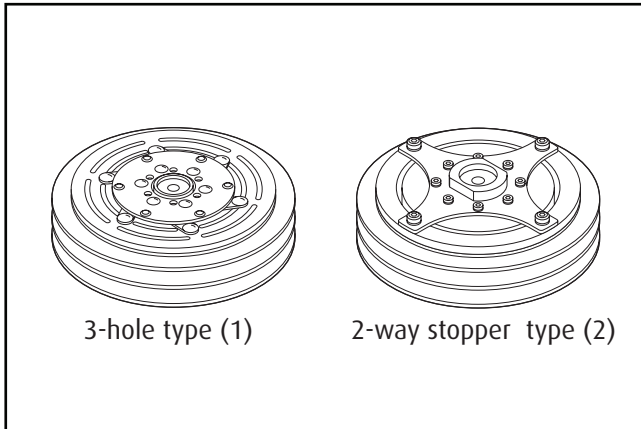
5- Tightening torques



Unit: N·m {kgf·m, lbf·ft}

Part	Thread size	Tightening torque
1. Center bolt	M10 x 1.25	25 - 30 {2.5 - 3.1, 18 - 22}
2. Field coil screw	M6 x 1.0	4.2 - 7.2 {0.4 - 0.7, 3.1 - 5.3}
3. Bolt	M10 x 1.5	25 - 32 {2.5 - 3.3, 18 - 24}
4. Oil filler plug	M10 x 1.5	15 - 18 {1.5 - 1.8, 11 - 13}
5. Connector bolt	M10 x 1.5	25 - 32 {2.5 - 3.3, 18 - 24}

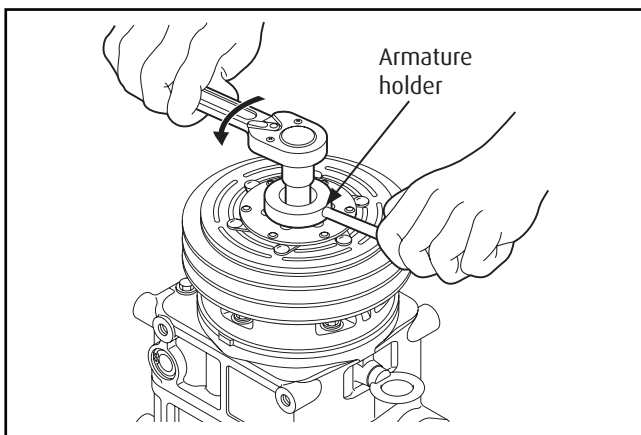
6- Service procedures - Magnetic clutch



Magnetic clutch

Removal

1. Check your armature type (see at left):
 - 3-hole type (1)
 - 2-way stopper type (2)

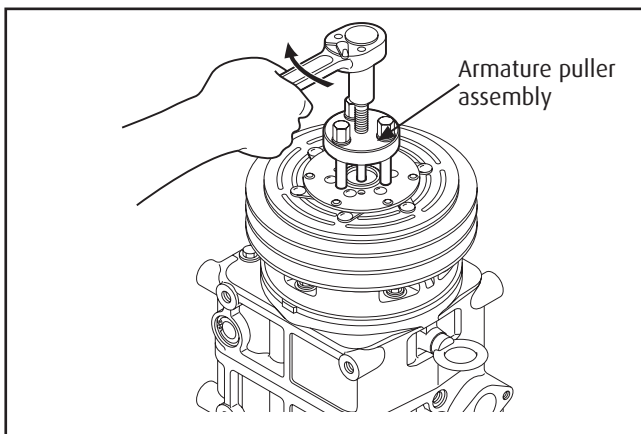


2. Remove the armature.

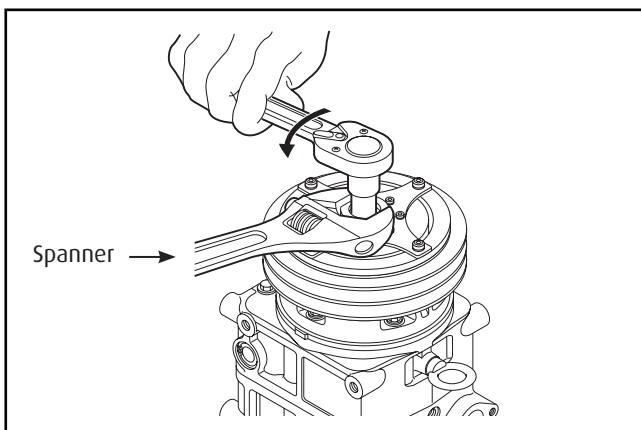
CAUTION!

The armature removal process differs according to the armature type

- If it is a 3-hole type armature (1)
 - a. Remove the center bolt using an armature holder to prevent armature assembly rotation.

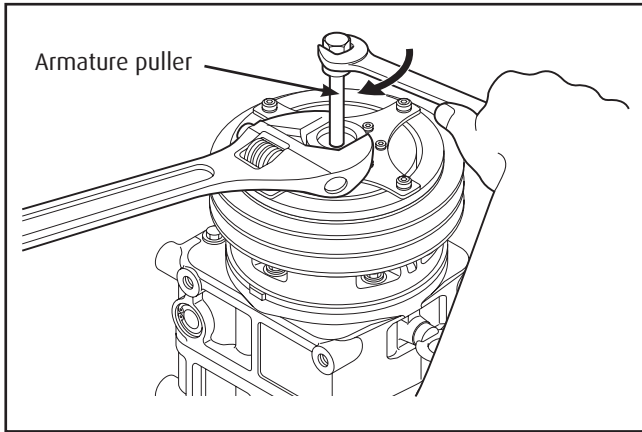


- b. Remove the armature assembly using an armature puller assembly. Remove the shims from the compressor driveshaft or armature assembly.

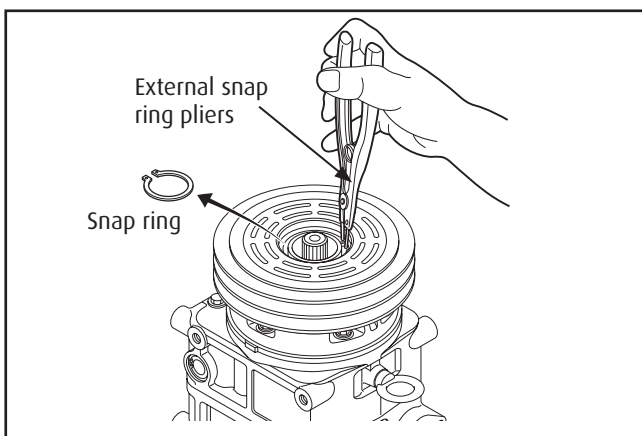


- If it is a 2-way stopper type armature (2)
 - a. Remove the center bolt using a spanner to prevent armature assembly rotation.

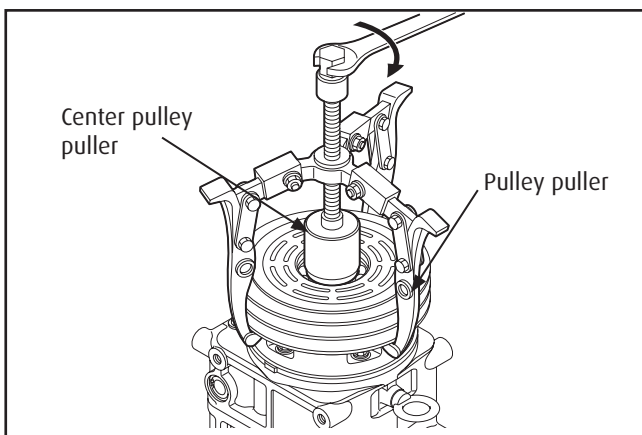
6- Service procedures - Magnetic clutch



- b. Remove the armature assembly using an armature puller. Remove the shims from the compressor driveshaft or armature assembly.



3. Remove the snap ring (Z0010244) using external snap ring pliers.



4. Position the center pulley puller at the end of the driveshaft.
5. Attach a suitable pulley puller to the pulley. Hook the puller claws to the edge of the pulley as shown.
6. Tighten the center pulley puller bolt to remove the pulley.

7. Remove the six field coil/compressor screws. Then remove the field coil.

WARNING!

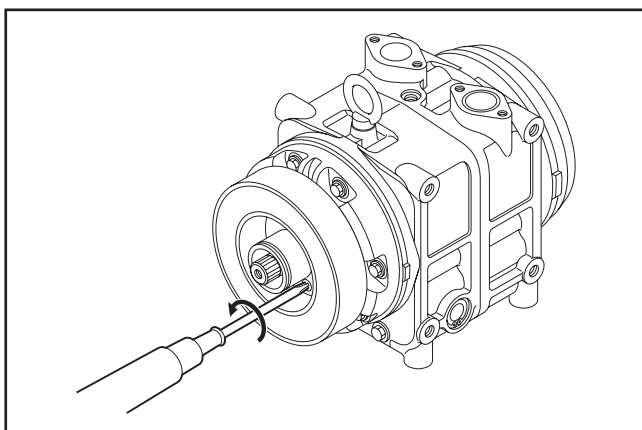
Removing the pulley will systematically damage the pulley bearing.

CAUTION!

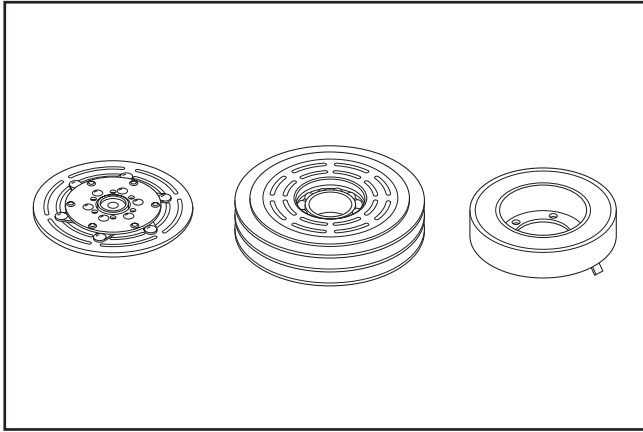
Do not clip the puller claws into the pulley groove to prevent pulley groove damage.

CAUTION!

Do not hold the field coil by the harness.



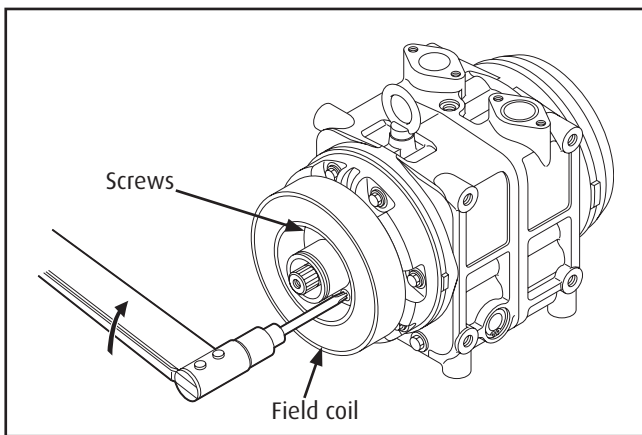
6- Service procedures - Magnetic clutch



Magnetic clutch

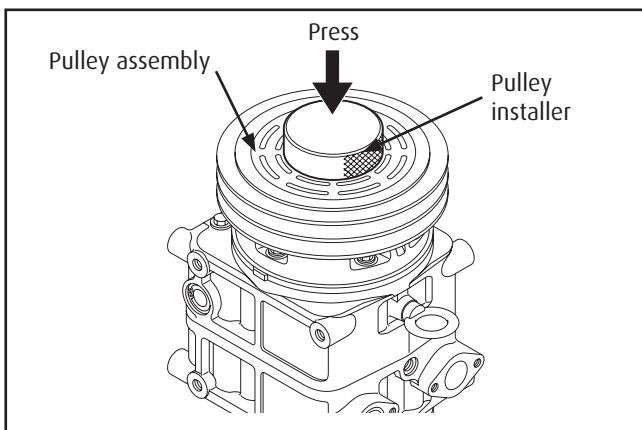
Inspection

1. If the contact surface has been damaged by excessive heat, the armature and pulley must be replaced.
2. Check the appearance of the pulley assembly. If the contact surface of the pulley is excessively grooved due to slippage, both the pulley and armature must be replaced. The contact surface of the pulley assembly must be cleaned with a suitable solvent before reinstallation.
3. Check the field coil for a loose connector or cracked insulation.



Installation

1. Install the field coil on the compressor (with the harness on top) and tighten the mounting screws to the specified torque.
Specified torque: 4.2 - 7.2 N·m
{0.4 - 0.7 kgf·m, 3.1 - 5.3 lbf·ft}
2. Carefully place the wire harness/strain relief.

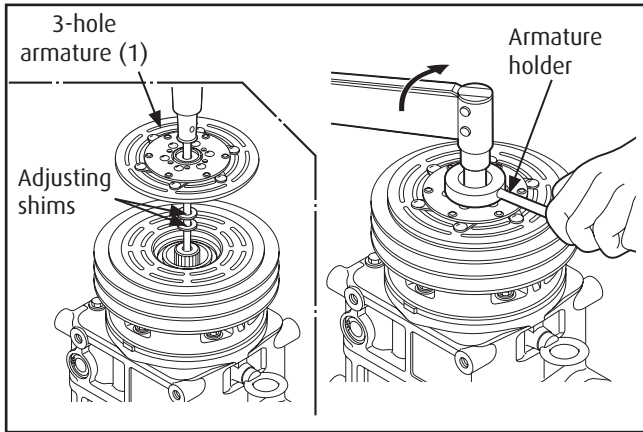


- If you are using a press
3. Install the pulley assembly using the pulley installer and the press.

CAUTION!

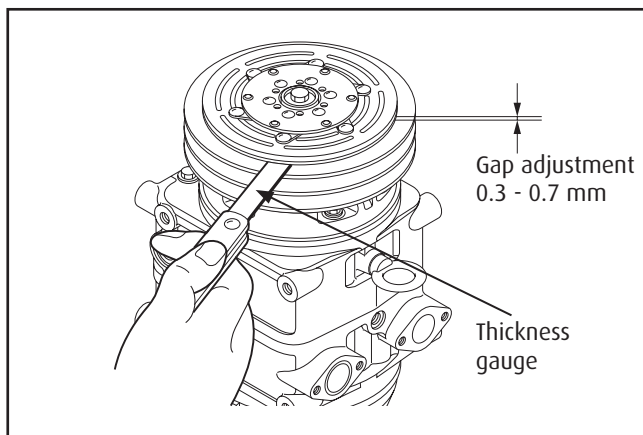
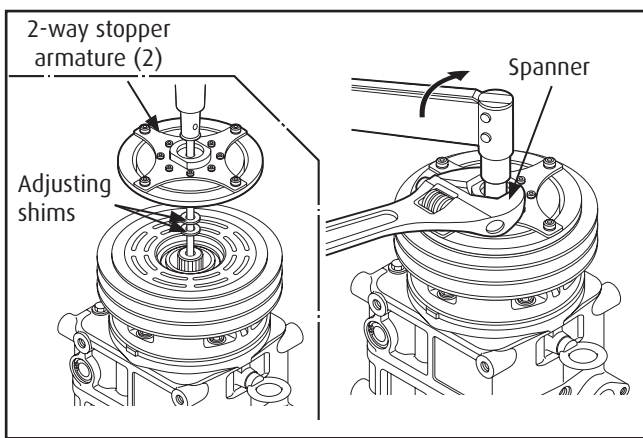
Use only a press to install the pulley assembly. Do not use a hammer. The use of a hammer may result in damage or deformation.

6- Service procedures - Magnetic clutch



4. Install the armature assembly on the driveshaft together with the original shim(s) and press it down.
5. Install the armature bolt and tighten it to the specified torque using an armature holder (for 3-hole armature) or a spanner (for 2-way stopper armature) to prevent armature assembly rotation.

Specified torque: 25 - 30 N·m
{2.5 - 3.1 kgf·m, 18 - 22 lbf·ft}



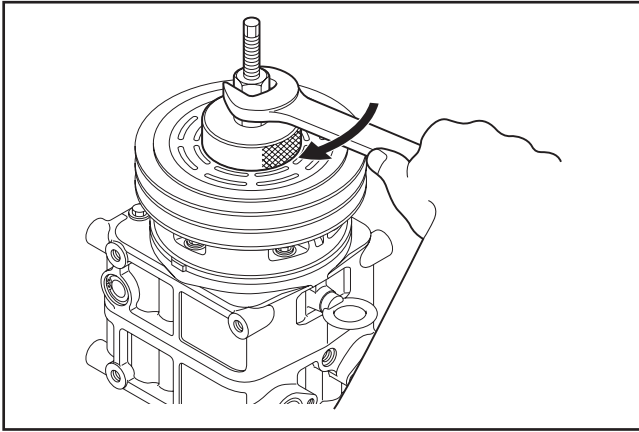
6. Check that the clutch clearance is as specified. If necessary adjust the clearance using shim(s). Adjusting shims are available in the following thicknesses:

Shim Part No.	Thickness
Z0010245	0.2 mm {0.008 in}
Z0010246	0.3 mm {0.012 in}

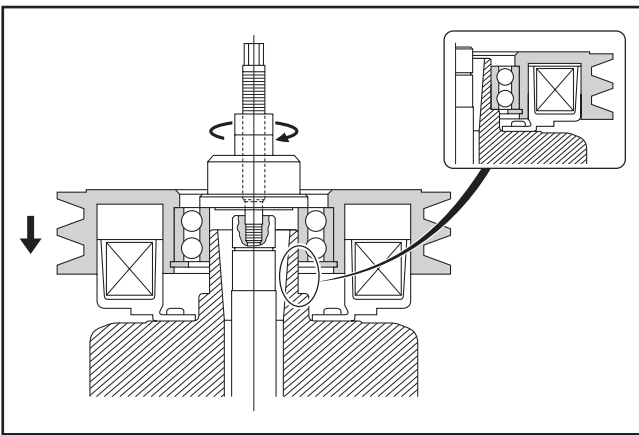
Specified clearance: 0.3 - 0.7 mm
{0.012 - 0.028 in}

8. Run in the clutch as described on page 21.

6- Service procedures - Magnetic clutch

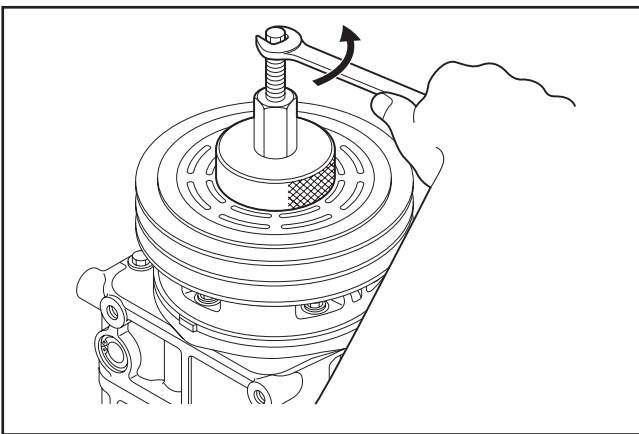


- If you are not using a press
3. Install the pulley using a pulley installer assembly and a spanner.

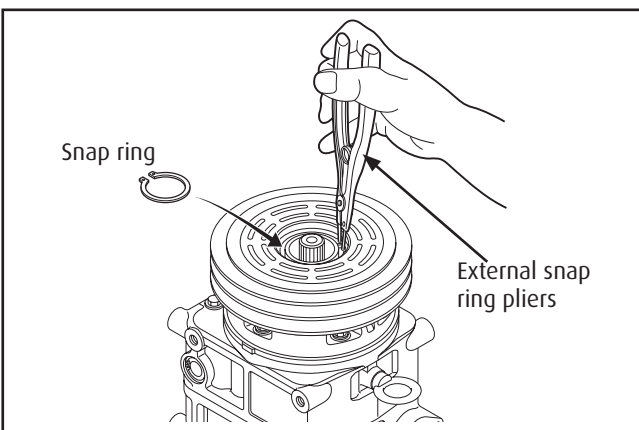


CAUTION!

If the bolt of the pulley installer assembly is not screwed into the driveshaft, it may result in damage.

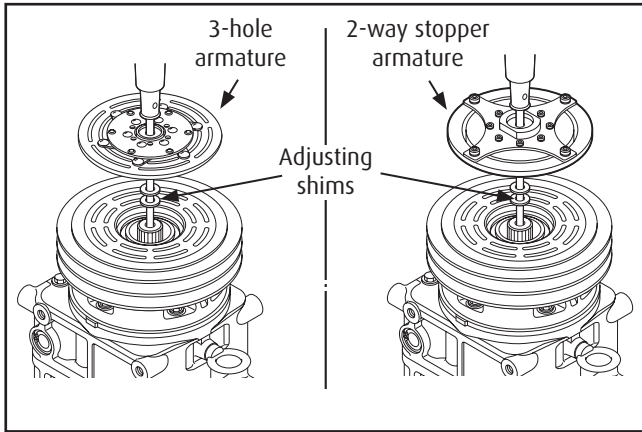


4. Once the pulley is fixed, loose the collar and remove the pulley installer assembly.

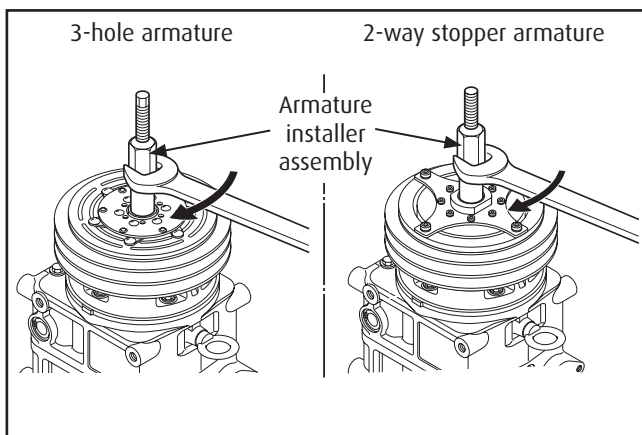


5. Install the snap ring (beveled edge up) using external snap ring pliers.

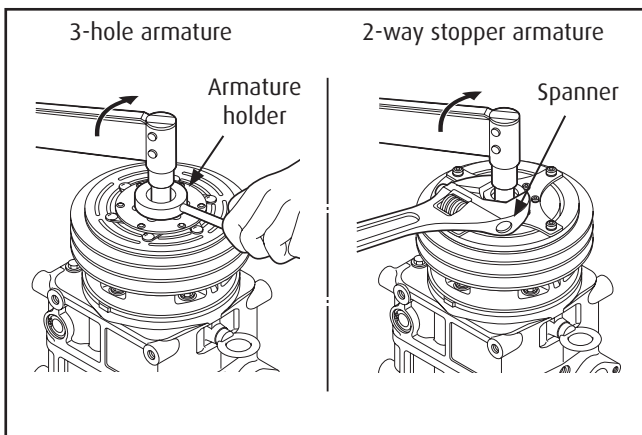
6- Service procedures - Magnetic clutch



6. Install the armature assembly on the driveshaft together with the original shim(s).

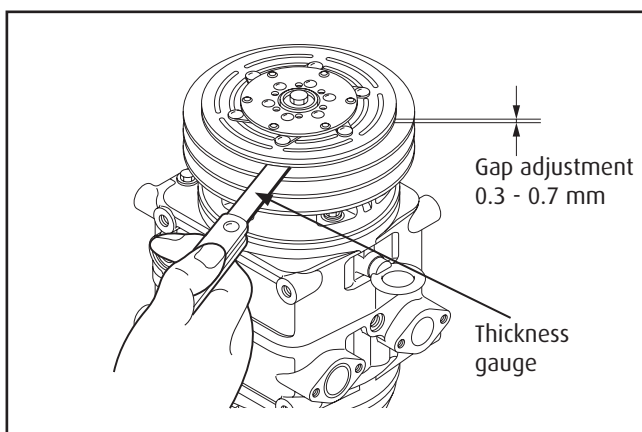


7. Install the armature assembly using an armature installer assembly.



8. Install the armature bolt and tighten to the specified torque using an armature holder or a spanner to prevent armature assembly rotation.

Specified torque: 25 - 30 N·m
{2.5 - 3.1 kgf·m, 18 - 22 lbf·ft}



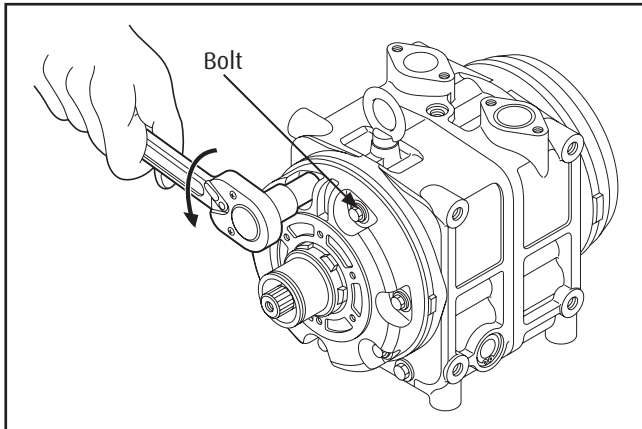
9. Check that the clutch clearance is as specified. If necessary adjust the clearance using shim(s). Adjusting shims are available in the following thicknesses:

Shim Part No.	Thickness
Z0010245	0.2 mm {0.008 in}
Z0010246	0.3 mm {0.012 in}

Specified clearance: 0.3 - 0.7 mm
{0.012 - 0.028 in}

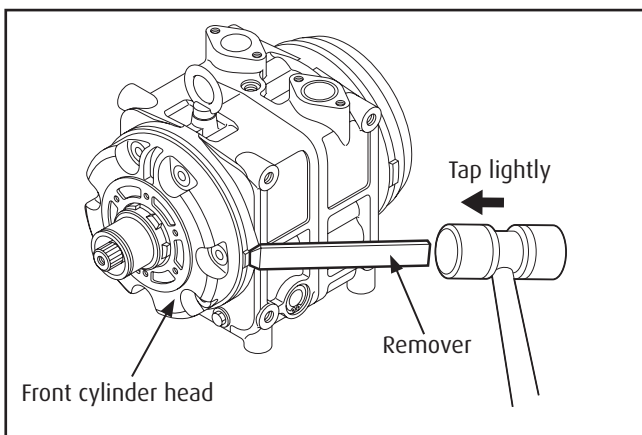
8. Run in the clutch as described on page 21.

7- Service procedures - Shaft seal assembly

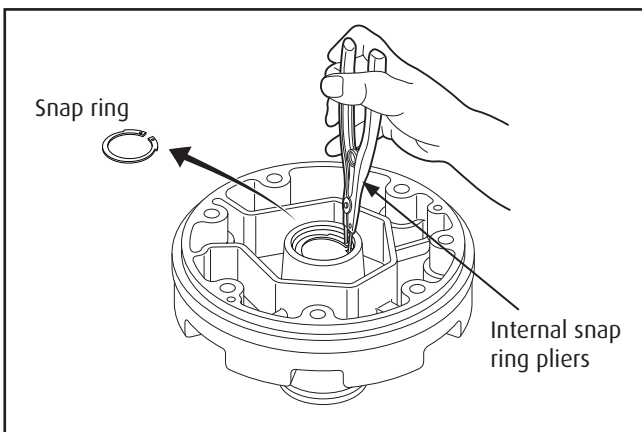


Removal

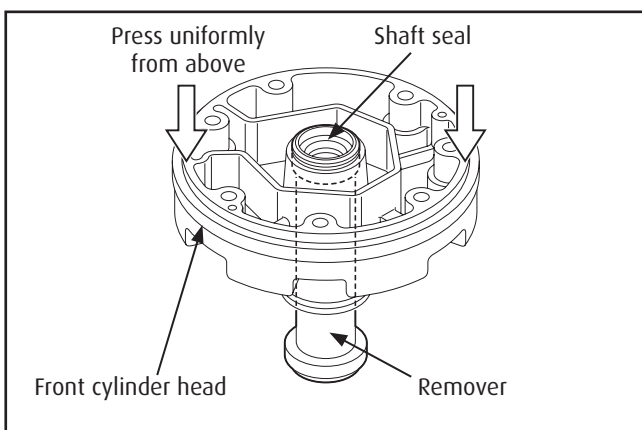
1. Remove the magnetic clutch assembly as described on page 29.
2. Remove the bolts securing the connectors, and then remove the connectors and strainer from the cylinder shaft assembly.
3. Remove the oil filler plug and then drain the oil.
4. Remove the seven bolts securing the head using an hexagon (14 mm) wrench.



5. Alternately tap the two projections on the front head using a remover and a mallet to remove the front cylinder head.

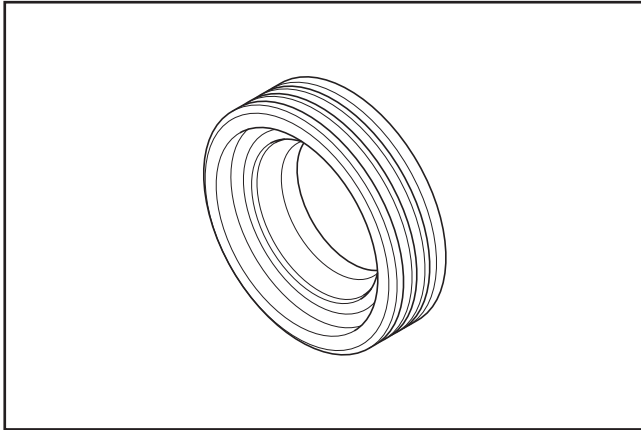


6. Remove the snap ring using the internal snap ring pliers.



7. Remove the shaft seal assembly using a remover.

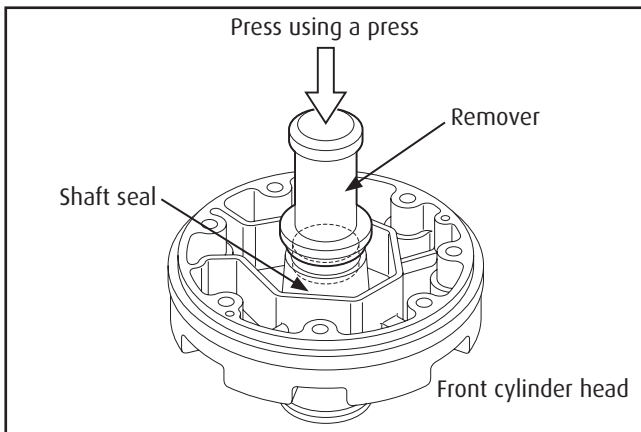
7- Service procedures - Shaft seal assembly



Inspection

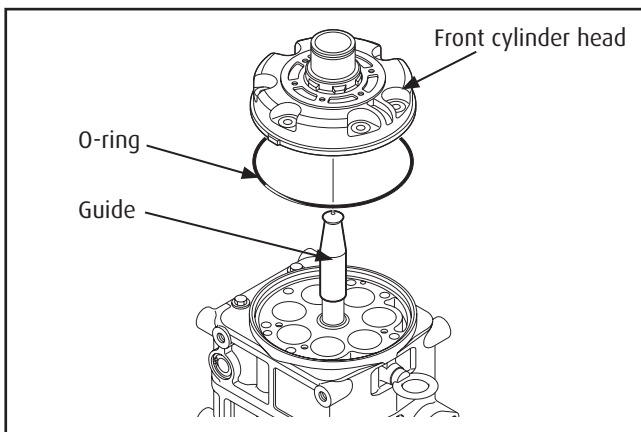
The shaft seal must not be reused.

Always use a new shaft seal when reassembling the compressor. Ensure that the seal seat is free from lint and dirt that could damage the shaft seal lip.



Installation

1. Clean the portion of the front cylinder head where the shaft seal is to be assembled.
2. Assemble the shaft seal on the remover.
3. Coat the shaft seal well with compressor oil and install the shaft seal in the front cylinder head with the shaft seal remover.
4. Install the snap ring using the internal snap ring pliers.



5. Position the guide on the shaft
6. Coat the new O-ring with clean compressor oil and install it in the front cylinder head
7. Install the front cylinder head

CAUTION!

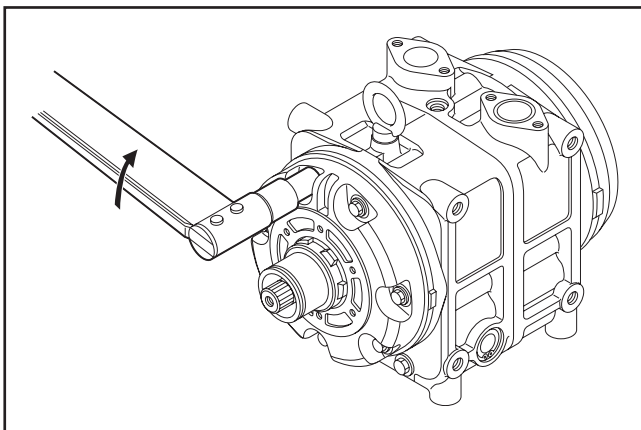
Align the pins and tap the head lightly and evenly with a plastic hammer.

8. Remove the guide
9. Install the seven bolts from the front cylinder head side and tighten them to the specified torque:

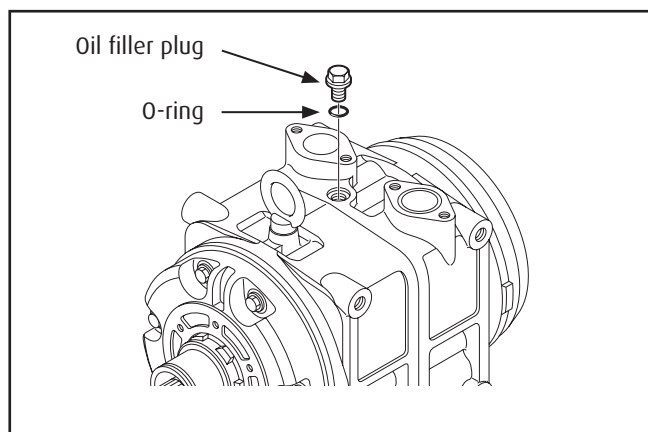
**Specified torque: 25 - 32 N·m
{2.5 - 3.3 kgf·m, 18 - 24 lbf·ft}**

Tighten each bolt gradually (in three or more stages) to ensure the specified torque.

10. Turn the drive shaft 2, 3 times by hand to ensure that the shaft rotates smoothly.



7- Service procedures - Shaft seal assembly



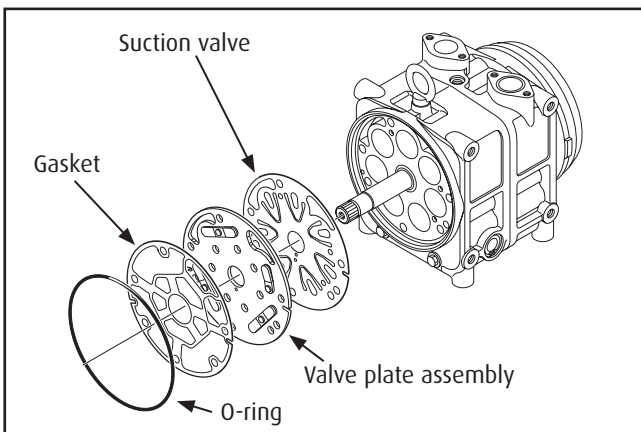
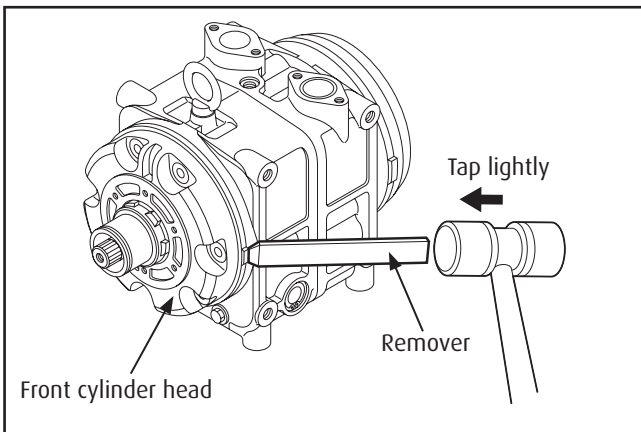
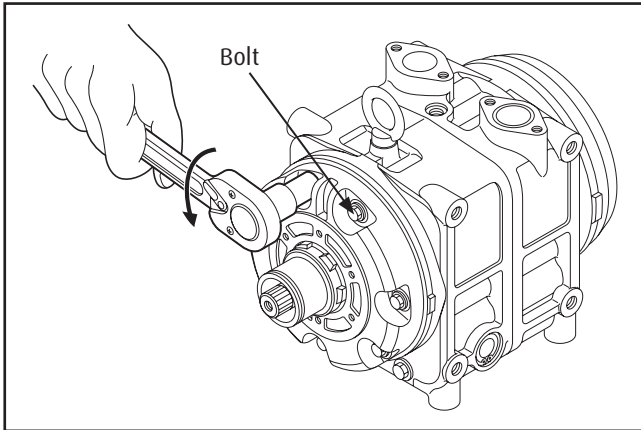
11. Fill the compressor with the specified amount of clean compressor oil through the oil filler.
12. Install the oil filler plug with a new O-ring, and tighten it to the specified torque:
Specified torque: 15 - 18 N·m
{1.5 - 1.8 kgf·m, 11 - 13 lbf·ft}
13. Install the strainer in the suction port.
14. Fit the blanking plates/connectors to the suction and discharge connections, and tighten them to the specified torque:
Specified torque: 25 - 32 N·m
{2.5 - 3.3 kgf·m, 18 - 24 lbf·ft}
15. Install the magnetic clutch as described on page 31.
16. Run in the compressor as described on page 21.
17. Perform the leak test as described on page 22.

8- Service procedures - Cylinder heads

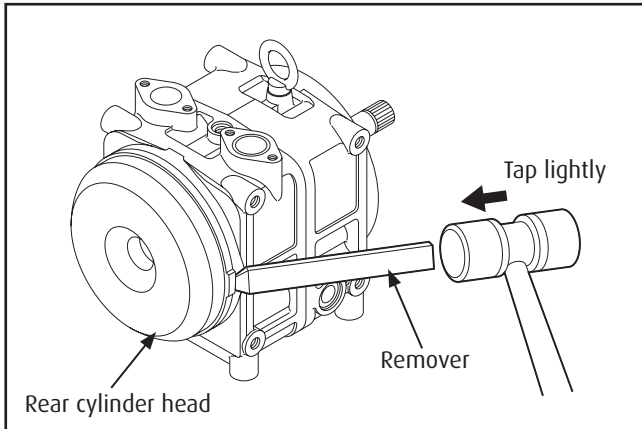
Cylinder heads (Front & Rear)

Disassembly

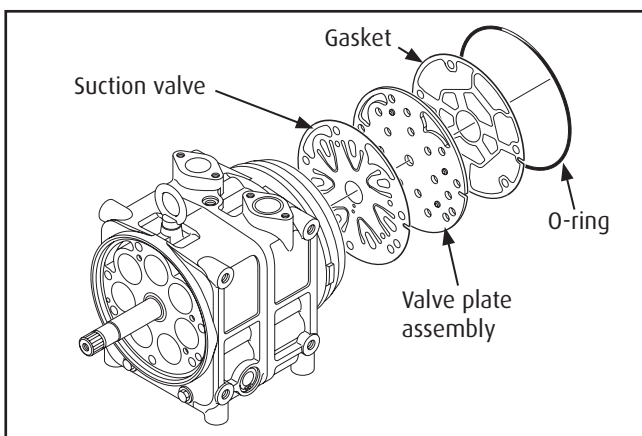
1. Remove the magnetic clutch assembly as described on page 29.
2. Remove the four bolts securing the connectors, and then remove the connectors and strainer from the cylinder shaft assembly.
3. Remove the oil filler plug and then drain the oil.
4. Remove the seven bolts securing the heads.
5. Alternately tap the two projections on the front head using the remover and mallet to remove the front cylinder head.
6. Remove the front valve plate assembly and then the suction valve (in that order).
7. Remove and discard the O-ring from the front cylinder head.
8. Remove all gasket material from the front cylinder head and the front valve plate.



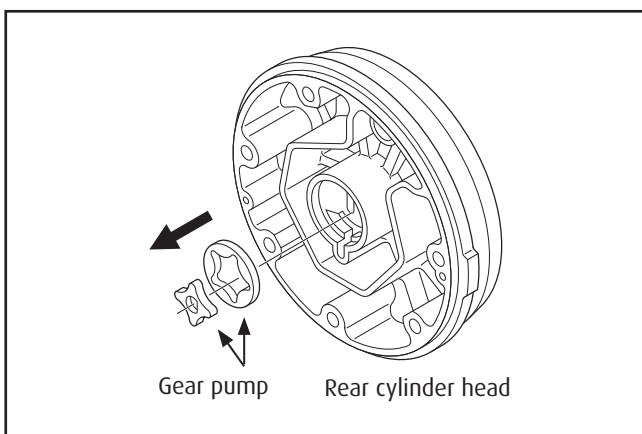
8- Service procedures - Cylinder heads



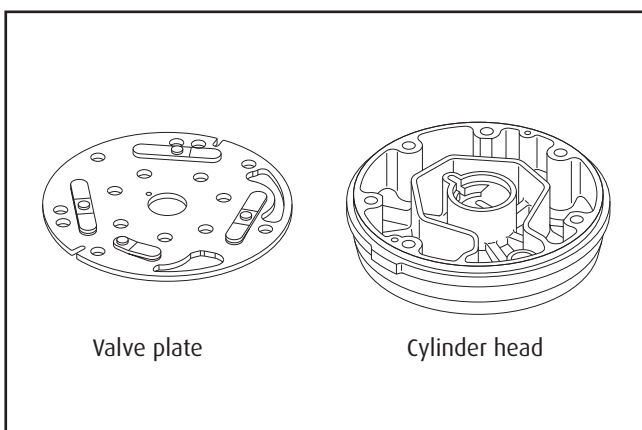
9. Alternately tap the two projections on the rear head using the remover and mallet to remove the rear cylinder head.



10. Remove the rear valve plate assembly and then the suction valve (in that order).
11. Remove and discard the O-ring from the rear cylinder head.
12. Remove all gasket material from the rear cylinder head and the rear valve plate.



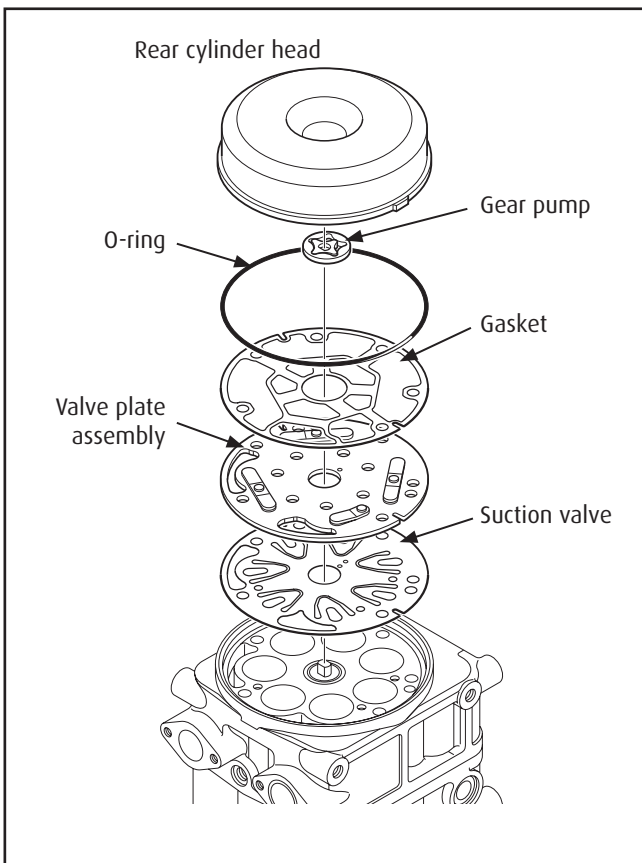
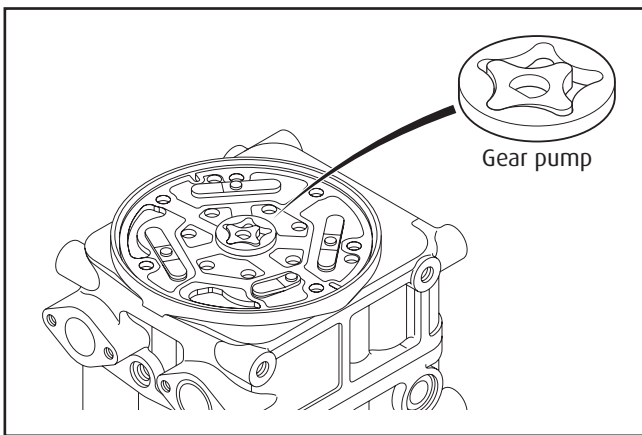
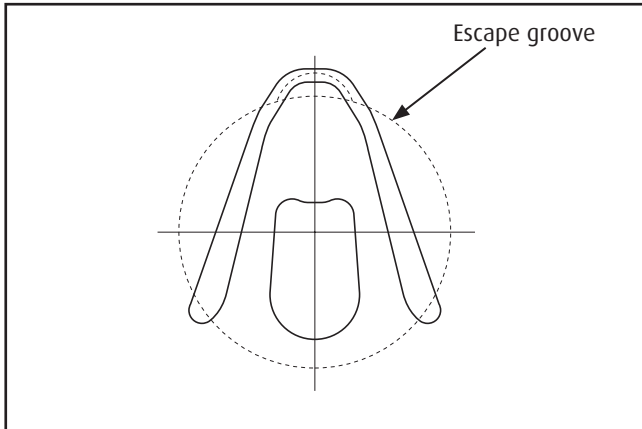
13. Remove the gear pump from the rear cylinder head or the end of the driveshaft.



Inspection

Check the front and rear valve plates for scratched, bent or damaged parts.
Inspect both cylinder heads and both valves plates for nicks or burrs on the sealing surfaces.
Clean both cylinder heads and both valve plates or replace them if they are cracked or damaged.
Check that there are no clogged passages in the valve plates.

8- Service procedures - Cylinder heads



Reassembly

Rear cylinder head

1. Place the cylinder shaft assembly on the bench with the rear side up.
2. Install the rear suction valve so that it matches the pins.

CAUTION!

Ensure each valve matches each cylinder valve escape groove.

3. Install the rear valve plate on the rear suction valve.

CAUTION!

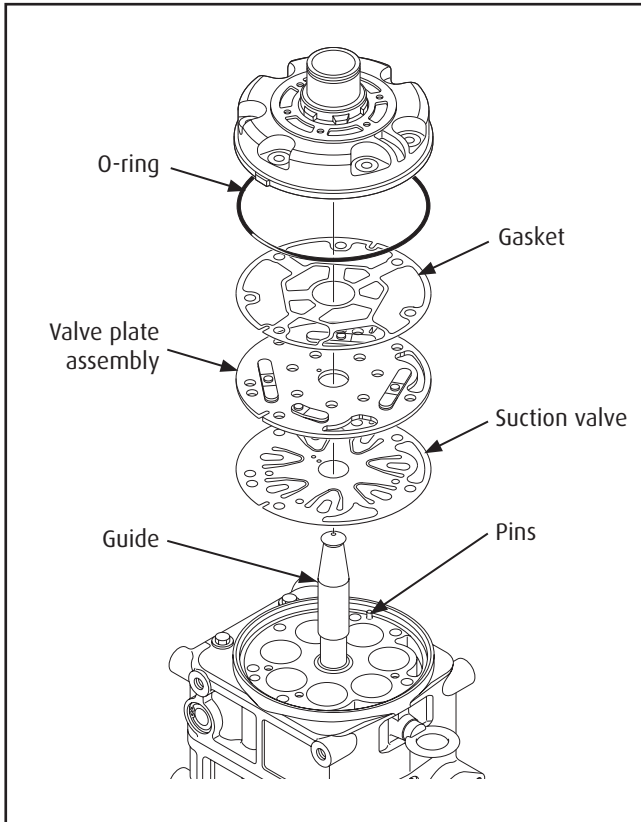
Do not mistake the front and rear valve plates.

4. Coat the new gasket with clean compressor oil and install it on the rear valve plate.
5. Coat the new gear pump with clean compressor oil and install it on the end of the drive shaft.

6. Coat the new O-ring with clean compressor oil and install it on the rear cylinder head.
7. Install the rear cylinder head.

When positioning the head, ensure the gear pump is inserted into the hole in the cylinder head.

8- Service procedures - Cylinder heads



Front Cylinder Head

1. Place the cylinder shaft assembly on the bench with the front side up.
2. Install the front suction valve so that it matches the spring pins.

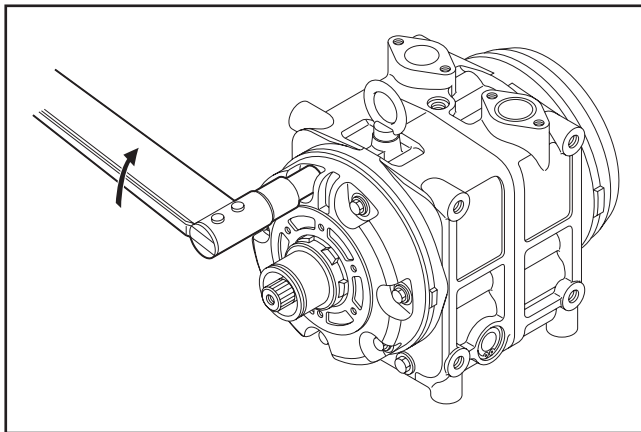
CAUTION!

Ensure each valve matches each cylinder valve escape groove.

3. Install the front valve plate on the front suction valve.
4. Coat the new gasket with clean compressor oil and install it on the front valve plate.
5. Position the guide on the shaft.
6. Coat the new O-ring with clean compressor oil and install it on the front cylinder head.
7. Install the front cylinder head.

CAUTION!

Align the spring pins and tap the head lightly and evenly with a plastic hammer.



8. Remove the guide.
9. Install the seven bolts from the front cylinder head side and tighten them to the specified torque.

**Specified torque: 25 ~ 32 N·m
{2.5 - 3.3 kgf·m, 18 - 24 lbf·ft}**

Tighten each bolt gradually (in three or more stages) to ensure the specified torque.

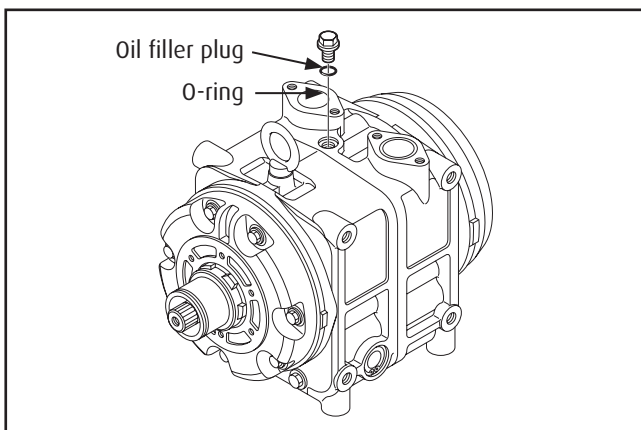
10. Turn the drive shaft 2, 3 times by hand to ensure that the shaft rotates smoothly.
11. Fill the compressor with the specified amount of clean compressor oil through the oil filler.
12. Install the oil filler plug with a new O-ring and tighten it to the specified torque.

**Specified torque: 15 - 18 N·m
{1.5 - 1.8 kgf·m, 11 - 13 lbf·ft}**

13. Install the strainer in the suction port.
14. Fit blanking plates/connectors to the suction and discharge connections, and tighten it to the specified torque.

**Specified torque: 25 - 32 N·m
{2.5 - 3.3 kgf·m, 18 - 24 lbf·ft}**

15. Install the magnetic clutch (see p.31).
16. Run in the compressor (see p.21).
17. Perform the leak test (see p.22).



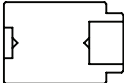

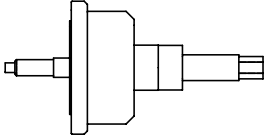
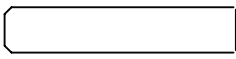
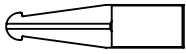
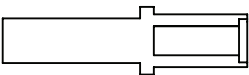
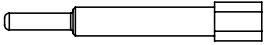
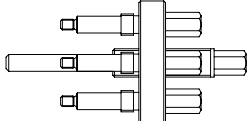


9- Service tools

In addition to standard tools, numerous special tools are necessary to service the Valeo **TM55 & TM65** compressors. The use of these special tools enables prompt and correct compressor service.

The drawings and the specifications of the service tools listed below are enclosed in the following pages.

Service tools

Item	Name	Picture	Ref. page	Application	Drawing page
1	Armature holder		29,32, 34	To fix armature	43
2	Armature installer assembly		34	To install armature	43-44
3	Center pulley puller		30	To remove pulley	45
4	Pulley installer		31	To install pulley	45
5	Pulley installer assembly		33	To install pulley	46-47
6	Cylinder head remover		35, 38, 39	To remove cylinder head and cylinder block	48
7	Guide		36, 41	To install shaft seal	48
8	Shaft seal remover / installer		35, 36	To remove and insert the shaft seal	49
9	Armature puller		30	To remove armature	49
10	Armature puller assembly		29	To remove armature	50-51

9- Service tools

Unless otherwise specified,
the edges to be slight chamfering.
Should remove burrs and fluff.

3rd Angle Proj.	Surface Treatment	Br		
	Heat Treatment & Hardness	- -HOF - HTL HRC40 to 45		
Part Name	Material	① SS41	② SS41	③ S45C
Armature Holder				

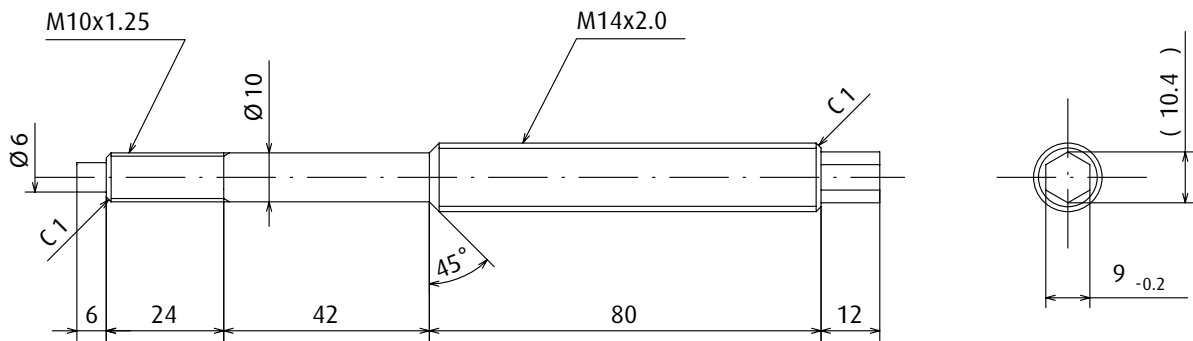
①	Bolt
②	Collar

3rd Angle Proj.	Material	
	Surface Treatment	
	Heat Treatment & Hardness	
Part Name	Material	Assy
Armature Installer Assy		

9- Service tools

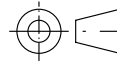
Armature Installer Assy

①



Unless otherwise specified,
the edges to be slight chamfering.
Should remove burrs and fluff.

3rd Angle Proj.



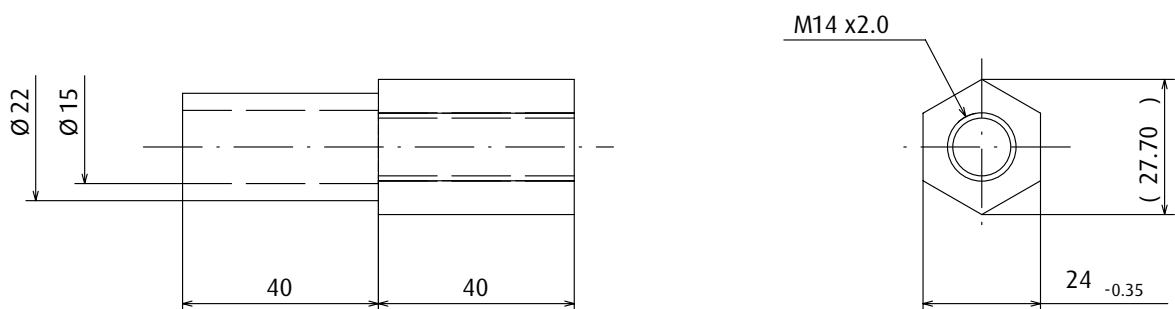
Surface Treatment	Br
Heat Treatment & Hardness	HQ-HQf HRC40 to 45
Material	S45C

Part Name

Bolt

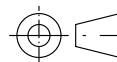
Armature Installer Assy

②



Unless otherwise specified,
the edges to be slight chamfering.
Should remove burrs and fluff.

3rd Angle Proj.

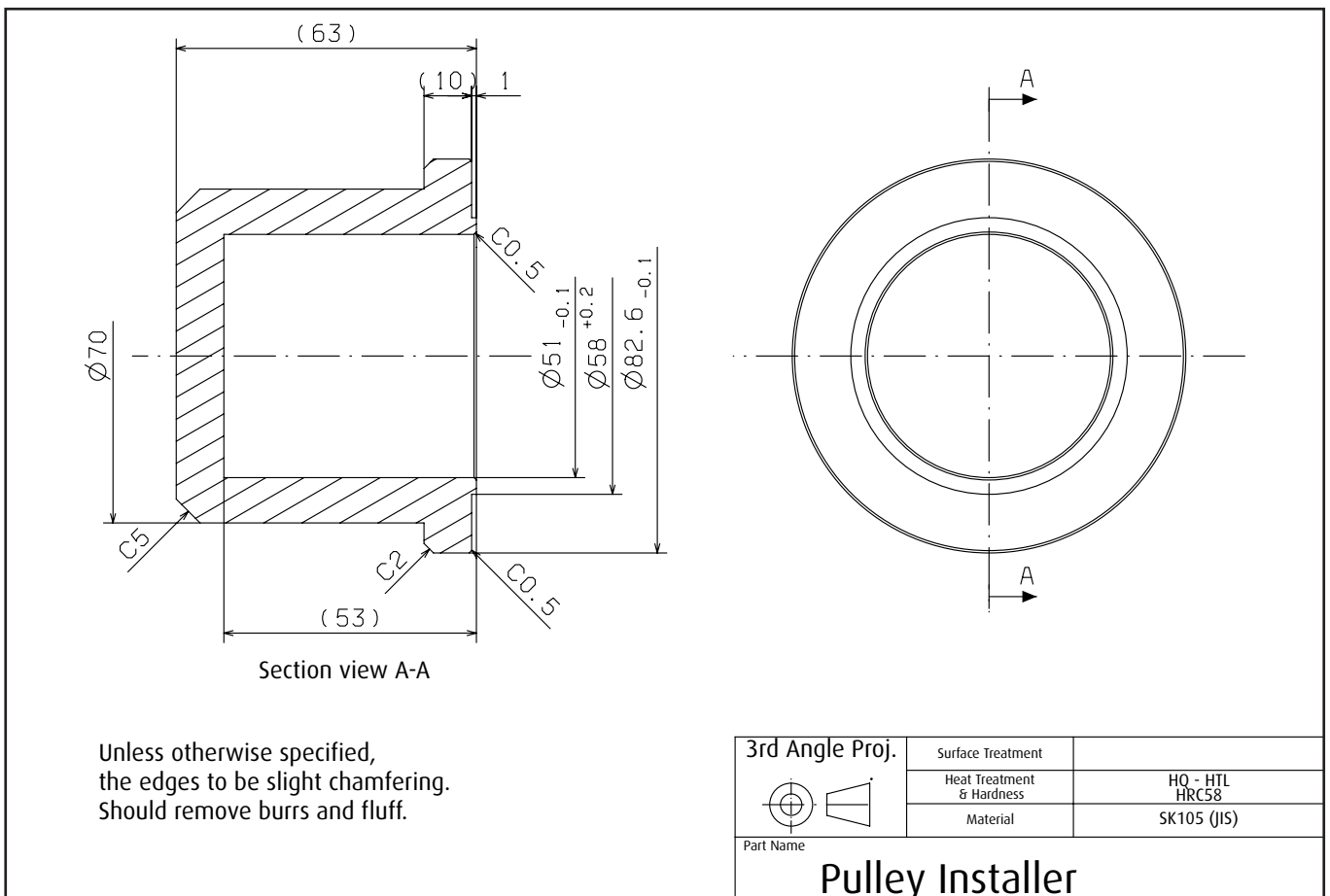
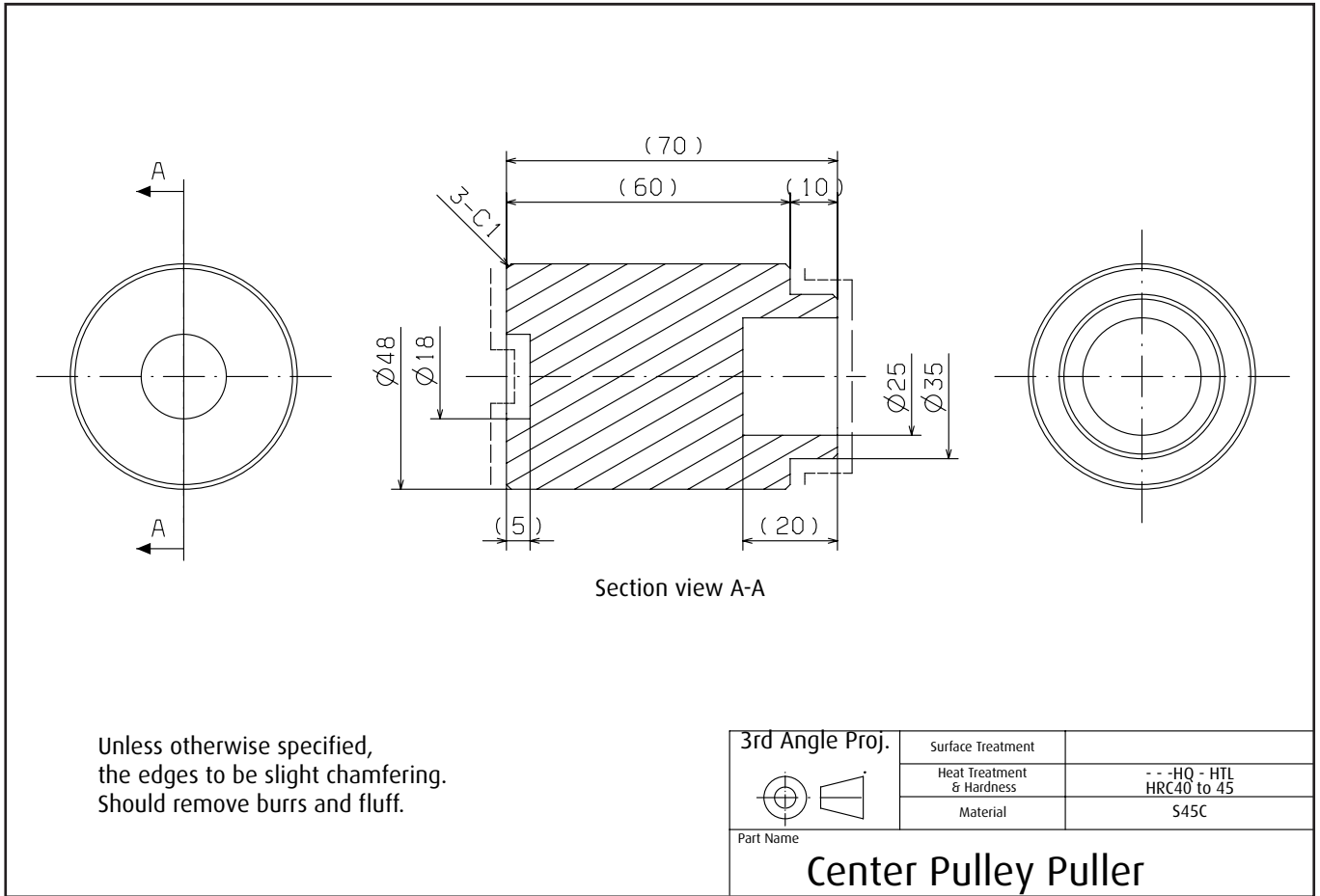


Surface Treatment	Br
Heat Treatment & Hardness	HQ-HQf HRC40 to 45
Material	S45C

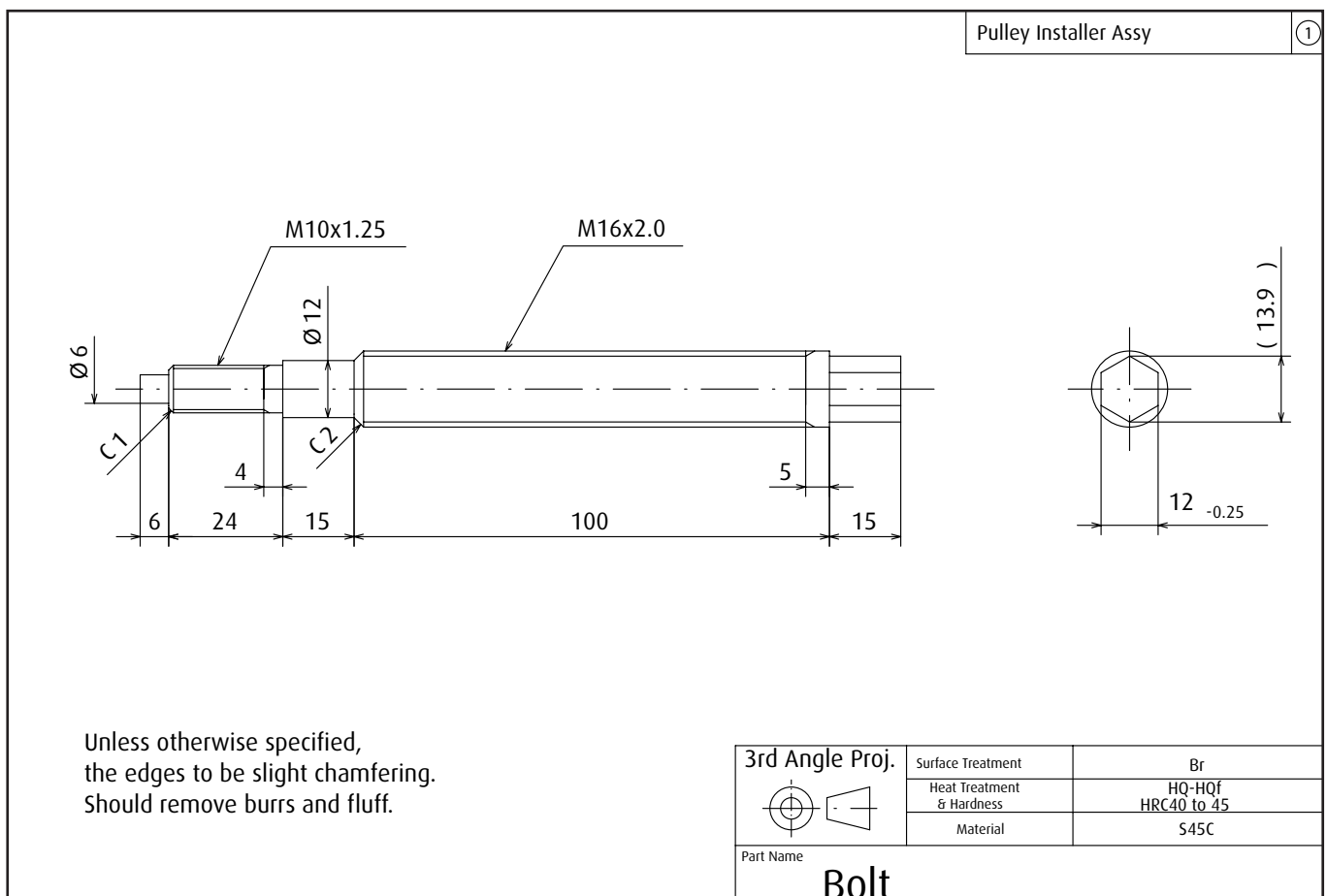
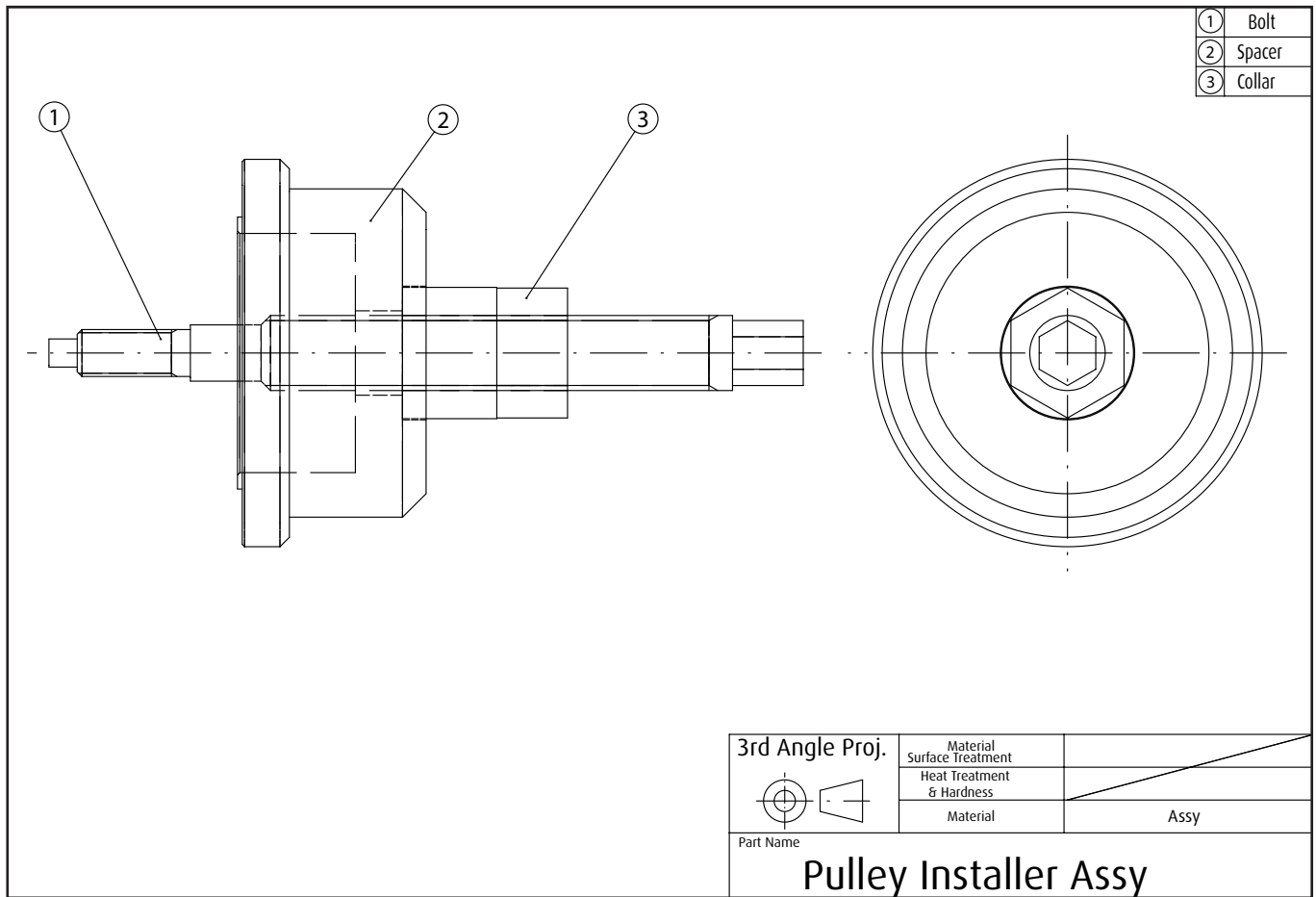
Part Name

Collar

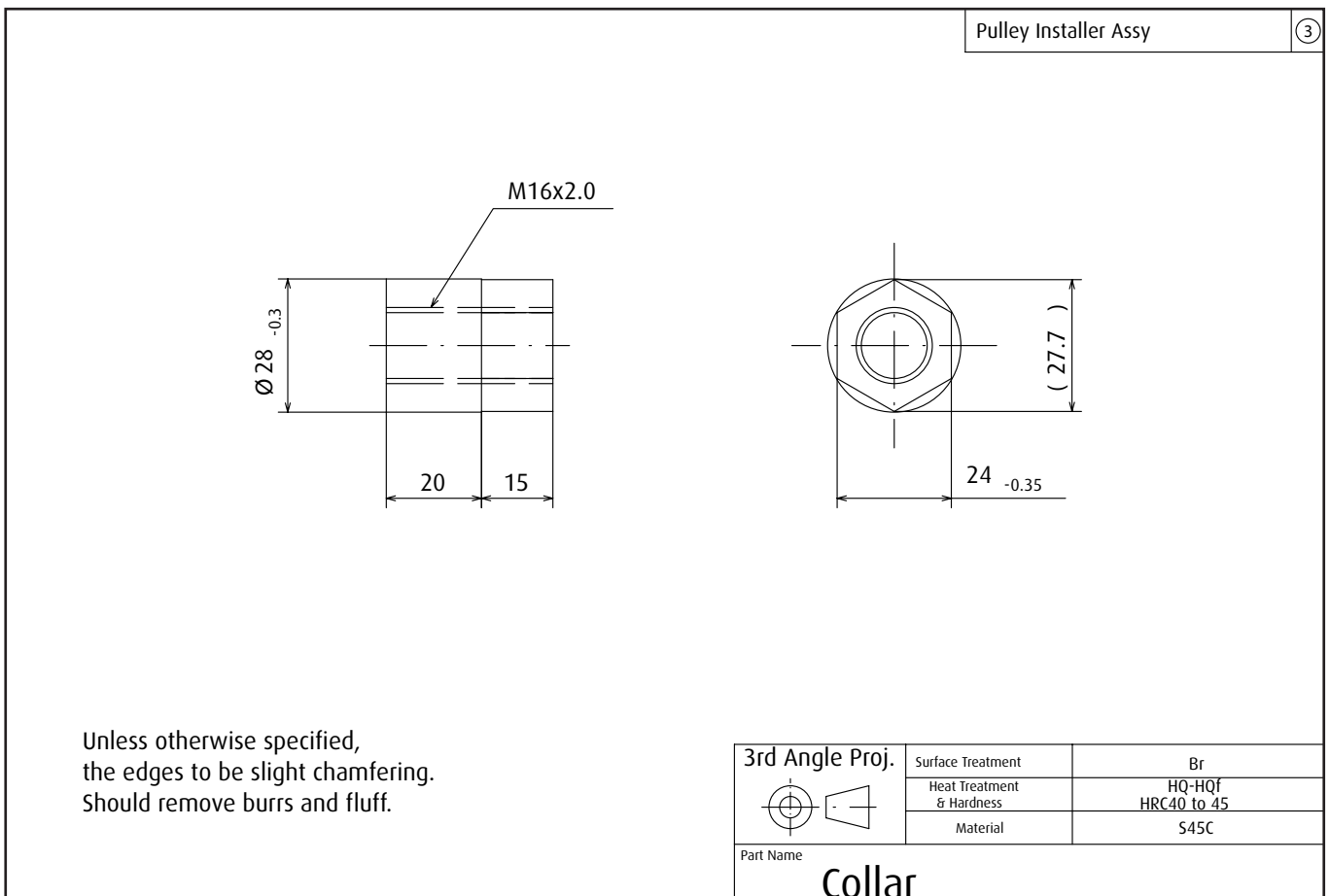
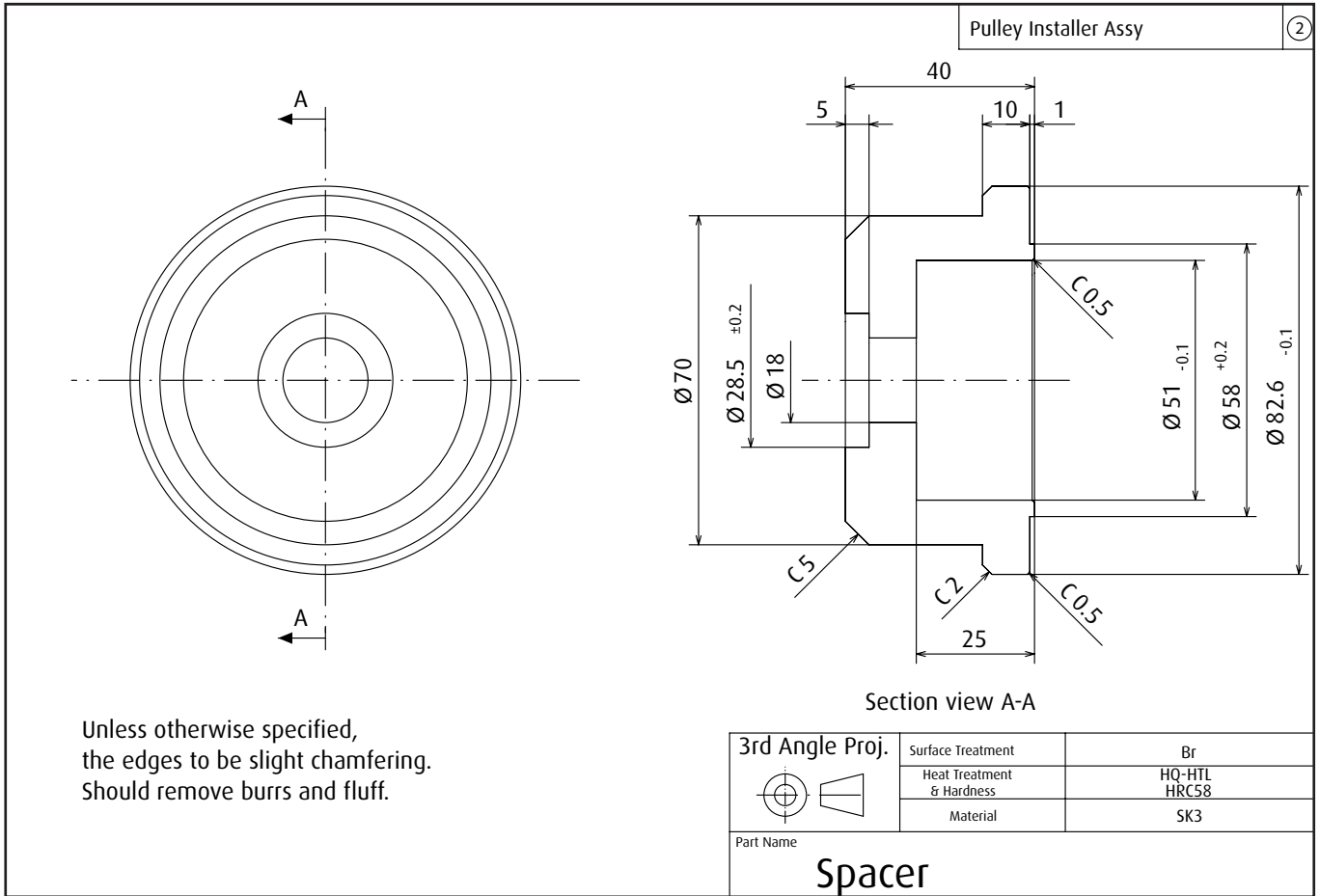
9- Service tools



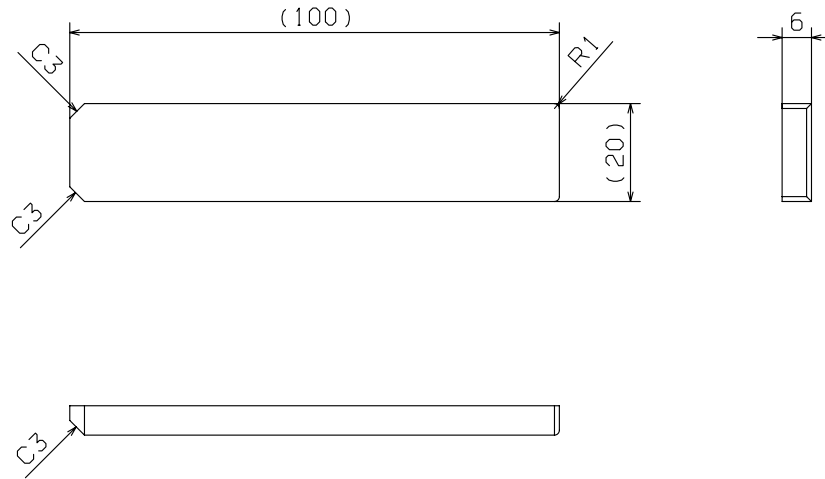
9- Service tools



9- Service tools

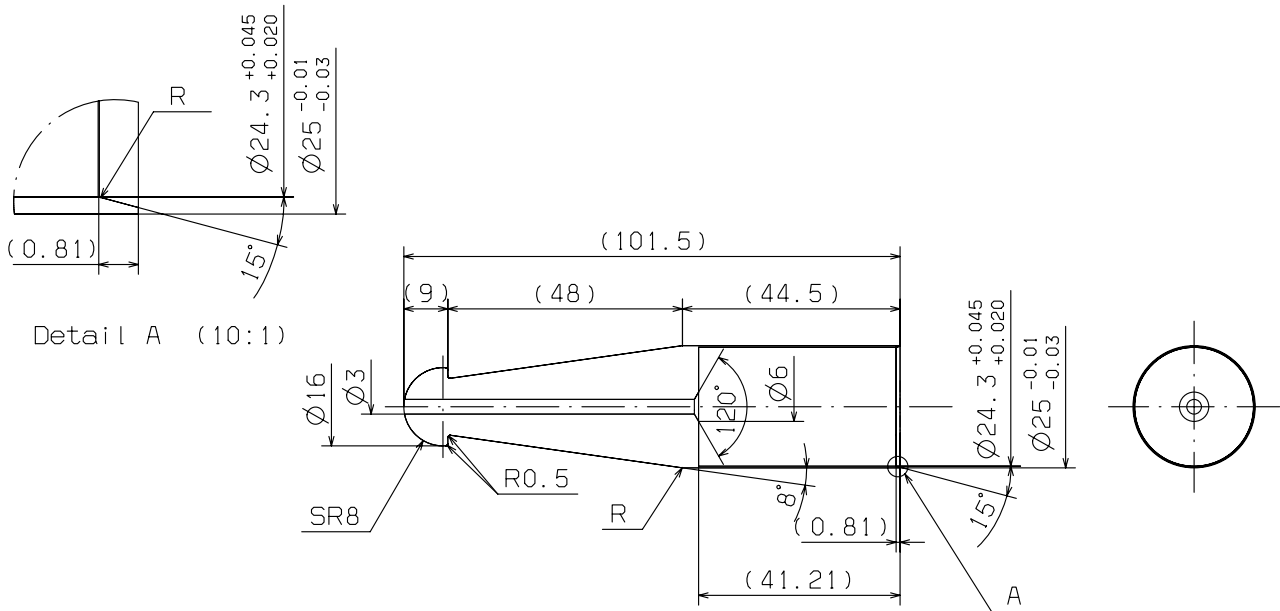


9- Service tools



Unless otherwise specified,
the edges to be slight chamfering.
Should remove burrs and fluff.

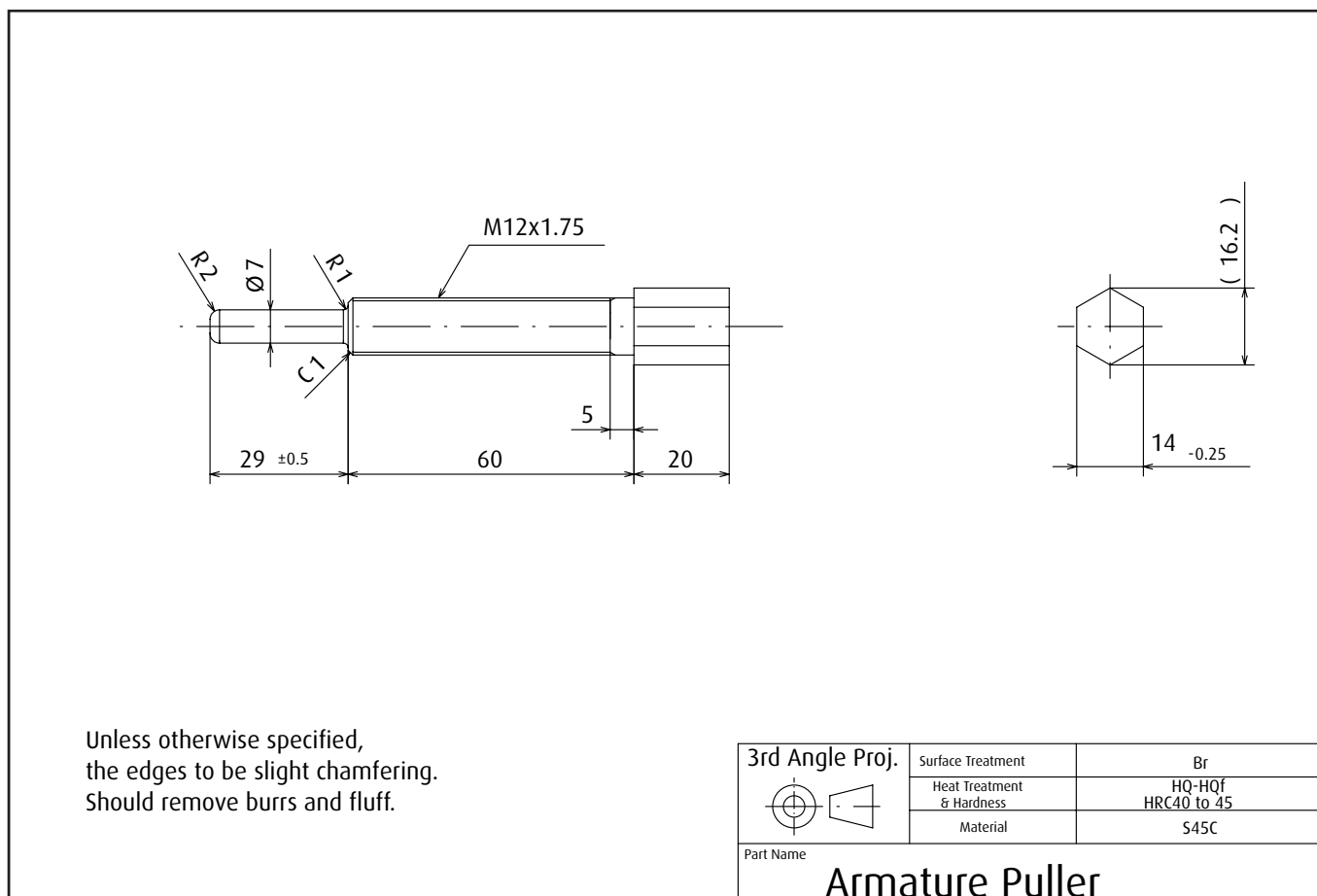
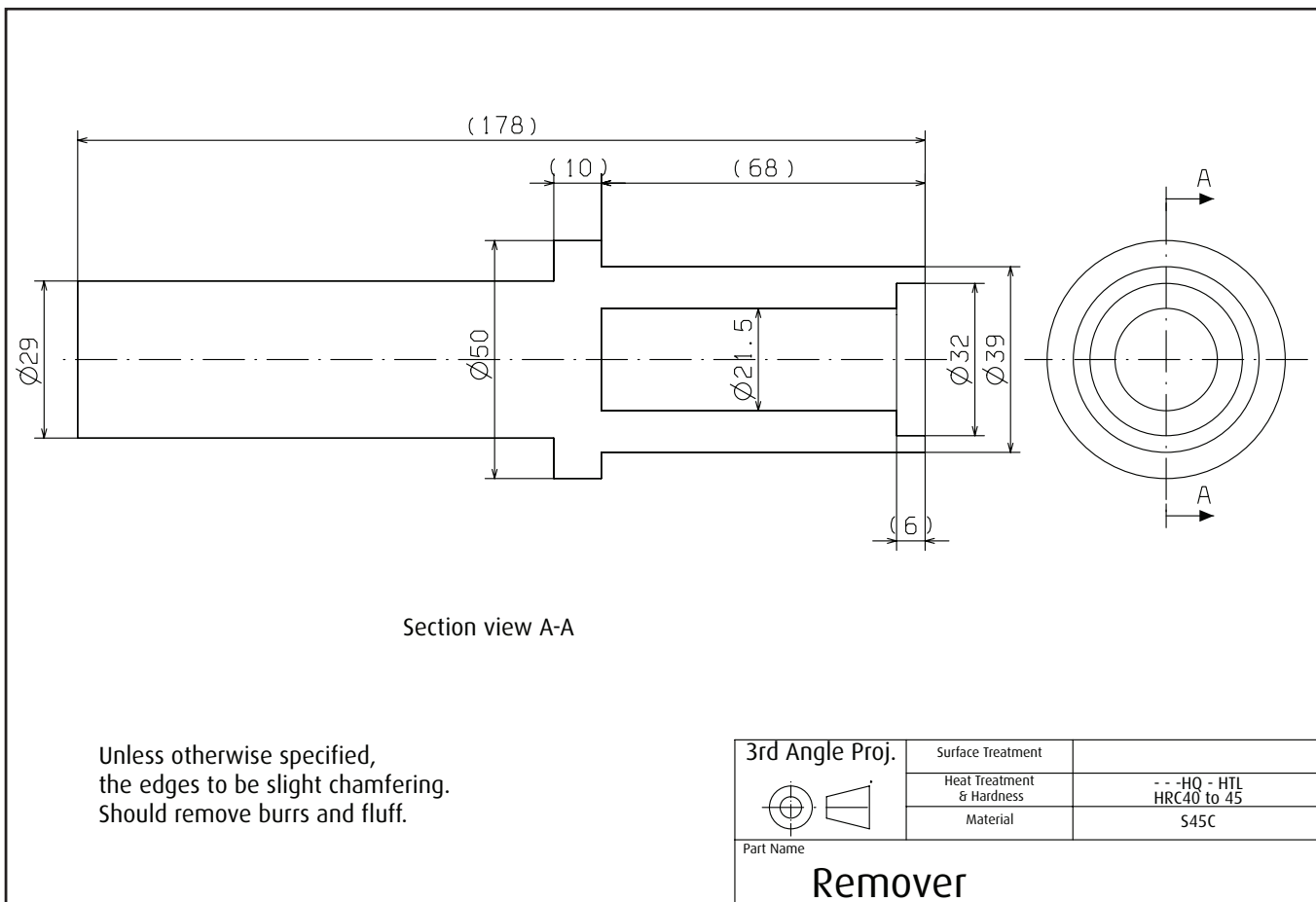
3rd Angle Proj.	Surface Treatment	
	Heat Treatment & Hardness	
	Material	SK85 (JIS)
Part Name		
Remover (for cyl. head)		



Unless otherwise specified,
the edges to be slight chamfering.
Should remove burrs and fluff.

3rd Angle Proj.	Surface Treatment	
	Heat Treatment & Hardness	
	Material	SUS304
Part Name		
Shaft Seal Guide		

9- Service tools



9- Service tools

①	Plate
②	Pole
③	Bolt

3rd Angle Proj. 	Surface Treatment	
	Heat Treatment & Hardness	
	Material	
Part Name		
Armature Puller Assy		

Armature puller assy	①
----------------------	---

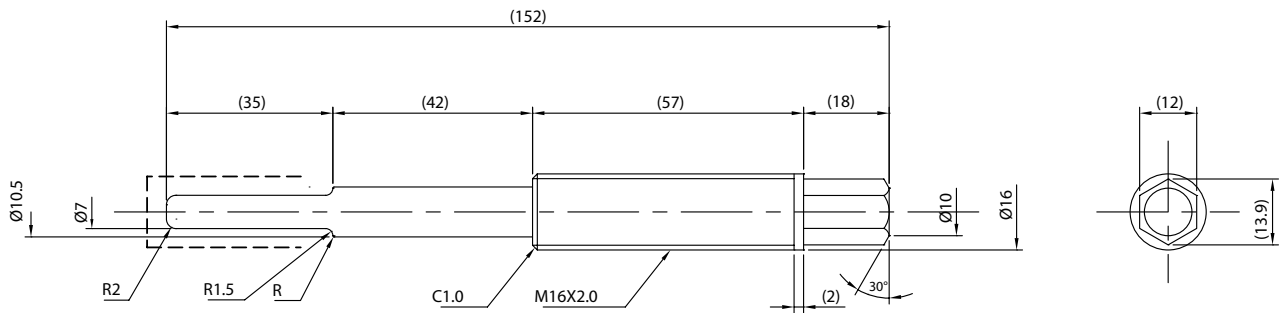
Unless otherwise specified, the edges to be slight chamfering. Should remove burrs and fluff.

3rd Angle Proj. 	Surface Treatment	Br
	Heat Treatment & Hardness	
	Material	S45C
Part Name		
Plate		

9- Service tools

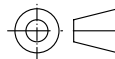
Armature puller assy

②



Unless otherwise specified,
the edges to be slight chamfering.
Should remove burrs and fluff.

3rd Angle Proj.



Surface Treatment

Br

Heat Treatment
& Hardness

--HQ - HQf
HRC40 to 45

Material

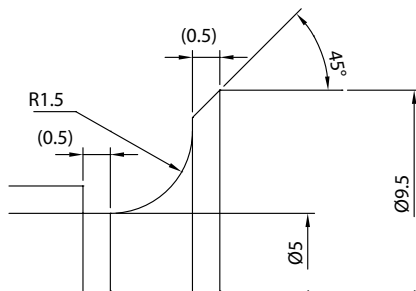
S45C

Part Name

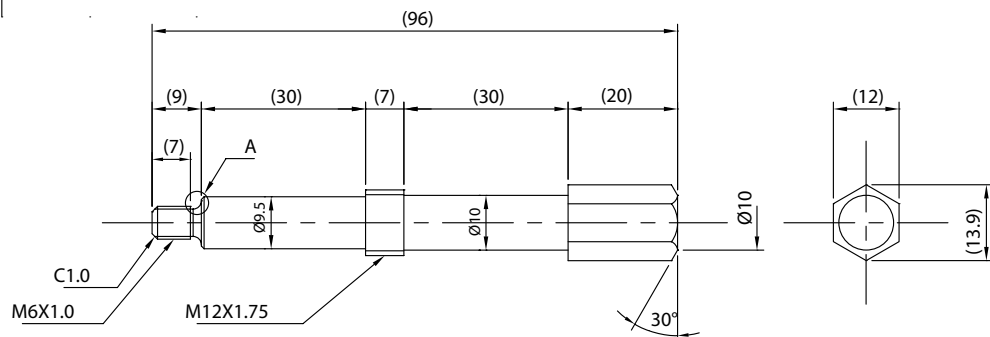
Pole

Armature puller assy

③

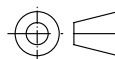


A section detailed view
(10/1)



Unless otherwise specified,
the edges to be slight chamfering.
Should remove burrs and fluff.

3rd Angle Proj.



Surface Treatment

Br

Heat Treatment
& Hardness

--HQ - HQf
HRC40 to 45

Material

S45C

Part Name

Bolt

10- Service parts

1. Compressor body service kits, sets and parts

Item*	Part name	Reference	Quantity
OVERHAUL KIT (O-RING SET + GASKET SET + SHAFT SEAL)		Z0014427	-
O-RING SET		Z0014430	-
12	O-ring body (front & rear head)	Z0004833	n=2
20	O-ring drain	569300-4000	n=1
GASKET SET		Z0014431	-
13	Gasket front head	Z0004779	n=1
31	Gasket rear head	Z0004780	n=1
9	Gasket (bolt) 9 per set	569310-6200	n=9
SHAFT SEAL (for service)		-	-
11	Shaft seal	Z0007461	n=1
OTHER COMPRESSOR PARTS		-	-
14	Valve plate assy (front)	Z0004775	n=1
30	Valve plate assy (rear)	Z0004777	n=1
15	Suction valve	Z0004774	n=1

*See Product description - Exploded view (p.10)

2. Connector assy (Z0011222) service parts

Item*	Part name	Reference	Quantity	Remarks
24	Connector (body)	Z0011223	n=1	Dis./Suc.
23	Gasket	Z0011226	n=1	For conn.
26	Gasket	Z0011227	n=1	For piping
25	Bolt	Z0011228	n=2	For conn.

*See Product description - Exploded view (p.10)

3. Oil

Item	Part name	Reference	Quantity
-	ZXL 100PG (250 cc)	569900-0600	250 cc

VALEO COMPRESSORS - **TM55 & TM65** for HFC-134a use
SERVICE MANUAL

Version: SM5565-13012.01EN

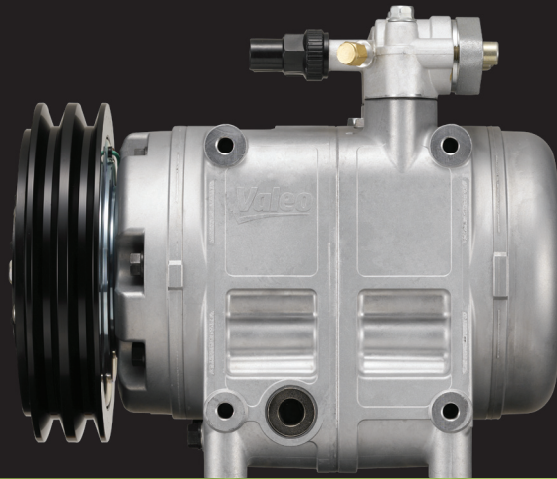
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For any inquiry regarding the present service manual,
contact us at vc-oura-sales@valeo.com

Valeo **TM55 & TM65** Compressors for Bus Air-Conditioning



Valeo **TM55 & TM65** Benefits

- High reliability
- Integration flexibility
- Great cooling capacity
- Enhanced performance
- Lower fuel consumption
- Compact & robust design
- Improved field serviceability
- Reduced noise and vibrations
- Staggering value through innovation

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www.valeocompressors.com

Asia

39 Sendai, Kumagaya-shi
Saitama-ken 360-0193 Japan
Phone: +81 (0) 48 539 3800
Fax: +81 (0) 48 539 3843
Email: vc-oura-sales@valeo.com

China

No.2677 Shiji Avenue, Eco. & Tec. Dvt
Zone 130031 Changchun, Jilin PRC
Phone: +86 (0) 431 8499 2025
Fax: +86 (0) 431 8499 2004
Email: vc-changchun-sales@valeo.com

Europe, Middle East & Africa

8, rue Louis Lormand ZA de l'Agiot
78321 La Verriere, France
Phone: +33 (0) 1 3013 5027
Fax: +33 (0) 1 3461 5898
Email: vc-angers-sales@valeo.com

Americas

2520 Esters Blvd #100
Dallas, TX 75261 United States
Phone: +1 972 456 1077
Fax: +1 972 456 1090
Email: vc-dallas-sales@valeo.com



Parts Manual

C1.1 Industrial Engine

G8N1-Up (Engine)

Product and Dealer Information

Note: For product identification plate locations, see the section "Product Identification Information" in the Operation and Maintenance Manual.

Delivery Date: _____

Product Information

Model: _____

Product Identification Number: _____

Engine Serial Number: _____

Transmission Serial Number: _____

Generator Serial Number: _____

Attachment Serial Numbers: _____

Attachment Information: _____

Customer Equipment Number: _____

Dealer Equipment Number: _____

Dealer Information

Name: _____ Branch: _____

Address: _____

Dealer Contact

Phone Number

Hours

Sales: _____

Parts: _____

Service: _____

MEMORANDA

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GENERAL INFORMATION

1. ENGINE IDENTIFICATION

Cat engines are identified with Serial Numbers and Arrangement Numbers. In some cases, Modification Numbers are also used. The serial number plate which shows these numbers is mounted on the engine.

Cat dealers need this information to determine which components were included on the engine when it was assembled at the factory. This permits accurate identification of replacement part numbers.

2. ORDERING PARTS

WARNING

When replacement parts are required for this product Caterpillar recommends using Caterpillar replacement parts or parts with equivalent specifications including, but not limited to, physical dimensions, type, strength and material.

Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

Quality Cat replacement parts are available from Cat dealers throughout the world. Their parts inventories are up to date and include all parts normally required to protect your investment in Cat Engines. Dealers may offer repair kits or remanufactured parts to allow selection of the most effective repair alternative for a particular situation. When ordering parts, your order should specify the quantity, part number, part name, and the serial number/product identification number of the engine for which the parts are needed.

3. PARTS MANUAL ORGANIZATION

Product information in this manual is presented as "information elements" that represent all of the components for the specific model. An Engine Arrangement is an example of an information element. The information elements are organized alphabetically by part name and secondarily by part number within each major section of the manual.

4. TABLE OF CONTENTS

A table of contents (TOC) is found at the beginning of the manual. The TOC lists each section of the manual with a complete list of all information elements organized as they appear in the manual. Page numbers are provided for quick reference to detailed parts identification illustrations and serviceable consist lists.

5. MAINTENANCE PARTS INDEX

The Maintenance Parts Index, located near the beginning of the manual, references most frequently used maintenance part numbers, providing description, quantity, usage and page number. This information is organized alphabetically by part description.

6. INDEX

The index located near the front of the manual is an alphabetical listing of all information elements included in the manual. Page numbers are provided for quick reference to detailed parts identification illustrations and serviceable consist lists.

7. PART NUMBER INDEX

A numerical index listing all part numbers and the corresponding page number(s) appears at the back of the manual.

8. CAPTIONS

Captions located at the beginning each information element identify the part number and part name along with additional descriptive information. S/N information found in each caption should be used to select correct information for a specific engine. Field replacement options, identification of optional attachment components, and where used ("part of") information is also provided.

The first line of a caption is shown in larger type font to indicate the beginning of an information element. Captions for additional pages that may be required to illustrate an information element will be shown in standard type font and will include the term (*contd.*).

9. NON-SERVICED PARTS

In some instances it is necessary to display non-serviced parts that are a link to lower level serviceable consist lists. These non-serviced part numbers are shown in *italic* type indicating that they are not available. All consist lists have not been converted to reflect this enhancement.

GENERAL INFORMATION

10. PARTS LIST REFERENCE NUMBERS

Numbers shown in the Ref No column correspond to numbers used in the associated graphic(s). An alphabetic suffix may be added to a reference number to identify lower level consist items. Numbers shown in the Graphic Ref column refer to the graphic number identifier displayed in the lower left corner of each illustration. The Graphic Ref number may be used in combination with the item Ref No to determine the correct part number. There may be intentional omission of a Ref No in a consist list as information is updated to reflect the latest serviceable part numbers.

11. INDENTED PART NAMES

When a part name is indented in a parts list, it is part of (included in) the group or assembly under which it is indented.

12. ILLUSTRATION REFERENCE LETTERS

When necessary, illustrations contain reference letters (A, B, C etc.) that are intended to track lines and harnesses from one point to another. They are also used to show where to reconnect illustrations that have been separated.

13. ABBREVIATIONS AND SYMBOLS

O.D. – Outside Diameter
I.D. – Inside Diameter
A – Not Part Of This Group
B – Use As Required
C – Change From Previous Type
D – Order By The Meter
E – Order By The Centimeter
F – Not Shown
G – Order By The Inch
I – Refer To Hydraulic Information System
M – Metric Part
R – Remfg Part May Be Available
Y – Separate Illustration
Z – Not Serviced Separately

14. DESCRIPTION OF TYPE CHANGES

Type - A type is defined as any configuration change that requires an additional Information Element for an Arrangement, Group, or Assembly. If serial number breaks for types are not available, a type # (Type 1, Type 2, etc.) will be displayed in the caption. These "type" changes are identified with a "C" note (change from previous type) in the Parts List. Only the "types" that apply to this Parts Manual will be included. Additional types may exist causing "C" notes to appear on an Information Element when no other types are shown.

15. <END>

This symbol indicates the end of an information element.

NOTE:

Continuing improvement and advancement of product design may cause changes to your engine which may not be included in this publication. Whenever a question arises regarding your Cat product or this publication, please consult your Cat dealer for the latest available information.

REPAIR ALTERNATIVES

REMANUFACTURED COMPONENTS

As an option when making repairs consider Cat Remanufactured Components. Components that are available through the Cat Remanufactured Program are identified three ways in the parts book:

- with the letter R in the note field of the parts list
- with an R* at the beginning of the first line of the caption
- with an *R at the end of the first line of the caption

Typical components included in the Remanufacturing Program include:

ALTERNATORS
CONNECTING RODS
CRANKSHAFTS - UNDERSIZE
CRANKSHAFTS - UPGRADE TO NEW
CYLINDER HEADS
ELECTRONIC CONTROL MODULES (ECM)
ELECTRONIC SENSORS
FUEL INJECTORS
FUEL NOZZLES
FUEL PUMPS
GOVERNORS
OIL PUMPS
PISTONS
SHORT BLOCKS
STARTERS
TURBOCHARGERS - COMPLETE
TURBOCHARGER CARTRIDGES
WATER PUMPS

Cat Remanufactured engines for many engine arrangements are also available.

SUPPLEMENTAL COOLANT ADDITIVES

CUSTOMER BENEFITS:

Protects against cavitation, foam, erosion, corrosion, and scale buildup in cooling systems.

- Provides measured coolant conditioner.

DESCRIPTION:

Additives deplete from the coolant with normal operation. For this reason, Supplemental Coolant Additives (SCA) must be added to all heavy duty coolants at regular intervals. In addition, when not using a fully formulated, pre-charged antifreeze, like Cat DEAC, an initial charge of SCA must be added to the cooling system. The amount of SCA added to the system is dependent on the capacity of the system.

The SCA for initial fill is provided as a liquid. SCA's for maintenance intervals are available in liquid form and as a spin-on element. (No Spin-on available for 3600 Family of Engines)

NOTE:

The amount of SCA added at initial fill is not the same as the amount added at maintenance intervals.

The coolant additive elements can be used with any ethylene or propylene glycol type antifreeze which meets ASTM D4985 or ASTM D5345 Specifications.

NOTE:

For use with standard heavy duty coolant only, not for use with Extended Life Coolant.

PARTS NEEDED:

Cooling System Capacity		Liquid SCA at Initial Fill	Liquid SCA at Maintenance*	Spin-on SCA Maintenance Element*
Liters	Gallons			
22-30	(6-8)	3P-2044 (1)	6V-3542 (1)	111-2370 (1)
30-38	(8-10)	3P-2044 (1) 6V-3542 (1)	111-2372 (1)	111-2369 (1)
38-49	(10-13)	3P-2044 (1) 8T-1589 (1)	111-2372 (1)	111-2369 (1)
49-64	(13-17)	3P-2044 (2)	8T-1589 (1)	9N-3368 (1)
64-83	(17-22)	3P-2044 (2) 8T-1589 (1)	111-2372 (1) 6V-3542 (1)	111-2371 (1)
83-114	(22-30)	3P-2044 (3) 8T-1589 (1)	3P-2044 (1)	9N-3718 (1)
114-163	(30-43)	3P-2044 (5)	3P-2044 (1) 6V-3542 (1)	111-2371 (2)
163-242	(43-64)	3P-2044 (8)	3P-2044 (2)	9N-3718 (2)

* Normal maintenance period is 250 hrs. See your Operation and Maintenance Manual for complete coolant maintenance instructions.

() Indicates quantity required.

MAINTENANCE PARTS

DESCRIPTION	PART NUMBER	QTY	WHERE USED	PAGE
AIR INLET AND EXHAUST SYSTEM				
FILTER ELEMENT-AIR	246-5011	1	FILTER ELEMENT AS-AIR	136
BASIC ENGINE				
FILTER ELEMENT-BREATHER	153-5939	1	COVER GP-VALVE MECHANISM	33
		1	COVER GP-VALVE MECHANISM	35
FILTER ELEMENT-BREATHER (CRANKCASE)	153-5939	1	COVER GP-VALVE MECHANISM	37
PLUG (DRAIN) (ENGINE OIL PAN)	423-6224	2	PLUG GP-OIL PAN	92
PLUG-DRAIN (ENGINE OIL)	165-3605	2	PLUG GP-OIL PAN	93
V-BELT (ALTERNATOR, WATER PUMP)	183-3942	1	V-BELT GP	98
V-BELT (ALTERNATOR)	365-5827	1	V-BELT GP	99
V-BELT (DRIVE)	183-3942	1	V-BELT GP	97
COOLING SYSTEM				
CAP-RADIATOR	202-6616	1	RADIATOR & FAN GP	120
		1	RADIATOR GP	124
		1	RADIATOR GP	130
	365-1622	1	RADIATOR GP	128
GASKET-COVER	231-7858	1	COVER GP-REGULATOR HOUSING	110
GASKET-COVER (TEMPERATURE REGULATOR)	231-7858	1	HOUSING GP-WATER REGULATOR	113
HOSE-RADIATOR	244-0503	1	RADIATOR GP	130
	258-4520	1	RADIATOR GP	130
HOSE-RADIATOR (LOWER)	258-4520	1	RADIATOR & FAN GP	120
		1	RADIATOR GP	124
HOSE-RADIATOR (UPPER)	244-0503	1	RADIATOR & FAN GP	120
		1	RADIATOR GP	124
REGULATOR-WATER TEMPERATURE	231-7859	1	PUMP GP-WATER	116
		1	PUMP GP-WATER	118
ELECTRICAL AND STARTING SYSTEM				
FILTER AS-FUEL	358-9226	1	CONNECTION GP-ELECTRICAL	182
GLOW PLUG	307-8672	3	GLOW PLUG GP	183
KEY-IGNITION	361-3925	1	SWITCH GP-START	203
KIT-ELEMENT (FUEL FILTER)	067-6987		CONNECTION GP-ELECTRICAL	182
FUEL SYSTEM				
FILTER AS-FUEL	243-6411	1	PUMP GP-FILTER & FUEL TRANSFER	154
	358-9226	1	PUMP GP-FILTER & FUEL TRANSFER	154
		1	PUMP GP-FUEL TRANSFER	173
FILTER ELEMENT-FUEL	276-1806	1	PUMP GP-FUEL PRM & PRIM FILTER	172
FILTER ELEMENT-FUEL (FILTER)	276-1806	1	FILTER GP-FUEL	146
GASKET	069-2922	2	PUMP GP-FILTER & FUEL TRANSFER	154
KIT-ELEMENT (FUEL FILTER)	067-6987	1	PUMP GP-FILTER & FUEL TRANSFER	154

MAINTENANCE PARTS

DESCRIPTION	PART NUMBER	QTY	WHERE USED	PAGE
		1	PUMP GP-FUEL TRANSFER	173
PLUG-DRAIN (FUEL FILTER)	302-7777	3	FILTER GP-FUEL	146
PLUG-DRAIN (WATER SEPARATOR)	302-7777	3	PUMP GP-FUEL PRM & PRIM FILTER	172
LUBRICATION SYSTEM				
CAP-FILLER (ENGINE OIL)	334-0272	1	FILLER GP-ENGINE OIL	103
CAP-FILLER (ENGINE)	334-0272	1	FILLER GP-ENGINE OIL	102
		1	FILLER GP-OIL	105
CAP-OIL FILLER (ENGINE)	217-7358	1	FILLER GP-ENGINE OIL	102
		2	FILLER GP-ENGINE OIL	103
		1	FILLER GP-OIL	105
FILTER AS-ENGINE OIL	220-1523	1	FILTER GP-ENGINE OIL	106
SEAL (ENGINE OIL FILL CAP)	153-5933	2	FILLER GP-ENGINE OIL	103
	288-6593	1	FILLER GP-ENGINE OIL	103
SEAL (ENGINE OIL FILLER)	153-5933	1	FILLER GP-ENGINE OIL	102
		1	FILLER GP-OIL	105
	288-6593	1	FILLER GP-ENGINE OIL	102
		1	FILLER GP-OIL	105
OPERATOR STATION				
LAMP (GLOW PLUG INDICATOR)	197-8547	1	LAMP GP-INDICATOR	205
SERVICE EQUIPMENT AND SUPPLIES				
HOSE-RADIATOR	244-0503	1	PARTS GP-MISCELLANEOUS	206

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ENGINE ARRANGEMENT

316-8410 ENGINE AR 21 BRAKE KW (28 BHP) AT 3400 RPM FIELD REPLACEMENT ORDER 435-1650-PAGE: 9

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			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	328-1431	1	CAMSHAFT GP						27
Y	336-2073	1	CONNECTION GP-ELECTRICAL						182
Y	308-5610	1	CONNECTION GP-EXHAUST						135
			-OR-						
Y	329-4424	1	MANIFOLD GP-EXHAUST						141
Y	328-1430	1	CONTROL GP-GOVERNOR						142
Y	328-1435	1	COVER GP-VALVE MECHANISM						37
Y	313-1984	1	COVER GP-ENGINE						29
Y	328-1434	1	COVER GP-REGULATOR HOUSING						110
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	322-3808	1	DRIVE GP-FAN						50
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			S/N: G8N1-4271						
Y	365-0486	1	FILLER GP-ENGINE OIL						105
			S/N: G8N4272-UP						
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	328-1433	1	HOUSING GP-FLYWHEEL						63
Y	328-1429	1	HOUSING GP-FRONT						74
Y	339-3016	1	KIT-FRONT GEAR						76
Y	392-8729	1	LIFTING GP-ENGINE						79
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	322-3806	1	MOUNTING GP-FAN						114
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	328-1432	1	PUMP GP-FUEL INJECTION						169
Y	317-6706	1	PUMP GP-FUEL PRM & PRIM FILTER						172
Y	319-7356	1	PUMP GP-FUEL TRANSFER						175
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Y	319-7357	1	SOLENOID GP-SHUTOFF						189
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	319-7358	1	SWITCH GP-PRESSURE						202
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Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

316-8414 ENGINE AR

21 BRAKE KW (28 BHP) AT 3400 RPM
FIELD REPLACEMENT ORDER 435-1650-PAGE: 9

SMCS-1000

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NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	328-1431	1	CAMSHAFT GP						27
Y	321-6741	1	CONNECTION GP-ELECTRICAL						181
Y	328-1430	1	CONTROL GP-GOVERNOR						142
Y	313-1984	1	COVER GP-ENGINE						29
Y	328-1435	1	COVER GP-VALVE MECHANISM						37
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	329-4423	1	DRIVE GP-FAN						51
			-OR-						
Y	311-5829	1	DRIVE GP-FAN						49
Y	313-1966	1	DRIVE GP-PUMP						53
Y	329-4422	1	FAN GP						111
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			-OR-						
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	328-1433	1	HOUSING GP-FLYWHEEL						63
Y	328-1429	1	HOUSING GP-FRONT						74
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
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Y	329-4424	1	MANIFOLD GP-EXHAUST						141
Y	329-4427	1	MOUNTING GP-ENGINE						80
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	329-4419	1	PAN GP-OIL						87
Y	329-4428	1	PARTS GP-MISCELLANEOUS						206
Y	313-1963	1	PISTON & ROD GP						91
Y	320-9108	1	PLUG GP-OIL PAN						93
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	328-1432	1	PUMP GP-FUEL INJECTION						169
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	319-7351	1	STARTING MOTOR GP-ELECTRIC						195
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

318-1667 ENGINE AR 10 BRAKE KW (13 BHP) AT 1500 RPM FIELD REPLACEMENT ORDER 435-1644-PAGE: 44

SMCS-1000

i05319156

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	323-2409	1	CAMSHAFT GP						25
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	308-5610	1	CONNECTION GP-EXHAUST						135
Y	329-8577	1	COVER GP-FRONT HOUSING						32
			-OR-						
Y	313-1984	1	COVER GP-ENGINE						29
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			-OR-						
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	318-8880	1	FLYWHEEL GP						56
Y	313-2021	1	GLOW PLUG GP						183
Y	323-2408	1	GOVERNOR GP						151
Y	318-8879	1	HOUSING GP-FLYWHEEL						61
Y	323-2407	1	HOUSING GP-FRONT						72
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	323-2410	1	PUMP GP-FUEL INJECTION						165
Y	317-6706	1	PUMP GP-FUEL PRM & PRIM FILTER						172
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8803	1	RADIATOR GP						124
Y	320-9114	1	SHUTOFF GP-ELECTRICAL						187
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

318-1670 ENGINE AR 12 BRAKE KW (16 BHP) AT 1800 RPM

SMCS - 1000

i03519324

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	321-3143	1	CAMSHAFT GP						24
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	329-8577	1	COVER GP-FRONT HOUSING						32
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	318-8880	1	FLYWHEEL GP						56
Y	313-2021	1	GLOW PLUG GP						183
Y	321-3142	1	GOVERNOR GP						149
Y	318-8879	1	HOUSING GP-FLYWHEEL						61
Y	321-3140	1	HOUSING GP-FRONT						70
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	313-2026	1	LAMP GP-INDICATOR						205
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	321-3334	1	PUMP GP-FUEL INJECTION						163
Y	317-6706	1	PUMP GP-FUEL PRM & PRIM FILTER						172
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8803	1	RADIATOR GP						124
Y	320-9114	1	SHUTOFF GP-ELECTRICAL						187
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (ALTERNATOR)						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

318-7060 ENGINE AR

12 BRAKE KW (16 BHP) AT 1800 RPM
FIELD REPLACEMENT ORDER 435-1632-PAGE: 43

SMCS-1000

i05377294

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	321-3143	1	CAMSHAFT GP						24
Y	321-6741	1	CONNECTION GP-ELECTRICAL						181
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	329-8577	1	COVER GP-FRONT HOUSING						32
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	318-8880	1	FLYWHEEL GP						56
Y	313-2021	1	GLOW PLUG GP						183
Y	321-3142	1	GOVERNOR GP						149
Y	318-8879	1	HOUSING GP-FLYWHEEL						61
Y	321-3140	1	HOUSING GP-FRONT						70
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	321-3334	1	PUMP GP-FUEL INJECTION						163
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	369-9326	1	RADIATOR GP						130
Y	369-8737	1	RADIATOR GP						128
Y	320-9114	1	SHUTOFF GP-ELECTRICAL						187
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (ALTERNATOR)						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

318-7061 ENGINE AR

10 BRAKE KW (13 BHP) AT 1500 RPM

FIELD REPLACEMENT ORDER 435-1644-PAGE: 44

SMCS-1000

i05377330

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	323-2409	1	CAMSHAFT GP						25
Y	321-6741	1	CONNECTION GP-ELECTRICAL						181
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	329-8577	1	COVER GP-FRONT HOUSING						32
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	318-8880	1	FLYWHEEL GP						56
Y	313-2021	1	GLOW PLUG GP						183
Y	323-2408	1	GOVERNOR GP						151
Y	318-8879	1	HOUSING GP-FLYWHEEL						61
Y	323-2407	1	HOUSING GP-FRONT						72
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	323-2410	1	PUMP GP-FUEL INJECTION						165
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	369-9326	1	RADIATOR GP						130
Y	369-8737	1	RADIATOR GP						128
Y	320-9114	1	SHUTOFF GP-ELECTRICAL						187
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (ALTERNATOR)						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

318-7062 ENGINE AR 10 BRAKE KW (13 BHP) AT 1800 RPM

SMCS - 1000

i05371807

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	321-3143	1	CAMSHAFT GP						24
Y	321-6741	1	CONNECTION GP-ELECTRICAL						181
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	313-1984	1	COVER GP-ENGINE						29
-OR-									
Y	329-8577	1	COVER GP-FRONT HOUSING						32
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
-OR-									
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	318-8880	1	FLYWHEEL GP						56
Y	313-2021	1	GLOW PLUG GP						183
Y	321-3142	1	GOVERNOR GP						149
Y	318-8879	1	HOUSING GP-FLYWHEEL						61
Y	321-3140	1	HOUSING GP-FRONT						70
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2026	1	LAMP GP-INDICATOR						205
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	321-3334	1	PUMP GP-FUEL INJECTION						163
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8803	1	RADIATOR GP						124
-OR-									
Y	369-8737	1	RADIATOR GP						128
-OR-									
Y	369-9326	1	RADIATOR GP						130
Y	320-9114	1	SHUTOFF GP-ELECTRICAL						187
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

435-1643 ENGINE AR

20 BRAKE KW (26 BHP) AT 3000 RPM

FIELD REPLACEMENT FOR 307-9829-PAGE: 14: FOR 425-7984-PAGE: 19: FOR 431-1765-PAGE:
21: FOR 317-1548-PAGE: 15: FOR 359-6599-PAGE: 18: FOR 303-4105-PAGE: 11: FOR 342-
0403-PAGE: 17, 438-7872-PAGE: 22

FIELD INSTALLATION

SMCS-1000

i05345649

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	329-9765	1	CAMSHAFT GP						28
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	342-1268	1	COVER GP-ENGINE						31
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	367-9248	1	DRIVE GP-POWER TAKE-OFF						52
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	325-5586	1	FLYWHEEL GP						57
Y	313-2021	1	GLOW PLUG GP						183
Y	342-7619	1	HOUSING GP-FLYWHEEL						65
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	392-8729	1	LIFTING GP-ENGINE						79
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	342-7622	1	PARTS GP-MISCELLANEOUS						207
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1965	1	VALVE MECHANISM GP						100
AVAILABLE REPAIR KIT(S):									
Y	339-3016	1	KIT-FRONT GEAR						76
Y - SEPARATE ILLUSTRATION									

<END>

ENGINE ARRANGEMENT

435-1650 ENGINE AR 21 BRAKE KW (28 BHP) AT 3400 RPM FIELD REPLACEMENT FOR 316-8414-PAGE: 2

SMCS-1000

i05364102

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	328-1431	1	CAMSHAFT GP						27
Y	328-1430	1	CONTROL GP-GOVERNOR						142
Y	342-1268	1	COVER GP-ENGINE						31
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	367-9248	1	DRIVE GP-POWER TAKE-OFF						52
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	325-5586	1	FLYWHEEL GP						57
Y	313-2021	1	GLOW PLUG GP						183
Y	342-7619	1	HOUSING GP-FLYWHEEL						65
Y	328-1429	1	HOUSING GP-FRONT						74
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	392-8729	1	LIFTING GP-ENGINE						79
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	342-7622	1	PARTS GP-MISCELLANEOUS						207
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	328-1432	1	PUMP GP-FUEL INJECTION						169
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

435-1651 ENGINE AR

SMCS - 1000

i05364096

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	321-3143	1	CAMSHAFT GP						24
Y	342-1268	1	COVER GP-ENGINE						31
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	367-9248	1	DRIVE GP-POWER TAKE-OFF						52
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	325-5586	1	FLYWHEEL GP						57
Y	313-2021	1	GLOW PLUG GP						183
Y	321-3142	1	GOVERNOR GP						149
Y	342-7619	1	HOUSING GP-FLYWHEEL						65
Y	321-3140	1	HOUSING GP-FRONT						70
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	392-8729	1	LIFTING GP-ENGINE						79
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	342-7622	1	PARTS GP-MISCELLANEOUS						207
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	321-3334	1	PUMP GP-FUEL INJECTION						163
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

303-4105 ENGINE AR-PRIMARY

20 BRAKE KW (26 BHP) AT 3000 RPM

FIELD REPLACEMENT ORDER 435-1643-PAGE: 8

SMCS-1000

i05301900

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	329-9765	1	CAMSHAFT GP						28
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	329-8577	1	COVER GP-FRONT HOUSING						32
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			-OR-						
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	313-1969	1	HOUSING GP-FLYWHEEL						58
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2026	1	LAMP GP-INDICATOR						205
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (ALTERNATOR)						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

303-4107 ENGINE AR-PRIMARY

18 BRAKE KW (25 BHP) AT 2800 RPM

FIELD REPLACEMENT ORDER 435-1648-PAGE: 45

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i04495027

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	313-1984	1	COVER GP-ENGINE						29
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	308-5704	1	FILTER GP-FUEL						146
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	313-1969	1	HOUSING GP-FLYWHEEL						58
Y	313-6213	1	HOUSING GP-FRONT						68
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-6216	1	PUMP GP-FUEL INJECTION						160
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

303-4108 ENGINE AR-PRIMARY

18 BRAKE KW (25 BHP) AT 2800 RPM

FIELD REPLACEMENT ORDER 435-1648-PAGE: 45

SMCS-1000

i04093349

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	313-6215	1	CAMSHAFT GP						23
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	329-8577	1	COVER GP-FRONT HOUSING						32
			-OR-						
Y	313-1984	1	COVER GP-ENGINE						29
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			-OR-						
Y	365-0486	1	FILLER GP-OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	318-8880	1	FLYWHEEL GP						56
Y	313-2021	1	GLOW PLUG GP						183
Y	313-6214	1	GOVERNOR GP						147
Y	318-8879	1	HOUSING GP-FLYWHEEL						61
Y	313-6213	1	HOUSING GP-FRONT						68
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2026	1	LAMP GP-INDICATOR						205
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-6216	1	PUMP GP-FUEL INJECTION						160
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (ALTERNATOR)						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

307-9829 ENGINE AR-PRIMARY

20 BRAKE KW (26 BHP) AT 3000 RPM

FIELD REPLACEMENT ORDER 435-1643-PAGE: 8

SMCS-1000

i04119211

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
			S/N: G8N1-1832						
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
			S/N: G8N1833-UP						
Y	329-9765	1	CAMSHAFT GP						28
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	325-5589	1	COVER GP-VALVE MECHANISM						35
Y	313-1984	1	COVER GP-ENGINE						29
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	322-3808	1	DRIVE GP-FAN						50
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1981	1	FAN GP-SUCTION						112
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			-OR-						
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-6218	1	FLYWHEEL GP						55
Y	313-2021	1	GLOW PLUG GP						183
Y	313-6217	1	HOUSING GP-FLYWHEEL						60
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2026	1	LAMP GP-INDICATOR						205
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	325-5596	1	MANIFOLD GP-EXHAUST						140
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	319-7352	1	PAN GP-OIL						85
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
			S/N: G8N1-1832						
Y	334-0280	1	PUMP GP-FILTER & FUEL TRANSFER						154
			S/N: G8N1833-UP						
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (ALTERNATOR)						97
			-OR-						
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

317-1548 ENGINE AR-PRIMARY

20 BRAKE KW (26 BHP) AT 3000 RPM

SMCS - 1000

i05360010

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	329-9765	1	CAMSHAFT GP						28
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	329-8577	1	COVER GP-FRONT HOUSING						32
			-OR-						
Y	313-1984	1	COVER GP-ENGINE						29
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			-OR-						
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	313-1969	1	HOUSING GP-FLYWHEEL						58
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2026	1	LAMP GP-INDICATOR						205
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	319-7352	1	PAN GP-OIL						85
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	317-6706	1	PUMP GP-FUEL PRM & PRIM FILTER						172
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	319-7357	1	SOLENOID GP-SHUTOFF						189
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

318-8405 ENGINE AR-PRIMARY

20 BRAKE KW (26 BHP) AT 3000 RPM

SMCS - 1000

i05422278

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	329-9765	1	CAMSHAFT GP						28
Y	321-6741	1	CONNECTION GP-ELECTRICAL						181
Y	317-7194	1	CONNECTOR GP-CAB HEATER LINES						109
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	313-1984	1	COVER GP-ENGINE						29
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	334-0278	1	FILLER GP-ENGINE OIL						103
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	334-0279	1	FILTER GP-ENGINE OIL						107
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	313-6217	1	HOUSING GP-FLYWHEEL						60
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	334-0277	1	PAN GP-OIL						89
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	334-0280	1	PUMP GP-FILTER & FUEL TRANSFER						154
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	317-6706	1	PUMP GP-FUEL PRM & PRIM FILTER						172
			-OR-						
Y	308-5704	1	FILTER GP-FUEL						146
Y	313-1978	1	PUMP GP-WATER						116
Y	320-9114	1	SHUTOFF GP-ELECTRICAL						187
Y	319-7357	1	SOLENOID GP-SHUTOFF						189
Y	319-7351	1	STARTING MOTOR GP-ELECTRIC						195
Y	319-7358	1	SWITCH GP-PRESSURE						202
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

342-0403 ENGINE AR-PRIMARY

20 BRAKE KW (126 BHP) AT 3000 RPM

FIELD REPLACEMENT ORDER 435-1643-PAGE: 8

SMCS-1000

i05421417

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	329-9765	1	CAMSHAFT GP						28
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	313-1984	1	COVER GP-ENGINE						29
Y	325-5589	1	COVER GP-VALVE MECHANISM						35
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
			-OR-						
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	313-1969	1	HOUSING GP-FLYWHEEL						58
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2026	1	LAMP GP-INDICATOR						205
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	325-5596	1	MANIFOLD GP-EXHAUST						140
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	319-7352	1	PAN GP-OIL						85
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	334-0280	1	PUMP GP-FILTER & FUEL TRANSFER						154
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (ALTERNATOR)						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

359-6599 ENGINE AR-PRIMARY

19.7 BRAKE KW (26.4 BHP) AT 3000 RPM

FIELD REPLACEMENT ORDER 435-1643-PAGE: 8

SMCS-1000

i04843970

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	329-9765	1	CAMSHAFT GP						28
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	313-1984	1	COVER GP-ENGINE						29
Y	325-5589	1	COVER GP-VALVE MECHANISM						35
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	308-5704	1	FILTER GP-FUEL						146
Y	313-6218	1	FLYWHEEL GP						55
Y	313-2021	1	GLOW PLUG GP						183
Y	313-6217	1	HOUSING GP-FLYWHEEL						60
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	319-7352	1	PAN GP-OIL						85
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

425-7984 ENGINE AR-PRIMARY

20 BRAKE KW (26 BHP) AT 3000 RPM

FIELD REPLACEMENT ORDER 435-1643-PAGE: 8

SMCS-1000

i05431883

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	329-9765	1	CAMSHAFT GP						28
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	313-1984	1	COVER GP-ENGINE						29
Y	325-5589	1	COVER GP-VALVE MECHANISM						35
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	322-3808	1	DRIVE GP-FAN						50
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1981	1	FAN GP-SUCTION						112
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-6218	1	FLYWHEEL GP						55
Y	313-2021	1	GLOW PLUG GP						183
Y	313-6217	1	HOUSING GP-FLYWHEEL						60
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	325-5596	1	MANIFOLD GP-EXHAUST						140
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	319-7352	1	PAN GP-OIL						85
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	334-0280	1	PUMP GP-FILTER & FUEL TRANSFER						154
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

431-1763 ENGINE AR-PRIMARY

12 BRAKE KW (16 BHP) AT 1800 RPM

FIELD REPLACEMENT ORDER 435-1632-PAGE: 43

SMCS-1000

i05432744

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	321-3143	1	CAMSHAFT GP						24
Y	321-6741	1	CONNECTION GP-ELECTRICAL						181
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	329-8577	1	COVER GP-FRONT HOUSING						32
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	318-8880	1	FLYWHEEL GP						56
Y	313-2021	1	GLOW PLUG GP						183
Y	321-3142	1	GOVERNOR GP						149
Y	318-8879	1	HOUSING GP-FLYWHEEL						61
Y	321-3140	1	HOUSING GP-FRONT						70
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	321-3334	1	PUMP GP-FUEL INJECTION						163
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	369-8737	1	RADIATOR GP						128
Y	320-9114	1	SHUTOFF GP-ELECTRICAL						187
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP (DRIVE)						97
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

ENGINE ARRANGEMENT

431-1765 ENGINE AR-PRIMARY

20 BRAKE KW (26 BHP) AT 3000 RPM

FIELD REPLACEMENT ORDER 435-1643-PAGE: 8

SMCS-1000

i05432757

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	319-7354	1	ALTERNATOR GP-CHARGING						179
Y	329-9765	1	CAMSHAFT GP						28
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	313-1984	1	COVER GP-ENGINE						29
Y	325-5589	1	COVER GP-VALVE MECHANISM						35
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	308-5704	1	FILTER GP-FUEL						146
Y	313-6218	1	FLYWHEEL GP						55
Y	313-2021	1	GLOW PLUG GP						183
Y	313-6217	1	HOUSING GP-FLYWHEEL						60
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	319-7352	1	PAN GP-OIL						85
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	319-7355	1	V-BELT GP (INCLUDES 1-BELT)						98
Y	313-1965	1	VALVE MECHANISM GP						100
Y - SEPARATE ILLUSTRATION									
<END>									

ENGINE ARRANGEMENT

438-7872 ENGINE AR-PRIMARY

20 BRAKE KW (26 BHP) AT 3000 RPM

FIELD REPLACEMENT ORDER 435-1643-PAGE: 8

SMCS-1000

i05731980

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-1982	1	ALTERNATOR GP-CHARGING						177
Y	329-9765	1	CAMSHAFT GP						28
Y	308-2319	1	CONNECTION GP-ELECTRICAL						180
Y	308-2309	1	CONNECTION GP-EXHAUST						134
Y	329-9764	1	CONTROL GP-GOVERNOR						144
Y	313-1984	2	COVER GP-ENGINE						29
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	365-0486	1	FILLER GP-ENGINE OIL						105
Y	318-8804	1	FILTER GP-AIR						137
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	313-1970	1	FLYWHEEL GP						54
Y	313-2021	1	GLOW PLUG GP						183
Y	313-1969	1	HOUSING GP-FLYWHEEL						58
Y	313-1967	1	HOUSING GP-FRONT						66
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	313-2022	1	LIFTING GP-ENGINE						78
Y	313-1991	1	MANIFOLD GP-EXHAUST						139
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-1972	1	PULLEY GP-WATER PUMP						95
Y	313-1968	1	PUMP GP-FUEL INJECTION						157
Y	308-2320	1	PUMP GP-FUEL PRIMING						171
Y	313-2009	1	PUMP GP-FUEL TRANSFER						173
Y	313-1978	1	PUMP GP-WATER						116
Y	318-8815	1	RADIATOR & FAN GP						120
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-1971	1	STARTING MOTOR GP-ELECTRIC						192
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	308-2314	1	SWITCH GP-START						203
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1983	1	V-BELT GP						97
Y	313-1965	1	VALVE MECHANISM GP						100
			AVAILABLE REPAIR KIT(S) :						
Y	339-3016	1	KIT-FRONT GEAR						76
			(INCLUDES COVER, SPRING, COLLAR, CLIP, WASHERS, & SHIMS)						
Y - SEPARATE ILLUSTRATION									
<END>									

BASIC ENGINE

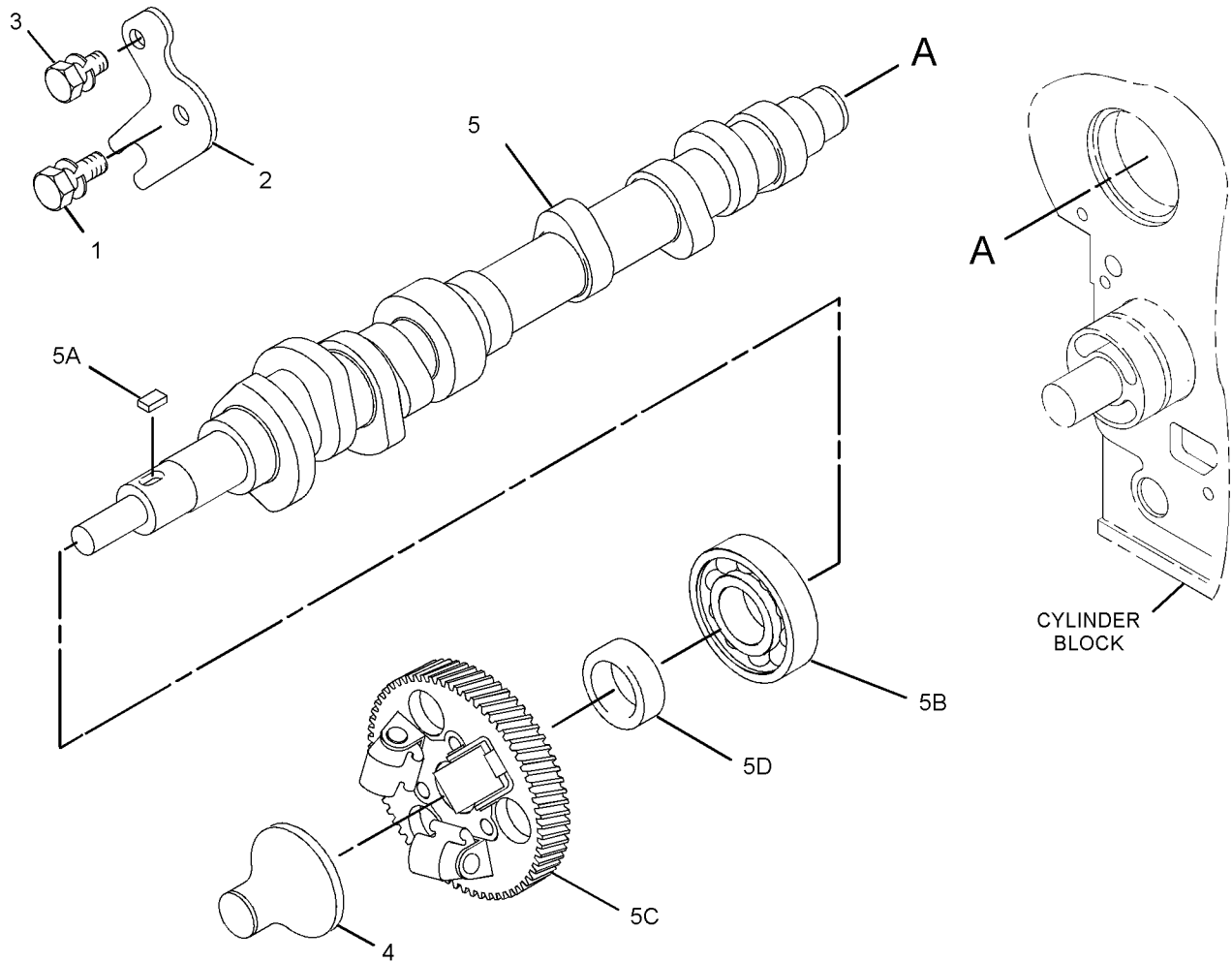
313-6215 CAMSHAFT GP PART OF 435-1648 CYLINDER BLOCK GP-LONG

SMCS-1210

i03705553

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6838	1	BOLT						
	2	1	153-7990	1	PLATE						
M	3	1	9X-6153	1	BOLT (M6X1X10-MM)						
	4	1	308-1904	1	SLIDER						
	5	1	313-2038	1	CAMSHAFT AS						
	5A	1	153-6492	1	KEY-WOODRUFF						
	5B	1	183-3605	1	BEARING						
	5C	1	311-5847	1	GEAR-CAMSHAFT						
	5D	1	313-9323	1	SPACER						

M - METRIC PART



GRAPHIC #1

<END>

g02019236

BASIC ENGINE

321-3143 CAMSHAFT GP

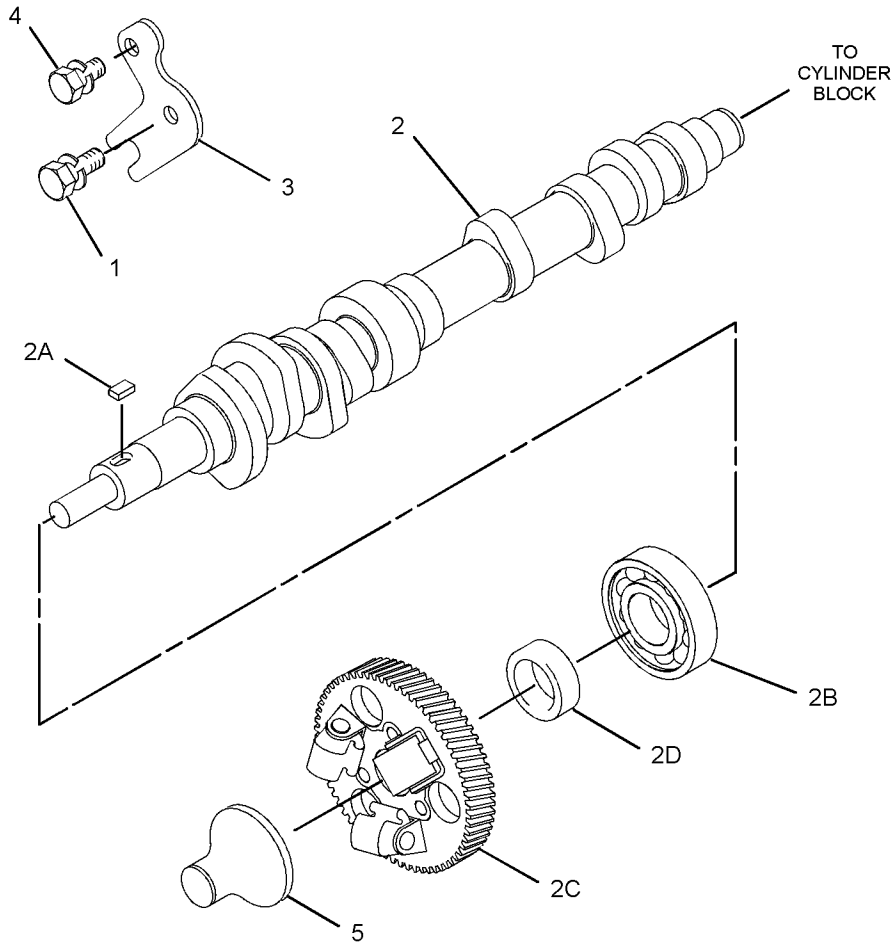
PART OF 435-1632 CYLINDER BLOCK GP, 435-1651 ENGINE AR

SMCS-1210

i03737907

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6838	1	BOLT						
	2	1	313-2038	1	CAMSHAFT AS						
	2A	1	153-6492	1	KEY-WOODRUFF						
	2B	1	183-3605	1	BEARING						
	2C	1	311-5847	1	GEAR-CAMSHAFT						
	2D	1	313-9323	1	SPACER						
	3	1	153-7990	1	PLATE						
M	4	1	9X-6153	1	BOLT (M6X1X10-MM)						
	5	1	308-1904	1	SLIDER						

M - METRIC PART



GRAPHIC #1

<END>

g02022462

BASIC ENGINE

323-2409 CAMSHAFT GP

PART OF 435-1644 CYLINDER BLOCK GP

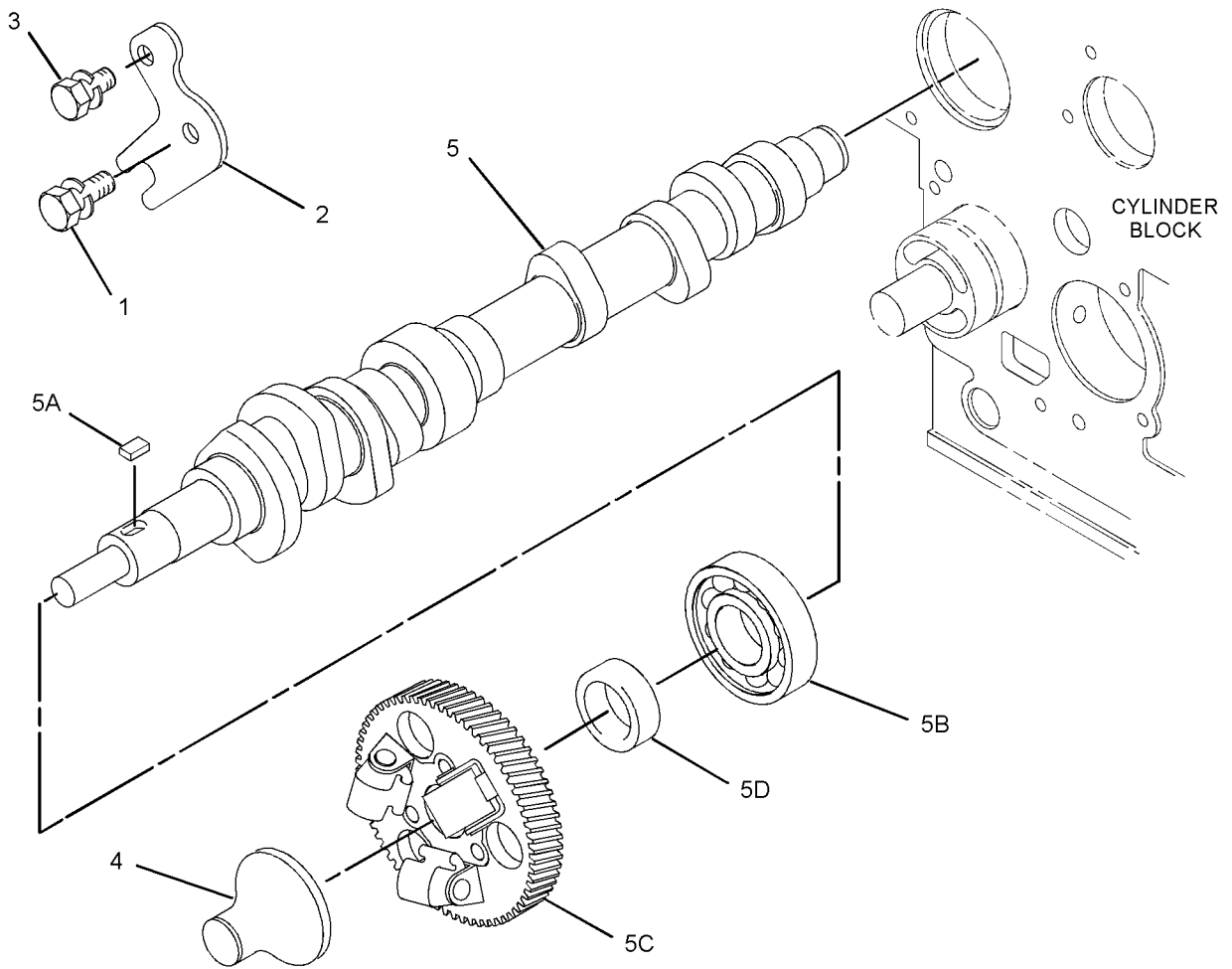
TYPE 1

SMCS-1210

i03770795

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6838	1	BOLT						
	2	1	153-7990	1	PLATE						
M	3	1	9X-6153	1	BOLT (M6X1X10-MM)						
	4	1	308-1904	1	SLIDER						
	5	1	313-2038	1	CAMSHAFT AS						
	5A	1	153-6492	1	KEY-WOODRUFF						
	5B	1	183-3605	1	BEARING						
	5C	1	311-5847	1	GEAR-CAMSHAFT (52-TEETH)						
	5D	1	313-9323	1	SPACER						

M - METRIC PART



GRAPHIC #1

<END>

g01991495

BASIC ENGINE

323-2409 CAMSHAFT GP

PART OF 435-1644 CYLINDER BLOCK GP

TYPE 2

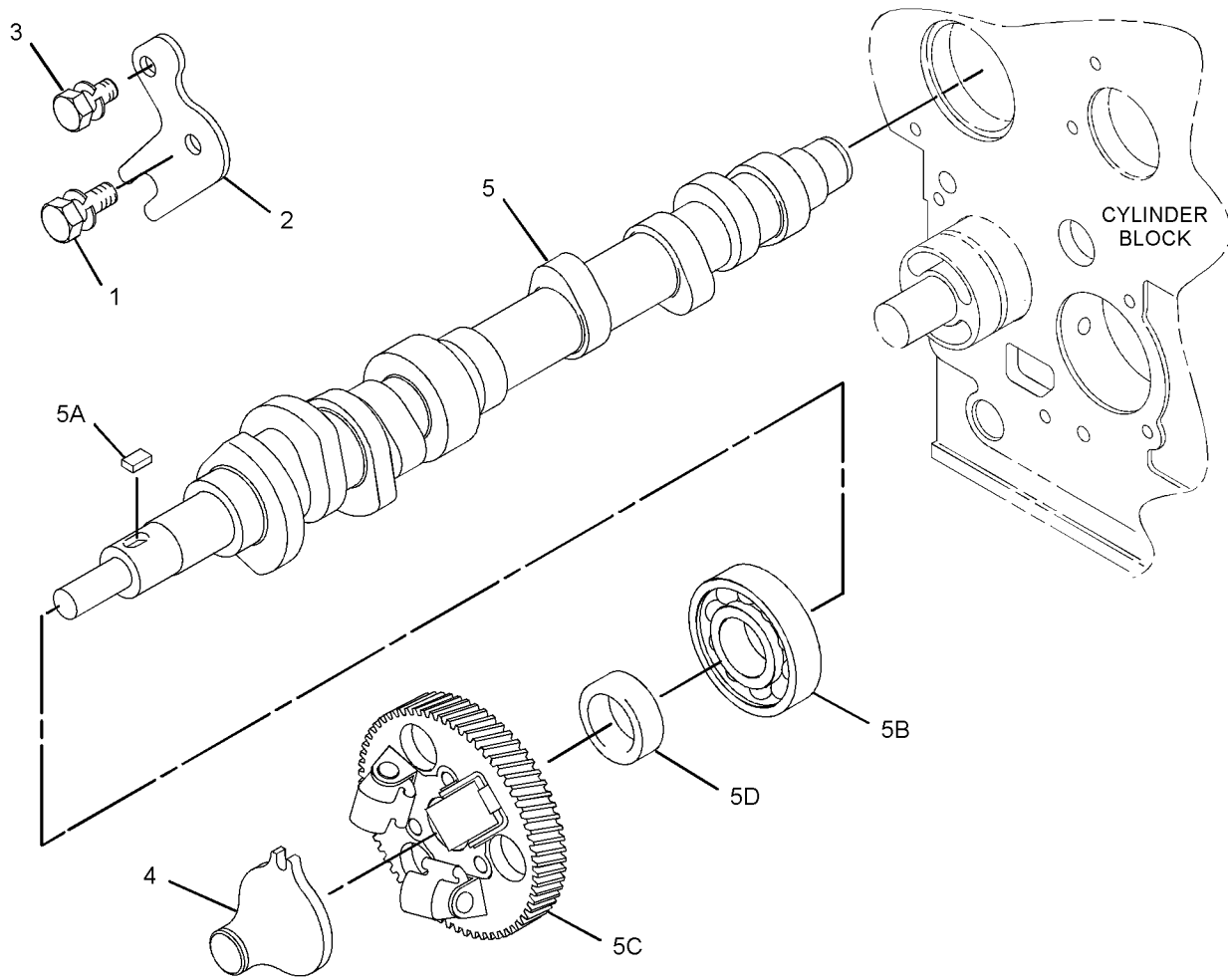
SMCS-1210

i05325314

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6838	1	BOLT						
	2	1	153-7990	1	PLATE						
M	3	1	9X-6153	1	BOLT (M6X1X10-MM)						
C	4	1	363-8409	1	SLIDER						
C	5	1	363-8410	1	CAMSHAFT AS						
	5A	1	153-6492	1	KEY-WOODRUFF						
	5B	1	183-3605	1	BEARING						
	5C	1	363-8408	1	GEAR (52-TEETH)						
	5D	1	313-9323	1	SPACER						

C - CHANGE FROM PREVIOUS TYPE

M - METRIC PART



GRAPHIC #1

<END>

g03700672

BASIC ENGINE

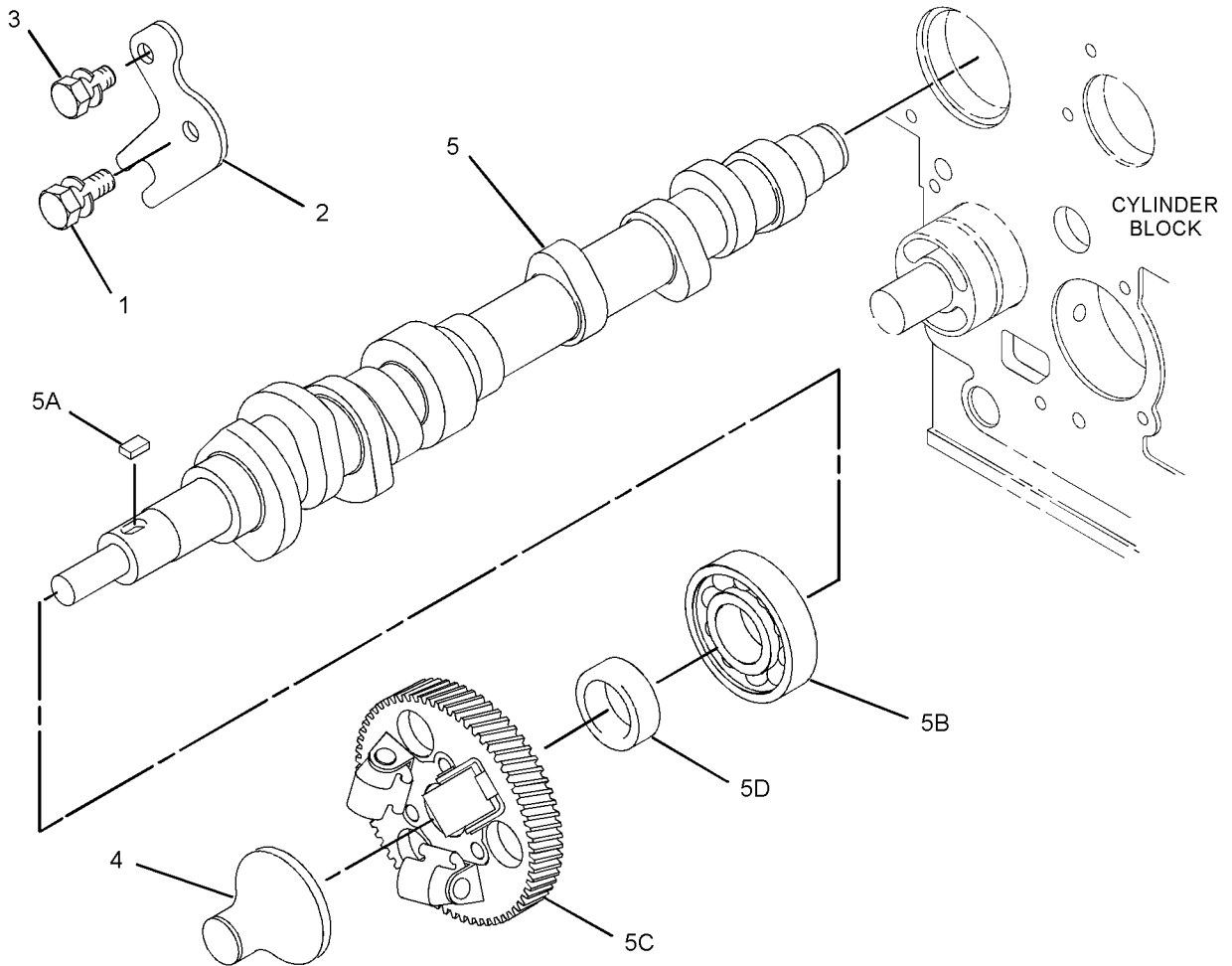
328-1431 CAMSHAFT GP PART OF 435-1650 ENGINE AR

SMCS-1210

i03770645

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6838	1	BOLT						
	2	1	153-7990	1	PLATE						
M	3	1	9X-6153	1	BOLT (M6X1X10-MM)						
	4	1	308-1904	1	SLIDER						
	5	1	328-1426	1	CAMSHAFT GP						
	5A	1	153-6492	1	KEY-WOODRUFF						
	5B	1	183-3605	1	BEARING						
	5C	1	311-5847	1	GEAR-CAMSHAFT (52-TEETH)						
	5D	1	313-9323	1	SPACER						

M - METRIC PART



GRAPHIC #1

<END>

g01991495

BASIC ENGINE

329-9765 CAMSHAFT GP

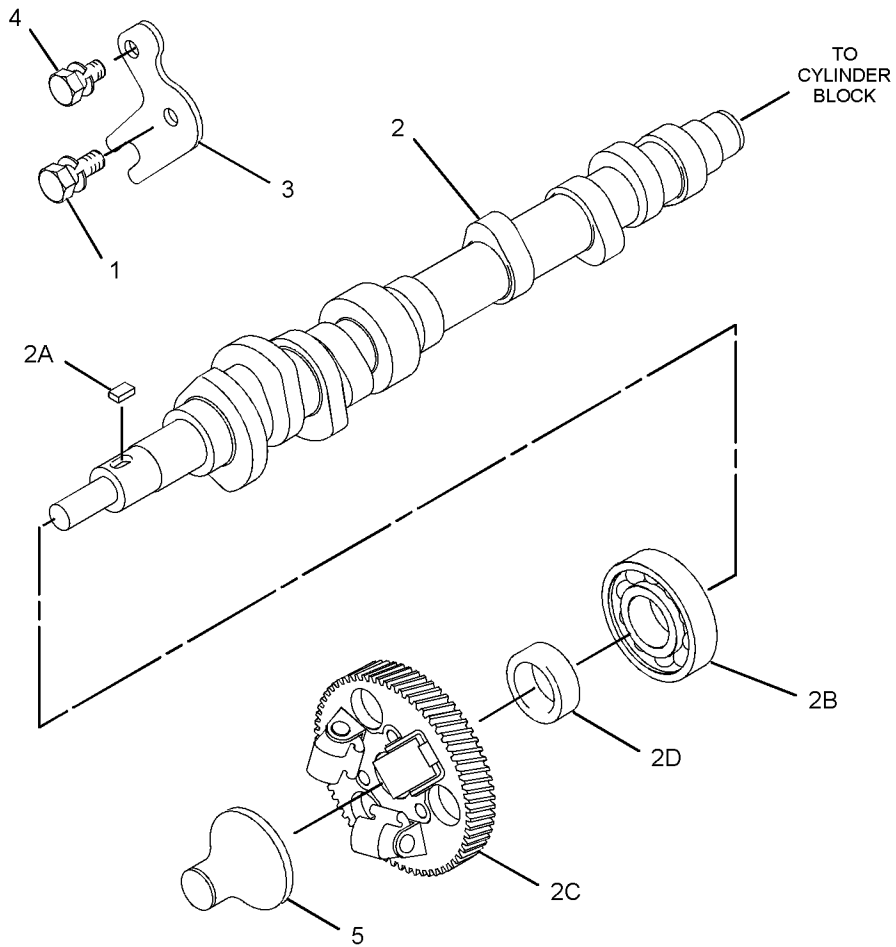
PART OF 435-1643 ENGINE AR

SMCS-1210

i03737905

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6838	1	BOLT						
	2	1	313-2038	1	CAMSHAFT AS						
	2A	1	153-6492	1	KEY - WOODRUFF						
	2B	1	183-3605	1	BEARING						
	2C	1	311-5847	1	GEAR - CAMSHAFT						
	2D	1	313-9323	1	SPACER						
	3	1	153-7990	1	PLATE						
M	4	1	9X-6153	1	BOLT (M6X1X10-MM)						
	5	1	308-1904	1	SLIDER						

M - METRIC PART



GRAPHIC #1

<END>

g02022462

BASIC ENGINE

313-1984 COVER GP-ENGINE

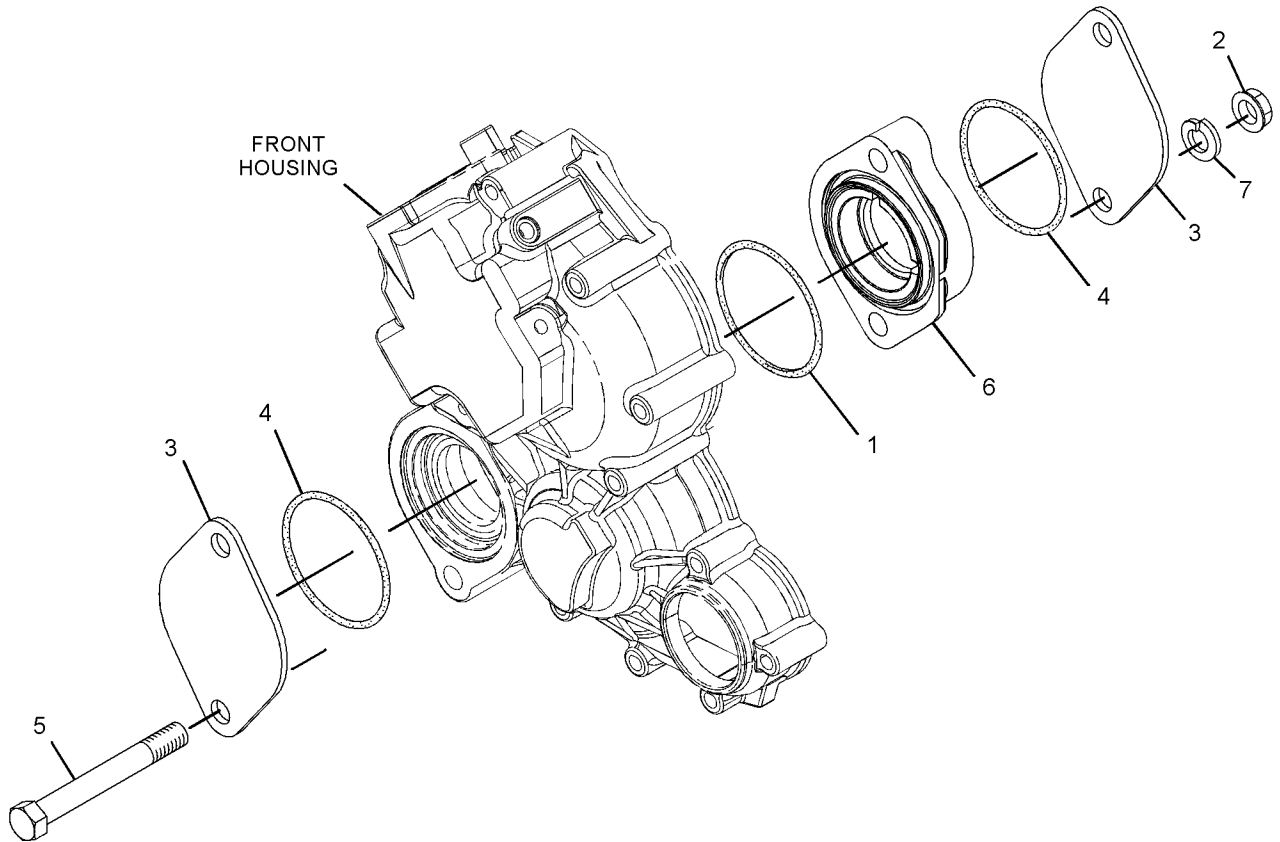
PART OF 435-1644 CYLINDER BLOCK GP

TYPE 1

SMCS-1000

i03935996

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6497	1	SEAL-O-RING						
	2	1	311-1171	2	NUT						
	3	1	311-5852	2	PLATE						
	4	1	311-5853	2	SEAL-O-RING						
	5	1	311-5854	2	BOLT						
	6	1	313-2034	1	RETAINER AS-BEARING						
	7	1	154-2403	2	WASHER						



GRAPHIC #1

<END>

g02158621

BASIC ENGINE

313-1984 COVER GP-ENGINE

PART OF 435-1644 CYLINDER BLOCK GP

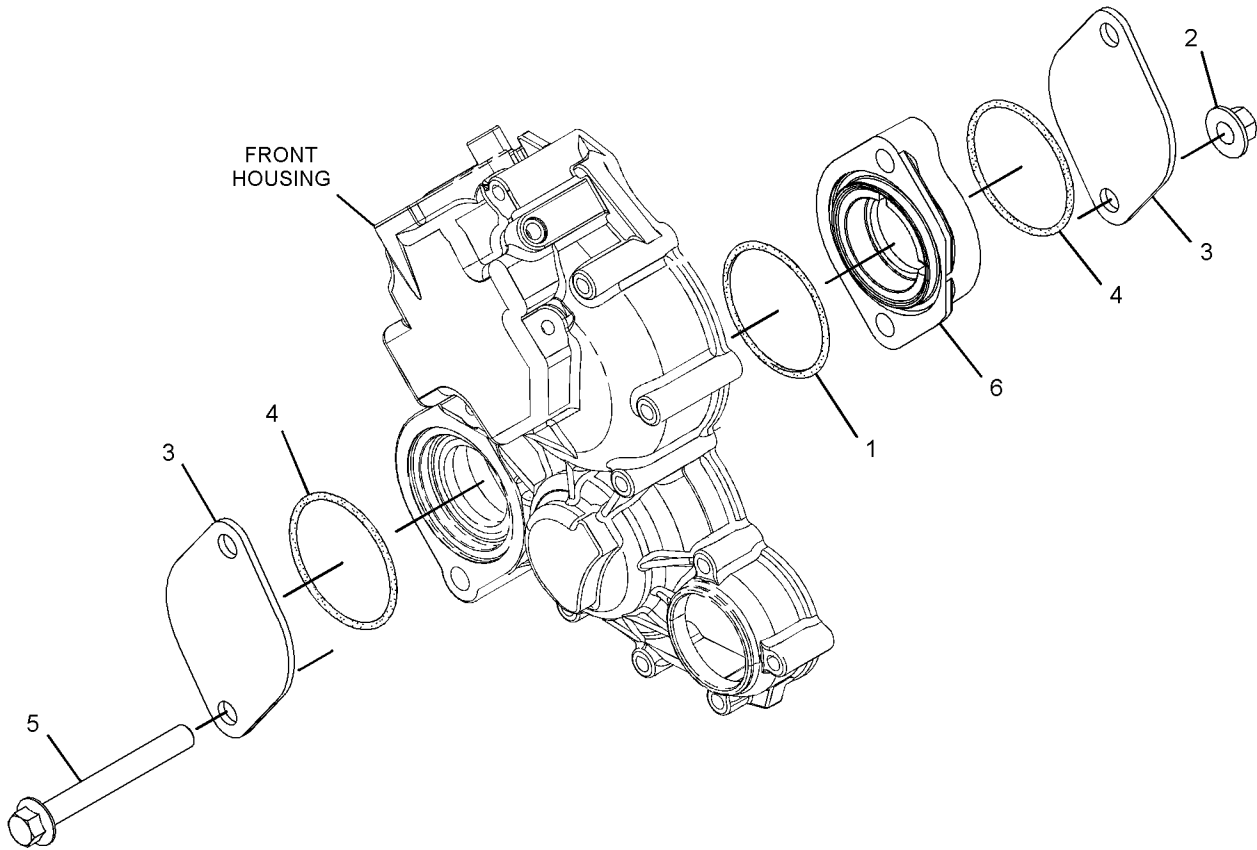
TYPE 2

SMCS-1000

i05407105

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6497	1	SEAL-O-RING						
CM	2	1	175-7141	2	NUT-HEX FLANGE (M10X1.5-THD)						
	3	1	311-5852	2	PLATE						
	4	1	311-5853	2	SEAL-O-RING						
CM	5	1	103-5687	2	BOLT (M10X1.5X85-MM)						
	6	1	313-2034	1	RETAINER AS-BEARING						

C - CHANGE FROM PREVIOUS TYPE
M - METRIC PART



GRAPHIC #1

<END>

g03471759

BASIC ENGINE

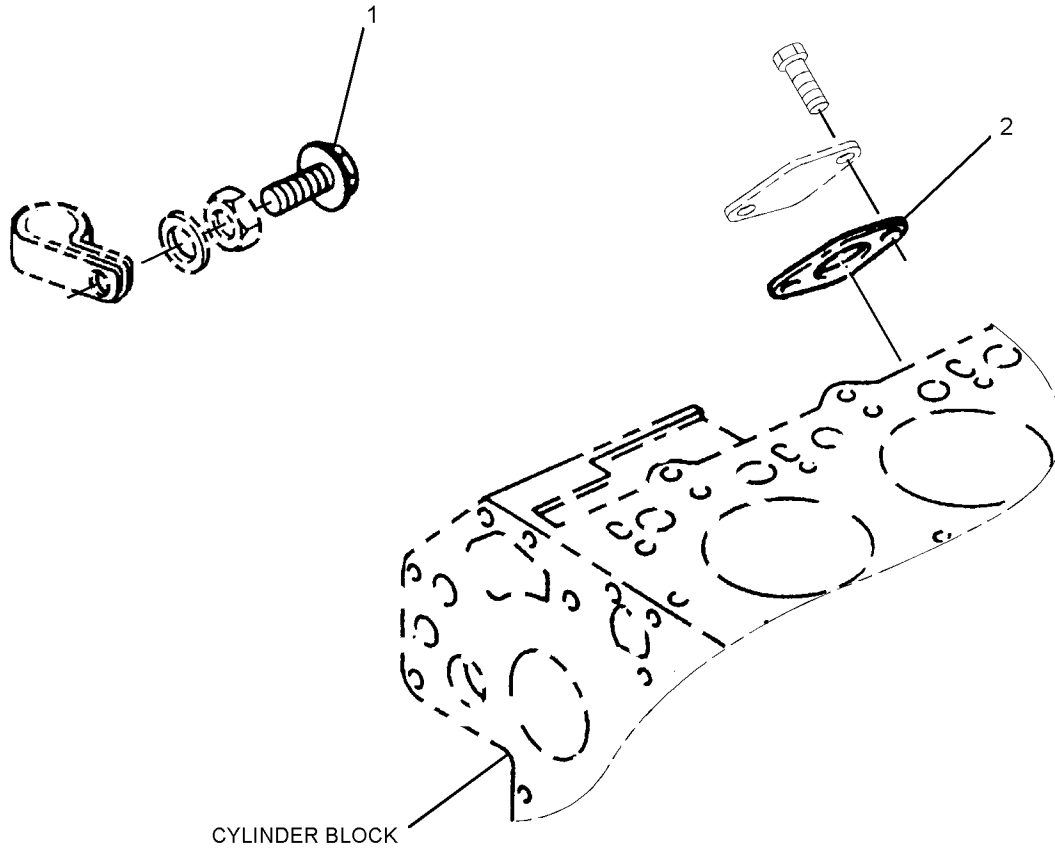
342-1268 COVER GP-ENGINE

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1000

i05320108

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	165-2141	1	BOLT						
	2	1	215-2606	1	GASKET						



GRAPHIC #1

<END>

g03375158

BASIC ENGINE

329-8577 COVER GP-FRONT HOUSING

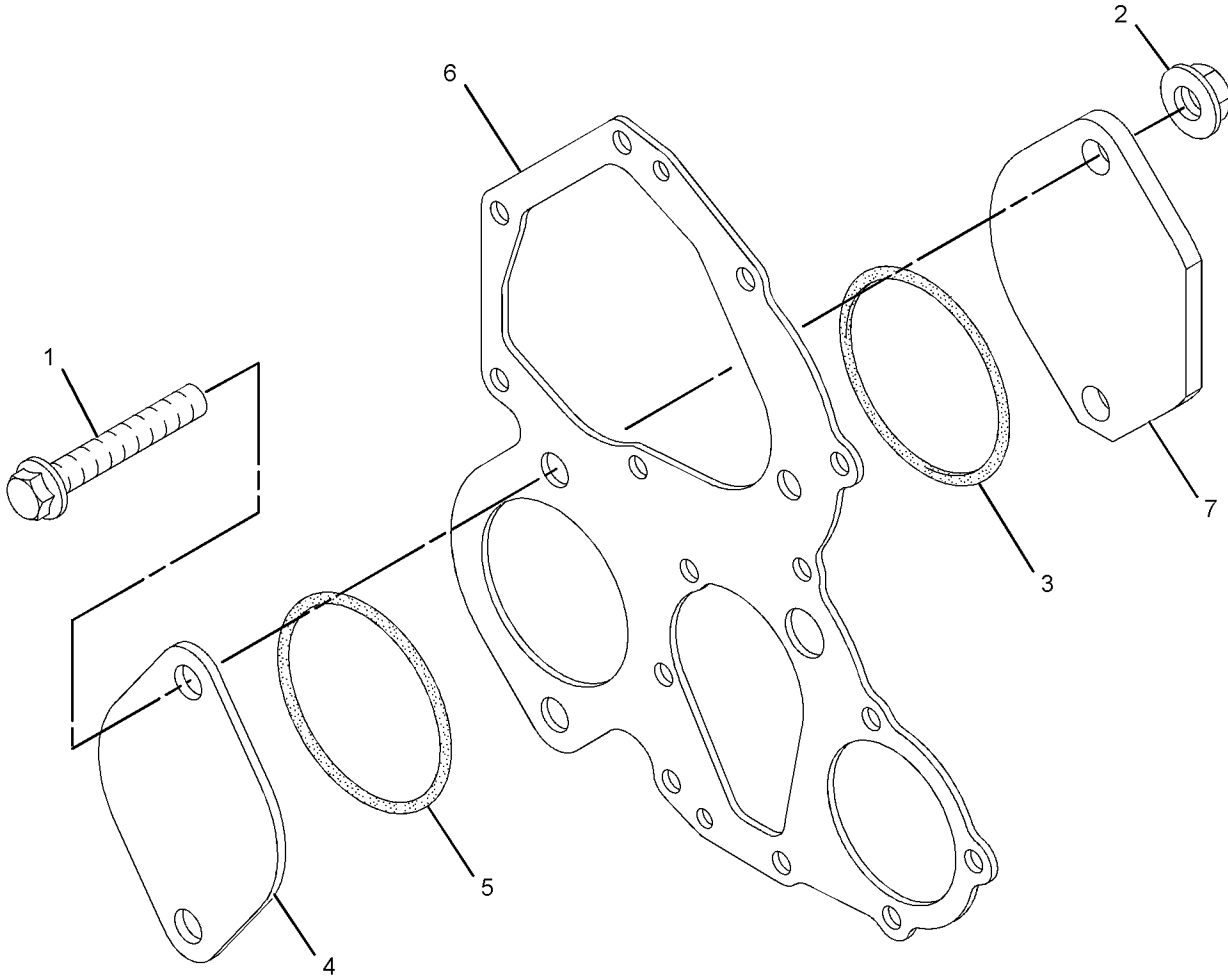
PART OF 435-1632 CYLINDER BLOCK GP

SMCS-1151, 1166

i03124562

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	6I-0454	2	BOLT (M10X1.5X70-MM)						
	2	1	6I-0594	2	NUT (M10X1.5-THD)						
	3	1	153-6497	1	SEAL-O-RING						
	4	1	311-5852	1	PLATE						
	5	1	311-5853	1	SEAL-O-RING						
	6	1	321-5906	1	PLATE						
	7	1	329-8576	1	PLATE						

M - METRIC PART



GRAPHIC #1

<END>

g01614834

BASIC ENGINE

313-1986 COVER GP-VALVE MECHANISM

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1107

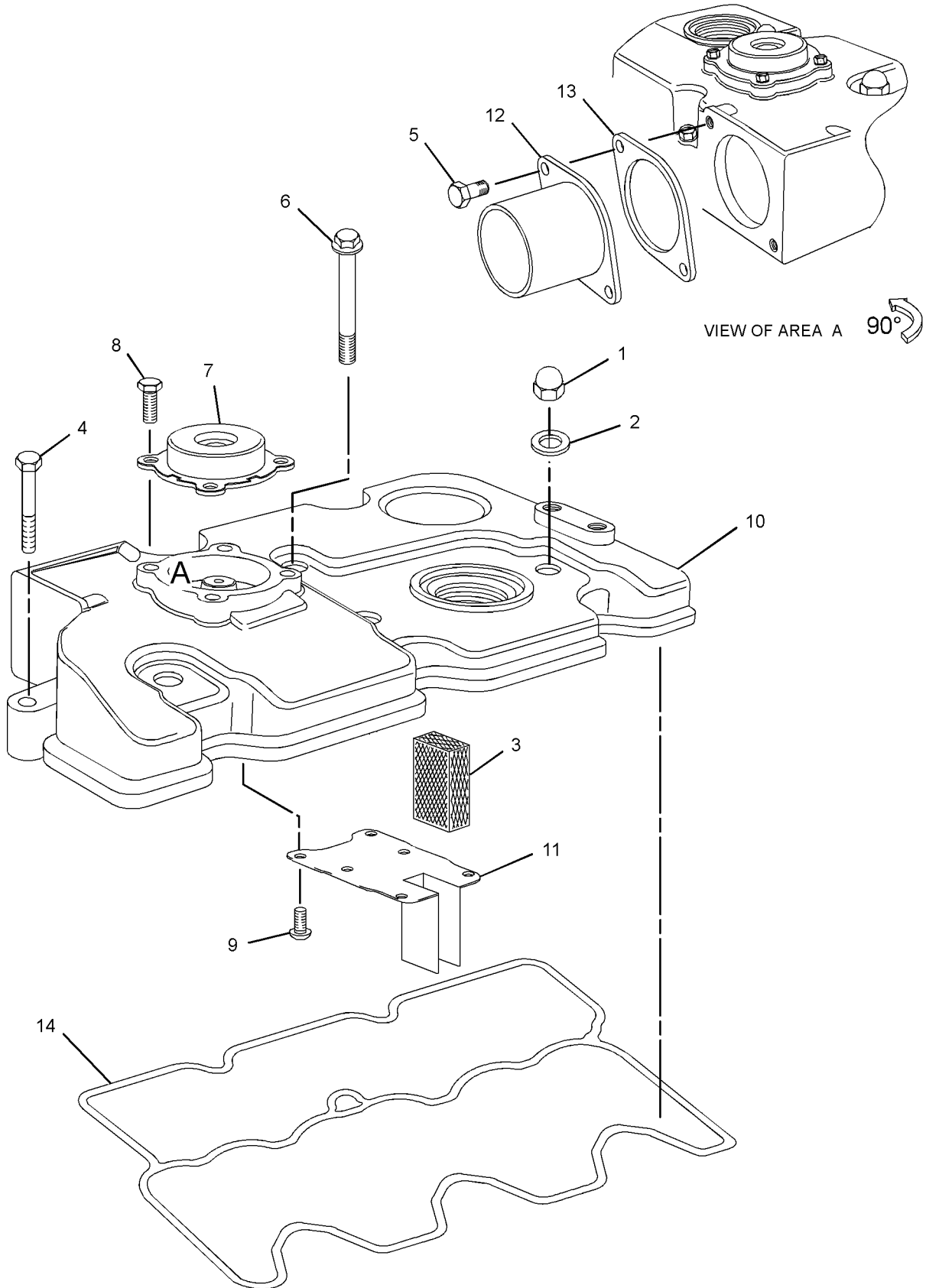
i05374849

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5934	3	NUT						
	2	1	153-5936	3	WASHER						
	3	1	153-5939	1	FILTER ELEMENT-BREATHER						
	4	1	153-6861	2	BOLT						
	5	1	153-7640	2	BOLT						
	6	1	165-2139	3	BOLT						
	7	1	217-5859	1	VALVE-BREATHER (CRANKCASE)						
	8	1	217-5860	4	BOLT						
	9	1	217-5862	6	BOLT						
	10	1	231-3009	1	COVER-VALVE						
	11	1	231-3010	1	PLATE-RETAINING						
	12	1	231-3013	1	CONNECTION-AIR						
	13	1	432-8339	1	GASKET (AIR INTAKE)						
	14	1	444-7398	1	GASKET-COVER						

BASIC ENGINE

313-1986 COVER GP-VALVE MECHANISM (contd.)

i05374849



GRAPHIC #1

<END>

g03416038

BASIC ENGINE

325-5589 COVER GP-VALVE MECHANISM

SMCS-1107

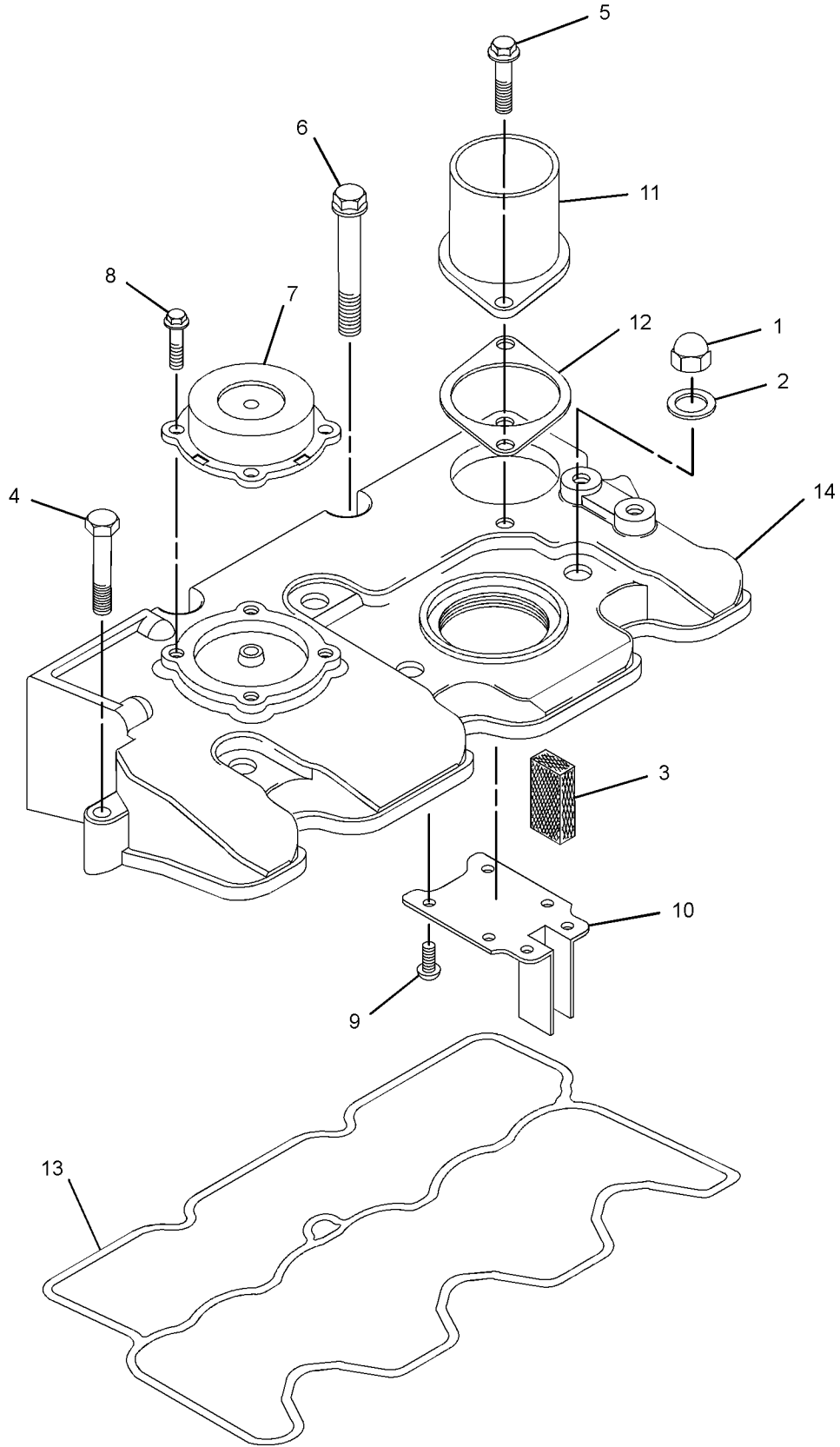
i05374867

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5934	3	NUT						
	2	1	153-5936	3	WASHER						
	3	1	153-5939	1	FILTER ELEMENT-BREATHER						
	4	1	153-6861	2	BOLT						
	5	1	153-7640	2	BOLT						
	6	1	165-2139	3	BOLT						
	7	1	217-5859	1	VALVE-BREATHER (CRANKCASE)						
	8	1	217-5860	4	BOLT						
	9	1	217-5862	4	BOLT						
	10	1	231-3010	1	PLATE-RETAINING						
	11	1	231-3013	1	CONNECTION-AIR						
	12	1	432-8339	1	GASKET (AIR INTAKE)						
	13	1	444-7398	1	GASKET-COVER						
	14	1	238-1330	1	COVER-VALVE						

BASIC ENGINE

325-5589 COVER GP-VALVE MECHANISM (contd.)

i05374867



GRAPHIC #1

<END>

g03411637

BASIC ENGINE

328-1435 COVER GP-VALVE MECHANISM

SMCS-1107

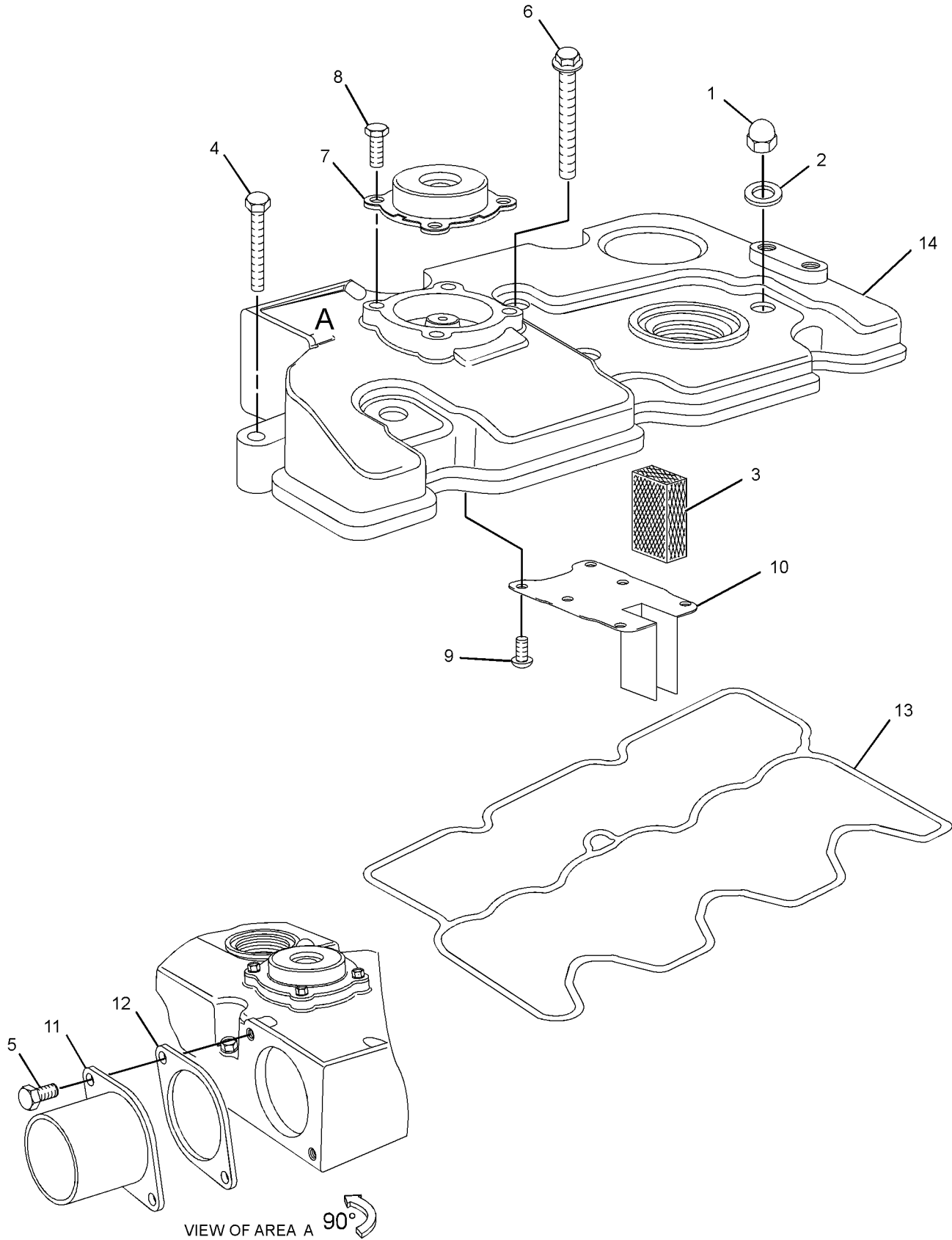
i05374877

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5934	3	NUT						
	2	1	153-5936	3	WASHER						
	3	1	153-5939	1	FILTER ELEMENT-BREATHER (CRANKCASE)						
	4	1	153-6861	2	BOLT						
	5	1	153-7640	2	BOLT						
	6	1	165-2139	3	BOLT						
	7	1	217-5859	1	VALVE-BREATHER (CRANKCASE)						
	8	1	217-5860	4	BOLT						
	9	1	217-5862	4	BOLT						
	10	1	231-3010	1	PLATE-RETAINING						
	11	1	231-3013	1	CONNECTION-AIR						
	12	1	432-8339	1	GASKET (AIR INTAKE)						
	13	1	444-7398	1	GASKET-COVER						
	14	1	269-7005	1	COVER-VALVE						

BASIC ENGINE

328-1435 COVER GP-VALVE MECHANISM (contd.)

i05374877



GRAPHIC #1

VIEW OF AREA A



<END>

g03418337

BASIC ENGINE

313-1962 CRANKSHAFT GP

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1202

i05755571

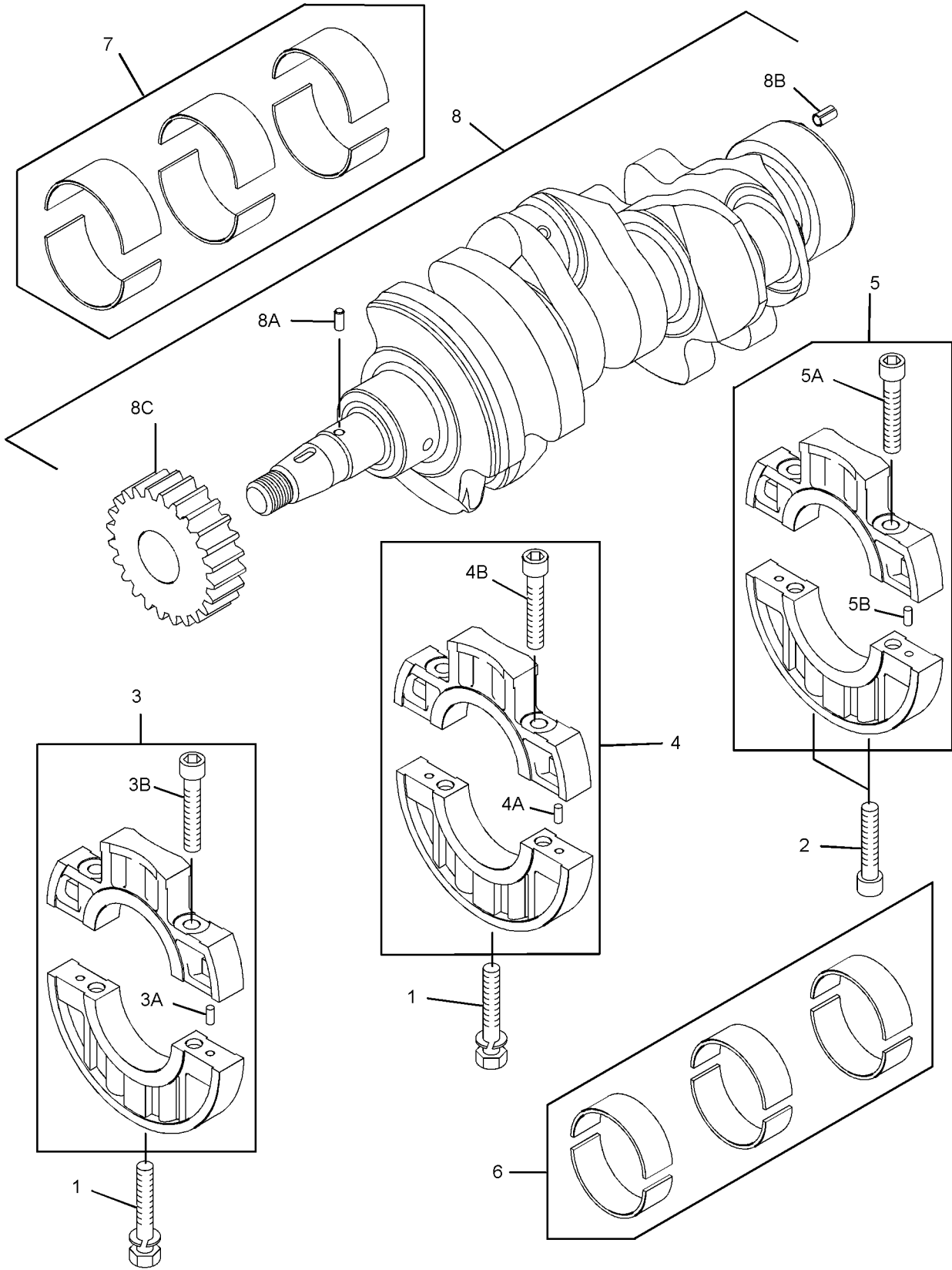
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5397	2	BOLT (M16X1.5-THD)						
	2	1	153-5408	2	BOLT						
	3	1	231-2801	1	CAP AS-BEARING						
	3A	1	153-5402	2	DOWEL						
	3B	1	153-5403	2	BOLT						
	4	1	231-2802	1	CAP AS-BEARING						
	4A	1	153-5402	2	DOWEL						
	4B	1	153-5403	4	BOLT						
	5	1	231-2803	1	CAP AS-BEARING						
M	5A	1	8T-0276	2	BOLT (M8X1.25X45-MM)						
	5B	1	153-5402	2	DOWEL						
	6	1	304-4764	1	KIT-BEARING						
B	7	1	304-4766	1	KIT-CRANKSHAFT BEARING						
AB		1	304-4767		KIT-CRANKSHAFT BEARING						
	8	1	313-2027	1	CRANKSHAFT AS						
	8A	1	153-5518	1	KEY						
	8B	1	153-5519	1	PIN						
	8C	1	356-3225	1	GEAR-CRANKSHAFT (26-TEETH)						

A - NOT PART OF THIS GROUP
 B - USE AS REQUIRED
 M - METRIC PART

BASIC ENGINE

313-1962 CRANKSHAFT GP (contd.)

i05755571



GRAPHIC #1

<END>

g01389555

BASIC ENGINE

313-1957 CYLINDER BLOCK GP

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1201

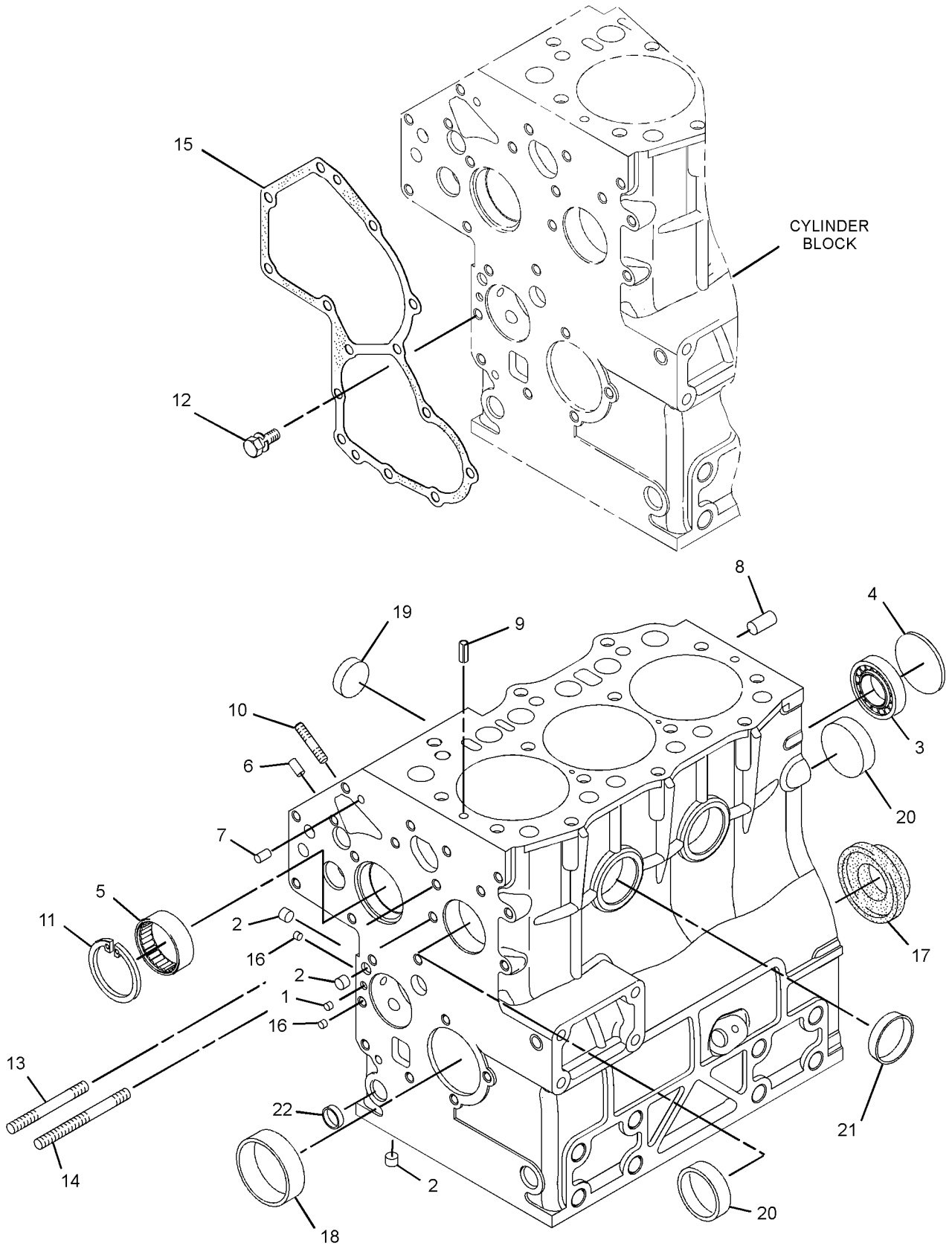
i05743707

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5385	1	PLUG						
	2	1	153-5387	4	PLUG						
	3	1	6B-0924	1	BALL BEARING						
	4	1	153-5391	1	PLUG						
	5	1	153-5392	1	BEARING						
	6	1	153-5393	2	DOWEL						
	7	1	153-5394	2	DOWEL						
	8	1	153-5395	2	DOWEL						
	9	1	153-5396	2	PIN						
	10	1	153-5407	2	STUD						
	11	1	153-5409	1	CLIP						
	12	1	153-6838	3	BOLT						
	13	1	183-1163	1	STUD						
	14	1	183-1164	1	STUD						
	15	1	452-4518	1	GASKET						
	16	1	221-1136	4	PLUG						
	17	1	231-8819	1	SEAL - CRANKSHAFT						
	18	1	304-3560	1	BUSHING						
	19	1	237-9315	1	PLUG (SEALING)						
	20	1	366-4251	2	PLUG-SEAL						
	21	1	288-6538	1	PLUG						
	22	1	288-6539	1	CAP						

BASIC ENGINE

313-1957 CYLINDER BLOCK GP (contd.)

i05743707



GRAPHIC #1

<END>

g01991613

BASIC ENGINE

435-1632 CYLINDER BLOCK GP

12 BRAKE KW (16 BHP) AT 1800 RPM

FIELD REPLACEMENT FOR 318-7060-PAGE: 5, 431-1763-PAGE: 20

SMCS-1201

i05392789

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	321-3143	1	CAMSHAFT GP						24
Y	342-1268	1	COVER GP-ENGINE						31
Y	329-8577	1	COVER GP-FRONT HOUSING						32
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	325-5586	1	FLYWHEEL GP						57
Y	313-2021	1	GLOW PLUG GP						183
Y	321-3142	1	GOVERNOR GP						149
Y	342-7619	1	HOUSING GP-FLYWHEEL						65
Y	321-3140	1	HOUSING GP-FRONT						70
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	392-8729	1	LIFTING GP-ENGINE						79
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	342-7622	1	PARTS GP-MISCELLANEOUS						207
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	321-3334	1	PUMP GP-FUEL INJECTION						163
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	315-6638	1	SWITCH GP-PRESSURE						201
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

BASIC ENGINE

435-1644 CYLINDER BLOCK GP

10 BRAKE KW (13 BHP) AT 1500 RPM

FIELD REPLACEMENT FOR 318-7061—PAGE: 6

SMCS-1201

i05431019

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	323-2409	1	CAMSHAFT GP						25
Y	313-1984	1	COVER GP-ENGINE						29
Y	342-1268	1	COVER GP-ENGINE						31
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	325-5586	1	FLYWHEEL GP						57
Y	313-2021	1	GLOW PLUG GP						183
Y	323-2408	1	GOVERNOR GP						151
Y	342-7619	1	HOUSING GP-FLYWHEEL						65
Y	323-2407	1	HOUSING GP-FRONT						72
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	392-8729	1	LIFTING GP-ENGINE						79
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	342-7622	1	PARTS GP-MISCELLANEOUS						207
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	323-2410	1	PUMP GP-FUEL INJECTION						165
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

BASIC ENGINE

435-1648 CYLINDER BLOCK GP-LONG

18 BRAKE KW (25 BHP) AT 2800 RPM

FIELD REPLACEMENT FOR 303-4107-PAGE: 12: FOR 303-4108-PAGE: 13

SMCS-1020

i05476751

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	313-6215	1	CAMSHAFT GP						23
Y	342-1268	1	COVER GP-ENGINE						31
Y	313-1986	1	COVER GP-VALVE MECHANISM						33
Y	313-1962	1	CRANKSHAFT GP						39
Y	313-1957	1	CYLINDER BLOCK GP						41
Y	313-1964	1	CYLINDER HEAD GP						48
Y	367-9248	1	DRIVE GP-POWER TAKE-OFF						52
Y	313-1966	1	DRIVE GP-PUMP						53
Y	313-1975	1	FILLER GP-ENGINE OIL						102
Y	308-2298	1	FILTER GP-ENGINE OIL						106
Y	325-5586	1	FLYWHEEL GP						57
Y	313-2021	1	GLOW PLUG GP						183
Y	313-6214	1	GOVERNOR GP						147
Y	342-7619	1	HOUSING GP-FLYWHEEL						65
Y	313-6213	1	HOUSING GP-FRONT						68
Y	313-1980	1	HOUSING GP-WATER REGULATOR						113
Y	339-3016	1	KIT-FRONT GEAR						76
Y	392-8729	1	LIFTING GP-ENGINE						79
Y	308-4735	1	MOUNTING GP-ENGINE OIL FILTER						108
Y	313-1973	1	PAN GP-OIL						81
Y	342-7622	1	PARTS GP-MISCELLANEOUS						207
Y	313-1963	1	PISTON & ROD GP						91
Y	309-6720	1	PLUG GP-OIL PAN						92
Y	313-1976	1	PULLEY GP-CRANKSHAFT						94
Y	313-6216	1	PUMP GP-FUEL INJECTION						160
Y	313-1978	1	PUMP GP-WATER						116
Y	313-2023	1	SOLENOID GP-SHUTOFF						188
Y	313-2024	1	SWITCH GP-PRESSURE						200
Y	313-2035	1	SWITCH GP-TEMPERATURE						204
Y	313-1965	1	VALVE MECHANISM GP						100

Y - SEPARATE ILLUSTRATION

<END>

BASIC ENGINE

319-7268 CYLINDER HEAD AS

PART OF 313-1964 CYLINDER HEAD GP

SMCS-1100, 1101

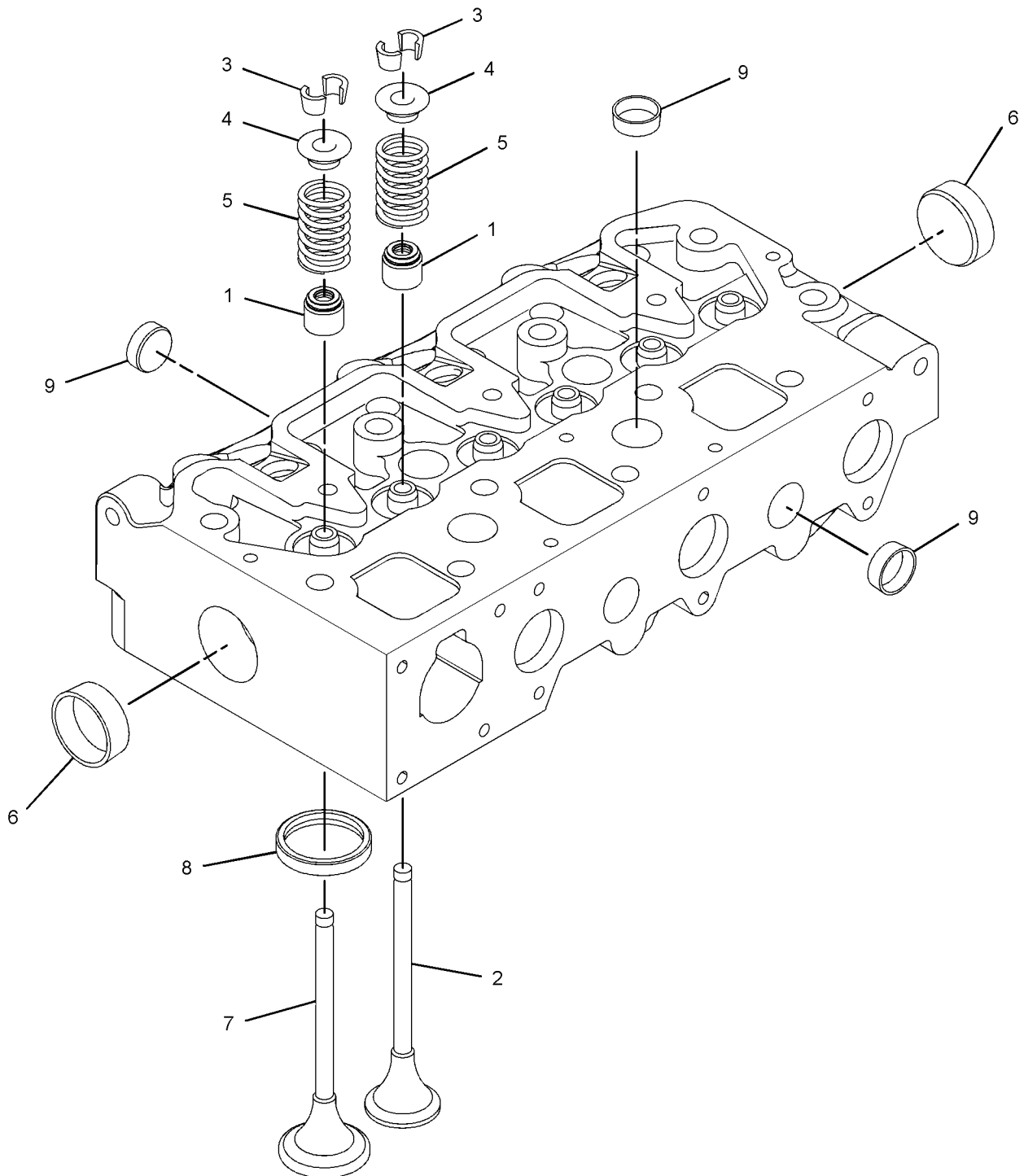
i05787599

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	440-5104	6	SEAL						
	2	1	153-5555	3	VALVE-EXHAUST						
	3	1	153-5556	12	RETAINER						
	4	1	153-5557	6	CAP						
	5	1	153-5558	6	SPRING						
	6	1	291-1808	2	CAP						
	7	1	231-2070	3	VALVE-INLET						
	8	1	256-2085	1	INSERT-VALVE SEAT						
	9	1	288-6537	8	CAP						

BASIC ENGINE

319-7268 CYLINDER HEAD AS (contd.)

i05787599



GRAPHIC #1

<END>

g03679057

BASIC ENGINE

313-1964 CYLINDER HEAD GP

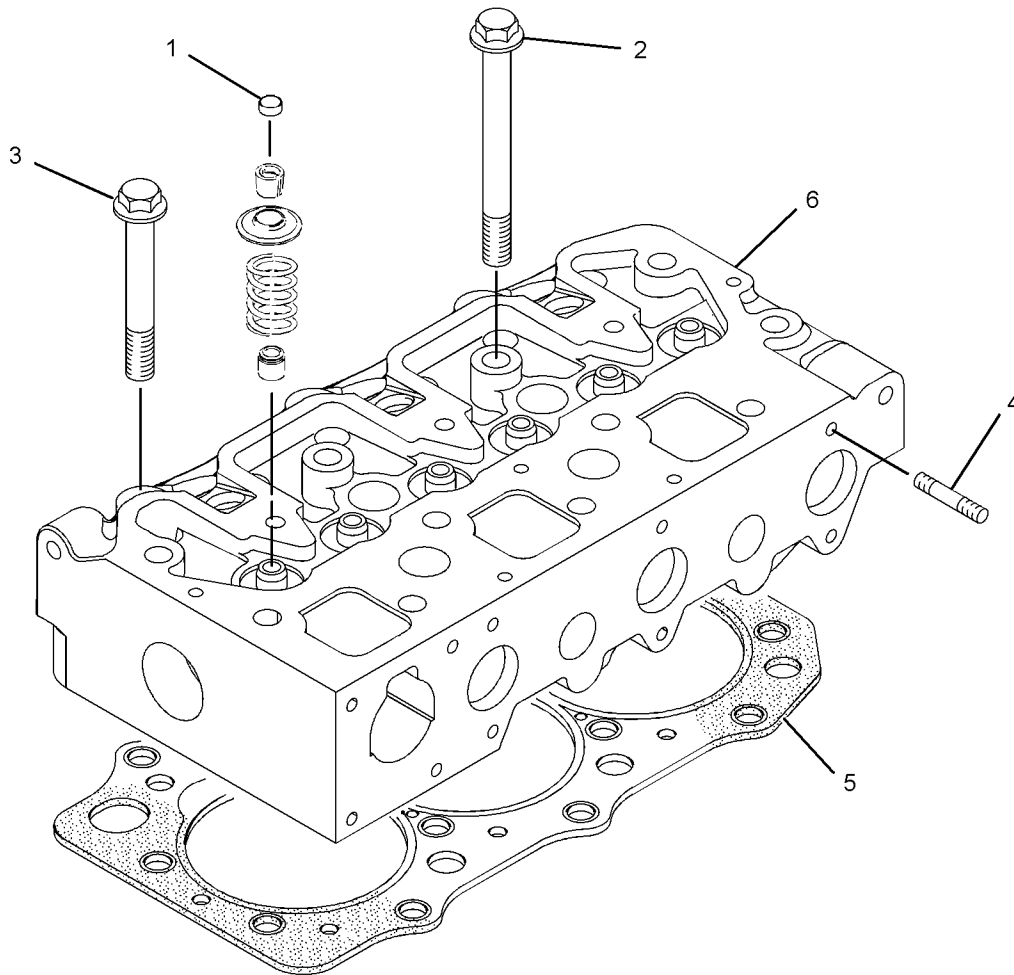
PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1100

i05009562

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	322-7485	6	CAP-VALVE SPRING						
	2	1	153-5575	11	BOLT						
	3	1	153-5578	3	BOLT						
	4	1	153-5944	2	STUD						
B	5	1	231-2073	1	GASKET-HEAD (1.3-MM THK)						
B		1	254-4504	1	GASKET-HEAD (1.2-MM THK)						
Y	6	1	319-7268	1	CYLINDER HEAD AS						46

B - USE AS REQUIRED
Y - SEPARATE ILLUSTRATION



GRAPHIC #1

<END>

g01388603

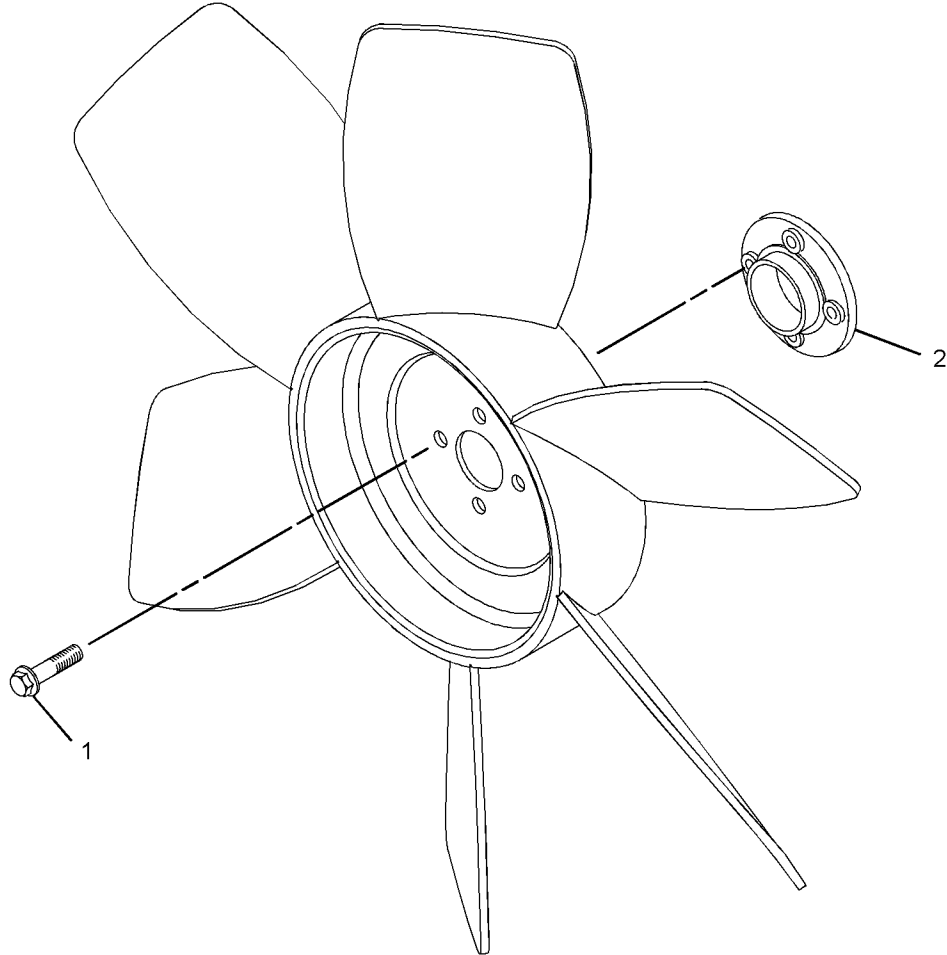
BASIC ENGINE

311-5829 DRIVE GP-FAN

SMCS-1359

i05031403

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6861	4	BOLT						
	2	1	161-8260	1	PLATE						



GRAPHIC #1

<END>

g01427123

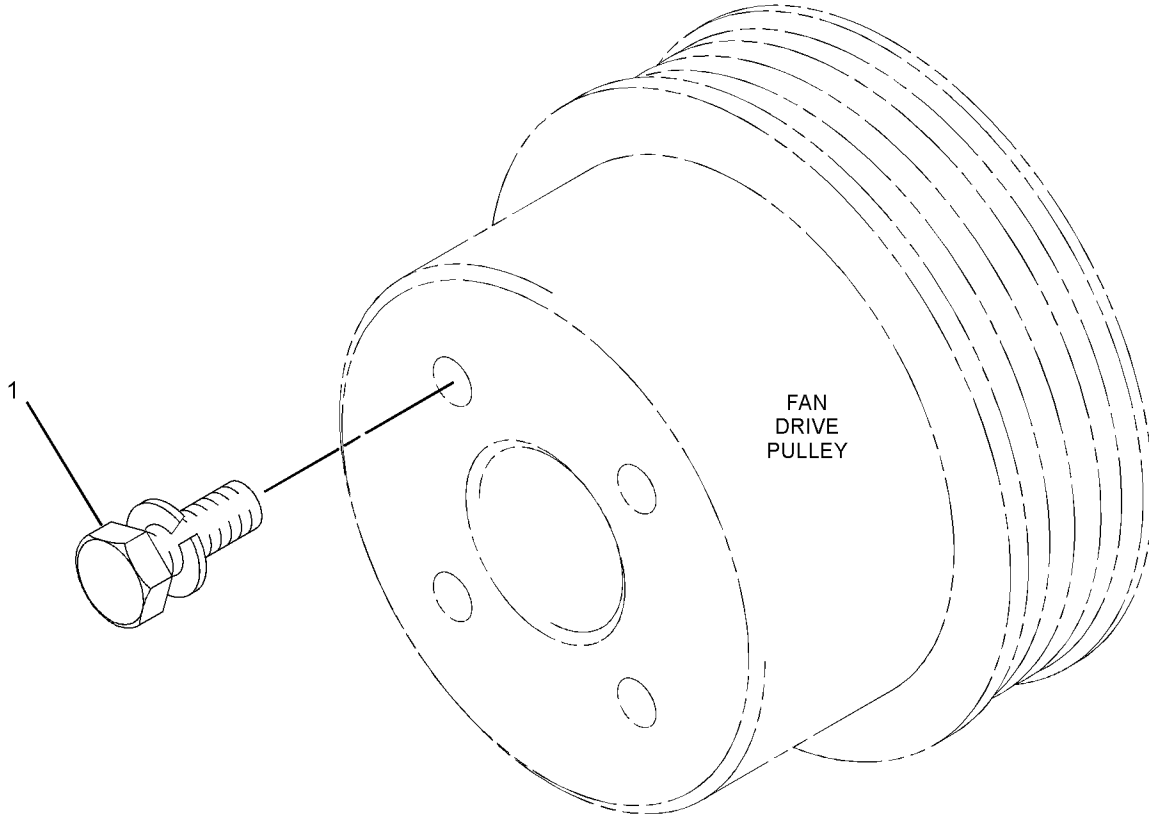
BASIC ENGINE

322-3808 DRIVE GP-FAN

SMCS-1359

i03116001

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	249-7263	4	BOLT						



GRAPHIC #1

<END>

g01514615

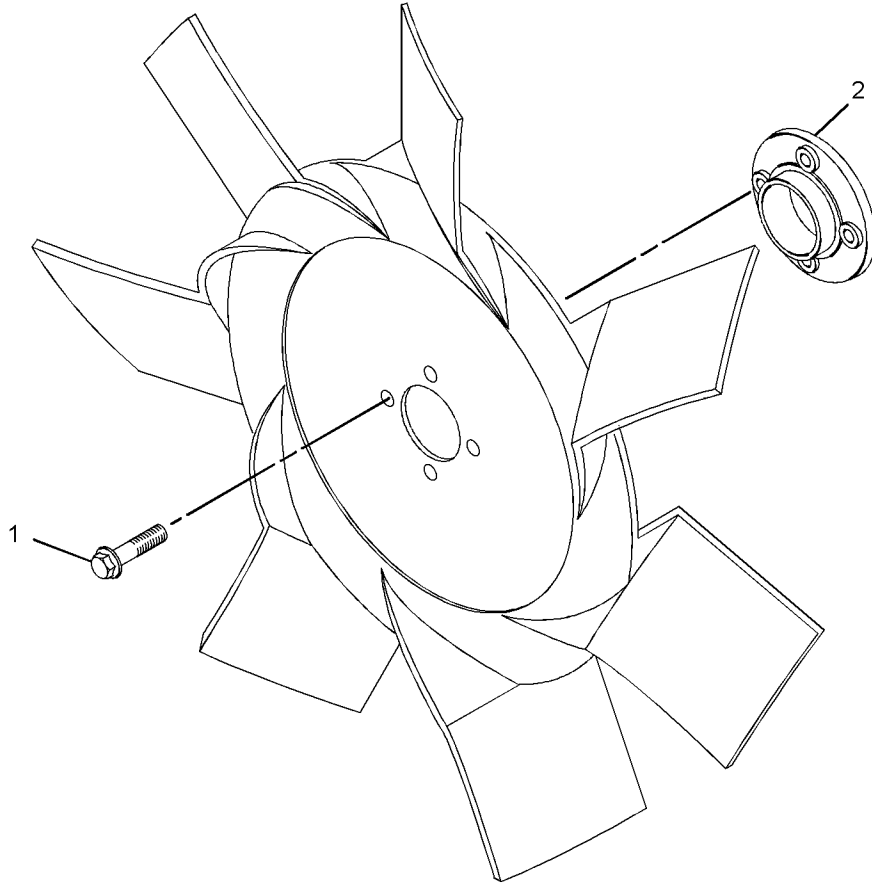
BASIC ENGINE

329-4423 DRIVE GP-FAN

SMCS-1359

i03122849

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6861	4	BOLT						
	2	1	161-8260	1	PLATE						



GRAPHIC #1

<END>

g01959143

BASIC ENGINE

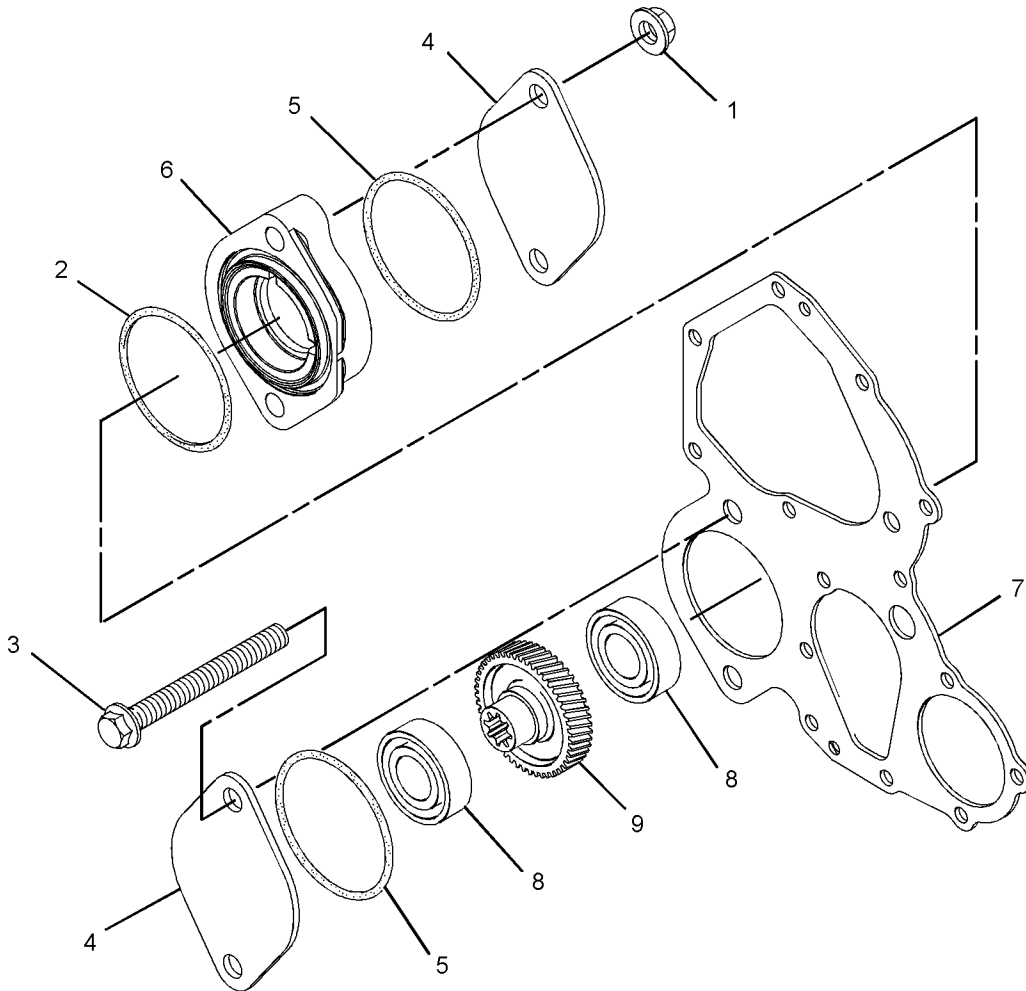
367-9248 DRIVE GP-POWER TAKE-OFF

PART OF 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1165

i05345832

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	6I-0594	2	NUT (M10X1.5-THD)						
	2	1	153-6497	1	SEAL-O-RING						
	3	1	198-5842	2	BOLT-WASHER HEAD (M10X1.5X90-MM)						
	4	1	311-5852	2	PLATE						
	5	1	311-5853	2	SEAL-O-RING						
	6	1	313-2034	1	RETAINER AS-BEARING						
	7	1	321-5906	1	PLATE						
	8	1	331-9381	2	BALL BEARING						
	9	1	335-8323	1	GEAR (33-TEETH)						



GRAPHIC #1

<END>

g02406350

BASIC ENGINE

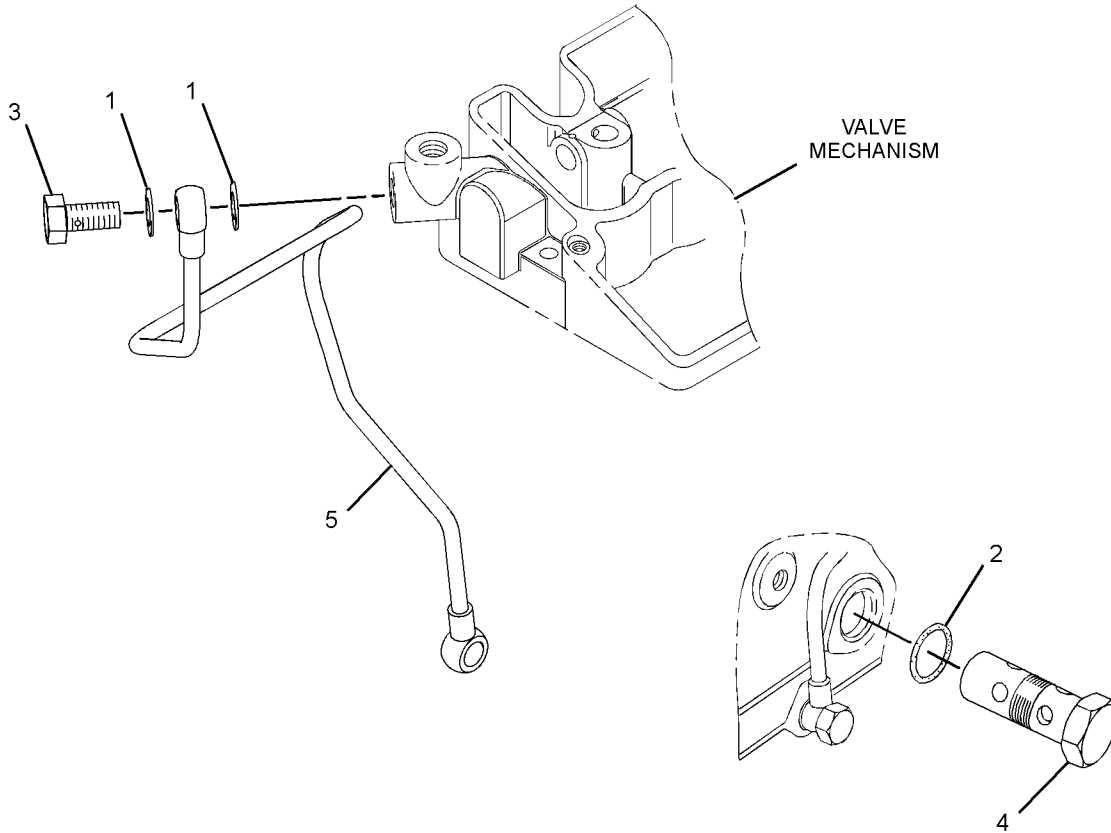
313-1966 DRIVE GP-PUMP

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1650, 435-1651 ENGINE AR

SMCS-1017, 1207, 3108

i03705549

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5936	2	WASHER						
	2	1	153-6853	1	SEAL-O-RING						
	3	1	153-6881	1	BOLT						
	4	1	154-1942	1	VALVE-RELIEF (ENGINE OIL PRESSURE)						
	5	1	231-7864	1	TUBE-OIL						



GRAPHIC #1

<END>

g02005853

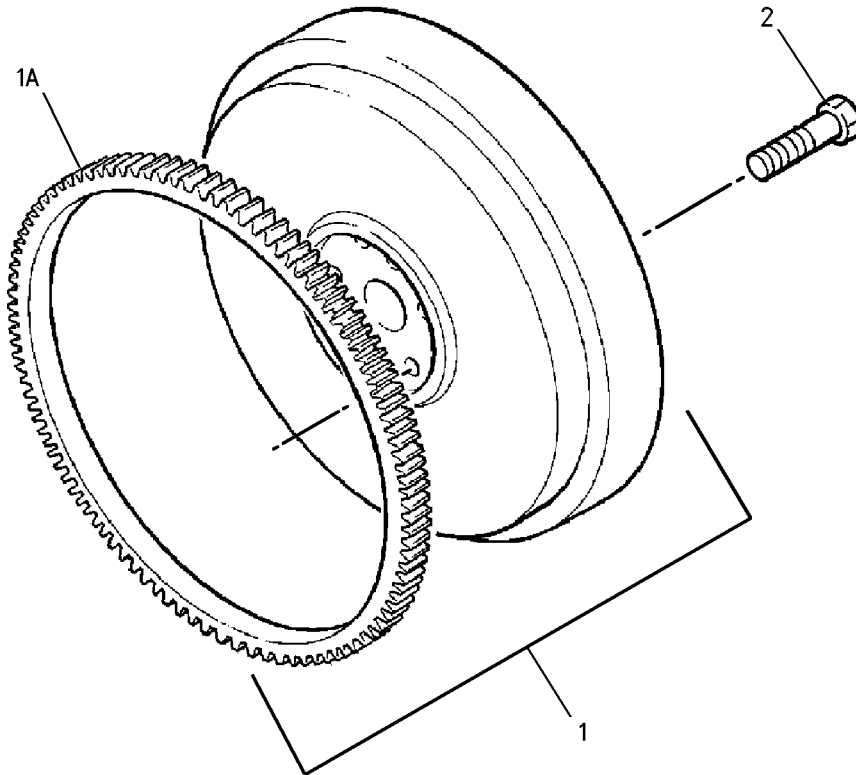
BASIC ENGINE

313-1970 FLYWHEEL GP

SMCS-1156

i02973411

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1		327-4311	1	FLYWHEEL GP						
	1A		153-6865	1	GEAR-STARTER (96-TEETH)						
	2		153-6866	6	BOLT						



GRAPHIC #1

<END>

g00640580

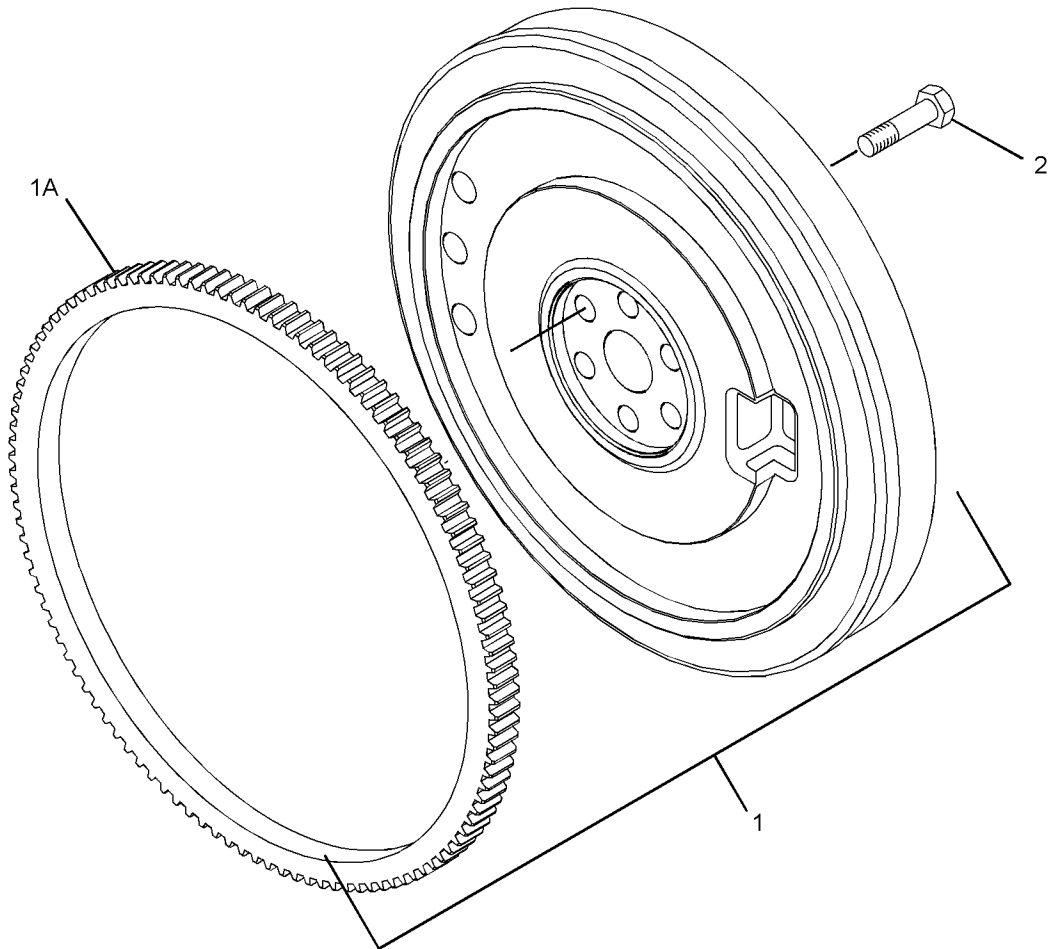
BASIC ENGINE

313-6218 FLYWHEEL GP

SMCS-1156

i03569644

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	327-5257	1	FLYWHEEL GP						
	1A	1	154-2405	1	GEAR-STARTER (126-TEETH)						
	2	1	153-6866	6	BOLT						



GRAPHIC #1

<END>

g01389284

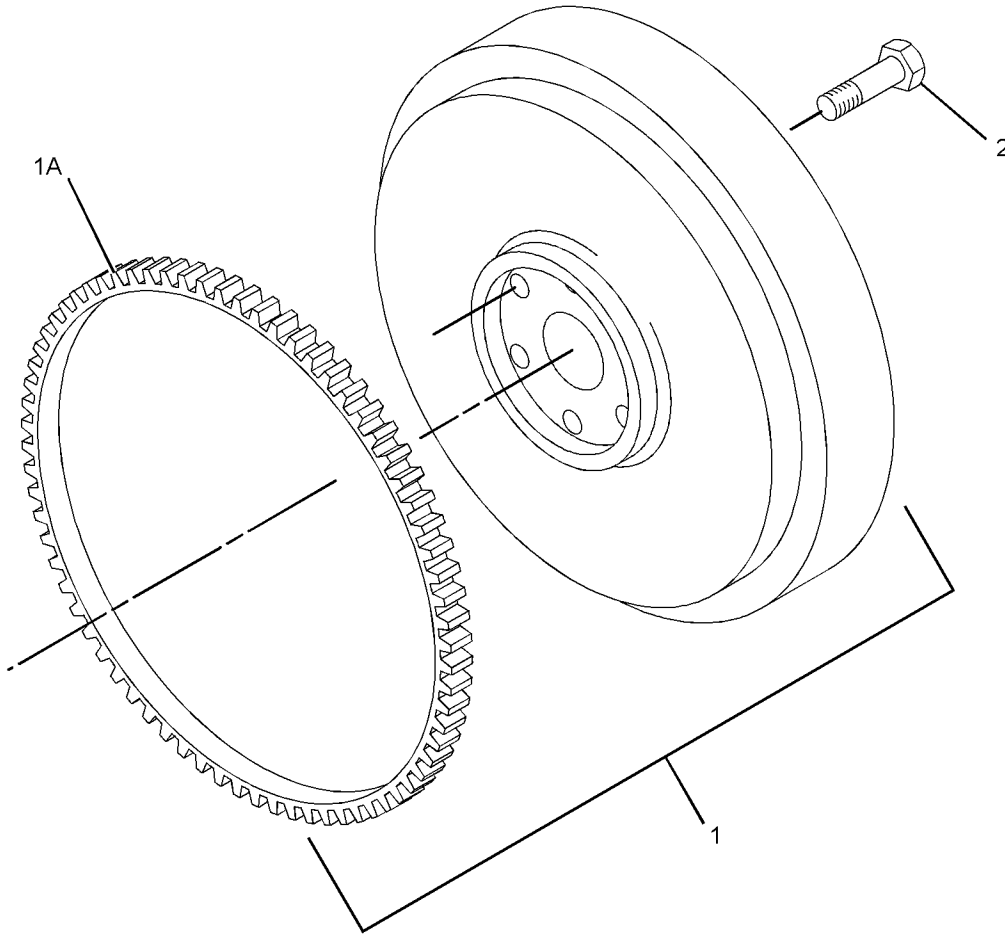
BASIC ENGINE

318-8880 FLYWHEEL GP

SMCS-1156

i02980218

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	327-5149	1	FLYWHEEL GP						
	1A	1	153-6865	1	GEAR-STARTER (96-TEETH)						
	2	1	153-6866	6	BOLT						



GRAPHIC #1

<END>

g01502339

BASIC ENGINE

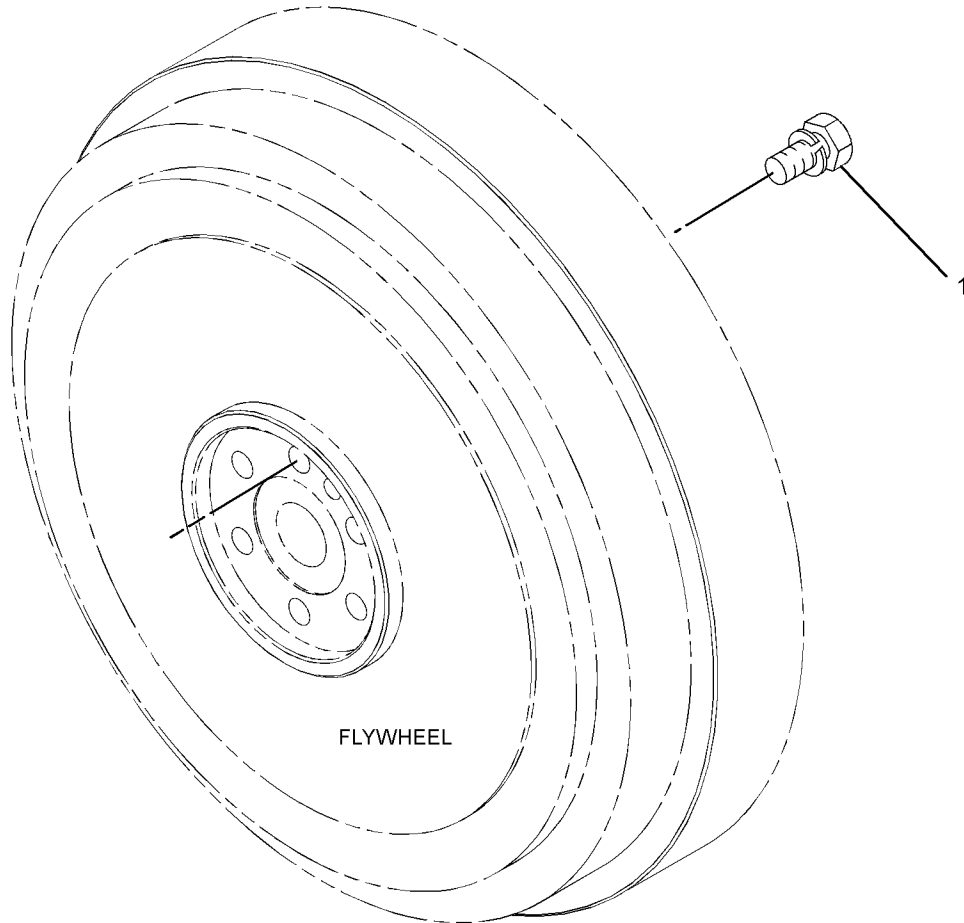
325-5586 FLYWHEEL GP

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1156

i02959121

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE	
					1	2	3	4	5	6 (PRODUCT LEVEL)		
	1	1	153-6866	6	BOLT							



GRAPHIC #1

<END>

g01502245

BASIC ENGINE

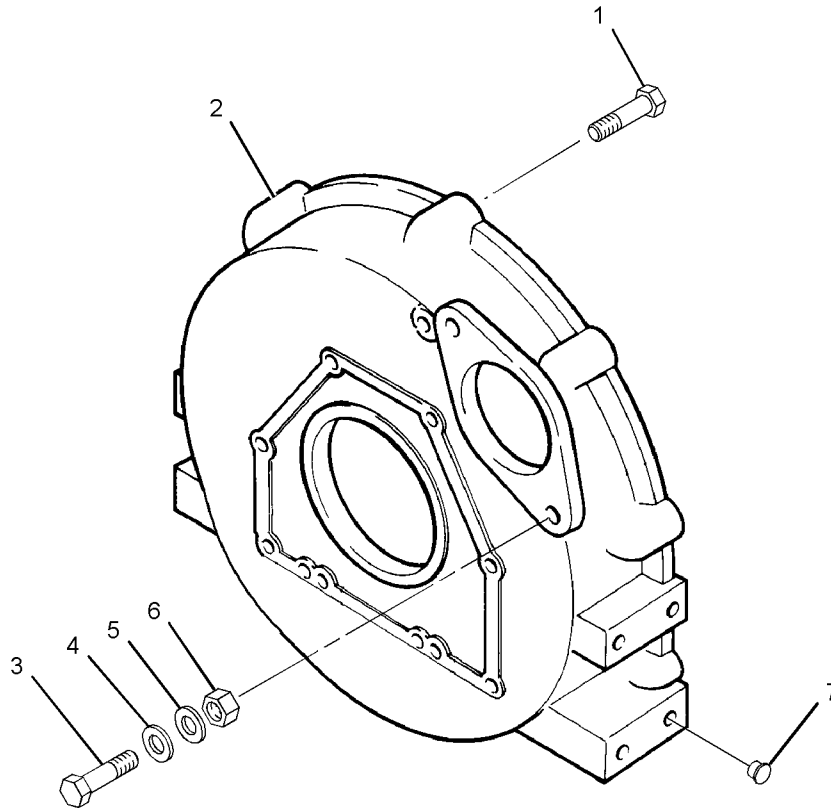
313-1969 HOUSING GP-FLYWHEEL

TYPE 1

SMCS-1157

i03152227

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	138-7146	8	BOLT						
	2	1	138-7166	1	HOUSING-FLYWHEEL						
	3	1	138-7142	2	BOLT						
	4	1	154-1399	2	WASHER						
	5	1	154-2403	2	WASHER						
	6	1	155-8085	2	NUT						
	7	1	154-2395	1	PLUG						



GRAPHIC #1

<END>

g01141591

BASIC ENGINE

313-1969 HOUSING GP-FLYWHEEL

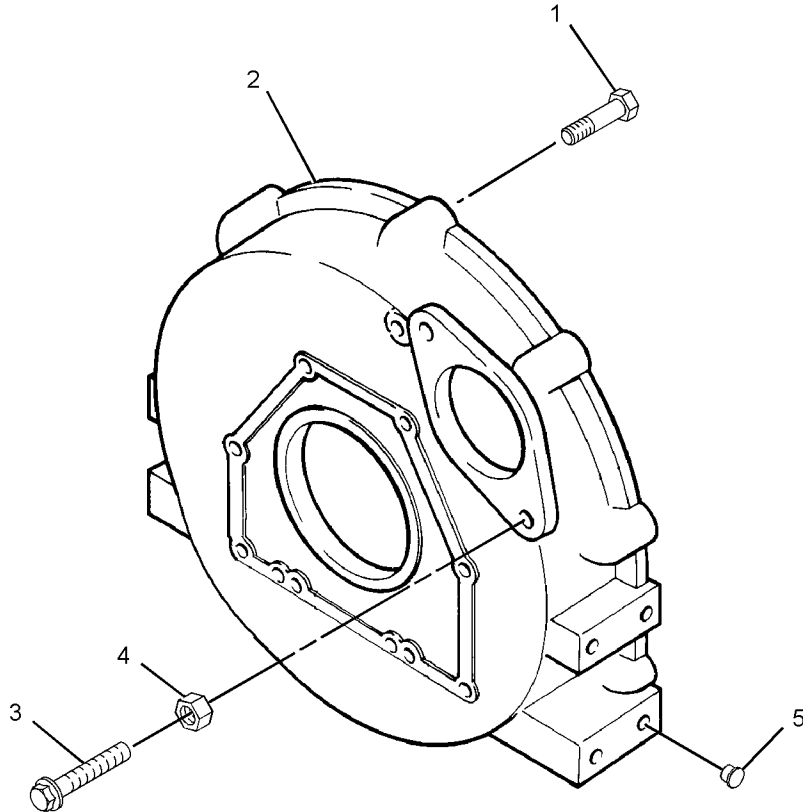
TYPE 2

SMCS-1157

i03617903

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	138-7146	8	BOLT						
	2	1	138-7166	1	HOUSING-FLYWHEEL						
CM	3	1	140-8783	2	BOLT (M10X1.5X45-MM)						
C	4	1	6I-0594	2	NUT (M10X1.5-THD)						
	5	1	154-2395	1	PLUG						

C - CHANGE FROM PREVIOUS TYPE
M - METRIC PART



GRAPHIC #1

<END>

g01997113

BASIC ENGINE

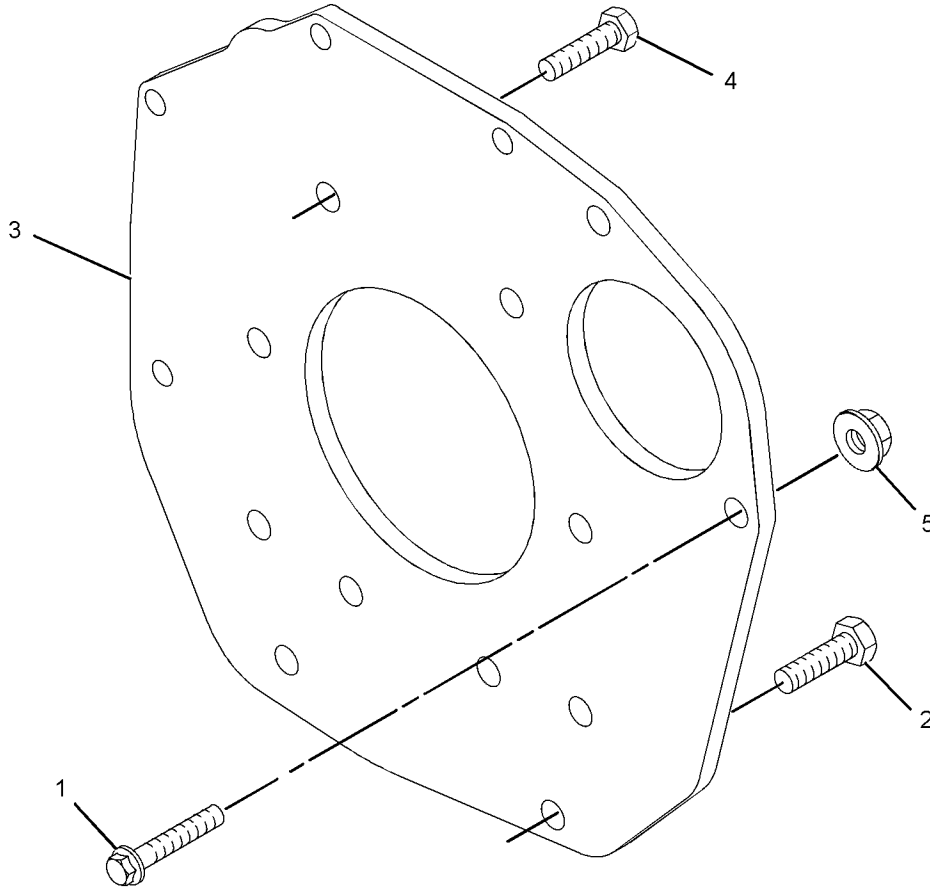
313-6217 HOUSING GP-FLYWHEEL

SMCS-1157

i03854776

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
M	1	1	140-8783	2	BOLT (M10X1.5X45-MM) (STARTER MOTOR)						
	2	1	153-6375	2	BOLT						
	3	1	153-6867	1	PLATE						
	4	1	153-6868	8	BOLT						
	5	1	6I-0594	2	NUT (M10X1.5-THD)						

M - METRIC PART



GRAPHIC #1

<END>

g02163828

BASIC ENGINE

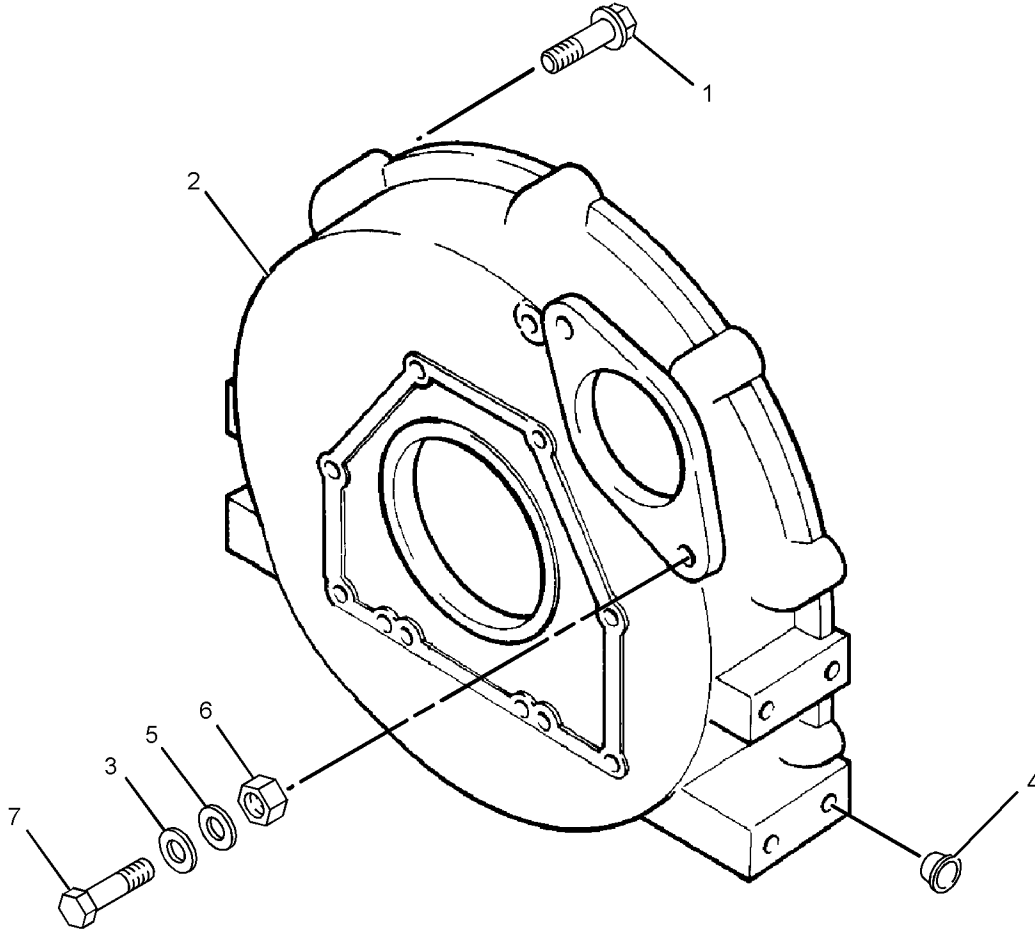
318-8879 HOUSING GP-FLYWHEEL

TYPE 1

SMCS-1157

i02904224

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	138-7146	8	BOLT						
	2	1	138-7149	1	HOUSING-FLYWHEEL						
	3	1	154-1399	2	WASHER						
	4	1	154-2395	4	PLUG						
	5	1	154-2403	2	WASHER						
	6	1	155-8085	2	NUT						
	7	1	138-7142	2	BOLT						



GRAPHIC #1

<END>

g01502282

BASIC ENGINE

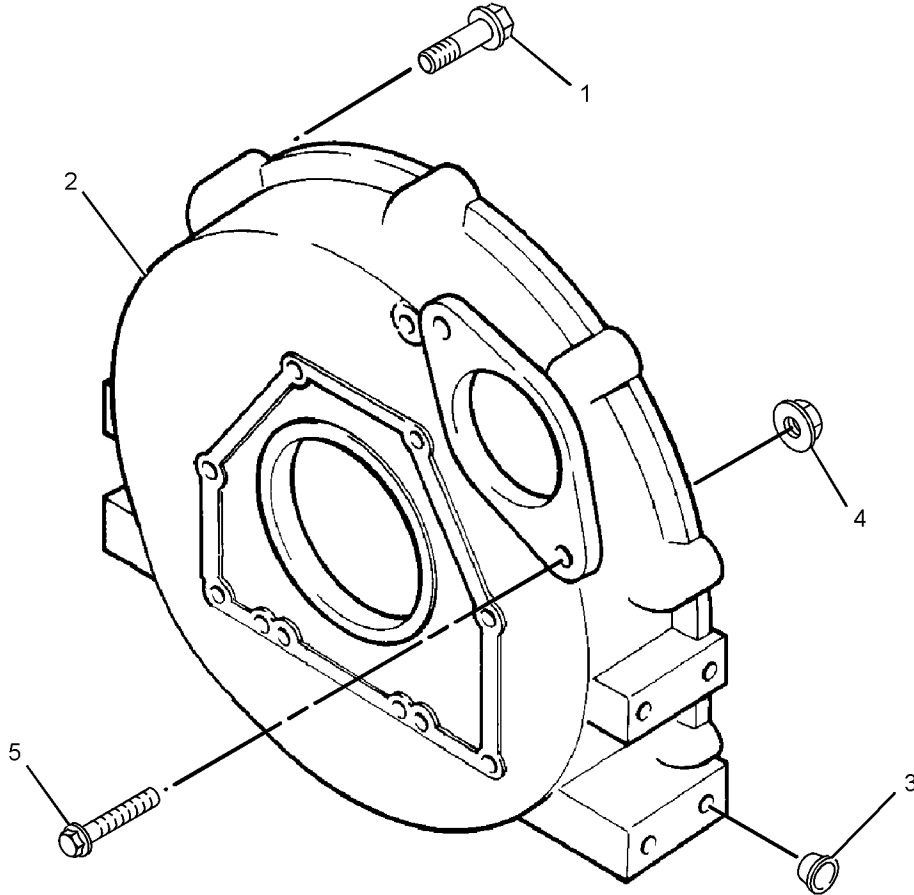
318-8879 HOUSING GP-FLYWHEEL TYPE 2

SMCS-1157

i03560704

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	138-7146	8	BOLT						
	2	1	138-7149	1	HOUSING-FLYWHEEL						
	3	1	154-2395	4	PLUG						
C	4	1	6I-0594	2	NUT (M10X1.5-THD)						
CM	5	1	140-8783	2	BOLT (M10X1.5X45-MM)						

C - CHANGE FROM PREVIOUS TYPE
M - METRIC PART



GRAPHIC #1

<END>

g01953447

BASIC ENGINE

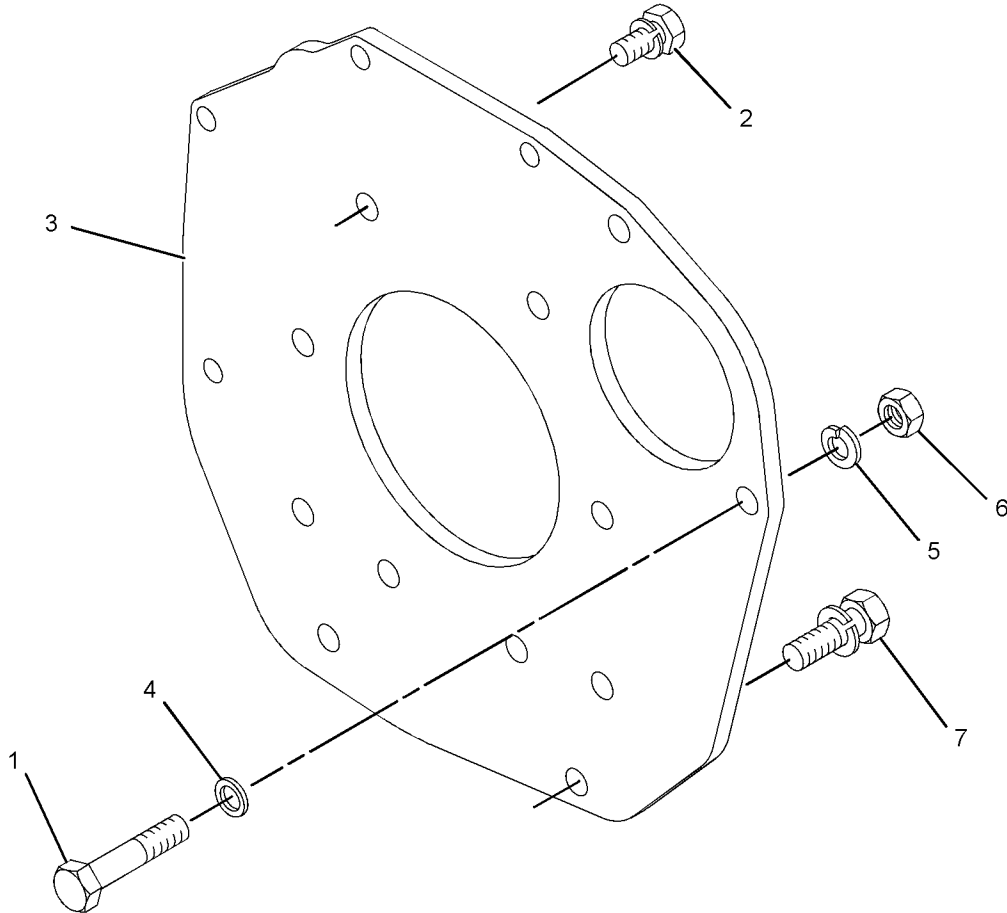
328-1433 HOUSING GP-FLYWHEEL

TYPE 1

SMCS-1157

i02973228

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	138-7142	2	BOLT						
	2	1	138-7146	8	BOLT						
	3	1	153-6867	1	PLATE						
	4	1	154-1399	2	WASHER						
	5	1	154-2403	2	WASHER						
	6	1	155-8085	2	NUT						
	7	1	165-2141	2	BOLT						



GRAPHIC #1

<END>

g01512233

BASIC ENGINE

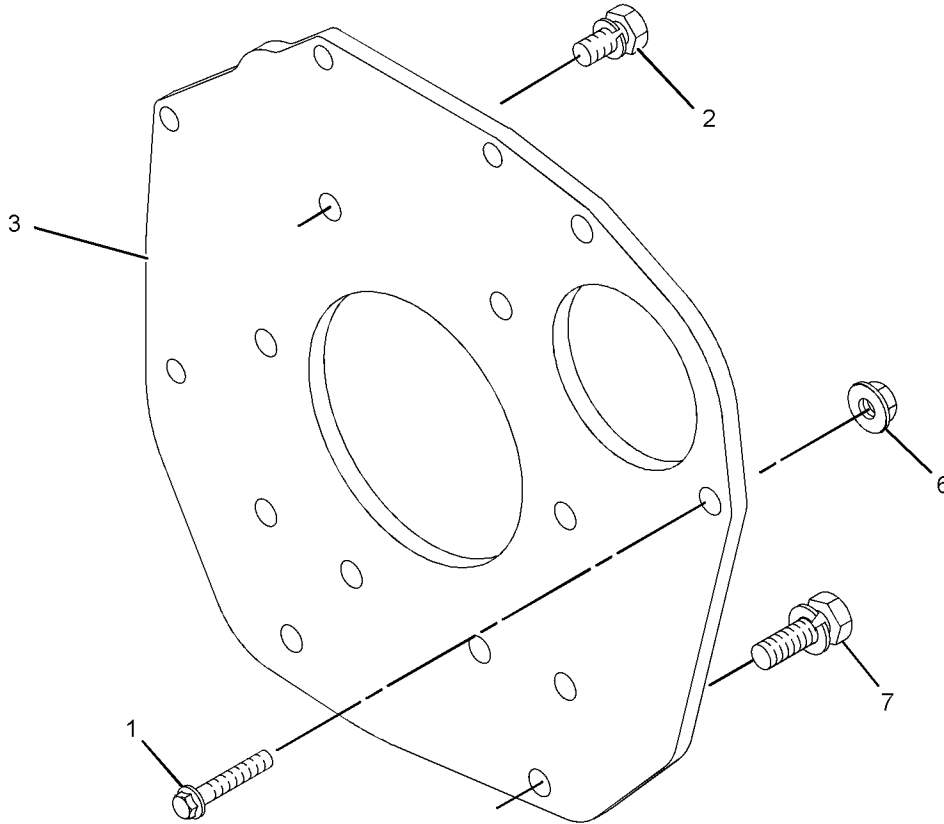
328-1433 HOUSING GP-FLYWHEEL TYPE 2

SMCS-1157

i03560701

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
CM	1	1	140-8783	2	BOLT (M10X1.5X45-MM)						
	2	1	138-7146	8	BOLT						
	3	1	153-6867	1	PLATE						
C	6	1	6I-0594	2	NUT (M10X1.5-THD)						
	7	1	165-2141	2	BOLT						

C - CHANGE FROM PREVIOUS TYPE
M - METRIC PART



GRAPHIC #1

<END>

g01947735

BASIC ENGINE

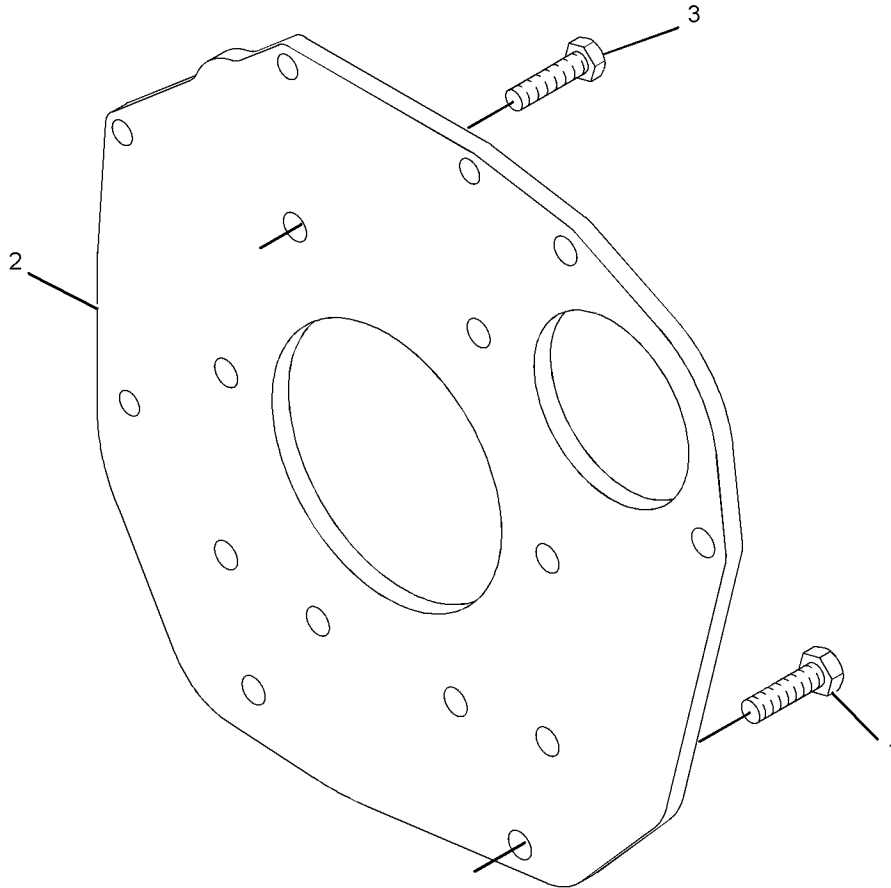
342-7619 HOUSING GP-FLYWHEEL

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1157

i03621901

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6375	2	BOLT						
	2	1	153-6867	1	PLATE						
	3	1	153-6868	8	BOLT						



GRAPHIC #1

<END>

g01975833

BASIC ENGINE

313-1967 HOUSING GP-FRONT

PART OF 435-1643 ENGINE AR

SMCS-1151, 1162, 1206

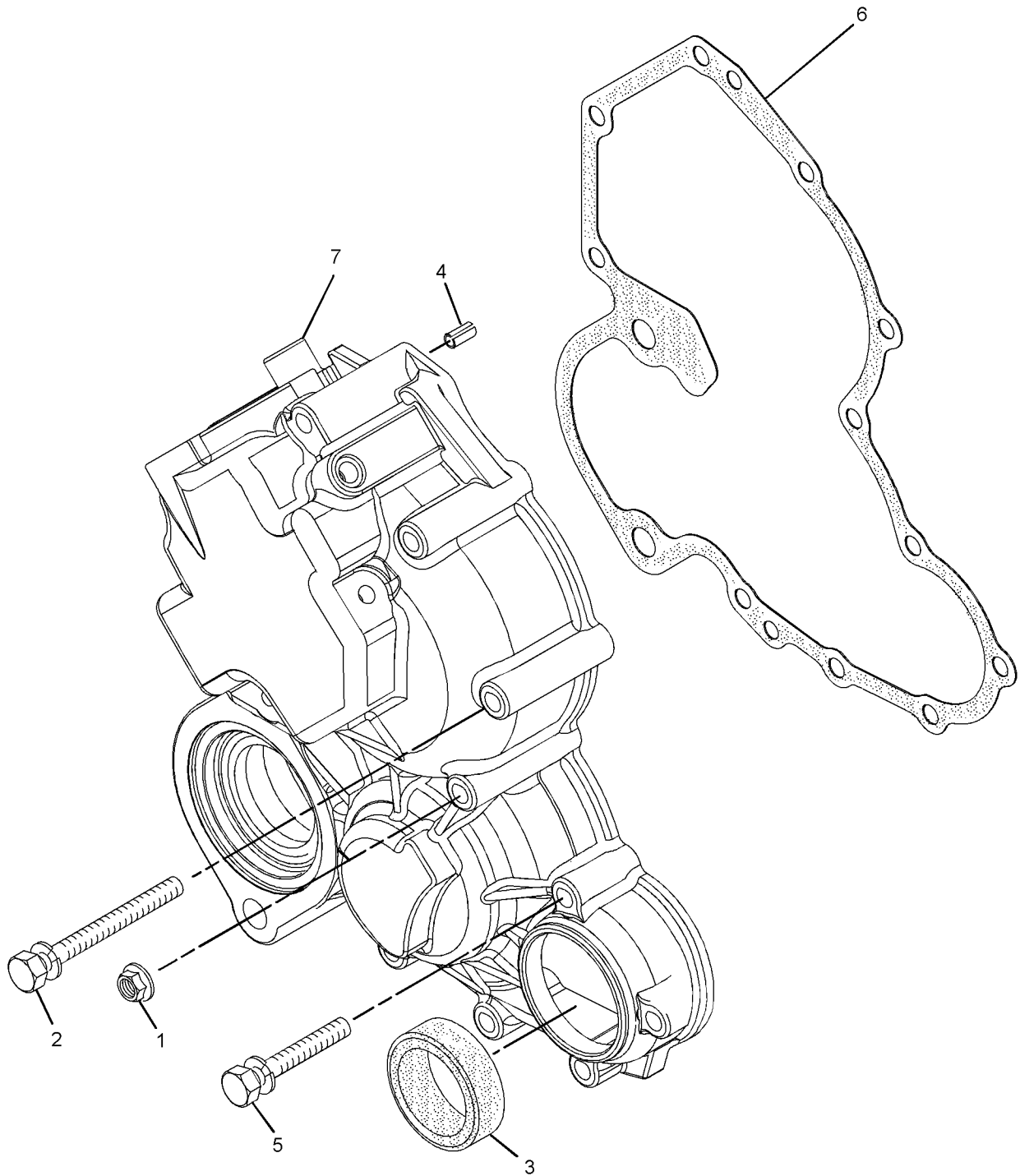
i03937878

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5960	1	NUT						
	2	1	153-5962	5	BOLT						
	3	1	153-7978	1	SEAL						
	4	1	154-1673	1	PIN						
	5	1	165-2140	5	BOLT						
	6	1	313-2032	1	GASKET						
	7	1	359-5135	1	HOUSING-FRONT						

BASIC ENGINE

313-1967 HOUSING GP-FRONT (contd.)

i03937878



GRAPHIC #1

<END>

g01652173

BASIC ENGINE

313-6213 HOUSING GP-FRONT

PART OF 435-1648 CYLINDER BLOCK GP-LONG

SMCS-1151, 1162, 1206

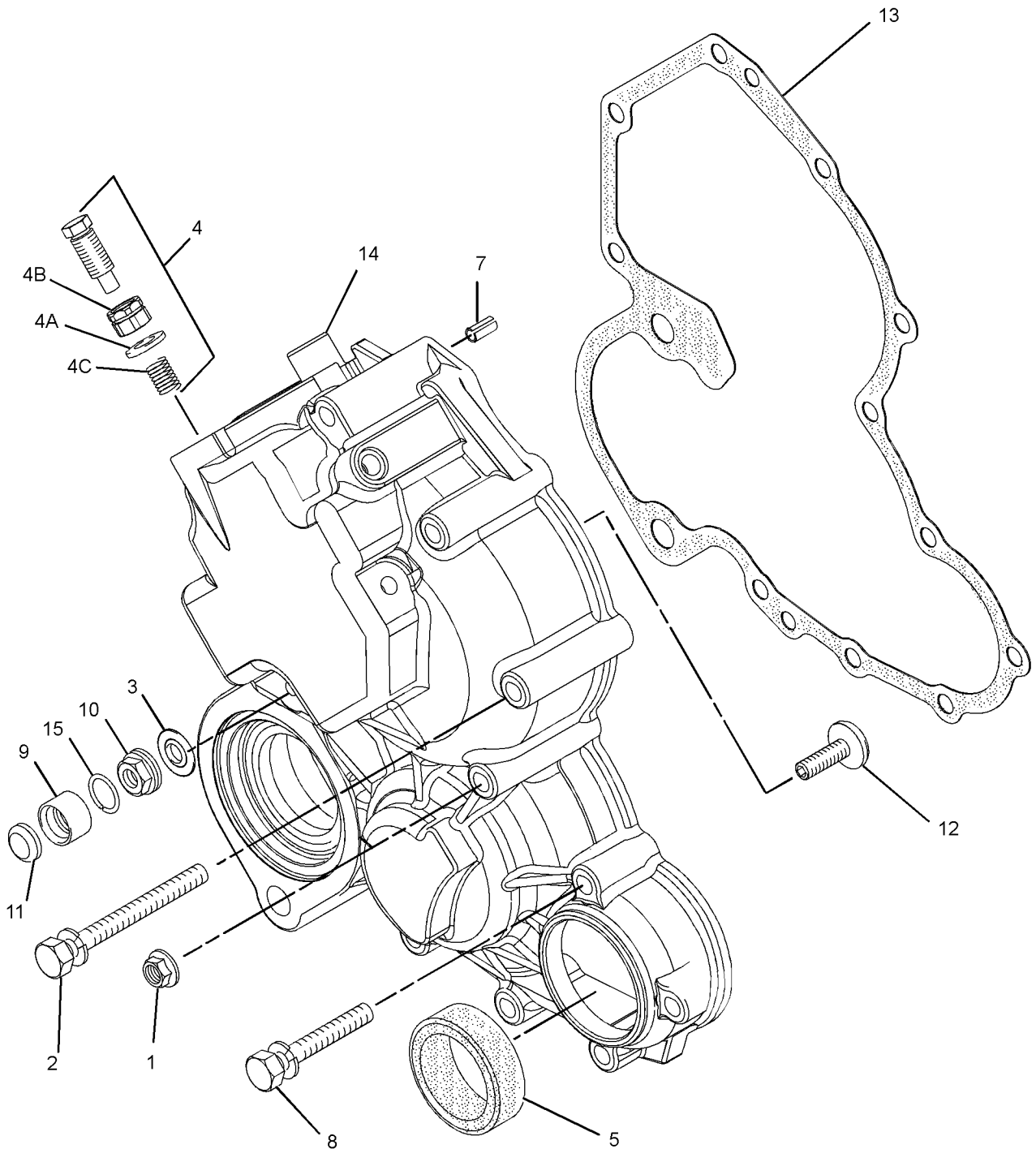
i05209135

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5960	1	NUT						
	2	1	153-5962	5	BOLT						
	3	1	153-6415	1	WASHER						
	4	1	313-5832	1	BOLT AS						
	4A	1	153-7987	1	WASHER						
	4B	1	191-9297	1	NUT						
	4C	1	313-5833	1	SPRING						
	5	1	153-7978	1	SEAL						
	7	1	5D-1319	1	PIN-SPRING						
	8	1	165-2140	5	BOLT						
	9	1	425-7065	1	CAP-TAMPER PROOF						
	10	1	321-4249	1	NUT						
	11	1	308-1901	1	CAP						
	12	1	309-6732	1	BOLT						
	13	1	313-2032	1	GASKET						
	14	1	359-5135	1	HOUSING-FRONT						
	15	1	308-1897	1	RING						

BASIC ENGINE

313-6213 HOUSING GP-FRONT (contd.)

i05209135



GRAPHIC #1

<END>

g01667515

BASIC ENGINE

321-3140 HOUSING GP-FRONT

PART OF 435-1632 CYLINDER BLOCK GP, 435-1651 ENGINE AR

SMCS-1151, 1162, 1206

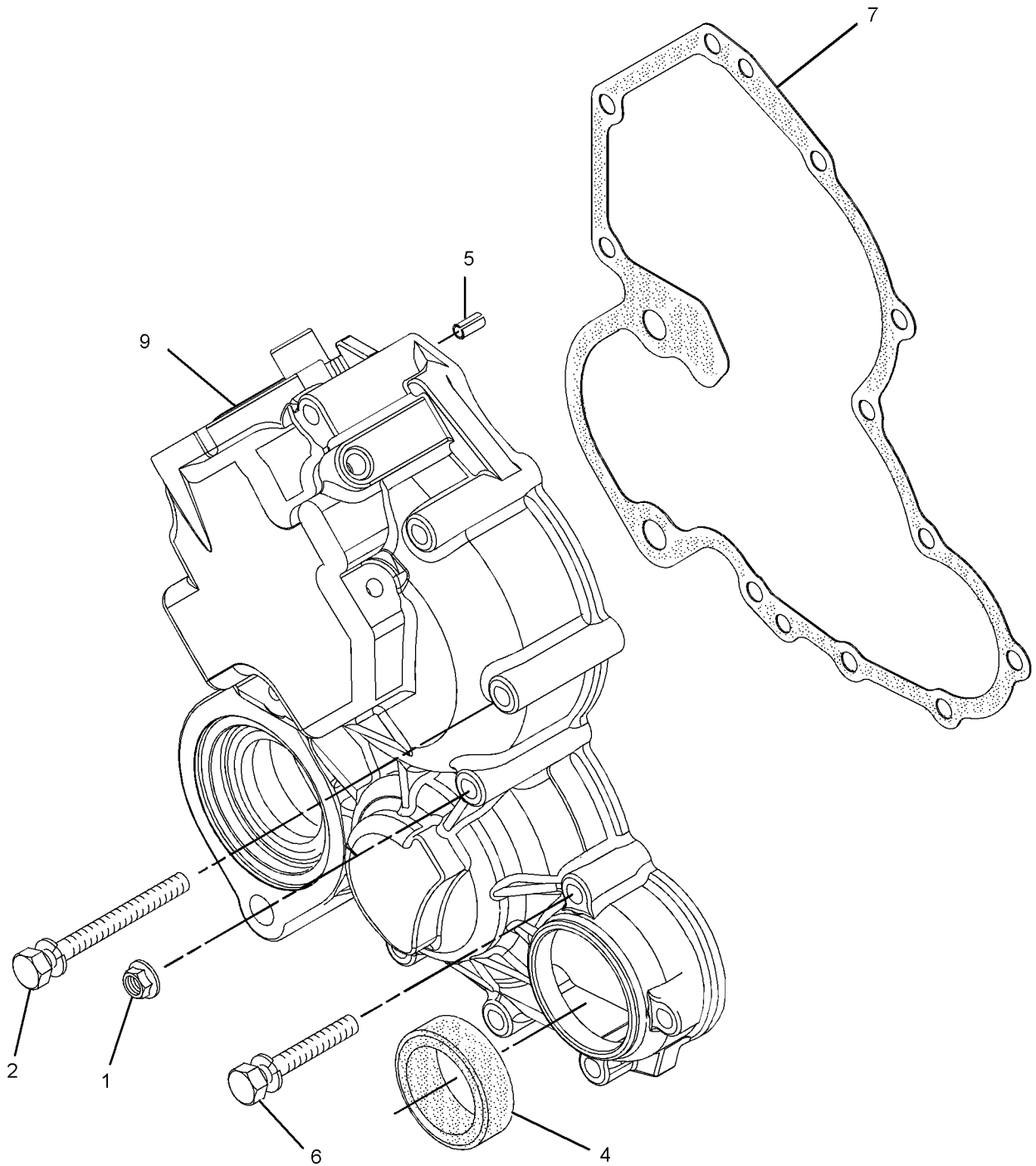
i03938510

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5960	1	NUT						
	2	1	153-5962	5	BOLT						
	4	1	153-7978	1	SEAL						
	5	1	154-1673	1	PIN						
	6	1	165-2140	5	BOLT						
	7	1	313-2032	1	GASKET						
	9	1	359-5135	1	HOUSING-FRONT						

BASIC ENGINE

321-3140 HOUSING GP-FRONT (contd.)

i03938510



GRAPHIC #1

<END>

g01712553

BASIC ENGINE

323-2407 HOUSING GP-FRONT

PART OF 435-1644 CYLINDER BLOCK GP

SMCS-1151, 1162, 1206

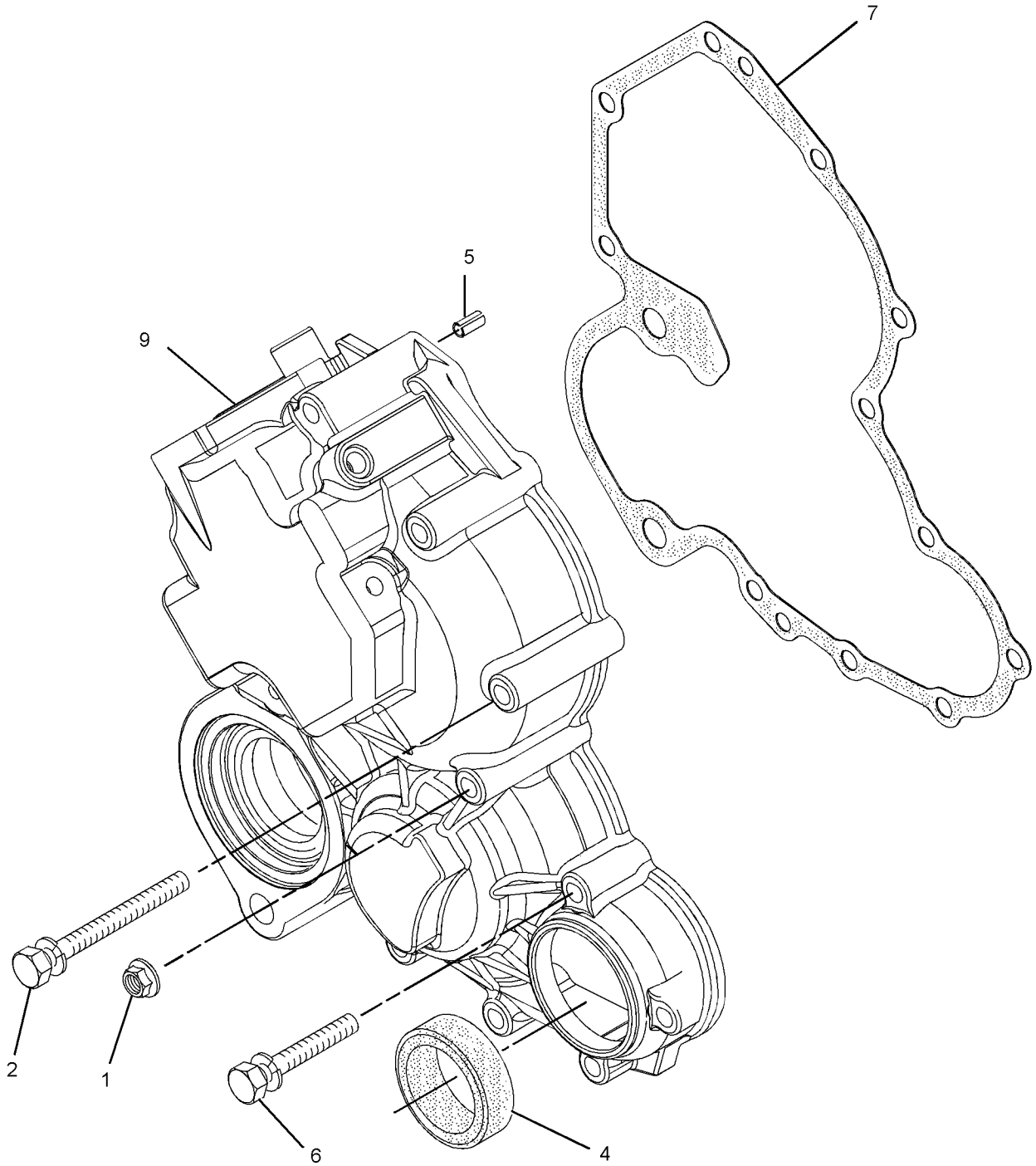
i03938690

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5960	1	NUT						
	2	1	153-5962	5	BOLT						
	4	1	153-7978	1	SEAL						
	5	1	154-1673	1	PIN						
	6	1	165-2140	5	BOLT						
	7	1	313-2032	1	GASKET						
	9	1	359-5135	1	HOUSING-FRONT						

BASIC ENGINE

323-2407 HOUSING GP-FRONT (contd.)

i03938690



GRAPHIC #1

<END>

g01623654

BASIC ENGINE

328-1429 HOUSING GP-FRONT

PART OF 435-1650 ENGINE AR

SMCS-1151, 1162, 1206

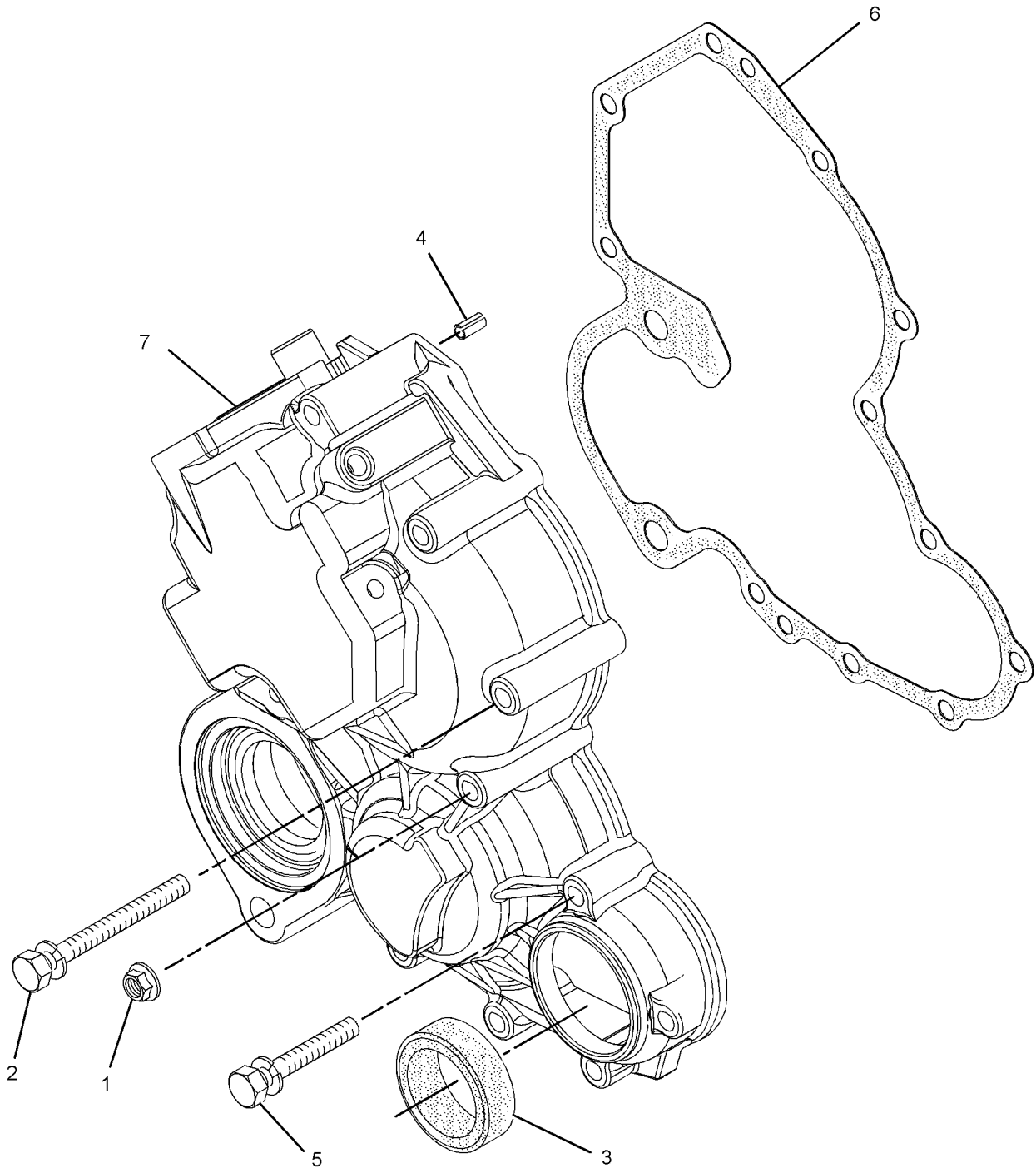
i03948497

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5960	1	NUT						
	2	1	153-5962	5	BOLT						
	3	1	153-7978	1	SEAL						
	4	1	5D-1319	1	PIN-SPRING						
	5	1	165-2140	5	BOLT						
	6	1	313-2032	1	GASKET						
	7	1	359-5135	1	HOUSING-FRONT						

BASIC ENGINE

328-1429 HOUSING GP-FRONT (contd.)

i03948497



GRAPHIC #1

<END>

g01512676

BASIC ENGINE

339-3016 KIT-FRONT GEAR

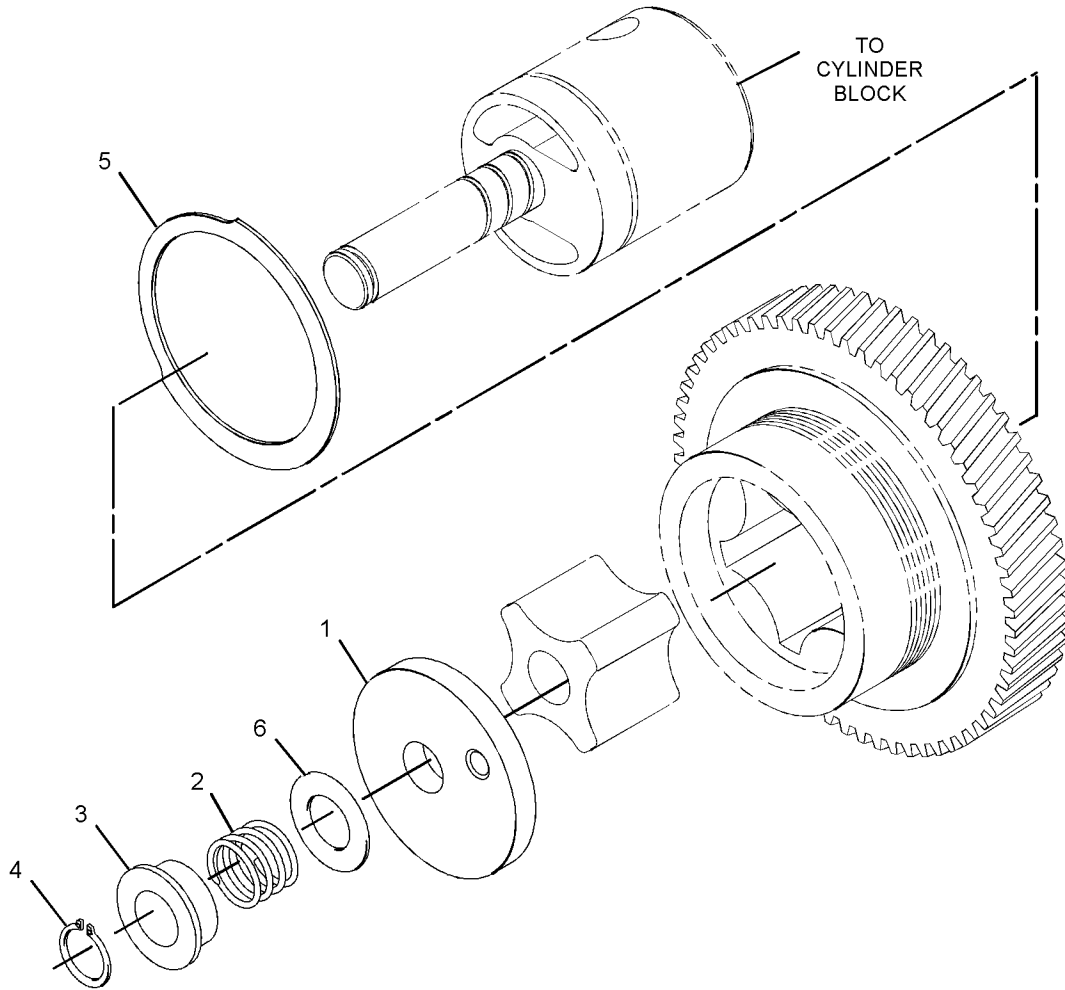
PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1204, 1212, 1234, 1361

i03742544

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6848	1	COVER						
	2	1	153-6849	1	SPRING						
	3	1	153-6850	1	COLLAR						
	4	1	153-6851	1	CLIP						
	5	1	153-7985	1	WASHER						
B	6	1	160-4150	1	SHIM (0.1-MM THK)						
B		1	160-4151	1	SHIM (0.15-MM THK)						
B		1	160-4152	1	SHIM (0.2-MM THK)						
B		1	160-4153	1	SHIM (0.5-MM THK)						

B - USE AS REQUIRED



GRAPHIC #1

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g02013913

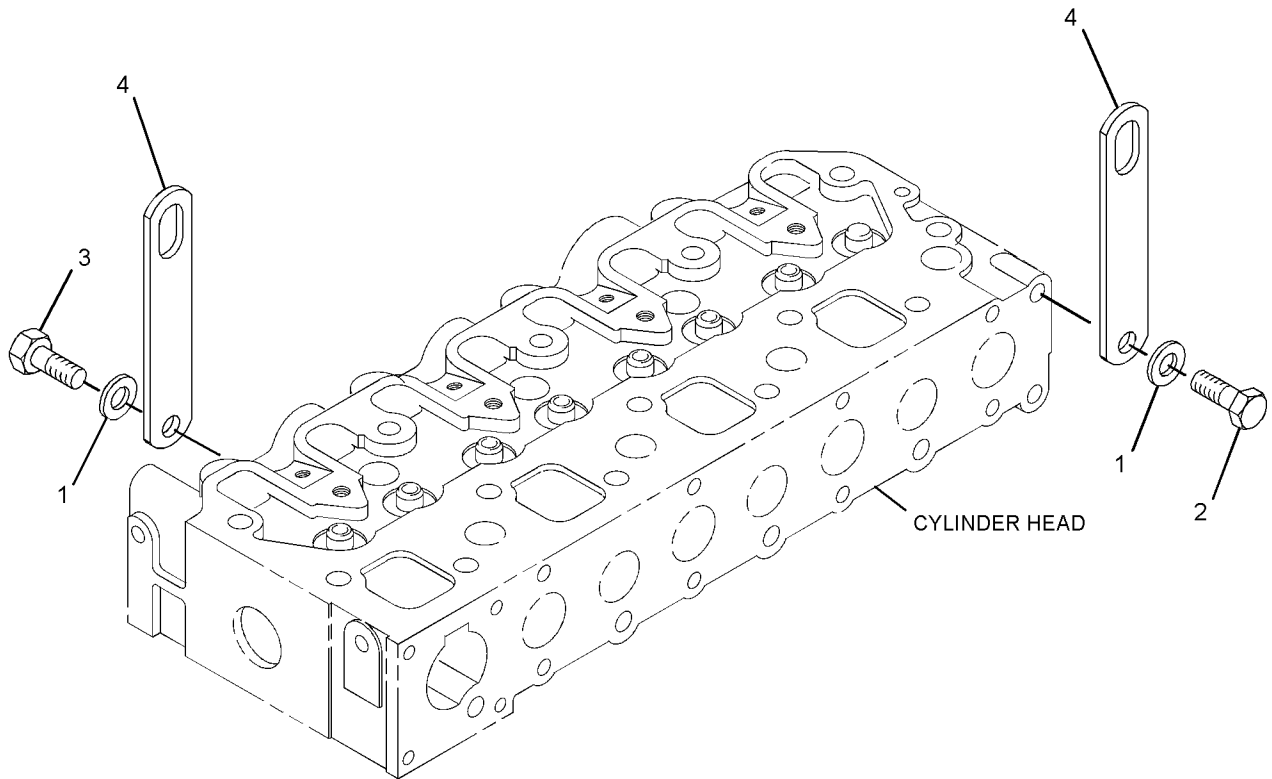
BASIC ENGINE

308-2315 LIFTING GP-ENGINE

SMCS-1122

i05261210

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	155-7984	2	WASHER						
	2	1	165-2141	1	BOLT						
	3	1	168-9001	1	BOLT						
	4	1	370-6544	2	PLATE-LIFTING						



GRAPHIC #1

<END>

g01414974

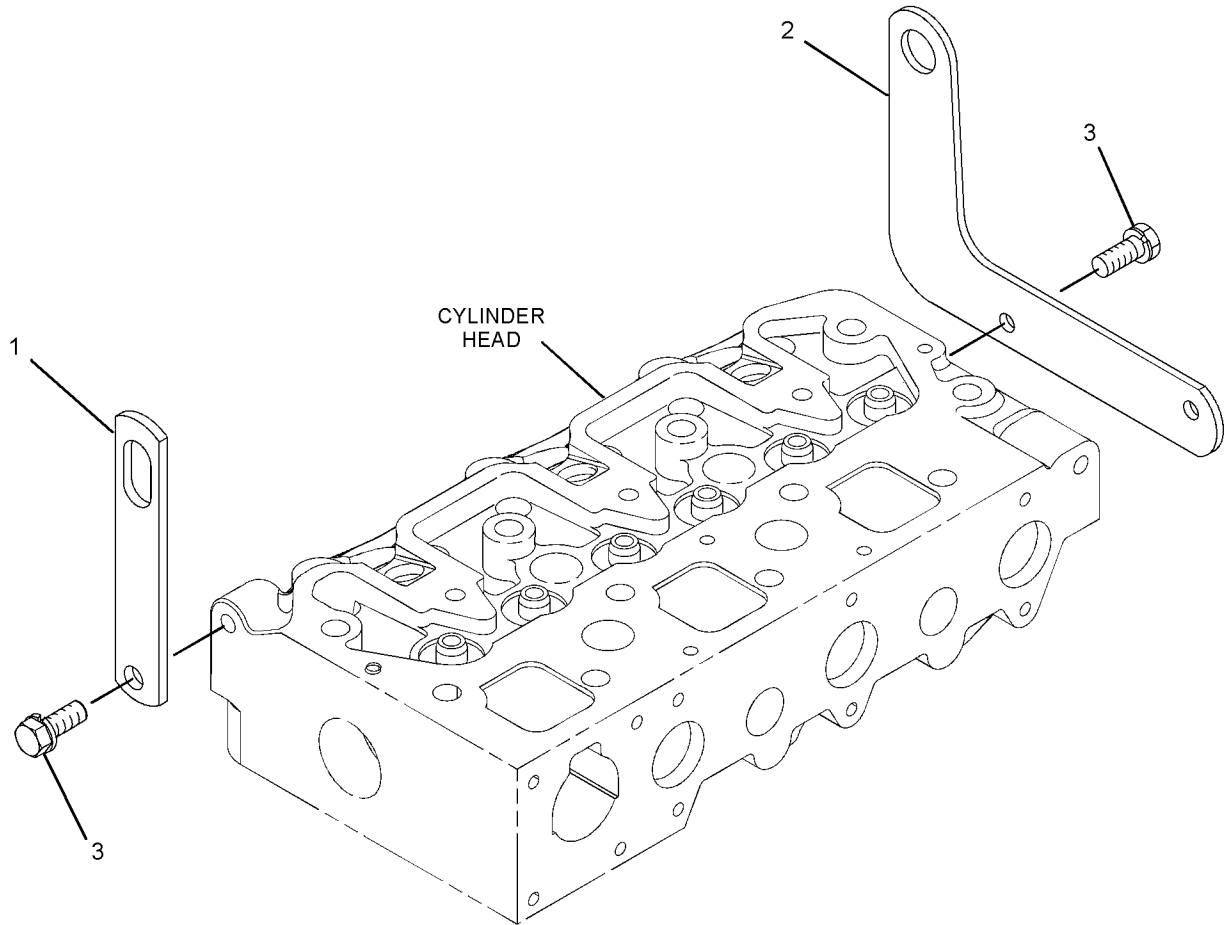
BASIC ENGINE

313-2022 LIFTING GP-ENGINE

SMCS-1122

i02904789

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	191-0573	1	PLATE (FRONT)						
	2	1	191-0574	1	PLATE (REAR)						
	3	1	153-6375	2	BOLT						



GRAPHIC #1

<END>

g01389539

BASIC ENGINE

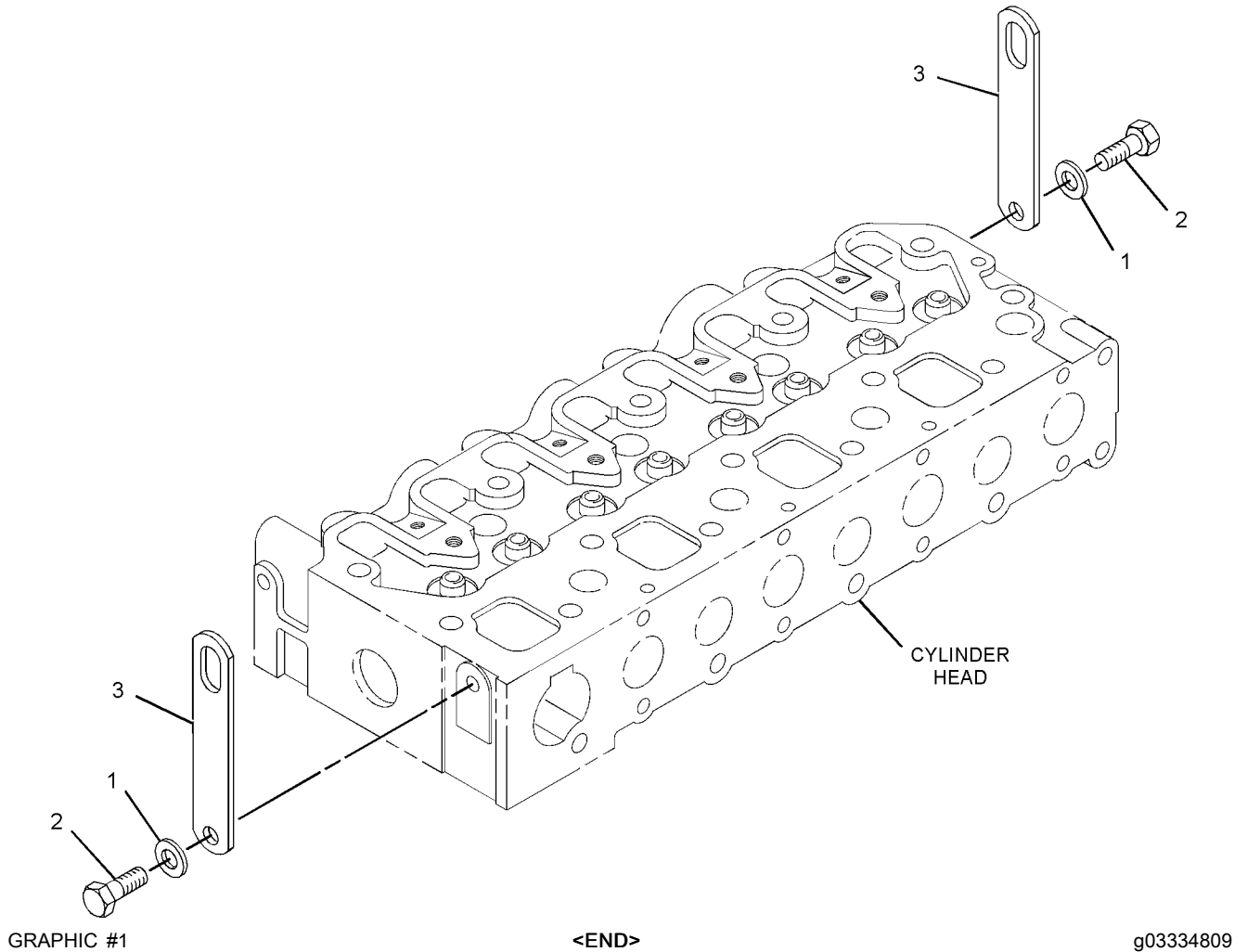
392-8729 LIFTING GP-ENGINE

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1122

i05090158

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	155-7984	2	WASHER						
	2	1	165-2141	2	BOLT						
	3	1	370-6544	2	PLATE-LIFTING						



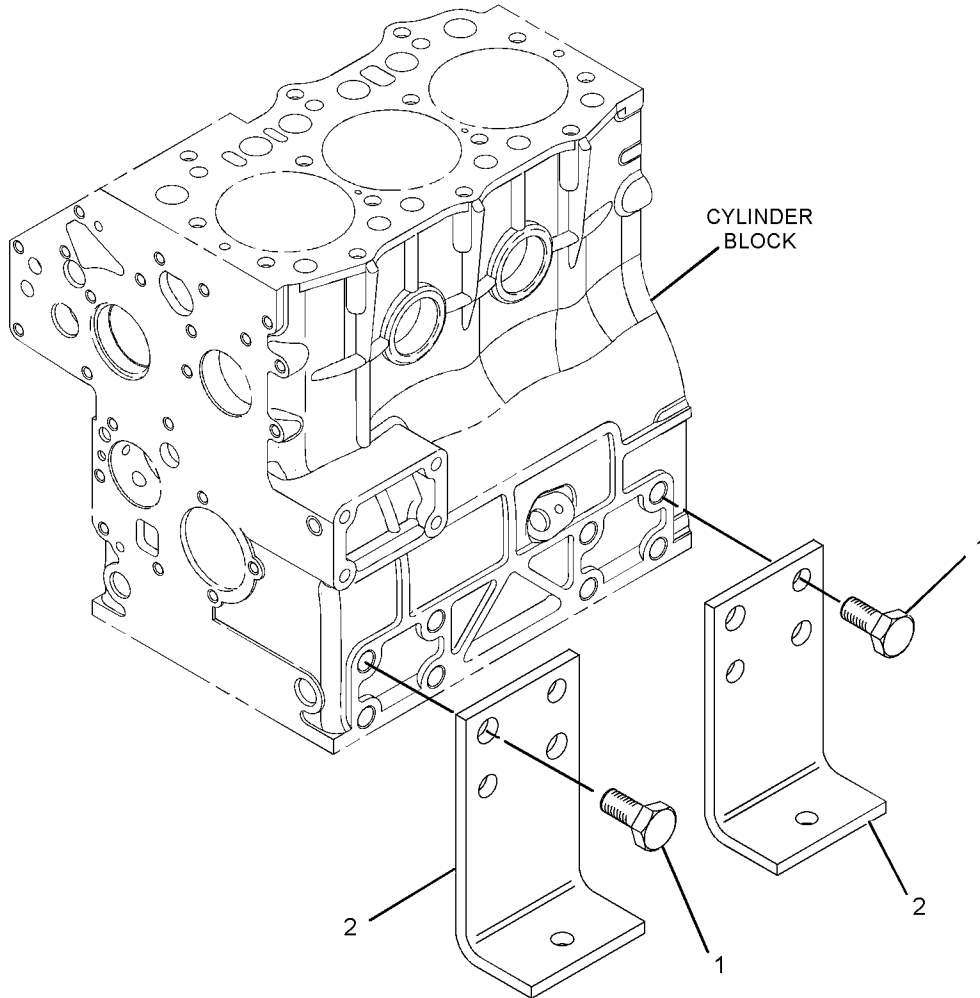
BASIC ENGINE

329-4427 MOUNTING GP-ENGINE

SMCS-1152, 1153, 1154

i03122852

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
1	1	1	197-8448	16	BOLT						
2	1	1	332-9144	4	BRACKET						



GRAPHIC #1

<END>

g01800453

BASIC ENGINE

313-1973 PAN GP-OIL

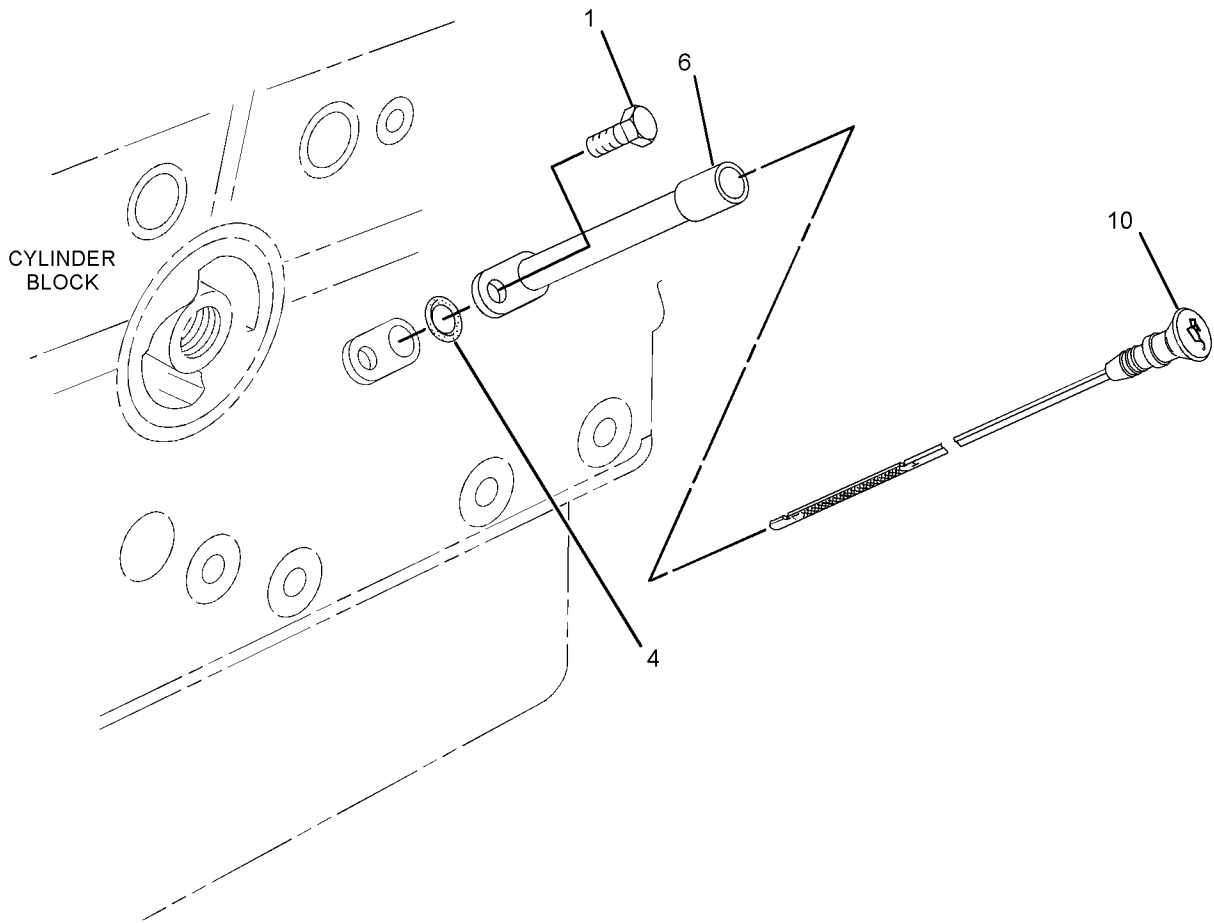
PART OF 435-1650 ENGINE AR

TYPE 1

SMCS-1302

i02978482

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1,2	153-6833	21	BOLT						
	2	2	153-6835	1	SEAL-O-RING						
	3	2	153-6838	2	BOLT						
	4	1	153-6841	2	SEAL-O-RING						
	5	2	219-4669	1	GASKET						
	6	1	229-5150	1	TUBE AS						
	7	2	230-7136	1	STRAINER						
	8	2	230-7138	1	TUBE-OIL SUCTION						
	9	2	238-1294	1	PAN-OIL						
	10	1	245-9735	1	GAUGE-OIL LEVEL (DIPSTICK) (ENGINE)						



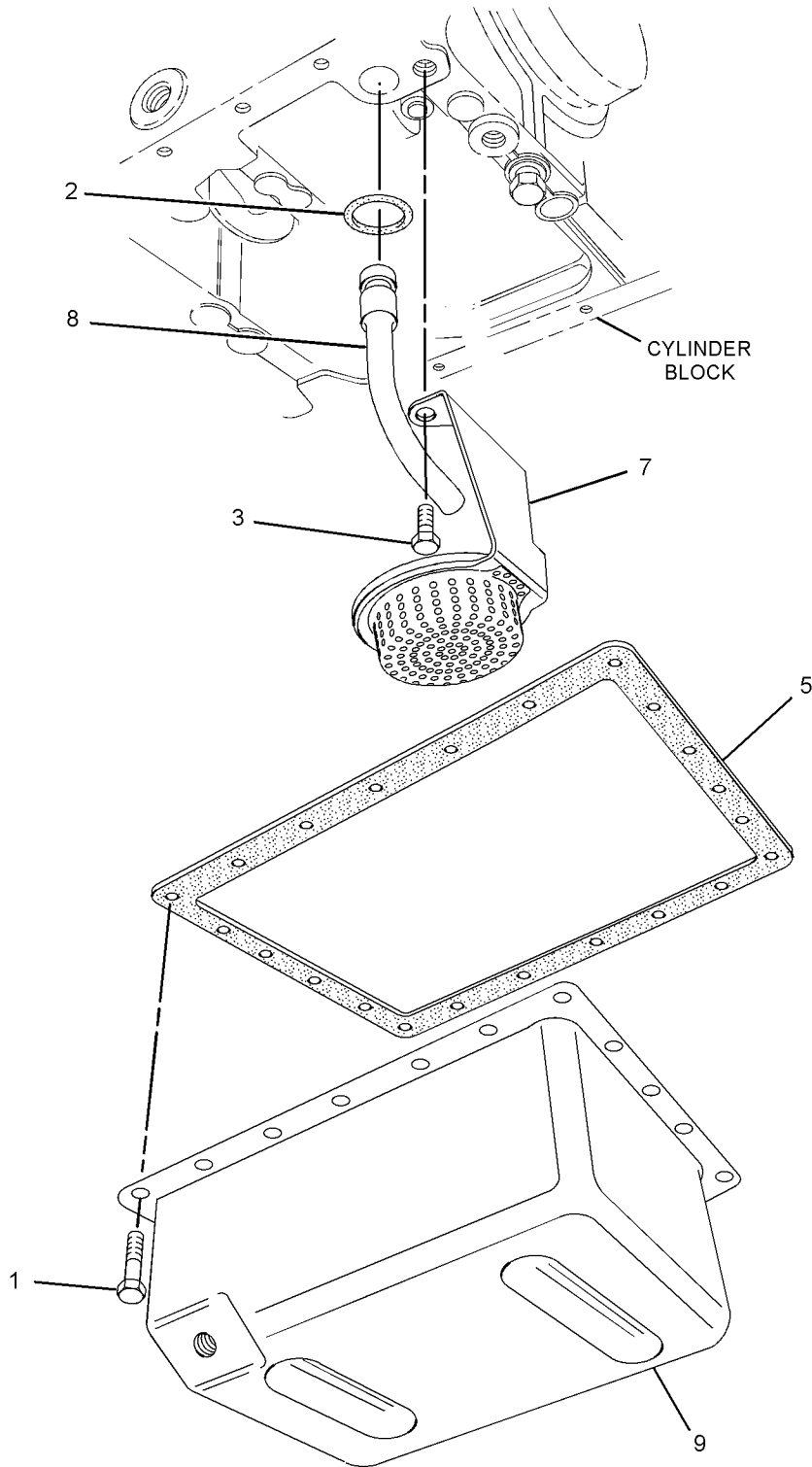
GRAPHIC #1

g01389007

BASIC ENGINE

313-1973 PAN GP-OIL (contd.)

i02978482



GRAPHIC #2

<END>

g01389008

BASIC ENGINE

313-1973 PAN GP-OIL

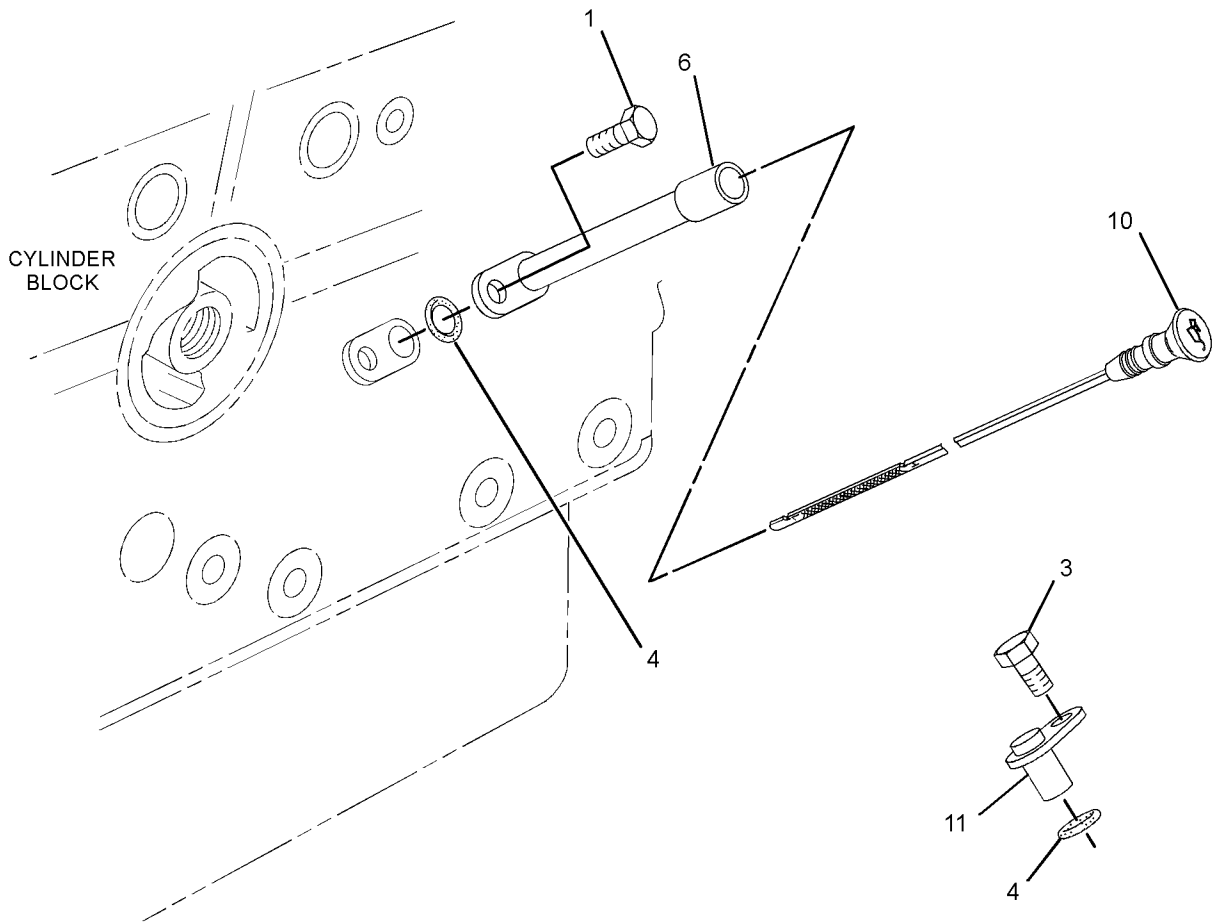
PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR
TYPE 2

SMCS-1302

i04943455

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1,2	153-6833	21	BOLT						
	2	2	153-6835	1	SEAL-O-RING						
C	3	1,2	153-6838	3	BOLT						
C	4	1	153-6841	4	SEAL-O-RING						
	5	2	219-4669	1	GASKET						
	6	1	229-5150	1	TUBE AS						
	7	2	230-7136	1	STRAINER (ENGINE OIL)						
	8	2	230-7138	1	TUBE-OIL SUCTION						
	9	2	238-1294	1	PAN-OIL						
	10	1	238-1295	1	GAUGE-OIL LEVEL (DIPSTICK) (ENGINE)						
C	11	1	369-8010	1	PLUG						

C - CHANGE FROM PREVIOUS TYPE



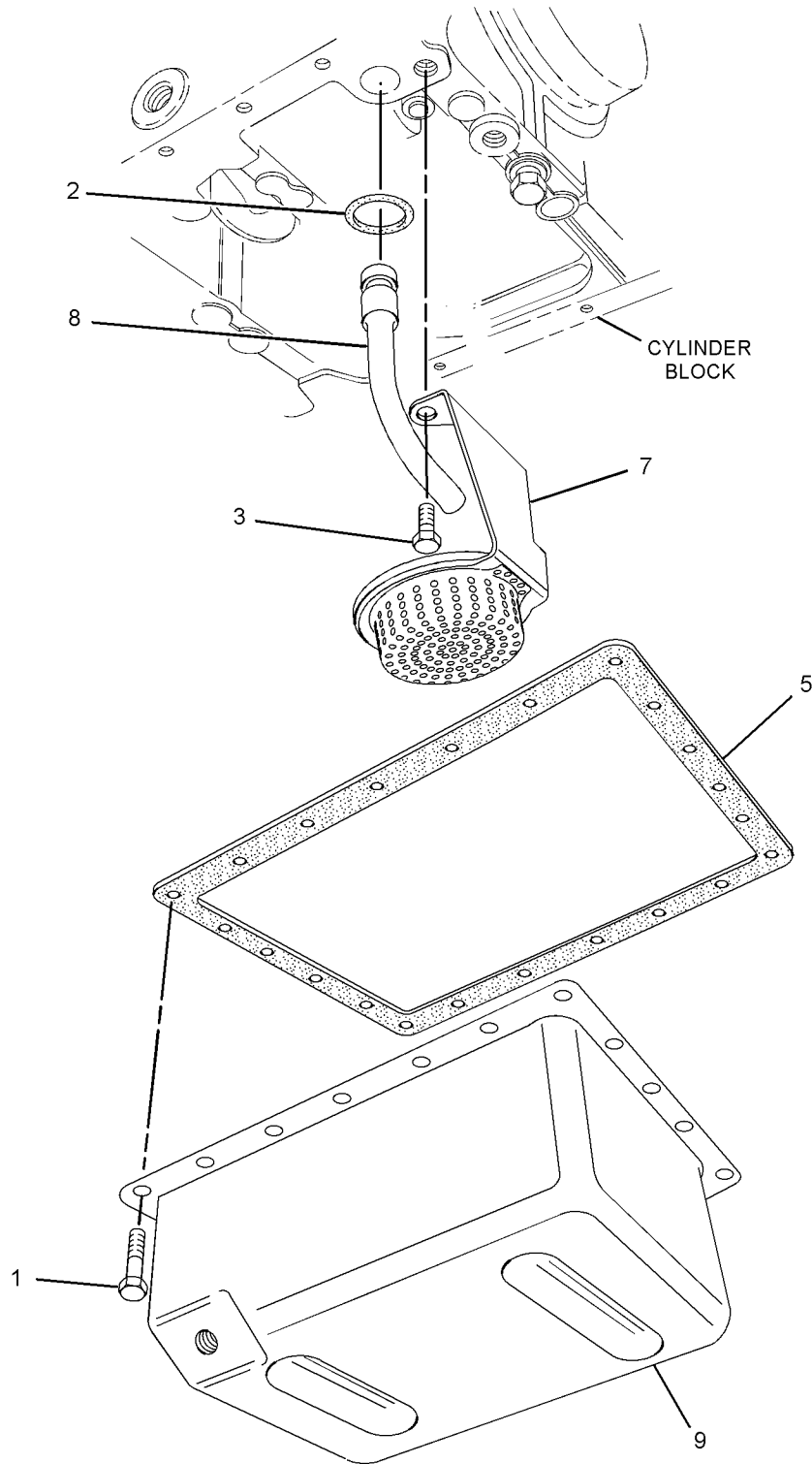
GRAPHIC #1

g01478146

BASIC ENGINE

313-1973 PAN GP-OIL (contd.)

i04943455



GRAPHIC #2

<END>

g01389008

BASIC ENGINE

319-7352 PAN GP-OIL-ENGINE

SMCS-1302

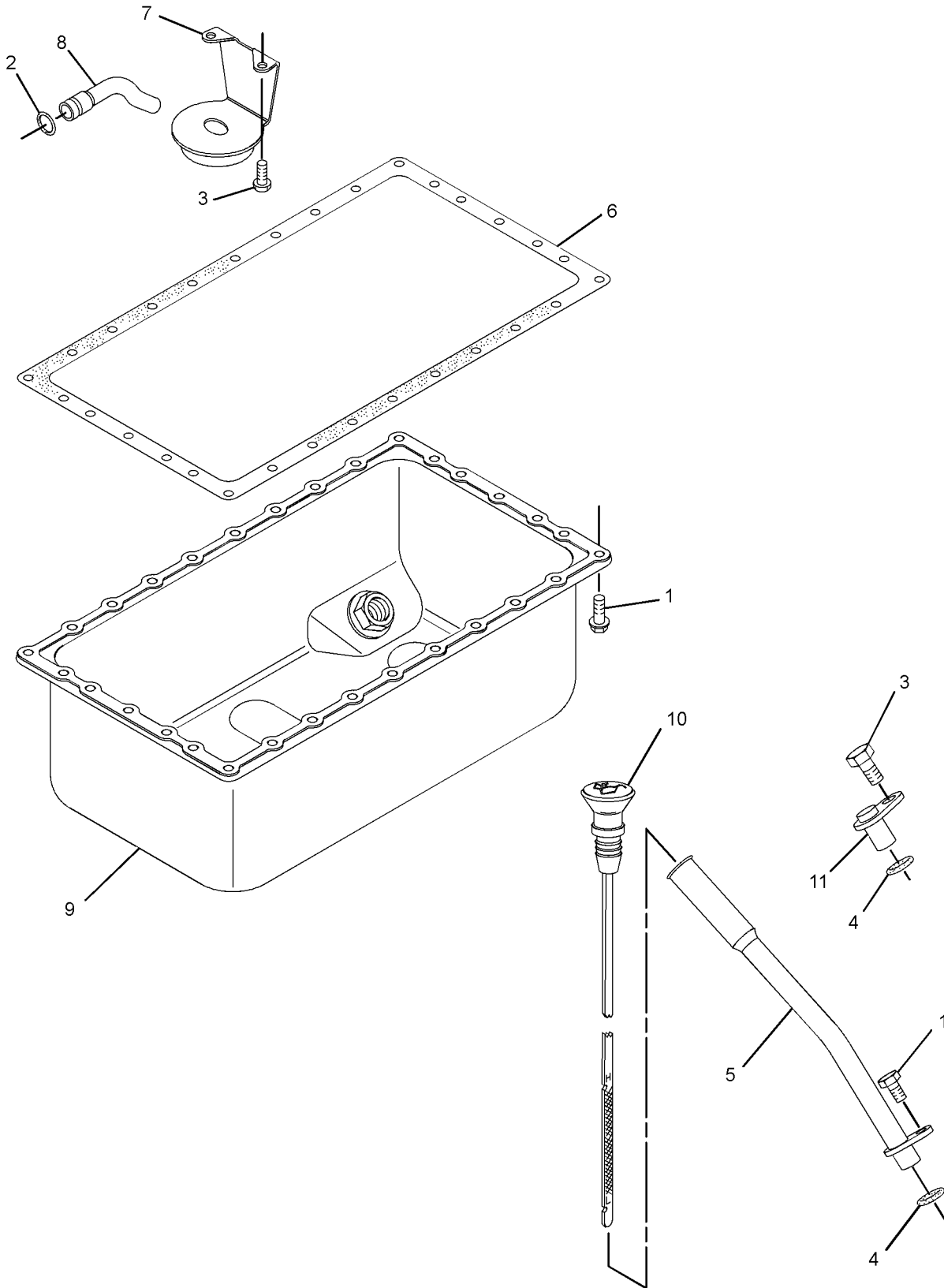
i04943466

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6833	21	BOLT						
	2	1	153-6835	1	SEAL-O-RING						
	3	1	153-6838	3	BOLT						
	4	1	153-6841	3	SEAL-O-RING						
	5	1	209-7084	1	TUBE AS-OIL GAUGE						
	6	1	219-4669	1	GASKET						
	7	1	230-7136	1	STRAINER (ENGINE OIL)						
	8	1	230-7138	1	TUBE-OIL SUCTION						
	9	1	238-1294	1	PAN-OIL						
	10	1	245-9735	1	GAUGE-OIL LEVEL (DIPSTICK) (ENGINE)						
	11	1	369-8010	1	PLUG						

BASIC ENGINE

319-7352 PAN GP-OIL (contd.)

i04943466



GRAPHIC #1

<END>

g01816994

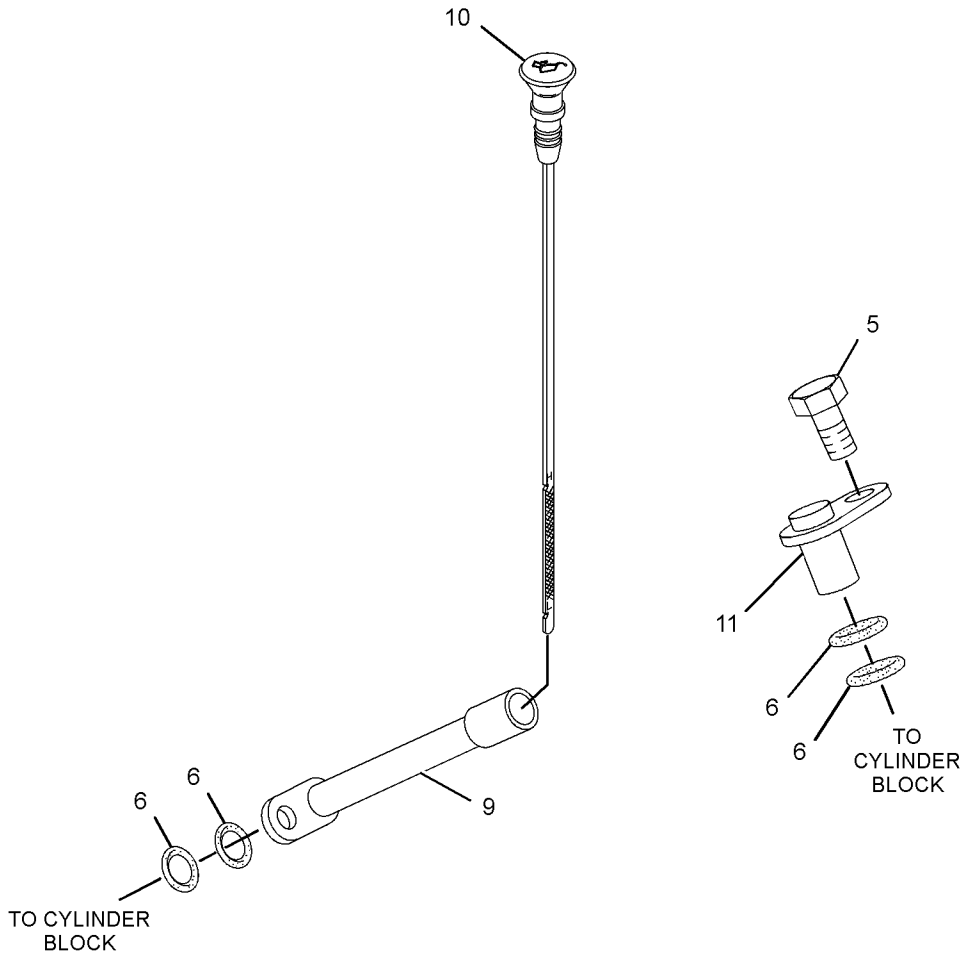
BASIC ENGINE

329-4419 PAN GP-OIL

SMCS-1302

i05811070

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	2	153-6830	1	PAN-OIL						
	2	2	153-6833	21	BOLT						
	3	2	153-6835	1	SEAL-O-RING						
	4	2	153-6837	1	STRAINER						
	5	1,2	153-6838	3	BOLT						
	6	1	153-6841	4	SEAL-O-RING						
	7	2	457-4244	1	HOSE						
	8	2	219-4669	1	GASKET						
	9	1	229-5150	1	TUBE AS						
	10	1	308-1929	1	GAUGE-OIL LEVEL (DIPSTICK) (ENGINE)						
	11	1	369-8010	1	PLUG						



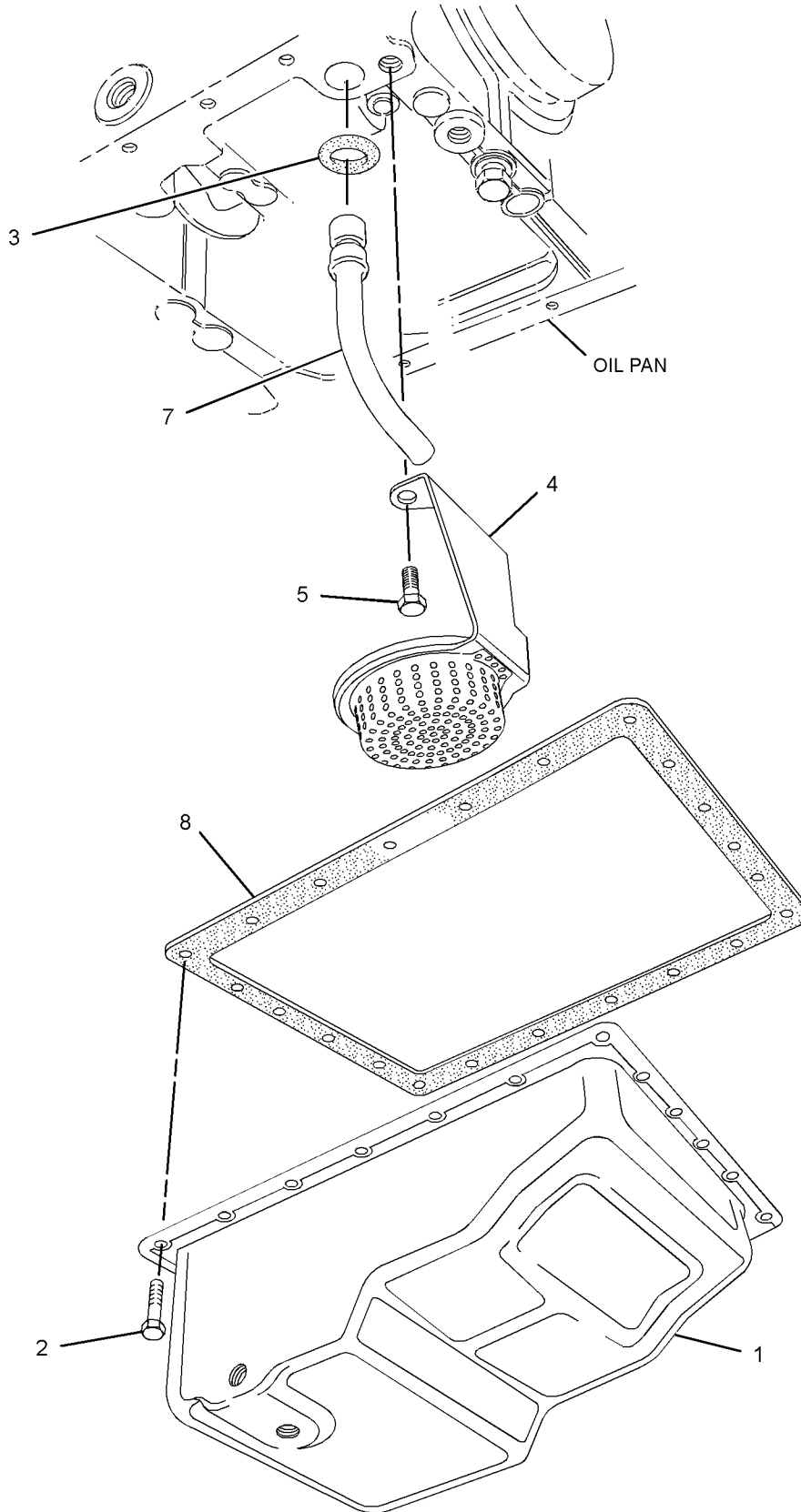
GRAPHIC #1

g01960494

BASIC ENGINE

329-4419 PAN GP-OIL (contd.)

i05811070



GRAPHIC #2

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g03688646

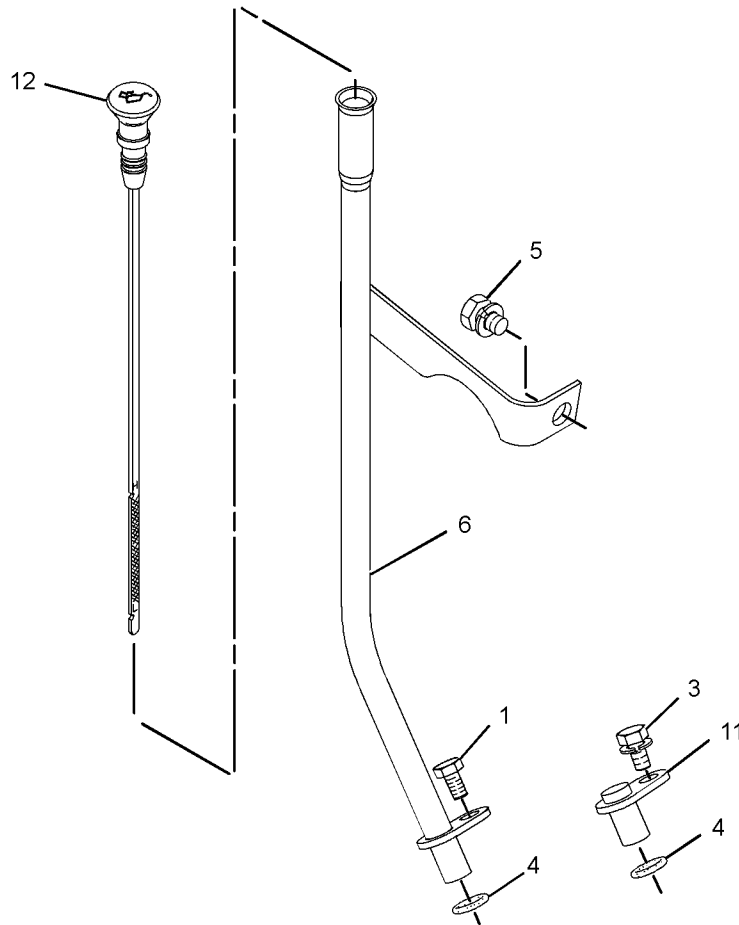
BASIC ENGINE

334-0277 PAN GP-OIL

SMCS-1302

i04943498

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1,2	153-6833	21	BOLT						
	2	2	153-6835	1	SEAL-O-RING						
	3	1,2	153-6838	3	BOLT						
	4	1	153-6841	4	SEAL-O-RING						
	5	1	180-6118	1	BOLT						
	6	1	209-7086	1	TUBE AS-OIL GAUGE						
	7	2	219-4669	1	GASKET						
	8	2	230-7136	1	STRAINER						
	9	2	230-7138	1	TUBE-OIL SUCTION						
	10	2	238-1294	1	PAN-OIL						
	11	1	369-8010	1	PLUG						
	12	1	334-0271	1	GAUGE GP-OIL LEVEL (DIPSTICK) (ENGINE)						



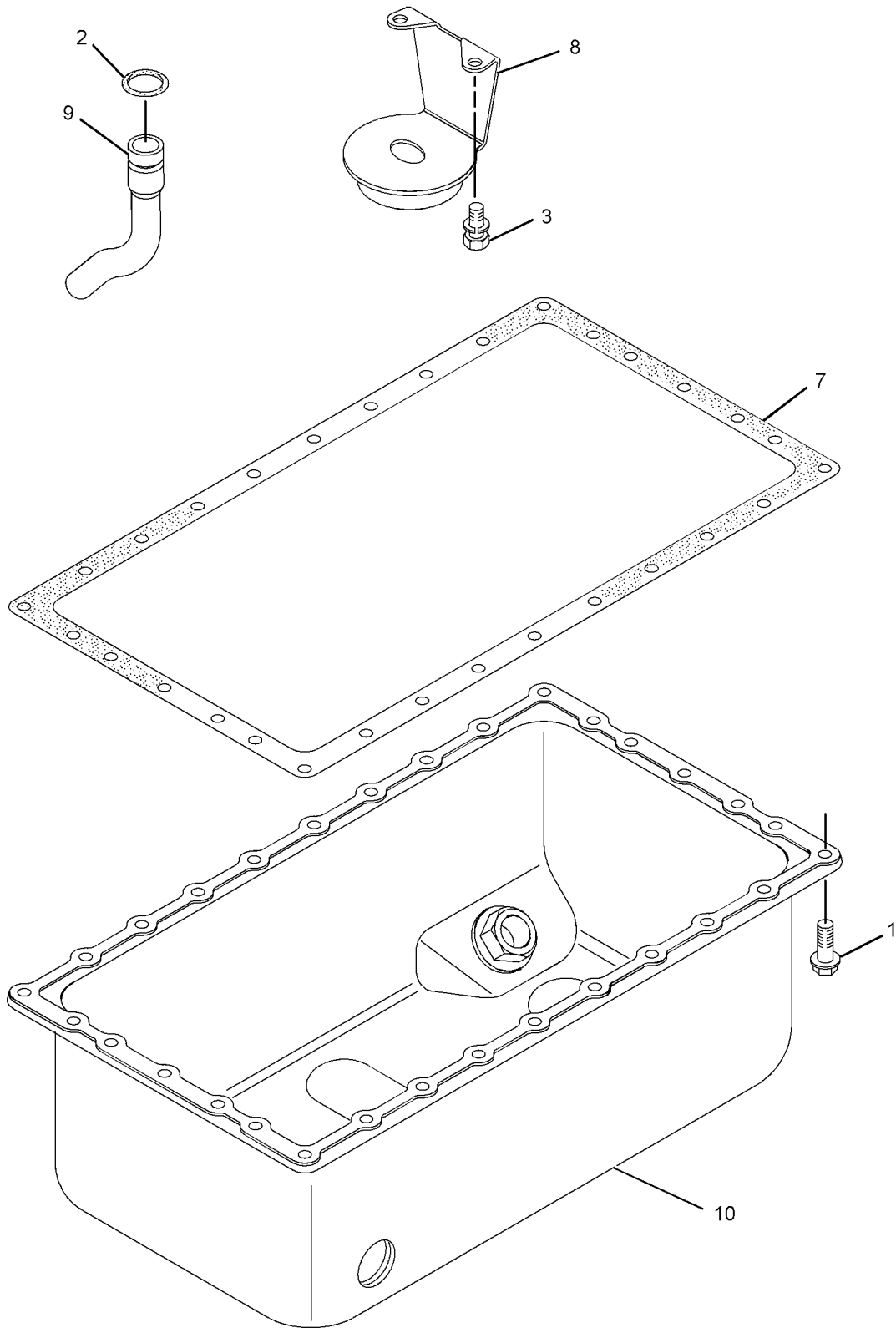
GRAPHIC #1

g01710736

BASIC ENGINE

334-0277 PAN GP-OIL (contd.)

i04943498



GRAPHIC #2

<END>

g01710737

BASIC ENGINE

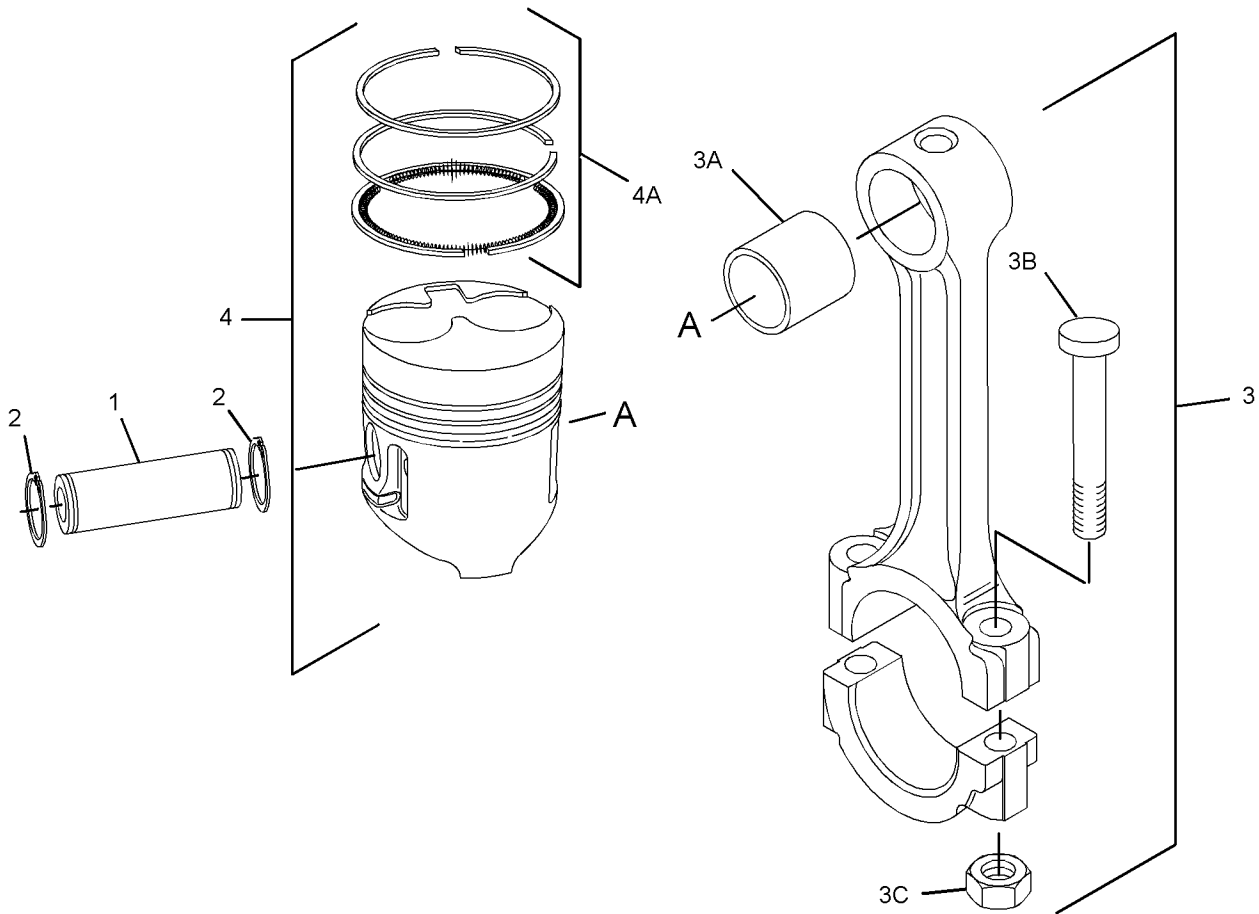
313-1963 PISTON & ROD GP

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1225

i02904842

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5540	3	PIN						
	2	1	153-5541	6	CLIP						
	3	1	231-3870	3	ROD AS-CONNECTING (EACH INCLUDES)						
	3A	1	153-5536	1	BUSHING						
	3B	1	153-5537	2	BOLT						
	3C	1	153-5538	2	NUT						
	4	1	290-8456	3	KIT-PISTON (EACH INCLUDES)						
	4A	1	290-8458	1	KIT-PISTON RING						



GRAPHIC #1

<END>

g01389579

BASIC ENGINE

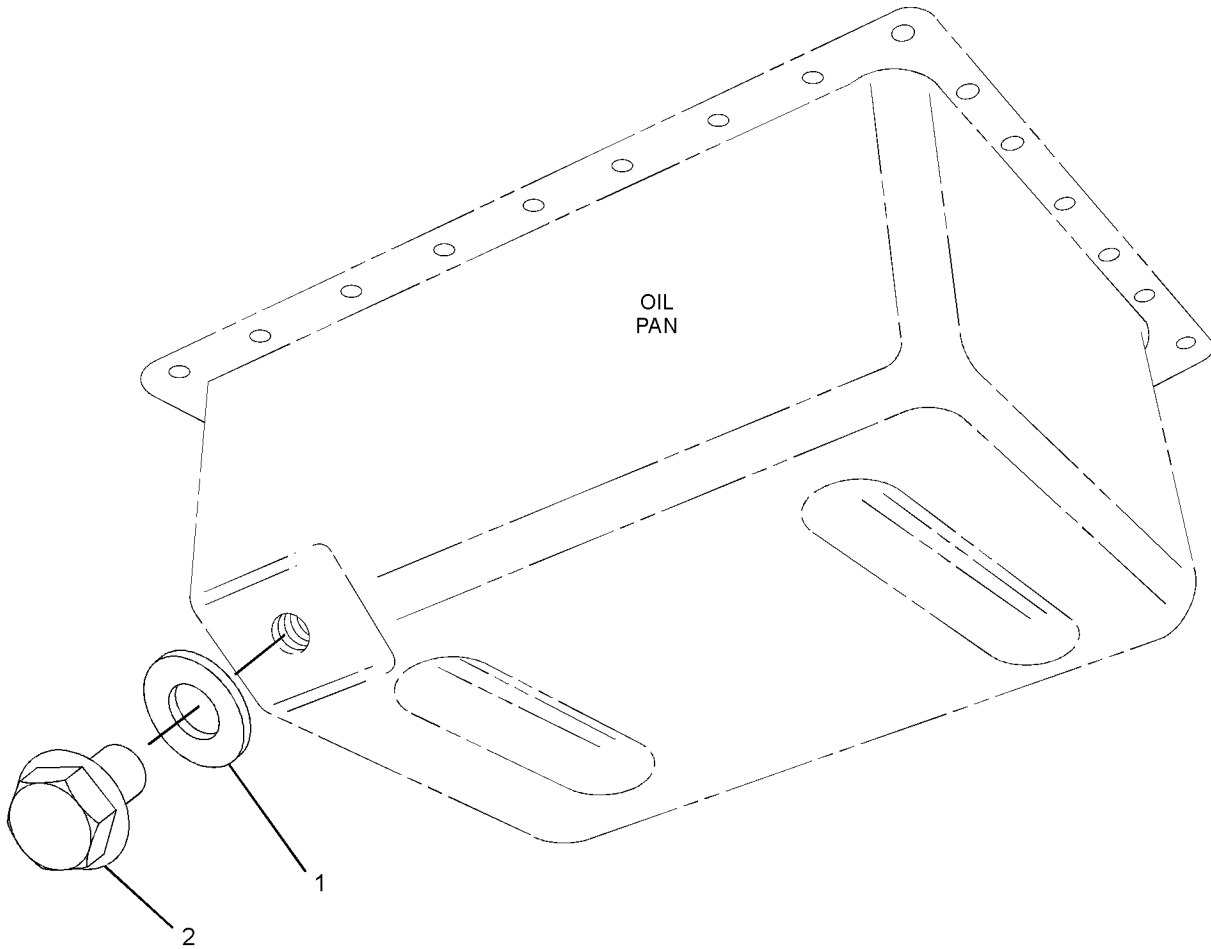
309-6720 PLUG GP-OIL PAN-ENGINE

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1302

i05815394

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6412	2	WASHER						
	2	1	423-6224	2	PLUG (DRAIN) (ENGINE OIL PAN)						



GRAPHIC #1

<END>

g03428832

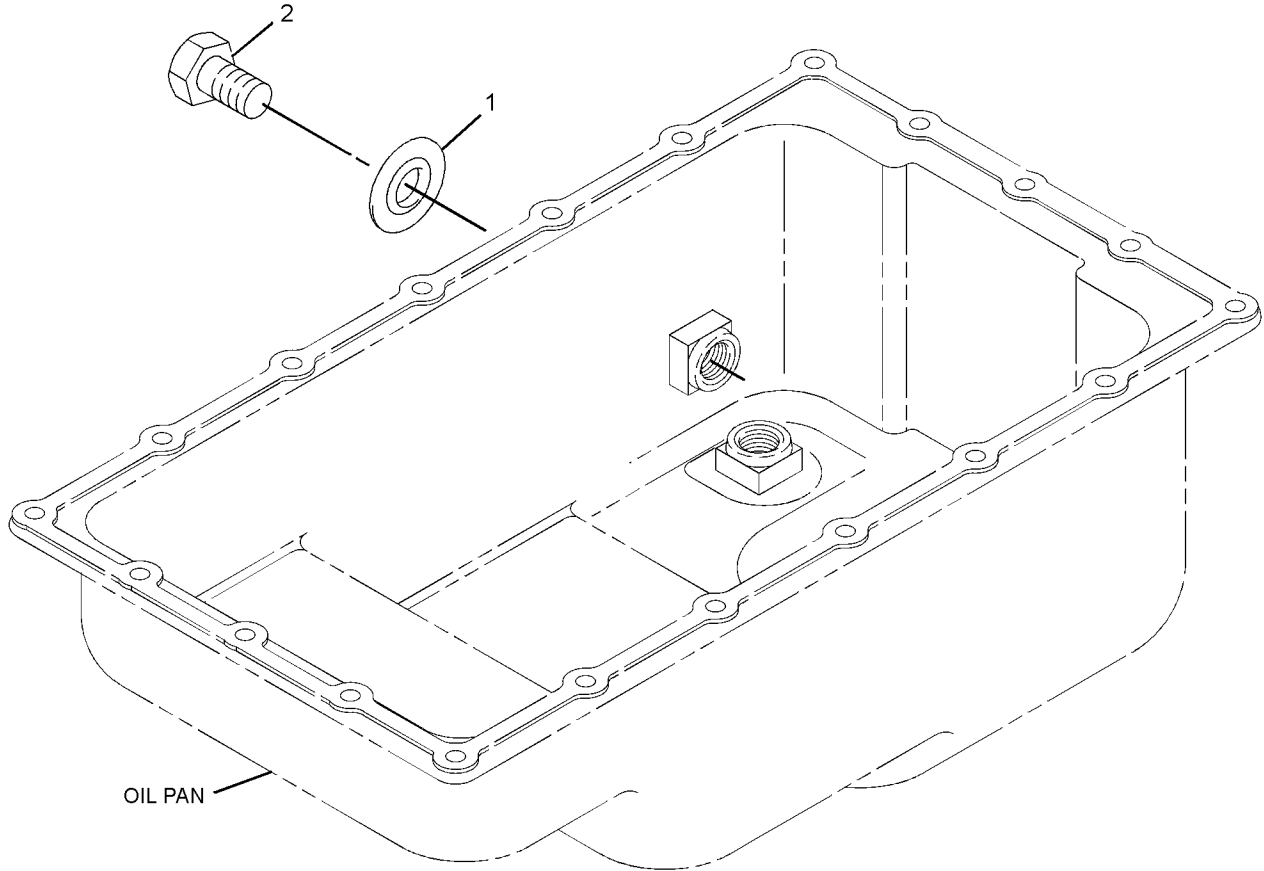
BASIC ENGINE

320-9108 PLUG GP-OIL PAN

SMCS-1302

i02906715

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6832	2	WASHER						
	2	1	165-3605	2	PLUG-DRAIN (ENGINE OIL)						



GRAPHIC #1

<END>

g01513429

BASIC ENGINE

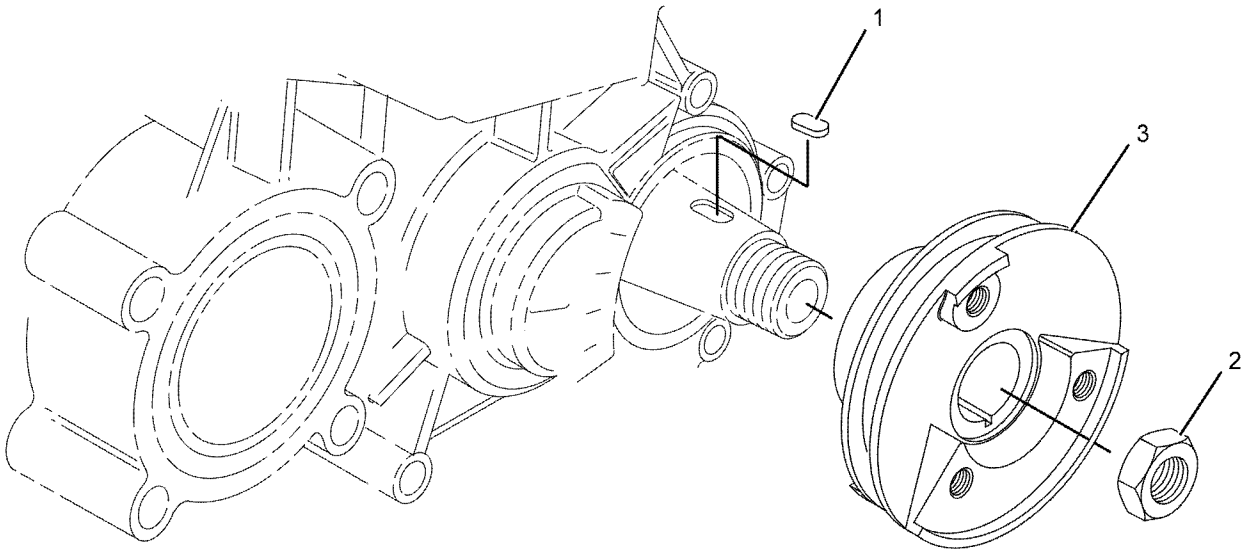
313-1976 PULLEY GP-CRANKSHAFT

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1205

i05416781

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6492	1	KEY-WOODRUFF						
	2	1	153-6496	1	NUT						
	3	1	177-3308	1	PULLEY-CRANKSHAFT						



GRAPHIC #1

<END>

g01142574

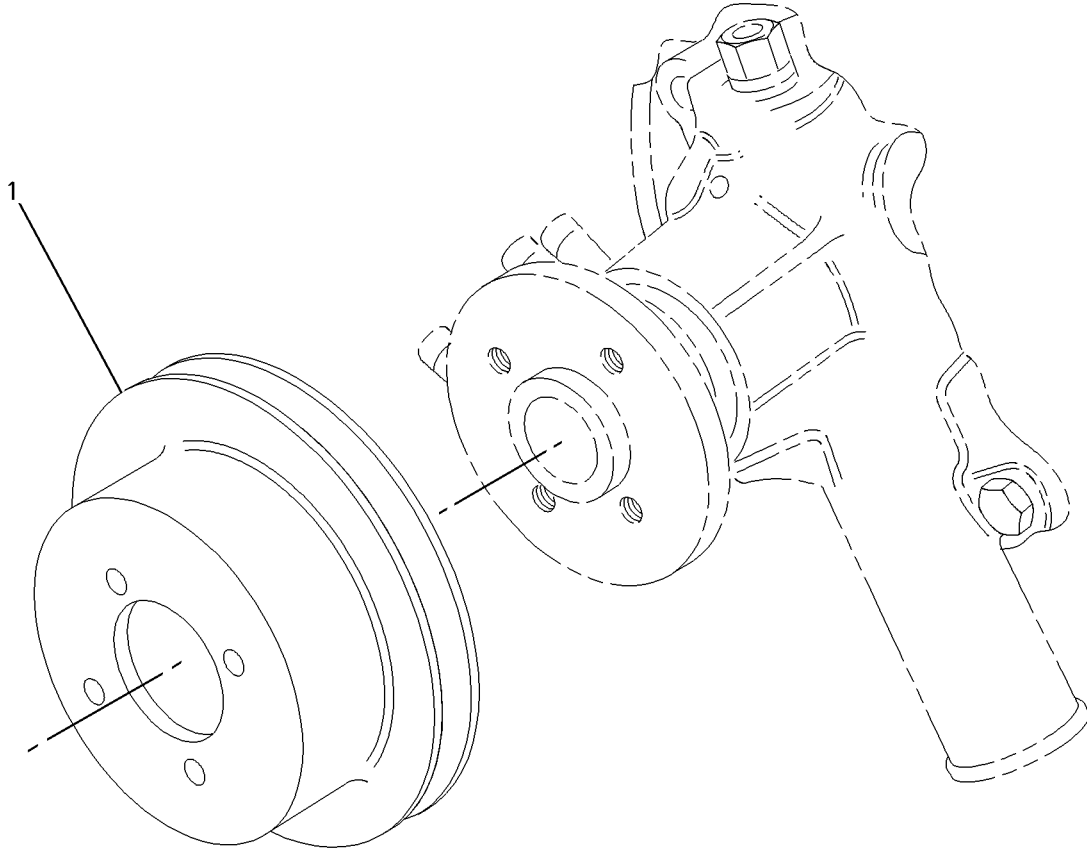
BASIC ENGINE

313-1972 PULLEY GP-WATER PUMP

SMCS-1384

i02904839

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5963	1	PULLEY-WATER PUMP						



GRAPHIC #1

<END>

g00852560

BASIC ENGINE

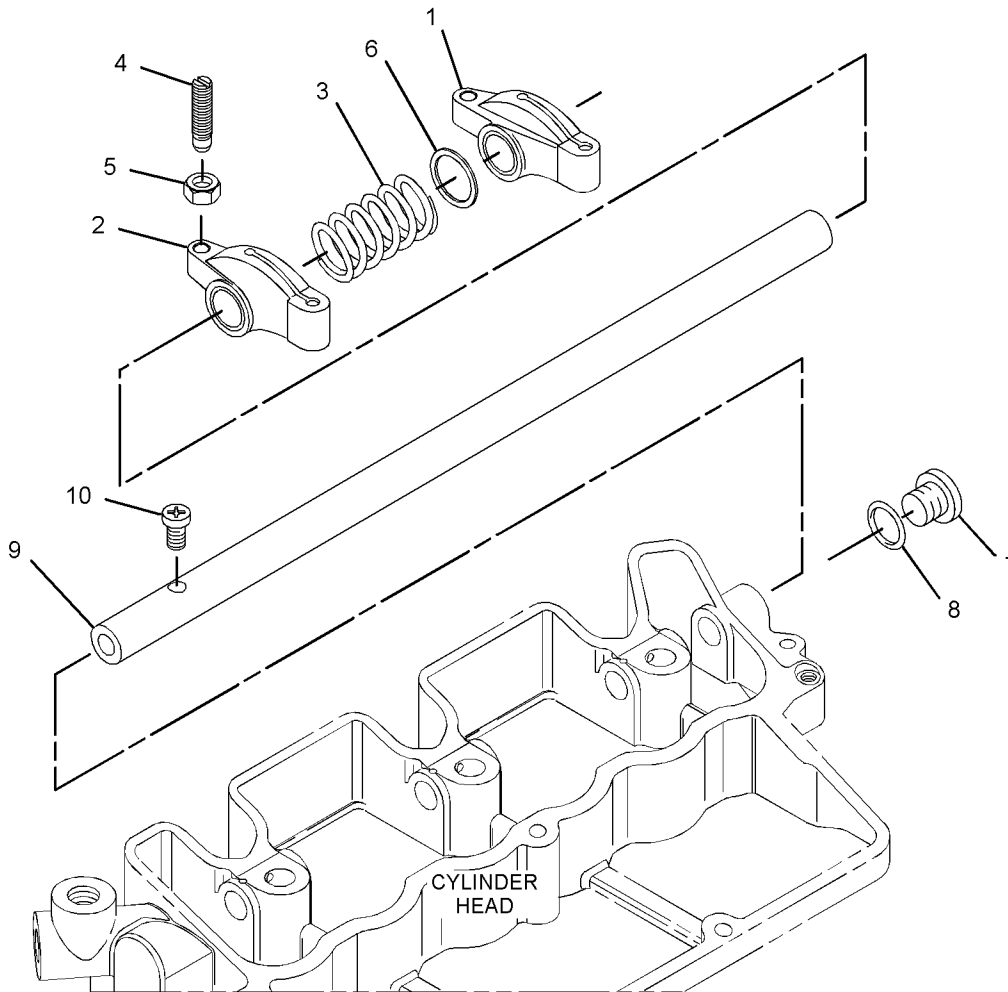
386-1972 ROCKER ARM AS

PART OF 313-1965 VALVE MECHANISM GP

SMCS-1123

i05140930

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5577	3	LEVER						
	2	1	153-5579	3	LEVER						
	3	1	153-5586	2	SPRING						
	4	1	153-5587	6	SCREW-ADJUSTMENT						
	5	1	153-5590	6	NUT						
	6	1	153-5595	4	WASHER						
	7	1	156-6948	1	PLUG						
	8	1	156-6950	1	SEAL-O-RING						
	9	1	231-2183	1	SHAFT						
	10	1	291-1799	1	BOLT						



GRAPHIC #1

<END>

g03334895

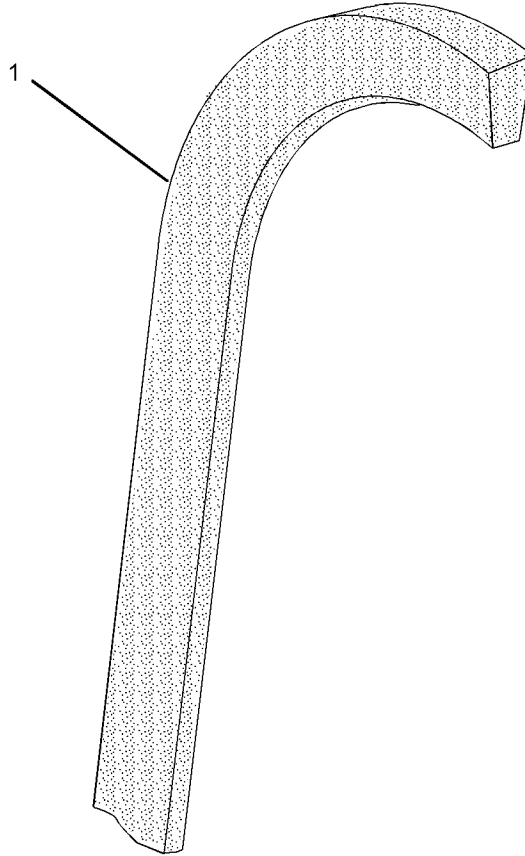
BASIC ENGINE

313-1983 V-BELT GP

SMCS-1357

i02927334

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	183-3942	1	V-BELT (DRIVE)						



GRAPHIC #1

<END>

g01389438

BASIC ENGINE

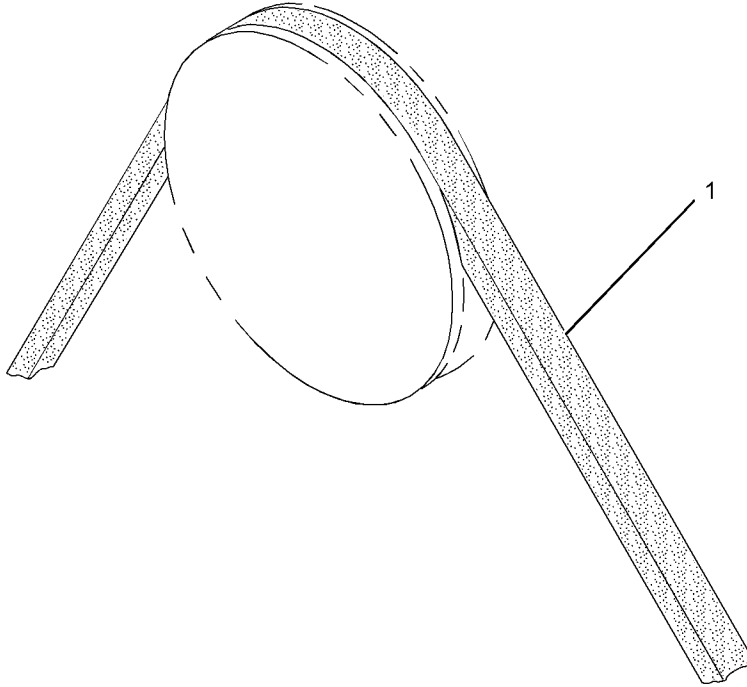
319-7355 V-BELT GP

S/N: G8N1-4055

SMCS-1357

i02904853

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	183-3942	1	V-BELT (ALTERNATOR, WATER PUMP)						



GRAPHIC #1

<END>

g01321905

BASIC ENGINE

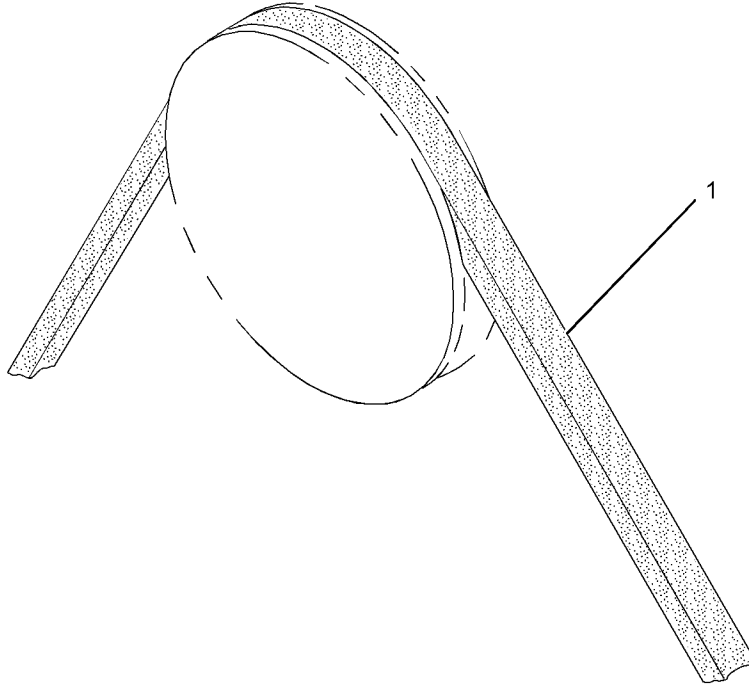
319-7355 V-BELT GP

SMCS-1357

i05228923

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
C	1	1	365-5827	1	V-BELT (ALTERNATOR)						

C - CHANGE FROM PREVIOUS TYPE



GRAPHIC #1

<END>

g01321905

BASIC ENGINE

313-1965 VALVE MECHANISM GP

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1102, 1121, 1123, 1209

i05608478

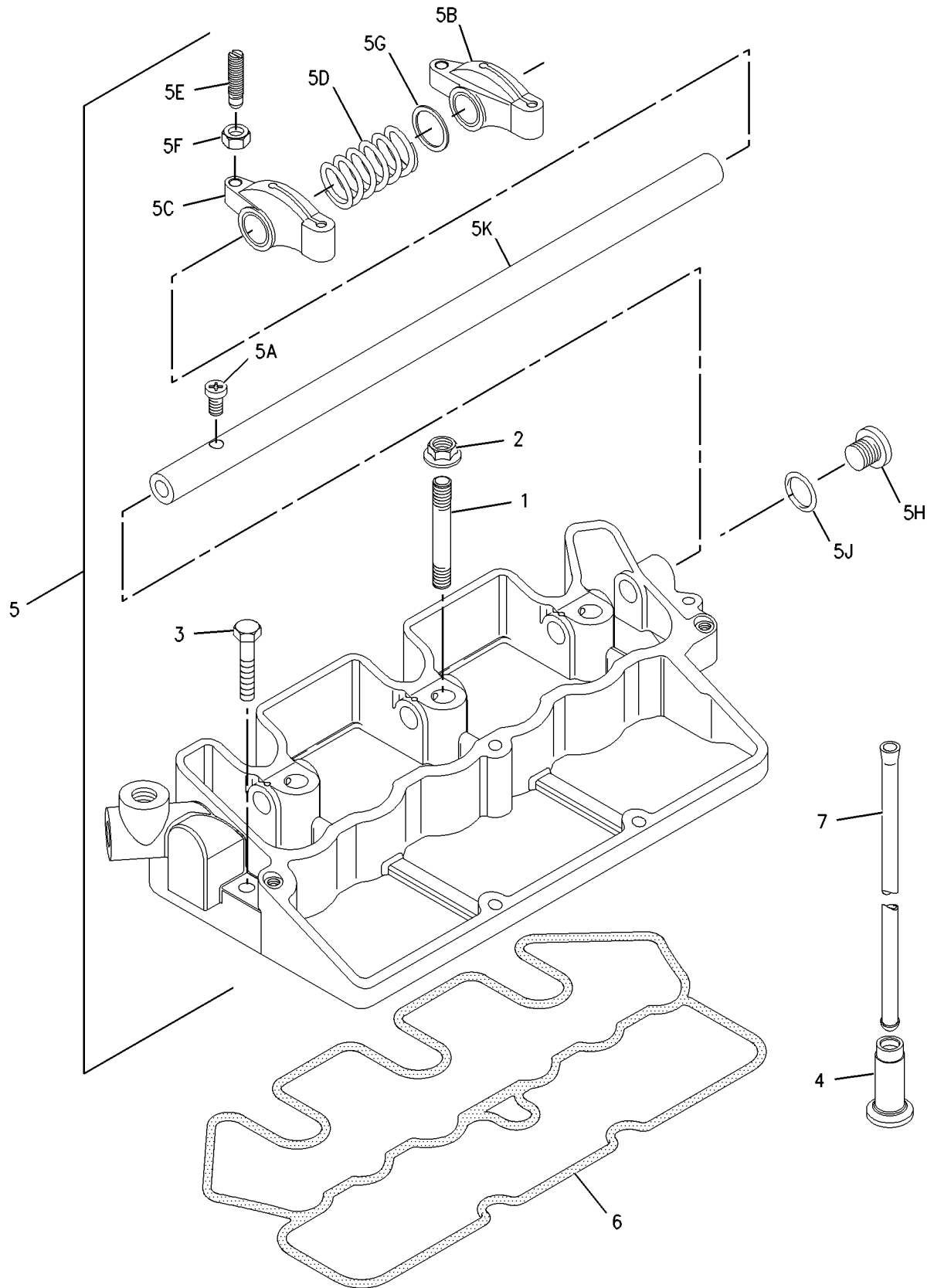
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME	SEE PAGE
					1 2 3 4 5 6 (PRODUCT LEVEL)	
	1	1	153-5591	3	STUD	
	2	1	153-5592	3	NUT	
	3	1	153-6861	2	BOLT	
	4	1	154-1249	6	TAPPET	
Y	5	1	386-1972	1	ROCKER ARM AS	96
	6	1	231-2208	1	SEAL	
	7	1	231-2209	6	PUSHROD	

Y - SEPARATE ILLUSTRATION

BASIC ENGINE

313-1965 VALVE MECHANISM GP (contd.)

i05608478



GRAPHIC #1

<END>

g00980906

LUBRICATION SYSTEM

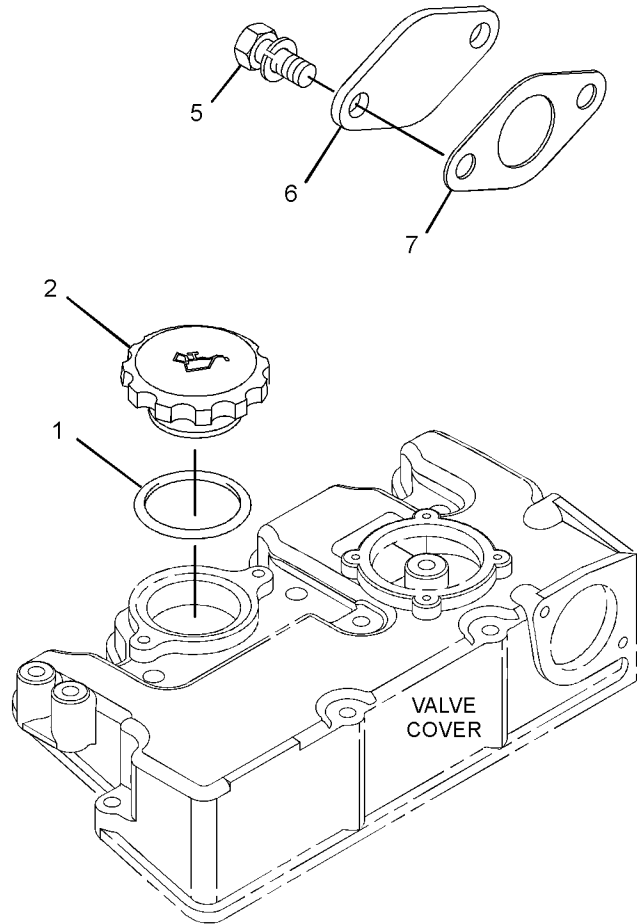
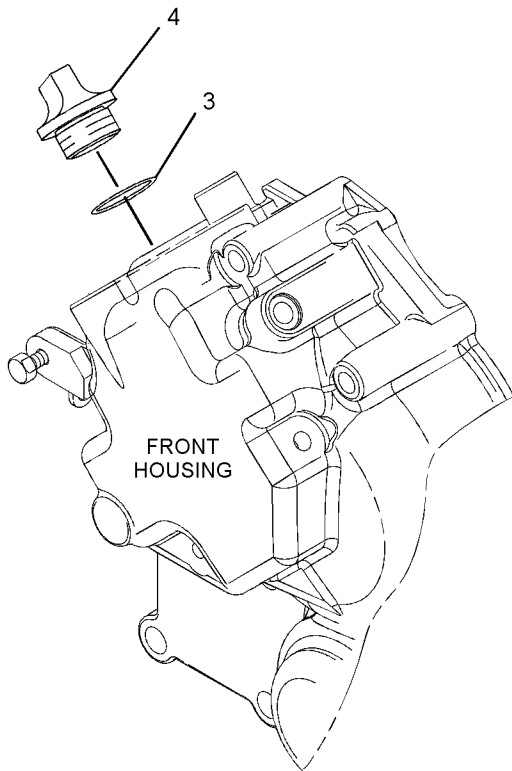
313-1975 FILLER GP-ENGINE OIL

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1316

i05202872

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5933	1	SEAL (ENGINE OIL FILLER)						
	2	1	217-7358	1	CAP-OIL FILLER (ENGINE)						
	3	1	288-6593	1	SEAL (ENGINE OIL FILLER)						
	4	1	334-0272	1	CAP-FILLER (ENGINE)						
	5	1	153-6838	2	BOLT						
	6	1	183-4323	1	COVER						
	7	1	215-2606	1	GASKET						



GRAPHIC #1

<END>

g03338050

LUBRICATION SYSTEM

334-0278 FILLER GP-ENGINE OIL

SMCS-1316

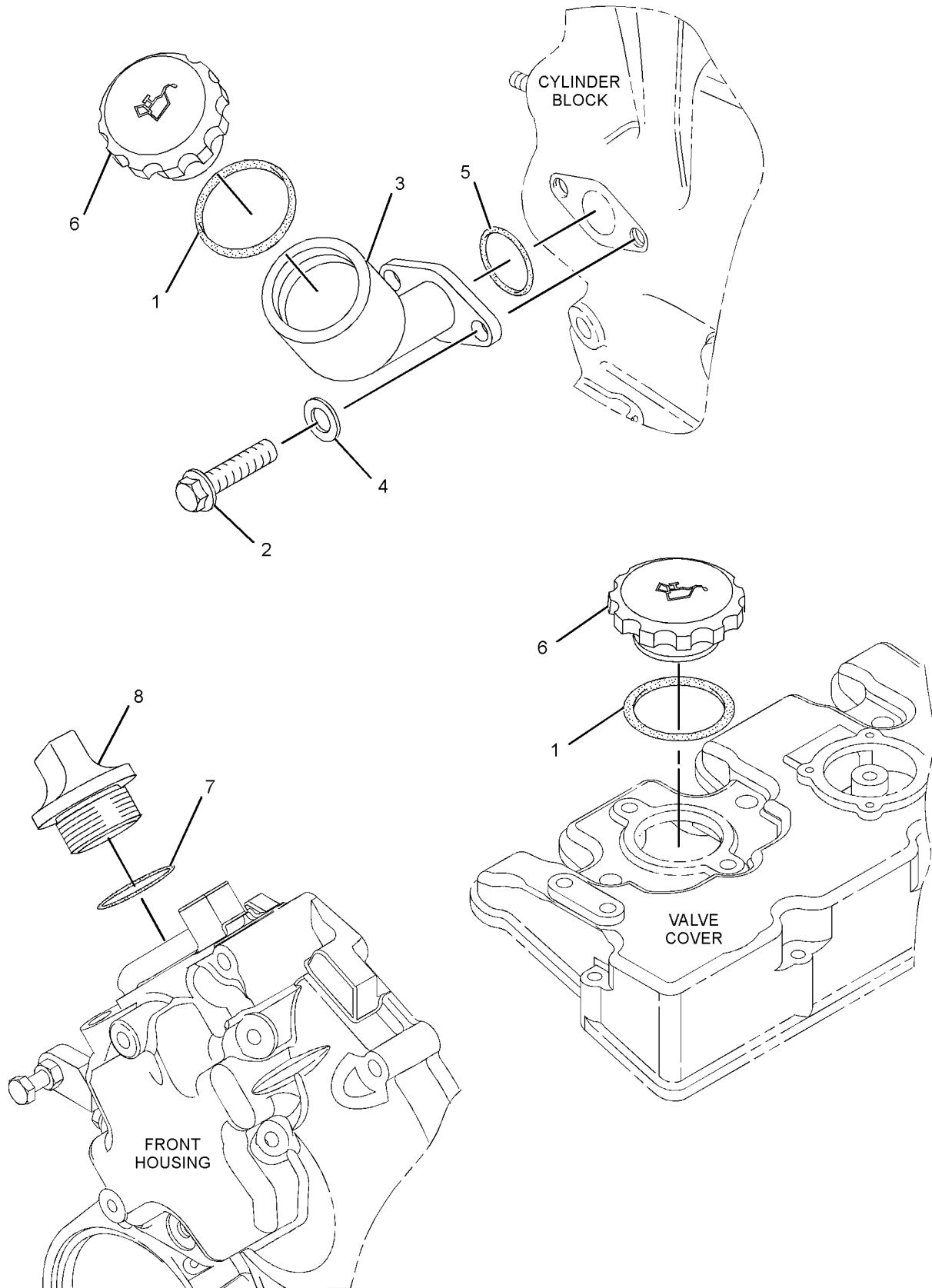
i03977589

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5933	2	SEAL (ENGINE OIL FILL CAP)						
	2	1	153-7640	2	BOLT						
	3	1	209-1355	1	FILLER-OIL (ENGINE)						
	4	1	9X-8256	2	WASHER (6.6X12X2-MM THK)						
	5	1	211-8559	1	SEAL-O-RING						
	6	1	217-7358	2	CAP-OIL FILLER (ENGINE)						
	7	1	288-6593	1	SEAL (ENGINE OIL FILL CAP)						
	8	1	334-0272	1	CAP-FILLER (ENGINE OIL)						

LUBRICATION SYSTEM

334-0278 FILLER GP-ENGINE OIL (contd.)

i03977589



GRAPHIC #1

<END>

g01960172

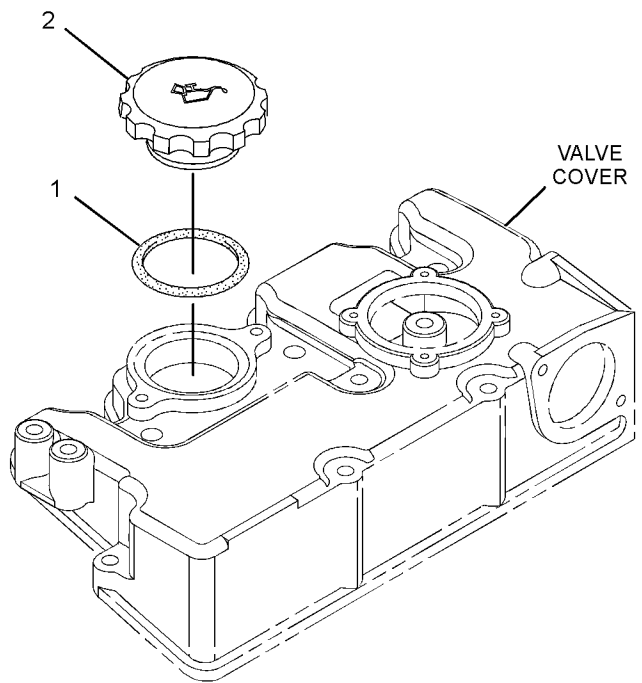
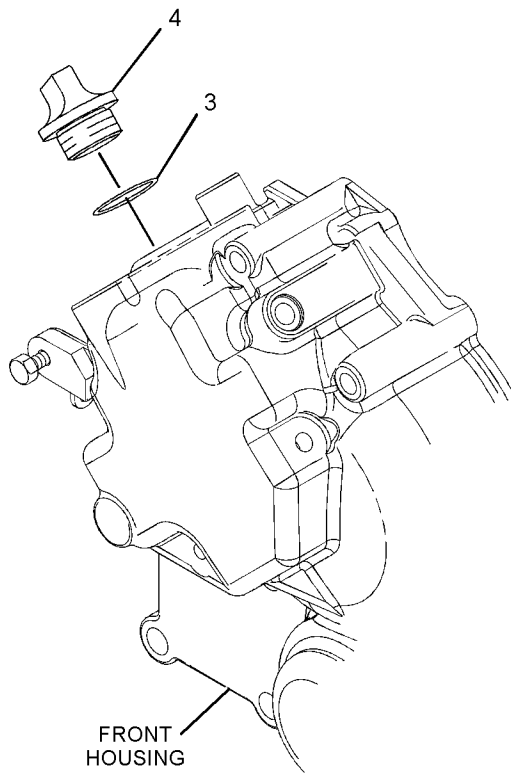
LUBRICATION SYSTEM

365-0486 FILLER GP-OIL

SMCS-1316

i04093369

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5933	1	SEAL (ENGINE OIL FILLER)						
	2	1	217-7358	1	CAP-OIL FILLER (ENGINE)						
	3	1	288-6593	1	SEAL (ENGINE OIL FILLER)						
	4	1	334-0272	1	CAP-FILLER (ENGINE)						



GRAPHIC #1

<END>

g01388692

LUBRICATION SYSTEM

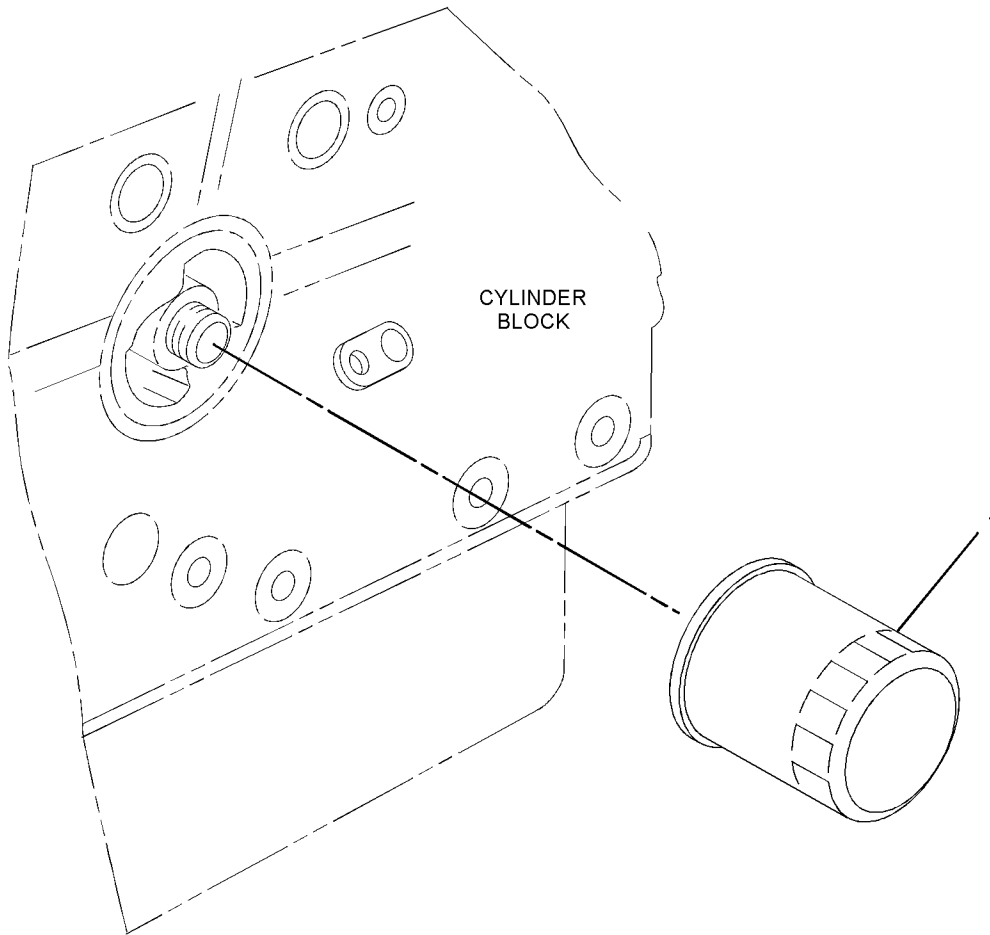
308-2298 FILTER GP-ENGINE OIL

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1306, 1308

i05815127

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	220-1523	1	FILTER AS-ENGINE OIL						



GRAPHIC #1

<END>

g01389723

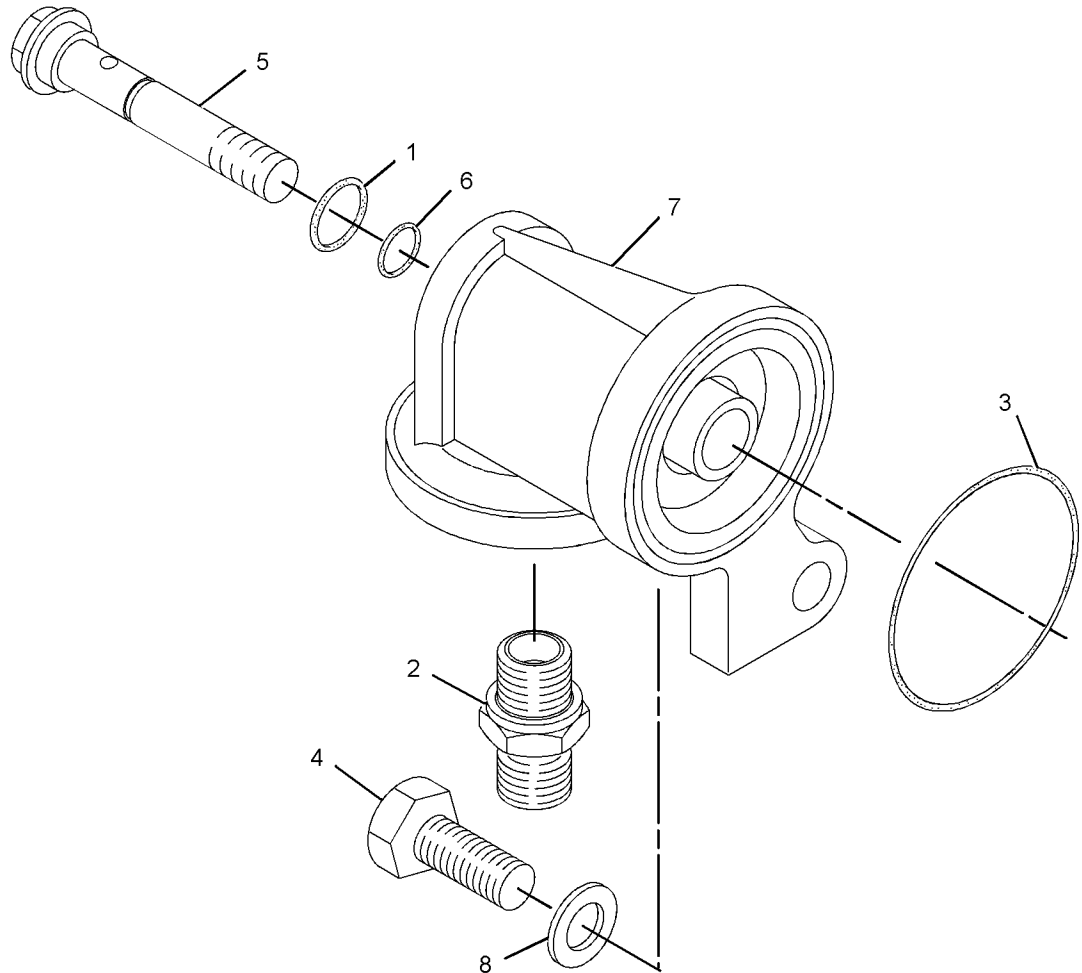
LUBRICATION SYSTEM

334-0279 FILTER GP-ENGINE OIL

SMCS-1306, 1308

i03465605

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	6I-1201	1	SEAL-O-RING						
	2	1	118-9145	1	CONNECTOR						
	3	1	164-7619	1	SEAL-O-RING						
	4	1	197-8449	1	BOLT						
	5	1	231-8920	1	BOLT						
	6	1	252-0787	1	SEAL-O-RING						
	7	1	334-0273	1	HEAD-OIL FILTER						
	8	1	334-0275	1	WASHER						



GRAPHIC #1

<END>

g01972156

LUBRICATION SYSTEM

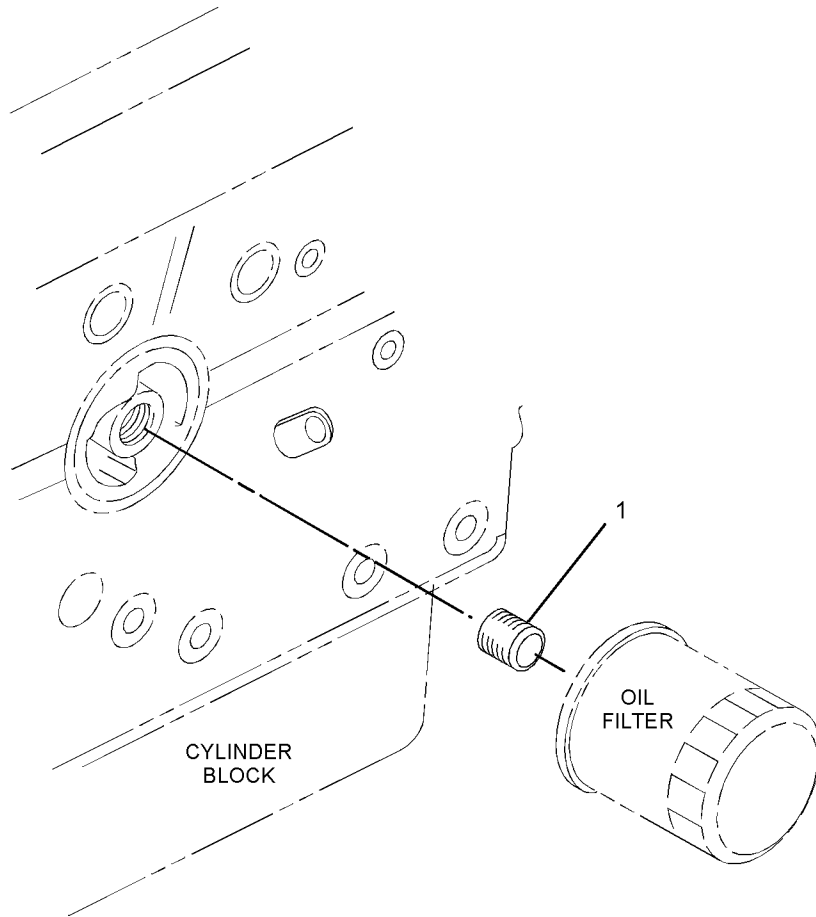
308-4735 MOUNTING GP-ENGINE OIL FILTER

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1306, 1308

i02786451

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6879	1	STUD-HOLLOW						



GRAPHIC #1

<END>

g01355707

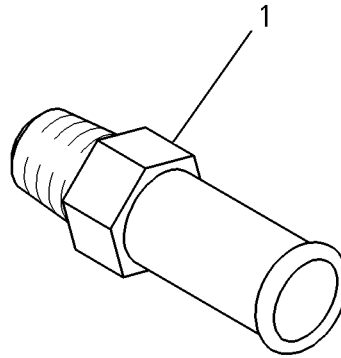
COOLING SYSTEM

317-7194 CONNECTOR GP-CAB HEATER LINES

SMCS-1380

i02853759

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	205-1133	2	CONNECTOR						



GRAPHIC #1

<END>

g00785852

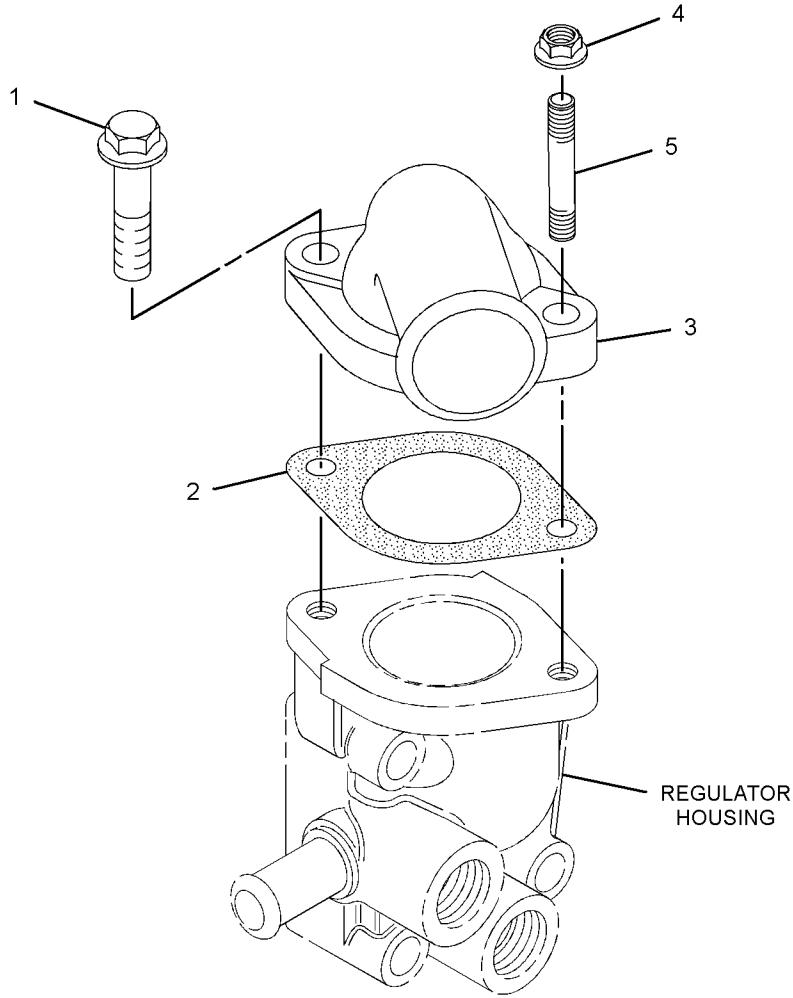
COOLING SYSTEM

328-1434 COVER GP-REGULATOR HOUSING

SMCS-1393

i05006662

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-7640	1	BOLT						
	2	1	231-7858	1	GASKET - COVER						
	3	1	267-0022	1	COVER - HOUSING						
	4	1	153-5960	1	NUT						
	5	1	153-5407	1	STUD						



GRAPHIC #1

<END>

g03185458

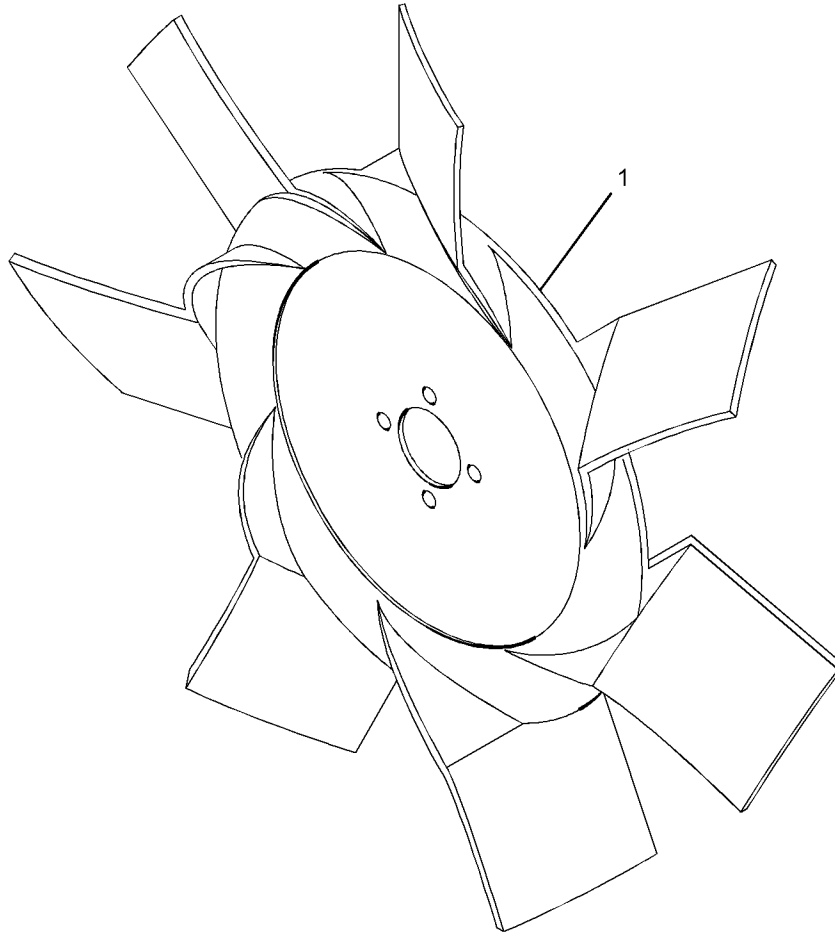
COOLING SYSTEM

329-4422 FAN GP

SMCS-1356

i03566144

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	328-6606	1	FAN (7-BLADE)						



GRAPHIC #1

<END>

g01884854

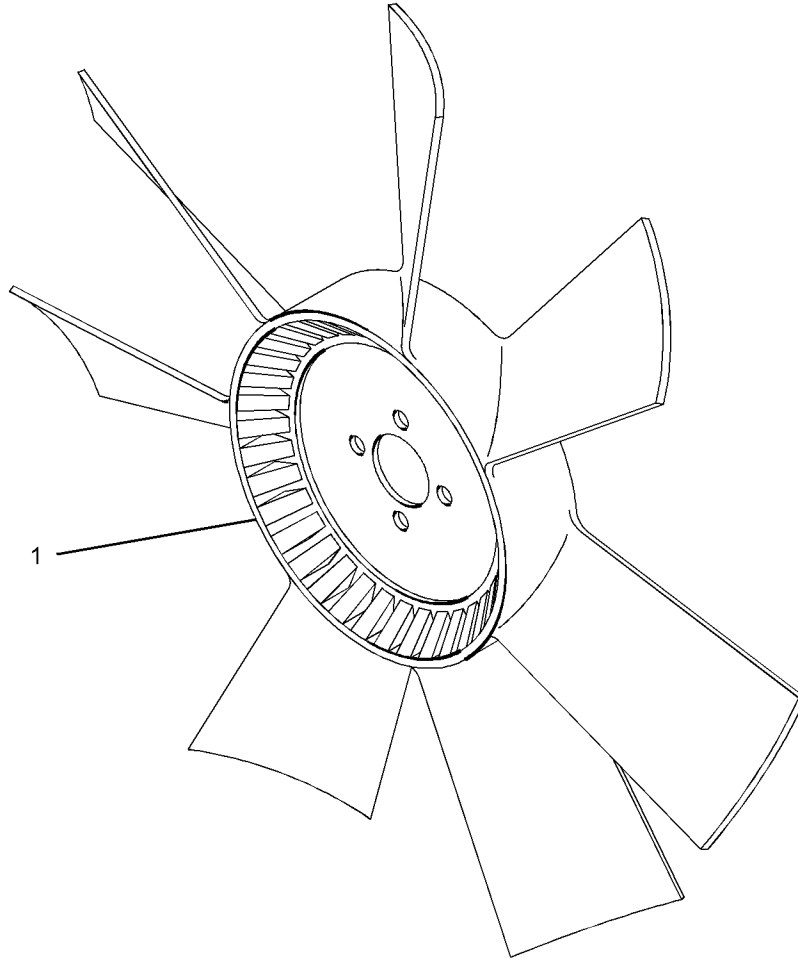
COOLING SYSTEM

313-1981 FAN GP-SUCTION

SMCS-1356

i02959148

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	183-3539	1	FAN-SUCTION						



GRAPHIC #1

<END>

g01387103

COOLING SYSTEM

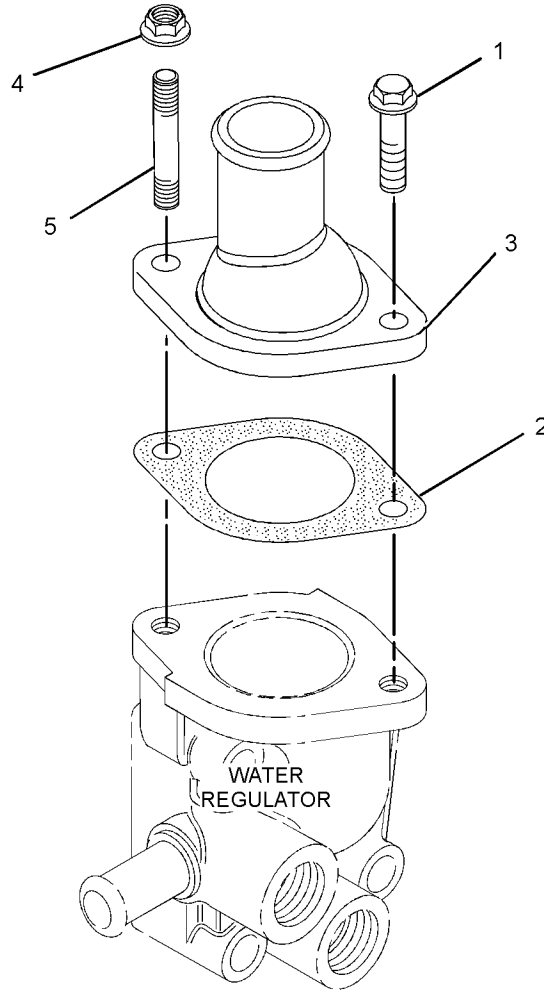
313-1980 HOUSING GP-WATER REGULATOR

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1393

i04003830

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-7640	1	BOLT						
	2	1	231-7858	1	GASKET-COVER (TEMPERATURE REGULATOR)						
	3	1	311-5851	1	HOUSING-WATER REGULATOR						
	4	1	153-5960	1	NUT						
	5	1	153-5407	1	STUD						



GRAPHIC #1

<END>

g02207174

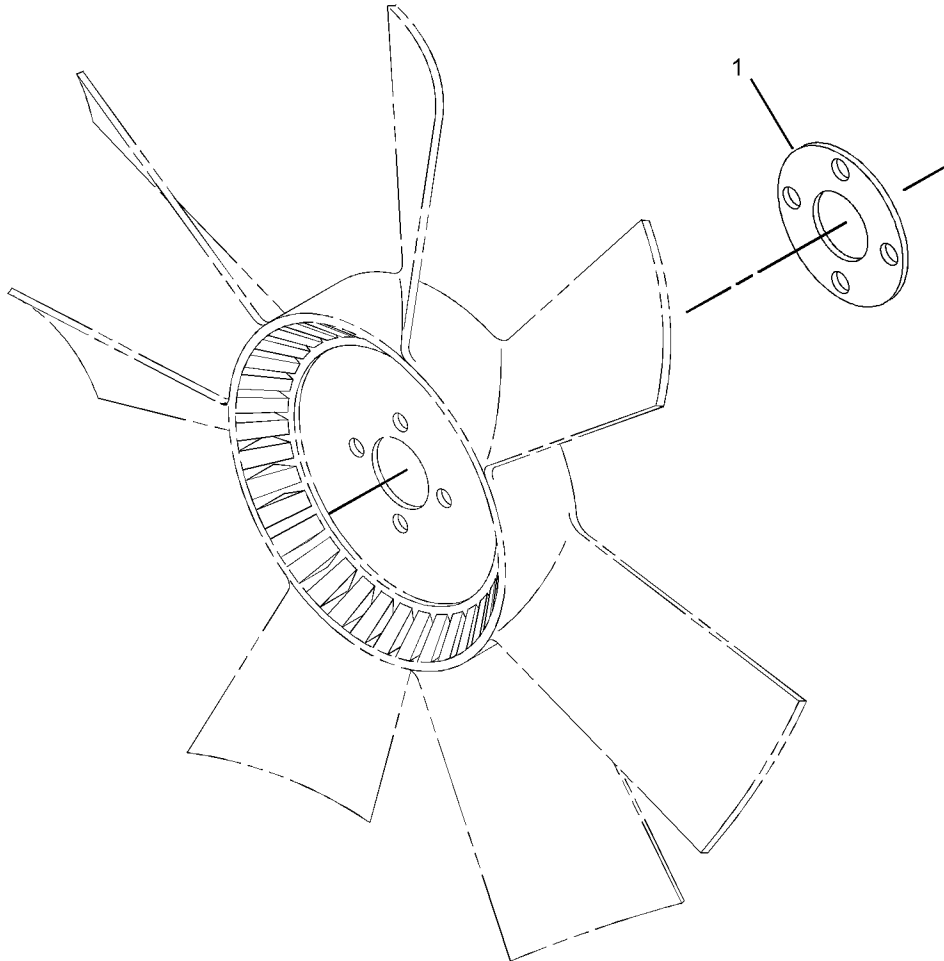
COOLING SYSTEM

322-3806 MOUNTING GP-FAN

SMCS-1356

i02908388

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-7639	1	PLATE						



GRAPHIC #1

<END>

g01516026

COOLING SYSTEM

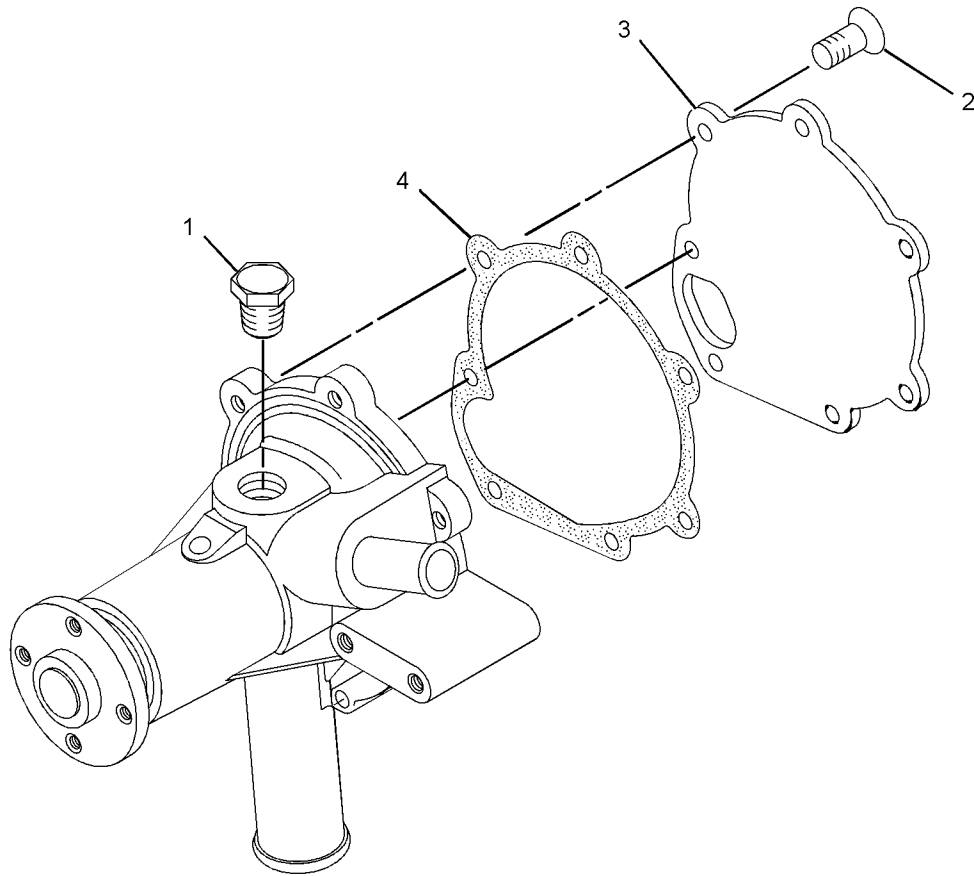
231-7854 PUMP GP-WATER

PART OF 313-1978 PUMP GP-WATER

SMCS-1361

i02755822

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	154-1817	1	PLUG						
	2	1	154-1820	3	BOLT						
	3	1	292-1994	1	PLATE						
	4	1	292-1995	1	GASKET						



GRAPHIC #1

<END>

g01370196

COOLING SYSTEM

313-1978 PUMP GP-WATER

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1651 ENGINE AR
TYPE 1

SMCS-1361

i03137725

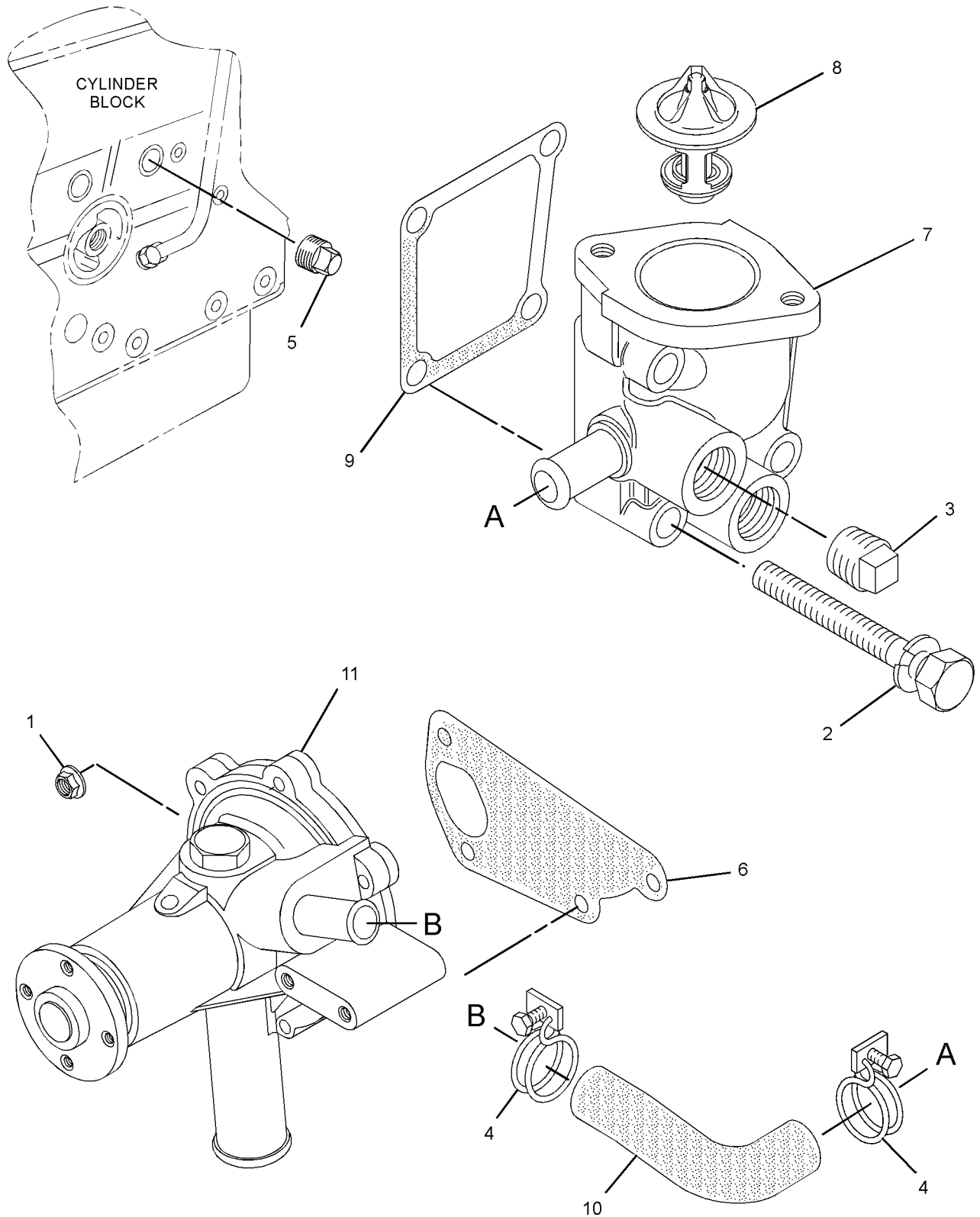
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5960	1	NUT						
	2	1	153-5962	4	BOLT						
	3	1	154-1817	2	PLUG						
	4	1	154-1824	2	CLAMP-HOSE						
	5	1	154-1831	1	PLUG						
	6	1	231-7853	1	GASKET-WATER PUMP						
	7	1	231-7857	1	HOUSING-REGULATOR						
	8	1	231-7859	1	REGULATOR-WATER TEMPERATURE						
	9	1	231-7861	1	GASKET						
	10	1	267-0328	1	HOSE						
Y	11	1	231-7854	1	PUMP GP-WATER						115

Y - SEPARATE ILLUSTRATION

COOLING SYSTEM

313-1978 PUMP GP-WATER (contd.)

i03137725



GRAPHIC #1

<END>

g01849133

COOLING SYSTEM

313-1978 PUMP GP-WATER

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR
TYPE 2

SMCS-1361

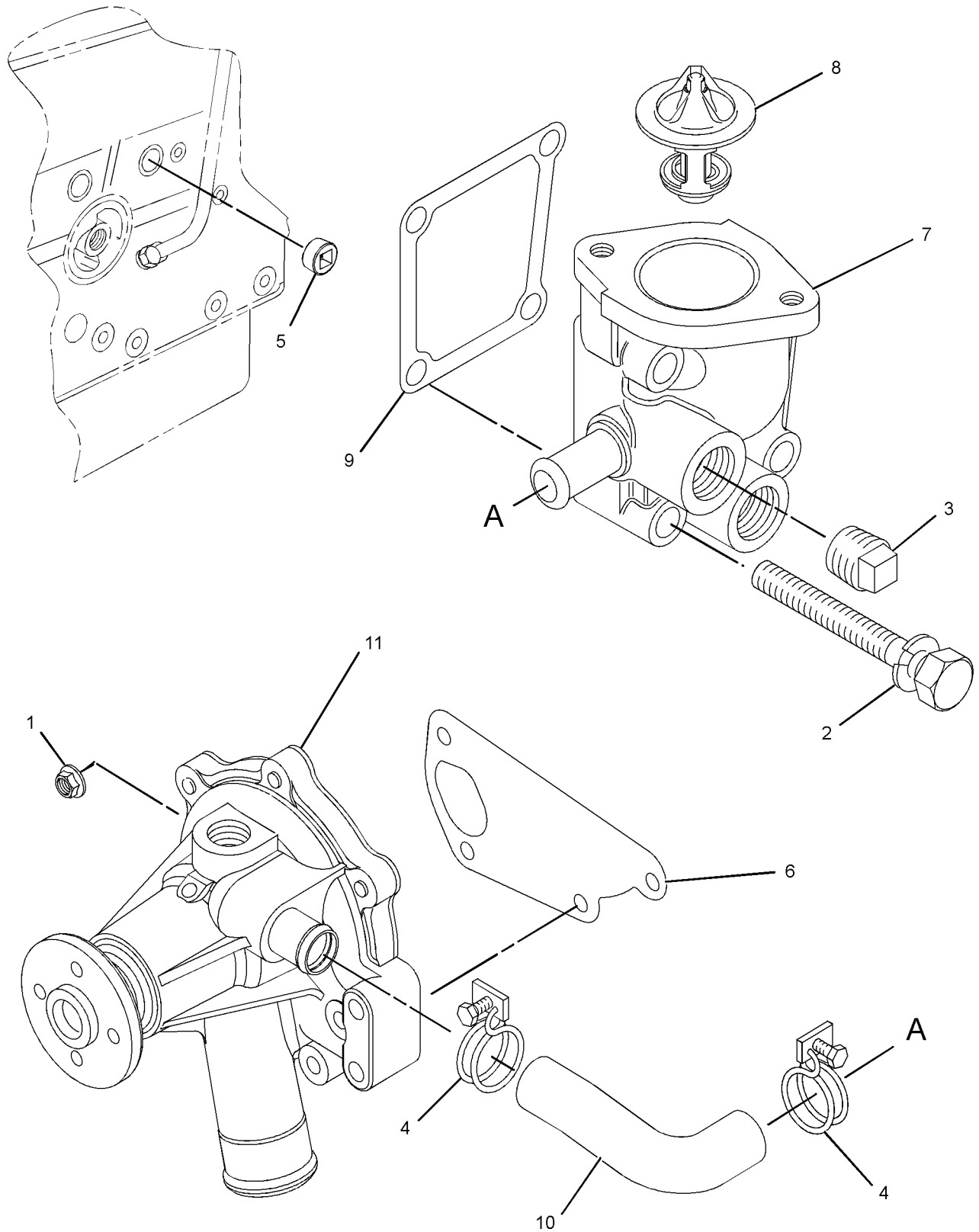
i05574414

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5960	1	NUT						
	2	1	153-5962	4	BOLT						
	3	1	154-1817	2	PLUG						
	4	1	154-1824	2	CLAMP-HOSE						
	5	1	439-4993	1	PLUG						
	6	1	231-7853	1	GASKET-WATER PUMP						
	7	1	231-7857	1	HOUSING-REGULATOR						
	8	1	231-7859	1	REGULATOR-WATER TEMPERATURE						
	9	1	231-7861	1	GASKET						
	10	1	267-0328	1	HOSE						
	11	1	371-0184	1	PUMP-WATER						

COOLING SYSTEM

313-1978 PUMP GP-WATER (contd.)

i05574414



GRAPHIC #1

<END>

g03541561

COOLING SYSTEM

318-8815 RADIATOR & FAN GP

SMCS-1353, 1356

i05166435

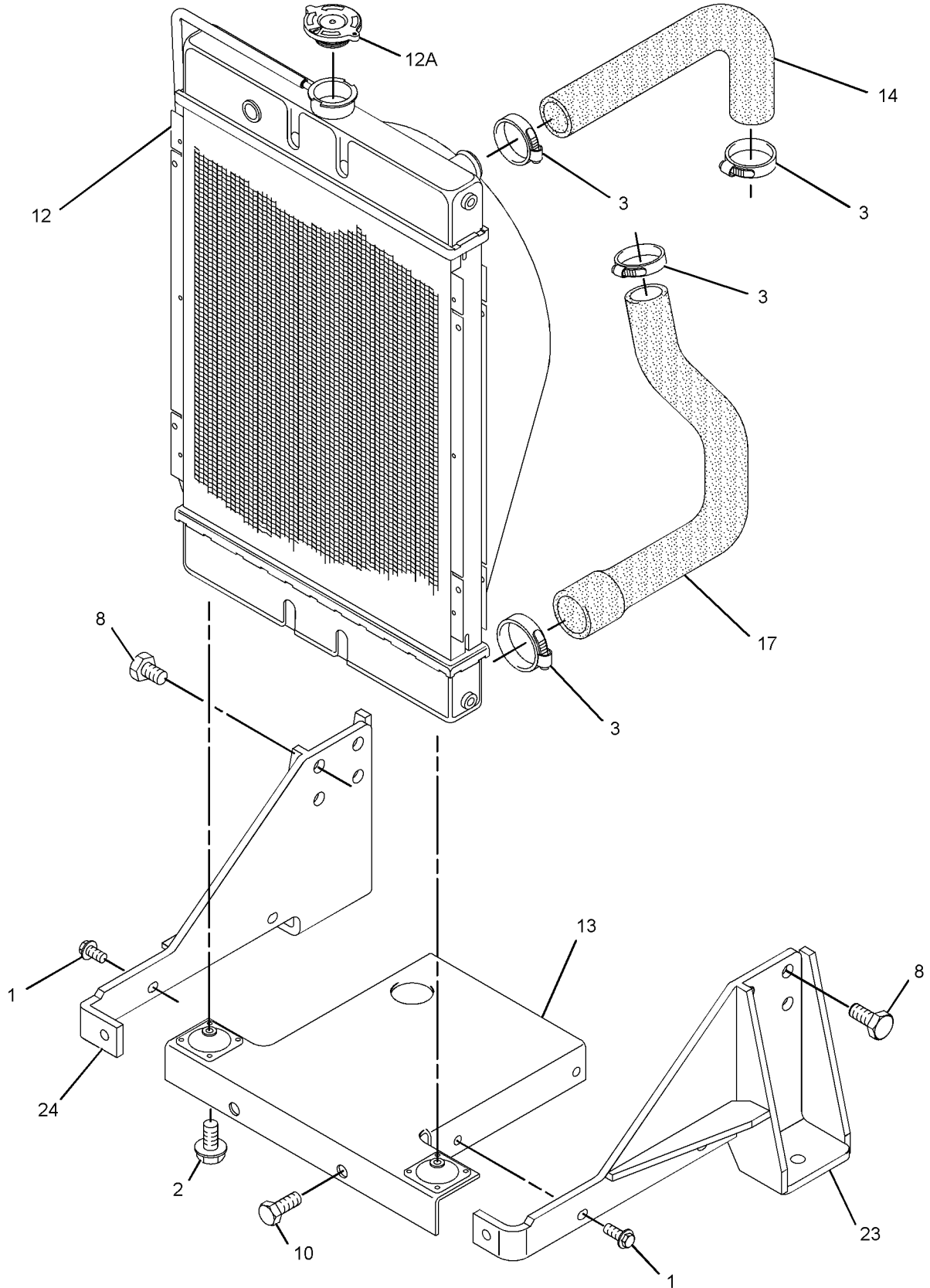
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	6I-0217	4	BOLT (M8X1.25X20-MM)						
	2	1	6I-0917	2	BOLT (M6X1X25-MM)						
	3	1	9M-7958	4	CLAMP-HOSE						
M	4	2	124-3815	8	BOLT (M8X1.25X16-MM)						
	5	2	153-5592	2	NUT						
	6	3	153-5961	4	BOLT						
	7	2	180-6118	10	BOLT						
	8	1,3	197-8448	15	BOLT						
	9	2	344-5868	1	MOUNT						
M	10	1	6I-0654	2	BOLT (M10X1.5X25-MM)						
	11	3	328-6606	1	FAN						
	12	1	244-0494	1	RADIATOR AS						
	12A	1	202-6616	1	CAP-RADIATOR						
	13	1	244-0495	1	SUPPORT						
	14	1	244-0503	1	HOSE-RADIATOR (UPPER)						
	15	2	244-0509	1	GUARD						
	16	3	255-1297	1	PLATE						
	17	1	258-4520	1	HOSE-RADIATOR (LOWER)						
	18	2	366-2615	1	GUARD AS-FAN						
M	18A	2	6I-0254	3	BOLT (M8X1.25X30-MM)						
	18B	2	362-8050	3	NUT						
	19	2	325-5924	1	GUARD-FAN (RH)						
	20	2	366-2614	1	GUARD-ALTERNATOR						
	21	2	325-5932	1	BRACKET						
	22	2	334-7437	1	BRACKET						
	23	1	325-5938	1	BRACKET						
	24	1	325-5939	1	BRACKET						
	25	3	325-5940	2	BRACKET						
	26	2	244-3259	2	CLIP						

M - METRIC PART

COOLING SYSTEM

318-8815 RADIATOR & FAN GP (contd.)

i05166435



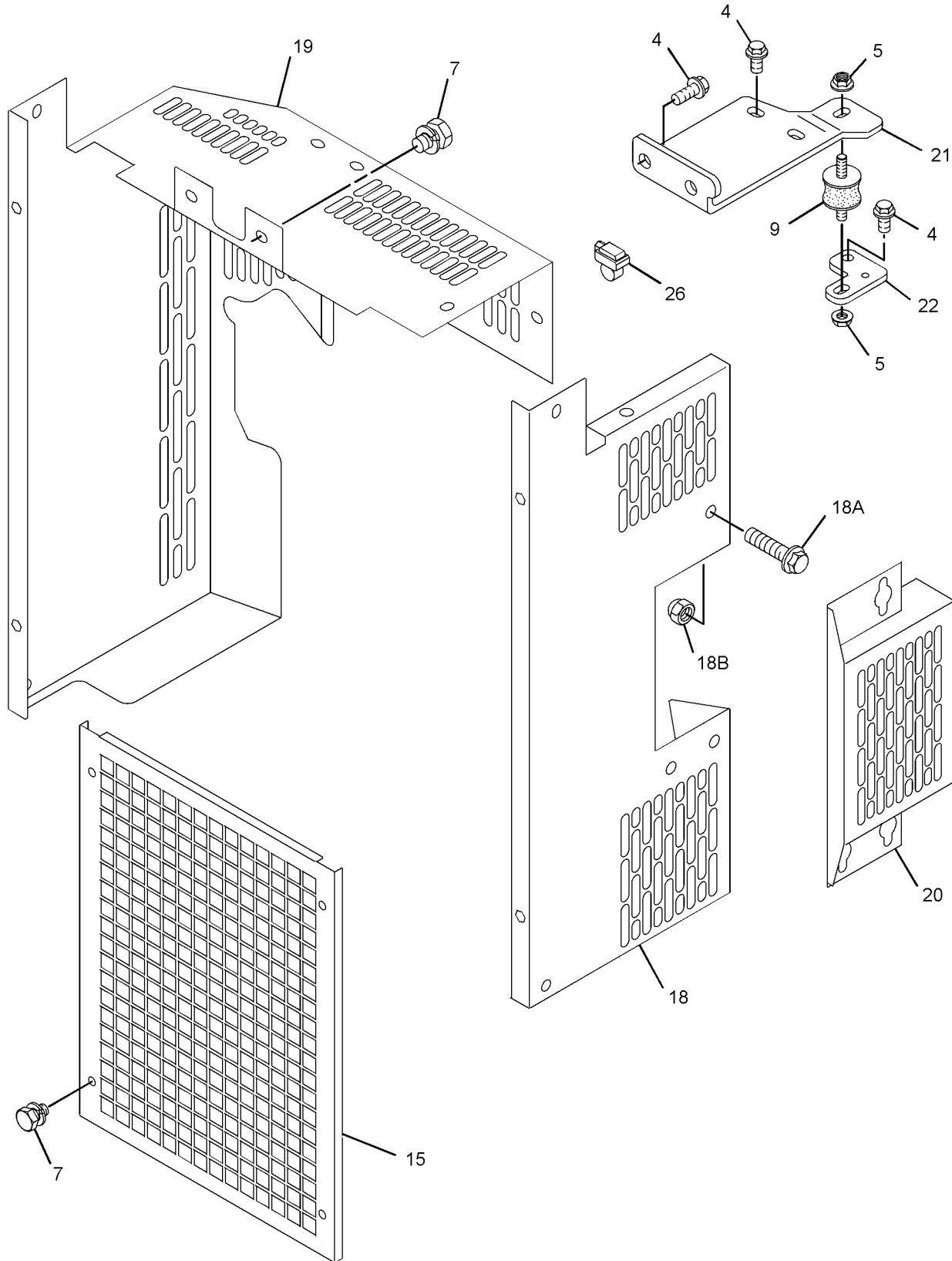
GRAPHIC #1

g01625315

COOLING SYSTEM

318-8815 RADIATOR & FAN GP (contd.)

i05166435



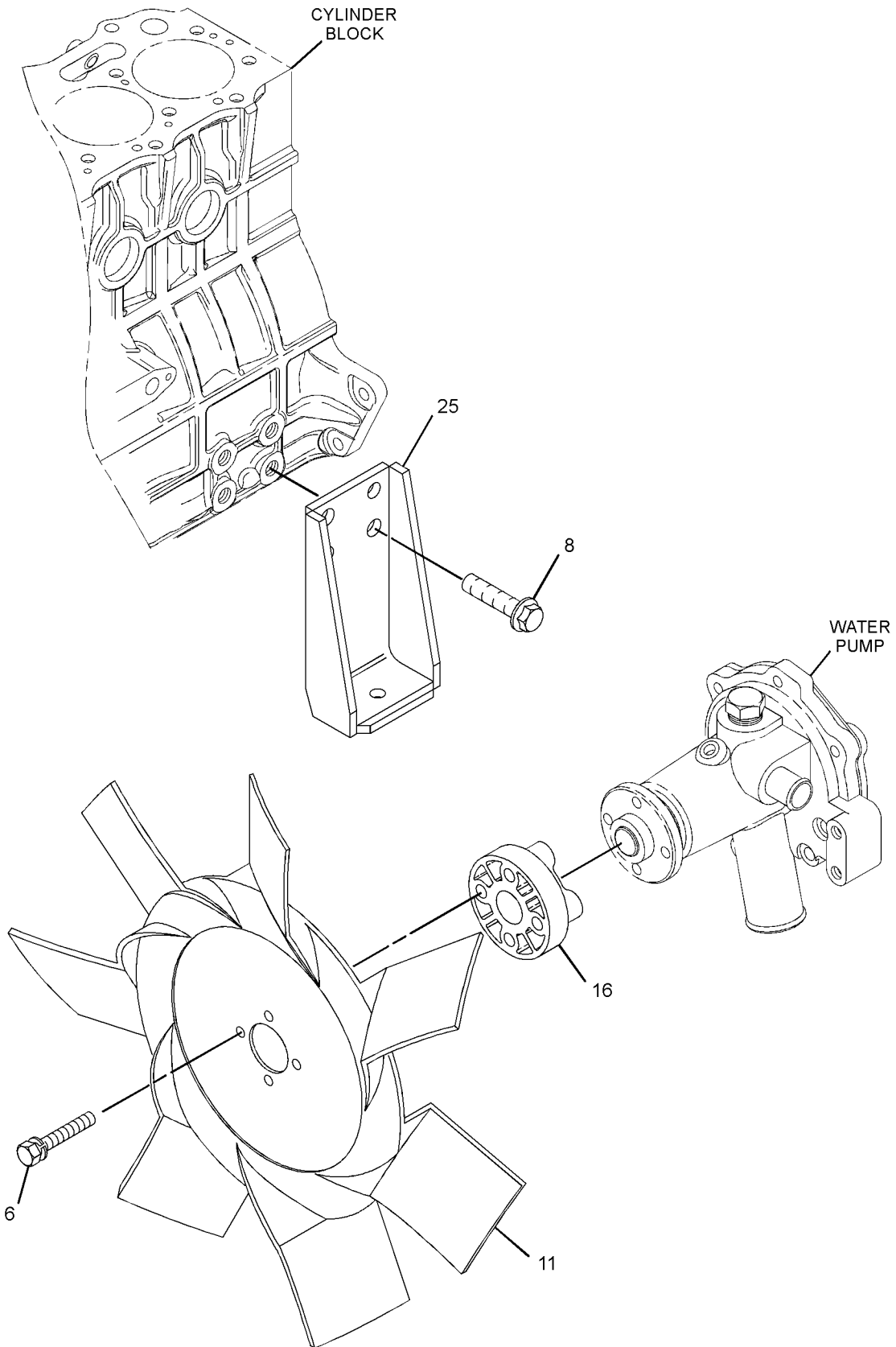
GRAPHIC #2

g02619123

COOLING SYSTEM

318-8815 RADIATOR & FAN GP (contd.)

i05166435



GRAPHIC #3

<END>

g02619124

COOLING SYSTEM

318-8803 RADIATOR GP

SMCS - 1353

i05208656

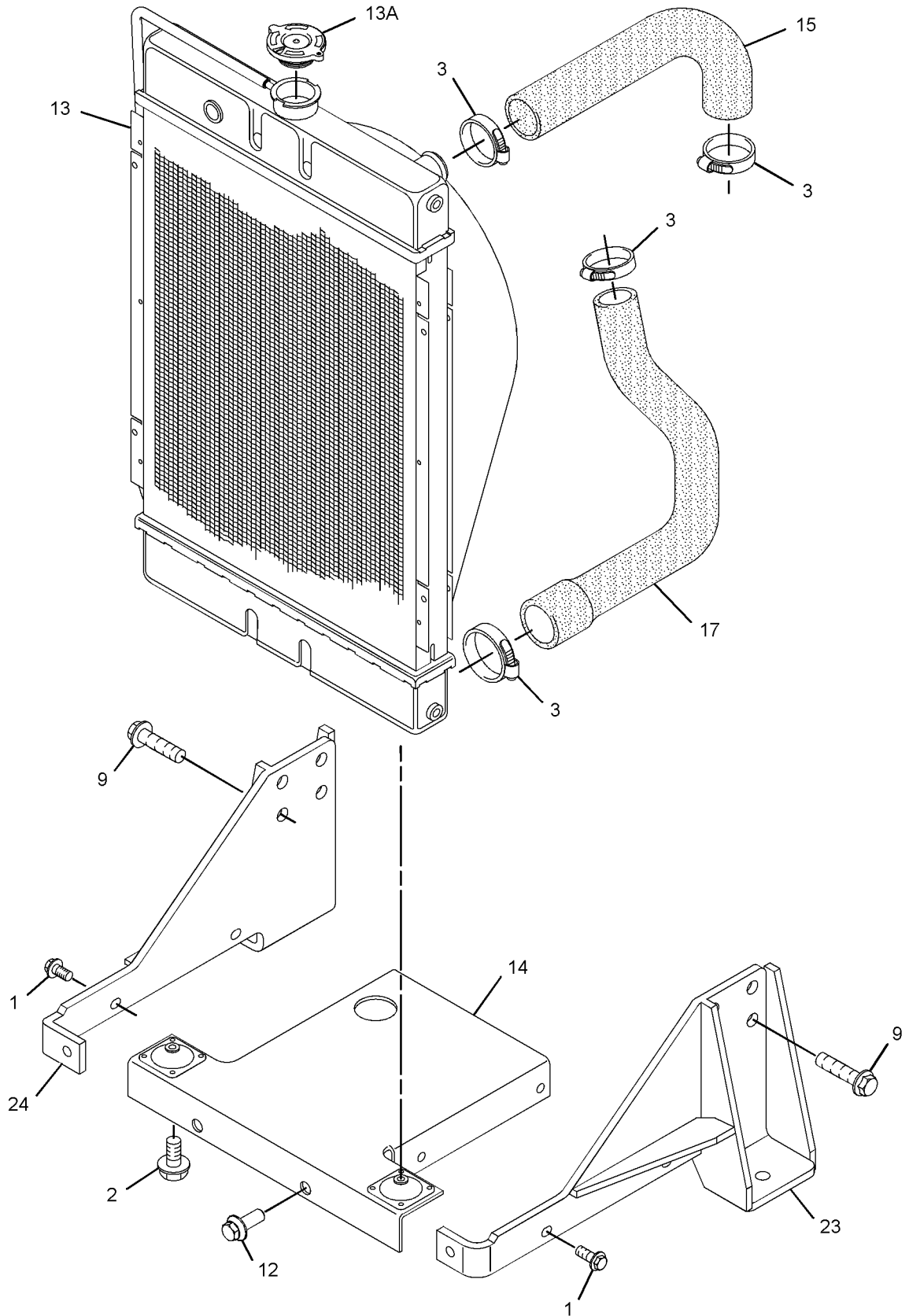
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	6I-0217	4	BOLT (M8X1.25X20-MM)						
	2	1	6I-0917	2	BOLT (M6X1X25-MM)						
	3	1	9M-7958	4	CLAMP-HOSE						
M	4	2	124-3815	8	BOLT (M8X1.25X16-MM)						
	5	2	153-5592	2	NUT						
	6	3	153-6861	4	BOLT						
	7	3	161-8260	1	PLATE						
	8	2	180-6118	10	BOLT						
	9	1,3	197-8448	15	BOLT						
	10	2	344-5868	1	MOUNT						
	11	3	238-0128	1	FAN-BLOWER						
M	12	1	6I-0654	2	BOLT (M10X1.5X25-MM)						
	13	1	244-0494	1	RADIATOR AS						
	13A	1	202-6616	1	CAP-RADIATOR						
	14	1	244-0495	1	SUPPORT						
	15	1	244-0503	1	HOSE-RADIATOR (UPPER)						
	16	2	244-0509	1	GUARD						
	17	1	258-4520	1	HOSE-RADIATOR (LOWER)						
	18	2	366-2615	1	GUARD AS-FAN (LH)						
M	18A	2	6I-0254	3	BOLT (M8X1.25X30-MM)						
	18B	2	362-8050	3	NUT						
	19	2	366-2614	1	GUARD-ALTERNATOR (RH)						
	20	2	325-5924	1	GUARD-FAN						
	21	2	325-5932	1	BRACKET						
	22	2	334-7437	1	BRACKET						
	23	1	325-5938	1	BRACKET						
	24	1	325-5939	1	BRACKET						
	25	3	325-5940	2	BRACKET						
	26	2	244-3259	2	CLIP						

M - METRIC PART

COOLING SYSTEM

318-8803 RADIATOR GP (contd.)

i05208656



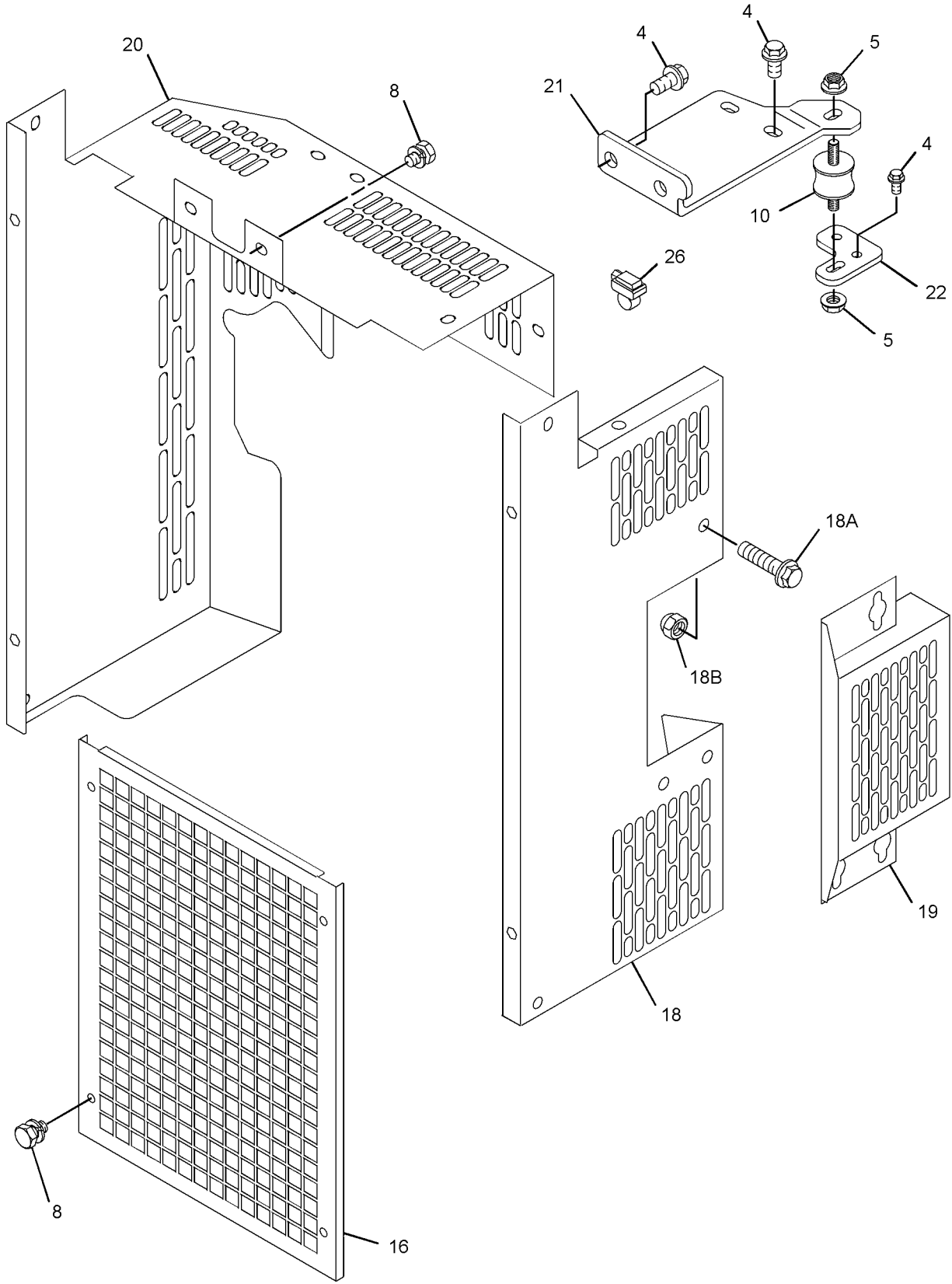
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g03213797

COOLING SYSTEM

318-8803 RADIATOR GP (contd.)

i05208656



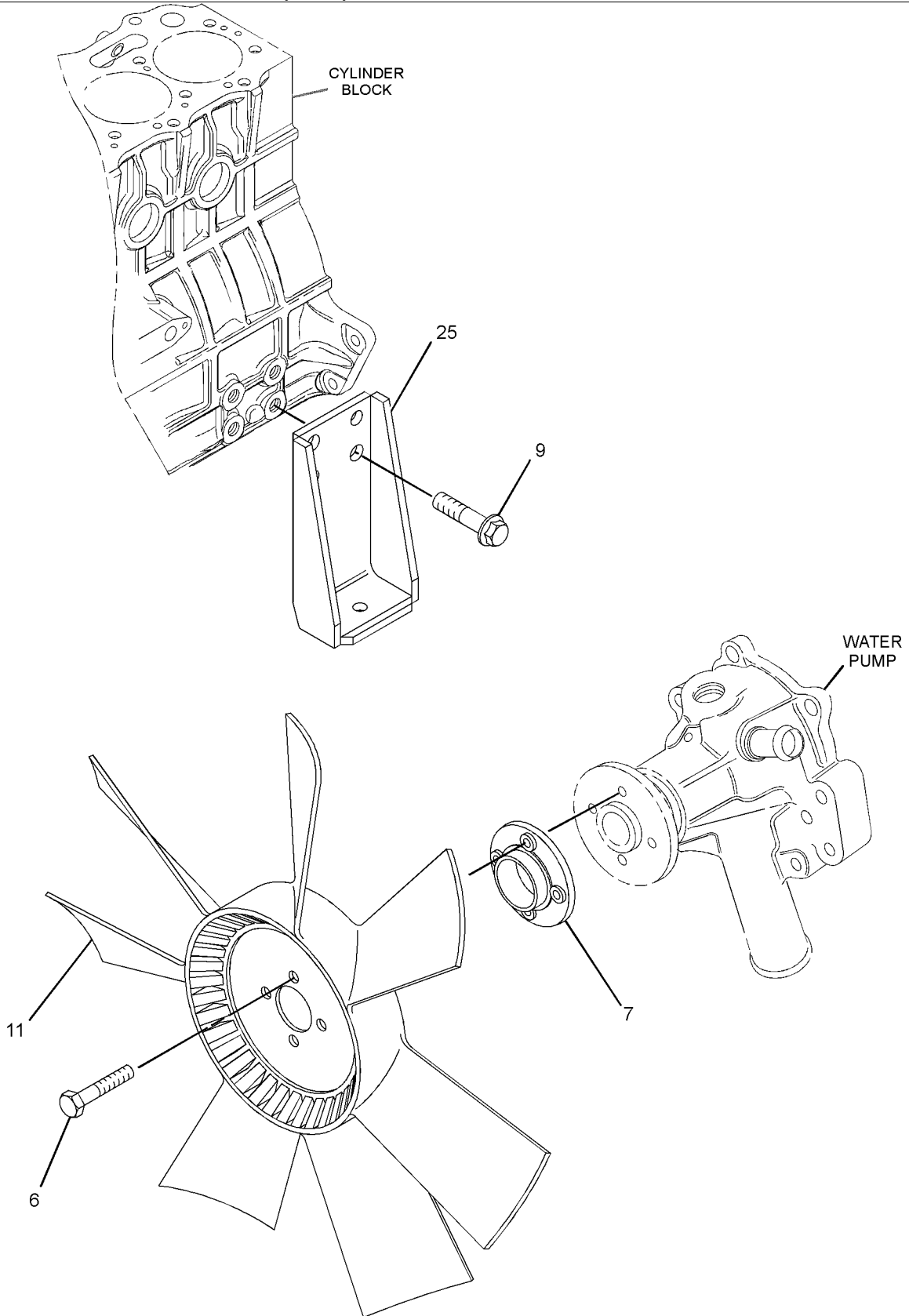
GRAPHIC #2

g03338921

COOLING SYSTEM

318-8803 RADIATOR GP (contd.)

i05208656



GRAPHIC #3

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g01761596

COOLING SYSTEM

369-8737 RADIATOR GP

SMCS-1353

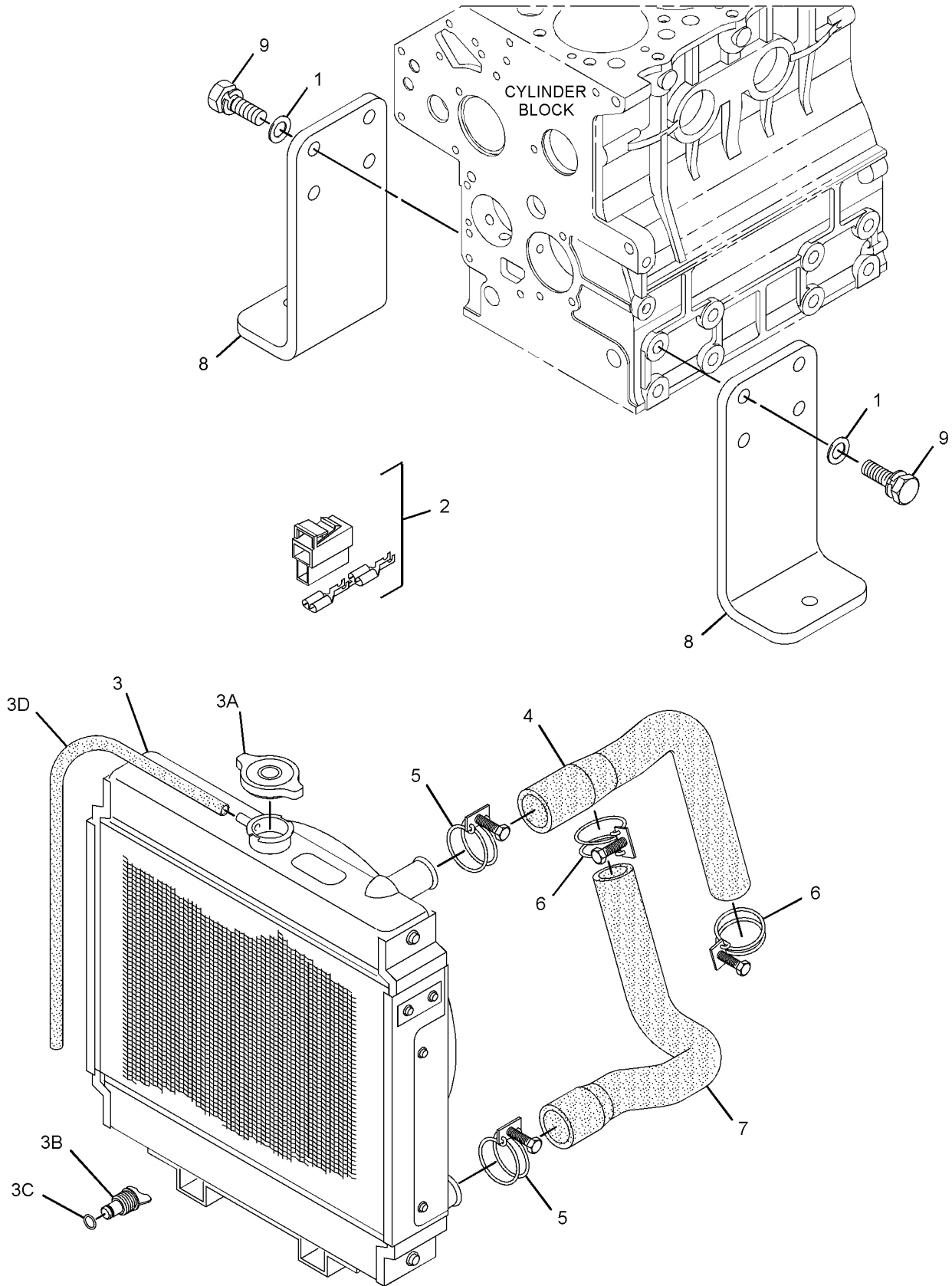
i04553398

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	155-8084	8	WASHER						
	2	1	183-4037	1	CONNECTOR AS						
	3	1	365-1621	1	RADIATOR AS						
	3A	1	365-1622	1	CAP-RADIATOR						
	3B	1	365-1623	1	TAP						
	3C	1	365-1624	1	SEAL-O-RING						
	3D	1	365-1625	1	HOSE-RADIATOR						
	4	1	365-1626	1	HOSE						
	5	1	365-1627	2	CLIP-HOSE						
	6	1	365-1628	2	CLIP-HOSE						
	7	1	365-1629	1	HOSE						
	8	1	367-6749	2	MOUNTING						
	9	1	367-6750	8	BOLT						

COOLING SYSTEM

369-8737 RADIATOR GP (contd.)

i04553398



GRAPHIC #1

<END>

g02729294

COOLING SYSTEM

369-9326 RADIATOR GP

SMCS - 1353

i05051950

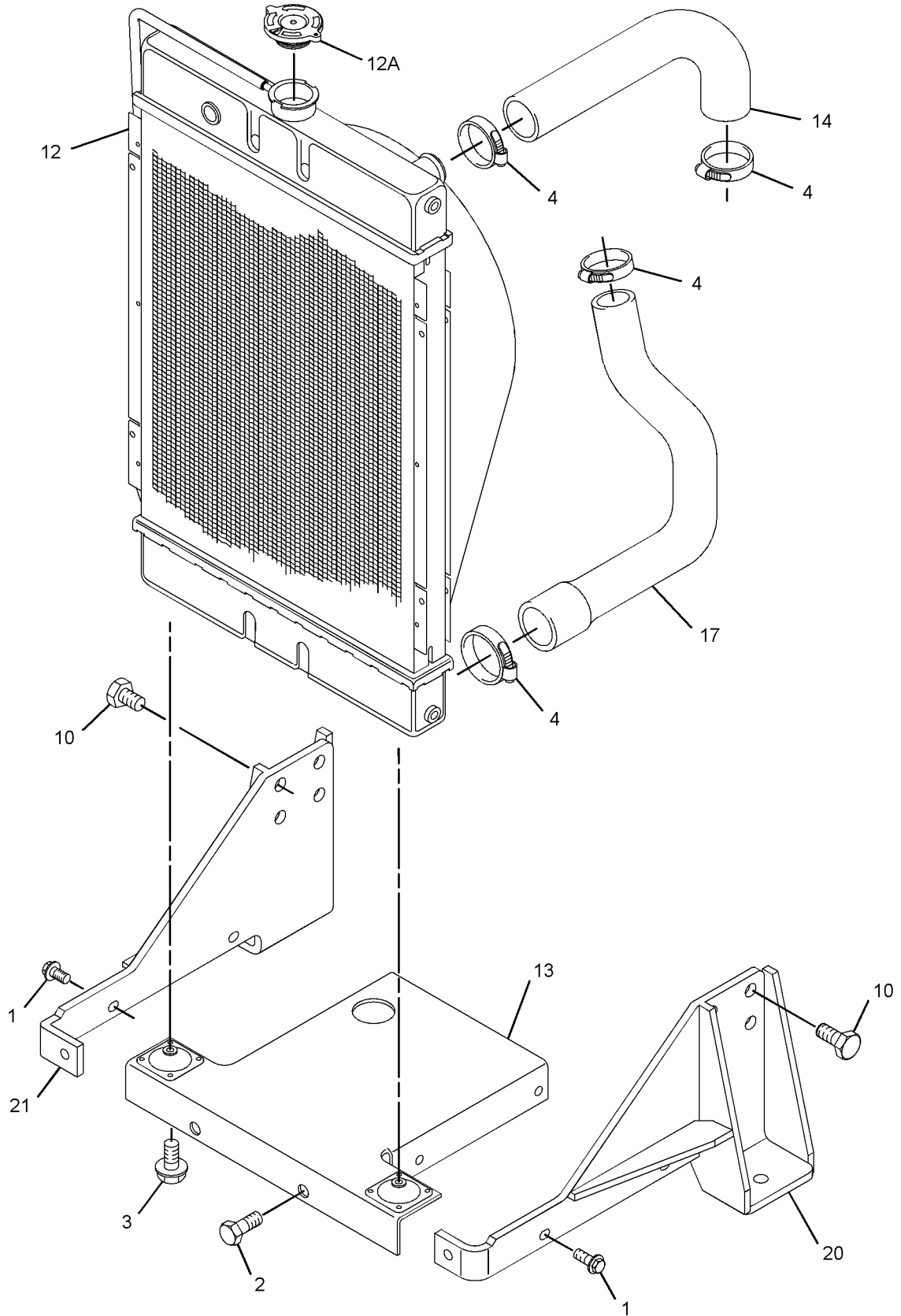
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	6I-0217	6	BOLT (M8X1.25X20-MM)						
M	2	1	6I-0654	2	BOLT (M10X1.5X25-MM)						
	3	1	6I-0917	2	BOLT (M6X1X25-MM)						
	4	1	9M-7958	2	CLAMP-HOSE						
M	5	2	124-3815	4	BOLT (M8X1.25X16-MM)						
	6	2	153-5592	2	NUT						
	7	3	153-6861	4	BOLT						
	8	3	161-8260	1	PLATE						
	9	2	180-6118	10	BOLT						
	10	1	197-8448	8	BOLT						
	11	3	238-0128	1	FAN-BLOWER						
	12	1	244-0494	1	RADIATOR AS						
	12A	1	202-6616	1	CAP-RADIATOR						
	13	1	244-0495	1	SUPPORT						
	14	1	244-0503	1	HOSE-RADIATOR						
	15	2	244-0509	1	GUARD						
	16	2	244-3259	1	CLIP						
	17	1	258-4520	1	HOSE-RADIATOR						
	18	2	325-5924	1	GUARD-FAN						
	19	2	325-5932	1	BRACKET						
	20	1	325-5938	1	BRACKET						
	21	1	325-5939	1	BRACKET						
	22	2	334-7437	1	BRACKET						
	23	2	344-5868	1	MOUNT						
	25	2	366-2614	1	GUARD-ALTERNATOR						
	26	2	366-2615	1	GUARD AS-FAN						
M	26A	2	6I-0254	3	BOLT (M8X1.25X30-MM)						
	26B	2	362-8050	3	NUT						

M - METRIC PART

COOLING SYSTEM

369-9326 RADIATOR GP (contd.)

i05051950



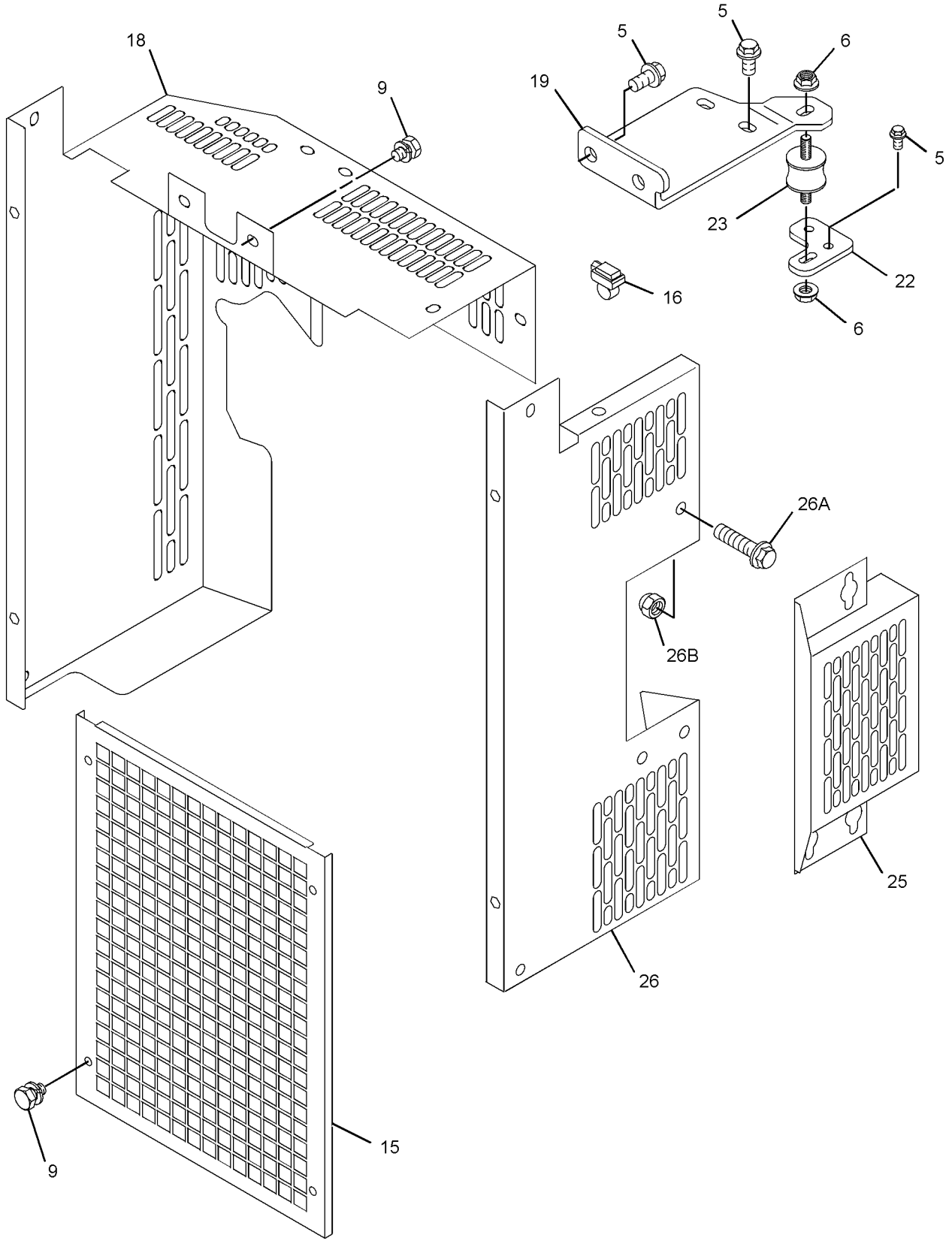
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g03334849

COOLING SYSTEM

369-9326 RADIATOR GP (contd.)

i05051950



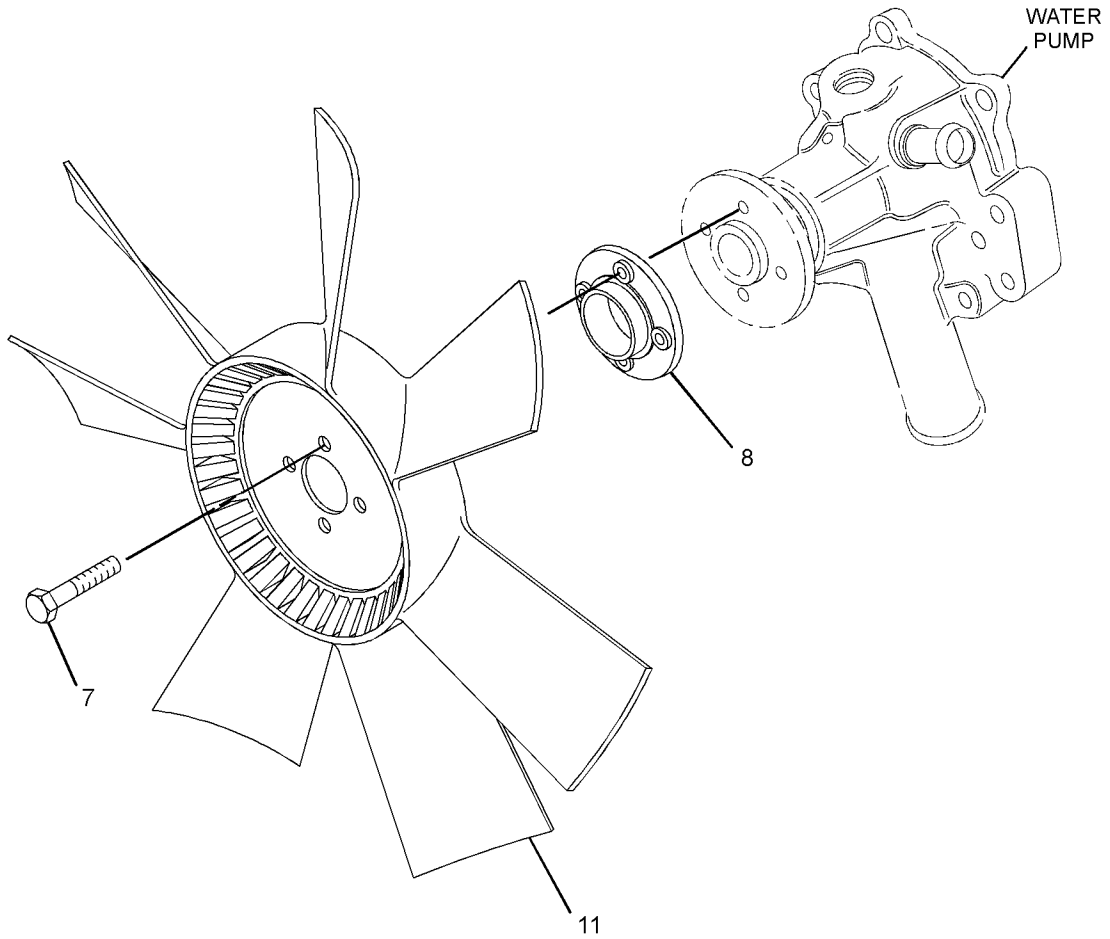
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g03334851

COOLING SYSTEM

369-9326 RADIATOR GP (contd.)

i05051950



GRAPHIC #3

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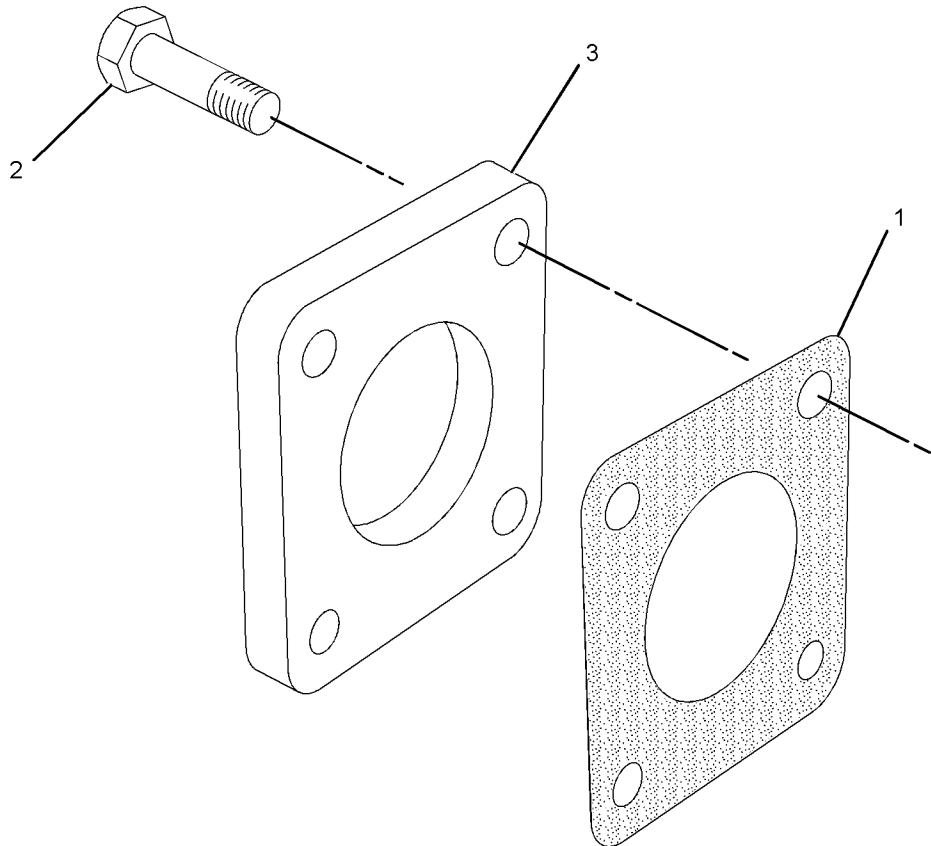
AIR INLET AND EXHAUST SYSTEM

308-2309 CONNECTION GP-EXHAUST

SMCS-1061

i05815375

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-7920	2	GASKET						
	2	1	168-9001	8	BOLT						
	3	1	366-3065	2	FLANGE						



GRAPHIC #1

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g01388832

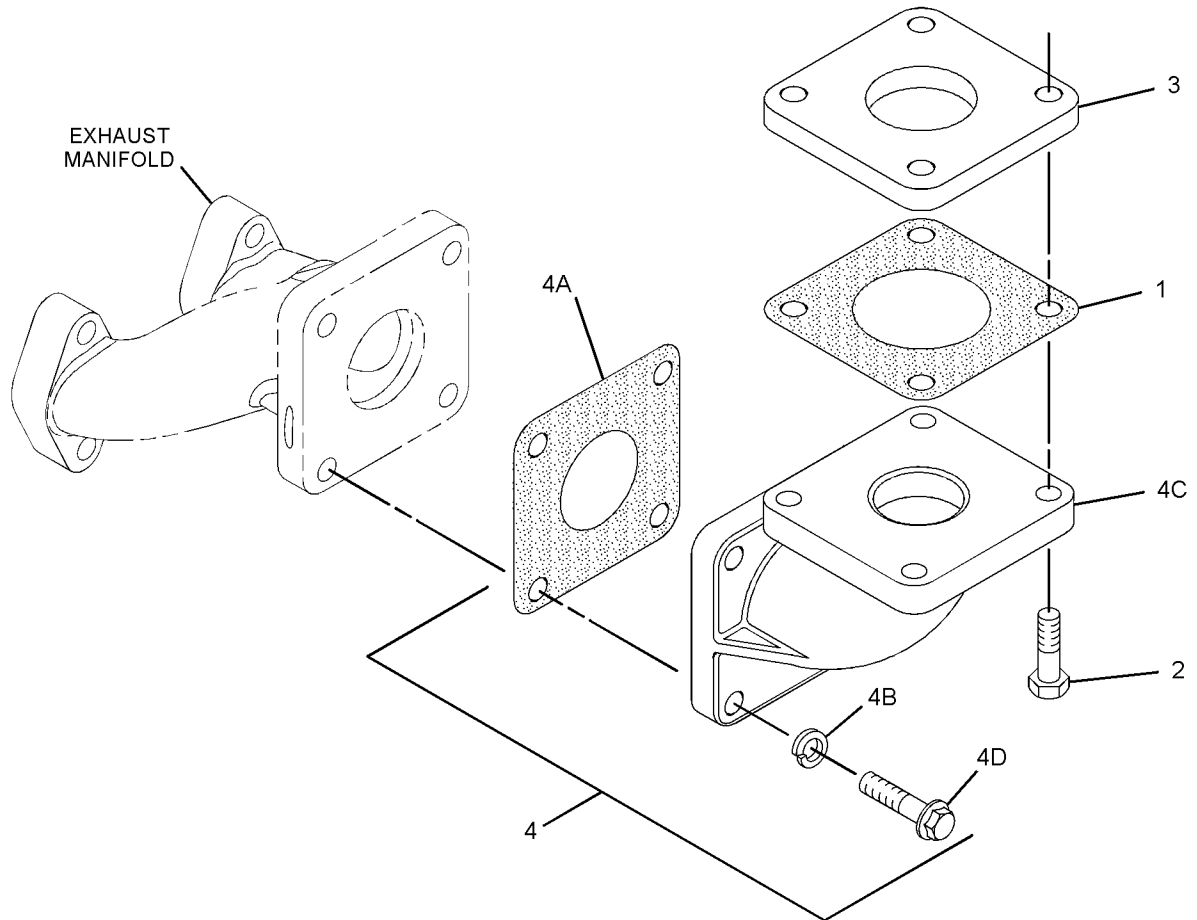
AIR INLET AND EXHAUST SYSTEM

308-5610 CONNECTION GP-EXHAUST

SMCS-1061

i04490212

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-7920	1	GASKET						
	2	1	168-9001	1	BOLT						
	3	1	366-3065	1	FLANGE						
	4	1	252-8372	1	ELBOW AS-EXHAUST						
	4A	1	153-7920	1	GASKET						
	4B	1	163-5372	4	WASHER (8X15.4X4-MM THK)						
	4C	1	191-0563	1	ELBOW-EXHAUST						
	4D	1	183-4335	4	BOLT						



GRAPHIC #1

<END>

g01358328

AIR INLET AND EXHAUST SYSTEM

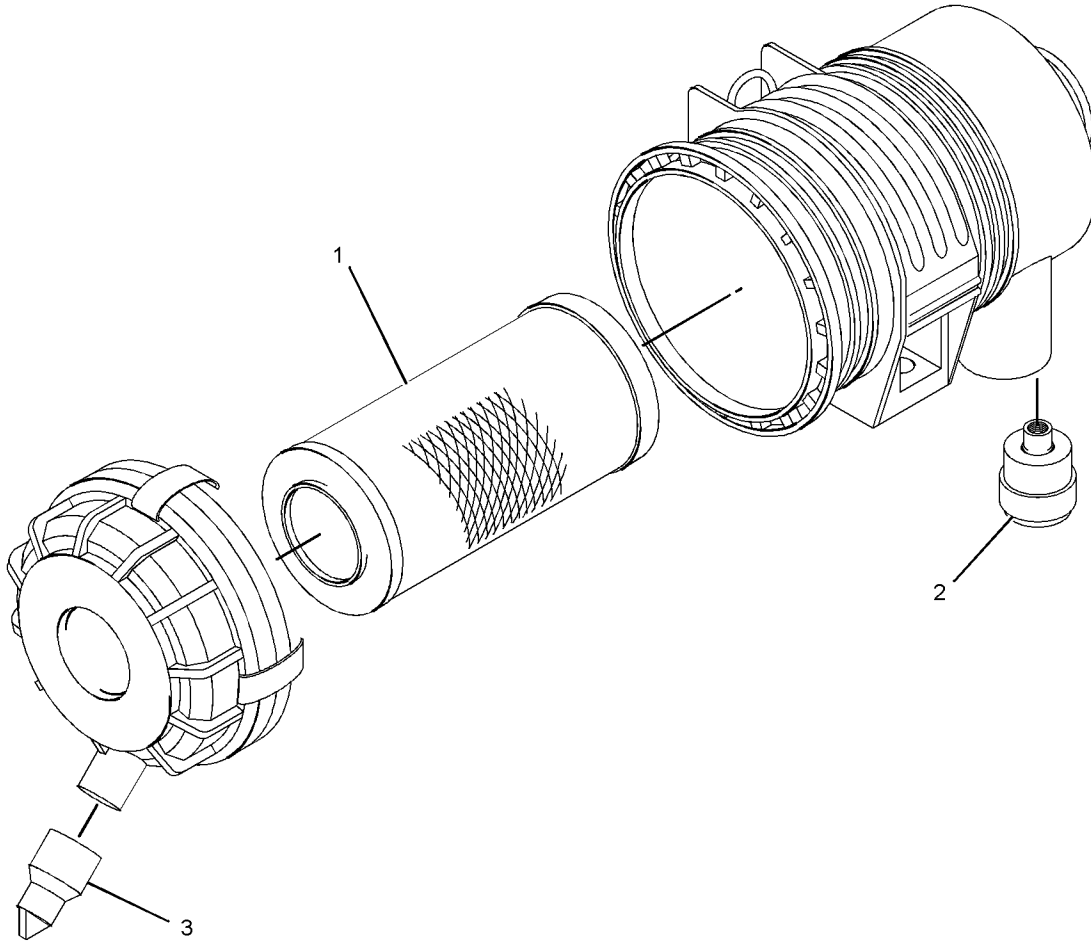
244-0514 FILTER ELEMENT AS-AIR

PART OF 318-8804 FILTER GP-AIR

SMCS - 1054

i02728068

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	246-5011	1	FILTER ELEMENT-AIR						
	2	1	271-5059	1	INDICATOR (AIR FILTER SERVICE)						
	3	1	271-5062	1	VALVE-AIR CLEANER DUST						



GRAPHIC #1

<END>

g01196605

AIR INLET AND EXHAUST SYSTEM

318-8804 FILTER GP-AIR

SMCS-1051, 1054

i03538172

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	6I-0217	2	BOLT (M8X1.25X20-MM)						
M	2	1	6I-0254	2	BOLT (M8X1.25X30-MM)						
	3	1	103-6714	2	CLIP						
	4	1	153-5592	2	NUT						
	5	1	244-0508	1	HOSE						
Y	6	1	244-0514	1	FILTER ELEMENT AS-AIR						136
	7	1	247-1376	1	BRACKET-FILTER						
	8	1	292-1992	1	SPACER						
	9	1	318-8805	1	BRACKET						
	10	1	334-7295	1	CAP-RAIN						

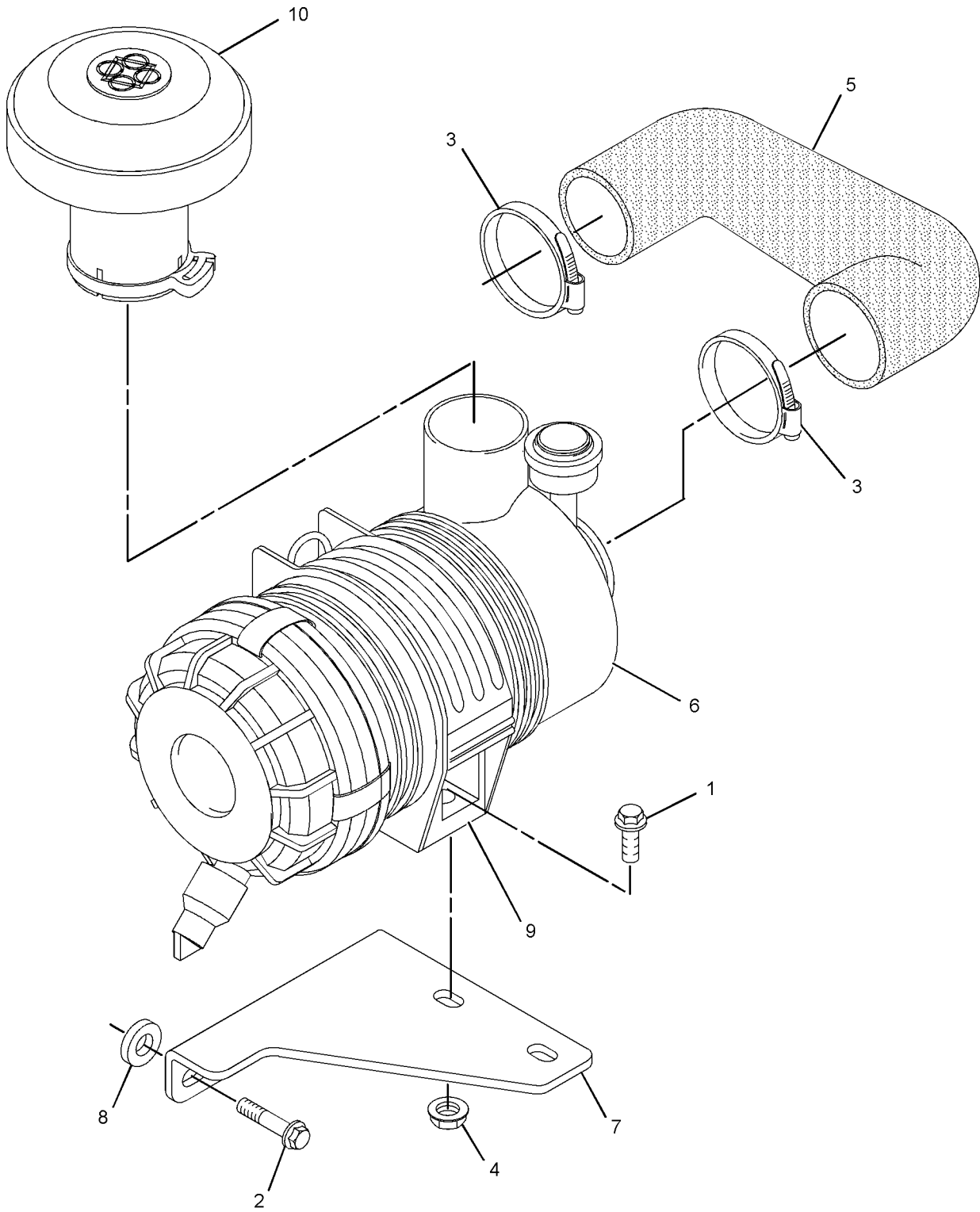
M - METRIC PART

Y - SEPARATE ILLUSTRATION

AIR INLET AND EXHAUST SYSTEM

318-8804 FILTER GP-AIR (contd.)

i03538172



GRAPHIC #1

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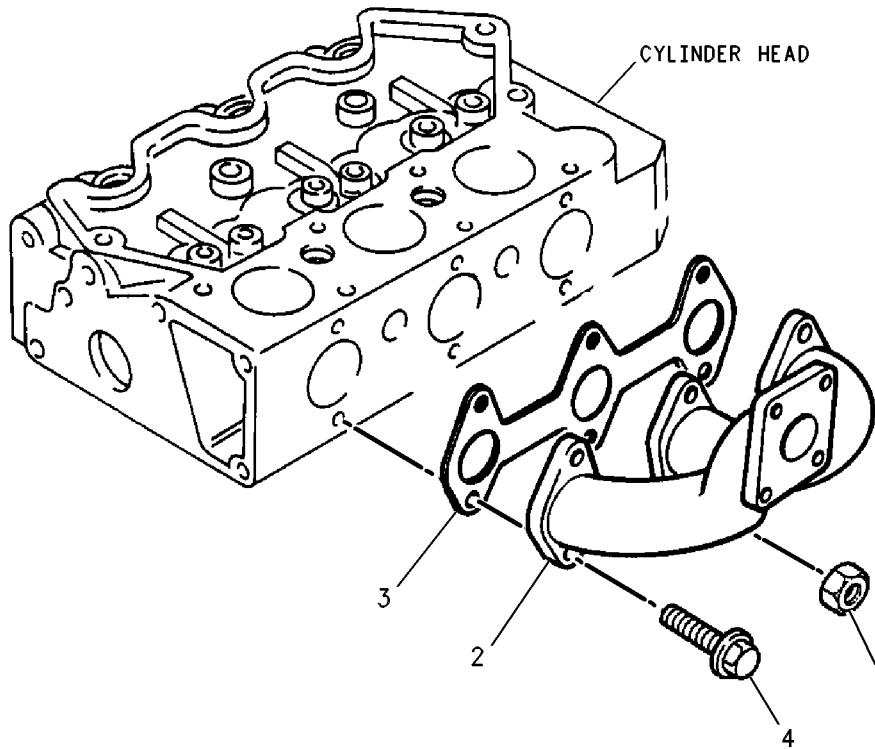
AIR INLET AND EXHAUST SYSTEM

313-1991 MANIFOLD GP-EXHAUST

SMCS-1059

i02904800

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5960	2	NUT						
	2	1	153-6859	1	MANIFOLD-EXHAUST						
	3	1	153-6860	1	GASKET						
	4	1	153-6861	4	BOLT						



GRAPHIC #1

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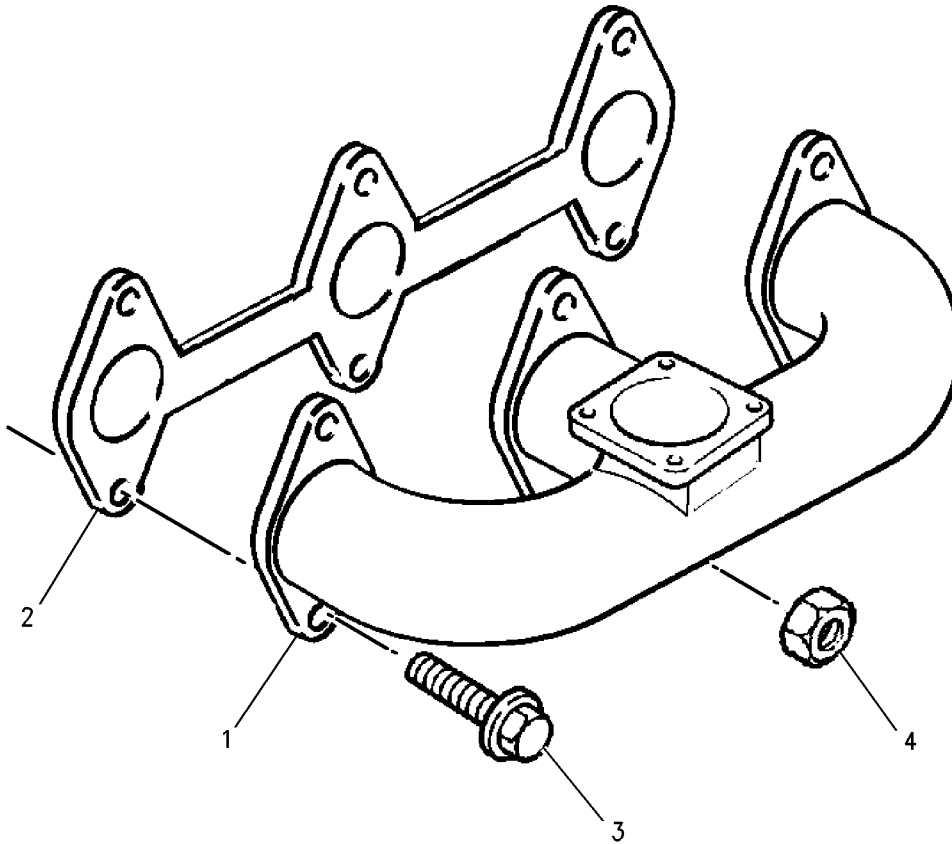
AIR INLET AND EXHAUST SYSTEM

325-5596 MANIFOLD GP-EXHAUST

SMCS-1059

i02959127

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	183-4332	1	MANIFOLD-EXHAUST						
	2	1	153-6860	1	GASKET						
	3	1	153-6861	4	BOLT						
	4	1	153-5960	2	NUT						



GRAPHIC #1

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g00688840

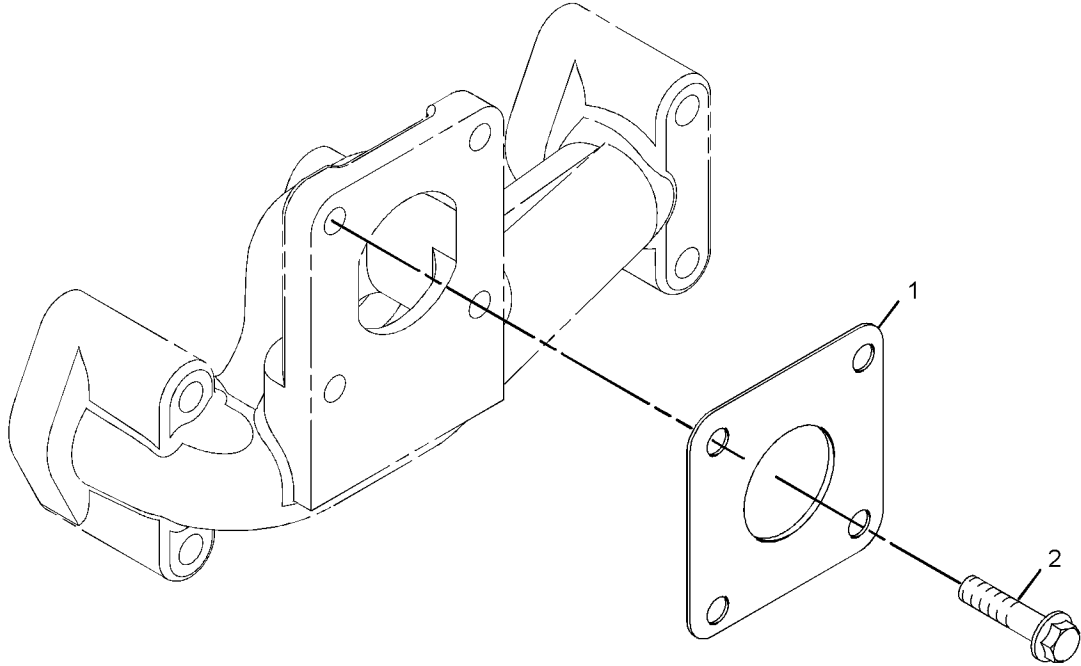
AIR INLET AND EXHAUST SYSTEM

329-4424 MANIFOLD GP-EXHAUST

SMCS-1059

i03122850

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-7920	1	GASKET						
	2	1	168-9001	1	BOLT						



GRAPHIC #1

<END>

g01959165

FUEL SYSTEM

328-1430 CONTROL GP-GOVERNOR

PART OF 435-1650 ENGINE AR

SMCS-1265, 1276

i05518469

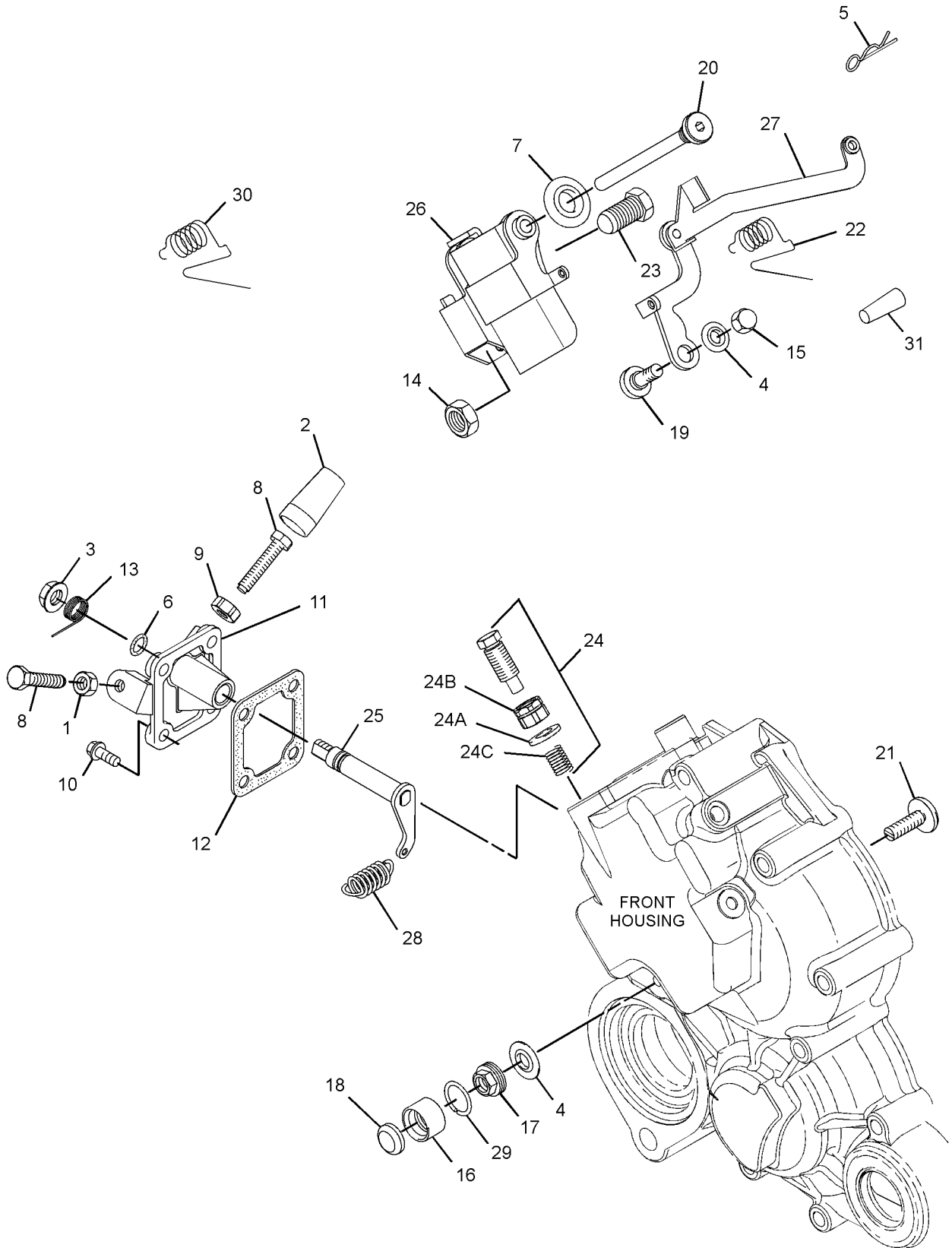
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	5C-2890	1	NUT (M6X1-THD)						
	2	1	139-5511	1	CAP (TAMPER RESISTANT)						
	3	1	153-5592	1	NUT						
	4	1	153-6415	2	WASHER						
	5	1	153-7983	1	PIN						
	6	1	095-1574	1	SEAL-O-RING						
	7	1	154-2715	1	WASHER						
	8	1	369-4486	2	BOLT						
	9	1	162-2207	1	NUT						
	10	1	106-8916	4	BOLT (M6X16-MM)						
	11	1	335-5578	1	BRACKET						
	12	1	423-7724	1	GASKET						
	13	1	308-1882	1	SPRING						
	14	1	308-1889	1	NUT						
	15	1	308-1892	1	NUT						
	16	1	425-7065	1	CAP-TAMPER PROOF						
	17	1	321-4249	1	NUT						
	18	1	308-1901	1	CAP						
	19	1	308-4266	1	SHAFT						
	20	1	390-3731	1	SHAFT						
	21	1	309-6732	1	BOLT						
	22	1	311-0655	1	SPRING						
	23	1	313-2025	1	BOLT-SPECIAL (THROTTLE STOP)						
	24	1	313-5832	1	BOLT AS						
	24A	1	153-7987	1	WASHER						
	24B	1	191-9297	1	NUT						
	24C	1	313-5833	1	SPRING						
	25	1	334-0732	1	ARM (FRONT HOUSING)						
	26	1	390-3729	1	LEVER-CONTROL						
	27	1	324-3398	1	LEVER-CONTROL						
	28	1	327-5129	1	SPRING						
	29	1	308-1897	1	RING						
	30	1	336-2965	1	SPRING						
	31	1	330-9189	1	PLUG						

M - METRIC PART

FUEL SYSTEM

328-1430 CONTROL GP-GOVERNOR (contd.)

i05518469



GRAPHIC #1

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g02603196

FUEL SYSTEM

329-9764 CONTROL GP-GOVERNOR

PART OF 435-1643 ENGINE AR

SMCS-1265, 1276

i05518841

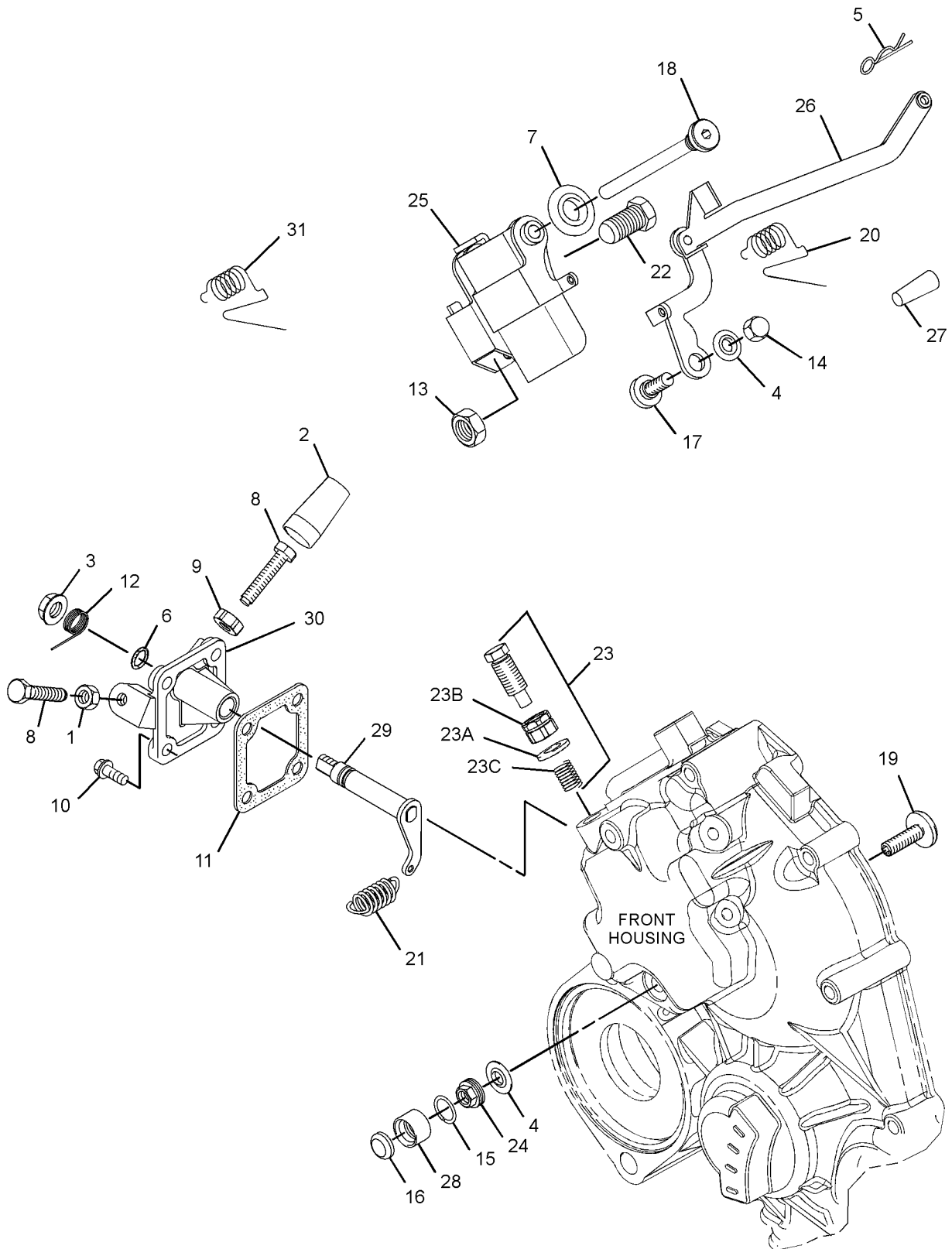
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	5C-2890	1	NUT (M6X1-THD)						
	2	1	139-5511	1	CAP (TAMPER RESISTANT)						
	3	1	153-5592	1	NUT						
	4	1	153-6415	2	WASHER						
	5	1	153-7983	1	PIN						
	6	1	095-1574	1	SEAL-O-RING						
	7	1	154-2715	1	WASHER						
	8	1	369-4486	2	BOLT						
	9	1	162-2207	1	NUT						
	10	1	106-8916	4	BOLT (M6X16-MM)						
	11	1	423-7724	1	GASKET						
	12	1	308-1882	1	SPRING						
	13	1	308-1889	1	NUT						
	14	1	308-1892	1	NUT						
	15	1	308-1897	1	RING						
	16	1	308-1901	1	CAP						
	17	1	308-4266	1	SHAFT						
	18	1	390-3731	1	SHAFT						
	19	1	309-6732	1	BOLT						
	20	1	311-0655	1	SPRING						
	21	1	311-9622	1	SPRING						
	22	1	313-2025	1	BOLT-SPECIAL (THROTTLE STOP)						
	23	1	313-5832	1	BOLT AS						
	23A	1	153-7987	1	WASHER						
	23B	1	191-9297	1	NUT						
	23C	1	313-5833	1	SPRING						
	24	1	321-4249	1	NUT						
	25	1	390-3729	1	LEVER-CONTROL						
	26	1	324-3398	1	LEVER-CONTROL						
	27	1	330-9189	1	PLUG						
	28	1	425-7065	1	CAP-TAMPER PROOF						
	29	1	334-0732	1	ARM (FRONT HOUSING)						
	30	1	335-5578	1	BRACKET						
	31	1	336-2965	1	SPRING						

M - METRIC PART

FUEL SYSTEM

329-9764 CONTROL GP-GOVERNOR (contd.)

i05518841



GRAPHIC #1

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g02603178

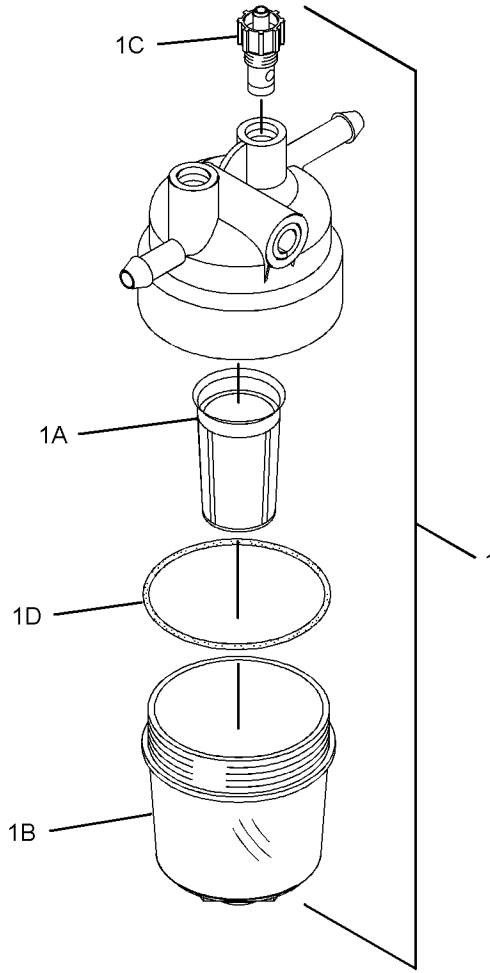
FUEL SYSTEM

308-5704 FILTER GP-FUEL

SMCS-1261

i02979432

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	276-1804	1	FILTER GP-FUEL						
	1A	1	276-1806	1	FILTER ELEMENT-FUEL (FILTER)						
	1B	1	302-7776	1	BOWL-FUEL FILTER						
	1C	1	302-7777	3	PLUG-DRAIN (FUEL FILTER)						
	1D	1	302-7778	1	SEAL						



GRAPHIC #1

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g01363080

FUEL SYSTEM

313-6214 GOVERNOR GP PART OF 435-1648 CYLINDER BLOCK GP-LONG

SMCS-1264, 1908

i05516251

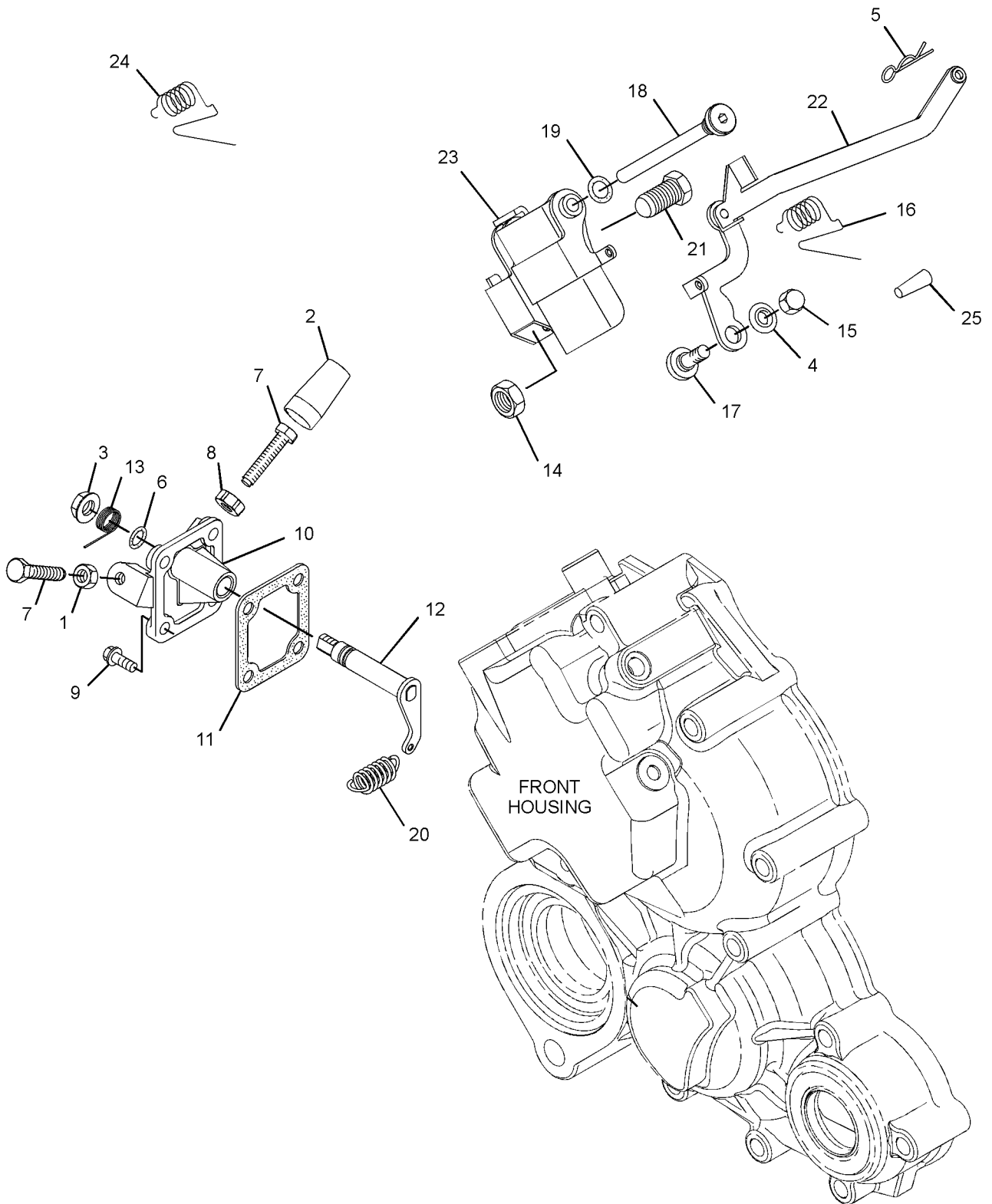
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	5C-2890	1	NUT (M6X1-THD)						
	2	1	139-5511	1	CAP (TAMPER RESISTANT)						
	3	1	153-5592	1	NUT						
	4	1	153-6415	1	WASHER						
	5	1	153-7983	1	PIN						
	6	1	095-1574	1	SEAL-O-RING						
	7	1	369-4486	2	BOLT						
	8	1	162-2207	1	NUT						
	9	1	106-8916	4	BOLT (M6X16-MM)						
	10	1	335-5578	1	BRACKET						
	11	1	423-7724	1	GASKET						
	12	1	334-0732	1	ARM (FRONT HOUSING)						
	13	1	308-1882	1	SPRING						
	14	1	308-1889	1	NUT						
	15	1	308-1892	1	NUT						
	16	1	311-0655	1	SPRING						
	17	1	308-4266	1	SHAFT						
	18	1	390-3731	1	SHAFT						
	19	1	309-6729	1	SEAL-O-RING						
	20	1	311-9622	1	SPRING						
	21	1	313-2025	1	BOLT-SPECIAL (THROTTLE STOP)						
	22	1	324-3396	1	LEVER-CONTROL						
	23	1	390-3729	1	LEVER-CONTROL						
	24	1	336-2965	1	SPRING						
	25	1	330-9189	1	PLUG						

M - METRIC PART

FUEL SYSTEM

313-6214 GOVERNOR GP (contd.)

i05516251



GRAPHIC #1

<END>

g02599741

FUEL SYSTEM

321-3142 GOVERNOR GP

PART OF 435-1632 CYLINDER BLOCK GP, 435-1651 ENGINE AR

SMCS-1264, 1908

i05517142

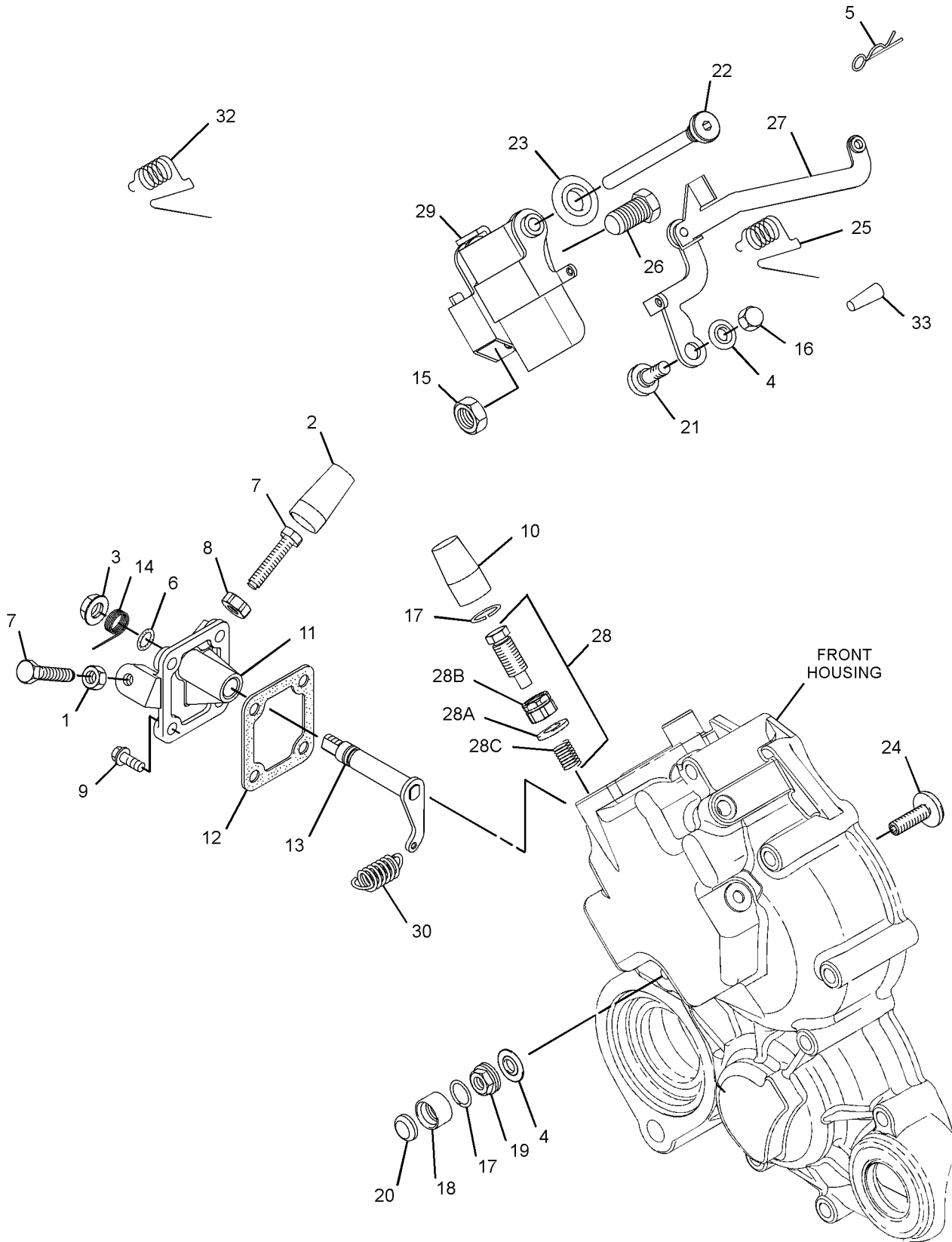
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	5C-2890	1	NUT (M6X1-THD)						
	2	1	139-5511	1	CAP (TAMPER RESISTANT)						
	3	1	153-5592	1	NUT						
	4	1	153-6415	2	WASHER						
	5	1	153-7983	1	PIN						
	6	1	095-1574	1	SEAL-O-RING						
	7	1	369-4486	2	BOLT						
	8	1	162-2207	1	NUT						
	9	1	106-8916	4	BOLT (M6X16-MM)						
	10	1	217-7115	1	CAP (TAMPER RESISTANT)						
	11	1	335-5578	1	BRACKET						
	12	1	423-7724	1	GASKET						
	13	1	334-0732	1	ARM (FRONT HOUSING)						
	14	1	308-1882	1	SPRING						
	15	1	308-1889	1	NUT						
	16	1	308-1892	1	NUT						
	17	1	308-1897	2	RING						
	18	1	425-7065	1	CAP-TAMPER PROOF						
	19	1	321-4249	1	NUT						
	20	1	308-1901	1	CAP						
	21	1	308-4266	1	SHAFT						
	22	1	390-3731	1	SHAFT						
	23	1	154-2715	1	WASHER						
	24	1	309-6732	1	BOLT						
	25	1	311-0655	1	SPRING						
	26	1	313-2025	1	BOLT-SPECIAL (THROTTLE STOP)						
	27	1	324-3396	1	LEVER-CONTROL						
	28	1	313-5832	1	BOLT AS						
	28A	1	153-7987	1	WASHER						
	28B	1	191-9297	1	NUT						
	28C	1	313-5833	1	SPRING						
	29	1	390-3729	1	LEVER-CONTROL						
	30	1	321-3145	1	SPRING						
	32	1	336-2965	1	SPRING						
	33	1	330-9189	1	PLUG						

M - METRIC PART

FUEL SYSTEM

321-3142 GOVERNOR GP (contd.)

i05517142



GRAPHIC #1

<END>

g02598936

FUEL SYSTEM

323-2408 GOVERNOR GP PART OF 435-1644 CYLINDER BLOCK GP

SMCS-1264, 1908

i05518565

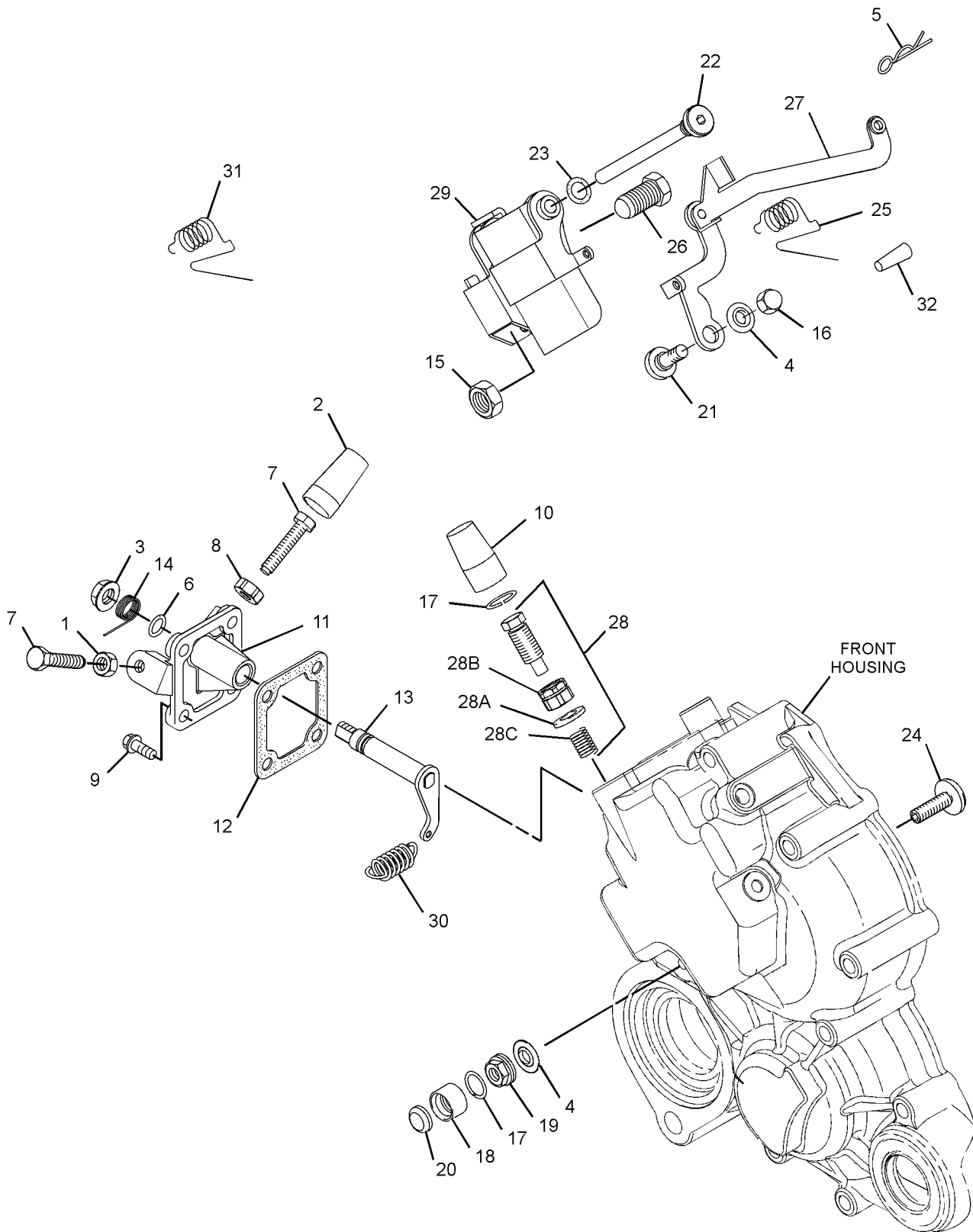
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	5C-2890	1	NUT (M6X1-THD)						
	2	1	139-5511	1	CAP (TAMPER RESISTANT)						
	3	1	153-5592	1	NUT						
	4	1	153-6415	2	WASHER						
	5	1	153-7983	1	PIN						
	6	1	095-1574	1	SEAL-O-RING						
	7	1	369-4486	2	BOLT						
	8	1	162-2207	1	NUT						
	9	1	106-8916	4	BOLT (M6X16-MM)						
	10	1	217-7115	1	CAP (TAMPER RESISTANT)						
	11	1	335-5578	1	BRACKET						
	12	1	423-7724	1	GASKET						
	13	1	334-0732	1	ARM (FRONT HOUSING)						
	14	1	308-1882	1	SPRING						
	15	1	308-1889	1	NUT						
	16	1	308-1892	1	NUT						
	17	1	308-1897	2	RING						
	18	1	425-7065	1	CAP-TAMPER PROOF						
	19	1	321-4249	1	NUT						
	20	1	308-1901	1	CAP						
	21	1	308-4266	1	SHAFT						
	22	1	390-3731	1	SHAFT						
	23	1	309-6729	1	SEAL-O-RING						
	24	1	309-6732	1	BOLT						
	25	1	311-0655	1	SPRING						
	26	1	313-2025	1	BOLT-SPECIAL (THROTTLE STOP)						
	27	1	324-3398	1	LEVER-CONTROL						
	28	1	313-5832	1	BOLT AS						
	28A	1	153-7987	1	WASHER						
	28B	1	191-9297	1	NUT						
	28C	1	313-5833	1	SPRING						
	29	1	390-3729	1	LEVER-CONTROL						
	30	1	364-1817	1	SPRING						
	31	1	336-2965	1	SPRING						
	32	1	330-9189	1	PLUG						

M - METRIC PART

FUEL SYSTEM

323-2408 GOVERNOR GP (contd.)

i05518565



GRAPHIC #1

<END>

g02598677

FUEL SYSTEM

366-1272 INJECTOR GP-FUEL

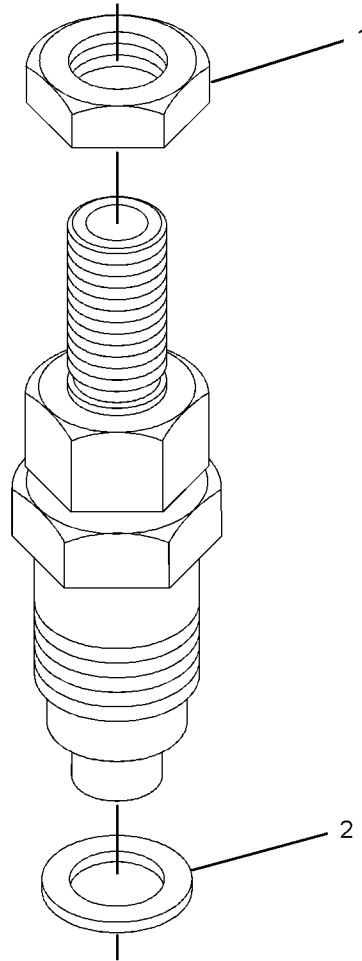
PART OF 323-2410 PUMP GP-FUEL INJECTION

SMCS-1251, 1254, 1290, 1713

i04892707

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME	SEE PAGE
					1 2 3 4 5 6 (PRODUCT LEVEL)	
	1	1	232-0792	1	NUT	
	2	1	232-0793	1	WASHER-SPECIAL	

PARTS SHOWN IN GRAPHIC(S) WITHOUT A REFERENCE NUMBER ARE NOT SERVICED SEPARATELY



GRAPHIC #1

<END>

g03118980

FUEL SYSTEM

334-0280 PUMP GP-FILTER & FUEL TRANSFER

SMCS-1256, 1261

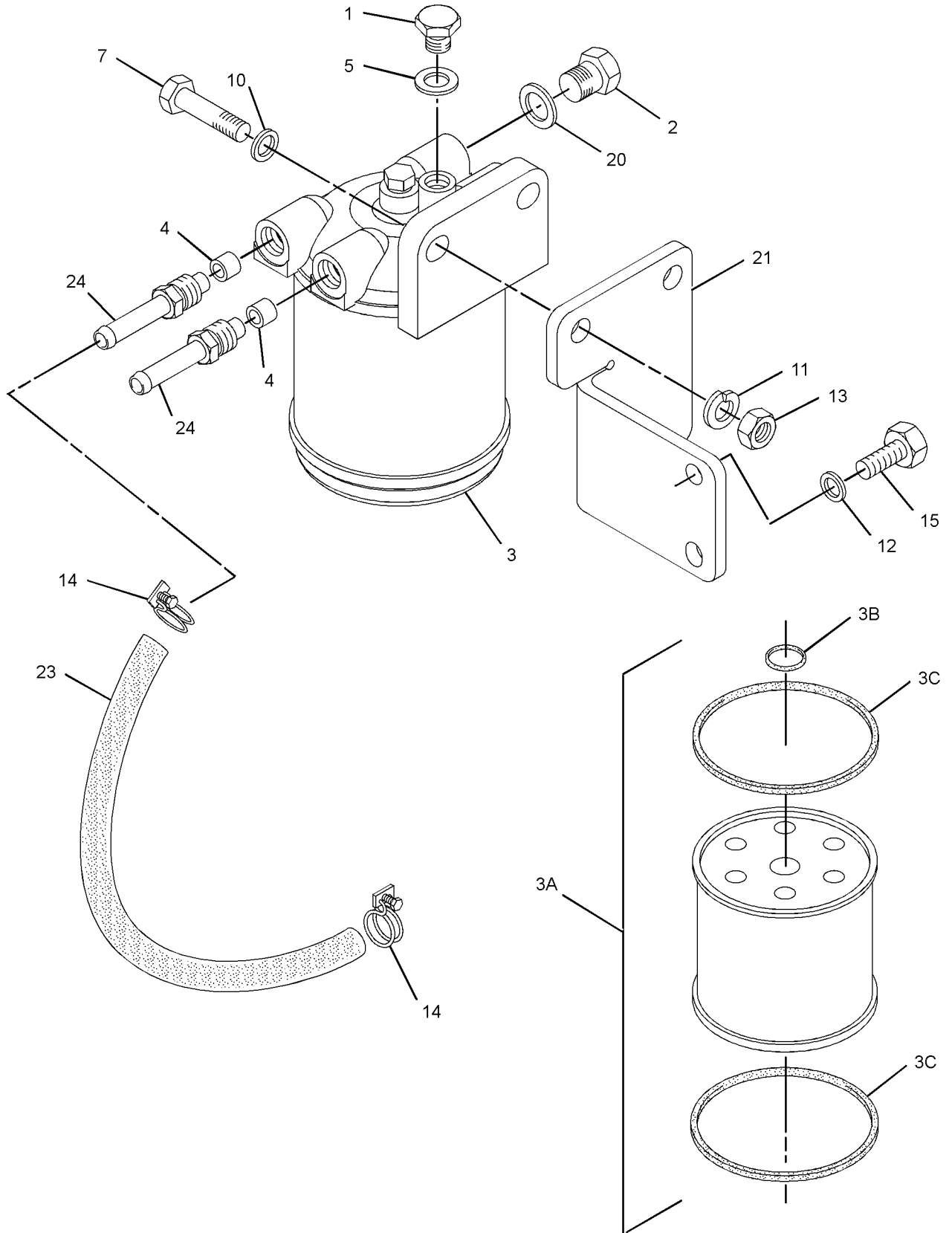
i04524931

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	7W-4694	1	PLUG						
	2	1	033-7849	2	PLUG						
	3	1	358-9226	1	FILTER AS-FUEL						
	3A	1	067-6987	1	KIT-ELEMENT (FUEL FILTER)						
	3B	1	6F-4855	2	SEAL-O-RING						
	3C	1	069-2922	2	GASKET						
	4	1	067-6269	2	FERRULE						
	5	1	067-6317	1	WASHER (0.4X0.566X0.04-IN THK)						
	6	2	183-4036	1	CONNECTOR						
	7	1	138-7162	2	BOLT (M10X1.5X30-MM)						
	8	2	153-5592	1	NUT						
	10	1	154-1399	2	WASHER						
	11	1	154-2403	2	WASHER						
	12	1,2	155-7984	3	WASHER						
	13	1	155-8085	2	NUT						
	14	1	160-3550	2	CLAMP-HOSE						
	15	1,2	165-2141	3	BOLT						
	16	2	183-4320	1	PUMP AS-FUEL TRANSFER						
	17	2	183-4321	1	BRACKET						
	20	1	311-9048	1	WASHER						
	21	1	226-2264	1	BRACKET						
	22	2	243-6411	1	FILTER AS-FUEL						
	23	1	269-2569	1	TUBE						
	24	1	302-4187	2	TUBE						

FUEL SYSTEM

334-0280 PUMP GP-FILTER & FUEL TRANSFER (contd.)

i04524931



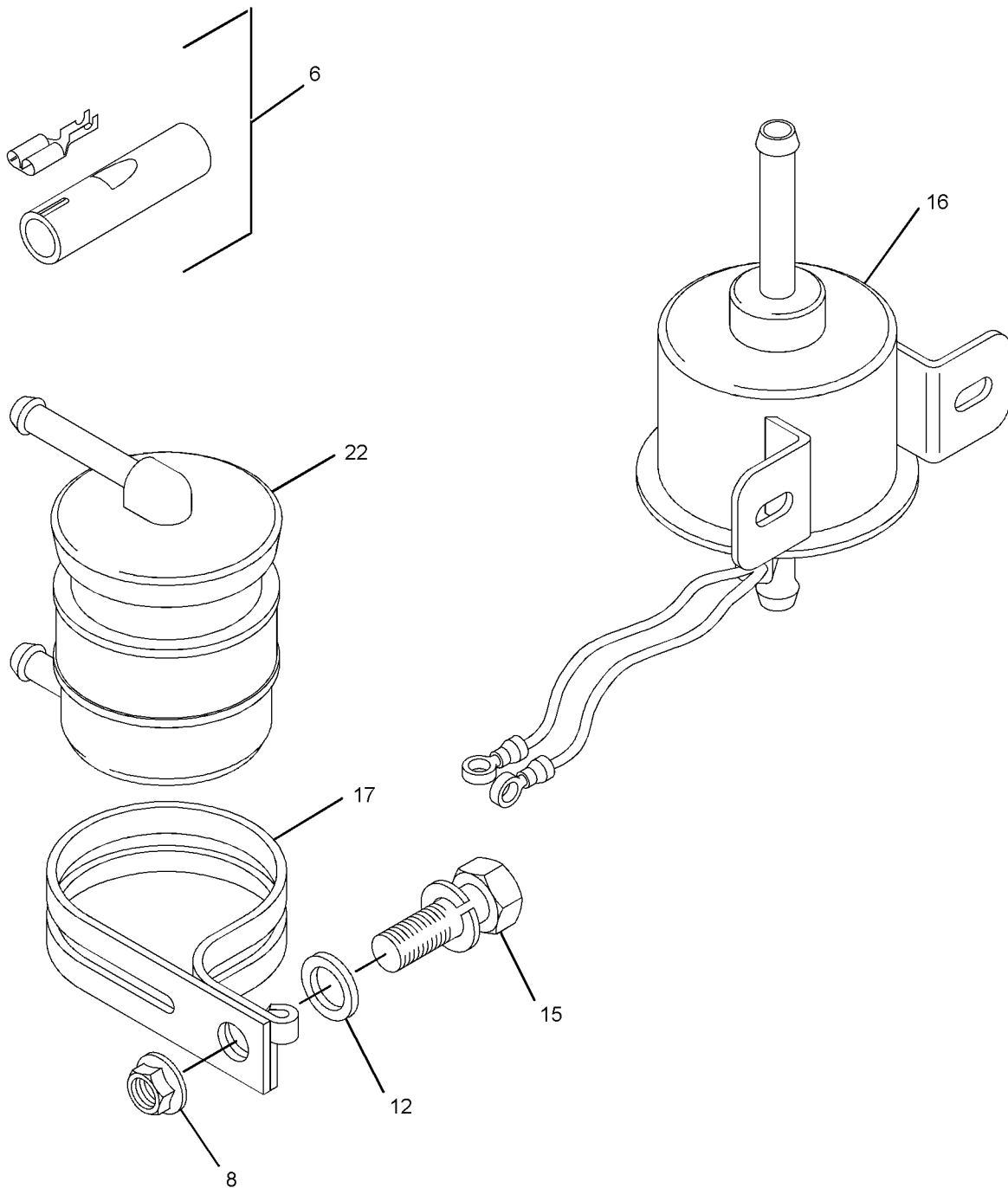
GRAPHIC #1

g02154292

FUEL SYSTEM

334-0280 PUMP GP-FILTER & FUEL TRANSFER (contd.)

i04524931



GRAPHIC #2

<END>

g02711708

FUEL SYSTEM

313-1968 PUMP GP-FUEL INJECTION

PART OF 435-1643 ENGINE AR

SMCS-1251, 1290

i02959145

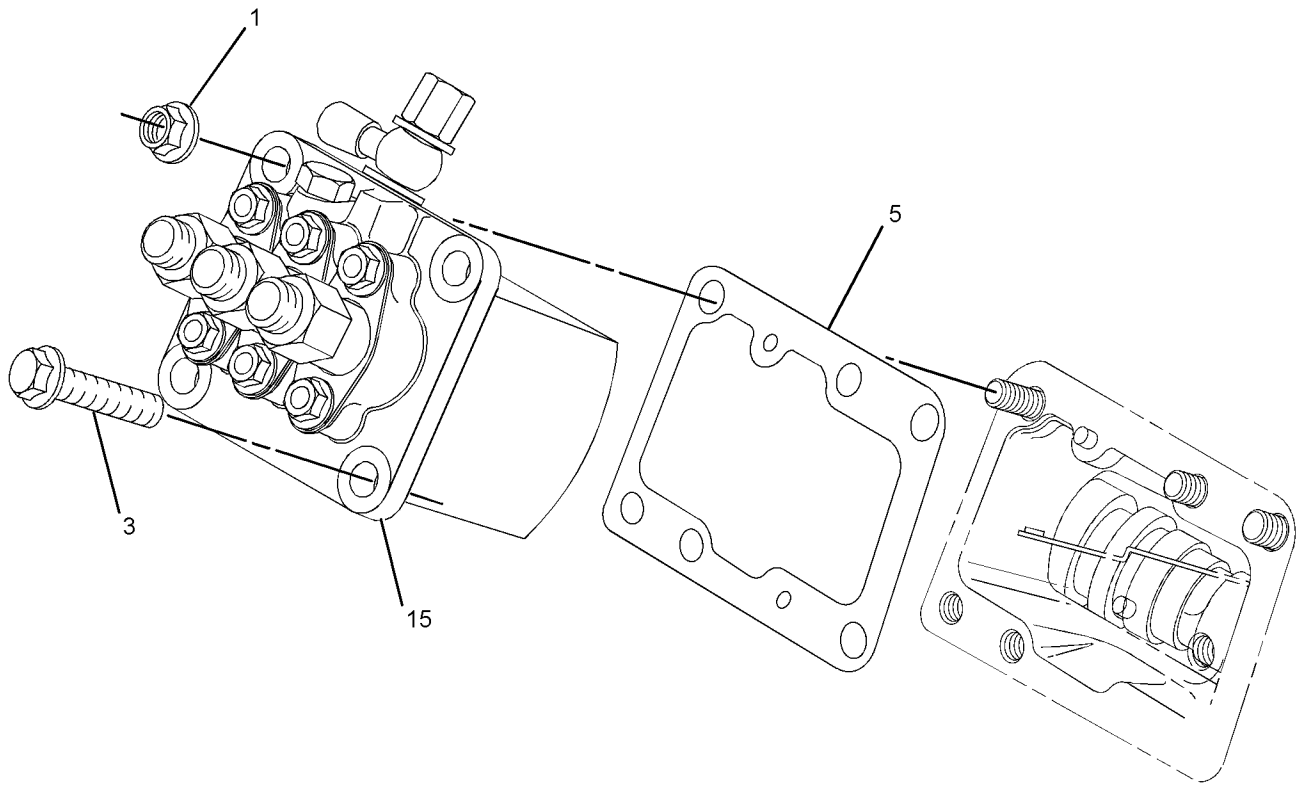
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1,2	153-5960	4	NUT						
	2	2	153-6415	1	WASHER						
	3	1	153-7640	2	BOLT						
	4	2	154-2716	3	SEAL						
B	5	1	153-6385	1	SHIM (0.2-MM THK)						
B		1	161-1432	1	SHIM (0.3-MM THK)						
B		1	161-1433	1	SHIM (0.4-MM THK)						
B		1	161-1434	1	SHIM (0.5-MM THK)						
B		1	161-1435	1	SHIM (0.9-MM THK)						
B		1	312-1583	1	SHIM (0.25-MM OS)						
B		1	312-1582	1	SHIM (0.35-MM OS)						
	6	2	183-3353	2	BOLT						
	7	2	231-7702	1	TUBE AS (CYL NO. 1)						
	8	2	231-7703	1	TUBE AS (CYL NO. 2)						
	9	2	231-7704	1	TUBE AS (CYL NO. 3)						
	10	2	231-7739	1	LINE AS						
	11	2	232-0218	2	CLAMP						
	12	2	232-0290	1	CONNECTOR						
	13	2	252-9229	3	INJECTOR AS-FUEL (EACH INCLUDES)						
	13A	2	232-0793	1	WASHER-SPECIAL						
	14	2	290-8014	4	CLAMP						
	15	1	313-2039	1	PUMP AS-FUEL INJECTION						
	16	2	313-2040	1	HOSE						

B - USE AS REQUIRED

FUEL SYSTEM

313-1968 PUMP GP-FUEL INJECTION (contd.)

i02959145



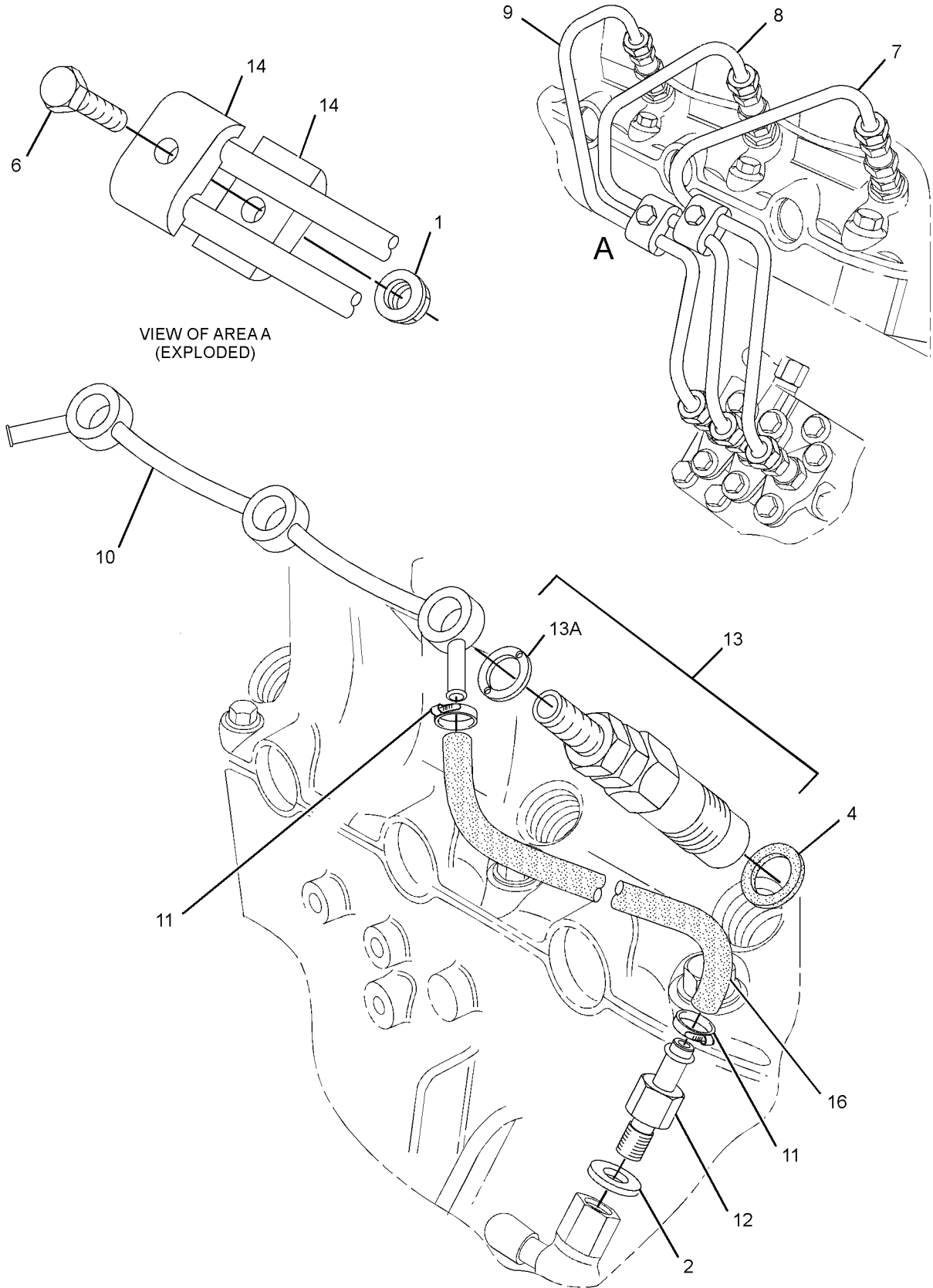
GRAPHIC #1

g01387217

FUEL SYSTEM

313-1968 PUMP GP-FUEL INJECTION (contd.)

i02959145



GRAPHIC #2

<END>

g01387219

FUEL SYSTEM

313-6216 PUMP GP-FUEL INJECTION

PART OF 435-1648 CYLINDER BLOCK GP-LONG

SMCS-1251, 1290

i03568960

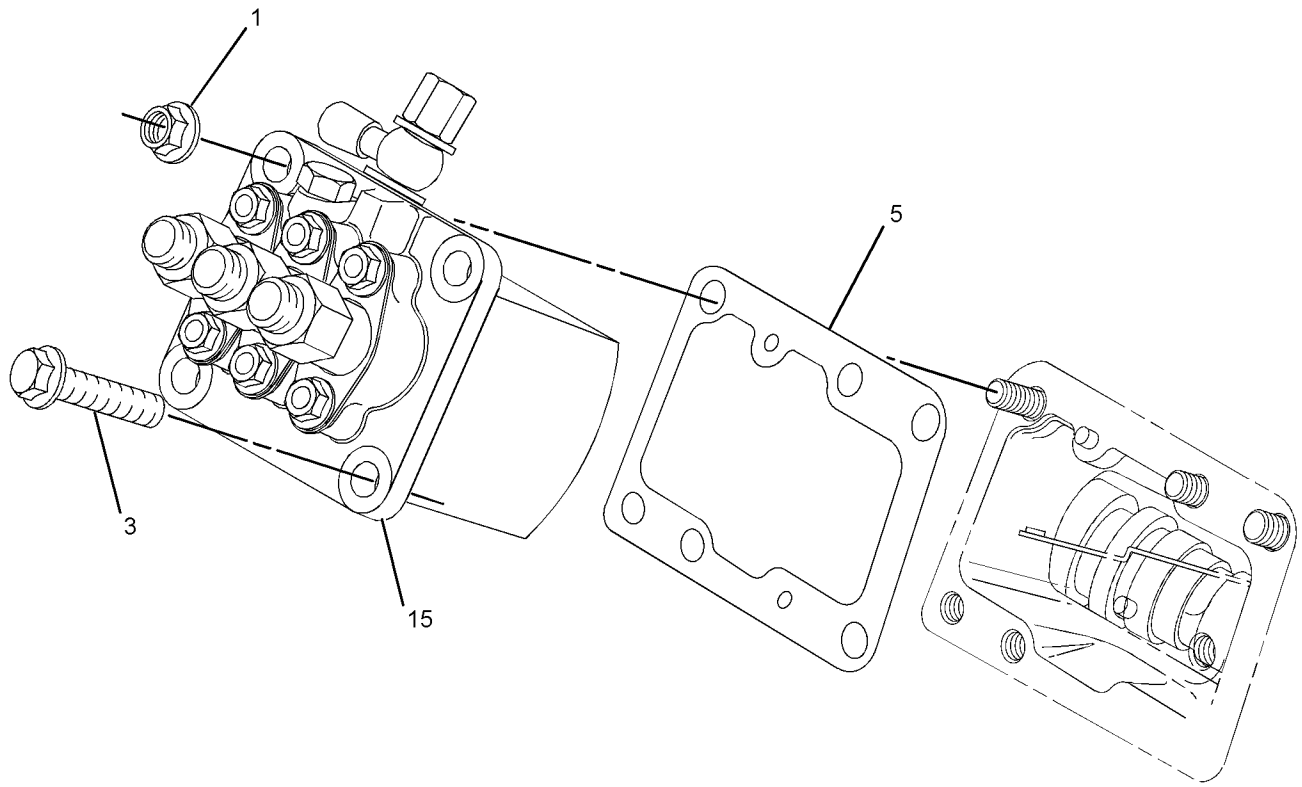
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1,2	153-5960	4	NUT						
	2	2	153-6415	1	WASHER						
	3	1	153-7640	2	BOLT						
	4	2	154-2716	3	SEAL						
B	5	1	153-6385	1	SHIM (0.2-MM THK)						
B		1	161-1432	1	SHIM (0.3-MM THK)						
B		1	161-1433	1	SHIM (0.4-MM THK)						
B		1	161-1434	1	SHIM (0.5-MM THK)						
B		1	161-1435	1	SHIM (0.9-MM THK)						
B		1	312-1583	1	SHIM (0.25-MM OS)						
B		1	312-1582	1	SHIM (0.35-MM OS)						
	6	2	183-3353	2	BOLT						
	7	2	231-7702	1	TUBE AS (CYL NO. 1)						
	8	2	231-7703	1	TUBE AS (CYL NO. 2)						
	9	2	231-7704	1	TUBE AS (CYL NO. 3)						
	10	2	231-7739	1	LINE AS						
	11	2	232-0218	2	CLAMP						
	12	2	232-0290	1	CONNECTOR						
	13	2	252-9229	3	INJECTOR AS-FUEL (EACH INCLUDES)						
	13A	2	232-0793	1	WASHER-SPECIAL						
	14	2	290-8014	4	CLAMP						
	15	1	313-2039	1	PUMP AS-FUEL INJECTION						
	16	2	313-2040	1	HOSE						

B - USE AS REQUIRED

FUEL SYSTEM

313-6216 PUMP GP-FUEL INJECTION (contd.)

i03568960



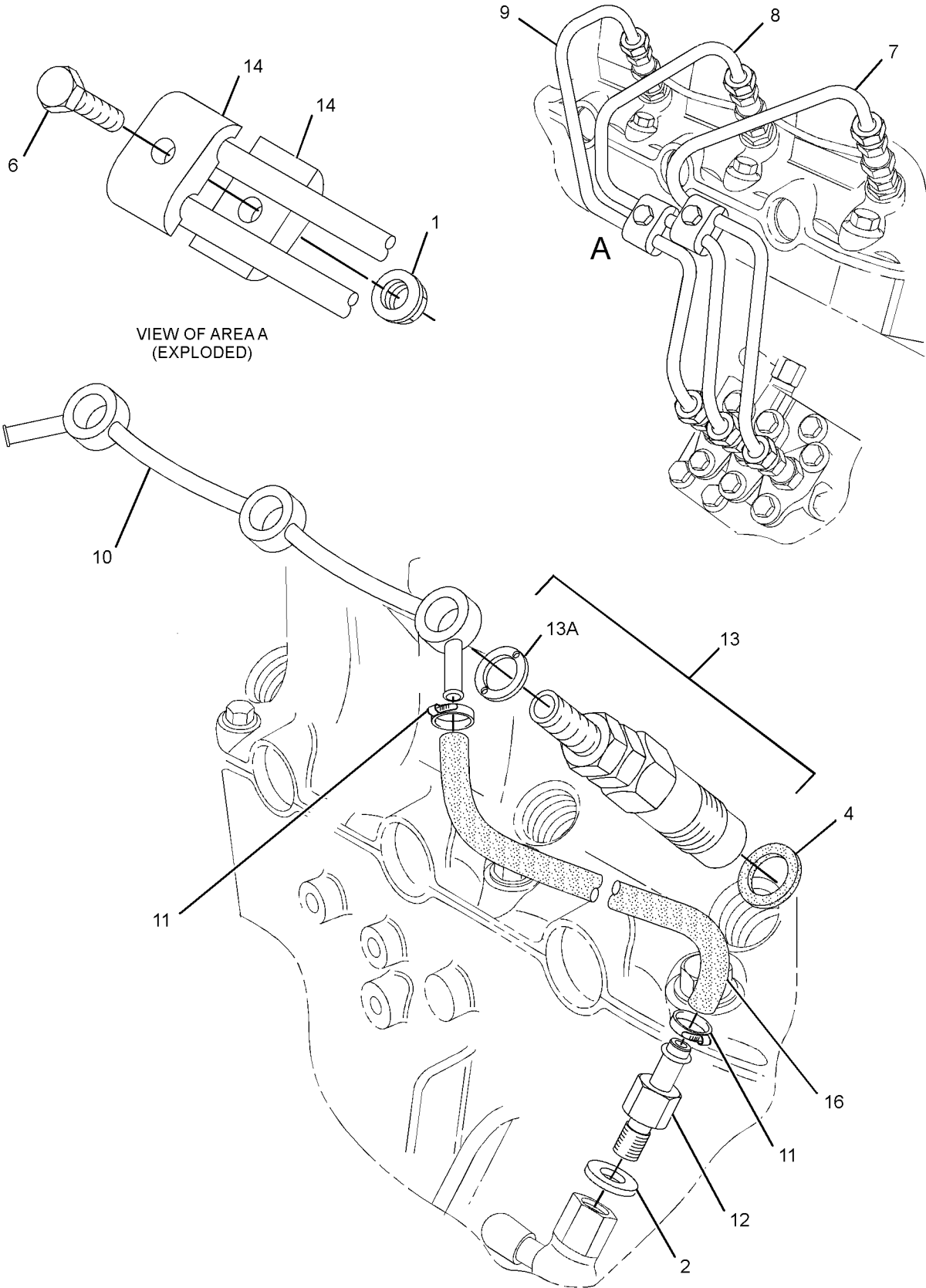
GRAPHIC #1

g01387217

FUEL SYSTEM

313-6216 PUMP GP-FUEL INJECTION (contd.)

i03568960



GRAPHIC #2

<END>

g01387219

FUEL SYSTEM

321-3334 PUMP GP-FUEL INJECTION PART OF 435-1632 CYLINDER BLOCK GP, 435-1651 ENGINE AR

SMCS-1251, 1290

i02904101

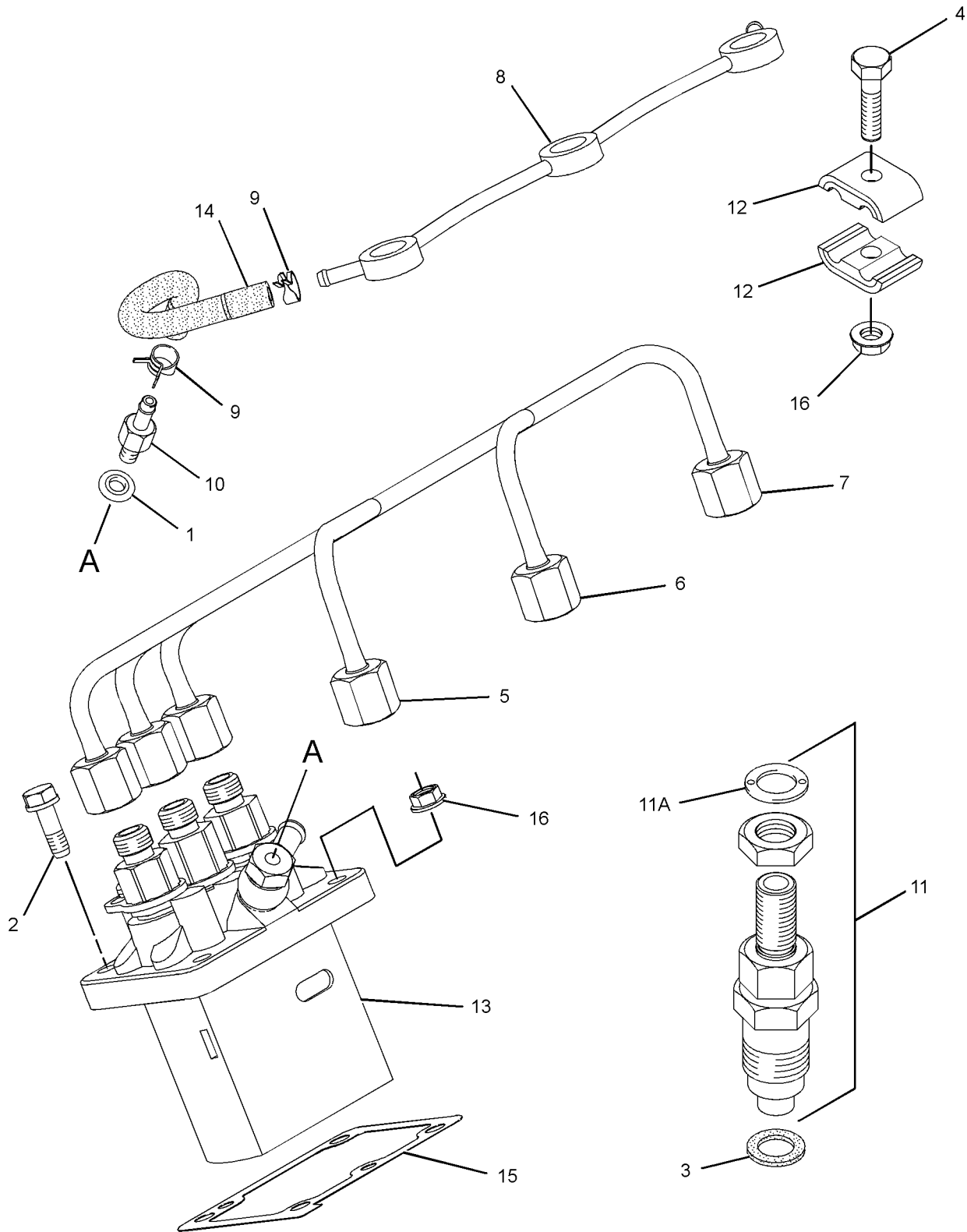
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6415	1	WASHER						
	2	1	153-7640	2	BOLT						
	3	1	154-2716	3	SEAL						
	4	1	183-3353	2	BOLT						
	5	1	231-7702	1	TUBE AS (CYL NO. 1)						
	6	1	231-7703	1	TUBE AS (CYL NO. 2)						
	7	1	231-7704	1	TUBE AS (CYL NO. 3)						
	8	1	231-7739	1	LINE AS						
	9	1	232-0218	2	CLAMP						
	10	1	232-0290	1	CONNECTOR						
	11	1	252-9229	3	INJECTOR AS-FUEL						
	11A	1	232-0793	1	WASHER-SPECIAL						
	12	1	290-8014	4	CLAMP						
	13	1	293-3230	1	PUMP GP-FUEL INJECTION						
	14	1	313-2040	1	HOSE						
	15	1	153-6385	1	SHIM (0.2-MM THK)						
AB		1	161-1432	1	SHIM (0.3-MM THK)						
AB		1	161-1433	1	SHIM (0.4-MM THK)						
AB		1	161-1434	1	SHIM (0.5-MM THK)						
AB		1	161-1435	1	SHIM (0.9-MM THK)						
AB		1	312-1582	1	SHIM (0.35-MM OS)						
AB		1	312-1583	1	SHIM (0.25-MM OS)						
	16	1	153-5960	4	NUT						

A - NOT PART OF THIS GROUP
B - USE AS REQUIRED

FUEL SYSTEM

321-3334 PUMP GP-FUEL INJECTION (contd.)

i02904101



GRAPHIC #1

<END>

g01433837

FUEL SYSTEM

323-2410 PUMP GP-FUEL INJECTION

PART OF 435-1644 CYLINDER BLOCK GP

TYPE 1

SMCS-1251, 1290

i02927311

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6415	1	WASHER						
	2	1	153-7640	2	BOLT						
	3	1	154-2716	3	SEAL						
	4	1	183-3353	2	BOLT						
	5	1	231-7702	1	TUBE AS (CYL NO. 1)						
	6	1	231-7703	1	TUBE AS (CYL NO. 2)						
	7	1	231-7704	1	TUBE AS (CYL NO. 3)						
	8	1	231-7739	1	LINE AS						
	9	1	232-0218	2	CLAMP						
	10	1	232-0290	1	CONNECTOR						
	11	1	252-9229	3	INJECTOR AS-FUEL						
	11A	1	232-0793	1	WASHER-SPECIAL						
	12	1	290-8014	4	CLAMP						
	13	1	293-3230	1	PUMP GP-FUEL INJECTION						
	14	1	313-2040	1	HOSE						
	15	1	153-6385	1	SHIM (0.2-MM THK)						
AB		1	161-1432	1	SHIM (0.3-MM THK)						
AB		1	161-1433	1	SHIM (0.4-MM THK)						
AB		1	161-1434	1	SHIM (0.5-MM THK)						
AB		1	161-1435	1	SHIM (0.9-MM THK)						
AB		1	312-1582	1	SHIM (0.35-MM OS)						
AB		1	312-1583	1	SHIM (0.25-MM OS)						
	16	1	153-5960	4	NUT						

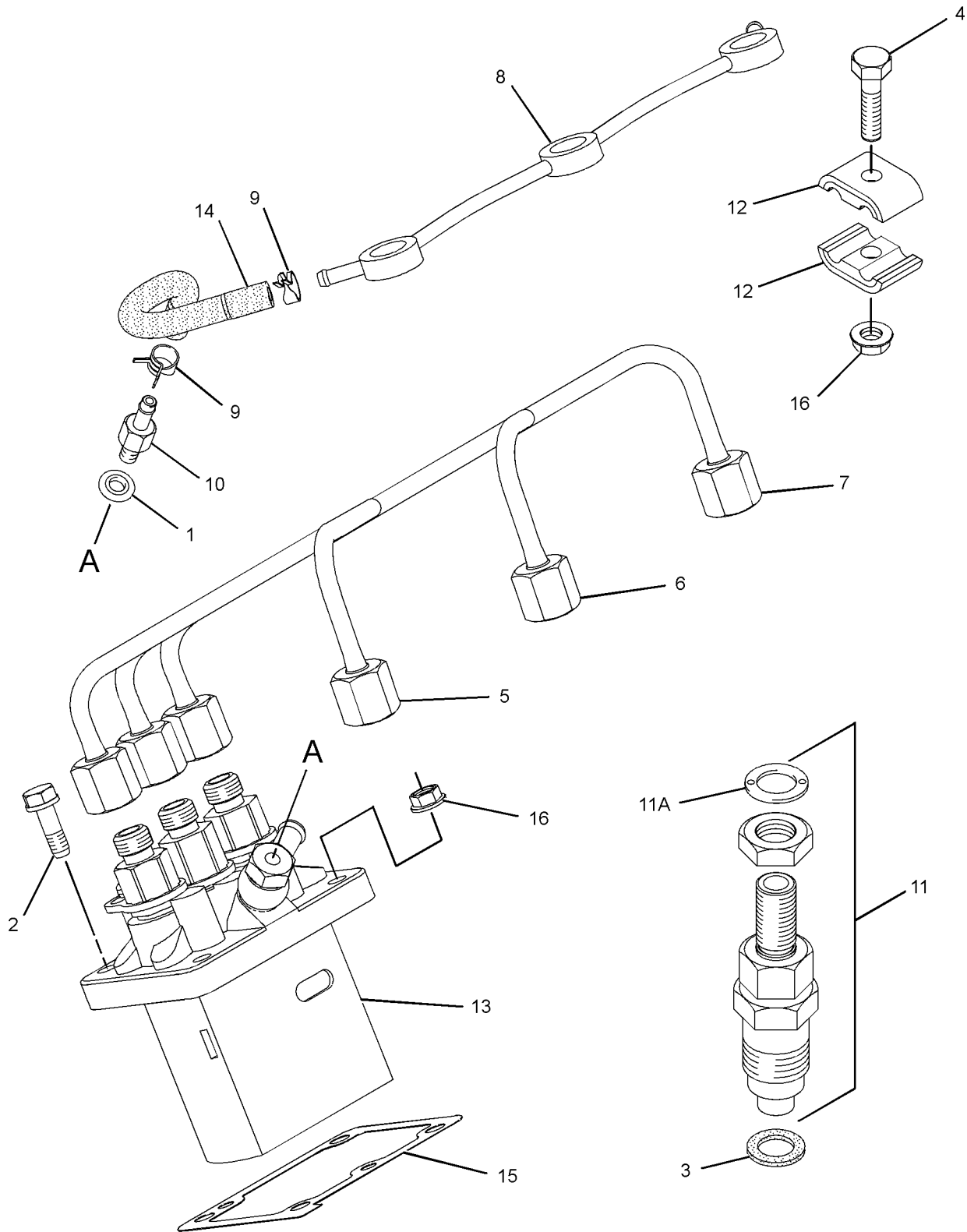
A - NOT PART OF THIS GROUP

B - USE AS REQUIRED

FUEL SYSTEM

323-2410 PUMP GP-FUEL INJECTION (contd.)

i02927311



GRAPHIC #1

<END>

g01433837

FUEL SYSTEM

323-2410 PUMP GP-FUEL INJECTION

PART OF 435-1644 CYLINDER BLOCK GP

TYPE 2

SMCS-1251, 1290

i04892442

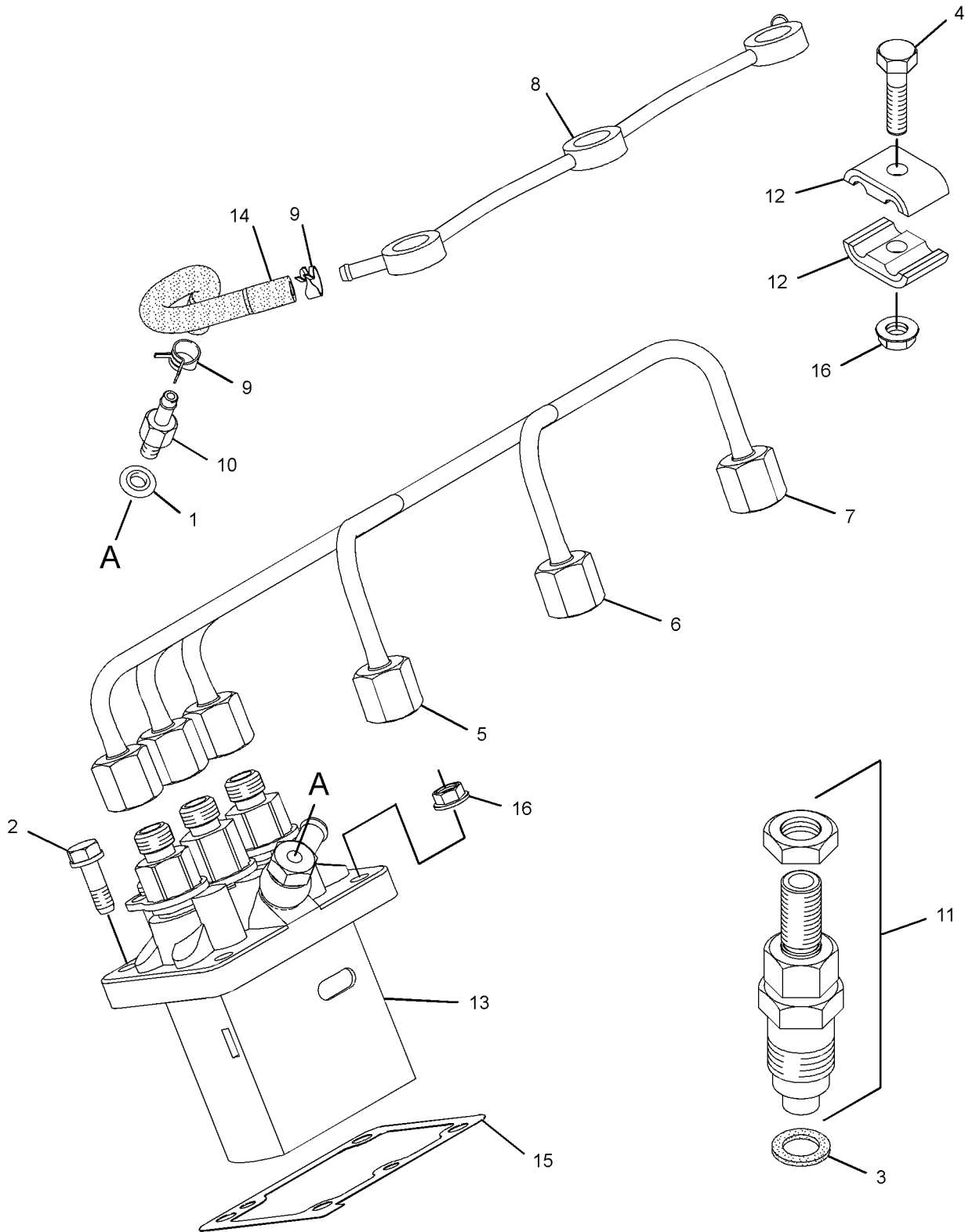
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6415	1	WASHER						
	2	1	153-7640	2	BOLT						
	3	1	154-2716	3	SEAL						
	4	1	183-3353	2	BOLT						
	5	1	231-7702	1	TUBE AS (CYL NO. 1)						
	6	1	231-7703	1	TUBE AS (CYL NO. 2)						
	7	1	231-7704	1	TUBE AS (CYL NO. 3)						
	8	1	231-7739	1	LINE AS						
	9	1	232-0218	2	CLAMP						
	10	1	232-0290	1	CONNECTOR						
CY	11	1	366-1272	3	INJECTOR GP-FUEL						153
	12	1	290-8014	4	CLAMP						
	13	1	293-3230	1	PUMP GP-FUEL INJECTION						
	14	1	313-2040	1	HOSE						
	15	1	153-6385	1	SHIM (0.2-MM THK)						
AB		1	161-1432	1	SHIM (0.3-MM THK)						
AB		1	161-1433	1	SHIM (0.4-MM THK)						
AB		1	161-1434	1	SHIM (0.5-MM THK)						
AB		1	161-1435	1	SHIM (0.9-MM THK)						
AB		1	312-1582	1	SHIM (0.35-MM THK) (0.35-MM OS)						
AB		1	312-1583	1	SHIM (0.25-MM THK) (0.25-MM OS)						
	16	1	153-5960	4	NUT						

A - NOT PART OF THIS GROUP
 B - USE AS REQUIRED
 C - CHANGE FROM PREVIOUS TYPE
 Y - SEPARATE ILLUSTRATION

FUEL SYSTEM

323-2410 PUMP GP-FUEL INJECTION (contd.)

i04892442



GRAPHIC #1

<END>

g03067339

FUEL SYSTEM

328-1432 PUMP GP-FUEL INJECTION

PART OF 435-1650 ENGINE AR

SMCS-1251, 1290

i02973364

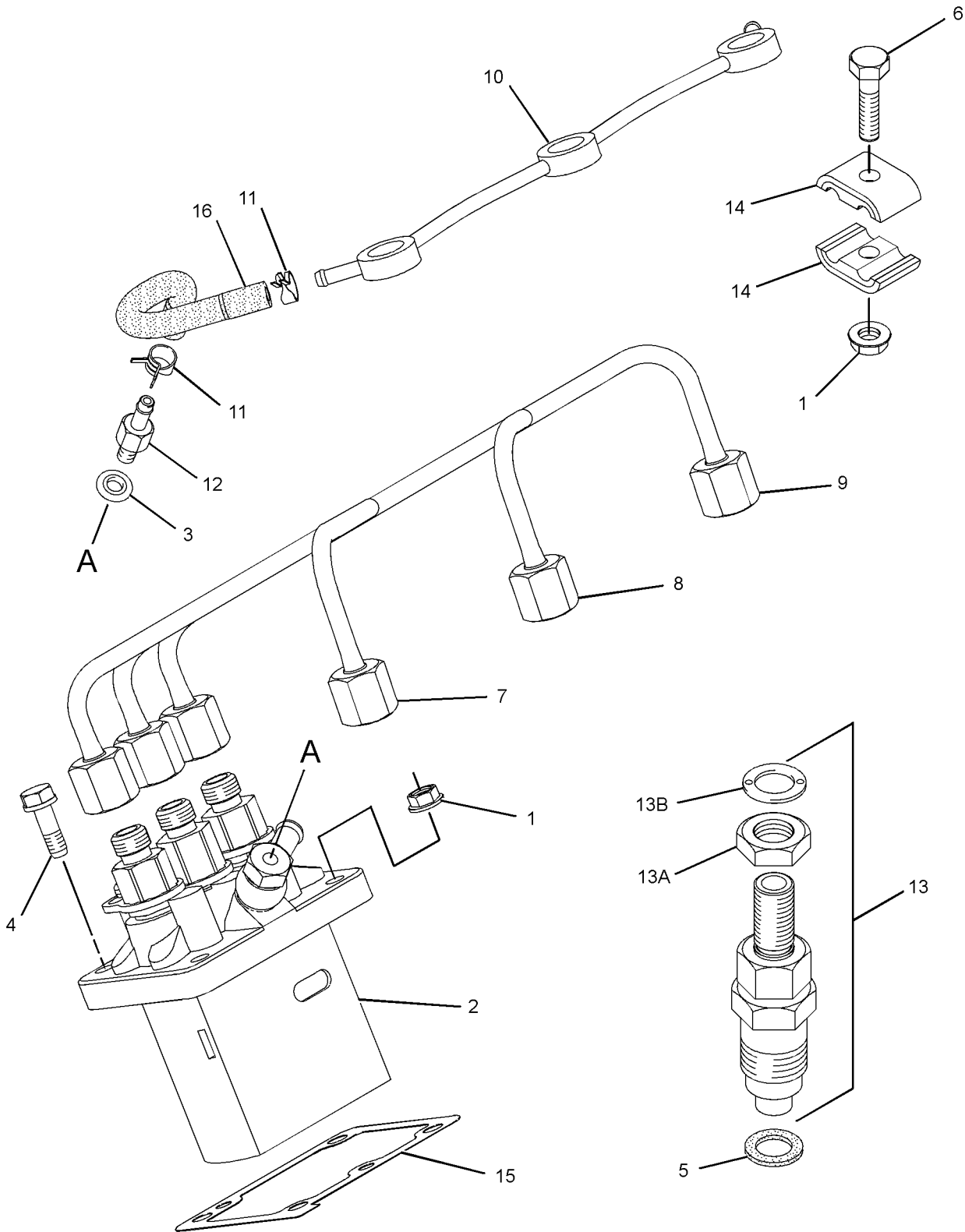
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5960	4	NUT						
	2	1	328-1427	1	PUMP-FUEL INJECTION						
	3	1	153-6415	1	WASHER						
	4	1	153-7640	2	BOLT						
	5	1	154-2716	3	SEAL						
	6	1	183-3353	2	BOLT						
	7	1	231-7702	1	TUBE AS (CYL NO. 1)						
	8	1	231-7703	1	TUBE AS (CYL NO. 2)						
	9	1	231-7704	1	TUBE AS (CYL NO. 3)						
	10	1	231-7739	1	LINE AS						
	11	1	232-0218	2	CLAMP						
	12	1	232-0290	1	CONNECTOR						
	13	1	232-0293	3	INJECTOR AS-FUEL						
	13A	1	232-0792	1	NUT						
	13B	1	232-0793	1	WASHER-SPECIAL						
	14	1	290-8014	2	CLAMP						
B	15	1	153-6385	1	SHIM (0.2-MM THK)						
B		1	312-1583	1	SHIM (0.25-MM THK)						
B		1	161-1432	1	SHIM (0.3-MM THK)						
B		1	312-1582	1	SHIM (0.35-MM THK)						
B		1	161-1433	1	SHIM (0.4-MM THK)						
B		1	161-1434	1	SHIM (0.5-MM THK)						
B		1	161-1435	1	SHIM (0.9-MM THK)						
	16	1	313-2040	1	HOSE						

B - USE AS REQUIRED

FUEL SYSTEM

328-1432 PUMP GP-FUEL INJECTION (contd.)

i02973364



GRAPHIC #1

<END>

g01513223

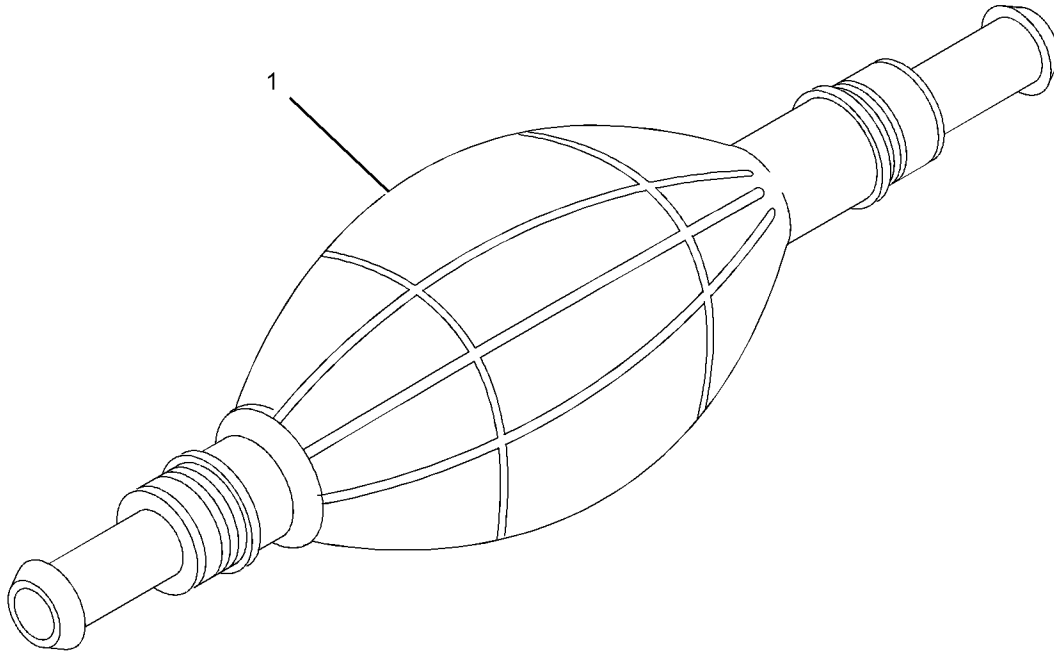
FUEL SYSTEM

308-2320 PUMP GP-FUEL PRIMING

SMCS-1258

i05815393

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	197-8540	1	PUMP GP-FUEL PRIMING						



GRAPHIC #1

<END>

g01912002

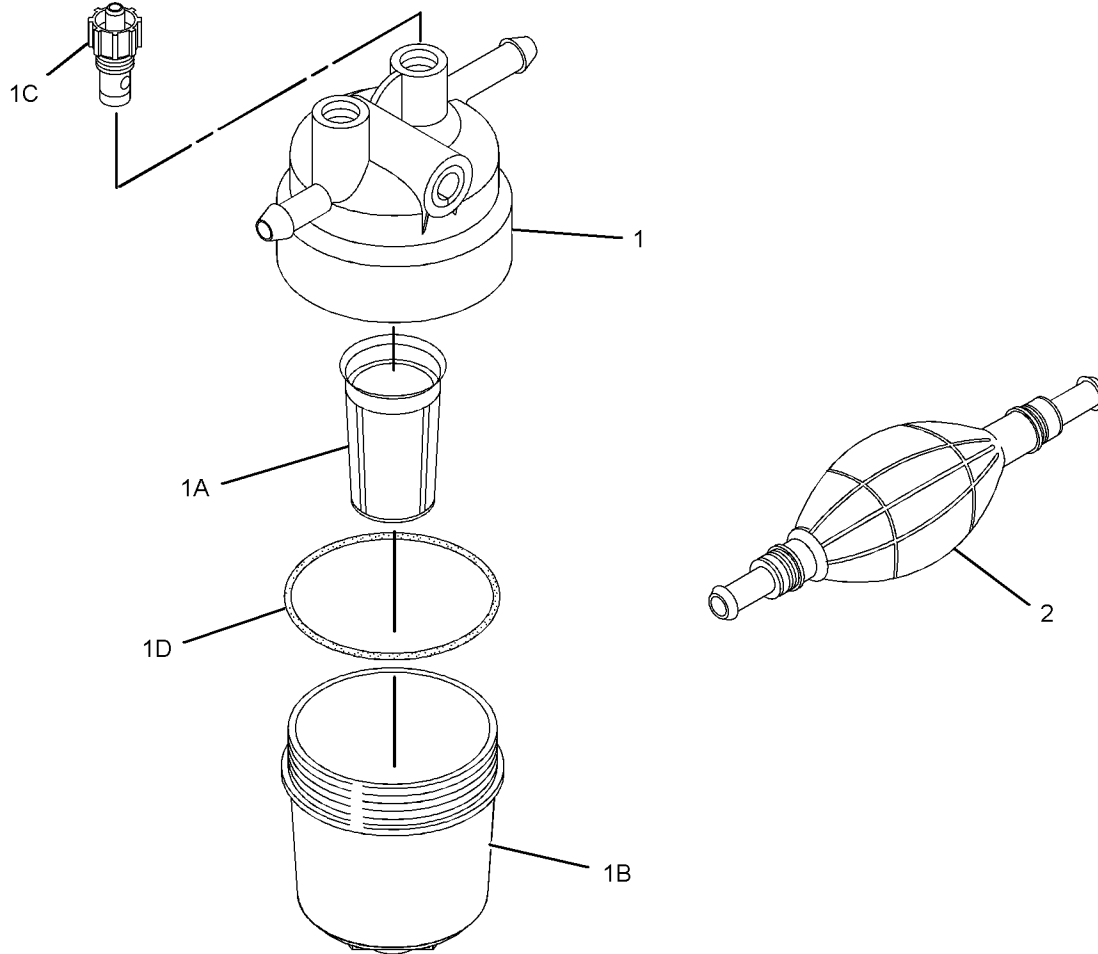
FUEL SYSTEM

317-6706 PUMP GP-FUEL PRM & PRIM FILTER

SMCS-1256, 1258, 1260

i03586462

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	276-1804	1	FILTER GP-FUEL (WATER SEPARATOR)						
	1A	1	276-1806	1	FILTER ELEMENT-FUEL						
	1B	1	302-7776	1	BOWL-FUEL FILTER						
	1C	1	302-7777	3	PLUG-DRAIN (WATER SEPARATOR)						
	1D	1	302-7778	1	SEAL						
	2	1	197-8540	1	PUMP GP-FUEL PRIMING						



GRAPHIC #1

<END>

g01915154

FUEL SYSTEM

313-2009 PUMP GP-FUEL TRANSFER

SMCS - 1256

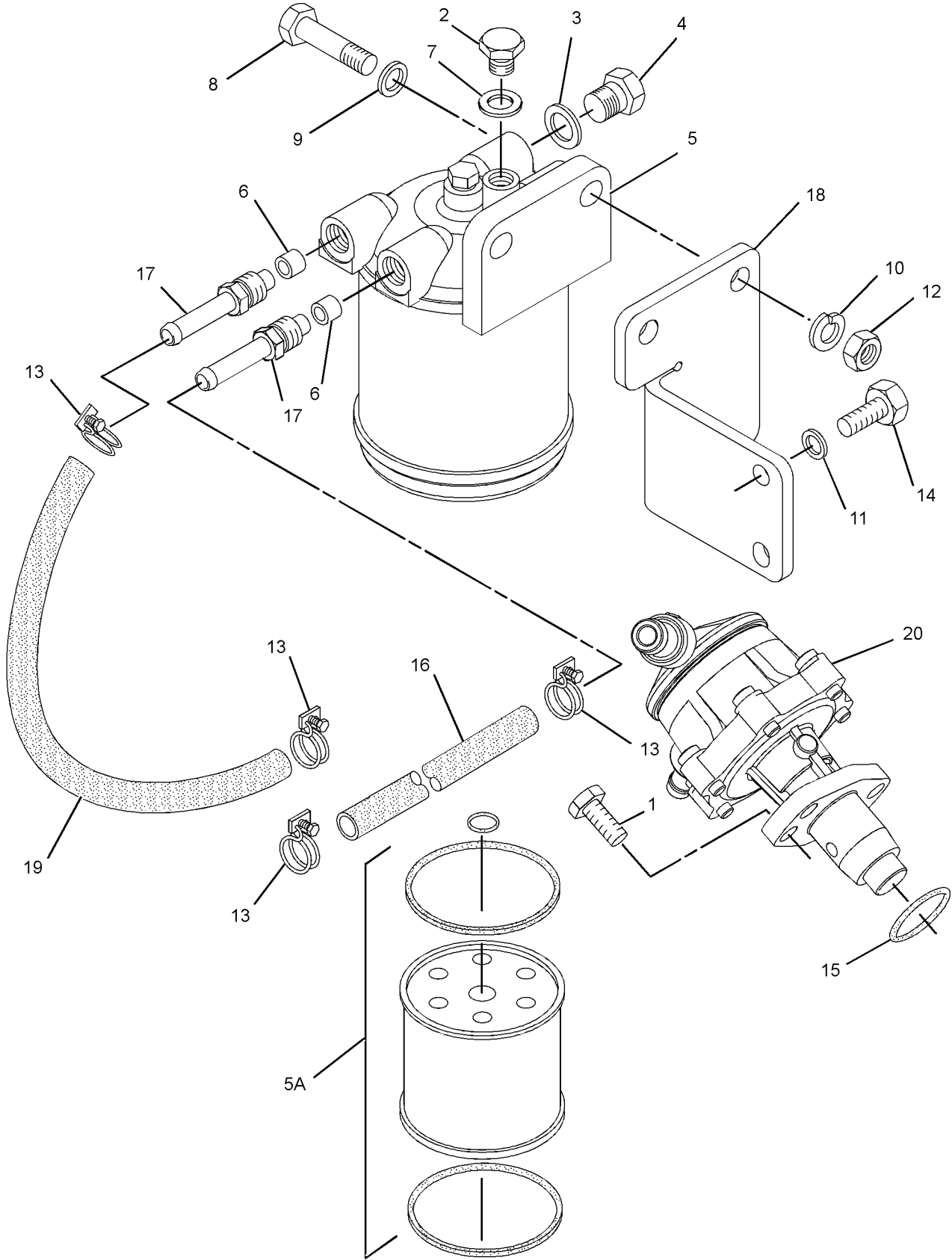
i05219130

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	6I-0846	2	BOLT (M6X1X14-MM)						
	2	1	7W-4694	1	PLUG						
	3	1	032-8100	2	WASHER (0.531X0.718X0.064-IN THK)						
	4	1	033-7849	2	PLUG						
	5	1	358-9226	1	FILTER AS-FUEL						
	5A	1	067-6987	1	KIT-ELEMENT (FUEL FILTER)						
	6	1	067-6269	2	FERRULE						
	7	1	067-6317	1	WASHER (0.4X0.566X0.04-IN THK)						
	8	1	138-7162	2	BOLT (M10X1.5X30-MM)						
	9	1	154-1399	2	WASHER						
	10	1	154-2403	2	WASHER						
	11	1	155-7984	2	WASHER						
	12	1	155-8085	2	NUT						
	13	1	160-3550	4	CLAMP-HOSE						
	14	1	165-2141	2	BOLT						
	15	1	176-7719	1	SEAL-O-RING						
	16	1	183-4330	1	TUBE-FUEL						
	17	1	302-4187	2	TUBE						
	18	1	226-2264	1	BRACKET						
	19	1	269-2569	1	TUBE						
	20	1	295-4070	1	PUMP AS-FUEL TRANSFER						

FUEL SYSTEM

313-2009 PUMP GP-FUEL TRANSFER (contd.)

i05219130



GRAPHIC #1

<END>

g03337579

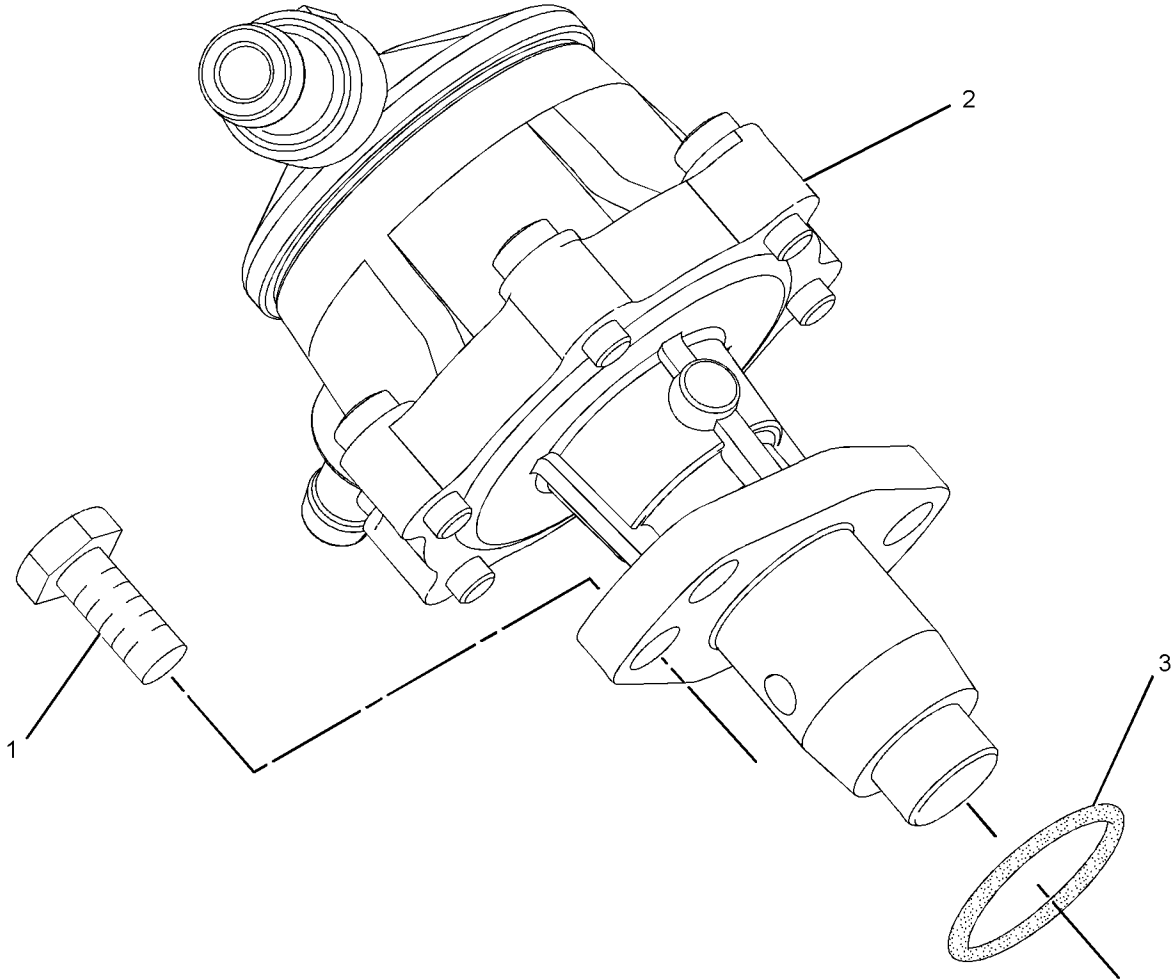
FUEL SYSTEM

319-7356 PUMP GP-FUEL TRANSFER

SMCS-1256

i05317366

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	6I-0846	2	BOLT (M6X1X14-MM)						
	2	1	295-4070	1	PUMP AS-FUEL TRANSFER						
	3	1	176-7719	1	SEAL-O-RING						



GRAPHIC #1

<END>

g01350846

ELECTRICAL AND STARTING SYSTEM

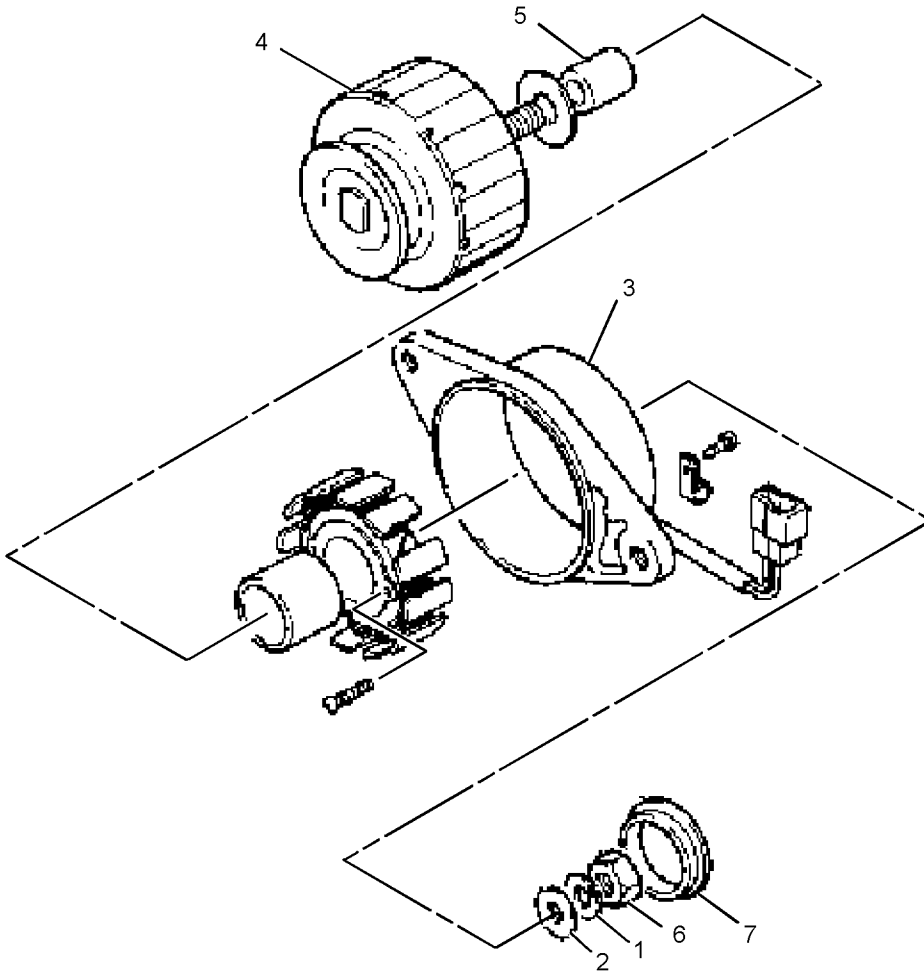
183-3938 ALTERNATOR GP-CHARGING

PART OF 313-1982 ALTERNATOR GP-CHARGING

SMCS-1405

i02612813

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	154-2403	1	WASHER						
	2	1	155-8084	1	WASHER						
	3	1	295-8597	1	PLATE AS						
	4	1	295-8605	1	PULLEY AS						
	5	1	295-8606	1	COLLAR						
	6	1	295-8607	1	NUT						
	7	1	295-8608	1	CAP						



GRAPHIC #1

<END>

g01380028

ELECTRICAL AND STARTING SYSTEM

313-1982 ALTERNATOR GP-CHARGING

SMCS-1405

i02927332

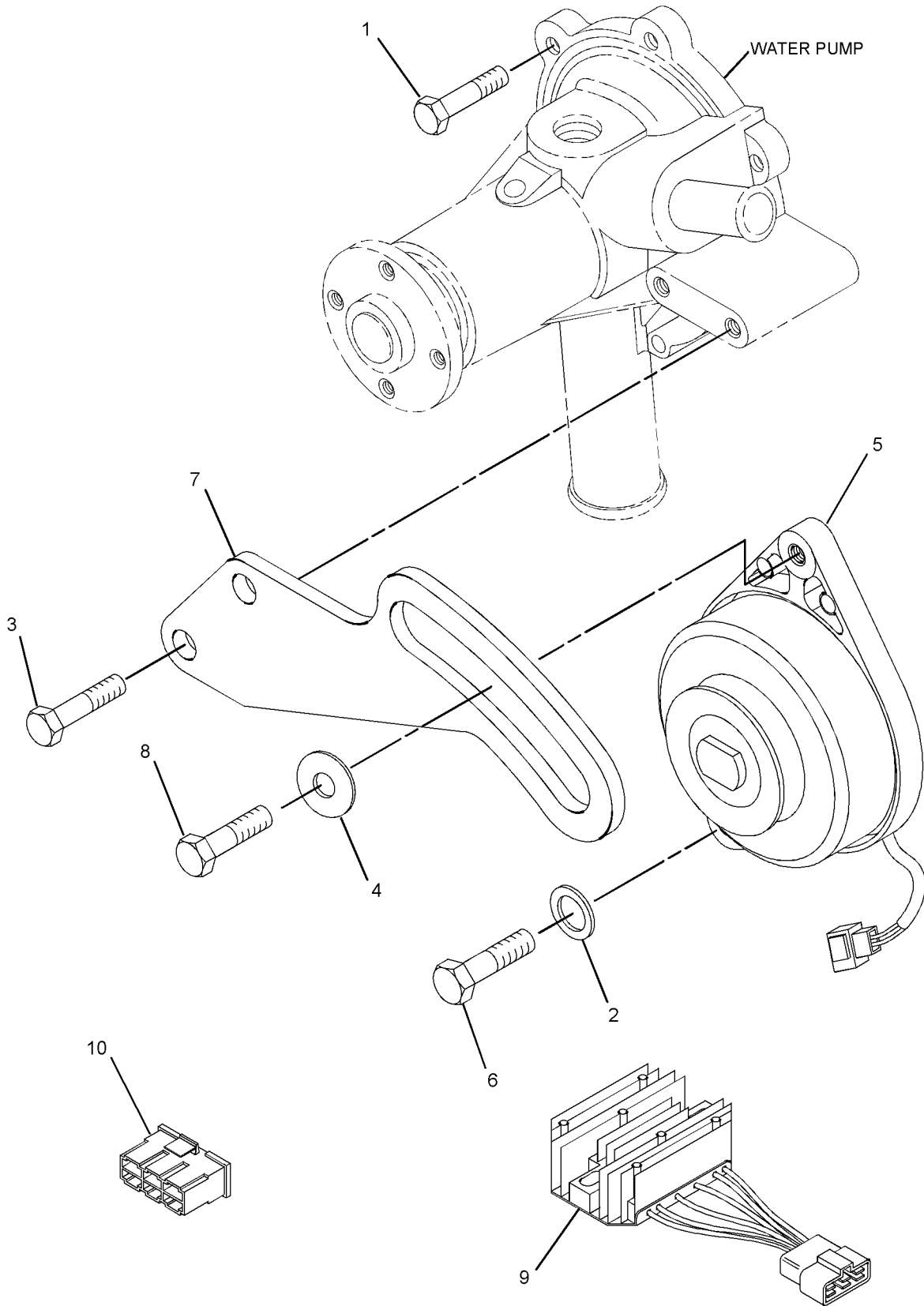
NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-5961	1	BOLT						
	2	1	155-8084	1	WASHER						
	3	1	165-2140	2	BOLT						
	4	1	168-9002	1	WASHER						
Y	5	1	183-3938	1	ALTERNATOR GP-CHARGING						176
	6	1	183-3939	1	BOLT						
	7	1	183-3940	1	LEVER-ADJUSTING						
	8	1	183-3941	1	BOLT						
	9	1	197-8816	1	REGULATOR (ALTERNATOR VOLTAGE)						
	10	1	234-8762	1	CONNECTOR						

Y - SEPARATE ILLUSTRATION

ELECTRICAL AND STARTING SYSTEM

313-1982 ALTERNATOR GP-CHARGING (contd.)

i02927332



GRAPHIC #1

<END>

g01389462

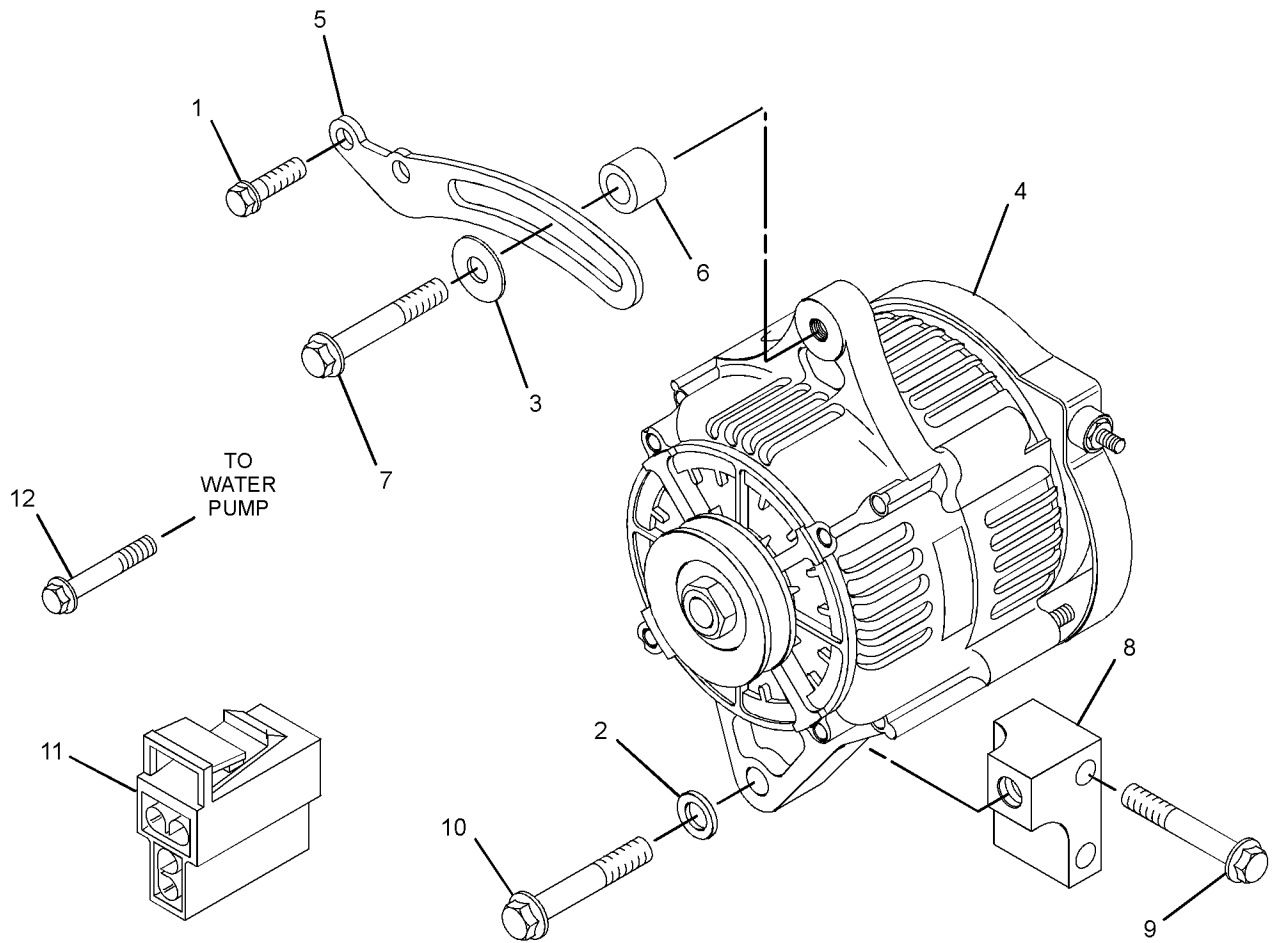
ELECTRICAL AND STARTING SYSTEM

319-7354 ALTERNATOR GP-CHARGING

SMCS-1405

i05229426

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-7640	2	BOLT						
	2	1	154-1399	1	WASHER						
	3	1	168-9002	1	WASHER						
	4	1	183-4029	1	ALTERNATOR GP-CHARGING						
	5	1	337-6523	1	LEVER-ADJUSTING						
	6	1	183-4031	1	SPACER						
	7	1	183-4032	1	BOLT						
	8	1	326-0053	1	BRACKET						
	9	1	183-4034	2	BOLT						
	10	1	183-4035	1	BOLT						
	11	1	183-4037	1	CONNECTOR AS						
	12	1	153-6840	3	BOLT						



GRAPHIC #1

<END>

g03342411

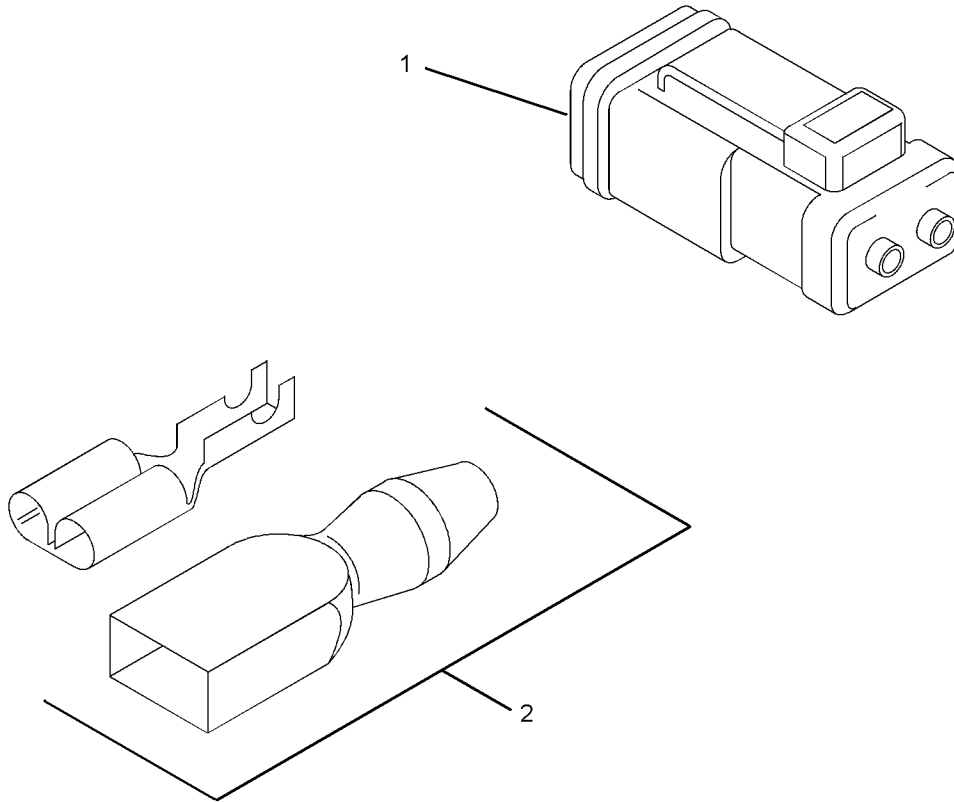
ELECTRICAL AND STARTING SYSTEM

308-2319 CONNECTION GP-ELECTRICAL

SMCS-1408

i05815179

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	254-5541	1	CONNECTION AS						
	2	1	197-8555	1	CONNECTION						



GRAPHIC #1

<END>

g01389483

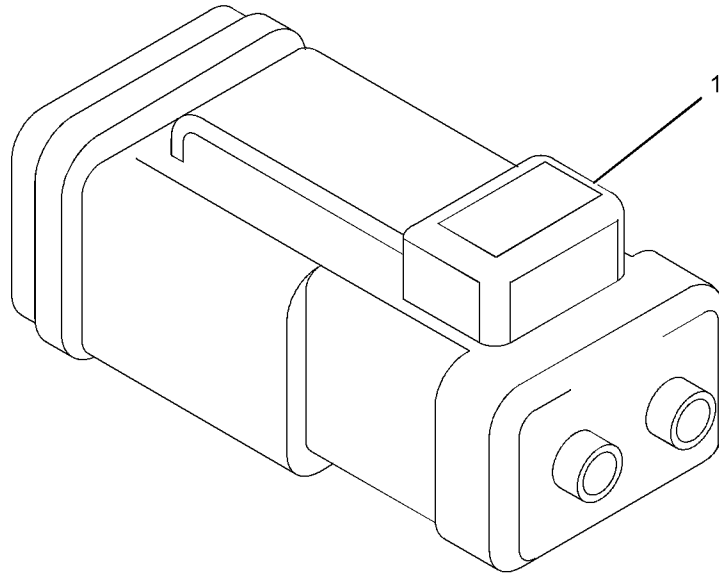
ELECTRICAL AND STARTING SYSTEM

321-6741 CONNECTION GP-ELECTRICAL

SMCS-1408

i02905403

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	254-5541	1	CONNECTION AS						



GRAPHIC #1

<END>

g01513229

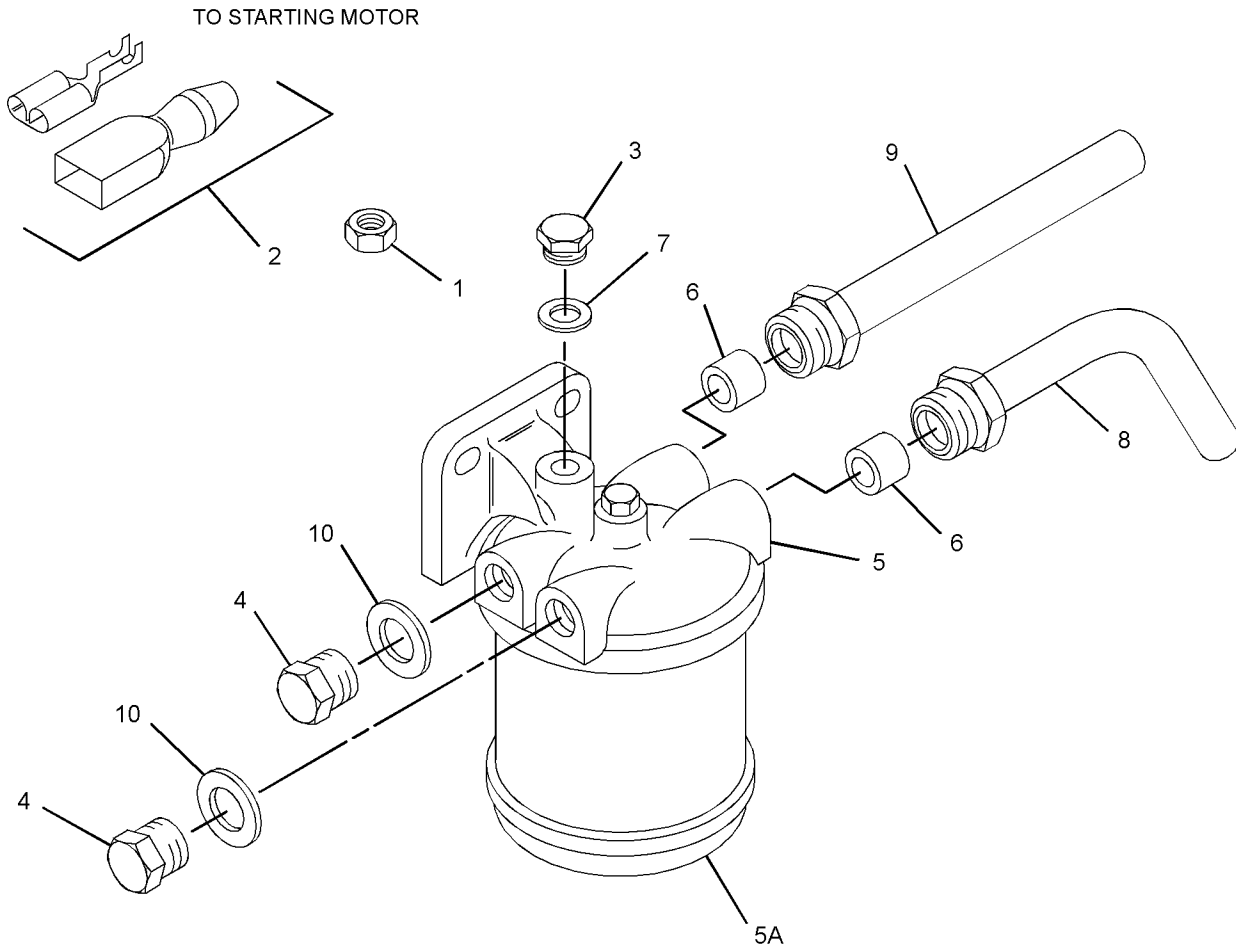
ELECTRICAL AND STARTING SYSTEM

336-2073 CONNECTION GP-ELECTRICAL

SMCS-1408

i05040989

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	180-8579	1	NUT						
	2	1	197-8555	1	CONNECTION (STARTING MOTOR)						
	3	1	7W-4694	1	PLUG						
	4	1	033-7849	1	PLUG						
	5	1	358-9226	1	FILTER AS-FUEL						
	5A	1	067-6987	1	KIT-ELEMENT (FUEL FILTER)						
	6	1	067-6269	2	FERRULE						
	7	1	067-6317	1	WASHER (0.4X0.566X0.04-IN THK)						
	8	1	218-2355	1	LINE-FUEL						
	9	1	302-4187	1	TUBE						
	10	1	311-9048	2	WASHER						



GRAPHIC #1

<END>

g03335784

ELECTRICAL AND STARTING SYSTEM

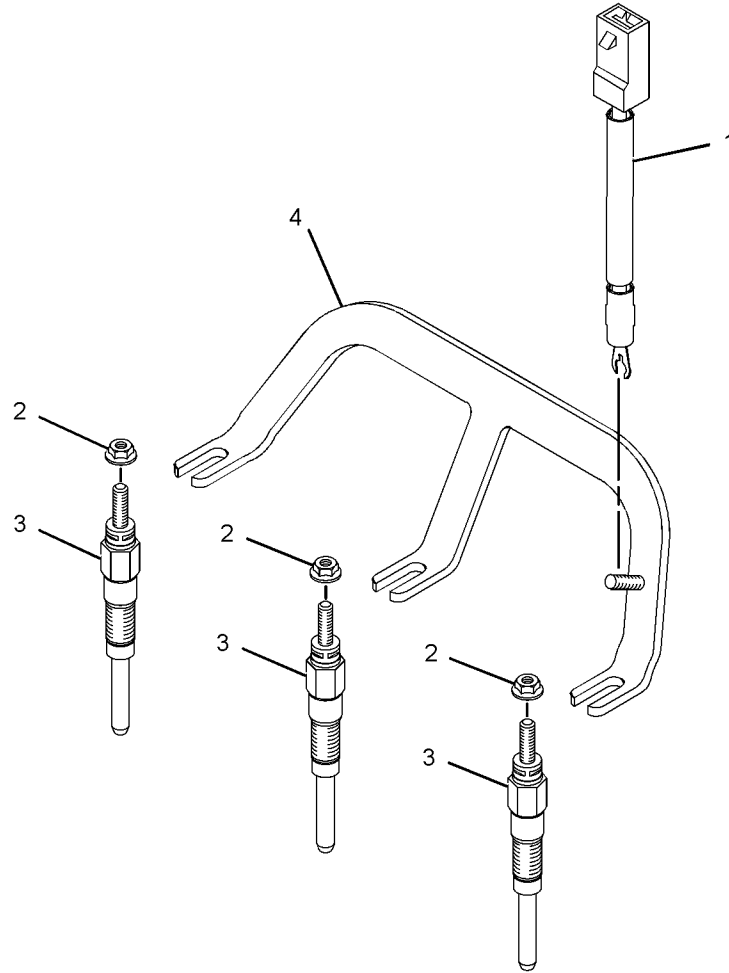
313-2021 GLOW PLUG GP

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1412

i05190663

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	155-8075	1	WIRE						
	2	1	231-2839	3	NUT - FLANGE						
	3	1	307-8672	3	GLOW PLUG						
	4	1	393-5482	1	BAR-BUS						



GRAPHIC #1

<END>

g01387002

ELECTRICAL AND STARTING SYSTEM

445-1048 HARNESS AS-ENGINE

30 FEET. OEM INTERFACE
AN ATTACHMENT

SMCS-1408

i05784317

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	383-6321	2	PLUG GP-CONNECTOR						186
	3S-2093	1	STRAP-CABLE						
	8T-8737	44	PLUG-SEAL						
	9X-4391	1	PLUG AS-CONNECTOR (70-PIN)						
	3E-4367	1	RING-RETAINING						
M	3E-8557	1	BOLT (M5X0.8X39.37-MM)						
	9X-5615	2	SEAL (INTERFACE, 70-PIN)						
E	125-7874		TUBE-HEAT SHRINK (5.72-MM DIA) (100-CM)						
	9X-3402	9	SOCKET-CONNECTOR (16-GA TO 18-GA)						
			-OR-						
	126-1768	9	SOCKET-CONNECTOR (14-GA TO 16-GA)						
	155-2255	1	KIT-CONNECTING PLUG (12-PIN)						
			(INCLUDES PLUG AS, WEDGE & INTERFACE SEAL)						
	165-4893	1	BOOT						
	230-4009	2	PLUG AS-CONNECTOR (12-PIN)						
			(EACH INCLUDES)						
	264-7034	1	SEAL-CONNECTOR						
E - ORDER BY THE CENTIMETER									
M - METRIC PART									
Y - SEPARATE ILLUSTRATION									

<END>

445-1049 HARNESS AS-ENGINE

50 FEET. OEM INTERFACE
AN ATTACHMENT

SMCS-1408

i05784318

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
	165-4893	1	BOOT						
	9X-4391	1	PLUG AS-CONNECTOR (70-PIN)						
	3E-4367	1	RING-RETAINING						
M	3E-8557	1	BOLT (M5X0.8X39.37-MM)						
	9X-5615	2	SEAL (INTERFACE, 70-PIN)						
	155-2255	1	KIT-CONNECTING PLUG (12-PIN)						
			(INCLUDES PLUG AS, WEDGE & INTERFACE SEAL)						
	230-4009	2	PLUG AS-CONNECTOR (12-PIN)						
			(EACH INCLUDES)						
	264-7034	1	SEAL-CONNECTOR						
Y	383-6321	2	PLUG GP-CONNECTOR						186
	8T-8737	44	PLUG-SEAL						
	9X-3402	9	SOCKET-CONNECTOR (16-GA TO 18-GA)						
			-OR-						
	126-1768	9	SOCKET-CONNECTOR (14-GA TO 16-GA)						
	194-5226	60	WIRE AS (16-GA)						
			-OR-						
	194-5227	60	WIRE AS (14-GA)						
	3S-2093	1	STRAP-CABLE						
E	125-7874		TUBE-HEAT SHRINK (5.72-MM DIA) (100-CM)						
E - ORDER BY THE CENTIMETER									
M - METRIC PART									
Y - SEPARATE ILLUSTRATION									

<END>

ELECTRICAL AND STARTING SYSTEM

445-1050 HARNESS AS-ENGINE

80 FEET. OEM INTERFACE
AN ATTACHMENT

SMCS-1408

i05784319

NOTE	PART NUMBER	QTY	PART NAME						SEE PAGE
			1	2	3	4	5	6 (PRODUCT LEVEL)	
	165-4893	1	BOOT						
	9X-4391	1	PLUG AS-CONNECTOR (70-PIN)						
	3E-4367	1	RING-RETAINING						
M	3E-8557	1	BOLT (M5X0.8X39.37-MM)						
	9X-5615	2	SEAL (INTERFACE, 70-PIN)						
	155-2255	1	KIT-CONNECTING PLUG (12-PIN)						
			(INCLUDES PLUG AS, WEDGE & INTERFACE SEAL)						
	230-4009	2	PLUG AS-CONNECTOR (12-PIN)						
			(EACH INCLUDES)						
	264-7034	1	SEAL-CONNECTOR						
Y	383-6321	2	PLUG GP-CONNECTOR						186
	8T-8737	44	PLUG-SEAL						
	9X-3402	9	SOCKET-CONNECTOR (16-GA TO 18-GA)						
			-OR-						
	126-1768	9	SOCKET-CONNECTOR (14-GA TO 16-GA)						
	194-5226	60	WIRE AS (16-GA)						
			-OR-						
	194-5227	60	WIRE AS (14-GA)						
	3S-2093	1	STRAP-CABLE						
E	125-7874		TUBE-HEAT SHRINK (5.72-MM DIA) (100-CM)						

E - ORDER BY THE CENTIMETER
M - METRIC PART
Y - SEPARATE ILLUSTRATION

<END>

ELECTRICAL AND STARTING SYSTEM

383-6321 PLUG GP-CONNECTOR

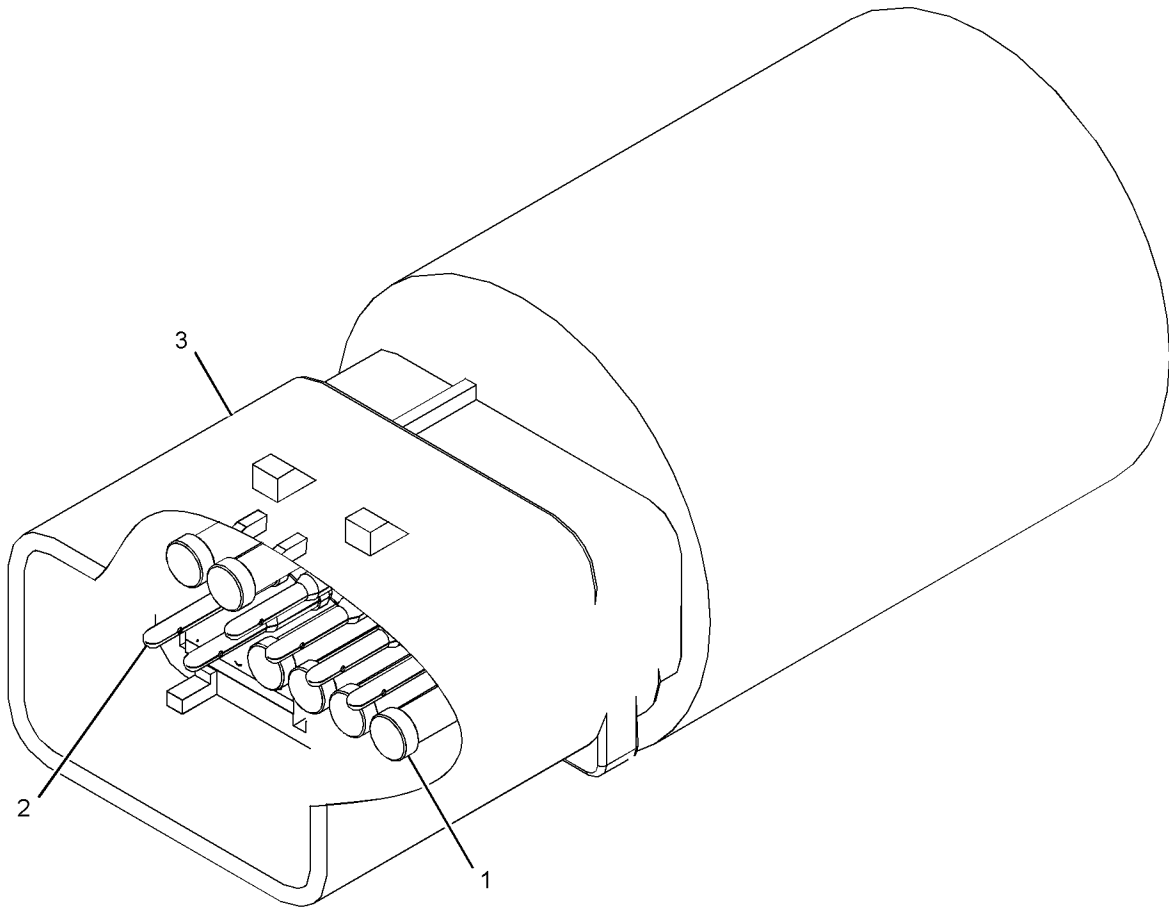
FOR USE WITH OEM HARNESS

PART OF 445-1048, 445-1049, 445-1050 HARNESS AS-ENGINE
AN ATTACHMENT

SMCS-1408

i05096315

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	8T-8737	6	PLUG-SEAL						
	2	1	180-9339	6	PIN-CONNECTOR (14-GA TO 18-GA)						
	3	1	230-4010	1	RECEPTACLE AS-CONNECTOR (12-PIN)						



GRAPHIC #1

<END>

g03267477

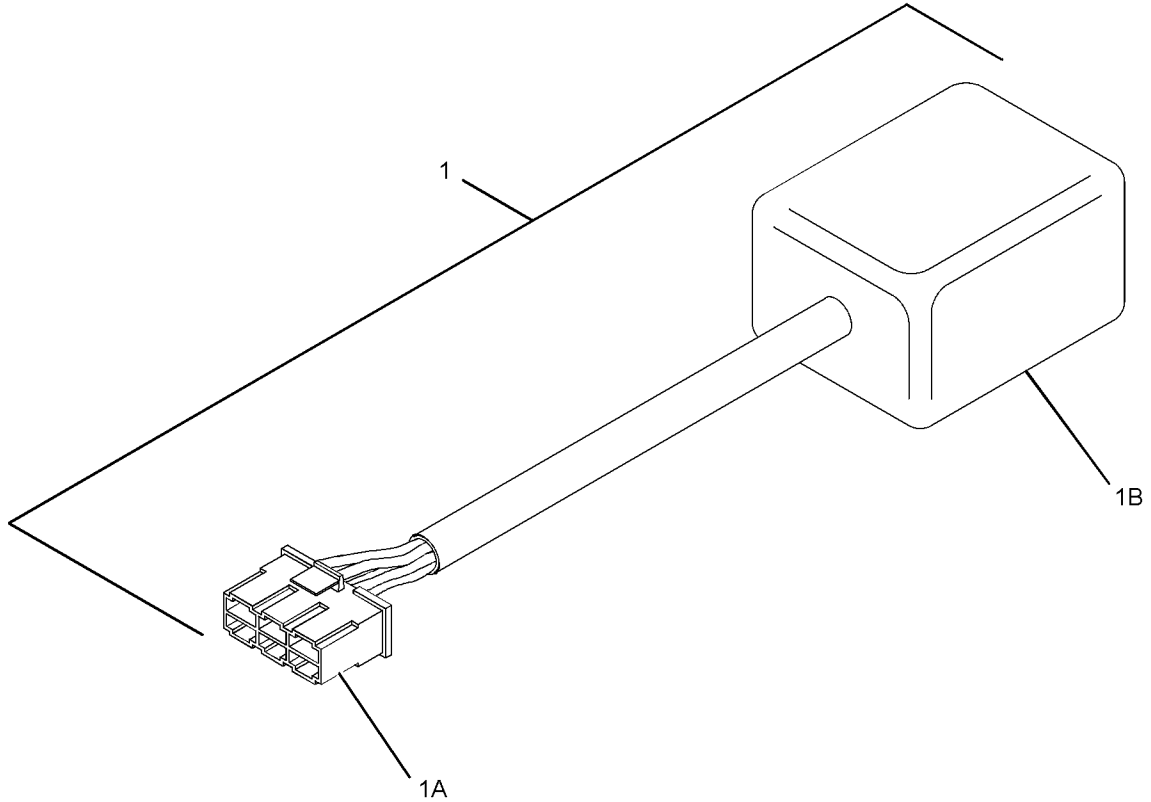
ELECTRICAL AND STARTING SYSTEM

320-9114 SHUTOFF GP-ELECTRICAL

SMCS-7418

i03384232

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	340-0199	1	SHUTOFF GP-ELECTRICAL						
	1A	1	234-8762	1	CONNECTOR						
	1B	1	318-5038	1	BOX						



GRAPHIC #1

<END>

g01504753

ELECTRICAL AND STARTING SYSTEM

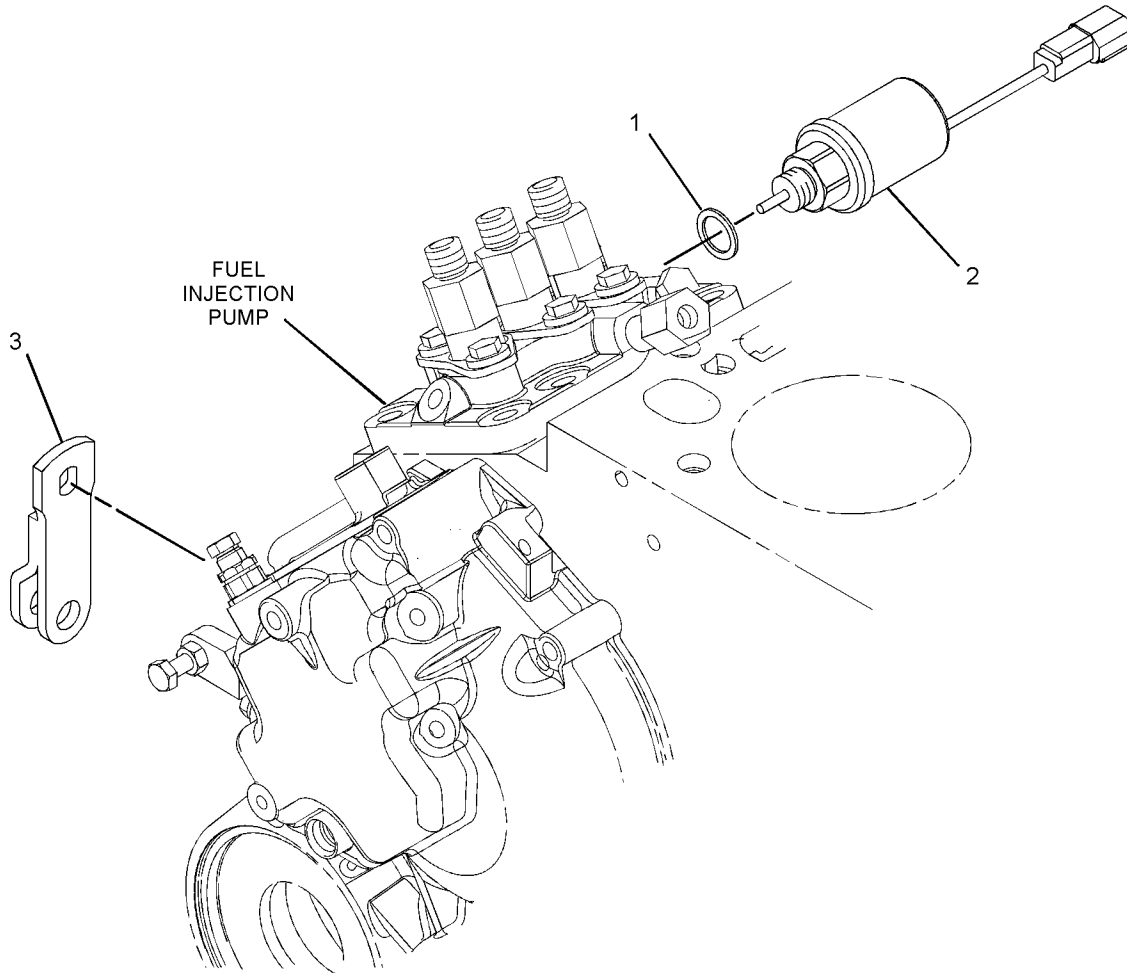
313-2023 SOLENOID GP-SHUTOFF

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1259

i05141380

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6412	1	WASHER						
	2	1	425-7981	1	SOLENOID (FUEL SHUTOFF)						
	3	1	308-1914	1	LEVER-CONTROL						



GRAPHIC #1

<END>

g01388777

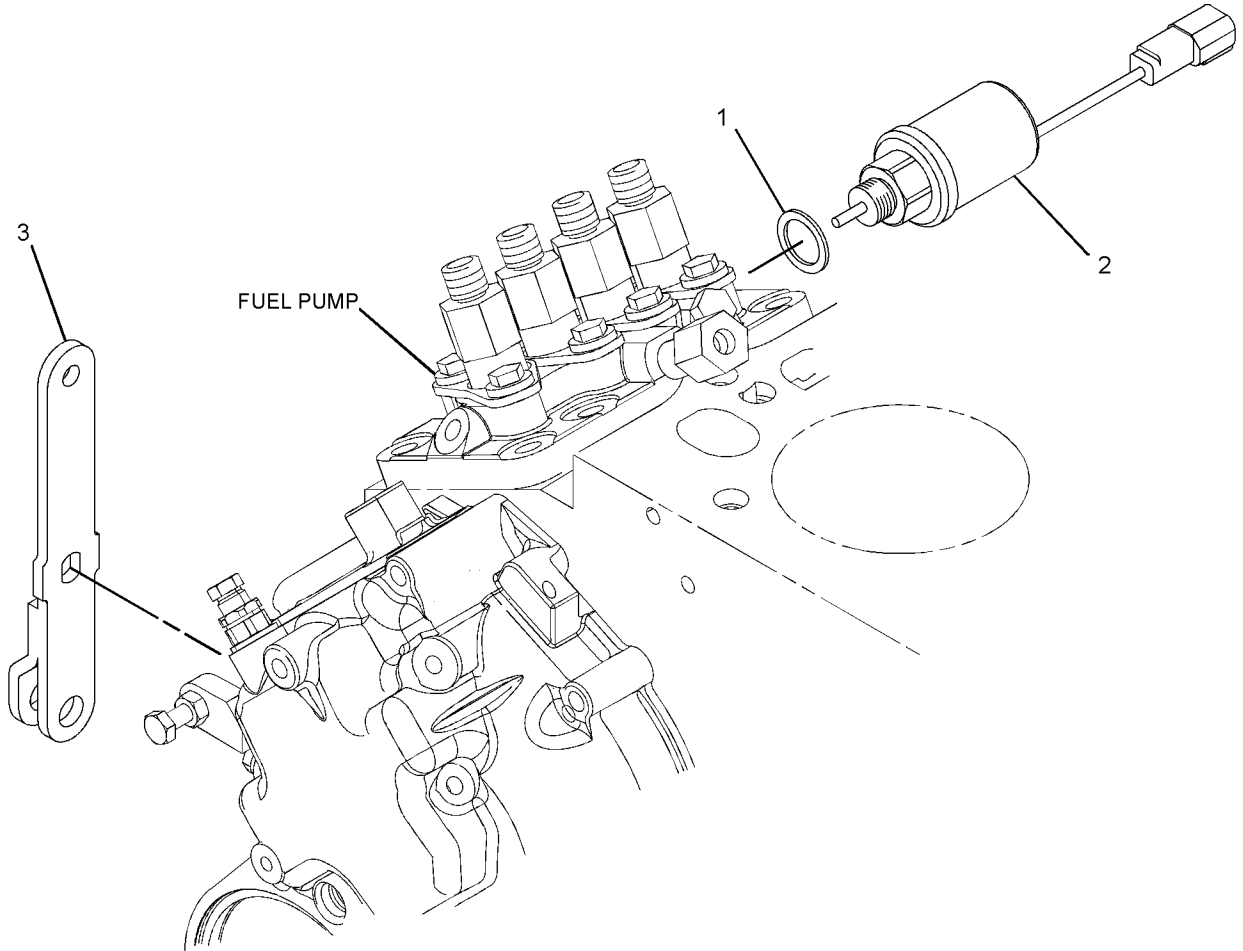
ELECTRICAL AND STARTING SYSTEM

319-7357 SOLENOID GP-SHUTOFF

SMCS-1259

i05141386

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	153-6412	1	WASHER						
	2	1	425-7981	1	SOLENOID (FUEL SHUTOFF)						
	3	1	315-5237	1	LEVER-CONTROL						



GRAPHIC #1

<END>

g01421434

ELECTRICAL AND STARTING SYSTEM

138-7454 STARTING MOTOR GP-ELECTRIC

FIELD REPLACEMENT ORDER 340-8308-PAGE: 198

PART OF 313-1971 STARTING MOTOR GP-ELECTRIC

SMCS-1453

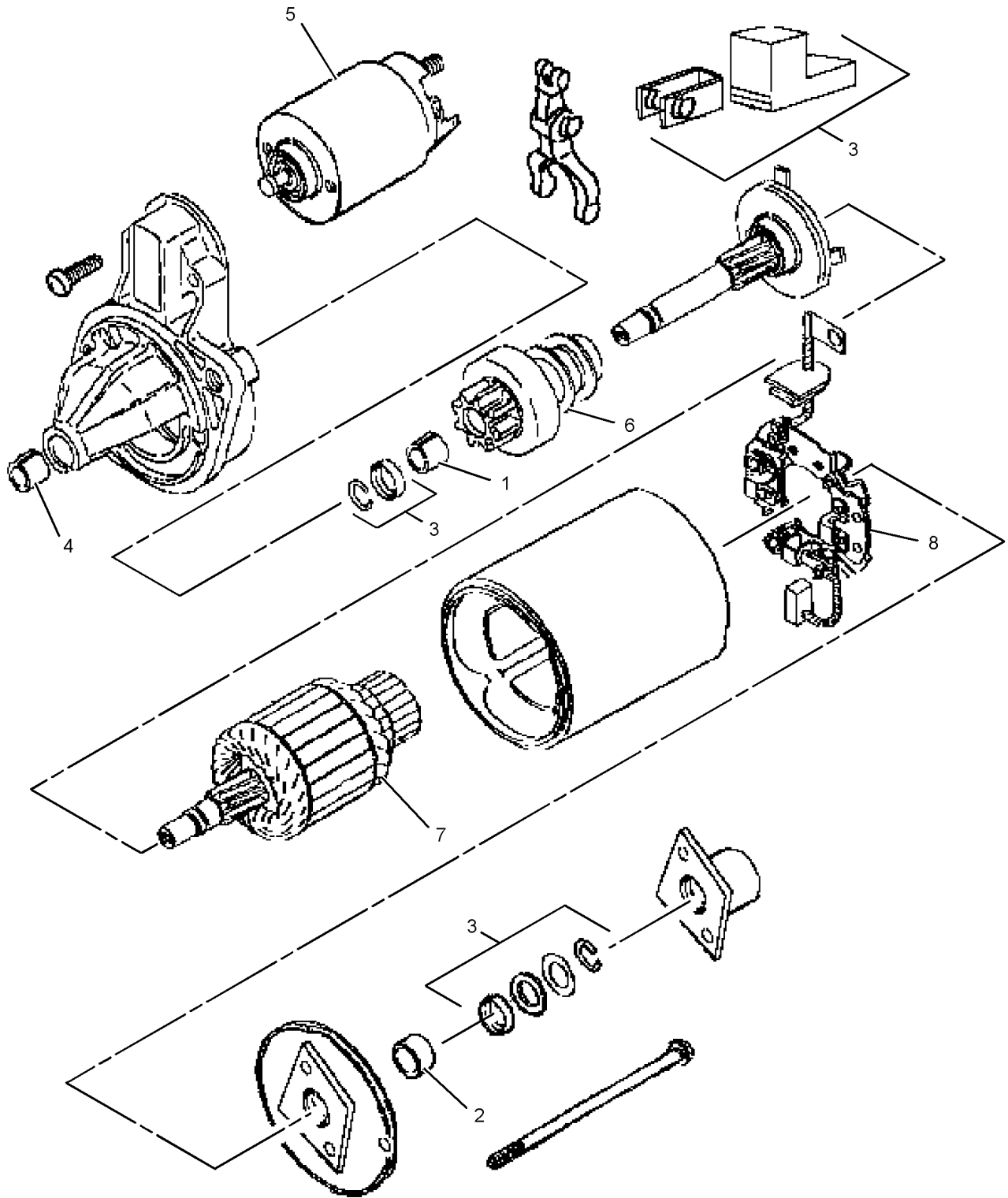
i03386780

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	242-7073	1	BUSHING						
	2	1	242-7076	1	BUSHING						
	3	1	242-7077	1	KIT-STARTING MOTOR						
	4	1	295-8592	1	BUSHING						
	5	1	295-8593	1	SOLENOID						
	6	1	295-8594	1	DRIVE						
	7	1	295-8595	1	ARMATURE						
	8	1	295-8596	1	HOLDER						

ELECTRICAL AND STARTING SYSTEM

138-7454 STARTING MOTOR GP-ELECTRIC (contd.)

i03386780



GRAPHIC #1

<END>

g01376039

ELECTRICAL AND STARTING SYSTEM

313-1971 STARTING MOTOR GP-ELECTRIC

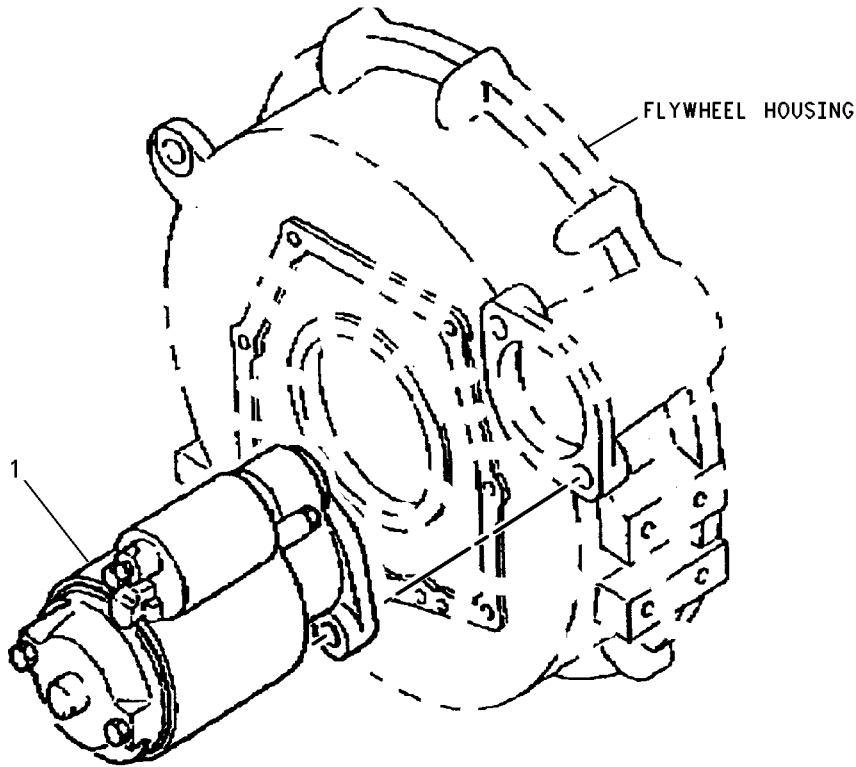
TYPE 1

SMCS-1453

i02904847

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
Y	1	1	138-7454	1	STARTING MOTOR GP-ELECTRIC						190

Y - SEPARATE ILLUSTRATION



GRAPHIC #1

<END>

g00640484

ELECTRICAL AND STARTING SYSTEM

313-1971 STARTING MOTOR GP-ELECTRIC

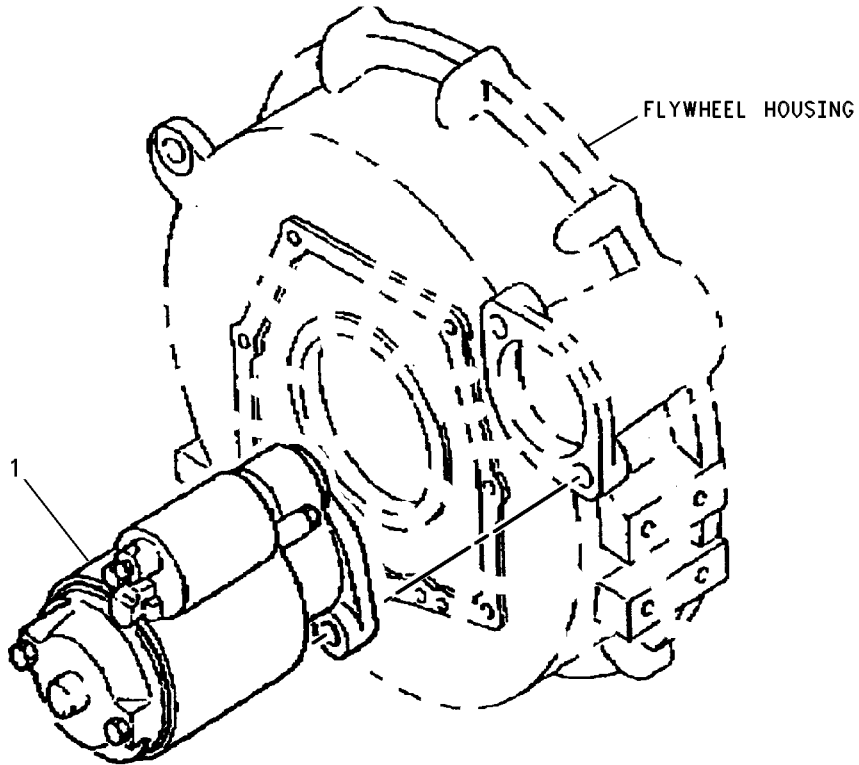
TYPE 2

SMCS-1453

i03938461

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
CY	1	1	367-3767	1	STARTING MOTOR GP-ELECTRIC						199

C - CHANGE FROM PREVIOUS TYPE
Y - SEPARATE ILLUSTRATION



GRAPHIC #1

<END>

g00640484

ELECTRICAL AND STARTING SYSTEM

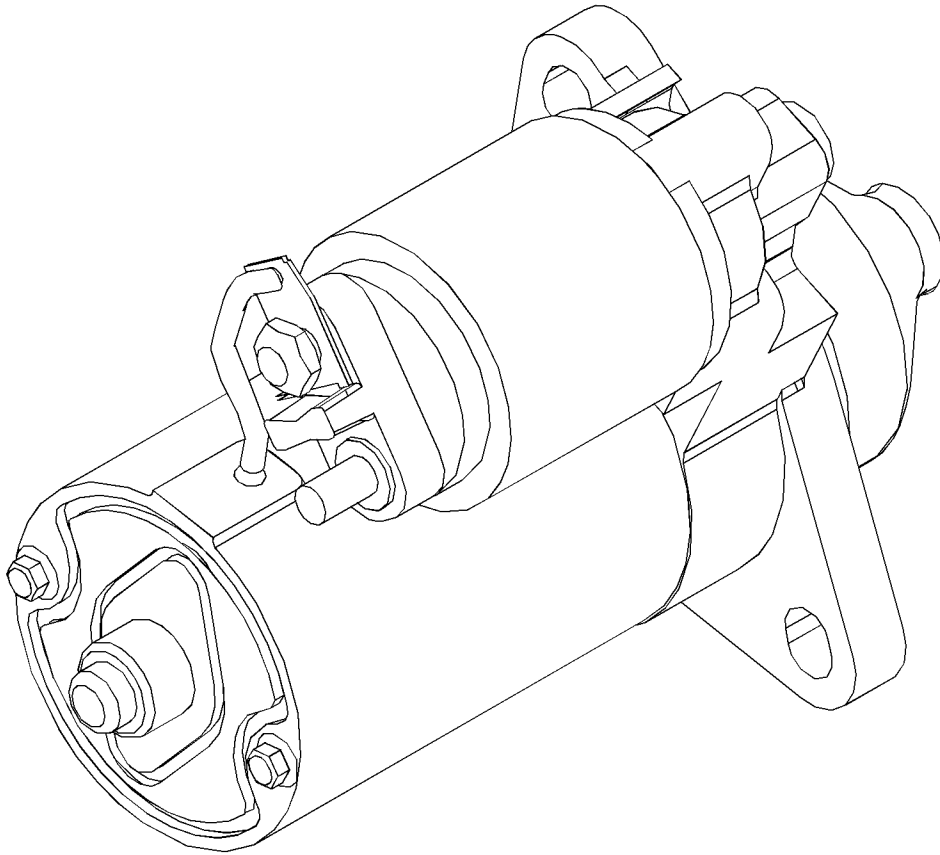
313-1971 STARTING MOTOR GP-ELECTRIC

TYPE 3

SMCS-1453

i05337795

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
(NO SERVICED PARTS)											



GRAPHIC #1

<END>

g03385028

ELECTRICAL AND STARTING SYSTEM

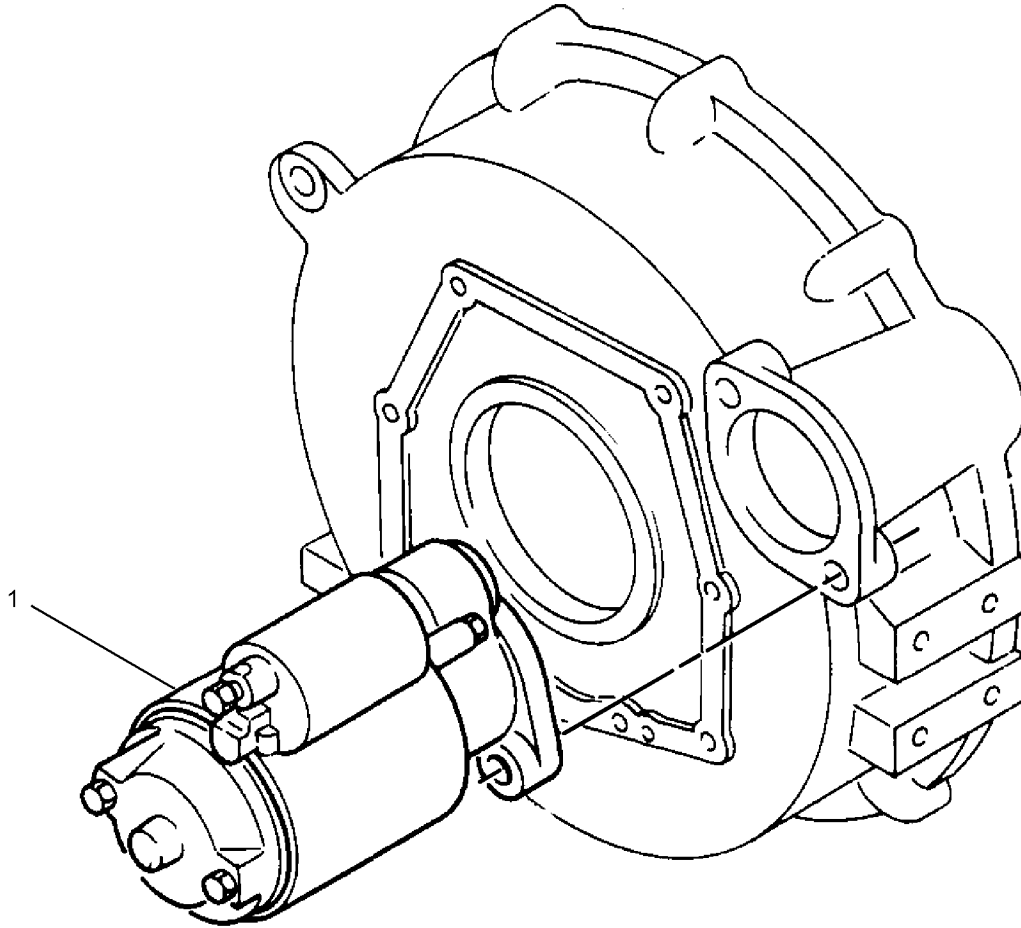
319-7351 STARTING MOTOR GP-ELECTRIC

TYPE 1

SMCS-1453

i03125340

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
1	1	1	138-6754	1	STARTING MOTOR GP-ELECTRIC						



GRAPHIC #1

<END>

g01350527

ELECTRICAL AND STARTING SYSTEM

319-7351 STARTING MOTOR GP-ELECTRIC

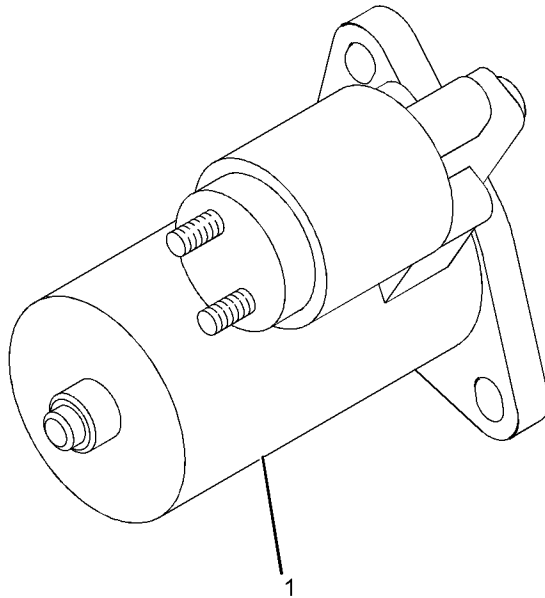
TYPE 2

SMCS-1453

i05260653

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
CY	1	1	361-3767	1	STARTING MOTOR GP-ELECTRIC						199

C - CHANGE FROM PREVIOUS TYPE
Y - SEPARATE ILLUSTRATION



GRAPHIC #1

<END>

g03349000

ELECTRICAL AND STARTING SYSTEM

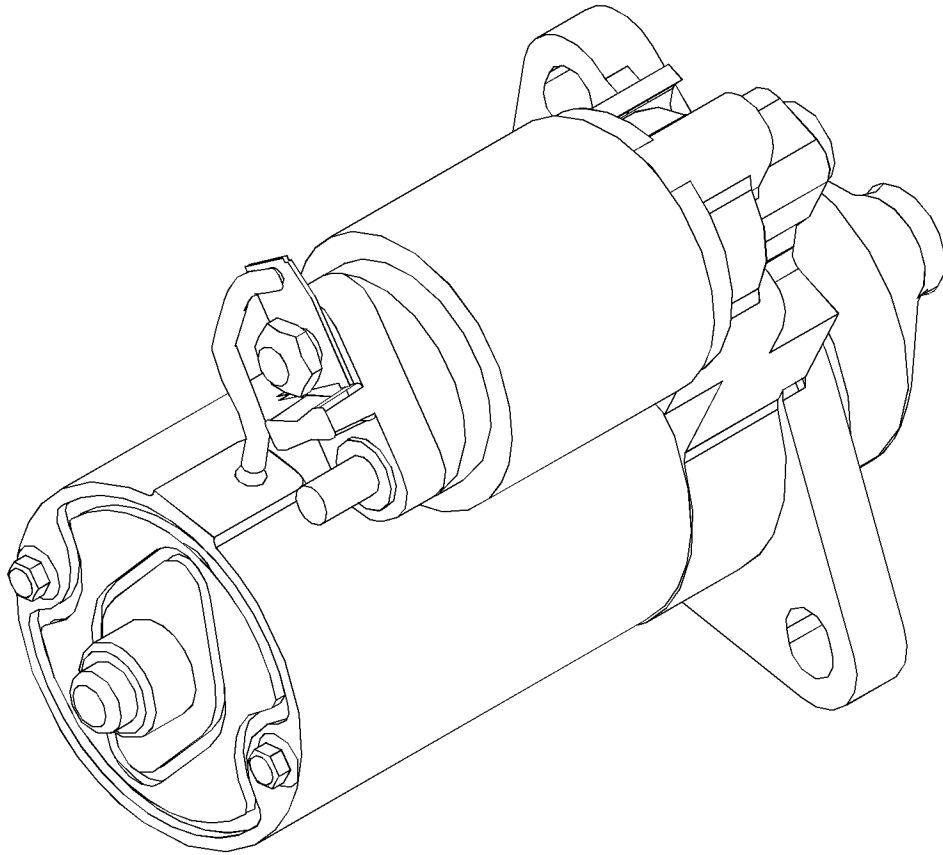
319-7351 STARTING MOTOR GP-ELECTRIC

TYPE 3

SMCS-1453

i05337806

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME	SEE PAGE
					1 2 3 4 5 6 (PRODUCT LEVEL)	
(NO SERVICED PARTS)						



GRAPHIC #1

<END>

g03385406

ELECTRICAL AND STARTING SYSTEM

340-8308 STARTING MOTOR GP-ELECTRIC

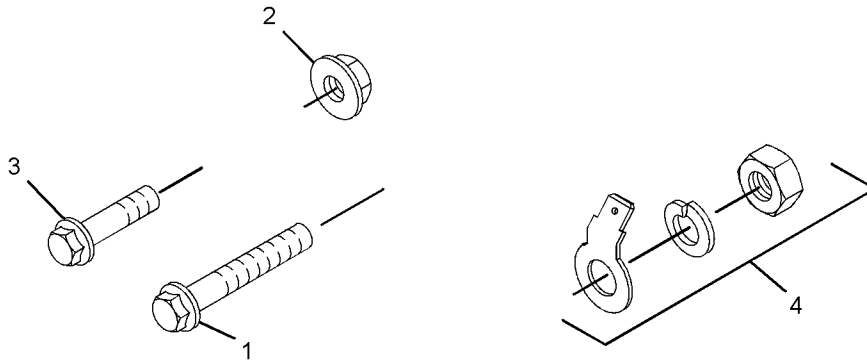
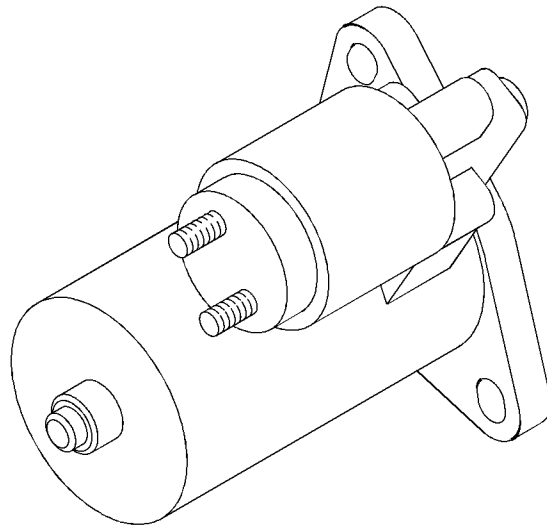
FIELD REPLACEMENT FOR 138-7454-PAGE: 190, 361-3767-PAGE: 199

SMCS-1453

i03386920

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
M	1	1	6I-0593	2	BOLT (M10X1.5X30-MM)						
	2	1	6I-0594	2	NUT (M10X1.5-THD)						
M	3	1	140-8783	2	BOLT (M10X1.5X45-MM)						
	4	1	333-7903	1	KIT-TERMINAL						

M - METRIC PART



GRAPHIC #1

<END>

g01755193

ELECTRICAL AND STARTING SYSTEM

361-3767 STARTING MOTOR GP-ELECTRIC-12-VOLT

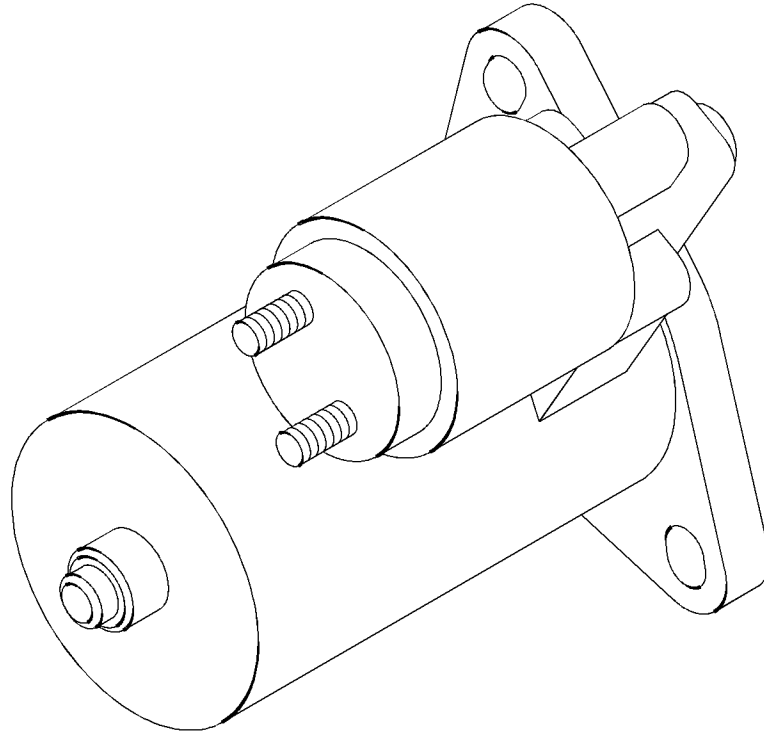
FIELD REPLACEMENT ORDER 340-8308-PAGE: 198
PART OF 313-1971, 319-7351 STARTING MOTOR GP-ELECTRIC

SMCS-1453

i03938013

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	

(NO SERVICED PARTS)



GRAPHIC #1

<END>

g02158607

ELECTRICAL AND STARTING SYSTEM

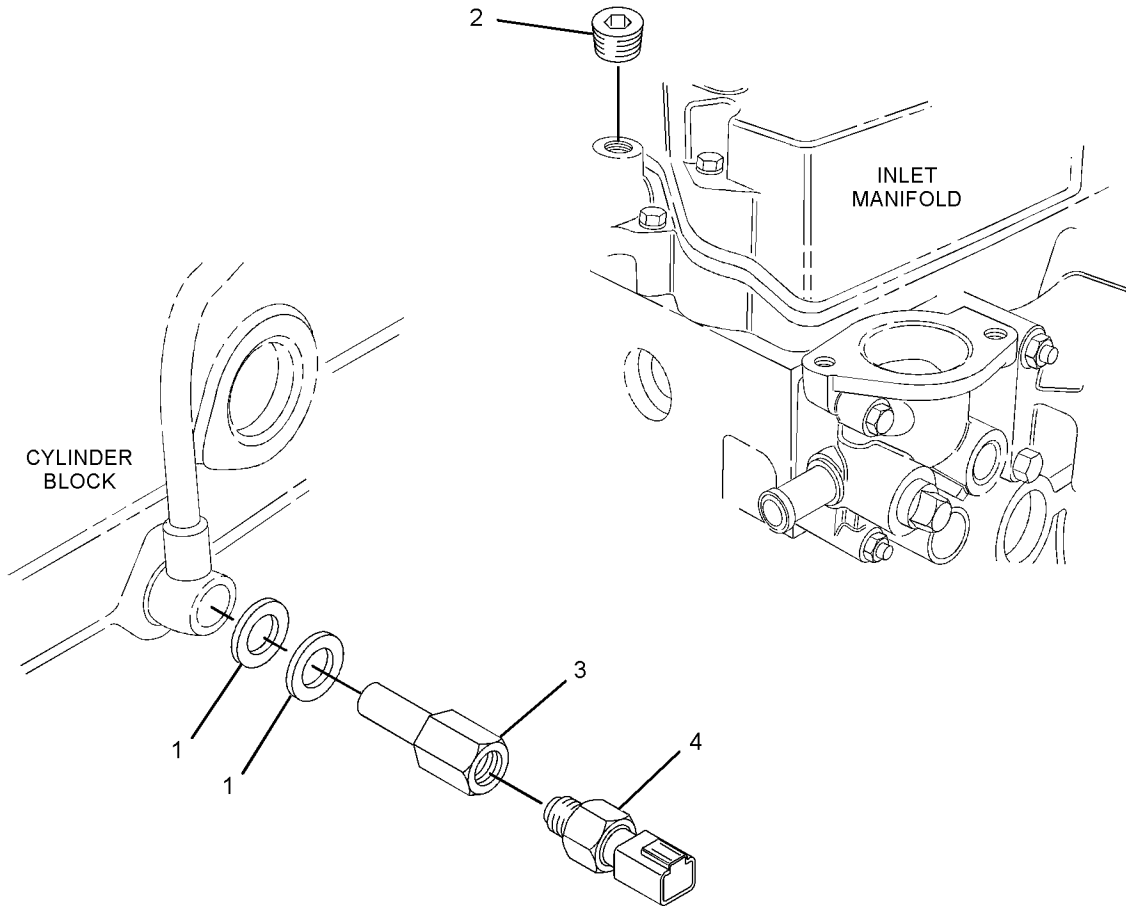
313-2024 SWITCH GP-PRESSURE-ENGINE OIL

PART OF 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-7400, 7421

i05533003

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5936	2	WASHER						
	2	1	183-1165	1	PLUG						
	3	1	438-1431	1	ADAPTER						
	4	1	292-1993	1	SWITCH-PRESSURE (ENGINE OIL)						



GRAPHIC #1

<END>

g03505827

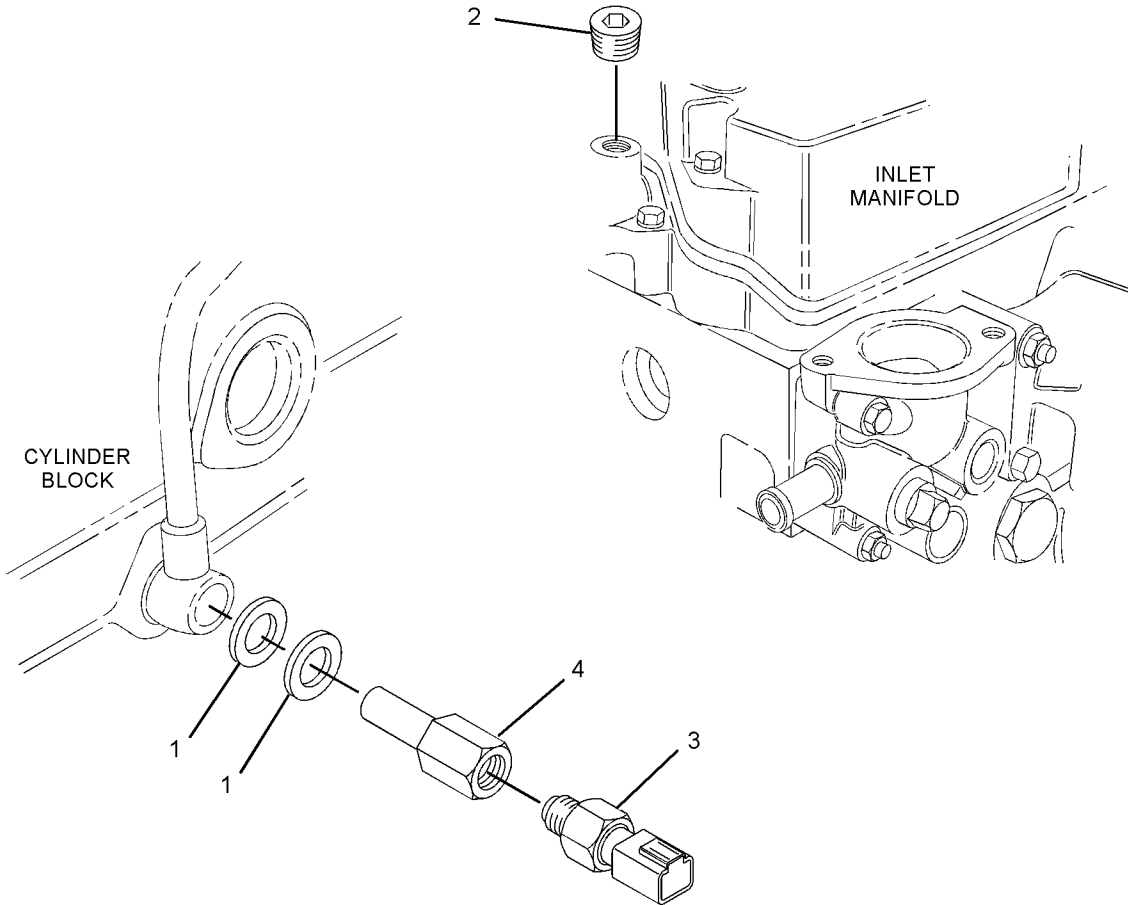
ELECTRICAL AND STARTING SYSTEM

315-6638 SWITCH GP-PRESSURE-ENGINE OIL PART OF 435-1632 CYLINDER BLOCK GP

SMCS-7400, 7421

i05533332

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5936	2	WASHER						
	2	1	183-1165	1	PLUG						
	3	1	291-1265	1	SWITCH-PRESSURE (ENGINE OIL)						
	4	1	438-1431	1	ADAPTER						



GRAPHIC #1

<END>

g03505824

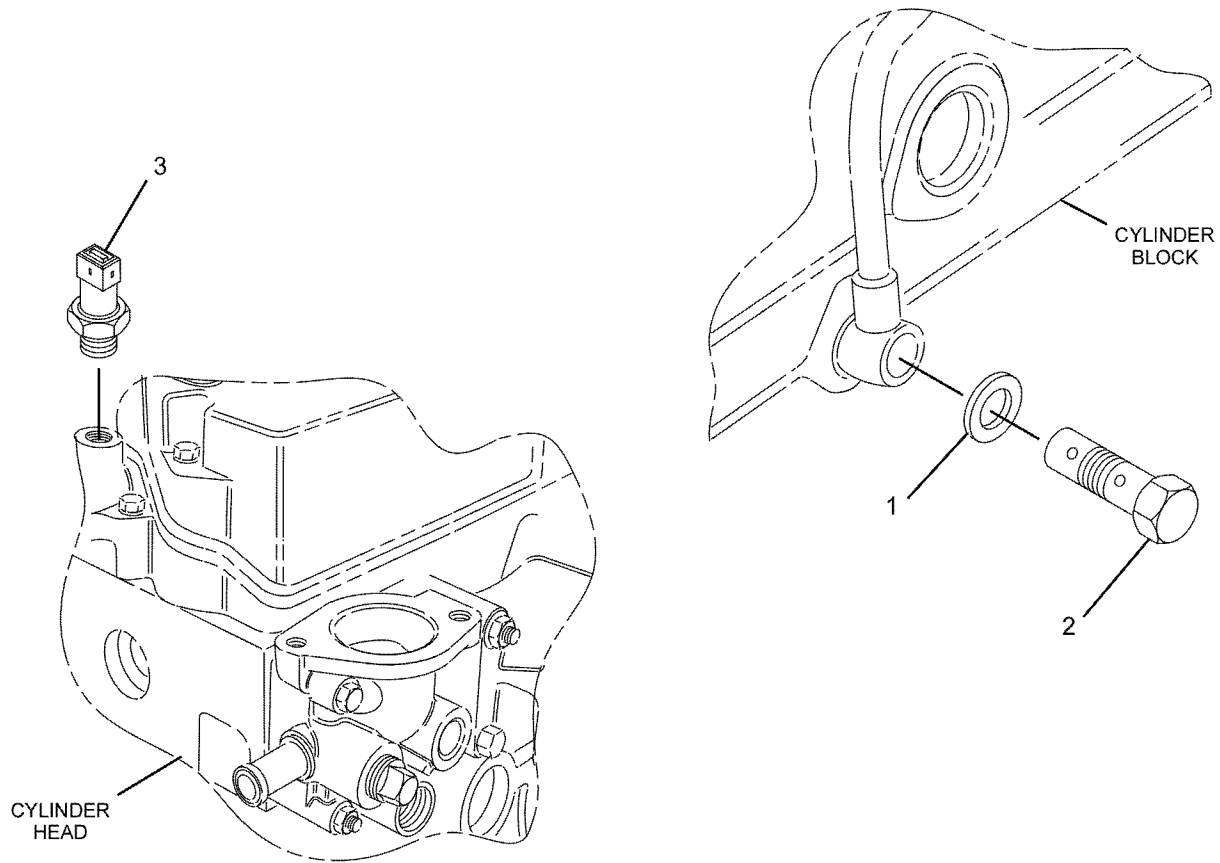
ELECTRICAL AND STARTING SYSTEM

319-7358 SWITCH GP-PRESSURE

SMCS-7400, 7421

i03334605

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-5936	2	WASHER						
	2	1	153-6881	1	BOLT						
	3	1	292-1993	1	SWITCH-PRESSURE (ENGINE OIL)						



GRAPHIC #1

<END>

g01141865

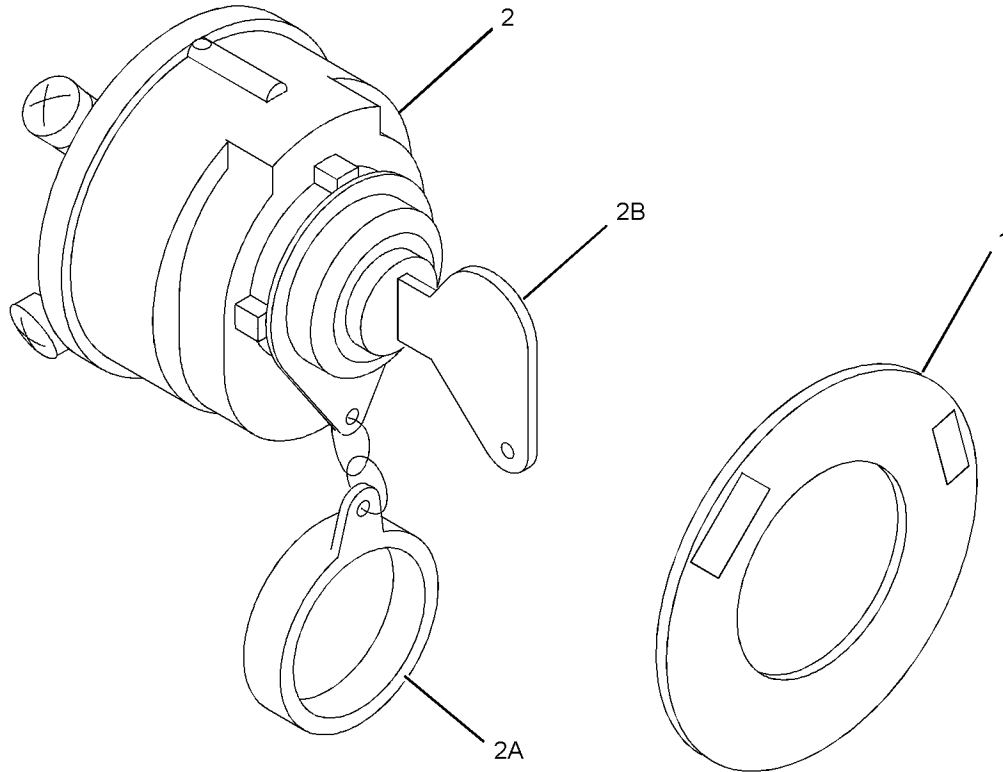
ELECTRICAL AND STARTING SYSTEM

308-2314 SWITCH GP-START

SMCS-1416

i05815178

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6	
	1	1	183-5460	1	PLATE						
	2	1	359-6000	1	SWITCH AS-START						
	2A	1	183-5458	1	CAP						
	2B	1	361-3925	1	KEY-IGNITION						



GRAPHIC #1

<END>

g01389581

ELECTRICAL AND STARTING SYSTEM

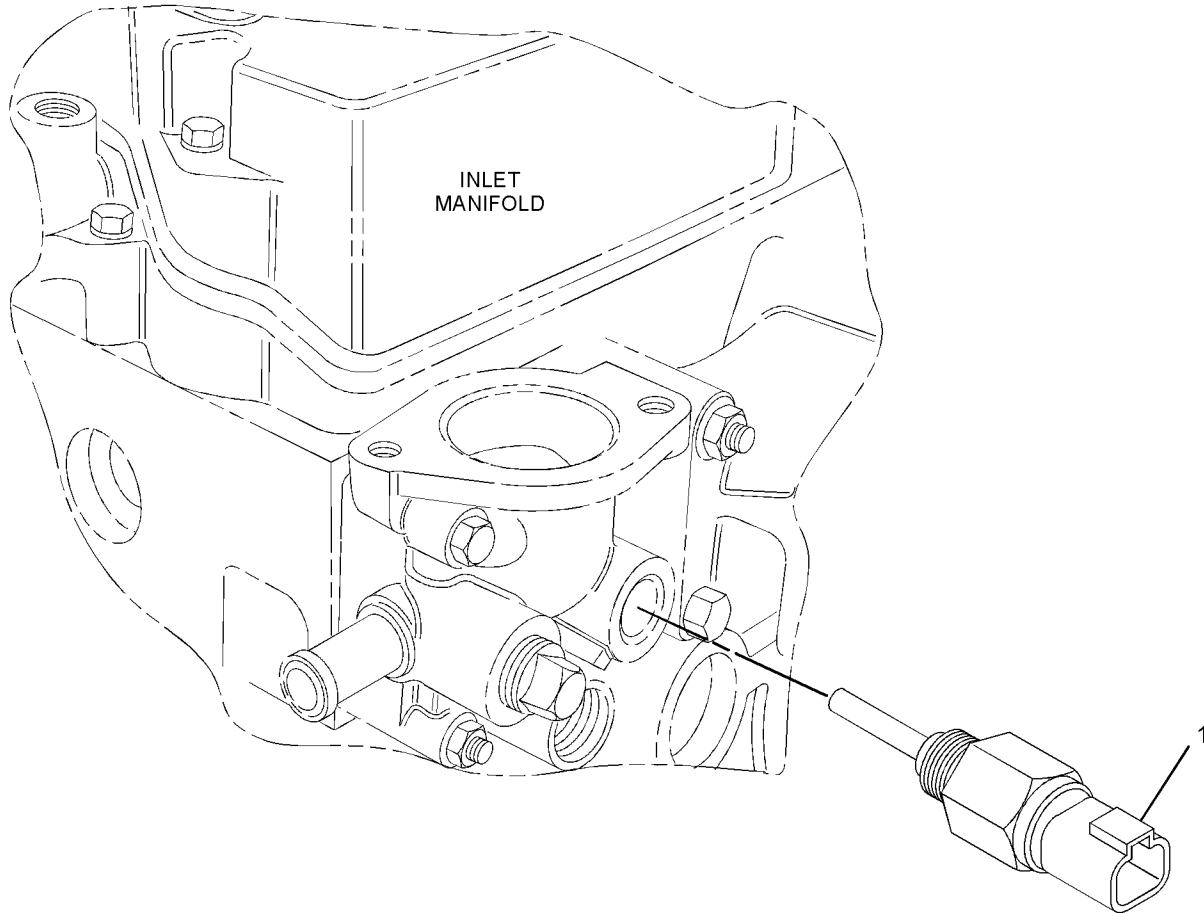
313-2035 SWITCH GP-TEMPERATURE-COOLANT

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-7400

i04899478

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	341-3600	1	SWITCH-TEMPERATURE (ENGINE COOLANT)						



GRAPHIC #1

<END>

g03076218

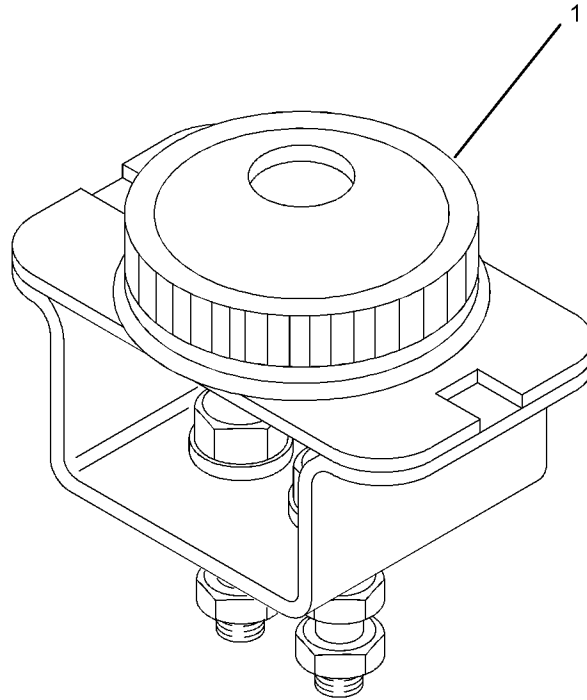
OPERATOR STATION

313-2026 LAMP GP-INDICATOR

SMCS-7451

i02904769

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	197-8547	1	LAMP (GLOW PLUG INDICATOR)						



GRAPHIC #1

<END>

g01389239

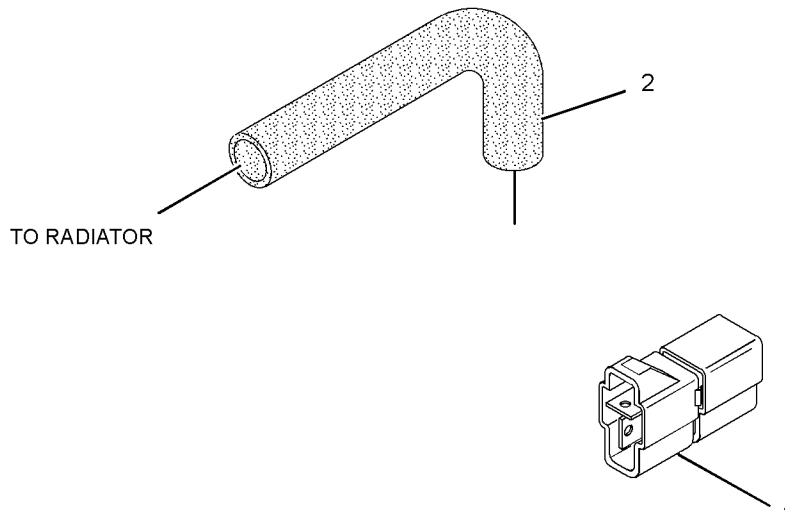
SERVICE EQUIPMENT AND SUPPLIES

329-4428 PARTS GP-MISCELLANEOUS

SMCS-1000, 7950

i03124529

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	200-5976	1	CONNECTION						
	2	1	244-0503	1	HOSE - RADIATOR						



GRAPHIC #1

<END>

g01960513

SERVICE EQUIPMENT AND SUPPLIES

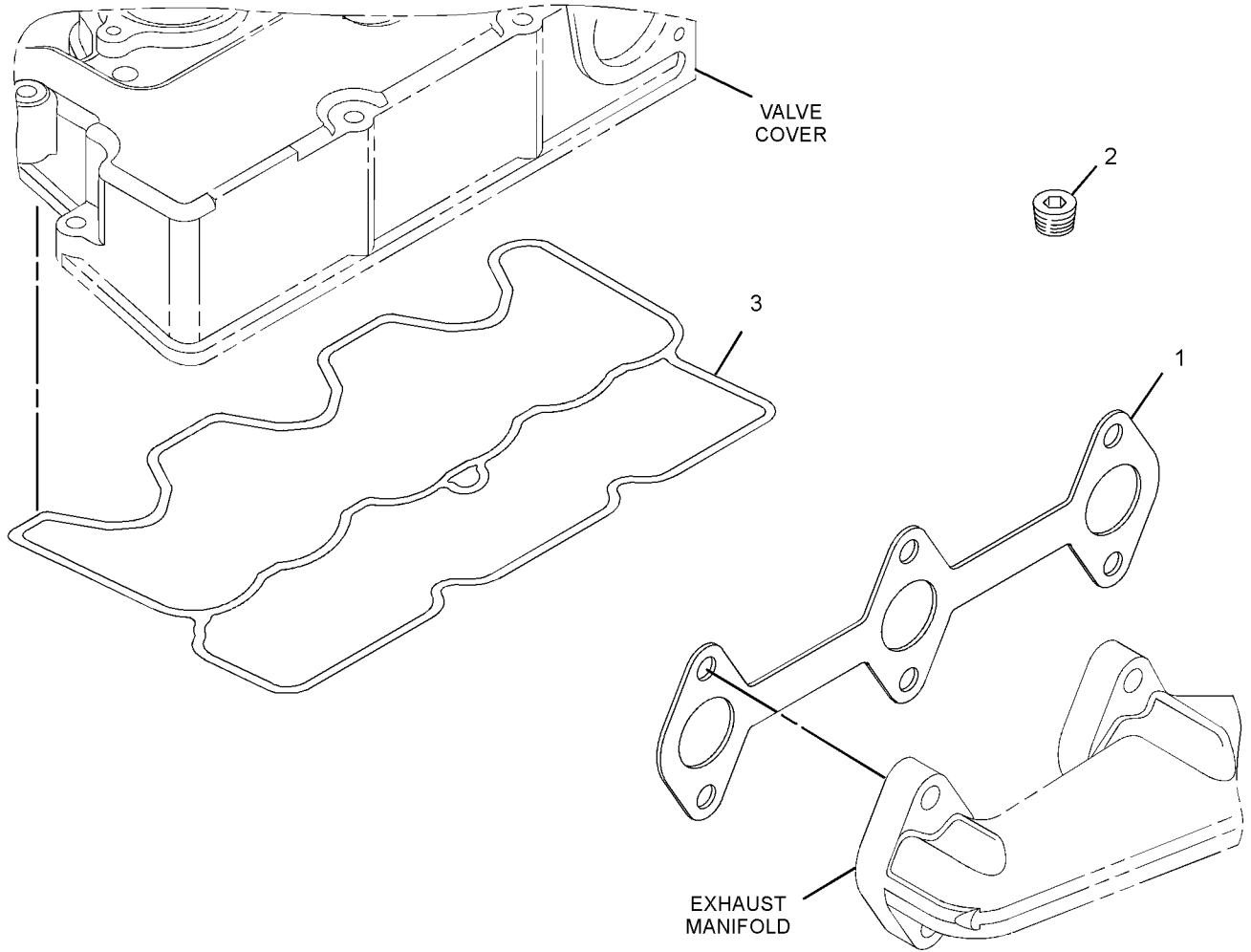
342-7622 PARTS GP-MISCELLANEOUS

PART OF 435-1632, 435-1644 CYLINDER BLOCK GP, 435-1648 CYLINDER BLOCK GP-LONG, 435-1643, 435-1650, 435-1651 ENGINE AR

SMCS-1000, 7950

i05374888

NOTE	REF NO	GRAPHIC REF	PART NUMBER	QTY	PART NAME						SEE PAGE
					1	2	3	4	5	6 (PRODUCT LEVEL)	
	1	1	153-6860	1	GASKET						
	2	1	183-1165	1	PLUG						
	3	1	444-7398	1	GASKET-COVER						



GRAPHIC #1

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g03418336

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