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4 TROUBLESHOOTING GUIDE

5 WARRANTY

HATZ DIESEL

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AVERY™ READY INDEX® INDEXING SYSTEM

information

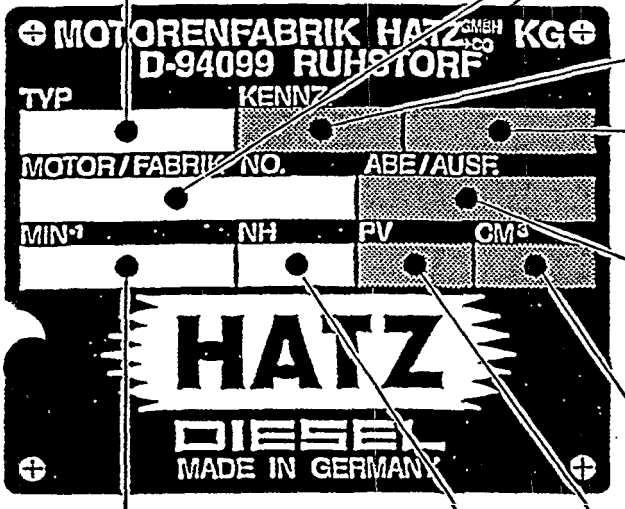
HATZ DIESEL

☐ SALES
☐ ENGINEERING
■ SERVICE
☐ PARTS

Bulletin No. **SE02C**

Date **08/01/99**

Subject: **SERIAL NUMBER DATA PLATE - LOCATION AND INFORMATION**
(Information Bulletin SE02B should be discarded and replaced with SE02C)



① TYP = Engine Type and Model

④ MOTORENFABRIK NO. = Serial Number*

② KENNZ. = Customer-Specification Number (on some engines)

③ Output in kW.

⑤ ABE/AUSF. = Execution Code (not used in **USA)**

⑨ CM^3 = Engine Displacement

⑧ PV = Special Factory Adjustment

⑦ **NH** = Fuel Rack **Setting** in Millimeters

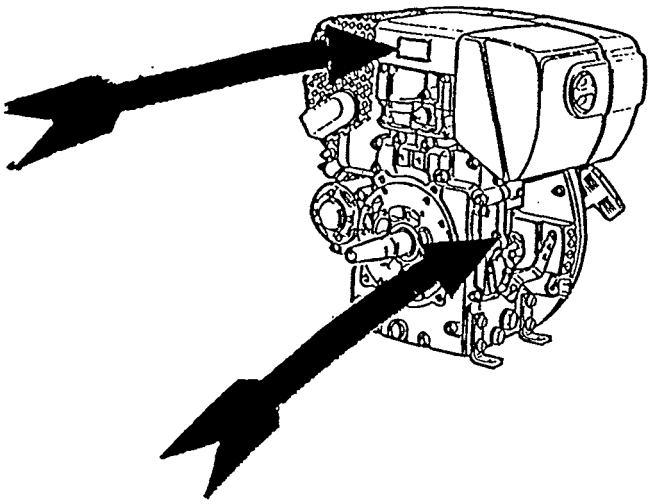
⑥ MIN-1 = **Maximum** Engine **Speed** (R.P.M.)

Sample Serial Number

024	**10**	**78**	123456
Type	Series	Year	Consecutive
Model		of	Numbering
(E79)		Manufacture	

*Beginning in 1994 the 12-digit serial **number was** increased to 13 digits. The Type/Model designation is now preceded with a zero because **of** the 3-digit model numbers.

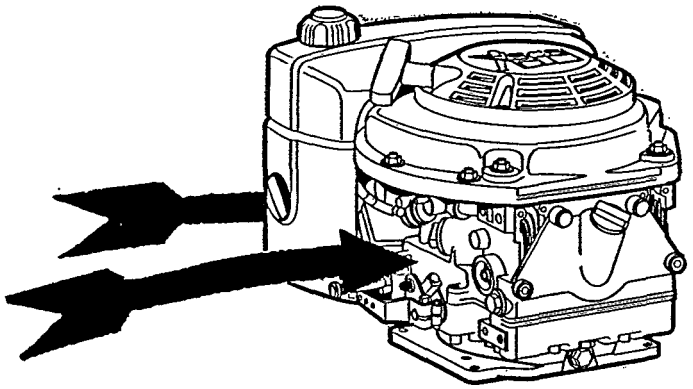
David Carlson,
Service Manager



1B20 1B30

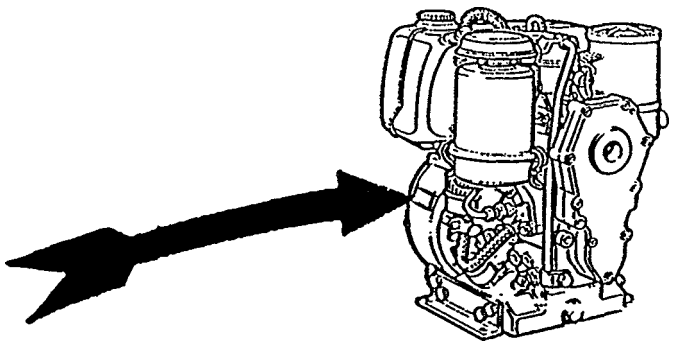
On **center** of **air ducting** on **PTO side.**

Later models, also on **crankcase by oil** fill **plug.**



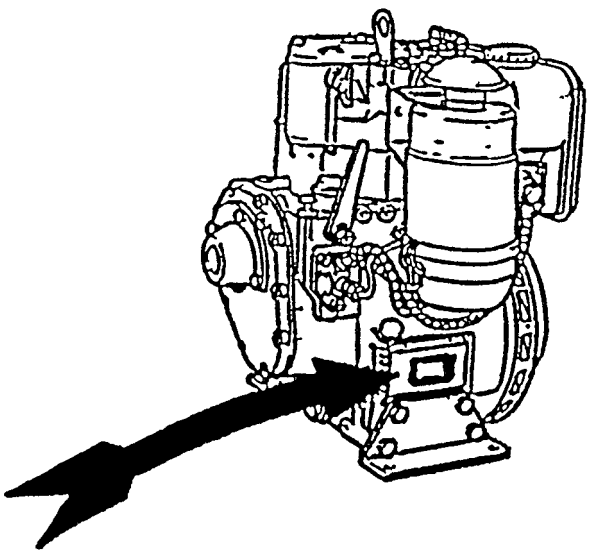
1B20V 1B30V

On center of air ducting between muffler and air cleaner on back side (can't see it in this view) and **on crankcase by side oil fill plug.**



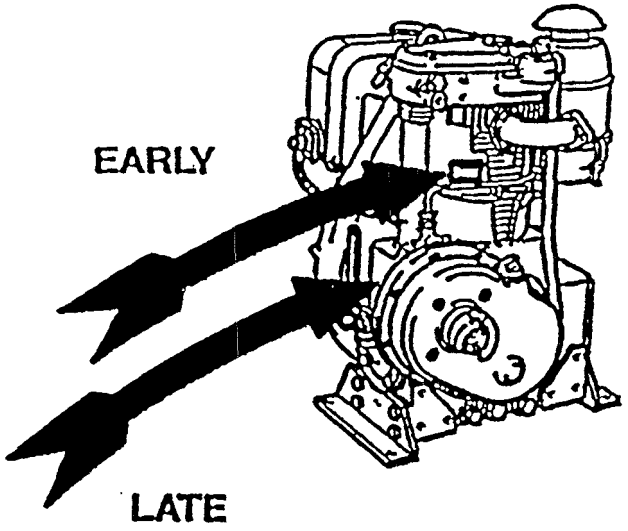
E671 E672 E673

On crankcase housing surrounding flywheel (injection **pump side),**



E71 E75 E79 E780 E785 E786

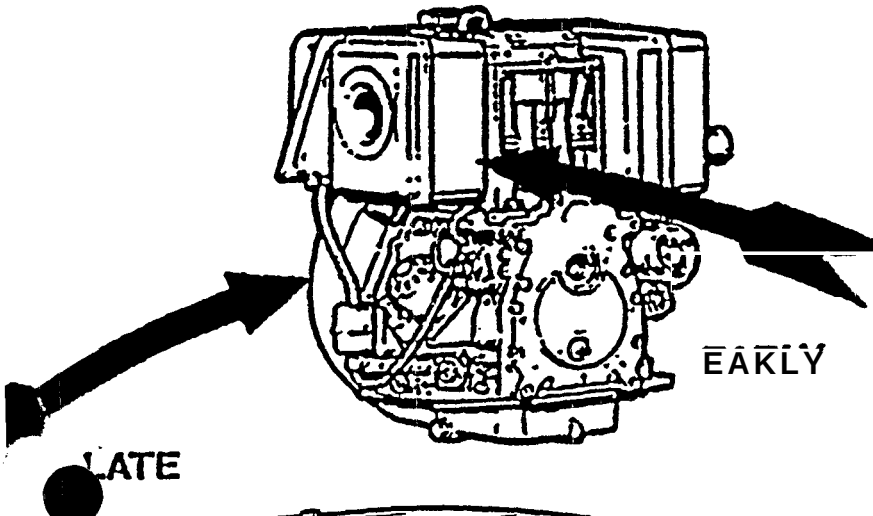
On air ducting below air cleaner near dipstick.



E80 **ES5** E88 E89

Early: On air ducting near **exhaust port (early).**

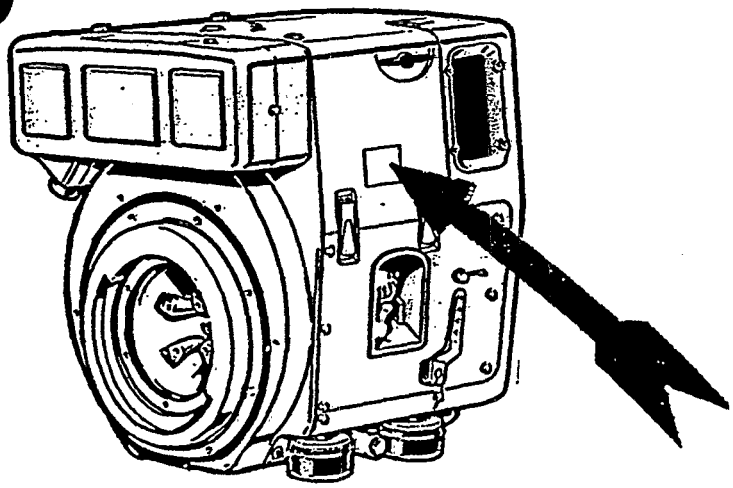
Late: Near **throttle lever (late).**



Small block – 1D30/31 1D40/41/50
Large block – 1D60 1D80/81

Early: On *air* filter housing.

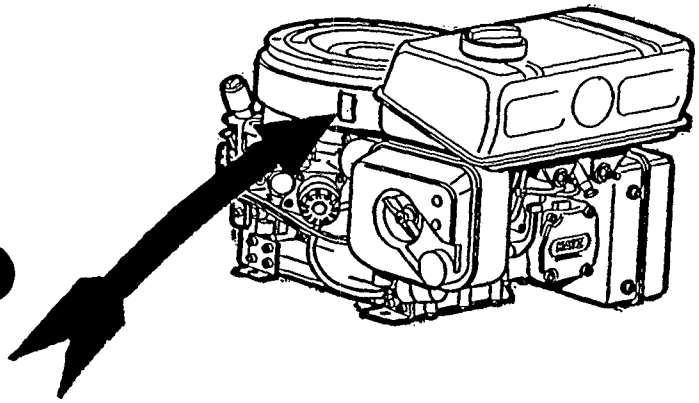
Late: On flywheel housing (injection pump side).



1D30/31C 1D40/41C 1D60C 1D80/81C

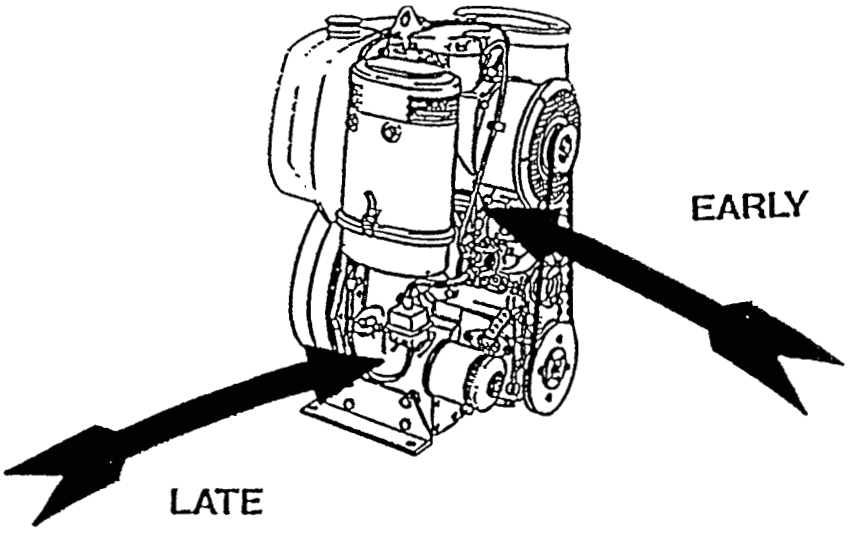
On sheetmetal panel on oil dipstick side.

Same location on the engine as above.



1D90V 1D90W

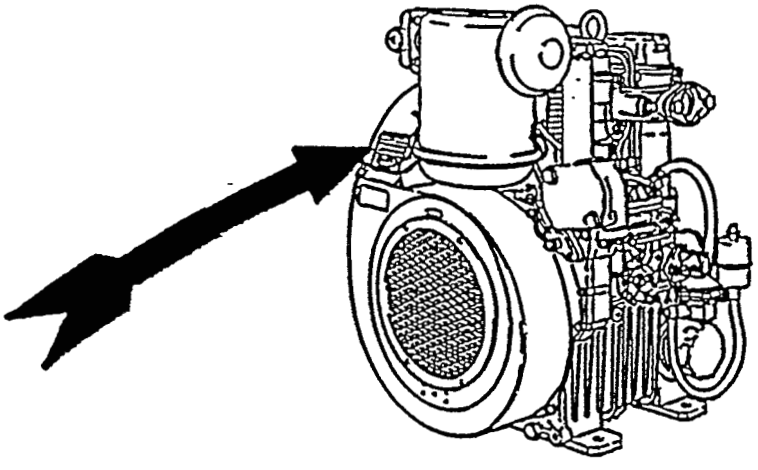
On flywheel housing, injection pump side.



E *950*

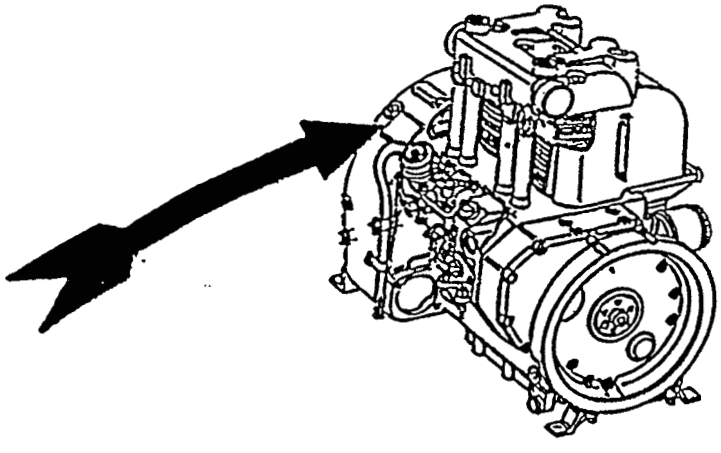
Early: On air ducting behind air filter (early),

Late: Near oil filter (late),



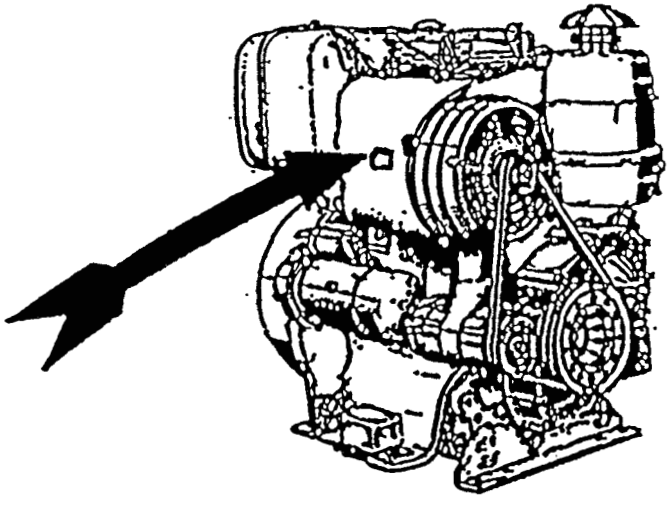
2G30 2G40

On air ducting above flywheel.



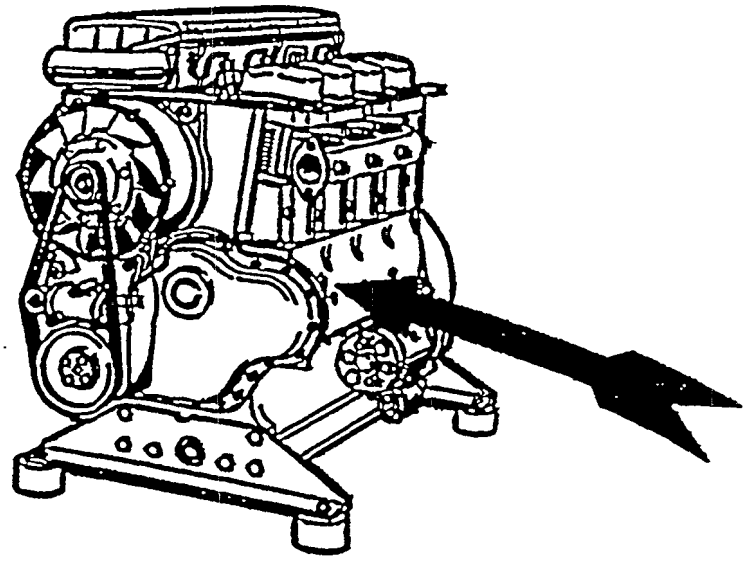
2782 2788 2789 2790

Near breather tube on flywheel side,



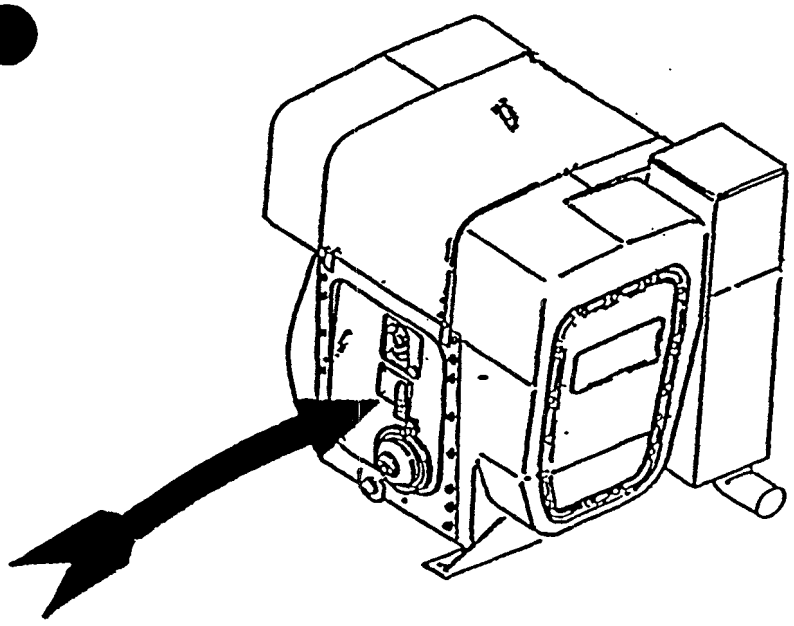
E108 2108 D108 V108

On air ducting behind fan



2L30 3L30 4L30
2L31 3L31 4L31
2L40 3L40 4L40
2M31 3M31 4M31
2M40 3M40 4M40
2M41 3M41 4M41

Below exhaust manifold behind timing ***gear*** **cover,**



Silent Packs "C"

2L30 3L30 4L30
2L31 3L31 4L31
2L40 3L40 4L40
2L41 3L41 4L41

Near throttle lever, also **below** exhaust manifold inside capsule.

MODEL INFORMATION

MODEL	SIN ** (Type)	First/Last Year of Production
E 90	1	1952 - 1956
Z 90 R	2	1953 - 1965
E 80	3	1953 - 1960
E 100	4	1953 - 1965
Z 100 R	5	1954 - 1959
E 85	9	1954 - 1960
E 85 F	10	1954 - 1957
E 89	11	1955 - 1995
E 80 F	12	1955 - 1997
D 100	13	1956 - 1959
E 85 F-B	14	1956 - 1984
E 80 F-B	15	1957 - 1984
E 75	16	1958 -
Z 105 R	17	1958 - 1967
D 105	18	1959 - 1967
E 95	19	1964 - 1974
Z 95	20	1964 - 1974
D 95	21	1965 - 1974
V 95	22	1965 - 1974
E 71	23	1961 - 1991
E 79	24	1962 -
E 780	27	1964 - 1998
E 785	28	1965 - 1984
E 671	29	1966 - 1974
E 571	30	1966 - 1975
Z 782	32	1968 - 1974
E 108	33	1969 - 1985
Z 108	34	1970 - 1987
D 108	35	1970 - 1987
V 108	36	1970 - 1987
Z 790	37	1971 -
E 950	44	1973 - 1990
E 572	45	1974 - 1977
E 672	46	1972 - 1977
Z 788	48	1973 - 1994
Z 789	49	1973 - 1994
2L30	51	1977 - 1988
3L30	52	1977 - 1988
4L30	53	1977 - 1988

MODEL	SIN ** (Type)	First/Last Year of Production
E 88	55	1984 - 1993
E 673	56	1977 -
E 573	57	1977 - 1998
HE 673	58	1978 - 1992
HE 780	59	1978 - 1992
H 2L30	60	1978 - 1989
H 3L30	61	1979 - 1989
A 1D40	62	1989 - 1995
2L40	64	1981 - 1998
3L40	65	1982 - 1998
4L40	66	1982 - 1998
2L31	68	1986 - 1995
3L31	69	1985 - 1995
4L31	70	1986 - 1995
1D31	71	1995 - 1998
1D81	73	1994 -
E 786	77	1984 - 1996
2M40	78	1984 - 1998
3M40	79	1984 - 1998
4M40	80	1984 - 1998
2G30	82	1986 - 1995
2M31	84	1987 - 1995
3M31	85	1987 - 1995
4M31	86	1987 - 1995
1D40	88	1989 - 1995
1D60	89	1989 - 1998
1D80	90	1989 - 1995
2G40	91	1988 -
1D30	92	1989 - 1995
1D35	93	1989 - 1997
1D41	94	1994 -
A1D41	95	1995 - 1998
1820	100	1997 -
1B30	101	1997 -
2L41	102	1997 -
3L41	103	1997 -
4L41	104	1997 -
2M41	105	1997 -
3M41	106	1997 -
4M41	107	1997 -
1D90	108	1997 -
1D50	109	1998 -
1B40	110	2000 -
1B20V	111	1998 -
1B30V	112	1998 -
1D90V	113	1998 -

** *Beginning* number(s) of engine serial nos.

6/99

LIST OF ENGINE FAMILIES, TYPES AND VERSIONS

Ed. 04,99

Range and colour	Basic-type	Bore x stroke (mm)	Type No.	Versions	Remark and explanation of code letters
B..	1 B 20	69 x 62	100		p.t.o.-shaft, Integral with crankshaft
	1 B 20 V	69 x 62	111	- 4	= SAE, tapered, ¾"
apple	1 B 30	80 x 69	101	- 6	= ital. tapered 23 mm
green	1 B 30 V	80 x 69	112	- 7	= SAE cyl. ¾" (keyway)
				- 8	= ditto with male-thread
	1 B 40		110	- 9	= cylindr. 20 mm Ø (keyway)
	serial production proposed for May 2000			- x	...x = short crankshaft, to screw in stubshaft or any other p.t.o. component
					..V = horizontal position with vertical crankshaft
5/6	E 571...*	71 x 57	36	)..LN(F)*	E ... ... = single cylinder
	E 671...*	71 X67	28	)..RN(F)*	. ... L. = anti-clockwise rotation
blue	E 572...*	71 x 57	45	)..LK(F)*	. ... R. = clockwise rotation
	E 672...*	71 x 67	46	)..RK(F)*	. ....N = protruding camshaft'
	E 573...	73 x 67	57	)..LHK*	. ... .K = protruding crankshaft'
	E 673...*	73 x 67	56	)..RHK*	. ....F = flangeable at governor side*
				)..LS	. ... .HK = add. handstart gear (previous version for crankhandle) start'
				)..LR*	. ... LS = short version for handcrank start and up-to-date (short version) (anti-clockwise only)
				) L36	. ... LR = recoilstart (anti-clockwise only)
				) R36	.3. = ital. flange*
				) L3N	.4. = flange SAEA
				) R47	H.... .. = watercooled
	HE 673..* (BMW-D7)	73 x 67	58'		• = for p.t.o. gov. side
					..6. = ital. stubshaft*
					..7. = stubhsaft cyl. SAE 3/4"
					..N* = tapered cam-shaft end
7..	E 71	71/75x80	23	)	3 = single cyl., power-take-off on flywheel as well as on gov. end
	E 75	75 x 80	16	)	
yellow	E 79	82 x 80	24	) E..	ES = power-take-off on flywheel side only; crankshaft not protruding on gov. end
	E 780.*	82 x 100	27	) ES..	...U= counter-rotating balance weight installed
	E 785.*	85 x 110	28	)	
	E 786 *	85 x 110	77	)	
				E780U	
				E785U	no "ES"-versions
				E786U	
	HE 780 (U)* (BMW= D12)	82x100	59		H. ...= watercooled
D..	1 D 30..*	86 X 65	02	))	
	1 D 31..	86 x 65	71	) ..S)	
pink	D 35..*	86 x 65	93	) ..T) 2	
		86 x 65	88	) ..Z) 3	
	4 1 D 40..	86 x 65	62	) ..U) .2	
	1 D 41 *	90 x 65	94	) ..C) .3	
	A 1 D 41..	90 x 65	95	)) .4	
	1 0 6 0	07 x 70	109	)) .6	
	1 D 80	86 x 85	89	))	
	1 D 80..*	400 x 85	90	))	
	1 D 81..	100 x 85	73		
	1D 90S[1]	104 x 85	108		
	1D 90V[2]	104 x 85	113		

	flange gov.side p.t.o.	dub. shaft gov.side p.t.o.
A..= semi-capsuled		
..S= anti-clockw. rotation, uncapsuled no counter-balance shafts	2.= accord. SAE Ø 146.1 mm	.2= cyl.shaft SAE 1" .3= ital.stand. tap.shaft
..T= clockw. rotation, uncapsuled no counter-balance shafts		
..Z= anticlockw. rotation, uncapsuled with counter-balance shafts	3.= ital.stand. Ø 105 mm	30 mm .6= ditto 23 mm
..U= clockwise rotation, uncapsuled with counter-balance shafts		.4= tap.shaft acc.SAE 1"
..C= anticlockw. rotation, capsuled with counter-balance-shafts		

..V= horizontal position with vertical crankshaft + W+ X+ Y with 1 0 90 only

Versions T - U: no more With 1 0 60 " 81 " 00

[1] = horizontal crankshaft

[2] = vertical crankshaft

Range and colour	Basic-type	Bore x stroke (mm)	Type No.	Versions	Remark and explanation of code letters
8.. rot	E 80..* E 85..* E 88..* E 89..*	80x100 85x100 90x105 90 x 105	15 14 55 11	) E ...) ....FG) .....G	E = single cylinder ..FG = flangeable on flywheel side .. ...G = heavy-flywheel-version; not flangeable
13.. orange		95x105	44	-	E= single cylinder, generally equipped with counter-rotating-balance shaft: hydr.pump directly flangeable
2.. light-green	2 G 30.* 2 G40	88x75 92 x 75	82 91	)..H)	2. = two-cylinder-type ..H = prepared to fit a hydraulic pump (introduced as a separate version in '97, before included in standard build)
Z.. brown	Z 782.* Z 788.* Z 789.* Z 790.	82x100 90x90 90x100 90x100	32 48 49 37	)) ..H))	Z= two-cylinder-type ..H = two positions for flanging hydraulic pump
M green	2 M 31* 3 M 31* 4 M 31*	102x90 102x90 102x90	84 85 86	))) ..H(LS)) ..L	2-, 3-, 4-cylinder .H= high swirl cylinder head + special camshaft for more power in the speed range n ≤ 2300 min^{-1}) (LS) = initially named the "low-speed" version .L = low swirl cylinder head + standard camshaft for operation speed n= > 2300 min^{-1} .Z= with counter rotating balance shafts 2 - 3 - 4 M 41: no versions "L" respect. "H"
	2 M 40 3 M 40 4 M 40	102x105 102x105 102x105	78 79 80	) .Z))	
	2 M 41 3 M 41 4 M 41	102x105 102x105 102x105	105 106 107	)))	
L dark-blue	2 L 30.* 3 L 30.* 4 L 30.*	95 x 100 95 x 100 95x100	51 52 63	)))	2-, 3-, 4-cylinder .S= semi-capsuled, no counter-rotating-balance shaft(s) .Z= semi-capusled, with counter-rotating-balance shaft(s) .C= capsuled, with counter-rotating-balance shafts .K= capsuled, without counter-rotating-balance shafts (with 4-cyl.versions at n ≤ 1800 min^{-1} only) ..H = high swirl cylinder head + special camshaft for more power in the speed range n ≤ 2300 min^{-1} Versions S - Z: from 1993 on part of the M-range, in which semi-capsulation is available as additional equipment 2 - 3 - 4 L 41: no version "H" (high swirl cylinder head) BMW: "D 20", "D 35" BMW: "D 50" H. = watercooled
	2 L 31.* 3 L 31.* 4 L 31.*	102x90 102 x 90 102 x 90	68 69 70	) ..S*) ..Z*) ..C	
	2 L 40. 3 L 40. 4 L 40.	102x105 102x105 102x105	64 65 66	) ..K))	
	2 L 41 3 L 41 4 L 41	102x105 102x105 102x105	102 103 104	)))	
	H 2 L 30.* H 3 L 30.*	95 x 100 95 x 100	60 61		

☒ = out of production

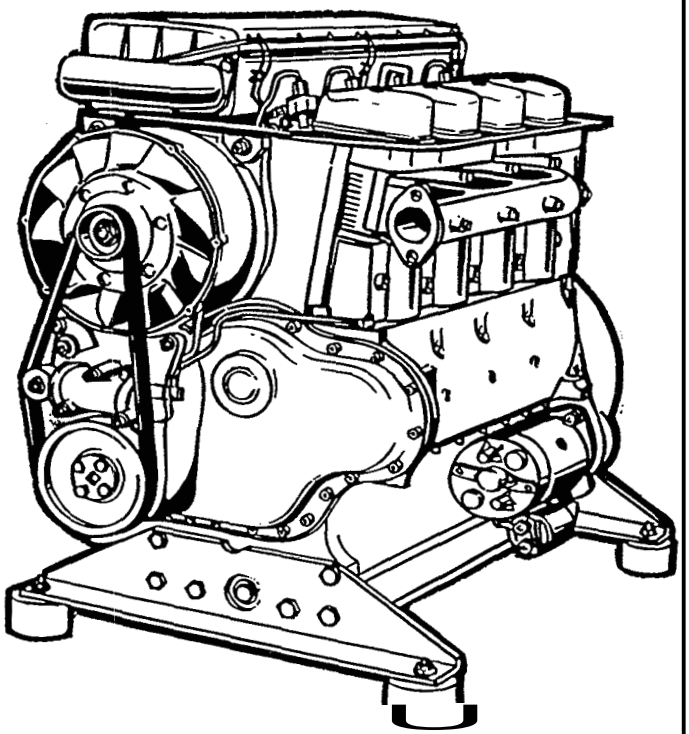
Original – Ersatzteile

Original – spare parts

Pièces de rechange d'origine

Repuestos originales

Pezzi di ricambio originali



2 M 40 .
3 M 40 .
4 M 40 .
2 M 41.
3 M 41.
4 M 41.

How To Use Your Parts Manual

HOW TO USE YOUR HATZ PARTS MANUAL

Your Hatz parts manual contains a wealth of information. To get correct parts you need to reference the engine serial number of the specific engine that is to be repaired. See Service Bulletin SE02C for serial number information and tag location. The engine type series number will guide you to the correct parts manual. Alternatively a newer parts manual along with the appropriate IMT Parts Bulletin (See page 17 through 22) may be referenced.

Gasket Kits, Maintenance Kits, and Emergency Kits are also available. The **15** X 21-cm parts manuals from Germany use **a** system, explained herein, to indicate which parts are included in different kits. See page ***9*** and 10. H.D.A. also supplies ***8*** ½" X 11" size parts manual and a P.R.O. Kits Catalog, p/n-00000017 which lists component parts in the kits. H.D.A. supplied "large" manuals also include the description of the part in English. Germany supplied manuals are designed for worldwide use. Due to space limitation, no description is used.

When locating a part number make sure you reference the correct column and correct item number. Pay special attention ***to*** the notes in the right hand column, especially if an item is listed more than once. Notes will indicate if the part is for **a** capsuled engine, clockwise rotation, counter-clockwise rotation, or other difference.

The larger capital letters with the black background indicate where the use of adhesives and sealants are necessary. A section in the front of the manual identifies which specific material to use and supplies the Hatz part number for it. See page 11 through 15.

Some parts are not listed in the standard Hatz parts manual. These include specialized parts for OEM applications, and component parts. Component Part Catalog 42, p/n-00000097 provides component parts of vendor supplied items. H.D.A. large size manuals also supply more information in the back sections. Your Hatz distributor can also determine specialized parts by referencing his Hatz microfiche library in most cases.

1-19-00

Bestellung **für HATZ-Original-Ersatzteile**
Order **for HATZ** Original spare parts
Commande de pièces d'origine HATZ
Pedido de repuestos originales **HATZ**
Ordine parti di ricambio originali **HATZ**

1 Besteller / Customer / Client / Cliente / Cliente

2

TYP

MOTOR/FABRIK NO.

MIN-1

3 Ersatzteilliste Nr I Spare parts list no./ Ciste des pikes de rechange n o I Lista de repuestos No./ Lista ricambi n.

2M40.19 ☐	3M40.19 ☐	4M40.19 ☐
2M41.12 ☐	3M41.12 ☐	4M41.12 ☐

4

Stück / Qty / Q.tà	HATZ Ident No.	Stück / Qty / Q.tà	HATZ Ident No.

5

6 Versandadresse/ Consignee/ Adresse destination Dirección / Indirizzo di destinazione

Bestellung an: Order at: Commande à: Pedido a:
- die nächste HATZ-Servicestelle (siehe Servicestellenverzeichnis)
- your nearest HATZ service station (see service-list)
- votre station-service HATZ la plus proche (voir liste "Service")
- al servicio HATZ más cercano (ver cuaderno de Servicio)
- al più vicino centro di servizio HATZ (vedi lista centri autorizzati)

MOTORENFABRIK HATZ
D-94099 RUHSTORF
Tel: 0 85 31 /319 - 0
Fax: 0 85 31 / 31 94 21

Note: The engine model series is listed in the third information box next to the engine model type.

INFORMATION REQUIRED FOR SPARE PARTS ORDERS

Hatz supplies a Spare Parts List with every engine. Corresponding part numbers can be found in the spare parts list for ordering.

To avoid costly mistakes by supplying the wrong parts, the following information should be provided when ordering parts. See engine name plate sample.

- Engine Type
- Engine Serial Number (Motor/Fabrik No.)
- Spare Parts List Series No.

If the series number of the engine (3rd and 4th or 4th and 5th digit of the engine serial number, see picture) correspond to the series number of the spare parts list (last two digits), one can be assured that the parts ordered are the correct vintage for the engine.

If the above numbers do not correspond, one cannot be sure that the correct **parts are** ordered. Please obtain **a** spare **parts** list **with** the same series number before ordering **parts.**

PICTURED EXAMPLE:

Correct series number of Spare Parts Catalog: **3M41.10**

Inhaltsverzeichnis		Index	Tafel-Nr. Table No.
M ..	Grundmotor	Basic engine	
00	Ersatzteilsätze	Spare parts kits	01
34	Zubehör	Accessories	02
01	Kurbelgehäuse	Crankcase	03 + 04
01	Massenausgleich	Compensation of masses	05
02, 03	Kurbelwelle	Crankshaft	06
04	Nockenw., Regler. Spritzversteller	Camshaft, governor, timer	07
04	Drehzahlverstellung	Speed control	08
05.06	Kolben, Pleuel, Zylinder	Piston, conrod, cylinder	09
07	Zylinderkopf	Cylinder head	10
08	Deckel z. Zyl.-Kopf.	Cover cyl.-head	11
09, 10	Stoßstangen, Ölpumpe	Pushrod, oil pump	11
11	Steuerdeckel	Timing cover	12
12	Startfiillung	Extra fuel device	13
13	Geblase	Blower	14
14	Einspritzausriistung	Injection equipment	15
16, 17	Riemenscheibe, Schwungrad	Pulley, flywheel,	
20	Hydr. Abstellvorrichtung	hydr. belt tensioner	16
22, 27	Luftfilter, Luftansaugrohr	Air filter, air intake manifold	17
26	Luftfiihrung	Air ducting	18, 19
			20
A ..	Zusatzausrustung	Equipements	
01	Förderpumpe	Fuel feed pump	21
01	Kraftstoffbehälter	Fuel tank	22
02	Zyklon	Cyclon	23
03	Auspuff	Exhaust	24
04	Andrehkurbel, Andrehvorr.	Starting handle, starting device	25
04	Oekompressionsautomatik	Autom. decompression	26
04	Abschaltautomatik mech.	Autom. shut-off device mec.	27
05	Starter, Generator	Starter, alternator	28
05, 10	Armaturenkasten	Instrument box	29
05, 10	Armaturen. Leitungen	Electric equipment, wirings	30
06	Motorfüße, Schwingungsdämpfer	Engine brackets, vibration damper	31
07	Ölkühler, Olwanne	Oil cooler, oil sump	32
08	Anbaut. Zuluftschacht, Abluftschacht	Air duct. adaption. air ducting	33
12. 15	Keilriemenschutz, Anschlußgeh.	V-belt guard, intermediate housing	34
16	Elastische Kupplung	Flexible coupling	35
18	Steuerdeckel f. Hydraulik	Timing cover hydr.	35
			Seite/Page
	Serien-Nr.-Änderungen	Serial-code modification list	98

Note: The "M" section refers to basic engine equipment and the **"A"** section refers to accessory or additional equipment. The number **in** the far right-hand column indicates the table number, **not** the page number.

IDENTIFICATION CODE FOR STANDARD ENGINES

Each engine is split up into a certain number of individual groups, the total of these group results in a complete standard equipment.

HATZ Diesel engines are split up according to the following systems:

IDENT. CODE	DESCRIPTION OF GROUP
M 00.00	Spare parts sets
M 01.00	Crankcase
M 02.00	Crankshaft
M 03.00	Bearing flange
M 04.00	Camshaft
M 05.00	Piston with conrod
M 06.00	Cylinder
M 07.00	Cylinder head
M 08.00	Cover for cylinder head
M 09.00	Push rod and protection tube
M 10.00	Oil pump
M 11.00	Governor housing
M 12.00	Extra fuel device
M 13.00	Blower
M 14.00	Injection pump and injection valve
M 15.00	Starting device
M 16.00	V-belt pulley resp. crankjaw
M 17.00	Flywheel
M 18.00	Suction nipple
M 19.00	Oil relief valve
M 20.00	Tension pulley, stop device/belt tensioner device
M 21.00	Fuel tank with fitter (also see A 01.00)
M 22.00	Air fitter (aiso see A 02.00)
M 23.00	Fuel filter with support (also see A 01.30)
M 24.00	Fuel lines (also see A 01.20)
M 25.00	Fuel tank with console (also see A 01.00)
M 26.00	Cowling / air duct
M 27.00	Air-intake manifold
M 28.00	Exhaust manifold (also see A 03.00)
M 29.00	Oil return pipe
M 30.00	Lifting bracket
M.31.00	Breather
M 32.00	Speed control (also see A 09.00)
M 33.00	Oil pressure gauge
M 34.00	Tools and labels
M 35.00	Capsule
M 36.00	Cooling liquids hoses (also see A 30.00)

IDENTIFICATION CODE FOR ADDITIONAL EQUIPMENT

Due to a comprehensive availability of additional equipment each and every engine is adaptable to the very special demands of installations. This additional equipment program is subdivided as follows:

A 01.00 Fuel
A 01.10 Fuel tanks
A 01.20 Fuel lines
A 01.30 Fuel filters
A 01.40 Fuel feed pumps
A 01.50 Supports, brackets

A 02.00 Combustion air
A 02.10 Oil bath air filters
A 02.11 Dry-type air filters
A 02.12 Wet-type air filters
A 02.13 Service indicators; vacuum gauges
A 02.20 Pre-cleaners; cyclones
A 02.30 Supports
A 02.40 Air intake pipes; manifolds

A *03.00* Exhausts
A 03.10 Exh. silencers / pepperbox
A 03.11 Exh. silencers / standard
A 03.12 Exh. silencers / high performance
A 03.13 Exh. silencers / special classification
A 03.20 Exh. silencers / combinations
A 03.30 Supports
A 03.40 Exhaust pipes; manifolds

A 04.00 Start mechanical / pneumatic
A 04.10 Starting handles without supports
A 04.11 Starting handles with supports
A 04.12 Cranking claws
A 04.20 Automatic decompression devices
A 04.21 Manual decompression devices
A 04.30 Rope starts
A 04.40 Spring starters
A 04.50 Inertion starters
A 04.60 Compressed air starters
A 04.70 Starting devices
A 04.80 Starting aids

A 05.00 Start electrical
A 05.10 Electric starter equipment compl.
A 05.20 Starter motors
A 05.30 Mount. parts for starter motors
A 05.40 Alternator / regulators
A 05.50 Mount. parts for alternators
A 05.60 Accessories; control panels
A 05.70 Glow plugs; electric starting aids; preheatings
A 05.80 Ring gears
A 05.90 Interference suppressions

A 06.00 Engine mountings
A 06.10 Standard engine brackets / rigid mount.
A 06.11 Special engine brackets / rigid mount.
A 06.20 Engine brackets / flexible mount.
A 06.30 Resilient mounts

A 07.00 Lubrication oil
A 07.10 Lub.-oil coolers
A 07.20 Lub.-oil filters; strainers
A 07.30 Oil sumps
A 07.40 Special oil filling devices
A 07.50 Special oil drain devices
A 07.60 Separate oil reservoirs with feed pump

A 08.00 Cooling air
A 08.10 Blower Covers
A 08.20 Inlet air ducts
A 08.30 Dirt protectors
A 08.40 Cleaning openings
A 08.50 Air ductings
A 08.60 Heating devices
A 08.70 Blowers

A 09.00 Speed controls
A 09.10 Speed control / infinitely variable
A 09.20 Speed control / Bowden control
A 09.30 Speed control/toothed segment
A 09.40 Speed control / adjustable speeds
A 09.50 Speed control / idle speed device
A 09.60 Special governors

A 10.00 Engine Controls
A 10.10 Fuel level
A 10.20 Oil pressure
A 10.21 Oil level
A 10.22 Oil temperature
A 10.30 Cylinder / cylinder head temp.
A 10.40 Exhaust gas temperature
A 10.50 Cooling air blower
A 10.60 Revolution counter
A 10.70 Hour meter
A 10.80 Indicators

A 11.00 Remote engine controls
A 11.10 Stop devices
A 11.20 Automatic shut down
A 11.30 Start-stop devices
A 11.60 Accessories; control panels

A **12.00** Protection devices
A **12.10** Belt guards
A **12.20** Flywheel / shaft protection devices
A **12.30** Exhaust silencer protections

A **13.00** Dynamic dampening
A **13.10** Torsional dynamic damper

A **14.00** Flywheels
A **14.10** Standard flywheels
A **14.20** Special flywheel

A **15.00 Housing-flanges-adaptors**
A **15.10** Engine flanges
A **15.20** Adaptor housings
A **15.30** Governor housings
(see also **16.50** outboard bearings)

A **16.00** P.T.O. not disengageable
A **16.70 P.T.O.** flanges
A **16.20** Stub shafts
A **16.30** Flexible couplings
A **16.40** Belt pulleys
A **16.50** Outboard bearings
A **16.60** Gear drives
A 16.61 Gears P.T.O. camshaft

A **17.00** P.T.O. disengageable
A **17.10** Clutch without outboard bearing: short-time disengageable
A **17.11** Clutch with outboard bearing: short-time disengageable
A **17.20** Clutch without outboard bearing: permanent disengageable
A **17.21** Clutch with outboard bearing: permanent disengageable
A **17.30** Initial drive clutches
A **17.40** Pivot bearings
A **17.50** Mount. parts for A **17.30**

A 18.00 P.T.O. Hydraulic
A **18.10** Mount. parts for hydraulic pumps
A **18.20** Hydraulic pumps
A 18.30 Hydraulic oil coolers

A 19.00 P.T.O Compressed air
A **19.10** Mount. parts for auxiliary compressor
A 19.20 Lubrication for auxiliary compressor

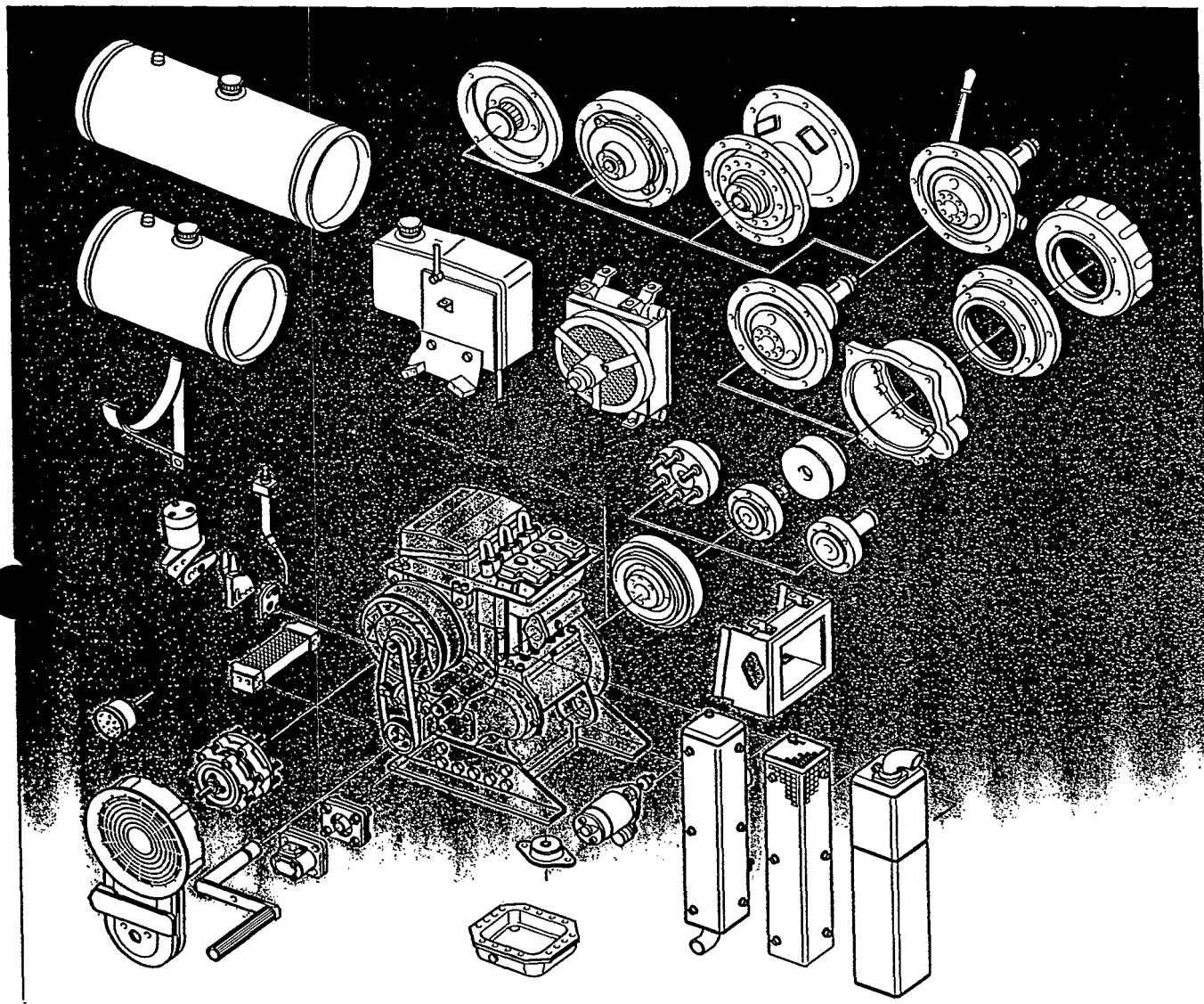
A **20.00** Gear boxes-reverse direction
A **20.10** Reduction gears without clutch
A 20.11 Reduction gears with clutch
A 20.20 Gear boxes / mechanical
A **20.30** Gear boxes / hydrostatic
A **20.40** Gear boxes / hydrodynamic
A **20.50** Marine reverse gears
A **20.60** Mount. parts for gears

A **21.00** Gear boxes-direct direction
A 21.10 Reduction gears without clutch
A **21.11** Reduction gears with clutch
A **21.20** Gear boxes / mechanical
A 21.30 Gear boxes / hydrostatic
A 21.40 Gear boxes / hydrodynamic
A **21.60** Mount. parts for gears

A **30.00** Water cooling
A **30.10** Mount. parts for pumps
A **30.20** Fresh water pumps
A **30.30** Pipes; hoses
A **30.40** Accessories

A 40.00 Pump units
A 40.10 Mount. parts for pumps
A 40.20 Pumps
A **40.30** Frames
A **40.40** Accessories

A 90.00 **Classifications-regulations**
A **90.11** Special outfit – Germanischer Lloyd
A **90.12** Special outfit – Lloyd register of shipping
A **90.13** Special outfit – Det Norske Veritas
Bureau Veritas



Ersatzteilsätze
Spare part kits
M 00 Jeux de pièces de rechange
Juegos de piecas de recambios
Serie guarnitioni

Tafel Nr.
Tabl. No.
Tavola N.
01

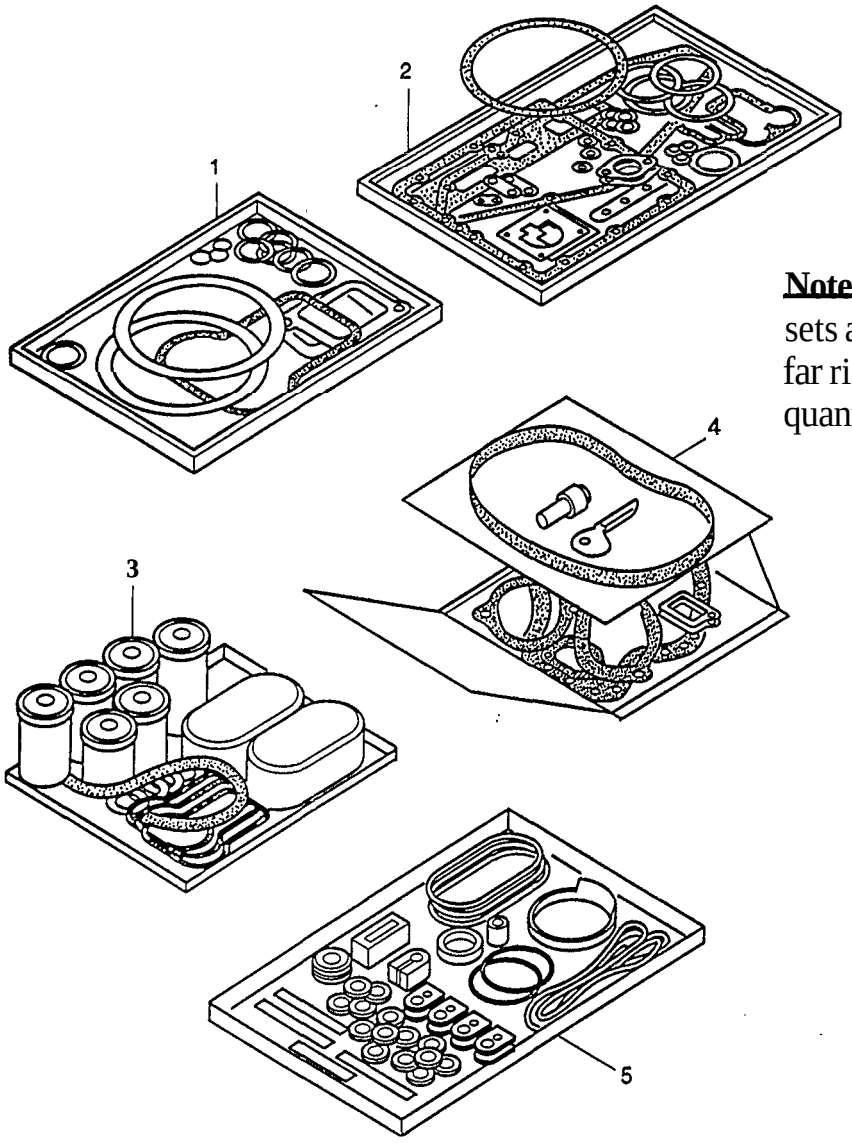


Fig.- No.	HATZ Ident-No.	Stück Qty. 2 M..	3 M..	4 M..	P / W d / D	Bemerkung Notes
						(W) Im Wartungssatz enthalten. Incl. in maintenance kit. Contenu dans le ieu d'entretien. Incluido en el juego de mantenimiento. Contenuto nella serie manutenzione
						(d) Im Dichtungssatz für 1 Zyl.-Kopf enthalten. Incl. in gasket set for 1 cylinder head. Contenu dans le jeu de joint p. 1 culasse. Incluido en el juego de juntas p. 1 culata. Contenuto nella serie guarnizioni p. 1 testa.
						(P) Im Pannensatz enthalten. Incl. in emergency kit. Contenu dans le jeu secour. Incluido en el juego para averias. Contenuto nella serie di prima necessità.
						(D) Im Dichtungssatz Kurbelgehäuse Incl. in gasket set crankcase. Contenu dans le jeu de joints carter moteur. Incluido en el juego de juntas caja cigueñal. Contenuto nella serie guarnizioni basamento.
						1: Anzahl pro Satz • Qty. per kit Ouantite par jeu Cantidad por juego. Qantità per serie.
1	00992202	2	3	4	P1	Dichtungssatz fur 1 Zylinderkopf Gasket set for 1 cyl. head Jeu de joint p. 1 culasse Juego de juntas para 1 culata. Serie guarnizioni per 1 testa.
2	01230902	1	1	1		Dichtungssatz für Kurbelgehäuse Gasket set for crankcase Jeu de joints p. carter moteur Juego de juntas para caja ciguenal. Serie guarnizioni basamento.
3	00987104	1				Wartungssatz fur 1000 h
3	00991504		1			1000 hours maintenance kit
3	01203304			1		Kit d'entretien 1000 heures • Juego de piezas para servicio 1000 horas. Kit di manutenzione a 1000 ore.
4	01226201	1	1	1		Pannensatz • Emergency kit
4	01544200	1	1	1	2-4M41	Kit de secours . Juego para averias. Kit di prima necessità.
5	01215601	1	1	1		Gummiteilesatz, Rubber como. set Garniture caout.. Guamicion goma Guarnizioni in gomma.

Note: Component parts of the gasket sets are located in the column to the far right of the part number. The quantity of each item is also indicated.

Deckel z. Zyl.-Kopf	Stoßstangen	Ölpumpe	Tafel Nr.
Cover cyl.-head	Pushrod	Oil pump	Tabl. No.
M 08 Couvercle culasse	M 09 Tige de culbuteur	M 10 Pompe à huile	Tavola N.
Tapa culata	Varilla de balancin	Bomba de aceite	
Coperchio bilanc.	Asta bilanciere	Pompa olio	11

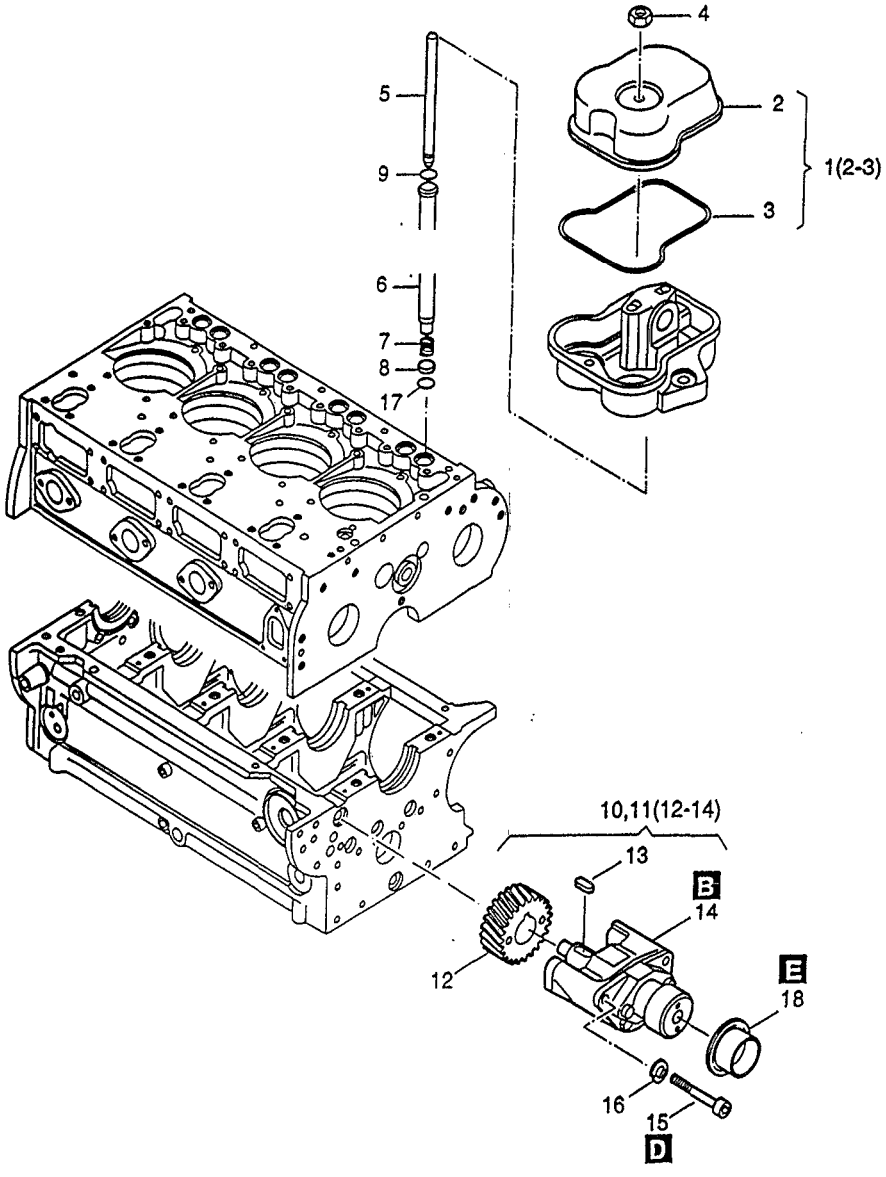


Fig.-No.	HATZ Ident-No.	Stuck Qty. 2 M	3 M	4 M	P / W d / D	Bemerkungen Notes
1	01205900	2	3	4		
2	▪▪▪▪▪▪▪					
3	40224900	2	3	4	W4/6/8 W4/6/8 d1 W2/3/4	123 x 2,5
4	50132300	2	3	4	W2/3/4	M 10
5	00743600	4	6	8		
6	03566701	4	6	8		
7	03185100	4	6	8		
8	03185200	4	6	8		
9	50288000	4	6	8	d2	17 x 3
10	00924204	1	1			
11	00923904			1		
12	03562020	1	1	1		
13	50316800	1	1	1		4 x 4 x 20 **DIN** 6885
14	▪▪▪▪▪▪▪					
15	50206800	3	3	3		M 8 x 105 DIN 912-8.8
16	50002800	3	3	3		8 **DIN** 128
17	50288100	4	6	8	d2	15 x 3,2
18	50289400	0...1	0 1	0 1		55 mm

Note:

P indicates Emergency Kit
W " Maintenance Kit
d " Gasket Set for one cylinder head
D " Gasket Set for crankcase

W4/6/8 indicates Fig. No.3 is included in the Maintenance Kit (W), quantities, (4) (6) (8).

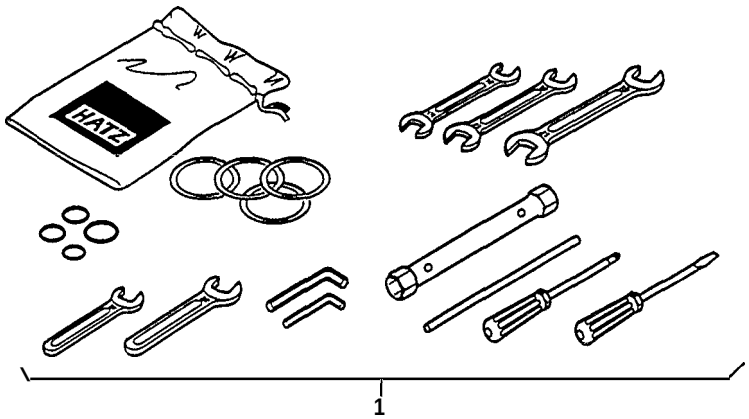
d1 indicates Fig. No.3 is included in the Gasket Set for one cylinder **head (d),** quantity (1).

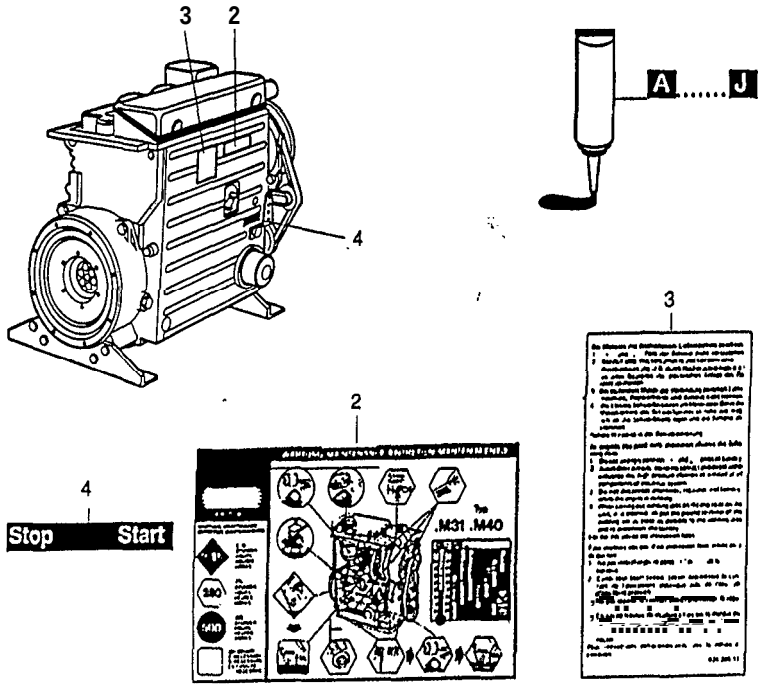
Zubehör
Accessoires
Accessoires
Accessoiros
Kit accessori

Tafel
Tabl
Tav
Tavo

02

Fig.-No.	HATZ Ident-No.	Stuck Qty. 2 M..	3 M..	4 M	P / W d / D	Bemerkungen Notes
1	00938301	1	1	1		Zubehorsatz . Accessoires kit Sort. accessoires Juego de accessorios Serie accessori
2	04039000	1				ohne Zusatzölwanne without add oil sump sans carter d'huile sin carter de aceite Senza coppa olio
2	03788101	1	1	1		
3	03430612	1	1	1		
4	03325400	1	1	1		





Dicht- und Klebestoffe Sealing- and bonding adhesives			Etanchéifiant et Colle Materias para empaquetar y pegar
A = 502 230 01	Loctite Activator N	500 ml	siehe Hinweis auf den
B = 502 231 00	Loctite 573	50 ml	einzelnen Bildtafeln
C = 502 232 00	Loctite 601	50 ml	as specified in *the* individual tables
D = 502 233 00	Loctite 221	50 ml	suivant les remarques sur les tableau
E = 502 234 00	Loctite **640**	10 ml	correspondant
F = 502 238 00	*Technicoll 8058*	0,75 kg	*según* las *indicaciónes* de las tablas
+ 502 239 00	Technicoll 8367	0,75 kg	correspondientes
G = 502 565 01	Loctite IS 407	20 g	seguire le indicazioni sul quadro
H = 502 825 01	*Silicon*	30 ml D1	*corrispondente*
J = 502 830 03	Hochtemp. Paste	100 ml	

Note: Accessory Kit and Decals.
Sealants and Adhesives.

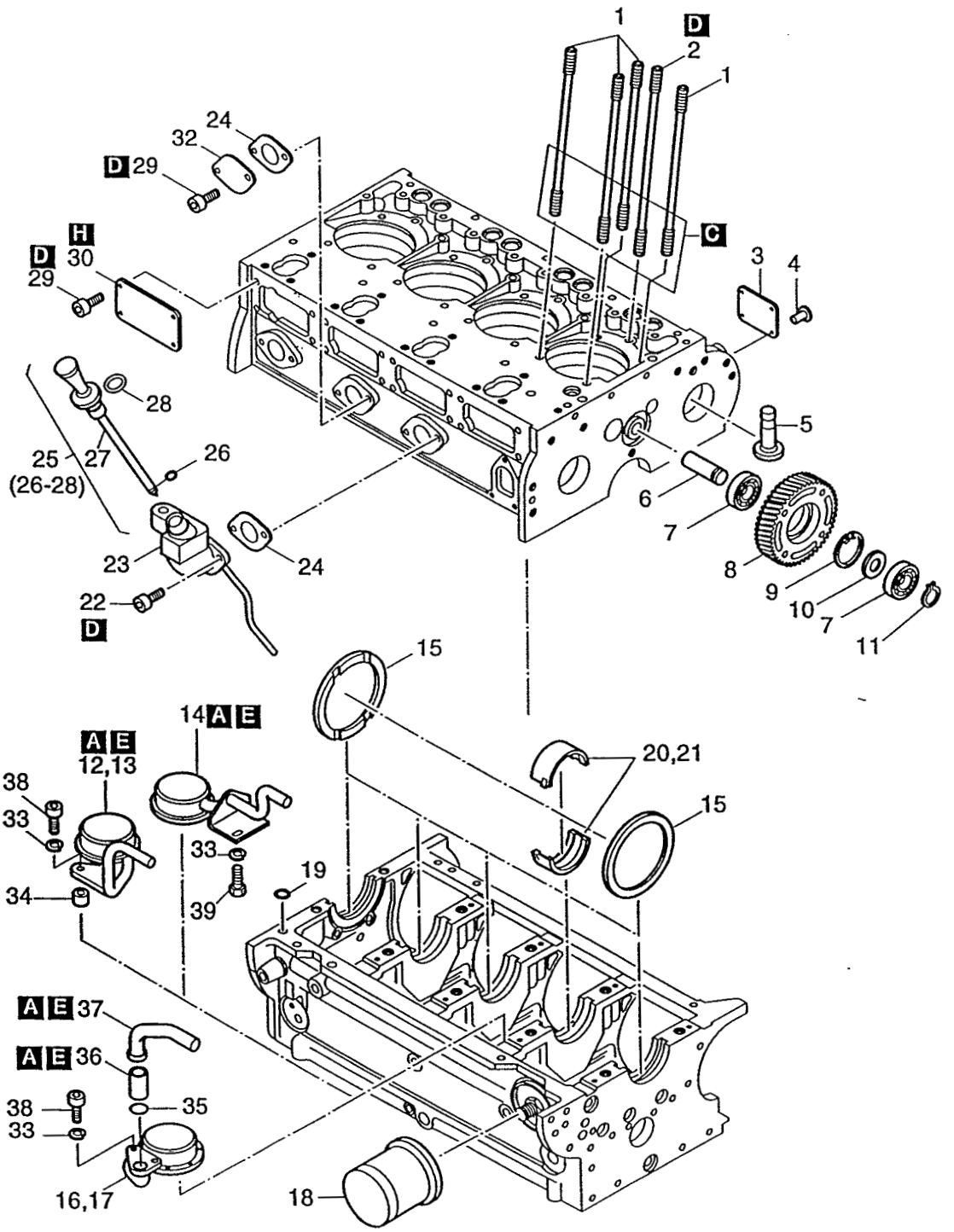
Hatz parts manuals also indicate where adhesives and sealants are required. The letter in the left-hand column refers to the item (noted inside a black box) required for assembly. Sample page follows.

M 01

Kurbelgehäuse
Crankcase
Carter moteur
Caja cigueñal
Basamento motore

Tafel Nr.
Tabl. No.
Tavola N.

04



16

~~Note:~~ Samples.

SEALING AND BONDING ADHESIVES
AS SPECIFIED IN THE INDIVIDUAL TABLES

FIG. NO.	PART NUMBER	DESCRIPTION		
A	502 230 01	Loctite Activator N	-	500 ml
B	502 231 00	Loctite 573	-	50 ml
C	502 232 00	Loctite 601	-	50 ml
D	502 233 00	Loctite 221	-	50 ml
E	502 234 00	Loctite 648	-	10 ml
F	502 238 00	Technicoll 8058 Adhesive	-	0.750 kg
+	502 239 00	Technicoll 8367 Solvent	-	0.750 kg
G	502 565 01	Loctite IS 407 Super Glue	-	20 g
H	502 825 01	Silicone Sealer	-	30 ml
J	502 830 03	High Temperature Paste (Can)	-	100 ml
K	503 426 00	High Temperature Paste (Tube)	-	100 g
L	502 566 00	Silicon Sealer	-	100 g
M	504 851 00	Grinding Paste	-	80 ml

Material used in repair work

Designation	Letter Code	Purpose	Location	Identification Number
Loctite 573 green	B	Surface jointing solution	Between the halves of the crankcase	502 231 00
Loctite 601 green	C	Jointing	Crankcase plugs	502 232 00
Loctite 221 red	D	Screw locking	Screw connections	502 233 00
Loctite Activator N	A	Surface pre-treatment	For cleaning and de-greasing parts to be sealed	502 230 01
Loctite 648 green	E	Jointing	For the breather valve in the governor housing.	502 234 00
Loctite IS 407	G	Adhesive	Adhesive for rubber gasket strips	502 565 01
Technicoll 8058	F	Adhesive	Adhesive for rubber gasket strips on the cooling system	502 238 00
Technicoll 8367		Solvent		502 239 00
Silicon	H	Surface jointing solution	For crankcase bottom oil sump cover	502 825 00
High temp paste	J K	Slushing grease - 100 ml - tube	Exhaust high temp. screw fittings	502 830 03 503 426 00

information

HATZ DIESEL

- ☐ SALES
- ☐ ENGINEERING
- ■ SERVICE
- ☐ **PARTS**

Bulletin No. SE47

Date 09/25/97

Subject: Sealant and Adhesive Product Conversions

We have found that the Loctite Corporation products vary between the European market and the North American market. The following are appropriate substitutes:

Hatz Part Number	European Market	North American Market
50223100	Loctite 573	Loctite Gasket Eliminator 518
50223200	Loctite 601	Loctite Retaining Compound 609
50223300	Loctite 221	Loctite Threadlocker 222
50223400	Loctite 648	Loctite Retainer 642
50256501	Loctite IS407	Loctite Super Bonder **498**

All Hatz **part** numbers are supplied **as** European market products.

David Carlson,
Service Manager

c:\SE47.sam (dls)

9/97

Fig.-No.	HATZ Ident-No.	Stück Qty.	P / W d ID	Bemerkungen Notes
		2..4M...		
1	50170800	2		M 6 x 25 DIN 912-8.8 A3C
2	00932700	2		
3	50170800	2		M 6 x 25 DIN 912-8.8 A3C
4	00921400	2		
5	04068900	1		220 mm
6	04069000	1		143 mm
7	03575500	4		
8	03646800	1		
9	03646900	1		
10	50002800	2		8 DIN 128
11	50051600	1		M 8 x 16 DIN 912-8.8
12	01301500	1		
13	50081200	4		A 6 DIN 137
14	50144400	4		M 6 DIN 934-8 A3C
15	40033300	0...1		F 21
16	- - - - - - -			
17	- - - - - - -			
18	04069200	1		113 mm
19	04069100	1		65 mm
20	- - - - - - -			
21	50159011	0...1		
22	50026700	1		M 8 x 16 DIN 933-8.8
23	50380500	1		6,4 DIN 6797 A3C
24	- - - - - - -			
25	50081200	1		A 6 DIN 137 A3C
26	50025400	2		M 6 x 10 DIN 933-8.8 A3C

Note: This is an international spare parts list, no part descriptions are used because of the five languages. Some DIN or dimensional information may be available.

Serien-Nr.-Änderungen
Serial-code modification list
Modification des Nos de serien
Modificación **de los** Nos **de serie**

		IMT.-No.
2 M 40.15	2 M **40.16**	89.487
3 M **40.15**	**3 M 40.16**	89.487
4 M **40.15**	**4 M 40.16**	89.487
2 **M 40.16**	**2 M 40.17**	89.488
2 M **40.17**	**2 M 40.18**	91.513
3 M **40.16**	**3 M 40.17**	89.488
3 M 40.17	**3** M **40.18**	91.513
4 M **40.16**	**4** M **40.17**	89.488
4 M 40.17	**4 M 40.18**	91.513
2 M **41.10**	**2** M **41.11**	98.578
2 M 41.11	2 **M 41.12**	98.582
3 M 41.10	**3** M **41.11**	98.578
3 M 41.11	**3 M 41.12**	98.582
4 M 41.10	**4 M 41.11**	98.578
4 M 41.11	**4 M 41.12**	98.582

Note: Use this modification page, found in the back of the parts manual, to determine which parts are not interchangeable between series.

Example: If ordering parts for a 2M41.10 (Series 10) from **a** 2M41.12 (Series 12) parts manual, you must review IMT (Parts Bulletins) numbers; 98.578 and 98.582. **Samples** follow.

IMT INFORMATION
Ersatzteile - Spare parts
Pièces de rechange
Recambios

2 – 4 M 41
2 – 4 L 41 C/K

cylinder head
temperature switch
see reverse

Code IMT No.
37 98.578
Dat 05.06.98
Bl. 1 von 1

Disp.	Bisher / Former / Ancienne: Benennung / Description / Désignation	Ident-No.	Symbol	Neu / New / Nouvelle: Ident-No.	Benennung / Description / Désignation	St. Qty.	Pos.	Typ	kg	WSI Nr ABC	DM br.
	Cylinder head and temperature switch for 2 – 4 M 41 and 2 – 4 L 41 C/K										
0	cylinder head	013 175 00		013 175 10	cylinder *head*	1					
0	temperature switch 180° C	400 328 01	< ≠ ≠ >	502 686 00	temperatur swith 220 ° C	1	42				
0	interned. piece	050 278 00				1	43				
0	joint	500 010 00				1	44				

Modification of series no.:
2-4 M 41.10 to 2-4 M 41.11
2-4 L 41.10 to 2-4 L 41.11

SYMBOL	INTERCHANGEABLE	NOT/NOW INTERCHANGEABLE
< ≠ ≠ >	old into new, new into old	
< ≠ ≠ >		old into new, new into old
< ≠ ≠ >	old into new	new into old
< ≠ ≠ >	new into old	old into new

erstellt MFD-Abs-ke | gesehen | Disposition 0 = bleibt ET Remains available Reste livrable | 1 = Aufbrauchen Use up Epuiser | 2 = Nacharbeiten Remachine Retoucher | 3 = Verschrotten Scrap Ferrailler

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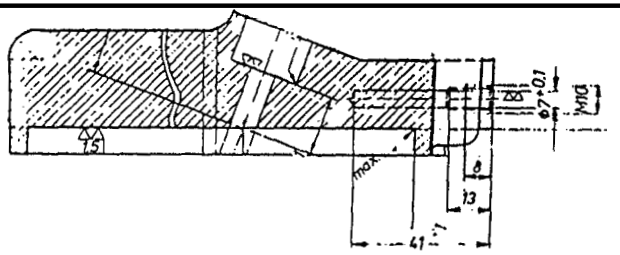
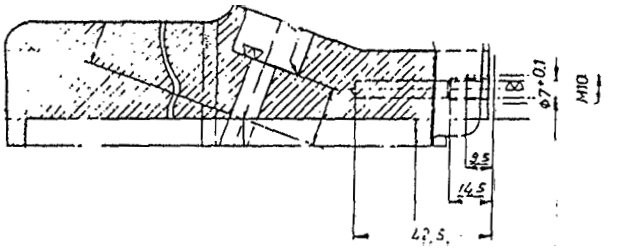
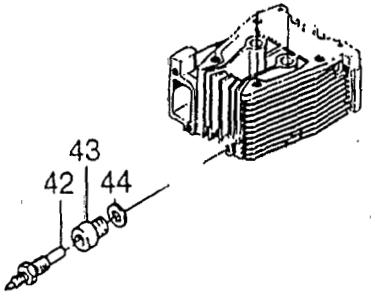
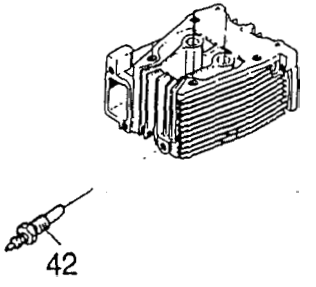
☎ 08531/319-0 - Fax: 08531/319-418

Bisher / Former / **Ancienne**	Neu / New / Nouvelle
	
	

IMT INFORMATION
Einzelteile Spare parts Pièces de rechange Recambios

Type + Tafel/Tabl. No.: 2 – 4 L / M 40, 2 – 4 L / M 41

Baugruppe / Group / Groupe: M 05 conrod

Code 37 IMT No. 98.582

Dat. 10.11.98

Bl. 1 von 4

see reverse

Disp	Bisher / Former / Ancienne: Benennung / Description Désignation	Ident-No.	Symbol	Neu / New / Nouvelle: Ident-No.	Benennung / Description Désignation	St. Qty.	WS Pos.	Typ	kg	ABC	DM br.
	Conrod 2 – 4 L / M 40 / 41 with flat mating face and fitting bolts										
	Conrod with bushing and **bolts**	**009** 297 **02**	<=>	**009** 297 **03**	conrod with bushing and **bolts**	1					
	Conrod screw	**037 752** 00	<≠>	037 752 10	conrod screw	1					

Serial-no. modification:

from	to	from	to
2M40.18	2M40.19	**2M41.11**	**2M41.12**
3M40.18	3M40.19	**3M41.11**	**3M41.12**
4M40.18	**4M40.19**	**4M41.11**	**4M41.12**
2L40.21	**2L40.22**	2L41.11	**2t41.12**
3L40.21	**3L40.22**	**3L41.11**	**3L41.12**
4L40.20	**4L40.21**	4L41.11	4L41.12

SYMBOL	INTERCHANGEABLE	NOT/NOW INTERCHANGEABLE
<=>	old into new, new into old	
<≠>		**old** into **new**, new into old
<=>	old into **new**	**new** into old
<≠>	*new into old*	*old into new*

erstellt MPD-Abs-kc | gesehen | Disposition 0 = bleibt ET Remains available Reste livrable | 1 = Aufbrauchen Use up Epuiser | 2 = Nacharbeiten Remachine Retoucher | 3 = Verschrotten Scrap Ferrailler

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HATZ Diesel
MOTORENFABRIK HATZ GmbH & Co. KG
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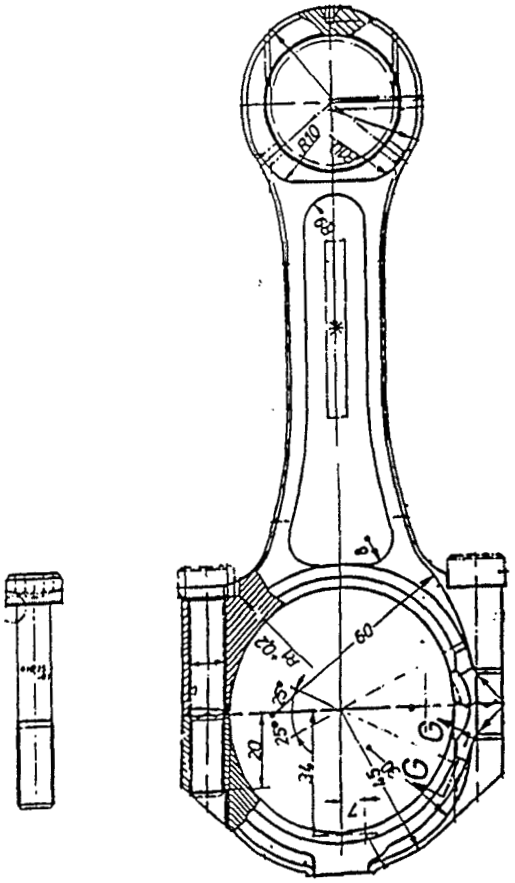
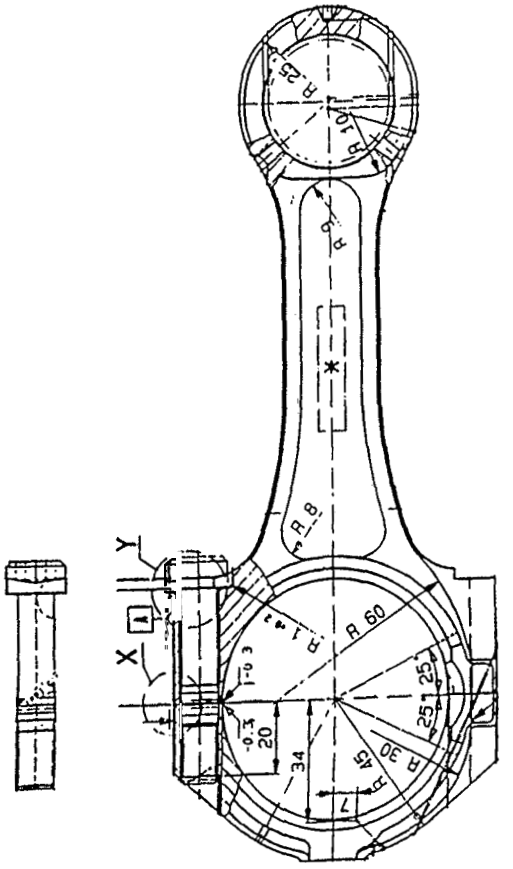
D-94095 Ruhstorf a.d. Rott
☎ 08531/319-0 · Fax 08531/319-418

Bisher / Former / Ancienne	Neu / New / Nouvelle
	

98.582

IMT PARTS BULLETIN INDEX

SYMBOL	
<==>	The old is interchangeable with the new and The new is interchangeable with the old.
<≠≠>	The old is not interchangeable with the new and The new is not interchangeable with the old.
<≠=>	The old is interchangeable with the new and The new is not interchangeable with the old.
<=≠>	The new is interchangeable with the old and The old is not interchangeable with the new.

NUMBERING SYSTEM

HATZ identifies all their products as engines, engine accessories, spare parts, and special tools by a standardized numbering system.

Each item or part is specified by an 8-digit identification number.

Identification Numbers are partitioned into sections as follows:

000 001 ..- 002 999 ..	=	Engines
003 000 ..- 029 999 ..	=	Engines accessories, assemblies, sub-assemblies, Customer spec. lists
030 000 ..- 599 999 ..	=	Individual parts
600 000 ..- 699 999 ..	=	Special tools
950 000 ..- 950 999 ..	=	Technical advice

HATZ 8-digit part numbers can be broken down as follows:

1st 6 digits	=	Part Number
Final 2 digits	=	Part Number Modification Index

Part Number Modification Index (last 2 digits of all HATZ spare parts numbers)

EXAMPLE P/N 400001 00

00 = ORIGINAL STATE
01 = FIRST MODIFICATION
02 = SECOND MODIFICATION, ETC.

As each modification is made to the part, the unit digit of the part number is incremented by one.

First, second, third modifications, etc. up to 09 are designed to be interchangeable in most cases therefore are not stated in the obsolete/replacement parts listing.

(00-09 interchangeable)
(10-19 interchangeable)
(20-29 interchangeable)

In case of major modifications to the part, the tenth's digit of the part number is incremented by one.

EXAMPLES: from 01 to 10
from 10 to 20

These parts are NOT directly interchangeable.

M 13 Blower
Soufflerie
Ventilador
Ventilatore

Tafel Nr.
Tabl. No.
Tavola N.

14

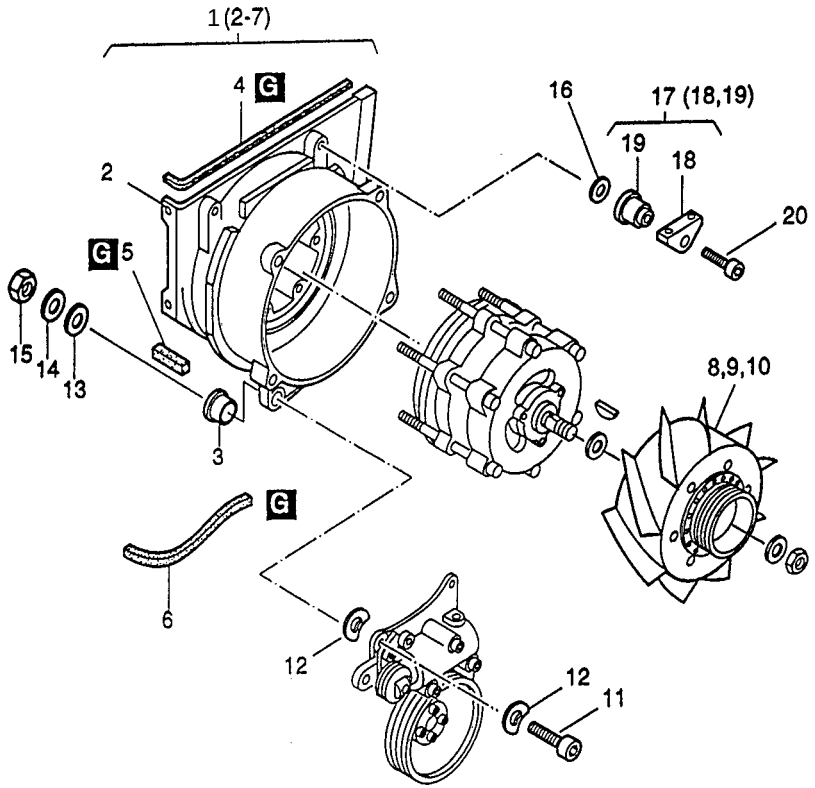


Fig.-No.	HATZ Ident-No.	Stuck Qty. 2 M	3 M	4 M	P / W d / D	Bemerkung Notes	
1	00740202	1	1				
1	01203701			1			
2	.....						
3	03562500	2	2	2			
4	03552600	1	1	1		335 mm	
5	03598500	1	1	1		33 mm	
6	03552401	1	1	1		240 mm	
7	.....						
8	00959000	1					
9	00989701		1				
10	00990011			1			
11	50055100	2	2	2		M 10 x 55	DIN 912-8.8
12	50061700	4	4	4		A 10	DIN 137
13	50070600	2	2	2		10,5	DIN 7349
14	50002900	2	2	2		10	DIN 128
15	50023500	2	2	2		M 10	DIN 934-8
16	03595600	0...4	0...4	0...4			
17	00919800	2	2	2			
18	.....	-					
19	03552600	2	2	2			
20	50052600	2	2	2		M 8 x 45	DIN 912-8.8

Note: The spare parts manual section "M" or **"A"** corresponds with the same section in the repair manual. Sample follows.

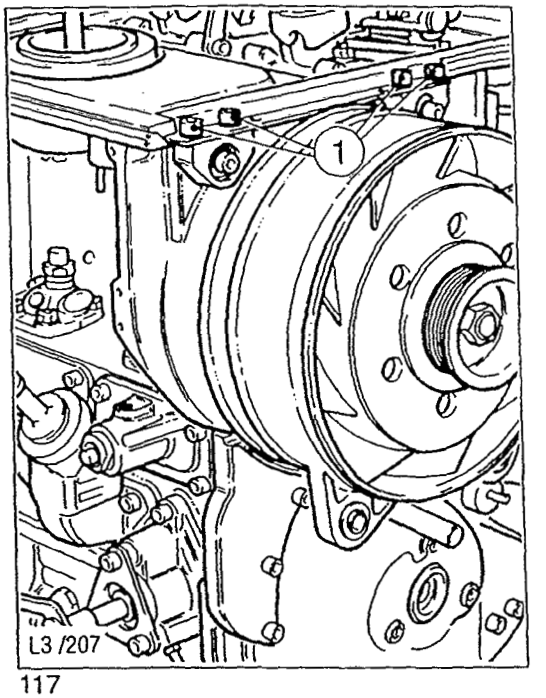
℗ -

Preparatory work:
- Take off the exhaust-system capsule (encapsulated engines only) and the silencer (muffler); see A 03.00.

Encapsulated engines:
- Take off the capsule side panel, air outlet duct, air guide housing and fan impeller; see M 35.00.

Non-encapsulated engines:
- Take off the cooling air guide.
- Take off the hydraulic shutdown device; see M 20.00.
- Disconnect the battery.

Removing:
- Mark and disconnect the wiring at the alternator.
- Take out screws (117/1).
- Pull out the fan housing.



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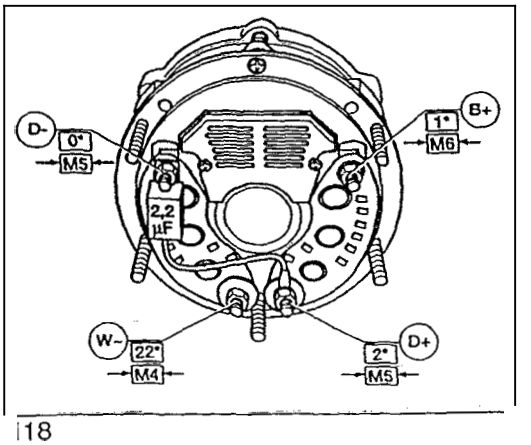
Checking **parts:**
- Check the fan housing sealing strips for signs of damage; if necessary, attach new sealing strips with adhesive ***G.***

Installing:
- Apply a slip agent, e.g. Vaseline, to the contact faces of the fan housing sealing strips.
- Install the fan housing and check that the sealing strips are correctly positioned.
- Re-assemble the items removed from the engine in the opposite order of work to that described for their removal.
- Make sure that the Poly-V belt is installed accurately.

Note:
When connecting cables to the alternator, do not accidentally interchange them; see Fig. 118.



118

~~Note:~~ Sample.

P.R.O.
KITS
CATALOG

HATZ DIESEL OF AMERICA, INC.
W229 N1645 WESTWOOD DRIVE
P.O. BOX 258
WAUKESHA, WI 53187-0258

MARCH, *1999*

P.R.O. KITS CATALOG

PARTS REQUIRED FOR OVERHAUL

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5	*Rubber Parts Kits*	58
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Part#: 000 000 17

1) CRANKCASE GASKET SETS

MODEL	*CRANKCASE GASKETSETS*	*PAGE*
1B20	015 542 00	16
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E80-E89	012 300 00	6
1D30/40/41	012 798 01	7
1D60/80/81/90	012 493 11	8
E950	012 301 00	9
2G30/40	012 280 00	10
Z782/Z790	012 302 00	11
E108/2108	012 305 00	12
D108/V108	012 306 00	13
2, 3, 4L30	012 307 01	14
2, 3, 4L/M40/41	012 309 02	15

E673

012 297 00 Crankcase Gasket Set

Qty	Part-No	Description
1	032 092 02	Gasket
	032 100 00	Gasket
2	040 713 00	Gasket
1	400 217 00	0-Ring 4.5x8.1x1.8
2	400 220 00	0-Ring 5x9x2
2	400 223 00	O-Ring 8x12x2
1	400 228 00	0-Ring 15x21.4x3,2
1	400 238 00	0-Ring 74x3
1	400 337 00	Oil Seal 30x47x8
1	400 342 00	Oil Seal 60x75x8
1	400 863 00	Felt Washer
5	500 010 00	Joint A10x16
2	500 011 00	Joint A12x15.5
1	500 015 00	Joint A21x26
2	500 624 00	Joint A10x13.5
1	501 538 00	O-Ring 23x29x3
1	501 540 00	O-Ring 110x116x3
1	502 524 00	Oil Seal 40x47x4
1	502 826 03	Sticker
1	503 244 00	Seal

E673LS

012 759 00 Crankcase Gasket Set

Qty	Part-No	Description
1	032 092 02	Gasket
1	039 131 00	Gasket
2	040 713 00	Gasket
1	400 217 00	0-Ring 4.5x8.1x1.8
2	40022000	O-Ring 5x9x2
2	400 223 00	O-Ring 8x12x2
1	400 228 00	O-Ring 15x21.4x3,2
1	400 238 00	O-Ring 74x3
1	400 337 00	Oil Seal 30x47x8
1	400 339 00	Oil **Seal** 40x52x7
1	400 342 00	Oil Seal 60x75x8
5	500 010 00	Joint A10x16
2	500 011 00	Joint A12x15.5
1	500 015 00	Joint A21x26
2	500 624 00	Joint A10x13.5
1	501 538 00	O-Ring 23x29x3
1	501 540 00	O-Ring 110x116x3
1	502 524 00	Oil Seal 40x47x4
1	502 826 03	Sticker
1	503 244 00	Seal

E71-780

012 298 00 Crankcase Gasket Set

Otv	Part-No	Description
1	031 502 02	Gasket f. Fuel Tank
2	031 684 00	Gasket
1	031 745 00	Gasket
1	031 99200	Gasket
2	40021700	O-Ring 4.5×8.1×1.8
2	400 223 00	O-Ring 8×12×2
2	400 229 00	O-Ring 16×22×3
1	40023600	O-Ring 36×44×4
1	400338 00	Oil Seal 35x47x7-9
1	400 339 00	Oil Seal 40x52x7-8.5
1	400 347 00	**Oil** Seal 70x85x8-9
2	500 009 00	Copper Washer **A8**
2	500 011 00	Copper Washer A12
2	500-01200	Copper Washer A14
1	500 015 00	Comer Washer A21
1	501 53800	O-Ring 32x29x3
2	502 229 00	O-Ring 100x108x4
1	502 826 03	**Sticker**
1	503 244 00	Sealing Ring

E786

012 299 00 Crankcase Gasket Set

Qtv	Part-No	Description
1	031 502 02	Gasket f. Fuel Tank
2	031 684 00	Gasket
1	031 745 00	Gasket
1	031 992 00	Gasket
2	400 217 00	O-Ring 4.5x8.1x1.8
2	400223 00	O-Ring 8x12x2
2	400229 00	O-Ring 16x22x3
1	400338 00	Oil Seal 35x47x7-9
1	400 339 00	Oil Seal 40x52x7-8.5
1	400 341 00	Oil Seal 50x65x8-10
1	400 347 00	Oil Seal 70x85x8-9
2	500 009 00	Copper Washer A8
2	500 011 00	Copper Washer A12
2	500 012 00	Copper Washer A14
1	500 015 00	Copper Washer A21
1	501 538 00	O-Ring:32x29x3
1	501 542 00	0-Ring.5x7x1
1	502 229 00	0-Ring 100x108x4
1	502 826 03	Sticker
1	503 244 00	Sealing Ring

E80-89

012 300 00 Crankcase Gasket Set

Qty	Part-No	Description
1	031 461 00	Gasket f. Cover
1	031 464 01	Gasket
1	031 500 00	Gasket
1	031 502 02	Gasket f. Fuel Tank
1	031 560 00	Gasket f. Cover .
2	031 684 00	Gasket
1	400 224 01	O-Ring 8x2 Gray
1	400 236 00	O-Ring 36x44x4
1	400 237 00	O-Ring 45x49x2
5	500 009 00	Joint A8x11.5
2	500 011 00	Joint A12x15.5
2	500 012 00	Joint A14x18
1	500 015 00	Joint A21x26
1	500 016 00	Joint A22x27
1	500 017 00	Joint C22x27
1	500 018 00	Joint A30x36
1	500 454 00	Oil Seal B55x70x8
1	500 456 00	Oil Seal B70x85x8
1	501 537 00	O-Ring 4.48x1.78
1	502 245 00	O-Ring 13.3x2.4
1	502 826 03	Sticker

lD30-41

012 798 01 Crankcase Gasket Set

Qty	Part-No	Description
1	037 951 00	0-Ring 265×269.4×3.6
2	037 958 00	0-Ring 12×18.3×7.3
2	040 713 00	Gasket
1	040 886 00	Sticker Label
1	050 689 00	Gasket
2	500 011 00	Joint A12×15.5
2	500 016 00	Joint A22×27
2	500 624 00	Joint A10×13.5
1	501 299 00	0-Ring.32×37×2.5
1	502 245 00	0-Ring:13.3×2.4
1	502 825 01	Silicon Sealer
1	502 826 03,	Sticker
1	502 864 00	Joint A24×29
1	503 258 10	Oil Seal 54×70×8
2	503 289 00	0-Ring 22×1,6
3	503 290 00	0-Ring 9.5×2.5
2	503 29200	**0-Ring** 50×55×3
1	503 304 00	0-Ring 27×2N
1	5033 18 00	0-Ring
1	503 354 00	O-Ring 4.7×1.6
1	503 497 00	0-Ring 100×2.5
2	503 597 00	0-Ring 20.29×2.62
1	503 63400	O-Ring 17×1.6
1	503 681 01	Oil Seal 52×80×10
1	50460400	O-Ring 18×2

012 493 11 Crankcase Gasket Set

Qty	Part-No	Description
1	037 951 00	0-Ring 265×26.94×3.6
2	037 958 00	0-Ring 12×18.3×7.3
2	040 713 00	Gasket
1	040 886 00	Sticker Label
1	050 689 00	Gasket
2	500 011 00	Joint A12×15.5
2	500 01600	Joint A22×27
2	500 624 00	Joint A10×13.5
1	501 299 00	0-Ring 32×37×2.5
1	50224500	
1	502 249 00	0-Ring 123×2.5
1	502 825 01	Silicon Sealer
1	502 826 03	Sticker
1	502 864 00	Joint A24×29
1	503 258 10	Oil Seal 54×70×8
2	503 289 00	O-Ring 22×1.6
3	503 290 00	O-Ring 9.5×2.5
2	503 292 00	0-Ring 50×55×3
1	503 304 00	O-Ring 27×2N
1	503 318 00	O-Ring
1	50335400	
2	503 597 00	O-Ring 20.29×2.62
1	503 627 00	Oil Seal 62×90×10
1	50363400	O-Ring 17×1.2
1	503 861 00	0-Ring 21x2
1	504 604 00	O-Ring 18x2

E950

012 301 00 Crankcase Gasket Set

Qty	Part-No	Description
2	031 684 00	Gasket
1	033921 00	Gasket
1	034 385 00	Gasket
1	034 387 00	Gasket
1	034 445 01	Gasket f. Blower
2	400 220 00	0-Ring 5×9×2
1	40022900	O-Ring 16×22×3
I	400 371 00	0-Ring 152.5×157.5×2.5
1	500 008 00	Copper Washer
7	500 009 00	Joint A8x11.5
2	500 011 00	Joint A12x15.5
2	50001200	Joint A14×18
3	500 01600	Joint A22×27
4	500 624 00	Joint A10×13.5
1	500 82200	Oil Seal 50×72×8 BBL
1	501 14701	Oil Seal 64×90×10
1	501 15200	Oil Seal 40×62×7 BBL
1	50153800	O-Ring 23×29×3
2	501 691 00	**0-Ring.**19×1.8
1	50222900	**0-Ring.**100×108×4
2	502245 00	O-Ring 13.3×2.4
1	502 481 00	10×14×2
1	502 826 03	Sticker

2G30/40

012 280 00 Crankcase Gasket Set

Qty	Part-No	Description
1	503 362 00	0-Ring 10x3
1	041 18500	Shiml.O
1	041 186 00	Shim 1.4
5	500 009 00	Joint A8×11.5
3	500 011 00	Joint A12×15.5
1	500 012 00	Joint A14×18
1	50153800	O-Ring 23×29×3
8	502 750 00	0-Ring 14~1.78
1	502 826 03	Sticker
1	503 011 00	Gasket
1	503 012 00	Joint
1	503 015 00	Oil Pan Gasket
1	503 039 00	Gasket
1	503 045 00	Oil Seal 38×52×8
2	503 065 00	O-Ring 8.73×1.78
2	503 081 00	O-Ring 2.9×1.78
1	503 105 00	O-Ring 41×1.78
1	503 112 00	Oil Seal 38×52×8
2	503 115 00	Gasket Timing Cover
2	503 123 00	Gasket 0.1
1	503 124 00	Gasket 0.2
2	503 125 00	Gasket 0.3
1	503 235 00	0-Ring 70×75×3.1
1	503 362 00	0-Ring 10x3

012 302 00 Crankcase Gasket Set

Qty	Part-No	Description
1	031 589 00	Breather Tube Gasket
2	031 907 00	Gasket
	032 118 01	Gasket
	032 121 00	Gasket, Sum
	032 124 00	Fuel Pum Gasket
	032 164 01	Gasket
1	032 168 00	Gasket
1	032 702 00	Gasket
1	032 704 00	Gasket
1	400 224 01	0-Ring 8x2 Gray
2	400 229 00	O-Ring 16×22×3
1	400 234 00	0-King:32×38×3
1	400 236 00	0-King 36×44×4
1	400 347 00	Oil Seal 70×85×8-9
1	400 371 00	O-Ring 152.5×157.5×2.5
2	400 817 00	O-Ring 12×16×2
1	500 008 00	Copper Washer
7	500 009 00	Joint A8x11.5
2	500 011 00	Joint A12×15.5
2	500 012 00	Joint A14×18
2	500 016 00	Joint A 22×27
1	500 624 00	Joint A10×13,5
1	501 147 01	Oil Seal 64×90×10
1	501 299 00	0-Ring 32×37×2.5
1	501 538 00	0-Ring 23×29×3
1	501 691 00	0-Ring 19×1.8
2	502 245 00	0-Ring 13.3×2.4
1	502 826 03	Sticker

E/Z108

012 305 00 Crankcase Gasket Set

Qty	Part-No	Description
2	031 589 00	Breather Tube Gasket
2	031 684 00	Gasket
1	031 792 00	Gasket
3	031 793 00	Gasket
1	031 807 00	Gasket
2	031 853 01	Gasket
1	031 884 01	Gasket
2	031 907 00	Gasket
1	033 478 00	Gasket
1	033 479 00	Gasket
1	033 480 00	Gasket
1	033 481 00	Gasket
1	033 531 00	Gasket
1	039 622 00	Asbestos Label
2	400 223 00	O-Ring 8×12×2
1	400 224 01	O-Ring 8×2 Gray
2	400 229 00	O-Ring 16×22×3
1	400 230 00	O-Ring 20×26×3
1	400 236 00	O-Ring 36×44×4
2	400 332 00	Usitring 12.7×18×1.5
1	400 347 00	Oil Seal 70×85×8-9
1	400 349 00	Oil **Seal** 82×100×13
1	400 553 00	Oil **Seal** 90×110×15
4	400 798 00	0-Ring 20.3×25.1×2.4
2	40081700	O-Ring 12×16×2
1	500 007 00	Joint A6×12
I	500 008 00	**Copper** Washer
2	500 011 00	Joint A12×15.5
6	500 012 00	Joint A14×18
1	500 013 00	Joint A16×22
1	500 014 00	Joint A18×22
1	500 015 00	Joint A21×26
1	500 016 00	Joint A22×27
3	500 018 00	Joint A30×36
1	500 908 00	0-Ring 70×2.5
2	501 691 00	0-Ring 19×1.8
I	502 245 00	0-Ring 13.3×2.4

D/V108

012 306 00 Crankcase Gasket Set

Qty	Part-No	Description
2	031 589 00	Breather Tube Gasket
1	031 792 00	Gasket
7	031 793 00	Gasket
1	031 807 00	Gasket
4	031 853 01	Gasket
4	031 907 00	Gasket
1	033 479 00	Gasket
1	033 480 00	Gasket
1	033 531 00	Gasket
1	039 622 00	Asbestos Label
1	400 224 01	O-Ring 8x2 Grav
2	40022900	O-Ring 16×22×3
1	40023000	O-Ring 20×26×3
1	40023600	O-Ring 36×44×4
6	400 332 00	Usitring 12.7×18×1.5
1	400 347 00	Oil Seal 70×85×8-9
1	400 349 00	Oil Seal 82× 100× 13
1	400 553 00	Oil Seal 90×110×15
8	400 798 00	Oil Seal 20.3×25.1×2.4
2	40081700	O-Ring 12×16×2
1	500 007 00	Joint A6× 12
1	500 008 00	**Comer** Washer
28	500 009 00	Joint A8×11.5
4	500 011 00	Joint A12×15.5
10	500 012 00	Joint A14×18
1	500 013 00	Joint A16×22
1	500 014 00	Joint A18×22
1	500 015 00	Joint A21×26
1	500 016 00	Joint A22×27
3	500 018 00	Joint A30×36
1	500 908 00	O-Ring 70×2.5
1	501 299 00	0-Ring 32×37×2.5
2	501 691 00	0-Ring 19×1.8
1	502 245 00	0-Ring 13.3×2.4

2-4L30

012 307 01 Crankcase Gasket Set

Qtv	Part-No	Description
8	031 684 00	Gasket
1	034 620 00	Gasket
1	034 659 00	Gasket
1	035 50601	Gasket. Seal Carrier
1	035 680 00	Gasket, Pump
1	035 681 00	Gasket
1	035 870 00	Rubber Ring
1	036140 01	Gasket. Side Cover
2	400 223 00	O-Ring 8×12×2
4	400 798 00	O-Ring 20.3×25.1×2.4
1	400 817 00	O-Ring 12×16×2
6	500 009 00	Joint A8×11.5
13	500 011 00	Joint A12×15
3	50001200	Joint A14×18
4	500 014 00	Joint A18×22
3	500 016 00	Joint A22×27
2	501 290 00	Gasket Oil Filler
1	501 291 00	Oil Seal B55×70×8
1	501 299 00	O-Ring 32×37×2,5
1	501 303 00	Oil Seal 70×90×10
2	501 304 00	O-Ring 16.3×2.4×21.1
2	501 307 00	O-Ring 42×2.5
4	501 322 00	O-Ring 33.3×2.4
1	501 324 01	O-Ring 53.57×3.53
1	501 399 00	O-Ring 23.3×2.4
2	501 422 00	O-Ring 24.8×1.5
6	501 629 00	Joint A8×14
1	502 025 02	O-Ring 3.0×1.6
1	502 194 00	O-Ring 12×2
1	502 245 00	0-Ring13.3x2.4
1	502 825 01	Silicon Sealer
1	502 82603	Sticker

2-4L/M40/41

012 309 02 Crankcase Gasket Set

Qty	Part-No	Description
8	031 684 00	Gasket
1	034 659 00	Gasket
1	035 506 01	Gasket, Seal Carrier
1	036 140 01	Gasket, Side Cover
3	038 650 00	Shim
3	038 650 10	Shim
4	038 968 02	Gasket 0.2
4	038 969 02	Gasket 0.3
1	039 344 00	Gasket
4	03969400	Joint
1	041 027 00	Washer **f.** Belt Tens.
1	400 217 00	0-Ring 4.5x8.1x1.8
1	400 223 00	0-Ring 8x12x2
1	400 817 00	0-Ring 12x16x2
8	500 009 00	Joint A8x11.5
9	500 011 00	Joint A12x15.5
5	500 012 00	Joint A14x18
2	500 01400	Joint A18x22
4	50001600	Joint A22x27
3	50062400	Joint A10x13.5
2	501 290 00	Gasket Oil Filler
1	501 291 00	Oil seal B55x70x8
1	501 299 00	O-Ring 32x37x2.5
2	501 304 00	O-Ring 16.3x2.4x21.1
2	501 307 00	0-Ring 42x2.5
1	501 324 01	O-Ring 53.57x3.53
1	501 399 00	0-Ring 23.3x2.4
2	501 422 00	O-Ring 24.8x1.5
6	501 629 00	Joint A8x14
1	502 025 02	0-Ring 3.0x1.6
1	502 194 00	0-Ring 12x2
1	502 245 00	O-Ring 13.3x2.4
1	502 246 01	Oil Seal 80x100x10
1	502631 00	O-Ring 37.8x1.5
1	502 825 01	Silicon Sealer
1	502 826 03	Sticker
1	503 244 00	Seal
2	503 267 00	0-Ring 9.7x1
1	503 467 00	0-Ring 7.5x2.5

1B20

015 542 00 Crankcase Gasket Set

Qty	Part-No	Description
1	015 837 00	Breather Tube
1	040 980 00	Sealing.Strip 331.5mm
1	400 337 00	Oil Seal 30x47x8
2	501 629 00	Joint A8x14
1	504 232 00	Oil Seal 40x55x10
1	504 403 00	0-Ring:8x1.5
2	504 698 00	Joint A8x11.5

13330

015 823 00 Crankcase Gasket Set

Qty	Part-No	Description
1	041 126 00	Sealing **Strip** 4 19mm
1	400 337 00	Oil Seal 30x47x8
2	501 629 00	Joint A8x14
1	504 403 00	O-Ring 8x1.5
1	404 498 00	**Oil** Seal 42x55x10
1	504 618 00	Rubber Sleeve
2	504 698 00	Joint A8x11.5

2) CYLINDER HEAD GASKET SETS

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E673

009 106 10 Cylinder Head Gasket Set

Qty	Part-No	Description
1	012 846 00	Gasket Oil Bath Air Cleaner
1	012 861 00	Gasket Muffler
1	032 089 02	Gasket
1	035 81800	Gasket Cvl. Head 0.4
1	035 820 00	Gasket Cyl. Head 0.6
2	400 81700	O-Ring 12x16x2
1	500 011 00	Joint A12x15.5
1	501 542 00	0-Ring 5x7x1
1	501 543 00	O-Ring 7.5x10.5x1.5
1	502 826 03	Sticker
1	502 827 00	Assembly Advice
4	502 880 00	0-Ring. 17x3

E71/75

003 394 10 Cylinder head Gasket Set

Qty	Part-No	Description
1	011 539 00	Gasket Muffler
1	011 540 00	Gasket Kit
1	031 605 00	Joint Washer
1	031 735 00	Gasket Cyl. Head 0.5
1	031 737 00	Gasket Cyl. Head 0.7
1	031 741 00	Gasket
1	032 288 00	Joint Washer 1.0
1	039 402 01	Gaskets Application
4	400 223 00	O-Ring 8x12x2
2	400 232 00	O-Ring 31x40x4.5
2	400 817 00	O-Ring 12x16x2
2	500 009 00	Joint A8x11.5
1	501 542 00	O-Ring 5x7x1
2	501 629 00	Joint A8x14
1	502 826 03	Sticker
1	502 827 00	Assembly Advice

E79/E780

003 552 11 Cylinder Head Gasket Set

Qty	Part-No	Description
1	011 539 00	Gasket Muffler
1	011 540 00	Gasket Kit
1	031 729 01	Gasket
1	031 741 00	Gasket
1	031 974 00	Gasket. Cyl. Head 0.5
1	031 976 00	Gasket Cyl. Head 0.7
1	032 288 00	Joint Washer 1.0
1	039 402 01	Gasket Application
4	400 223 00	O-Ring 8□12□2
2	400 232 00	O-Ring 31□40□4.5
2	400 817 00	O-Ring 12□16□2
2	500 009 00	Joint A8□11.5
1	501 542 00	O-Ring 5□7□1
2	501 629 00	Joint A8□14
1	502 826 03	Sticker
1	502 827 00	Assembly Advice

E785/E786

003 589 10 Cylinder Head Gasket Set

Qty	Part-No	Description
1	011 587 00	Gasket Oil Bath Air Cleaner
1	012 858 00	Gasket Muffler.
	031 729 01	Gasket
1	032 038 00	Gasket Cyl. Head 0.7
1	032 040 00	Gasket Cyl. Head 0.9
1	032 042 00	Gasket
1	032 288 00	Joint Washer 1.0
4	400 223 00	0-Ring 801202
2	400 232 00	0-Ring 31□40□4.5
2	400 817 00	0-Ring 12016□2
1	400 850 01	Injector Seal
2	500 009 00	Joint A80 11.5
1	501 542 00	0-Ring 5□7□1
2	501 629 00	Joint A80 14
1	502 826 03	Sticker
1	502 827 00	Assembly Advice

E80/85

003 312 11 Cylinder Head Set

Qty	Part-No	Description
1	012 847 00	Gasket Air Intake Tube
2	031 487 00	Joint Washer
1	031 498 01	Gasket Cover
1	031 554 00	Gasket Cyl. Head 0.5
1	031 556 00	Gasket Cyl. Head 0.7
1	031 589 00	Breather Tube Gasket
1	031 605 00	Joint Washer
1	032 288 00	Joint Washer 1,0
2	400 216 00	O-Ring 2.5174.901.2
4	400 223 00	O-Ring 8□12□2
2	400 225 00	O-Ring 11□19□4
2	400 235 00	O-Ring 35□47□6
2	400 817 00	O-Ring 12□16□2
2	500 009 00	Joint A80 11.5
1	500 020 01	Gasket 26SP-AF
1	502 826 03	Sticker
1	502 827 00	Assembly Advice
1	031 488 00	Gasket Cyl. Head 0.5
1	031 493 00	Gasket Cyl. Head 0.7

003 333 10 Cylinder Head Gasket Set

Qty	Part-No	Description
1	011 587 00	Gasket Oil Bath Air Cleaner/F
1	012 847 00	Gasket **Air** Intake Tube
1	012 860 00	Gasket Muffler
2	031 487 00	Joint Washer
1	031 589 00	Breather Tube Gasket
1	031 593 00	Gasket Cyl. Head 0.7
1	031 597 01	Gasket Cover
1	031 605 00	Joint Washer
1	032 288 00	Joint Washer 1.0
1	032 682 00	Gasket **Cvl.** Head 0.5
2	400 216 00	O-Ring 2.5×4.9×1.2
4	400 223 00	0-Ring 8×12×2
2	400225 00	O-Ring 11×19×4
2	400 235 00	0-Ring 35×47×6
2	400 817 00	0-Ring 12×16×2
2	500 009 00	Joint A8×11.5
1	50282603	Sticker
1	502 827 00	Assembly Advice

1D30/40

012 797 12 Cylinder Head Gasket Set

Qty	Part-No	Description.
1	014 **893** 10	Gasket Muffler
1	040 061 11	Valve Cover Gasket
1	040 258 00	Joint Washer
1	040 274 00	Gasket Cyl. Head 0.6
1	040 276 00	Gasket Cyl. Head 0.8
2	040 298 00	Gasket
2	400 224 01	O-Ring 8×2 Gray
2	400 817 00	O-Ring 12×6×2
2	500 008 00	Copper Washer
1	500 011 00	Joint A12×15.5
1	502 826 03	Sticker
2	503 301 00	O-Ring 4×1.2
2	503 302 00	O-Ring 19×3 N
2	504 057 00	Valve Stem Seal Cap
2	504 113 00	O-Ring 23×3.5 Green

1D31

015 225 00 Cylinder Head Gasket Set

Qty	Part-No	Description
1	014 893 10	Gasket Muffler
1	040 061 11	Valve Cover Gasket
1	040 258 00	Joint Washer
2	040 298 00	Gasket
1	041 010 00	Gasket Cyl. Head 0.6
1	041 012 00	Gasket Cyl. Head 0.8
2	400 224 01	0-Ring: 8x2 Grav
2	400 817 00	0-Ring 12×16×2
2	500 008 00	Copper Washer
1	500 011 00	Joint A12×15.5
1	502 826 03	Sticker
1	502 827 00	Assembly Advice
2	503 301 00	O-Ring 4×1.2
2	503 302 00	O-Ring 19×3N
2	503 920 00	Joint 9.3x14
2	504 057 00	Valve Stem Seal Cap
2	504 113 00	O-Ring 23×3.5 Green
2	504 584 00	Gasket

1D41

015 051 01 Cylinder Head Gasket Set

Qty	Part-No	Description
1	014 893 10	Gasket Muffler
1	040 061 11	Valve Cover Gasket
1	040 258 00	Joint Washer
2	040 298 00	Gasket
1	040 719 00	Gasket Cyl. Head 0.7
1	040 720 00	Gasket Cyl. Head 0.8
2	400 224 01	O-Ring 8×2Gray
2	400 817 00	O-Ring 12×16×2
2	500 008 00	Copper Washer
1	500 011 00	Joint A12×15.5
1	502 826 03	Sticker
2	503 301 00	O-Ring 4×1,2
2	503 302 00	0-Ring 19x3 N
2	504 057 00	Valve Stem Seal Cap
2	504 113 00	0-Ring 23×3.5 Green

012 642 11 Cylinder Head Gasket Set

Qty	Part-No	Description
1	014 711 10	Gasket, Muffler
1	040 061 11	Valve Cov.Gask. 16
2	040 063 00	Gasket
1	040 251 00	Gasket Cyl. Head 0.9
1	040 363 00	Gasket Cyl. Head 0.7
4		
1	040489 00	Rubber Ring
2	400 224 01	O-Ring 8x2 Gray
2	40081700	O-Ring 12×16×2
1	400 850 01	Injector Seal
2	500 008 00	Copper Washer
1	500 011 00	Joint A12x15.5
1	502 826 03	Sticker
2	503 301 00	0-Ring4xl.2
2	503 302 00	0-Ring 19x3N
2	503 303 00	O-Ring 23×3
2	504 052 00	Valve Stem Seal Cap

1D80

012 492 11 Cylinder Head Gasket Set

Qty	Part-No	Description
1	014 711 10	Gasket, Muffler
1	040 027 00	Gasket. Cyl. Head 0.9
1	040 061 11	Valve Cover Gasket
2	040 063 00	Gasket
1	040 365 00	Gasket Cyl. Head 0.7
1	040 366 00	Gasket Cyl. Head 0.8
1	040 489 00	Rubber Ring
4	040 845 00	Sealing Ring
2	400 224 01	0-Ring 8x2 Gray
2	40081700	O-Ring 12x16x2
1	400 850 01	Joint
2	500 008 00	Copper Washer
1	500 011 00	Joint A12x15.5
1	502 826 03	Sticker
2	503 301 00	0-Ring 4x1.2
2	503 302 00	O-Ring 19x3 N
2	503 303 00	O-Ring 23x3
2	504 052 00	Valve Stem Seal Cap

1D81

015 178 00 Cylinder Head Gasket Set

Qty	Part-No	Description
1	014291 00	Gasket Muffler
1	040 027 00	Gasket Cyl. Head 0.9
1	040 061 11	Valve CoverGasket
2	040 063 00	Gasket
1	040258 00	Joint Washer
1	040 365 00	Gasket Cvl. Head0.7
1	04036600	Gasket Cyl. Head 0.8
1	040 489 00	Rubber Ring
4	040 845 00	Sealing Ring
2	400 224 01	0-Ring 8x2 Gray
2	40081700	O-Ring 12x16x2
2	500 008 00	Copper Washer
1	500 011 00	Joint A12x15.5
1	502 82603	Sticker
1	502 827 00	Assembly Advice
2	503 301 00	O-Ring 4x1.2
2	503 302 00	0-Ring 19x3N
2	503 303 00	0-Ring 23x3
2	504 052 00	Valve Stem Seal Cap
2	504 598 00	Sealing Cyl. Screw

E950

007 037 10 Cylinder Head Gasket Sets

Qty	Part-No	Description
1	012 858 00	Gasket Muffler
1	032 288 00	Joint Washer 1.0
1	033 668 00	Gasket Cyl. Head 0.6
1	033 941 00	Gasket
I	034767 00	Gasket
2	400 228 00	0-Ring 15×21.4×3.2
1	400 558 00	Joint
1	400 734 00	Rubber Ring 012-1
1	400 815 00	0-Ring 8×13×2.5
3	500 009 00	Joint A8x11.5
2	50154200	O-Ring 5×7×1
4	502 580 00	O-Ring 17×3
1	502 826 03	Sticker
1	502 827 00	Assembly Advice

2G30

012 281 00 Cylinder Head Gasket Set

Qty	Part-No	Description
1	012 855 00	Gasket Muffler
1	032288 00	Joint Washer 1.1
1	037 819 00	Gasket Cyl. Head 0.7
1	037 935 00	Gasket Cyl. Head 0.6
1	03783902	Gasket
1	400 850 01	Injector Seal
2	500 009 00	Joint A8×11.5
1	500 016 00	Joint A22×27
2	501 629 00	Joint A8×14
1	502 084 00	0-Ring 32x3
1	502 826 03	Sticker
1	502 827 00	Assembly Advice
1	502 901 00	Joint 38x3
1	502 902 00	0-Ring 115.6×121×3.1
2	503 131 00	Joint A6×10

2G40

012 477 00 Cylinder Head Gasket Set

Qty	Part-No	Description
1	012 855 00	Gasket Muffler
1	032 288 00	Joint Washer 1.0
1	03783902	Gasket
1	037 929 00	Gasket Cyl. Head 0.6
1	041 109 00	Gasket Cyl. Head 0.55
1	400 850 01	Injector Seal
2	500 009 00	Joint A8×11.5
1	500 016 00	Joint A22×27
2	501 629 00	Joint A8×14
1	502 084 00	O-Ring 32×3
1	502 827 00	Assembly Advice
1	502 901 00	Joint 38×3
1	502 902 00	0-Ring 115.6×121×3.1
2	503 131 00	Joint A6×10

2788-2790

005 695 10 Cylinder Head Gasket Set

Qty	Part-No	Description
1	012 859 01	Gasket Muffler
1	012 860 00	Gasket Muffler
1	032 154 00	Gasket
2	032 162 12	Gasket Cover Cyl. Head
1	033 418 00	Gasket 0.7
1	033 420 00	Gasket 0.9
2	400 228 00	O-Ring 15×21.4×3.2
1	400 558 00	Joint
3	500 009 00	Joint A8× 1I.5
2	502 580 00	0-Ring 17x3
1	502 826 03	Sticker
1	502 827 00	Assembly Advice

E108/Z108/D108/V108

005 582 11 Cylinder Head Gasket Set

Qty	Part-NO	Description
2	031 839 01	Gasket
1	031 847 01	Gasket, Valve Cover
1	031 923 00	Gasket
1	032 300 00	Gasket
1	032 923 00	Gasket 0,6
1	032 924 00	Gasket 0,8
1	034 771 00	Gasket
4	400 228 00	O-Ring 15×21.4×3.2
2	400 555 00	Valve Stem Seal Cap
1	400 558 00	Joint
3	500 009 00	Joint A8× 11.5
1	500 024 01	Gasket 50SP-AF
1	502 827 00	Assembly Advice

2L30/3L30/4L30

009 919 00 Cylinder Head Gasket Set

Qty	Part-NO	Description
2	034 615 01	Air Intake Gasket
1	034699 00	Cover Gasket
1	035 590 00	Gasket Cyl. Head 0.9
1	035 592 00	Gasket Cyl. Head 1.1
2	400 228 00	0-Ring 15×21.4×3.2
1	400 850 01	Injector Seal
1	500 008 00	Copper Washer
2	500 009 00	Joint A8×11.5
2	502 580 00	0-Ring 17×3
1	502 826 03	Sticker
1	502 827 00	Assembly Advice
2	502 881 00	0-Ring 15×3.2

2-4M/L40/41

009 922 02 Cylinder Head Gasket Sets

Qty	Part-NO	Description
1	012 845 01	Gasket. Exhaust Man.
1	03624402	Gasket
	036 260 01	Gasket Cyl. Head 0.8
	036 262 01	Gasket Cyl. Head 1.0
	040 857 00	Hose 7×10×10
	041 073 00	Joint
1	400 850 01	Iniector Seal
1	500 008 00	Copper Washer
2	500 009 00	Joint A8×11.5
1	501 323 00	Nylock Nut
1	502 249 00	0-Ring 123×2.5
1	502 826 03	Sticker
1	502 827 00	Assembly Advice
2	502 848 00	Valve Stem Seal
2	502 880 00	0-Ring 17x3
4	502 881 00	0-Ring 15×3.2

1B20

01554100 Cylinder Head Gasket Set

Qty	Part-No	Description
2	041 065 00	Sealing Ring Timing Cover
2	041 075 00	Sealing Ring Cyl. Head
1	050 557 00	Gasket Cyl. Head. Cover
2	050 563 00	Gasket Air Filter
1	050 595 00	Gasket Cyl. Head 0.4
1	050 596 00	Gasket Cyl. Head 0.5
1	050 705 00	Joint Washer .Injector
5	050 801 00	Gasket Muffler
1	502 827 00	Assembly Advice
2	504 258 00	Valve Stem Seal Cap

1B30

015 822 00 Cylinder Head Gasket Set

Qty	Part-No	Description
2	041 065 00	Sealing Ring Timing Cover
2	041 335 00	Sealing Ring Cyl. Head
2	050 563 00	Gasket Air Filter
1	050 705 00	Joint Washer .Injector
1	050 933 01	Gasket Cyl. Head Cover
1	050 964 01	Gasket Cyl. Head 0.4
1	050 965 01	Gasket Cyl. Head 0.5
5	051 036 00	Gasket Muffler
1	502 827 00	Assembly Advice
2	504 258 00	Valve Stem Seal Cap
4	504 403 00	O-Ring 8x1.5

3) MAINTENANCE KITS

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E673

009 612 02 Maintenance Kit

Qty	Part-No	Description
1	031 691 03	Oil Drain Plug R1-2
2	031 731 00	Hexagon Nut
3	032 089 02	Gasket
2	400 894 01	Fuel Filter
7	500 015 00	Joint A21×26
2	500 035 00	Locking Washer
2	500 234 00	Hexagon Nut M 8x1

E71-780

009 613 02 Maintenance Kit

Qty	Part-No	Description
1	**006** 321 **01**	Oil Fill Cap
2	**031** 502 02	Gasket Fuel **Tank**
1	031 **506** 00	Disc
1	031 691 03	Oil Drain Plug R1-2
2	031 731 00	Hexagon Nut
3	031 741 00	Gasket
2	400 **438** 00	Filter Element
4	500 012 00	Joint **A14×18**
7	500 015 **00**	**Joint A21×26**
2	500 **232 00**	**Hexagon** Nut
4	500 627 00	All, Scr.M 6x10
6	501 629 00	Joint A8×14

E786

009 614 02 Maintenance Kit

Otv	Part-No	Description
1	006 321 01	Oil Fill Cap
2	031 502 02	Gasket Fuel Tank
1	031 506 00	Disc
1	031 691 03	Oil Drain Plug R1-2
2	031 731 00	Hexagon Nut
3	032 042 00	Gasket
2	400 438 00	Filter Element
4	50001200	Joint A14×18
7	500 015 00	JointA21×26
2	500 232 00	Hexagon Nut
4	500 627 00	All. Scr. M6× 10
6	501 629 00	Joint A8×14

Qty	Part-No	Description
1	005 623 00	Oil Fill Cap
2	031 490 00	Lock Nut
2	031 502 02	Gasket Fuel Tank
1	031 506 00	Disc
3	031 597 01	Gasket Cover
1	031 691 03	Oil Drain Plug R1-2
2	400 438 00	Filter Element
4	500 012 00	Joint A14×18
7	500 015 00	JointA21×26
7	500 018 00	Joint A30×36
2	500 232 00	Hexagon Nut
4	500 627 00	All. Scr. M 6×10

1D30-41

012 799 10 Maintenance Kit

Qty	Part-No	Description
4	014800 00	**Supra** Oil Filter
2	031 731 00	Hexagon Nut
3	040 061 11	Valve Cover Gasket
2	040 301 00	Air Filter
2	400 894 01	Fuel Filter
4	500 016 00	Joint A22×27
1	501 404 00	Drain-Plug
1	50329200	O-Ring 50×55×3

lD60-90

012 494 10 Maintenance Kit

Qty	Part-No	Description
4	014 800 00	Supra Oil Filter
2	031 731 00	Hexagon Nut
3	040 061 11	Valve Cover Gasket
2	014 930 00	Air Filter 1D60/81
2	400 894 01	Fuel Filter
4	500 016 00	Joint A22×27
1	501 404 00	Drain Plug
1	503 292 00	O-Ring 50×55×3

1D60C-1D81C

012 929 10 Maintenance Kit

Qty	Part-No	Description
4	014 800 00	Supra Oil Filter
2	014 930 00	Air Filter 1D60/81
2	031 731 00	Hexagon Nut
3	040 061 11	Valve Cover Gasket
2	400 894 01	Fuel Filter
4	500 014 00	Joint A18×22
1	500 442 00	Closing Screw M18×1.5
4	500 812 00	**Spring** Washer A6
2	501 708 00	All.Scr.M6×25
1	503 292 00	0-Ring 50×55×3

E950

009 617 01 Maintenance Kit

Qty	Part-No	Description
1	**006** 321 01	Oil Fill Cap
2	031 490 00	**Lock** Nut
1	033 659 01	Pressure Spring
2	033941 00	Gasket
1	*034* 767 *00*	Gasket
1	035 697 00	Pressure Spring
4	400 381 00	Oil Filter
2	400 894 01	Fuel Filter
4	500 016 00	Joint A22×27
1	500 444 00	Closing Screw AM22× 1.5
1	501 542 00	0-Ring 5×7×1

2G30/40

012 282 02 Maintenance Kit

Qty	Part-No	Description
1	006 321 01	Oil Fill Cap
2	031 731 00	Hexagon Nut
2	400 894 01	Fuel Filter
4	500 012 00	Joint A14×18
8	501 629 00	Joint A8×14
4	502 902 00	0-Ring 115.6×121×3.1
4	503 028 00	Oil Filter
1	503 11000	Drain Plug M14×1.5

Z788-790

009 618 01 Maintenance Kit

Qty	Part-No	Description
1	006 321 01	Oil Fill Cap
2	031 49000	Lock Nut
2	031 88401	Gasket
4	032 162 12	Valve Cover Gasket
2	400 073 00	Filter Element
1	400 284 00	**Hex.** Nut M8
4	400 381 00	Oil Filter Z788/790
1	490 365 00	Packing Rig
4	500 012 00	Joint A14×18
4	500 016 00	Joint A22×27
1	500 444 00	Clos. Screw AM22×1.5
5	500 627 00	All. Scr. M6×10
1	500 629 00	Disc B8.4

2L/M40/41

009 871 04 Maintenance Kit

Qty	Part-No	Description
2	009 529 00	Air Filter L&M
2	031 490 00	Lock Nut
1	036 476 00	Sealing Strip
2	400 653 00	Oil Filter L&M
4	500 014 00	Joint A18×22
4	500 016 00	Joint A22×27
1	500 442 00	Clos.Screw M18x1.5
2	501 323 00	Nylock Nut
1	501 404 00	Drain Plug
2	502 249 00	O-Ring 123×2,5
1	502 515 00	Fuel Filter Element
2	503 170 00	Fuel Prefilter
4	503 356 00	Combi Screw M6×16

3L/M40/41

009 915 04 Maintenance Kit

Qty	Part-No	Description
2	009 529 00	Air Filter L&M
2	031 490 00	Lock Nut
1	037 698 00	Sealing Strip
2	400 653 00	Oil Filter L&M
4	500 014 00	Joint A18×22
4	500 016 00	Joint A22×27
1	500 442 00	Clos. Screw M18×1.5
3	501 323 00	Nylock Nut
1	501 404 00	Drain Plug
3	502 249 00	O-Ring 123×2.5
1	502 515 00	Fuel Filter Element
2	503 170 00	Fuel Prefilter
4	503 356 00	Combi Screw M6×16

012 033 04 Maintenance Kit

Qty	Part-No	Description
4	009 529 00	Air Filter L&M
2	031 490 00	Lock Nut
2	036 476 00	Sealing.Strip
2	400 653 00	Oil Filter L&M
4	500 014 00	Joint A18×22
4	500 016 00	Joint A22×27
1	500 442 00	Clos. Screw M18×1.5
4	501 323 00	Nylock Nut
1	501 404 00	Drain Plug
4	502 249 00	0-Ring 123~2.5
1	502 515 00	Fuel Filter Element
2	503 170 00	Fuel Prefilter
4	503 356 00	Combi Screw M6×16

1B20

015 543 00 Maintenance Kit

Qty	Part-No	Description
4	050 557 00	Gasket Cyl. Head Cover
2	503 580 00	Grub Screw M8×10
1	503 731 00	Drain Plug M 22×1.5
2	504 260 00	Air Filter Element
2	504 405 00	Fuel Filter
4	504 698 00	Joint A22x27

1B30

015 824 00 Maintenance Kit

Qty	Part-No	Description
4	050 933 01	Gasket Cyl. Head Cover
2	503 580 00	Grub Screw M8×10
1	503 731 00	Drain Plug M 22× 1.5
2	504 260 00	Air Filter Element
2	504 405 00	Fuel Filter
4	504 698 00	Joint A22x27

4) EMERGENCY KITS

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E5/673

009 656 03 Emergency Kit

Qty	Part-No	Description
I	007 363 00	Closing Plug
1	009 106 10	Gasket Set Cyl. Head E5/673
1	037 423 00	Fuel Hose 7/1000
4	037 663 00	Washer 8.4×17×1.5
1	400 031 00	Joint Washer
1	400 046 00	Nozzle
1	400 326 11	Car, B30 Fuel Tank
1	400 995 00	Rain Protection Cap
1	490 375 00	Packing Ring
4	500 234 00	Hexagon Nut M8×1
2	501 444 00	Hexagon Nut M6

E71/E75

009 657 04 Emergency Kit

Qty	Part-No	Description
1	003 394 10	Gasket Set Cyl. Head E71/75
1	007 363 00	Closing Plug
1	008 055 00	Vent Valve
4	031 71700	Disc
2	031 718 00	Collar Nut
2	034 580 00	Collar Nut
1	036 934 00	Fuel Pipe LW 7x360
1	040 897 00	Fuel Hose 4.5×530
1	400 046 00	Nozzle
1	400 327 01	Cap Fuel Tank
1	400 995 00	Rain Protection Cap
1	490 375 00	Packing Ring
2	500 229 00	Hexagon Nut M8

E79

009 658 04 Emergency Kit

Qty	Part-No	Description
1	003 552 11	Gasket Set Cyl Head E79/780
1	007 363 00	Closing Plug
1	008 055 00	Vent Valve
4	031 71700	Disc
2	031 718 00	Collar Nut
2	034 580 00	Collar Nut
1	03693400	Fuel Hose 7×360
1	040 897 00	Fuel Hose 4.5×580
1	400 030 00	Joint Washer
1	400 046 00	Nozzle
1	400 327 01	Cap B40 Fuel Tank
1	400 404 00	Rain Protection Cap
1	490 19600	Packing Ring
2	500 229 00	Hexagon Nut **M8**
2	501 444 00	Hexagon Nut M6

E780

009 659 04 Emergency Kit

Qty	Part-No	Description
1	003 552 11	Gask.S.Cyl.H.79/780
1	00736300	Closing Plug
1	008 055 00	Vent Valve
4	031 717 00	Disc
2	031 718 00	Collar Nut
2	**034** 580 00	Collar Nut
1	040 897 00	Fuel Hose 4,5×580
1	036 **934** 00	Fuel Hose 7x360
1	400 030 00	Joint Washer
1	40004600	**Nozzle**
1	400 327 01	Cap B40.Fuel Tank
1	400 404 00	Rain Protection Cap
1	490 380 00	Packing Ring
2	500 229 00	Hexagon Nut M8
2	501 444 00	Hexagon Nut M6

E786

012 010 03 Emergency Kit

Qty	Part-No	Description
1	003 589 10	Gasket Set Cyl. Hd.785/786
1	007 363 00	Closing Plug
1	008 055 00	Vent Valve
4	03171700	Disc
2	031 830 00	Collar Nut
2	031 873 01	Collar Nut
1	040 897 00	Fuel Hose 4.5×580
1	036 934 00	Fuel Hose 7x360
1	400 327 01	Cap B40 Fuel Tank
1	400 367 00	Rain Protection Cap
1	490 380 00	Packing Ring
2	500 028 00	Spring Washer
2	500 229 00	Hexagon Nut M8
2	501 444 00	Hexagon Nut M6
1	502 576 10	Nozzle

1D30/40

012 801 11 Emergency Kits

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	012 797 12	Gasket Set Cyl. Hd.
1	036 734 00	Fuel Hose 7x510
1	400 327 01	Cap B40.Fuel Tank
2	503 470 00	Circlip As 24×1.75
1	503 832 00	Nozzle DLLA 170P260
1	039 020 00	Fuel Pipe
1	037 422 00	Fuel Pipe
1	013 083 00	Close. Plug

1D31

015 226 00 Emergency Kit

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	013 083 00	Closing Plug
1	015 225 00	Gasket Set Cyl. Hd.1D31
1	036 734 00	Fuel Hose 7x510
1	037 422 00	Fuel Hose 4.5×1000
1	039 020 00	Fuel Pipe
1	400 327 01	Cap F. Fuel Tank €340
2	503 470 00	Circlip 24×1.75
1	504 154 00	Nozzle DLLA 160P469

1D41

015 052 01 Emergency Kit

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	013 083 00	Closing Plug
1	015 051 01	Gasket Set Cvl. Head 1D41
1	036 734 00	Fuel Hose 7x510
1	037 422 00	Fuel Hose 4.5×1000
1	039 020 00	Fuel Pipe
1	400 327 01	Cap Fuel Tank B40
1	504 154 00	Nozzle DLLA 160P469

1D60

012 643 11 Emergency Kit

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	012 642 11	Gasket Set Cyl. Hd.1D60
1	013 083 00	Closing Plug
1	036 736 00	Fuel Hose 7x600
2	503 470 00	Circlip 24x1.75
1	503 834 00	Nozzle DLLA 160S 1181
1	503 858 01	Cap Fuel Tank B60
1	037 422 00	Fuel Hose 4.5x1000
1	039 020 00	Fuel Pipe

1D60C

012 930 11 Emergency Kit

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	012 642 11	Gasket Set Cyl. Hd.1D60
1	012 756 10	Closing Plug
1	037 422 00	Fuel Hose 4.5x1000
1	037 423 00	Fuel Hose 7x1000
1	039 020 00	Fuel Pipe
2	503 470 00	Circlip 24x1.75
1	503 834 00	Nozzle DLLA 160S 1181

1D80

012 495 11 Emergency Kits

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	012 492 11	Gasket Set Cvl. Hd.1D80
1	013 083 00	Closing Plug
1	036 736 00	Fuel Hose 7x600
1	037 422 00	Fuel Hose 4.5x1000
1	039 020 00	Fuel Pipe
2	503 470 00	Circlip 24x1.75
I	503 625 00	Nozzle LLA 158S1146
1	503 858 01	Cap Fuel Tank B60

1D81

015 084 00 Emergency Kit

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	013 083 00	Closing Plug
1	015 178 00	Gasket Set Cvl. Hd.1D81
1	036736 00	Fuel Hose **7x600**
1	037 422 00	Fuel Hose 4.5x1000
1	039 020 00	Fuel Pipe
2	503 470 00	Circlip 24x1.75
1	503 858 01	Cap Fuel Tank B60
1	504 152 01	Nozzle DLLA 154P620

1D80C

012 931 11 Emergency Kit

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	012 492 11	Gasket Set Cyl. Hd.
1	012 756 10	Closing Plug
1	037 422 00	Fuel Hose 4.5×1000
1	037 423 00	Fuel Hose 7×1000
1	039 020 00	Fuel Pipe
2	503 470 00	Circlip AS 24×1.75
1	503 625 00	Nozzle DLLA 15851146

1D81C

015 085 00 Emergency Kit

Qty	Part-No	Description
1	008 055 00	Vent Valve
1	012 756 10	Closing Plug
1	015 178 00	Gasket Set Cyl. Hd. 1D81
1	037 422 00	Fuel Hose 4,5×1000
1	037 423 00	Fuel Hose 7x1000
1	039 020 00	Fuel Pipe
2	503 470 00	Circlip AS 24×1.75
1	504 152 01	Nozzle DLLA 154P620

E950

009 664 03 Emergency Kit

Qty	Part-No	Description
1	007 037 10	Gask.S.Cyl.H.E950
1	008 055 00	Vent Valve
4	033 665 00	Hexagon Nut .Cyl.
1	034 441 01	Pin f. Rocker Shaft
4	034 575 00	Disc f. Stud
1	037 422 00	Fuel Hose 4.5×1000
1	037 423 00	Fuel Hose7×1000
1	400 327 01	Cap f. Fuel Tank B40
1	400 827 01	Nozzle DLLA 1563822
1	400 829 00	V-Belt 9.5×1100
1	490 377 00	Packing Ring
1	501 238 00	Ball 7MM III
3	501 444 00	Hexagon Nut M6

2G30

012 283 03 Emergency Kit

Qty	Part-No	Description
1	011253 00	Cap Fuel Tank
1	012 232 00	Connecting Piece
1	012 281 00	Gasket Set Cyl. Hd .2G30
2	031 718 00	Collar Nut
1	036 734 00	Fuel Hose 7x510
2	037 845 01	Collar Nut M10
4	037 914 00	Washer 10.1×22×2.1
1	039 226 00	Fuel Hose 3.5/1000
1	039 271 00	Fuel Hose 3.5/460
1	040 357 00	Washer
2	400 284 00	Hex. Nut M8
1	400 404 00	Rain Protection Cap
1	490 380 00	Packing Ring
2	500 028 00	Spring Washer 8
1	500 061 00	Banjo Bolt 4-5-3
2	501 480 00	Hexagon Nut M8
1	503 453 00	Switch Box Key
1	503 556 00	Nozzle DLLA159S1141

2G40

012 478 01 Emergency Kit

Qty	Part-No	Description
1	011 253 00	Cap Fuel Tank
1	012 232 00	Connecting Piece
1	012 477 00	**Gasket Set** Cyl. Hd.2G40
2	031 718 00	Collar Nut
1	036 734 00	Fuel Hose 7x510
2	037 845 01	Collar Nut M10
4	037 914 00	Washer 10.1×22×2.1
1	03922600	Fuel Hose 3.5/1000
1	039 271 00	Fuel Hose 3.5/460
1	040 357 00	Washer
2	400 284 00	Hex. Nut M8
1	400 404 00	Rain Protection Cap
1	490 380 00	Packing Ring
2	50002800	**Spring** Washer 8
1	500 061 00	Banjo Bolt 4-5-3
2	501 480 00	Hexagon Nut M8
1	503 453 00	Switch Box Key
1	503 556 00	Nozzle DLLA159S1141

Z788-790

009 *665* 03 Emergency Kit

Qty	Part-No	Descri tion
1	005 695 10	Gasket Set. Cyl. Hd .Z790
5	032 148 00	Washer 9.1×20×2.1
5	032 150 00	Collar Nut
1	400 327 01	Cap. Fuel Tank B40
1	400 724 00	Nozzle
1	490 213 00	Packing
4	500 028 00	Spring Washer 8
2	500 229 00	Hexagon Nut N8
2	501 481 00	Flat Washer 8.4

2-4M40

012 262 01 Emergency Kit

Qty	Part-No	Description
1	009 922 02	Gasket Set Cyl. Hd.
2	012 078 00	Fastener
2	035 927 00	Rubber Sleeve
2	036 252 00	Shank-Nut
5	036 481 00	Collar-Nut M10×1.25
6	400 284 00	Hex. Nut M8
3	500 027 00	Spring Washer 6
4	500 028 00	Lock Washer 8
4	500 229 00	Hexagon Nut M8
4	500 507 00	Allen Screw M6×16
4	500 812 00	Spring Washer A6
1	501 413 01	Nozzle DLLA 160S908
1	501 415 00	Poly. V-Belt 9J910
3	501 444 00	Hexagon Nut M6
4	502 051 00	Tooth. Lock W.V.8.4
4	502 052 00	Flat Head Screw M8×16
1	50287900	Rain Cap
1	503 453 00	IGN Key DS 14603

2-4M41

015 442 00 Emergency Kit

Qty	Part-No	Description
1	009 922 02	Gasket Set Cyl. Hd.
2	012 078 00	Fastener
2	035 927 00	Rubber Sleeve
2	036 252 00	Shank-Nut
5	036 481 00	Collar-Nut M10×1.25
6	400 284 00	Hex. Nut M8
3	500 027 00	Spring Washer 6
4	500 028 00	Lock Washer 8
4	500 229 00	Hexagon Nut M8
4	500 507 00	Allen Screw M6×16
4	500 812 00	Spring Washer A6
1	501 415 00	Poly. V-Belt 9J910
3	501 444 00	Hexagon Nut M6
4	502 051 00	Tooth. Lock W.V.8.4
4	502 052 00	Flat Head Screw M8×16
1	502 879 00	Rain Cap
1	503 453 00	IGN Key DS 14603
1	504 441 00	Nozzle DSLA 150P645

2L40C

012 057 01 Emergency Kit

Qty	Part-No	Description
1	009 922 02	Gasket .Set Cyl. Hd
2	035 927 00	Rubber Sleeve
2	036 252 00	Shank-Nut
5	036481 00	Collar Nut M10×1.25
6	40028400	Hex. Nut M8
3	500 027 00	**Spring** Washer ***6***
4	500 028 00	Lock Washer 8
4	500 229 00	Hexagon Nut M8
4	500 507 00	Allen Screw M6×16
4	500 812 00	Spring Washer A6
1	501 413 01	Nozzle DLLA 160S908
3	501 444 00	Hexagon Nut M6
1	502 031 00	Poly-V Belt 9J920
4	502 051 00	Tooth. Lock W.V.8,4
4	502 052 00	Flat Head Screw M8×16
1	503 453 00	IGN Key DS 14603

2L41C

015 441 00 Emergency Kit

Qty	Part-No	Description
1	009 922 02	Gasket Set Cyl. Hd
2	035 927 00	Rubber Sleeve
2	036 252 00	Shank-Nut
5	036 481 00	Collar Nut M10x1.25
6	400 284 00	Hex. Nut M8
3	500 027 00	**Spring** Washer ***6***
4	500 028 00	Lock Washer 8
4	500 229 00	Hexagon Nut M8
4	500 507 00	Allen Screw M6×16
4	500 812 00	Spring Washer A6
3	501 444 00	Hexagon Nut M6
1	502 031 00	Poly-V Belt 95920
4	502 051 00	Tooth. **Lock** W.V.8,4
4	502 052 00	Flat Head Screw M8×16
1	503 453 00	IGN Key DS 14603
1	504 441 00	Nozzle DSLA 150P645

3/4L40C

00 9872 02 Emergency Kit

Qty	Part-No	Description
1	009 922 02	Gasket Set Cyl. Hd.
2	035 927 00	Rubber Sleeve
2	03625200	Shank-Nut
5	036 481 00	Collar-Nut
6	400 284 00	Hex. Nut M8
3	500 027 00	Spring Washer 6
4	500028 00	Lock Washer 8
4	500 229 00	Hexagon Nut 8
4	500 507 00	Allen Screw M6×16
4	500 812 00	Spring Washer A6
1	501 413 01	Nozzle DLLA 160S908
1	501 415 00	Poly.V-Belt 9J910
3	501 444 00	Hexagon Nut M6
4	502 051 00	Tooth. Lock W.V.8.4
4	502 052 00	Flat Head Screw M8×16
1	503 453 00	IGN Key DS 14603

3/4L41C

015 443 00 Emergency Kit

Qty	Part-No	Description
1	009 922 02	Gasket Set Cyl. Hd.
2	035 927 00	Rubber Sleeve
2	036 252 00	Shank-Nut
5	036 481 00	Collar-Nut
6	400 284 00	Hex. Nut M8
3	50002700	Spring Washer 6
4	500 028 00	Lock Washer 8
4	500 229 00	Hexagon Nut 8
4	500 507 00	Allen Screw M6×16
4	500 812 00	**Spring** Washer **A6**
1	501 415 00	Poly.V-Belt 9J910
3	501 444 00	Hexagon Nut M6
4	502 051 00	Tooth. Lock W.V.8.4
4	502 052 00	Flat Head Screw M8×16
1	503 453 00	IGN Kev DS 14603
1	504 441 00	Nozzle **DSLA** 150P645

1B20

015 544 00 Emergency Kit

Qty	Part-No	Description
1	015 096 00	Closing Plug
1	015 541 00	Gasket Set Cyl. Head 1B20
1	015 791 00	Fuel Leak-Off Pipe
1	504 411 00	Hose Clip
1	504 422 00	Injection Nozzle

1B30

015 825 00 -Emergency Kit

Qty	Part-No	Description
1	015 096 00	Closing Plug
1	015 822 00	Gasket Set Cyl. Head 1B30
1	015 791 00	Fuel Leak-Off Pipe
1	504 411 00	Hose Clip
1	504 680 00	Injection Nozzle-

5) RUBBER PARTS KITS

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1D30C-41C

015 021 00 Rubber Parts Kit

Qty	Part-No	Description
4	037 553 00	Gasket
2	040 308 01	Sealing Strip 44mm
2	040 309 01	Sealing Strip 29mm
1	040 310 01	Sealing Strip 308mm
4	040 418 00	Rubber Ring
4	040 419 00	Sealing Ring
1	040 491 00	Sealing Strip
1	040 495 00	Sealing Strip
1	040 611 00	Sealing Plate
3	040 664 00	Gasket Interme.Wall
2	040 669 00	Sealg. Strip 230mm
3	040 749 00	Sealg. Strip 90mm
2	040 749 00	Sealg. Strip 90mm
1	040 750 00	Sealg. Strip 186mm
1	040 806 00	Sealg. Strip 8×8×530
1	040 772 00	Sealing Strip 10×8×122
1	040 800 00	Sealing Strip 10×8×160
1	040 806 00	Sealing Strip8x8x530
1	040 807 00	Sealing Strip 8×8×360
1	040 809 00	Sealing Strip
1	040 810 00	Sealing Strip 8×8×530
1	040 816 00	Sealing Strip 8×8×360
2	040 817 00	Sealing Strip 8×8×25
1	040 832 00	Sealing Strip 97mm
5	040 841 00	Catch
1	040 855 00	Sealing Strip 60mm
1	040 861 00	Sealging Strip 8×8×640
2	040 865 00	Sealing Strip 182L
1	040 876 00	Insulation Board

1D60C-1D81C

014 879 00 Rubber Parts Kit

Qty	Part-No	Description
1	035 798 00	Joint Washer
4	037 553 00	Gasket
1	039 931 00	Rubber Sleeve
1	040 388 00	Sealg. **Strip** 94mm
4	04041800	Rubber Ring
4	040 419 00	Sealing Ring
1	040 434 00	Sealing Plate
1	040 470 10	Rubber Insert
1	040 490 00	Sealing **Strip**
1	040 491 00	Sealing Strip
1	040 495 00	Sealing Strip
1	040 497 00	Sealing Strip 13×1×195
1	040553 00	Rubber Sleeve
1	040 554 01	Joint Washer
1	040 563 00	Sealing Strip
3	040 664 00	Gasket Intermed. Wall
2	040 667 00	Sealing **Strip** 104mm
1	040 669 00	Sealing Strip 230mm
1	040 670 00	Sealing Strip 280
2	040 679 00	Rubber Strip
1	040 735 00	Sealing Strip 8×8×420
1	040 736 00	Sealing Strip 8×8×170
1	040 737 00	Sealing Strip 8×8×134
2	040 738 00	Gasket
1	040 740 00	Insulating Bord
1	040 846 00	Sealing Plate
1	040 858 00	Sealing Strip
1	040 859 00	Sealing Strip
1	040 860 00	Sealing Strip
1	040 861 00	Sealing Strip 8×8×640
1	502 565 01	Loctite IS 407
1	502 566 00	Silicon Sealer

2-4M40/41

012 156 01 Rubber Parts Kit

Qty	Part-No	Description
2	035 662 00	Sealing **Strip**
1	035 689 00	Rubber Sleeve
1	035 690 00	Filing Piece
1	035 694 00	Gasket
17	035 755 00	Sealing Ring
1	035 794 00	Sealing Ring
1	035 797 00	Sealing Ring
4	035 927 00	Rubber Sleeve
1	035 940 01	Sealing Ring
2	035 977 00	0-Ring
1	036 485 00	Sealing Strip
2	036 486 00	Joint
2	037 785 00	Sealing Strip
1	040 689 00	Sealing Strip 220mm
1	040 690 00	Sealing.Strip 143LG
1	040 691 00	Sealing **Strip** 65LG
1	040 692 00	Sealing **Strip** 113LG
1	050 687 00	Rubber Sleeve
1	502 565 01	Loctite IS 407

2-4L40C

012 157 00 Rubber Parts Kit

Qty	Part-No	Description
3	035 654 00	Rubber Sleeve
1	035 689 00	Rubber Sleeve
1	035 690 00	Filing Piece
9	035 755 00	Sealing Ring
2	035 772 00	Sealing Strip
2	035 776 00	Sealing Strip
1	035 794 00	Sealing Ring
1	035 795 00	Sealing Ring
1	035 797 00	Sealing Ring
2	035 799 00	Joint Washer
1	035 862 01	Sealing Strip
4	035 927 00	Rubber Sleeve
2	035 935 00	Sealing Strip
1	035 940 01	Sealing Ring
4	035 952 00	Sealing Ring
2	035 977 00	O-Ring
1	036 127 00	Sealing Strip
1	036 239 10	Sealing Strip
4	036 372 00	Rubber Ring
1	036 463 00	Sealing Strip
1	036 473 00	Gasket
1	036 485 00	Sealing Strip
2	036 486 00	Joint
1	037 654 00	Sealing Strip
1	037 785 00	Sealing Strip
4	037 799 00	Retaining Clip
1	502 565 01	Loctite IS 407

6) EXHAUST CAPSULE KITS
2-4L40/41C

MODEL	*EXHAUST CAPSULE KITS*	*PAGE*
Bottom Outlet	015 115 00	64
Top Outlet	015 114 00	64

2-4L40/41C

015 115 00 Exhaust Capsule Kit -Bottom Outlet

Qty	Part-No	Description
1	009 029 01	Exhaust Capsule
1	008 718 01	Exhaust Capsule
1	038 779 00	Cover
1	008 492 01	Guard
2	501 389 00	All. Scr. M8×12
2	503 574 00	Screw M8×25
5	501 390 00	All. Scr. M6×10
2	400 286 00	Nut M10

2-4L40/41C

015 114 00 Exhaust Capsule Kit -Top Outlet

Qty	Part-No	Description
1	010 830 00	Exhaust Capsule
1	008 718 01	Exhaust Capsule
1	038 780 00	Cover
1	038 192 01	Guard
2	501 389 00	All. Scr. M8×12
2	503 574 00	Screw M8×25
5	501 390 00	All. Scr. M6×10
2	400 286 00	Nut M10

7) ENGINE CAPSULE KITS

MODEL	*ENGINE CAPSULE KITS*	*PAGE*
2L40/4 1C	015 11600	66
3L40/4 1C	015 11700	67
4L40/4 1C	015 11800	68

2L40/41C

015 116 00 Engine Capsule

Otv	Part-No	Description
2	036 389 00	Sticker Silent Pack
2	036 144 01	Sticker Label
1	037 883 01	Sticker Label
1	033 254 00	Sticker Label
1	031 752 00	Sticker Label 12V
1	036 694 00	Sticker Label 24V
1	034 306 12	Sticker Label
1	008 173 00	Electric Wire 1300L
1	036 928 00	Earth Strap
1	014 729 00	Cable Conduct
4	036 372 00	Rubber Ring
4	035 952 00	Sealing Ring
2	035 799 00	Joint Washer
1	035 929 01	Sealing Strip
1	035 940 01	Sealing Ring
1	035 690 00	Filing Piece
1	035 795 00	Sealing Ring
1	035 794 00	Sealing Ring
14	502 892 00	Hex Screw M6×12
4	501 390 00	All. Screw M6×10
4	503 356 00	Combi Screw M6×16
4	400 025 00	Rivet 2,4×6 SL51
5	500 254 00	Hex Screw M6×10
3	501 444 00	Hexagon Nut M6
5	500 812 00	Spring Washer A6
1	009 985 10	Cover
1	009 503 10	Blower Ducting
1	014 661 00	End Plat CPL
1	037 528 00	Plate
1	009 256 01	Air Ducting
1	009 499 00	Cover
1	009 741 00	Cover Cpl
1	009 353 20	Side Panel
1	009 024 01	Hood
1	035 788 00	Stiffner
1	036 160 01	Rubber Seal

3L40/41C

01511700 Engine Capsule Kit

Qty	Part-No	Description
2	036 389 00	Sticker Silent Pack
2	036 144 01	Sticker Label
1	037 883 01	Sticker Label
1	033 254 00	Sticker Label
1	031 752 00	Sticker Label 12V
1	036 694 00	Sticker Label 24V
1	034 306 12	Sticker Label
1	008 173 00	Electric Wire 1300L
1	036 928 00	Earth Strap
1	014 729 00	Cable Conduct
4	036 372 00	Rubber Ring
4	035 952 00	Sealing Ring
2	035 799 00	Joint Washer
4	035 798 00	Joint Washer
1	035 929 01	Sealing Strip
1	035 940 01	Sealing Ring
1	035 690 00	Filing Piece
1	035 795 00	Sealing Ring
1	035 794 00	Sealing Ring
14	502 892 00	Hex Screw M6×12
4	501 390 00	All. Screw M6×10
4	503 356 00	Combi Screw M6×16
4	400 025 00	Rivet 2.4×6 SL51
5	500 254 00	Hex Screw M6×10
3	501 444 00	Hexagon Nut M6
5	500 812 00	Spring Washer A6
1	009 985 10	Cover
1	012 332 00	Blower Ducting
1	014 662 00	End Plate Cpl.
1	037 529 00	Plate
1	009 257 10	Air Ducting
1	009 500 10	Cover
1	012 324 00	Stiffner
1	009 742 00	Cover Cpl.
1	010 969 11	Side Panel
1	009 068 01	Hood
1	035 826 00	Stiffner
1	036 16101	Rubber Seal

4L40/41

015 118 00 Engine Capsule Kit

Qty	Part-No	Description
2	036 389 00	Sticker Silent Pack
2	036 144 01	Sticker Label
1	037 883 01	Sticker Label
1	033 254 00	Sticker Label
1	031 752 00	Sticker Label 12V
1	036 694 00	Sticker Label 24V
1	034 306 12	Sticker Label
1	008 173 00	Electric Wire 1300L
1	03692800	Earth Strap
	014 729 00	Cable Conduct
	036 372 00	Rubber Ring
4	035 952 00	Sealing Ring
2	035 799 00	Joint Washer
4	035 798 00	Joint Washer
1	035 929 01	Sealing Strip
1	035 940 01	Sealing Ring
1	035 690 00	Filing Piece
1	035 795 00	Sealing Ring
1	035 794 00	Sealing Ring
14	502 892 00	Hex Screw M6×12
4	501 390 00	All. Screw M6×10
4	503 356 00	Combi Screw M6×16
4	400 025 00	Rivet 2.4×6 SL51
5	500 254 00	Hex Screw M6×10
3	501 444 00	Hexagon Nut M6
5	500 812 00	Spring Washer A6
1	009 985 10	Cover
1	009 503 10	Blower Ducting
1	009 220 01	Base Pan
1	014 662 00	End Plat CPL
1	009 968 02	Air Ducting
1	009 949 00	Cover
1	037 687 00	Sealing Plate
1	009 743 01	Cover Cpl.
1	009 355 20	Side Panel
1	009 069 01	Hood
1	036 162 01	Rubber Seal
1	035 827 00	Stiffner

8) REBUILT KIT LOWER END

MODEL	*REBUILTKITLOWER END*	*PAGE*
2L/M40	994 005 30	70
3L/M40	994 005 31	70
4L/M40	994 005 32	71
2L/M41	994 005 43	71
3L/M41	994 005 44	72
4L/M41	994 005 45	72

2L/M40

994 005 30 Rebuilt Kit Lower End

Qty	Part-No	Description
1	009 529 00	Air Filter L/M
2	009 734 01	Cyl. with Piston L/M40
1	012 309 02	Gasket Set Crankcase L/M40/41
2	034633 00	Thrust Washer
3	035 555 00	Main Bearing, Std.
1	035 687 00	Rubber Diaphragm
2	036 18401	Rod Bearing
1	036 489 00	Breather Hose
2	037 530 00	Connect Rod Bushing
1	400 213 00	Oil Pressure Switch
1	400 653 00	Oil Filter
1	502 515 00	Fuel Filter Element
1	503 170 00	Fuel Pre Filter

3L/M40

994 005 31 Rebuilt Kit Lower End

Qty	Part-No	Description
1	009 529 00	Air Filter L/M
3	009 734 01	Cyl. With Piston L/M40
1	012 309 02	Gasket Set Crankcase L/M40/41
2	034 633 00	Thrust Washer
4	035 555 00	Main Bearing, Std.
1	035 687 00	Rubber Diaphragm
3	036 184 01	Rod Bearing
1	036 489 00	Breather Hose
3	037 530 00	Connect Rod Bushing
1	400 213 00	Oil Pressure Switch
1	400 653 00	Oil filter
1	502515 00	Fuel Filter Element
1	503 170 00	Fuel Pre Filter

4L/M40

994 005 32 Rebuilt Kit Lower End

Qty	Part-No	Description
2	009 529 00	Air Filter L/M
4	009 734 01	Cyl. with Piston L/M40
1	012 309 02	Gasket Set Crankcase L/M40/41
2	034 633 00	Thrust Washer
5	035 555 00	Main Bearing, Std.
1	035 687 00	Rubber Diaphragm
4	036 184 01	Rod Bearing
1	036 489 00	Breather Hose
4	037 530 00	Connect Rod Bushing
1	502 722 00	Oil Pressure Switch
1	400 653 00	Oil Filter
1	502 515 00	Fuel Filter Element
1	503 170 00	Fuel Pre Filter

2L/M41

994 005 43 Rebuilt Kit Lower End

Qty	Part-No	Description
1	009 529 00	Air Filter L/M
2	015 447 00	Cyl. with Piston L/M41
1	012 309 02	Gasket Set Crankcase L/M40/41
2	034 633 00	Thrust Washer
3	035 555 00	Main Bearing, Std.
1	035 687 00	Rubber Diaphragm
2	036 184 01	Rod Bearing
1	03648900	Breather Hose
2	03753000	Connect Rod Bushing
1	400 213 00	Oil Pressure Switch
1	400 653 00	Oil Filter
1	502 515 00	Fuel Filter Element
1	503 170 00	Fuel Pre Filter

3L/M41

994 005 44 Rebuilt Kit Lower End

Qty	Part-No	Description
1	009 529 00	Air Filter L/M
3	015 447 00	Cyl. With Piston L/M40
1	012 309 02	Gasket Set Crankcase L/M40/41
2	034 633 00	Thrust Washer
4	035 555 00	Main Bearing, Std.
1	035 687 00	Rubber Diaphragm
3	036 184 01	Rod Bearing
1	036 489 00	Breather Hose
3	037 530 00	Connect Rod Bushing
1	400 213 00	Oil Pressure Switch
1	400 653 00	Oil filter
1	502 515 00	Fuel Filter Element
1	503 170 00	Fuel Pre Filter

4L/M41

994 005 45 Rebuilt Kit Lower End

Qty	Part-No	Description
2	009 529 00	Air Filter L/M
4	015 447 00	Cyl. with Piston L/M41
1	012 309 02	Gasket Set Crankcase L/M40/41
2	034 633 00	Thrust Washer
5	035 555 00	Main Bearing.. Std.
1	035 687 00	Rubber Diaphragm
4	103618401	Rod Bearing
1	036 489 00	Breather Hose
4	037 530 00	Connect Rod Bushine
1	50272200	Oil Pressure Switch
1	400 653 00	Oil Filter
1	502 5 15 00	Fuel Filter Element
1	503 170 00	Fuel Pre Filter

9) REBUILT KIT TOP END

MODEL	*REBUILT KIT TOP END*	*PAGE*
2L/M40/41	*994* 005 **29**	74

! One kit required per cylinder.

994 005 29 REBUILT KIT TOP END

One required per cylinder

Qty	Part-No	Description
1	009 922 02	Gasket Set **Cyl.** Head L/M40/41
2	030 434 02	Valve Retainer
2	031 490 00	Lock Nut
2	031 835 00	Valve Spring, Inner
2	031 841 00	Rocker Bushing
2	031 851 00	Pressure Spring
2	031 852 00	Pressure Ring
4	032 332 00	**Shim** 0.2
4	032 333 00	**Shim** 0.3
2	033 256 00	Valve **Spring,** Outer
4	034 560 00	Shim 0.4
4	035 806 00	Shim 0.15
2	036 209 00	Keeper (2=1)

10) CAPSULE FOAM KIT

MODEL	*REBUILTKITLOWER END*	*PAGE*
2L40/4 1C	994 005 33	*76*
3L40/4 *1C*	994 005 34	*76*
4L40/4 1C	994 005 35	*77*

! Foam Kits do not include sealing strips and washers.
For a complete foam and rubber overhaul, the corresponding rubber parts sets should be ordered in addition to the foam kit.

2L40/41C

994 005 33 Capsule Foam Kit

Qty	Part-No	Description
1	035 60 200	Sealing Strip, 93mm
1	035 63 701	Sealing Strip, 215mm
1	035 65 100	Sealing Strip
1	035 79 800	Rubber Washer
1	035 85 002	Sealing Plate
1	035 87 101	Insulating Plate
1	035 87 300	Insulation Board
1	035 87 600	Insulation Board
1	035 87 901	Sealing Plate
1	035 92 901	Sealing Plate
2	035 93 300	Sealing Strip
1	036 16 001	Rubber Seal
1	036 47 400	Insulation Board
1	036 47 600	Sealing Strip
1	037 50 401	Insulating Plate
1	037 61 401	Rubber Insert, Oil

3L40/41C

994 005 34 Capsule Foam Kit

Qty	Part-No	Description
1	035 602 00	Sealing **Strip,** 93mm
1	035 637 01	Sealing **Strip,** 215mm
1	035 651 00	Sealing Strip
1	035 798 00	Rubber Washer
1	035 850 02	Sealing Plate
1	035 871 01	Insulating Plate
1	035 879 01	Sealing Plate
1	035 929 01	Sealing Plate
1	036 474 00	Insulation Board
1	037 504 01	Insulating Plate
1	037 614 01	Rubber Insert, Oil
1	035 874 00	Insulation Board
1	035 877 00	Insulation Board
1	035 934 00	Sealing Strip
1	036 161 01	Rubber Seal
1	037 698 00	Sealing Strip

994 005 35 Capsule Foam Kit

Qty	Part-No	Description
1	035 602 00	Sealing Strip, 93mm
1	035 637 01	Sealing:Strip, 215mm
1	035 651 00	Sealing:Strip
1	035 798 00	Rubber Washer
1	035 850 02	Sealing Plate
1	035 879 01	Sealing Plat
1	035 929 01	Sealing Plat
1	036 474 00	Insulation Board
2	036 476 00	Sealing Strip
1	037 614 01	Rubber Insert, Oil
1	012 055 00	Lining
1	035 935 00	Sealing Strip
1	036 162 01	Rubber Seal
1	037 673 00	Lining
1	037 687 00	Sealing Plate
1	037 690 00	Insulation Board
1	037 767 00	Insulation Board
1	037 768 00	Insulation Board

MAINTENANCE

L-M SERIES

LUBRICATION

Use API CD - CE - CF4 Oil

Viscosity according to temperature

- **straight weight**
- **multiviscosity**

15W40	**summer**
10W30	**winter**

FUELS

- ASTM D *975*
  DF1/DF2
- **Extreme cold weather - dilute with kerosene**

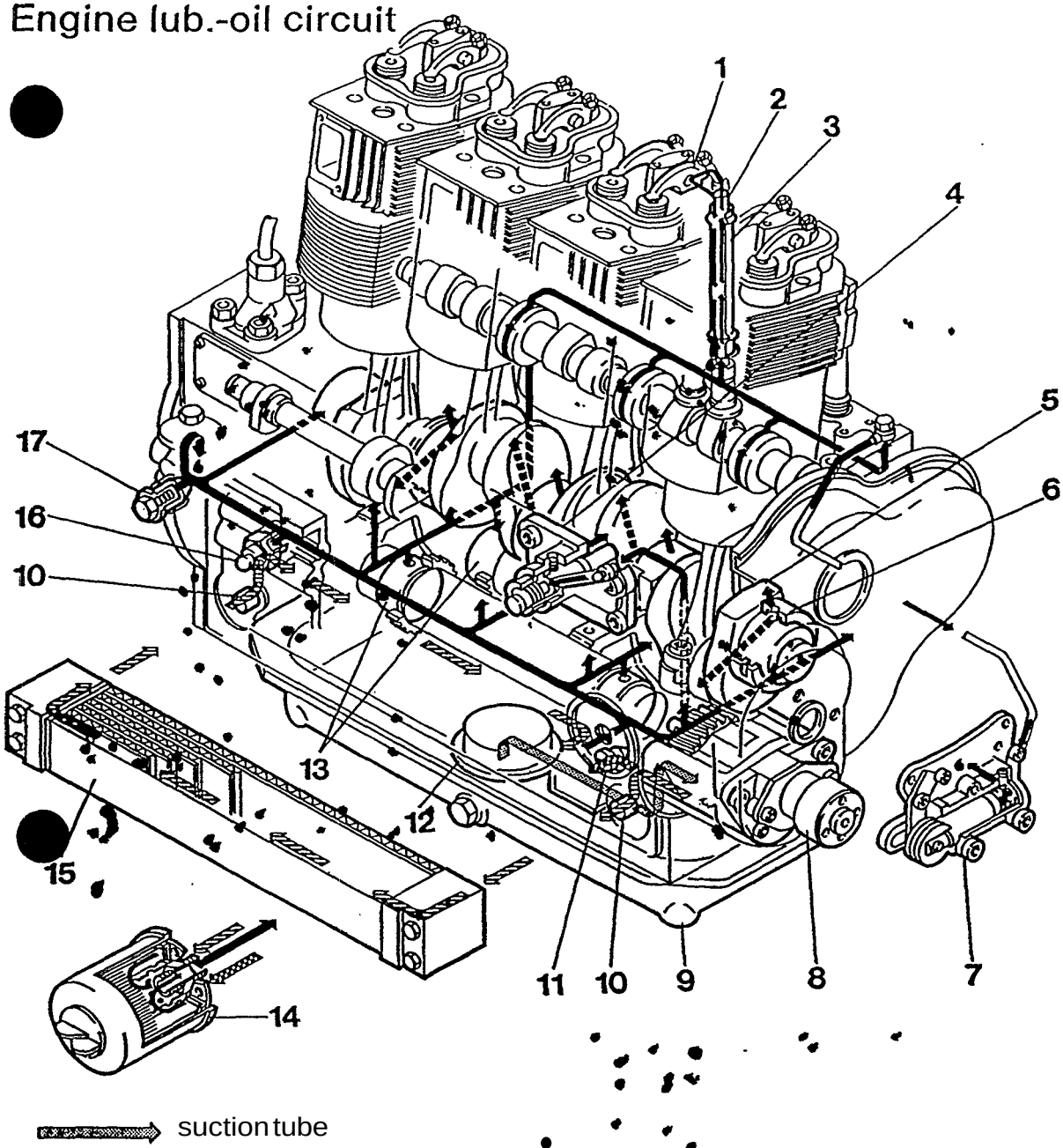
General Information

At 25 hours - New/Rebuilt

- **change engine oil and filter**
- **check and adjust valves**
- **check hardware for tightness**

DO NOT RETORQUE CYLINDER HEAD BOLTS

Engine lub.-oil circuit



suction tube

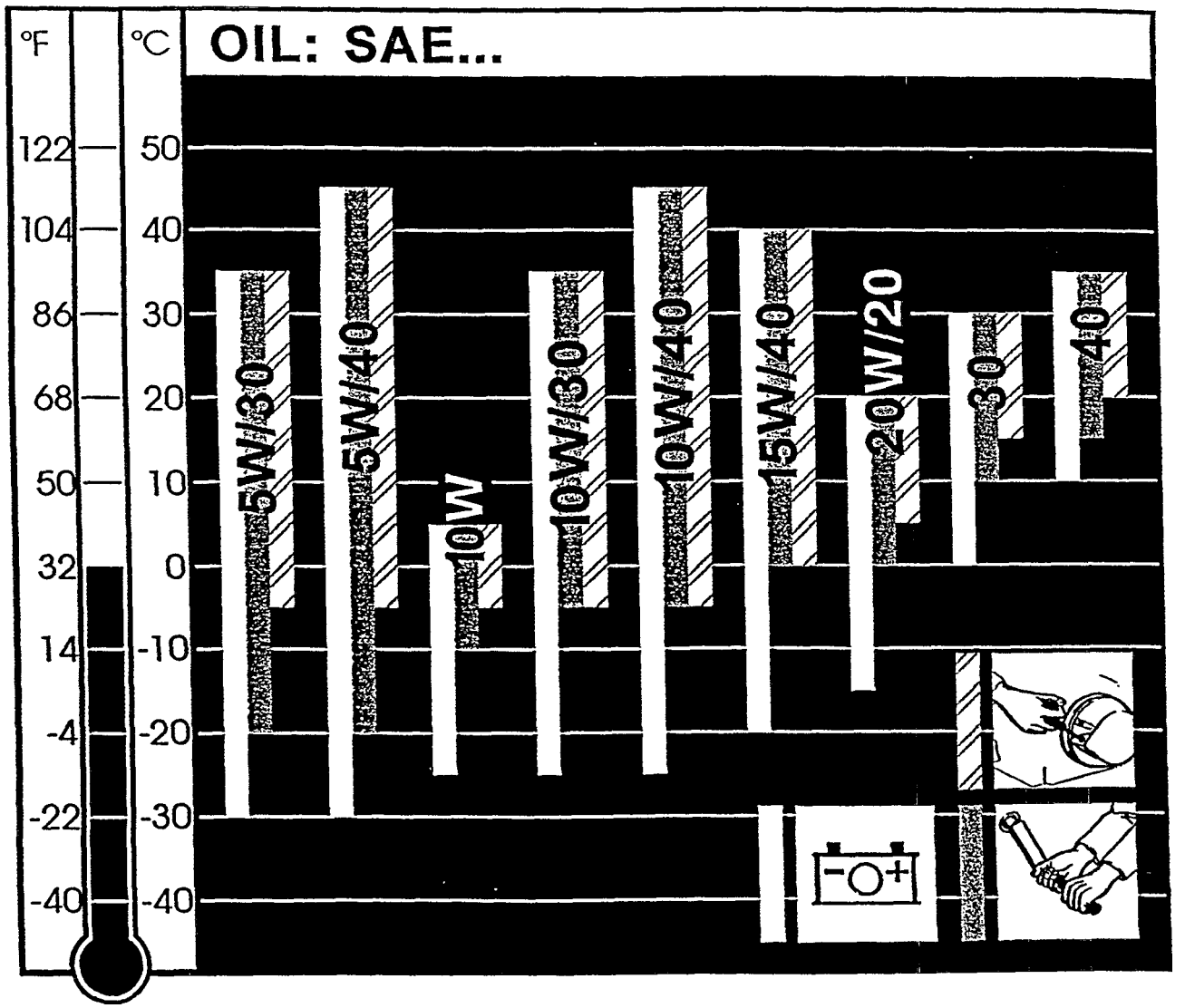
way of pressurized oil between pump and filter (at engines without oil-cooler)

way of pressurized oil between pump and filter if engine is equipped with oil-cooler

way of pressurized oil after oil filter

1 Rockers
2 Pushrods
3 Pushrod tubes
4 Excessive fuel device resp. HATZ auto-protection device
5 Crankshaft
6 Main bearings
7 Hydraulic belt tensioner
8 Lub.-oil pump
9 Oil sump
10 Closing plugs (engines without oil cooler)
11 Closing screw (engines with oil cooler)
12 Oil suction sieve
13 Counter rotating balance shaft(s)
14 Lub.-oil filter with bypass valve
15 Oil cooler
16 Oil pressure switch
17 Oil relieve valve

Oil Viscosity



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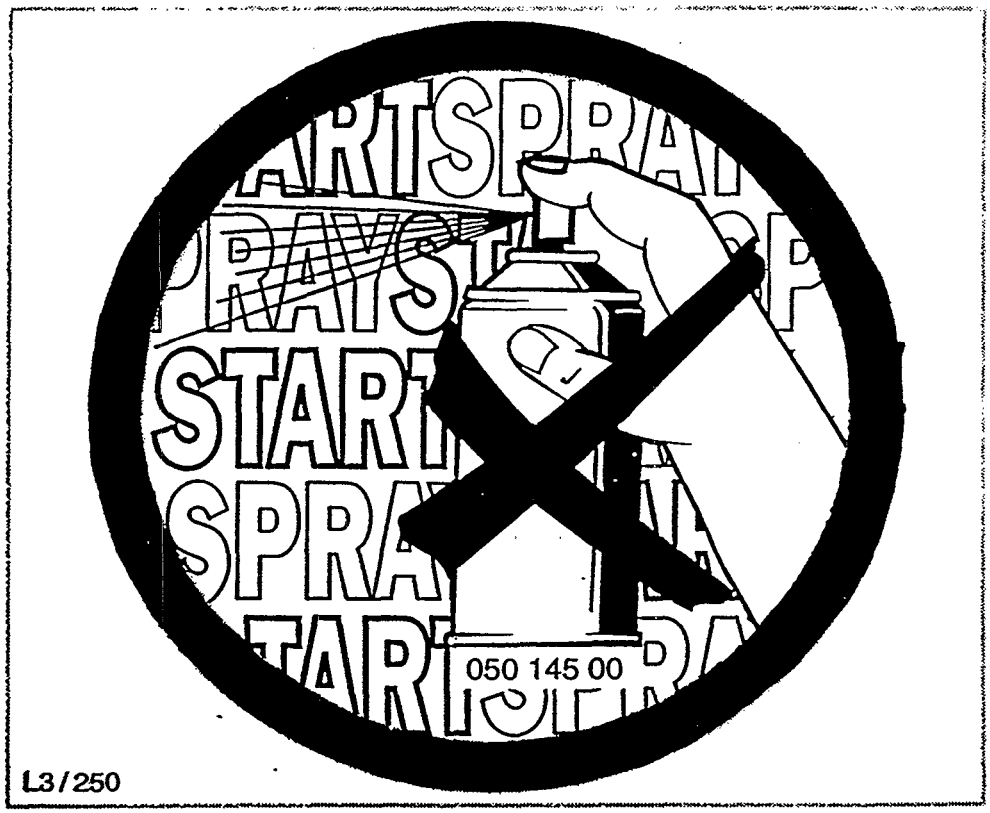
MSS-schi-es

Choose an engine oil viscosity that matches the ambient temperature when the engine is cold.



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The engine must be stopped before any maintenance work is attempted.
Comply with legal requi-rements when handling and disposing of old oil, filters and cleaning materials.
Keep the engine's starting key out of reach of unauthorized persons.
Disconnect the negative battery terminal.
At the end of the maintenance work, check that all tools have been removed from the engine and all safety guards, covers etc. replaced in their correct positions.
Before starting the engine, make sure that nobody is in the danger area (engine or driven machinery).

5.1. Maintenance summary

	Maintenance intervals	Maintenance work required
8-15	Every 8 – 15 hours of ope-ration, or before each daily start-up	Check oil level. Check combustion air intake area. Check the cooling air system
250	Every 250 hours of operation	Engine oil change (2 M 31./2 M 40./2 M 41 without sump, 2...4 L 31./2...4 L 40./2...4 L 41 in general). Clean fan, cooling fins and oil cooler. Check tightness of threaded connections. Check for contamination of fuel pre-filter, renew if necessary.* Checking operation of air cleaner maintenance indicator Do not tighten the cylinder head nuts.
500	Every 500 hours of operation	Renew the fuel pre-filter. Air cleaner maintenance Check and adjust valve clearances. Engine oil change (2 M 31./2 M 40./2 M 41 with sump, 3...4 M 31./3...4 M 40./3...4 M 41 in general). Renew the oilfilter.
1000	Every 1000 hours of operation	Renew the fuel filter

* Fuel pre-filter renewal intervals depend on the degree of fuel contamination, the care taken when refuelling and the amount of contamination inside the fuel tank.

L/M VALVE ADJUSTMENT

Important
Turn the engine over in the normal direction of rotation.
This is counter-clockwise in either case – at the flywheel or timing gear end.

Adjusting method for two-cylinder engines

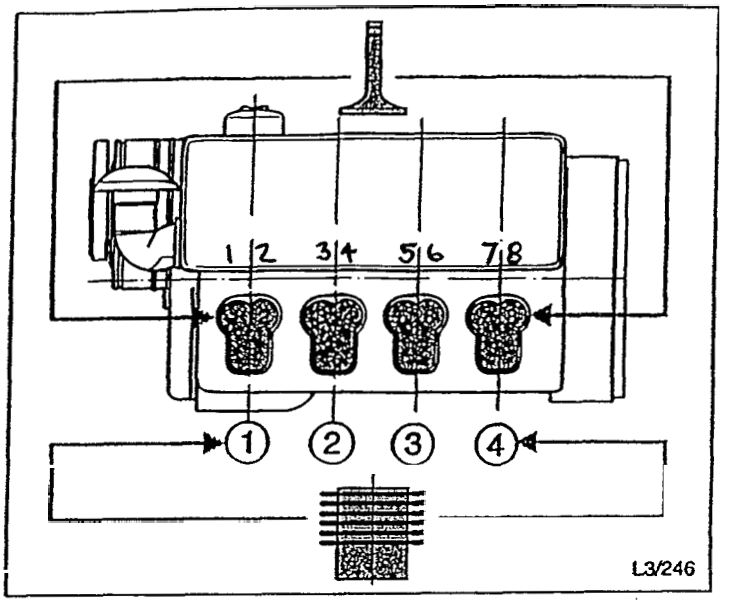
- The valves in cylinder 1 (at the fan end) must be in the overlap position (exhaust valve not yet closed, inlet valve just starting to open).
- Turn the crankshaft through 180 degrees in the normal direction of rotation, and check valve clearances at cylinder 2.
- Turn the crankshaft a further 180 degrees in the same direction as before, and check the valve clearances at cylinder 1.

Adjusting method for three- and four-cylinder engines (Figure 28)

Type	Valve No. ... fully open	Check valves at cyl. No.
3-cylinder	5	2
	3	1
4-cylinder	1	3
	5	4
4-cylinder	7	2
	3	1

- Check valve clearances with a feeler gauge.
- Valve clearances (inlet and exhaust valves) = **0.10 mm with engine cold.**
- If valve clearance is incorrect, slacken off hex nut "1". Turn adjusting screw "2" until feeler gauge '3' can just be pulled through between the rocker and the valve stem, with slight resistance to its movement, after nut "1" has been retightened (Figure 29).

Important:
Repeat the procedure for all valves, noting the adjusting method described above.



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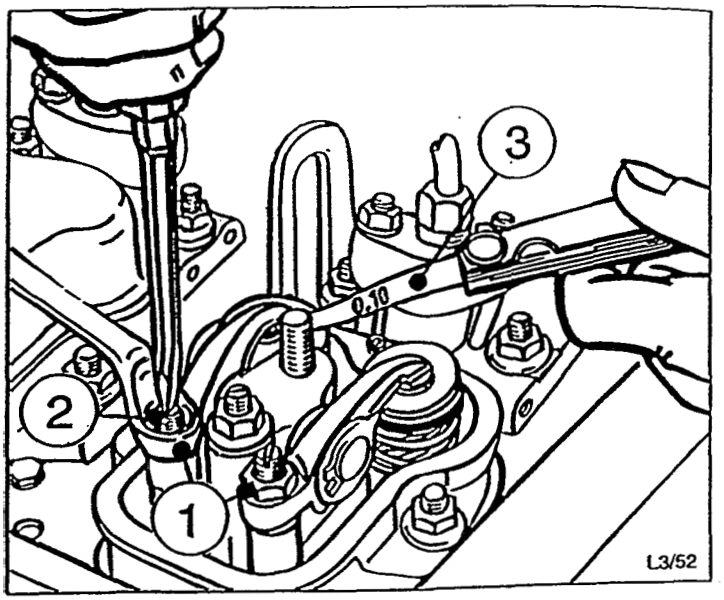

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information

HATZ DIESEL

- ☐ SALES
- ☐ ENGINEERING
- ■ SERVICE
- ☐ PARTS

Bulletin No. SE36

Oate 09/30/96

Subject: L&M Engines - Belt Replacement

This bulletin is designed to address the occasional belt life complaint on L and M Hatz engines. The belt generally lasts 2000 to 4000 operating hours, or two to three years, depending on operating conditions (i.e.: heat, dust, and other contaminants). If belt problems exist, please ask the customer to reference the L and M Instruction Book or send your customer this information by fax or mail.

Major reasons for premature belt failure or repeated belt failure are:

- Foreign material entering the blower fan. Binder twine and plastic, if they enter the blower fan, *can* strangulate the blower belt and pull it off the sheaves. This is not a common failure.
- The major reason for repeated failure is incorrect installation and failure to inspect why they failed.

Inspection and Installation:

1) Remove covers to access belt. Look for foreign materials which may have *caused* failure.

2) Remove lower pulley. Clean area below pulley.

3) Inspection
   a) Does the alternator shaft turn freely?
   b) Are the blower/alternator pulley grooves in good condition? (i.e.: no knicks, no material embedded)
   c) Check sheaves and bearings of the hydraulic belt tensioner pulley.
   d) Check grooves for knicks and embedded material of the lower pulley.

6.2. Renewing fan drive belt, checking operation of belt monitor

– Remove one machine screw at belt pulley '1' (Figure 32).

– Press back tensioning pulley "2" and lock it with the machine screw provided.

– Unscrew and remove the belt pulley.

–Take off the Poly-V belt.

Note:
If any grooves on the belt pulley have broken off or are bent, always renew the pulley.

Checking operation of belt monitor

Always check operation of the shutdown device when the belt is renewed.

– Remove the machine screw to release the piston with tensioning pulley '1' (Figure 33).

– Spring pressure will force the piston with tensioning pulley out of the housing.

–Angled lever "2" rotates downwards and releases shutdown pin "3".

Important
Shutdown pin must be forced out by spring loading or else automatic shutdown will not take place if the belt breaks.

installing the fan drive belt

– Push in shutdown pin '1' (Figure 34).

– Push piston with tensioning pulley "2" into housing "3" and lock with the machine screw.

– Place the Poly-V belt centrally on the fan pulley and install the tensioning pulley and the belt pulley (Figure 35).

– Retain the belt pulley with one machine screw '1' without pushing it fully on to the centering hub (Figure 36).

– Insert a large screwdriver between the hydraulic belt tensioner and the belt pulley and press it down until the pulley slides on to the centering hub (Figure 37).

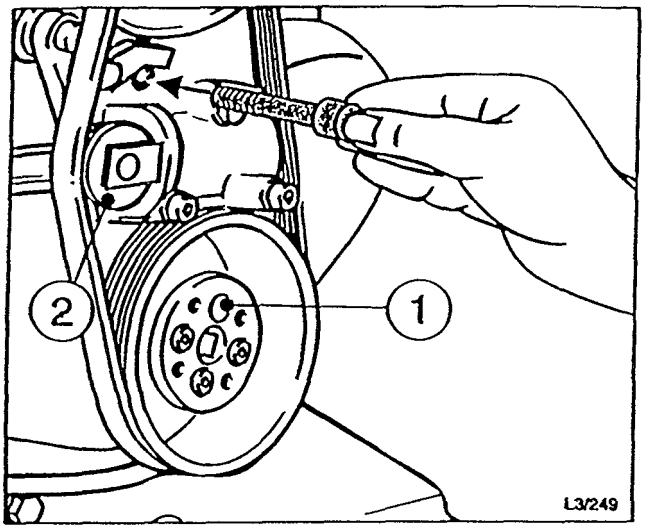
– Insert and tighten the remaining machine screws '1'.

Types of belt

Since the belt pulleys on the fan side differ in diameter on various engine types and versions, Poly-V belts of differing lengths are fitted.

Type and engine version	Ident. No.	Belt length (mm)	Fan pulley diameter (mm)
2L31/40C 3L31C	50203100	920	72
All other types and versions	50141500	910	64

Note:
In order to be sure of avoiding mistakes concerning the length of Poly-V belts when ordering them, it is best to measure the diameter of the belt pulley at the fan end and refer to the above table, using this figure as a starting point.



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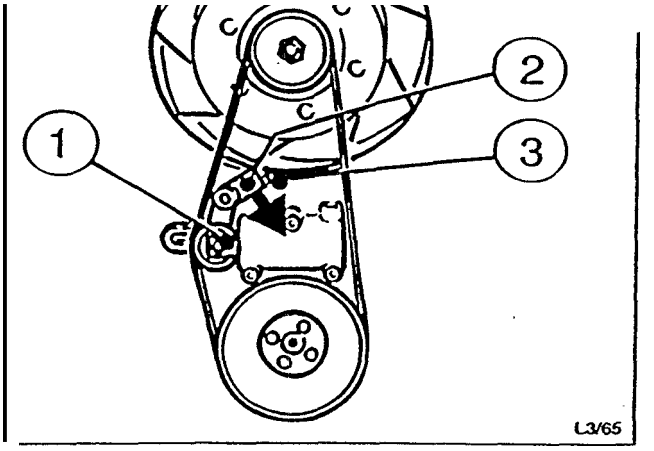

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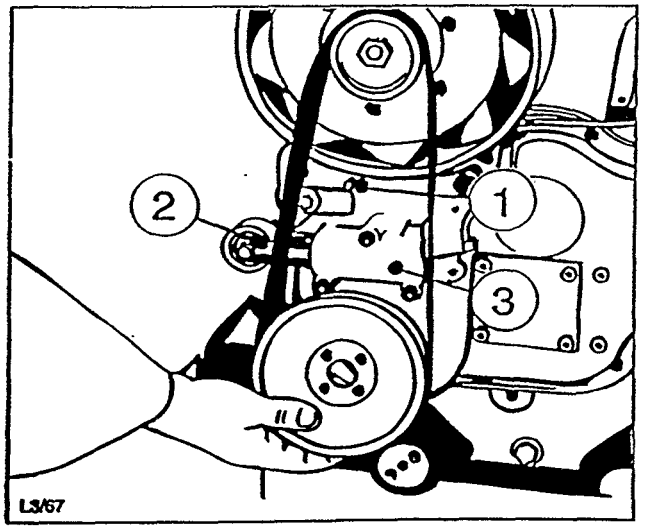

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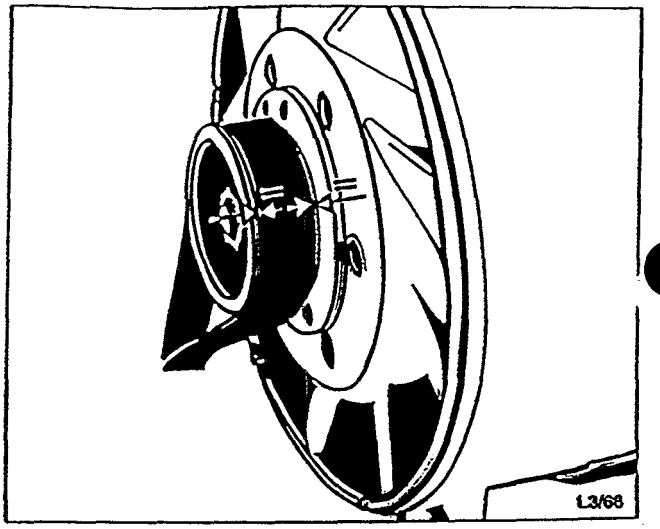

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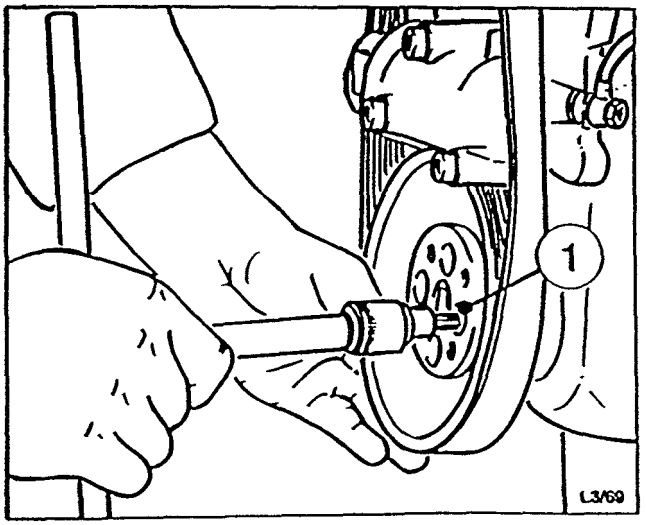

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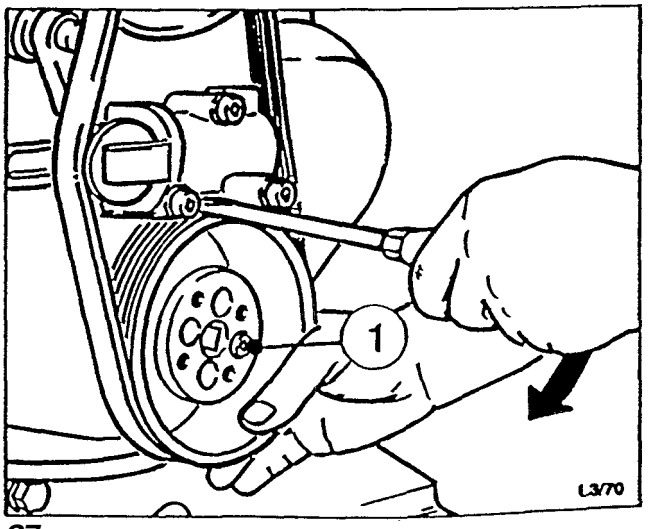
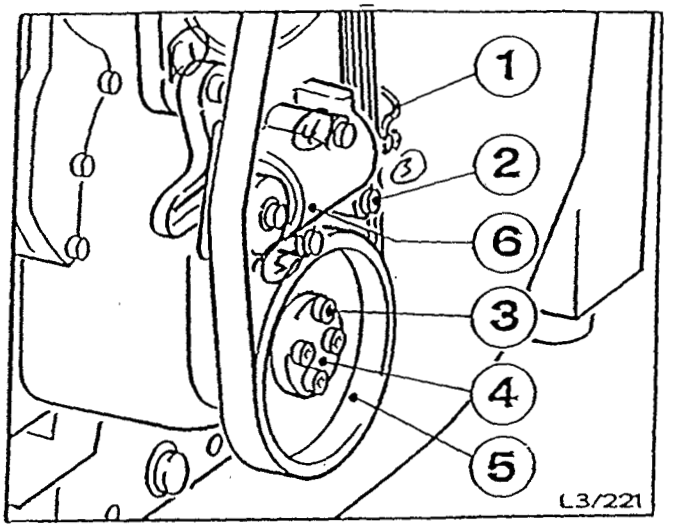


37

c:\mike\se36.sam

M40. Hydr. belt tensioner, disassembly and assembly



109

Preliminary work:

L30, L31, L40 C/K

- Remove cover from cooling air duct (6/20).

L..S/Z,M 31, M40

- Remove belt guard if fitted.
- Remove belt
- (See attached instructions)
- Remove allen screw (109/3) spring washers and adapter plate (109/4).
- Unscrew oil pipe (109/1) and remove allen screws (109/2)
- Lift out belt tensioner (109/6).

- Assemble In Reverse Order (See Tips Fig 110 & 111)

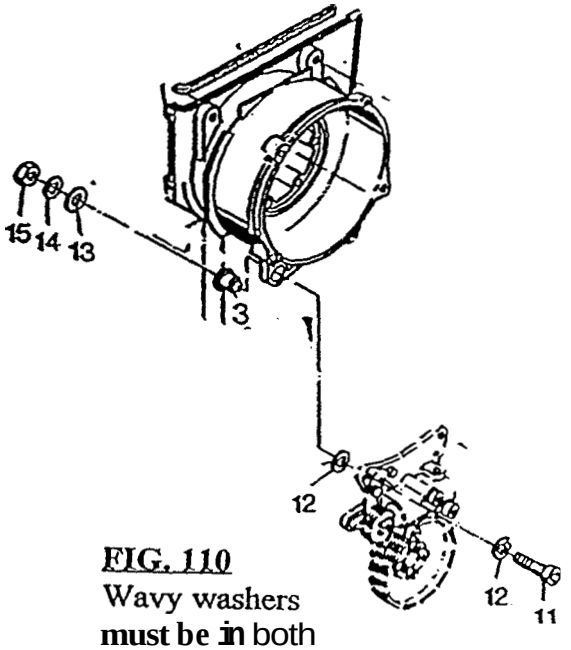


FIG. 110
Wavy washers must be in both sides of tensioner housing

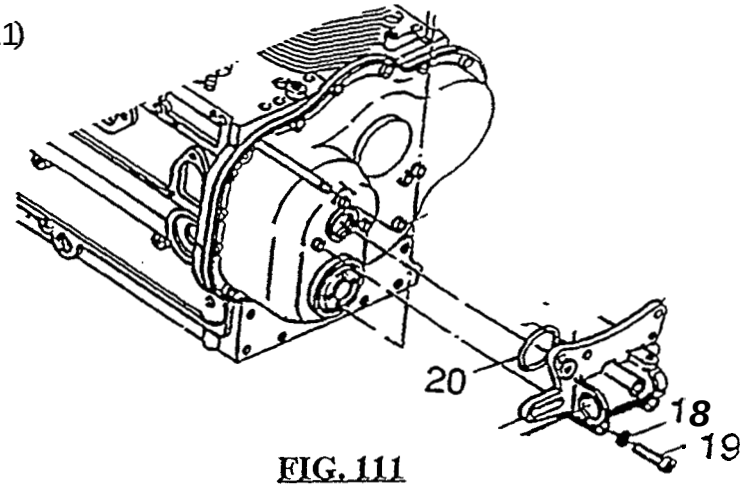
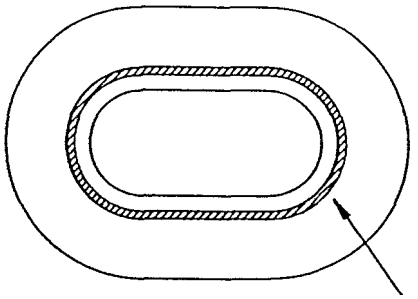


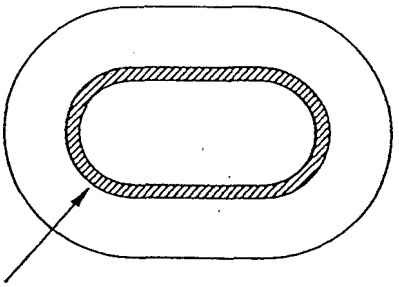
FIG. 111
Grease 0-Ring to hold in place against tensioner

L&M AIR FILTER

Hatz #009 529 *00*

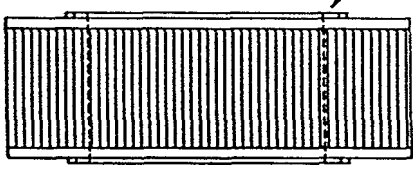
Aftermarket
(Mfg. unknown)

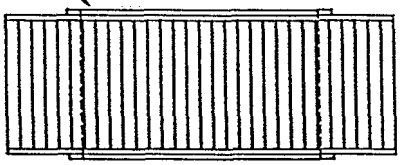




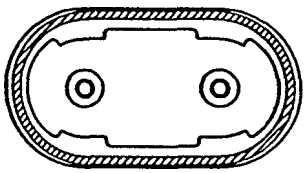
SEALING RING

170 FILTER PLEATS

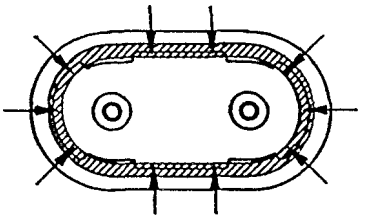




123 FILTER PLEA



NOTE: SEALING RING COMPLETELY SEATED



AREAS OF **POSSIBLE** LEAKAGE CAUSED BY POORLY FITTING SEALING RING.

SEALING RING/INTAKE INTERFACE

L&M FILTER COMPARISON

L&M series lubrication Characteristics:

Flow 4 cyl.	• 40 litre/min. @ 3000 RPM ≈ 10.5 gal./min.	• 23 litre/min. @ 1500 RPM ≈ *6.0* gal./min.
Flow 2 & 3 cyl.	• 20 litre/min @ 3000 RPM ≈ 5.3 gal./min.	• 11.5 litre/min @ 1500 RPM ≈ *3* gal./min..

Maximum oil temperature ⇒ 120° C (245° F)
Operating oil pressure ⇒ .6 Bar to 3 Bar (8.7 to 44 psi)

	HATZ	Fram	Napa
Part Number	400 653 00	3973	1348
Bypass pressure (psi)	32 TO 48 psi	27 to 29 psi	30 psi
Bypass flow rate (GPM)	8.66 GPM		
Filter area (in^2)	511.5 in^2	301.1 in^2	
Micron rating	12	10	25
Max operating psi	203 psi	210 psi	
Max flow rate (GPM)	14.3 GPM		*9* GPM
Test/Burst psi	232/?	?/500	?/290
Anti drain-back valve?	Yes	Yes	Yes

HATZ
DIESEL

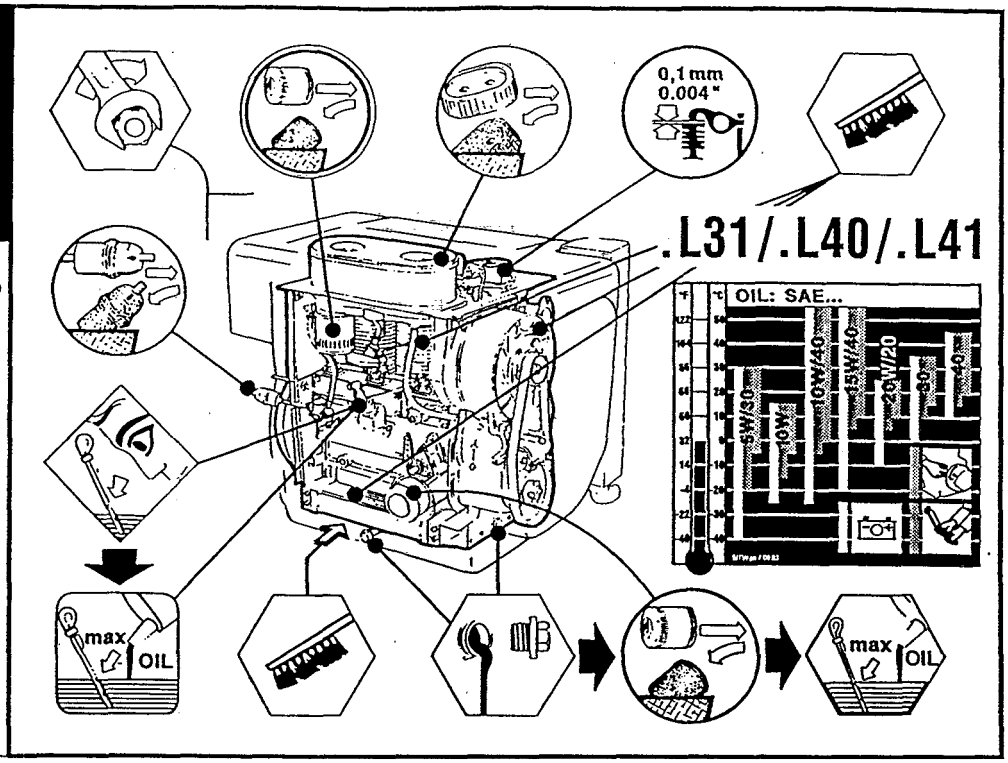
WARTUNG.MAINTENANCE
ENTRETIEN·MANTENIMIENTO
MANUTENZIONE

A 8-15 | n 250

STUNOEN·HOURS·HEURES
HORAS·ORE

500 | 1000

BEI BEDARF
IF NECESSARY
SI NECESSAIRE
EN CASO DE
NECESIDAD
SE NECESSARIO



HATZ
DIESEL

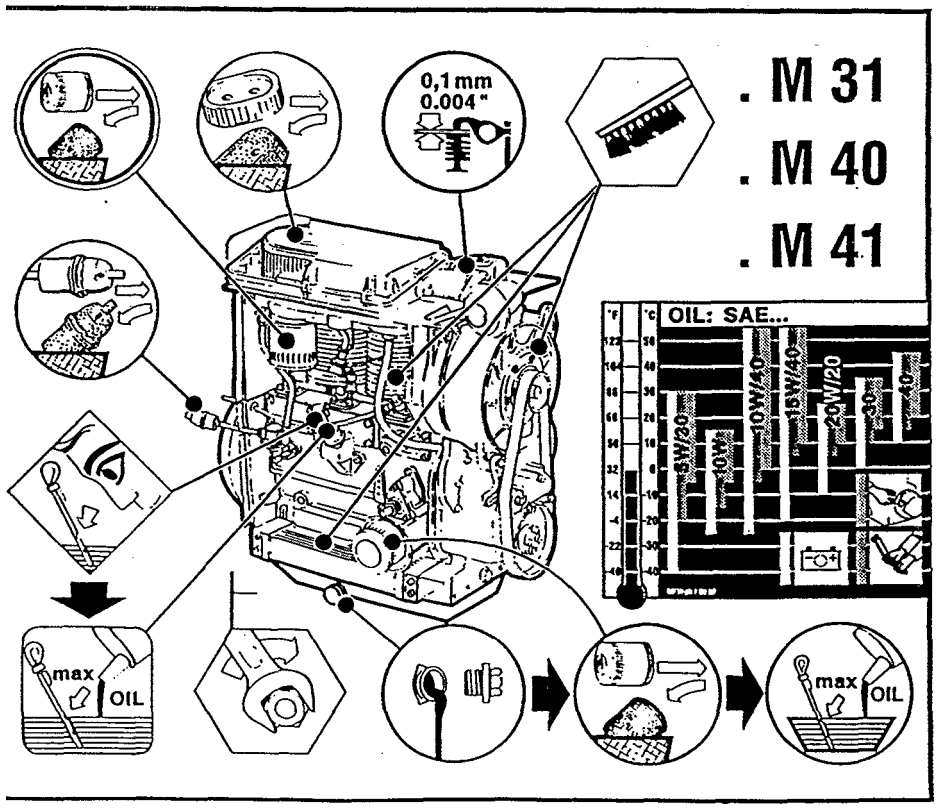
WARTUNG · MAINTENANCE
ENTRETIEN .MANTENIMIENTO
MANUTENZIONE

A 8-15 | n 250

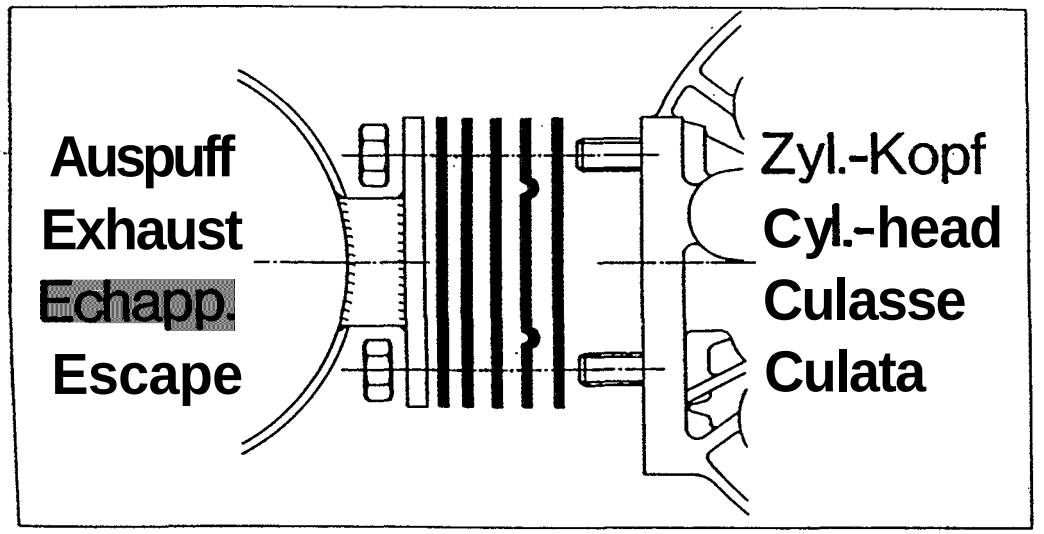
STUNOEN · HOURS · **HEURES**
HORAS .ORE

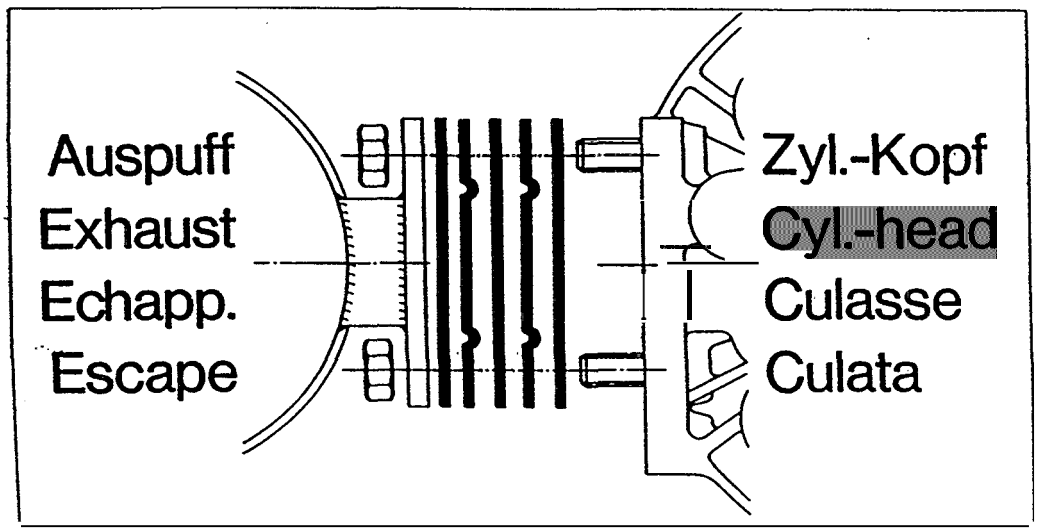
500 | 1000

BEI BEDARF
IF NECESSARY
SI NECESSAIRE
EN CASO DE
NECESIDAD
SE NECESSARIO



Mounting Order Of Exhaust Gasket Sets





P.O.BOX 258 ■ W229 N1645 WESTWOOD DR. ■ WAUKESHA, WI 53187-0258 ■ PH: (414) 544-0254 FAX: 414-544-6120

FOREIGN MATERIAL IN ENGINE LUBRICATION OILS AND THEIR ORIGIN

Element	Origin
Fe	All gray casting and steel parts.
Cr	Piston rings, valves, gudgeon pin (top layer), component alloy of crankshaft and camshaft (with Cu).
Sn (tin)	Bearing shells (top layer) and component of bronze.
Al	Piston, cylinder head and crankcase (light alloy).
Ni	Valves, valve guides, steel, etc.
c u	Bearing bushings (second layer) etc.; one element **of** brass and bronze.
Pb	Component of secondary layer of bearings.
Mo	Piston **rings** and oil additive.
K	Additive of lubrication oil and anti-freeze fluid.
B	Additive of lubrication oil and anti-freeze fluid.
Mg	Light alloy **parts** and oil additive.
Ca	Oil additives and mineral dust.
Ba	**Oil** additive.
P	Oil additive.
Zn (zinc)	Oil additive and one component **of** brass (with Cu).
Na	Oil additive and anti-freeze fluid.
Si	Light alloy (with Al + Mg), mineral dust, oil additive, seal rings, etc. to verify: check for relationship with Al + Mg.
Hc	Fuel Enters the oil due to improperly functioning injector nozzles or porosity of pump housing. Fuel in the oil mainly counts if the engine is operated under light load and speed only which keeps the lubrication oil temperature at a very low level thus fuel does not vaporize and remains in the oil.

Element	Origin
	Negative influences of fuel in the oil.
	Oil viscosity getting too low with the risk of improper lubrication mainly with bearings and camshaft to cam followers.
	Lubricating oil level getting too high (over maximum mark of dipstick) which causes the crankshaft and conrods to dip into the oil and cause a lot of internal friction with high temperature of the engine and of the lubricating oil.
H_2O	Water Is a product of combustion of fuel but in vapor form. Through the blow-by a certain percentage of the exhaust gas enters the lubrication oil. In all cases where the oil temperature is extremely low the water will not vaporize, then it undergoes a chemical reaction with sulfur oxide and may lead to corrosion on internal engine components. Engine oils usually contain bases to neutralize such acids.
Glycol	The main component of coolant fluid (anti-freeze additive.) If Glycol enters the oil and the oil reaches extremely high temperatures (about 150°C) it leads to heavy oxidation and thickening of the oil. In extreme cases the oil becomes solid like bitumen and can no longer be pumped to the bearings. Though Hatz engines are air cooled and do not require coolant fluid, we already experienced Glycol entering the lubrication oil just by using an oil drum or canister which was used to refill Glycol into water-cooled engines (2 percent or 20 cm^3 per liter is sufficient to cause the afro described problem).
Oxidation and viscosity	Oil is a hydrocarbon and undergoes oxidation if it gets in contact with oxygen. Oxidation causes thickening of oil to an extent which may block the whole oil circuit. The oxidation can be measured, but is also indicated by increased viscosity which is also measured and indicated in "centi-stokes" and the corresponding SAE class.

Element Abbreviations

Fe	Iron
Cr	Chromium
Sn	Tin
Al	Aluminum
Ni	Nickel
c u	Copper
Pb	Lead
Mo	Molybdenum
K	Potassium
B	Boron
Mg	Magnesium
Ca	Calcium
Ba	Barium
P	Phosphorus
Zn	zinc
Na	Sodium
Si	Silicon

BASIC ELECTRICAL WIRING DIAGRAMS

H.D.A. WIRE COLOR CODING – AS OF 10/99

WIRE NO.	COLOR:	APPLICATION:
0	green	Ground
1	red	B+
2	white	D+
3	yellow	Starter solenoid – terminal 50
	(see note A)	Stop solenoid – "pull" coil
4	blue/white	Oil pressure switch
5	blue/black	Cylinder head temperature switch
6	brown	Glow plug
7	orange	Stop solenoid – "hold" coil
8	brown (see note B)	Glow plug – 4 cylinder
9		Auto-start input (Special application)
10		Precision speed adjustment - motor positive (Special application)
11		Precision speed adjustment - motor negative (Special application)
12	blue/red	Oil pressure gauge
13		Reserved for special applications
14	orange/black (see note C)	Two-speed – "hold" coil
15		Reserved for special applications
16		Decompression solenoid (Special Application)
17	blue (see note D)	Air restricter switch
	blue/yellow (see note C)	Air restricter switch
18	yellow/black	Stop solenoid – "pull" coil
19	black/white	Cylinder head temperature gauge
20	blue/white (see note B)	Oil temperature switch
21	blue (see note B)	Belt break switch
22	red/white	Tachometer signal
23	red/blue (see note B)	Ammeter
24	black	Alternator Ducati C
25	blacWred	Oil temperature gauge
26	blue (see note C)	Anti-restart module – AUS terminal
27		Reserved for special applications
28	violet (see note C)	Speed adjustment solenoid – "pull" coil
29		Reserved for special applications

NOTES – Wire Color Coding

A = Before new power box system
B = Wire color subject to change
C = Used after Sept 99'
D = Used before Oct 99'

HATZ-specific markings

Terminal designations in the HATZ instrument box

Terminal	Designation
0	Ground
1	Alternator B+
2	3-phase generators: D+, Flywheel alternators: terminal L in regulator
3	Starter terminal 50
4	Oil pressure switch
5	Temperature switch on cylinder head
6	Glow plug I
7	Electromagnet for engine shut-off (hold winding)
8	Glow plug II
9	Start-Stop input
10	Positive pole for DC motor precision adjustment of speed
11	Negative pole for DC motor precision adjustment of speed
12	Oil pressure sensor
13	***Reserved for special applications***
14	Speed adjustment solenoid - hold winding
15	***Reserved for special applications***
16	Decompression solenoid
17	Maintenance switch for air filter
18	Electromagnet for engine shut-off (pickup winding)
19	Temperature sensor on cylinder head
20	Oil temperature switch
21	Fan monitoring switch
22	Terminal W for rev counter
23	Starter 30 (for connecting an ammeter)
24	Terminal C in regulators in flywheel alternators
25	Oil temperature sensor
26	Terminal 50f on starter protection module
27	***Reserved***
28	Speed adjustment solenoid - pickup winding
29	***Reserved***

MISC. ELECTRICAL WIRE OR CABLE INFORMATION

GUAGE AWG HDA	HATZ	STRANDS	TOTAL CROSS SECTIONAL AREA	RESISTANCE
TEW	mm^2	No./O.D. in.	Cir. Mils	OHMS/Mft.
0		19/.0745	105575	0.10
1		19/.0664	83870	0.13
	35	N.A.	69150	
8		168/0.01	16800	0.66
	6(5.5)	82/0.0115	11850 (I 0860)	-0.91
10		105/0.01	10500	0.98
	4(3.75)	56/0.0115	7900 (7415)	–1.43
12		65/0.01	6500	1.68
	2.5 (2.26)	50/0.0095	4940 (4465)	–2.14
14		41/0.01	4100	2.66
16		26/0.01	2600	4.00
	1	NA	–1975	–4.56

Note:
Typical wire type **used** by HDA for special harnesses and relay or junction boxes. Data taken **from** Industrial Electric Wire, Inc. technical guides.

TEW 105" C, 600V, **PVC** insulated Class K. **Standed** with combinations of 30AWG wires which are 0.01" in dia. or 100 circular mils.

Hatz wire furnished with engine harnesses is listed **as** cross sectional area in mm^2. **( )** Calculated from counted and measured strands.

Circular mil - Area of a circle one mil (.001") in diameter, 7.845×10^{-7} in^2

– - approximate

M - 1000

HATZ DIESEL OF AMERICA, INC.
W229 N1645 Westwood Drive
P.O. Box 258
Waukesha, WI 53187-0258

WIRE SIZE CONVERSION **TABLE**

Wiring diagrams for the Hatz engines show a wire identification which is a European standard. These standards have a cross reference to American wire sizes **as** follows:

HATZ SYMBOL	AMERICAN WIRE **GAUGE** NO.
$.75^2$	**18**
1^2	**16**
1.5^2	**14-16**
2.5^2	**12-14**
4^2	**10-12**
6^2	**10**
16^2	**4-6**
25^2	**2-4**

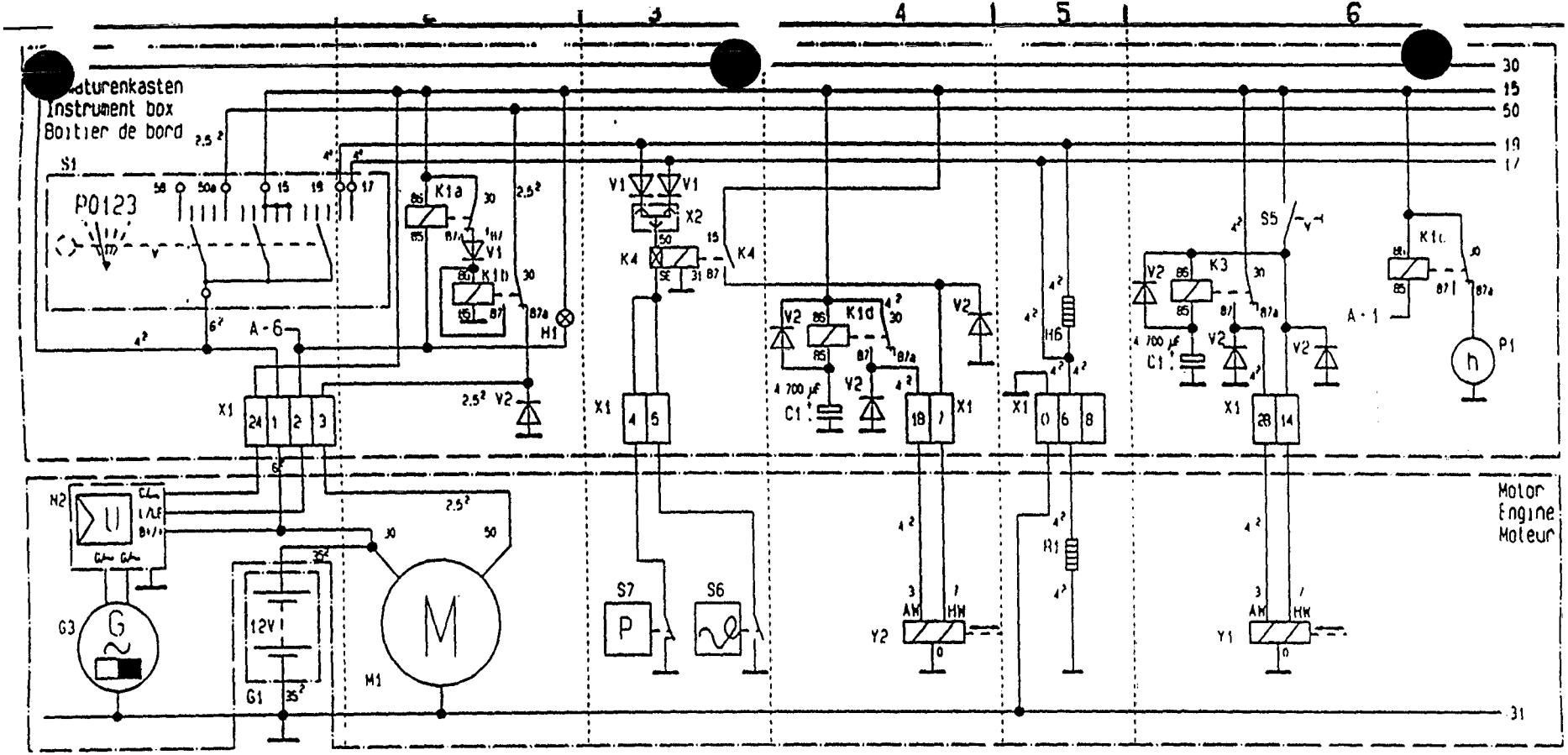
In many cases, past experience **of** the application will allow the customer to select between the two **sizes as** noted above. **To** be on the safe side, the larger **wire** size should be used when making modifications to the wiring because most likely the new wire length will be longer than the original.

Markings in HATZ circuit diagrams (as per DIN 40719)

New marking (DIN)	Designation of electrical components	Former marking (HATZ)
A 1	Instrument box	---
A 2	Instrument panel	---
A 3	Automatic start-stop	202
A 4	Starter protection module	201
B 1	Temperature sensor	171
B 2	Pulse speed sensor	---
B 3	Oil pressure sensor	167
B 4	Acoustic signal	193
C1	Capacitor	---
E 1	Heater for fuel filter	197
F 1	Fuse	179
G 1	Battery	125
G 2	3-phase generator	126
G 3	Flywheel alternator	126
H 1	Indicator, charging indicator lamp	129
H 2	Indicator, oil pressure	129
H 3	Indicator, engine temperature	129
H 4	Indicator, air filter (maintenance switch)	129
H 5	Indicator, belt monitor	129
H 6	Indicator, glow indicator	123
H 7	Indicator, fan monitor	129
H 8	Remote indicator lamp: engine on	---
K 1	Control relay 1 start / antirepeat start	151a
K 2	Controi relay 2 pre-glowing	151b
K 3	Control relay 3 'speedadjustment	151c
K 4	Engine protection relay	177
K 5	Time-lag relay	160
K 6	Start interlock relay	153
K 7	Timing relay (pulse relay)	198
K 8	Leistungsrelais	---

M 1	Starter motor	127
MG	Starter alternator	120
N 1	Regulator for starter alternator	124
N 2	Reguiator for flywheel alternator	124
N 3	Regulator for 3-phase generator (unless integrated)	124
N 4	Pulse generator (supplementary to Syncro regulator)	---
P 1	Hours meter	169
P 2	Rev counter	203
P 3	Pressure indicator	168
R 1	Glow plug	121
R 2	Heater flange	130
R 3	Series resistor for preheater	163
R 4	Resistor	181
R 5	Series resistor with thermostatic switch	---
S 1	Glow starting switch	182
s2	Ignition light switch	128
S 3	Preheater starter switch	122
S 4	Start-Stop switch	191
s5	Switch for speed adjustment	190
S 6	Temperature switch for engine temperature	161
s7	Oil pressure switch	167
S 8	Pressure switch for air filter	170
S 9	Fan monitoring switch	176
S 10	Temperature switch for preheating	---
S 11	Remote start switch	---
S 12	Remote stop switch	---
T 1	Transformer for rev counter	---
V 1	Decoupling diode	159
v 2	Free-wheeling diode	159
v 3	Zener diode	195
W 1	Ground, negative return line	---
w2	Shielded line on alternator	---

X 1	Terminal strip on instrument box	—
x2	Flat quick-connect distribution box	173
x3	Connector on Emergency Stop switch	156
x4	Socket on Emergency Stop switch	155
X 5	Terminal block in operators panel	—
X 6	Terminal block in terminal box	—
Y 1	Solenoid for speed adjustment	172
Y 2	Solenoid for engine shut-off	157
Y 3	Servo-magnet (= solenoid valve) for engine shut-off	194
Y 4	Fuel shut-off valve	158
Y 5	High-pressure shut-off valve	181
Z 1	Interference suppression filter	199
2 2	Interference suppression capacitor	200



Stromversorgung / Ladeeinrichtung Power supply / Charging device Alimentation electr / Chargeur	Starteinrichtung Starting device Dispos de demarr	Überwachung + Anzeige Monitoring + display Surveillance + temoin	Motorabstellung Motor shut-down Arret du moteur	Vorglühen Preheating Prechauffage	Optionen / Options * Betriebsstd.-zähler, Drehzahlverst. * Hours-run meter, speed adjustment * Compteur horaire, reglage de regime

Sämtliche Leitungen ohne Querschnittsangabe sind 1 mm²
All wires without conductur cross section data are 1 mm²
rout les cables sans indication de section sont de 1 mm²

Hubragnet zur Motorabstellung Anzugsstrom 44,5 A, Haltestrom 0,6 A
Solenoid lor engine stop inrush current 44.5 A, holding current 0,6 A
El.-aimant d arret du mot ' courant d action 44.5 A, courant or maint 0,6 A

Hinweis: Jede Änderung der Verdrahtung erfordert eine Rücksprache mit dem Werk !
Instruct Any changes in the wiring require a consultation of the factory !
Remarque Avant de modifier le cablage, contacter l usine !

Nr.	Datum	Name	Änderung

HATZ DIESEL
Motorenfabrik HATZ GmbH + Co. KG
Ruhstorf / Rott

2 G 30 / 2 G

12 V - Anlage mit Abschaltautomatik (mit Schwungrad-Lichtmaschine)
12 V - equipment with automatic shut off (with flywheel alternator)
Equipment 12 V avec arret automatic (avec alternateur dans volant)

	CAD	Datum	Name
gez.		23.01.95	Buchinger
ugpr.			

Stromlaufplan
Schematic diagram
Schema de cablage

Blatt 1
von 2 Bl.

039 291 10. 0824 Bl.1

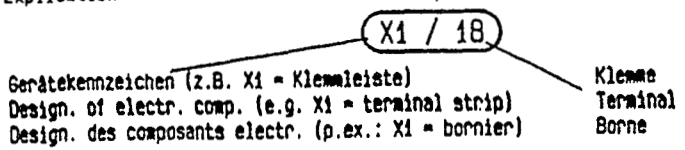
Fahrzeugleitungen mit Anschlußpunkten / Electrical wires with connecting points / Cables avec bornes de connexion

X1 / 0	008 528 01. 0514 Fahrzeugleitung, 330 lang	K1b / 85
X1 / 1	010 887 00. 0514 Fahrzeugleitung, 300 lang, 6mm²	S1 / 30
X1 / 2	010 321 00. 0584 Fahrzeugleitung, 400 lang	H1
X1 / 2	008 528 01. 0514 Fahrzeugleitung, 330 lang	K1a / 85
X1 / 3	010 902 01. 0514 Diode komplett mit Leitung	Masse ⊥
X1 / 3	010 892 00. 0514 Fahrzeugleitung, 300 lang, 2,5mm²	K1b / 87a
X1 / 4	033 568 00. 0324 FLKW 1, schw., 150 lang	X1 / 5
X1 / 4	QIO 89I 00, 0824 Fahrzeugleitung, 300 lang	K4 / SE
X1 / 6	035 362 00. 0284 ** FLKW 4, schw., 300 lang, 4mm²	H6
X1 / 6	010 888 00. 0514 ** Fahrzeugleitung, 140 lang, 4mm²	S1 / 17
X1 / 7	011 501 01. 0444 * Diode komplett mit Leitung	Masse ⊥
X1 / 7	010 891 00. 0824 * Fahrzeugleitung, 300 lang	K4 / 87
X1 / 18	011 501 01. 0444 * Diode komplett mit Leitung	Masse ⊥
X1 / 18	015 174 00. 0824 * Fahrzeugleitung, 200 lang	K1d / 87
X1 / 24	011 863 00. 0824 Fahrzeugleitung	K1a / 30
K1a / 86		S1 / 15
K4 / 15		

S1 / 15	QIO 9J6 00. 0444 Fahrzeugleitung, 100 lang	H1
S1 / 15	015 175 00. 0824 * Fahrzeugleitung, 150 lang	K1d (86)
S1 / 15	QIE I7E 00. 0824 Fahrzeugleitung am Hubmagnet	K1d / 30
		K1d / 86
		K1d / 85
		C1 / +
S1 / 17	010 898 01. 0514 Diode komplett mit Leitung	X2
S1 / 19	010 889 01. 0514 Diode komplett mit Leitung	X2
S1 / 19	010 889 00. 0514 ** Fahrzeugleitung, 120 lang, 4mm²	H6
S1 / 50a	010 921 00. 0514 Fahrzeugleitung, 300 lang, 2,5mm²	K1b / 30
X2	QIO 90I 00. 0514 Fahrzeugleitung, 100 lang	K4 / 50
K1a / 87a	011 787 00. 0824 Diode komplett	K1b / 86
K1b / 87		
C1 / -	015 176 00. 0824 * Fahrzeugleitung am Kondensator	Masse ⊥

Die Verdrahtung des Drehzahlverstellmagneten erfolgt entsprechend der Verdrahtung des Abstellmagneten (mit * gekennzeichnete Leitungen).

Erläuterungen:
Explanation:
Explication:



** Nur bei Anlage mit Vorglüheinrichtung

HATZ DIESEL

Motorenfabrik HATZ GmbH + Co. KG
Ruhstorf / Rott

2 G 30 / 2 G 40:

12 V Anlage mit Abschaltautomatik (mit Schwungrad-Lichtmaschine)
12 V - equipment with automatic shut-off (with flywheel alternator)
Equipment 12 V avec arret automatic (avec alternateur dans volant)

	CAD	Datum	Name
ge2.:		23.01.95	Buchinger
gepr.			

Stromlaufplan
Schematic diagram
Schema de cablage

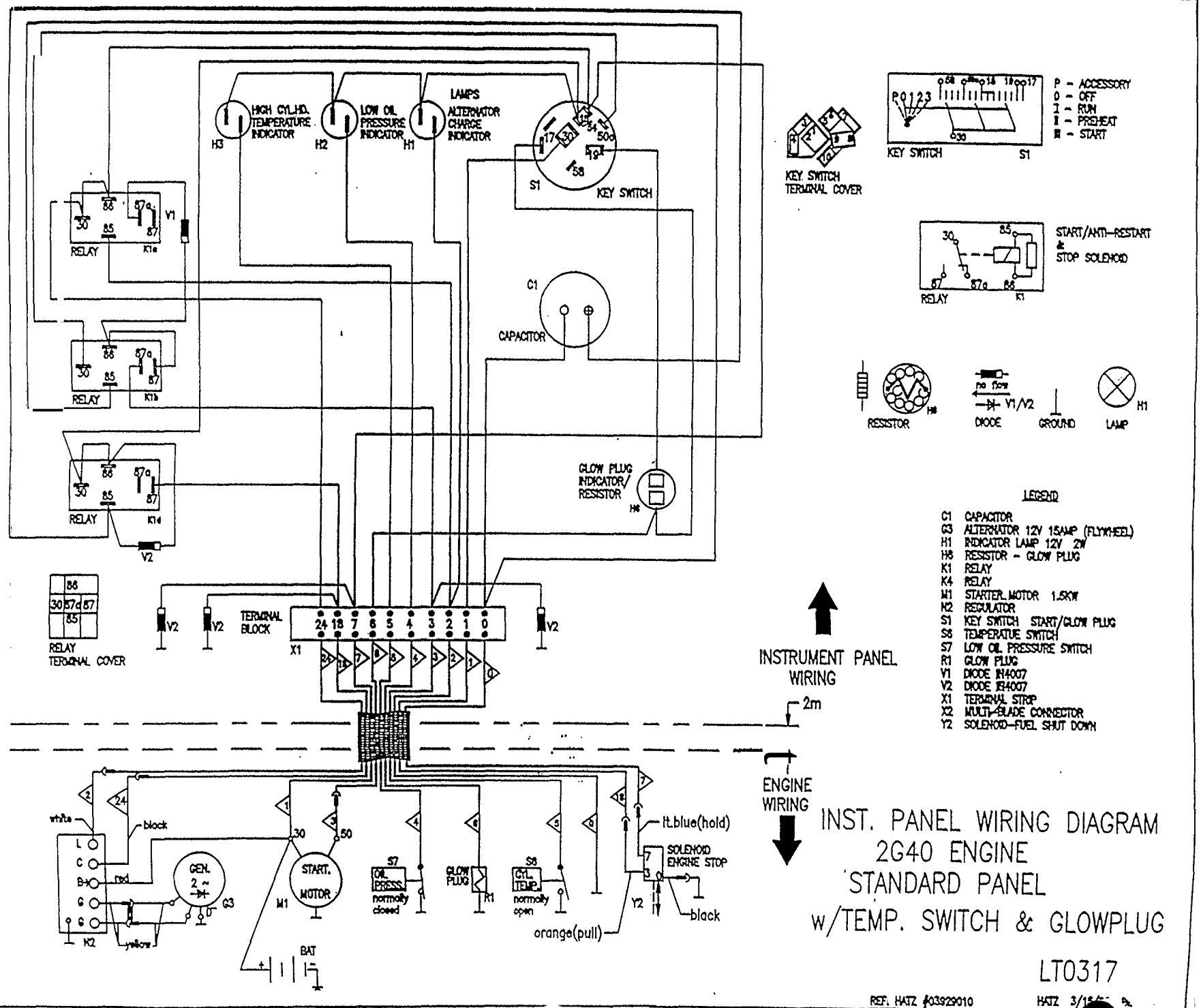
Blatt 2
von 2 Bl.

039 291 10. 0824 Bl.2

New Codt for HATZ Circuit Diagr.
(acc. to german stand. spec. DIN40719)

Code DESIGNATION OF ELECTR. COMP.

A1 Instrument box
A2 Instrument panel
A3 Automatic Start stoo device
A4 Starter protection module
B1 Temperature sensor
B2 Rev. pulse counter
B3 Oil pressure sensor
H4 Horn
C1 Capacitor
E1 Heater device for futl filter
F1 fuse
G1 Battery
G2 3-phase generator
G3 Flywheel alternator
H1 Indicator lamp for batt. /generator
H2 Indicator lamp for Oil pressure
H3 Indicator lamp lor engine temp.
H4 Indic. lamp for air filter (mainten.)
H5 Indicrtor lamp for V-belt failure
H6 Glow plug indicator
H7 Indicator lamp for blower
H8 Remote indicator leap: engine on
K1 Control relay 1 for start / anti-restart
K2 Control relay 2 for pre-glowing
K3 Control relay 3 for speed adjustment .
a4 Engine protection relay
K5 Time relay (delay)
K6 Start-locking relay
K7 Impulse relay
K8 Power relay
M1 Starter motor
MG Starter generator
N1 Regulatur for starter generator
N2 Regulator for flywheel alternator
N3 Regulator for 3-phase generator
N4 Impulse transmitter (f. Syncro-regul.)
P1 Hours-run meter
P2 Revolutions counter
P3 Pressure indicator
R1 Glow plug
R2 Heater flange
R3 Series resistor for glowing device
R4 Resistor
R5 Series resistor with thermostat. switch
S1 Glow starting switch (5 pos.)
S2 Main twitch
S3 Glow starting switch (3 pos.)
S4 Start-Stop-switch
S5 Switch for speed adjustment
S6 Temperatue snitch for engine temp.
S7 Oil pressure switch
S8 Press. switch for air filter (mainten.)
S9 Switch for blower control
S10 Temperature switch for preheating
S11 Remote start switch
312 Remote stop switch
T1 Transformer for speed measurement
V1 Decoupling diode
V2 Suppressor diode
V3 Zener diode
V4 Surge suppressor diode
W1 Earth / ground. minus return
W2 Screened cable at generator
X1 Terminal strip at instrument box
X2 Tab connector block
X3 Plug at emergency stop switch
X4 Socket at start stop switch
X5 Terminal block in operators panel
X6 Terminal block in terminal box
Y1 Solenoid for speed adjustment
Y2 Solenoid for engine stop
Y3 Solenoid-valve for engine stop
Y4 Fuel shut-off valve
Y5 High-pressure shut off valve
Z1 Interference suppression coil
Z2 Suppression capacitor



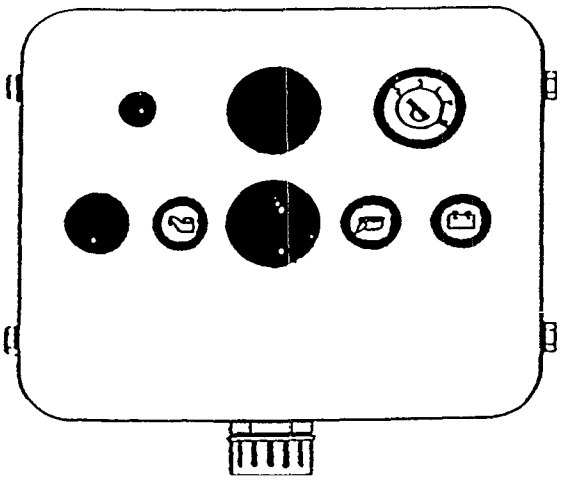
INST. PANEL WIRING DIAGRAM
2G40 ENGINE
STANDARD PANEL
w/TEMP. SWITCH & GLOWPLUG

LT0317

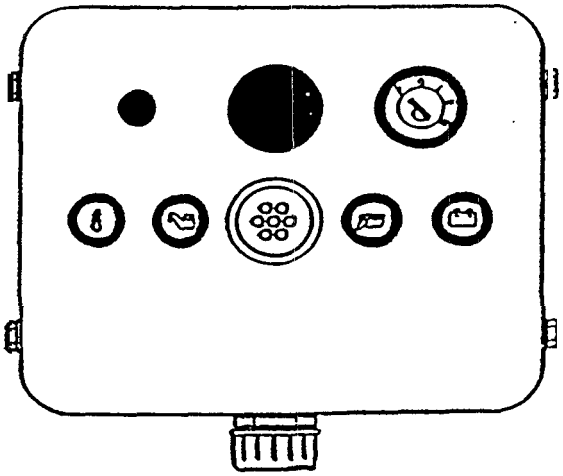
REF. HATZ #03929010

HATZ 3/

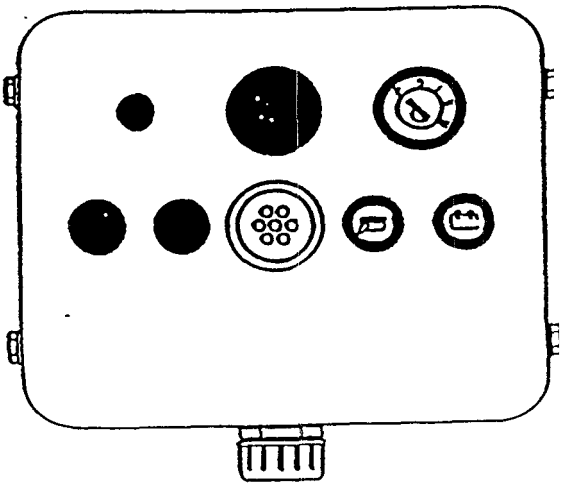
Instrument Control Boxes



Standard Control Box
Engine Accessory Part Number
01112202



Standard Control Box
with Preheat and Temperature
Indicator Light Options



Auto Stop Control Box
Spare Parts Number
01112802
Engine Accessory Part Number
01112302
Preheat Equipment is Optional

Wire Terminals in the Standard Control Box

24 – charge wire
18 – shutdown solenoid – "pull" voltage (if so equipped)
7 – shutdown solenoid – "hold" voltage (if so equipped)
6 – pre-heat
5 – temperature switch
4 – oil pressure switch
3 – starter motor solenoid
2 – charge light and anti-restart
1 – positive wire (plus)
0 – ground wire (negative)

Extra Wires

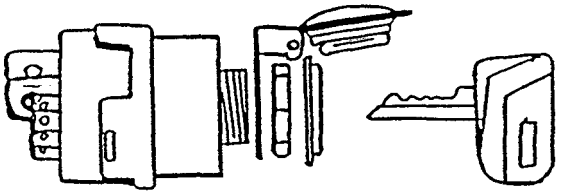
14 – two-speed solenoid – "hold" voltage
22 – tachometer / hourmeter
28 – two-speed solenoid – "pull" voltage

HATZ
INSTRUMENT BOXES

PART NUMBER	DESCRIPTION	ENGINE SERIES
10776900		E75 E79
11402901	STANDARD	1D31/41Z & 1D81C,Z
11406901	AUTO SHUT DOWN	1D31/41Z & 1D81C,Z
01524900	STANDARD	2G40
11526700	AUTO SHUT DOWN	2G40
01112202	STANDARD	2790
01112302	AUTO SHUT DOWN	2790
00817702	**STANDARD** 12 VOLT	2/3/4/M40/41 & 2/3/4/L40/41C
30826502	**STANDARD** 24 VOLT	2/3/4/M40/41 & 2/3/4/L40/41C
00824603	AUTO SHUT DOWN 12V.	2/3/4/M40/41 & 2/3/4/L40/41C
00819603	AUTO SHUT DOWN 24V.	2/3/4/M40/41 & 2/3/4/L40/41C
99400253	RELAY CONTROL PANEL	**ALL**

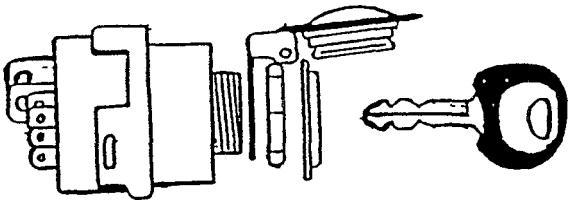
HATZ DIESEL KEY SMITCH

old style key switch
P.N. SO276500 incl. key

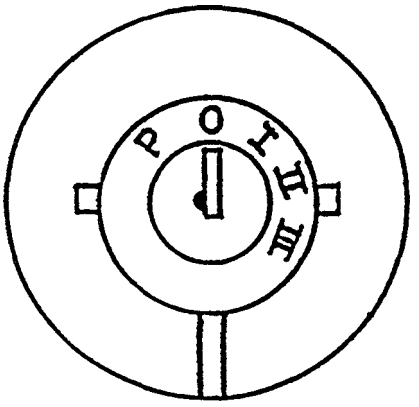


key P.N. SO166400

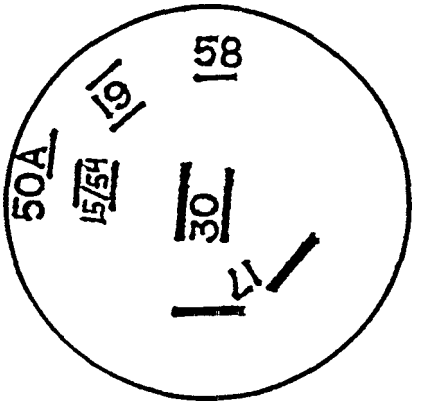
new style key switch
P.N. 50276501



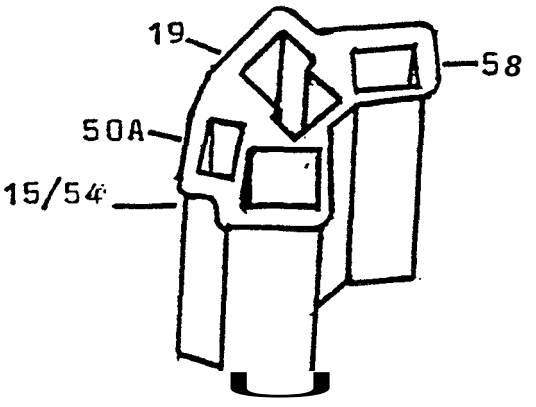
key P.N. 50166410



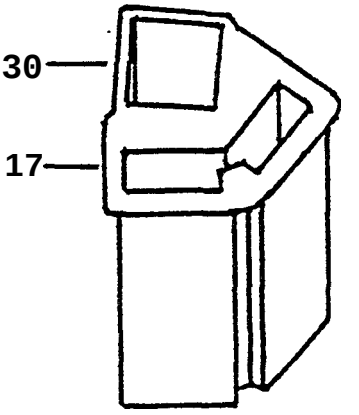
FRONT VIEW



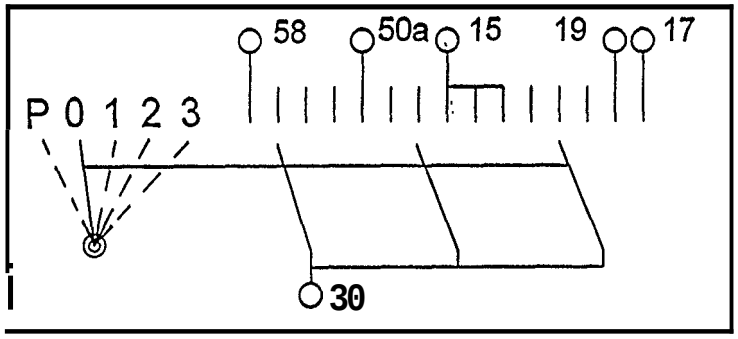
REAR VIEW

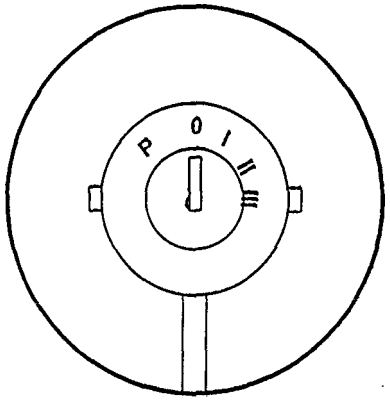


6 PRONG CONNECTOR PLUG
P.N. 50276700

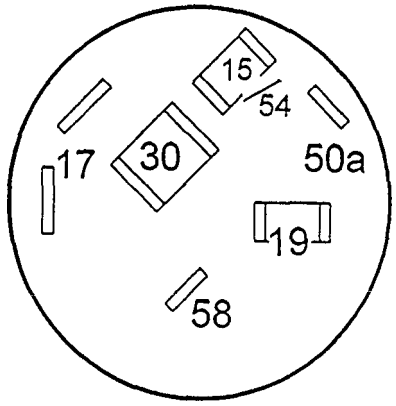


4 PRONG CONNECTOR PLUG
P.N. 50276600





FRONT VIEW



REAR VIEW

P -ACCESSORY
0 - OFF
I -RUN
II - PREHEAT
III - START

} SPRING RETURN TO I
RESET START BY TURNING TO OFF

MAXIMUM ELECTRICAL LOAD OF TERMINALS:

KEY POSITION	TERMINAL NUMBER	MAXIMUM 12 V	LOAD AT 24v	LOAD PERIOD
P	58	8A	4A	UNLIMITED
I	15/54	35A	17.5A	UNLIMITED
II	15/54	35A	17.5A	UNLIMITED
	19	60A	30A	2 MINUTES
III	15/54	35A	17.5A	UNLIMITED
	17	60A	60A	1 MINUTE
	50a	60A	40A	SHORT TIME

50276502

KEY SWITCH

wiringim.pre 12/95 jk

HATZ DIESEL KEY SWITCH
USED ON ALL ENGINES WITH ELECTRIC INSTRUMENT BOX

The key switch used by HATZ is an automotive type switch which has five key positions. The key can be inserted or removed in either position P or Θ. In the other three positions (I, II, III) the key cannot be removed. Also, position II and III are spring-loaded and upon releasing the key it will return to position I.

The front mounting surface of the switch has two raised square pegs for proper installation. These pegs properly align the switch and also hold the switch in place when the mounting nut is tightened. It is also possible to install the switch upside down. **NOTE:** Mounting the switch upside down should be avoided.

The rear of the switch has ten plug-in type terminals. Two are for battery connections and the other eight are output terminals.

The new key switch 50276501 has an improved internal mechanism, which has no tendency to get stuck in the wrong position. The new switch alsc has a new key. **NOTE:** The keys of the two switches are not inter-.changeable. The installation of the switch, measurement or size and electrical load of the teminals are identical to the old switch.

KEY SWITCH POSITIONS:

P - ACCESSORIES
Θ - OFF
I - ON OR RUN
II - PREHEAT - SPRING RETURN TO POSITION I
III - START AND PREHEAT - SPRING RETURN TO POSITION I

TERMINAL NUMBERS AND USE:

15/54 - GENERAL OUTPUT - 2 TERMINALS
30 - POSITIVE BATTERY INPUT - 2 TERMINALS
19 - OUTPUT TO GLOW PLUG - 2 TERMINALS
17 - OUTPUT TO GLOW PLUG - 2 TERMINALS
50a - OUTPUT TO STARTER SOLENOID - 1 TERMINAL
58 - TERMINAL NOT USED - 1 TERMINAL

MAXIMUM ELECTRICAL LOAD OF TERMINALS:

KEY POSITION	TERMINAL NUMBER	MAXIMUM 12 V	LOAD AT 24 V	LOAD PERIOD
P	58	8A	4A	UNLIMITED
I	15/54	35A	17.5A	UNLIMITED
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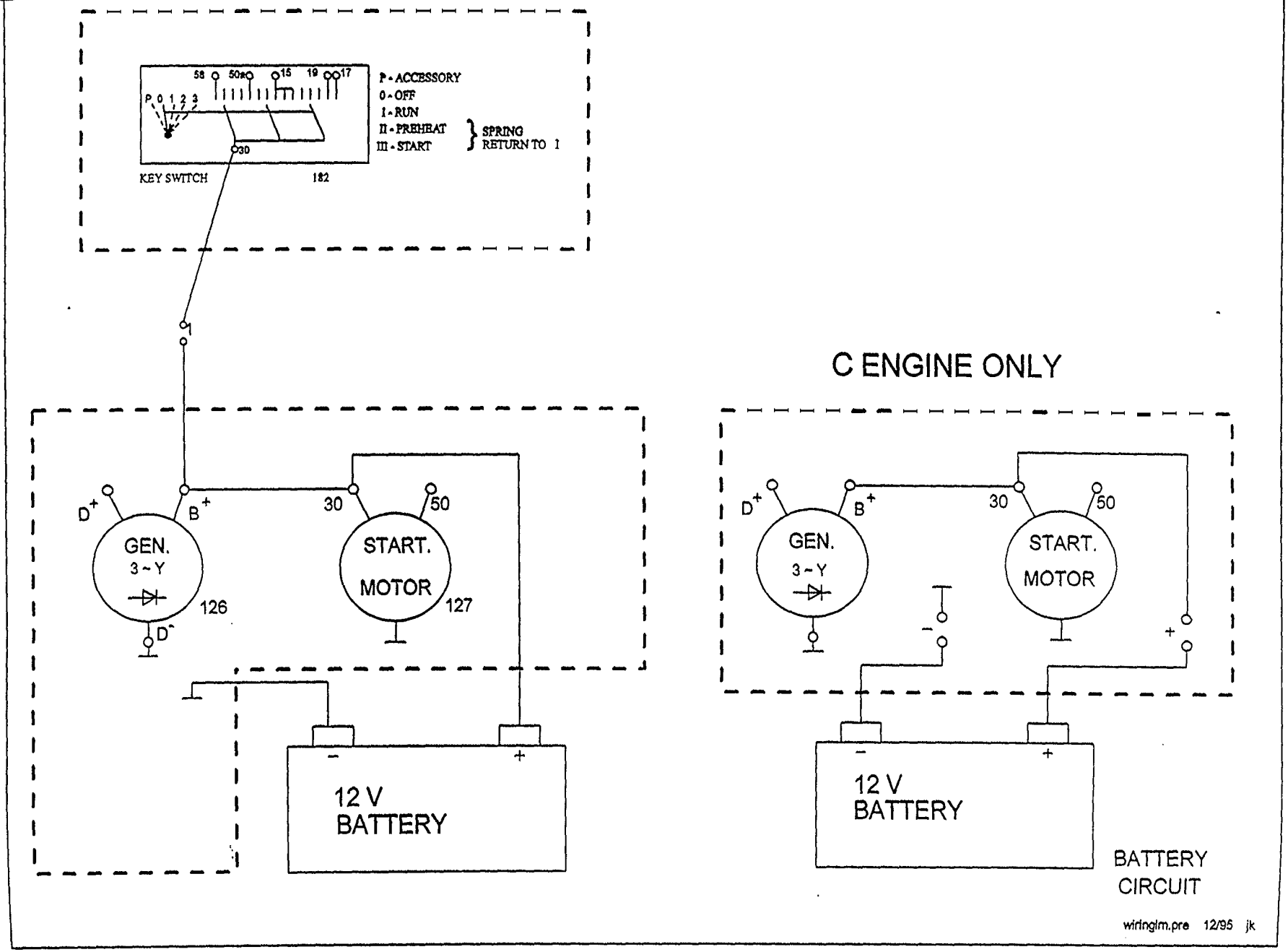
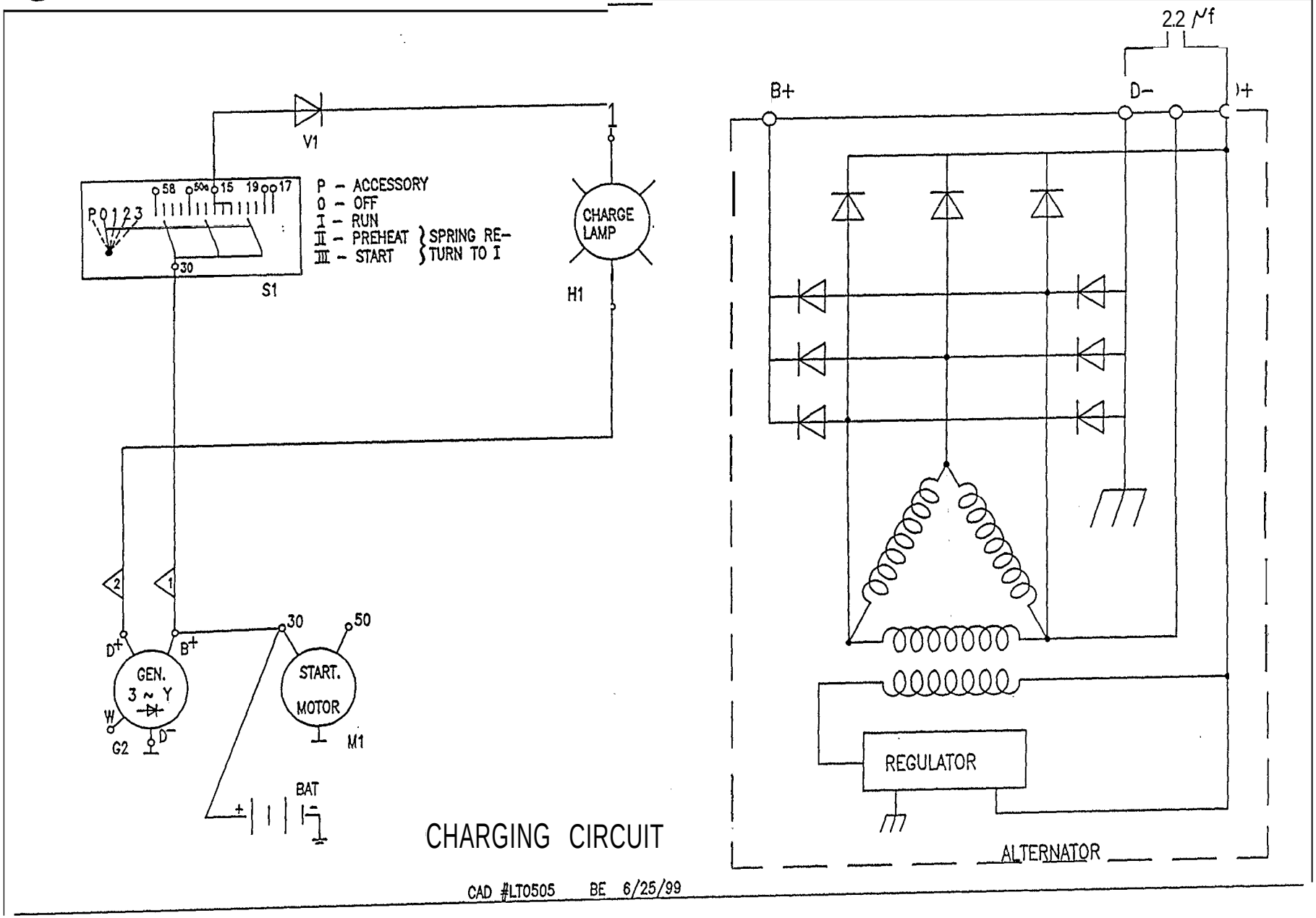
	19	60A	30A	2 MINUTES
III	15/54	35A	17.5A	UNLIMITED
	17	60A	60A	1 MINUTE
	50a	60A	40A	SHORT TIME


58
50a
15
19
17
P 0 1 2 3
30
KEY SWITCH
182
P - ACCESSORY
0 - OFF
I - RUN
II - PREHEAT
III - START
SPRING RETURN TO I
C ENGINE ONLY
D+
B+
30
50
GEN.
3 ~ Y
126
D-
START.
MOTOR
127
12 V
BATTERY
BATTERY
CIRCUIT
wiringim.pre 12/95 jk



CHARGING CIRCUIT

CAD #LT0505 BE 6/25/99

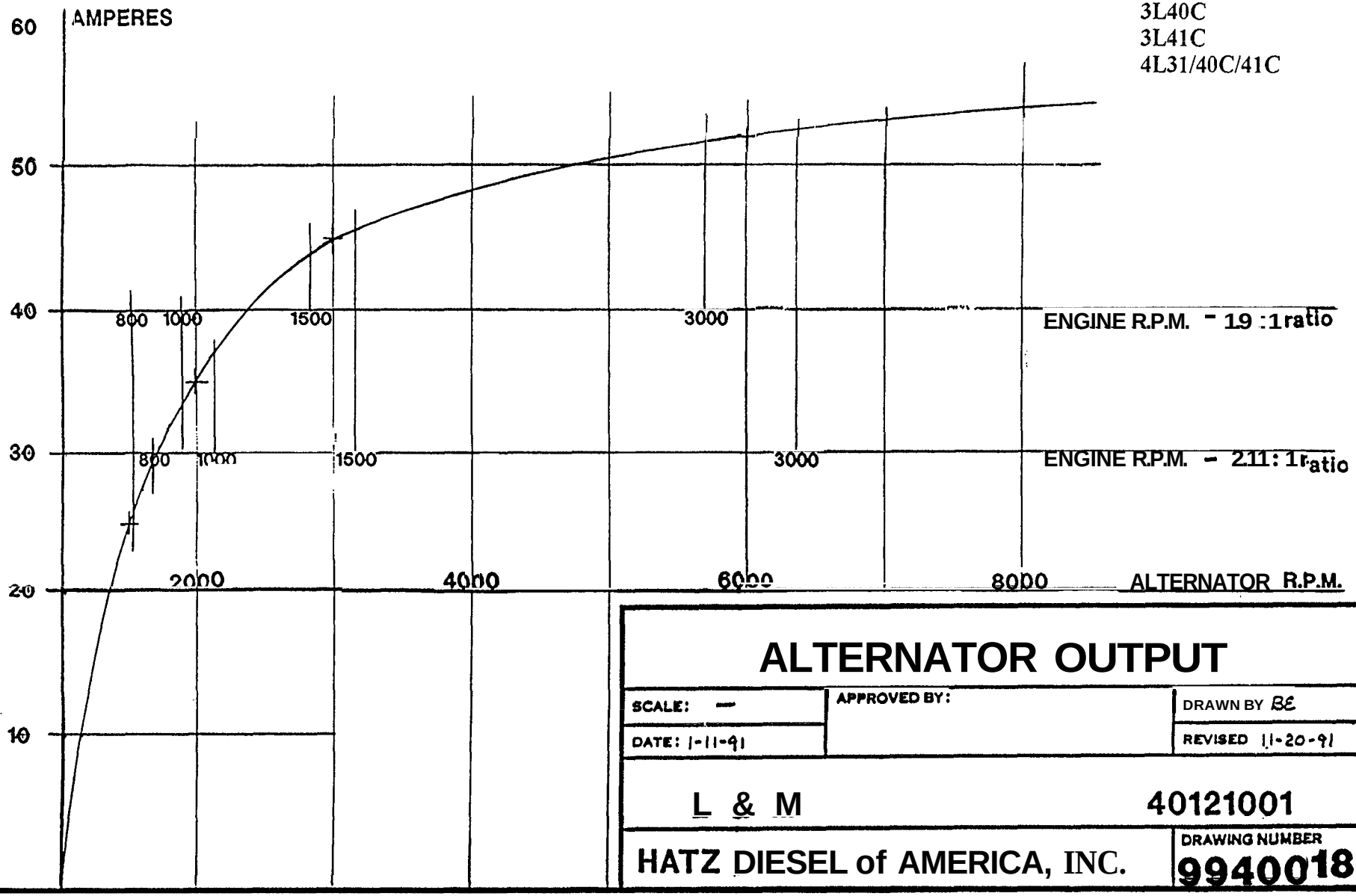
CHARGING CIRCUIT

HATZ uses a Valeo 12 volt alternator in the L and M model engines. The alternator stator windings produce 3 phase alternating current, which is then rectified to DC. The voltage regulator is also a part of the alternator. Take care when removing the regulator from the alternator as the field brushes are a part of the regulator module.

The charge light and the number two wire are used for field excitation and indication of charging. A bad connection or bulb will cause a charging failure. The diode is used to block alternator voltage from returning through wire 2 to the switch, when it is switched off.

The enlarged diagram is of a Pharis Rhone alternator. For proper service information and repair procedure, consult the HATZ Repair Manual.

Pulley Ratios	1.9:1	2.11:1
Engine Models	2-3L31	2-4M31
	2L40C	2L40S/Z
	2L41C	2-4M40
		2-4M41
		3L40C
		3L41C
		4L31/40C/41C



ALTERNATOR OUTPUT

SCALE: —	APPROVED BY:	DRAWN BY BE
DATE: 1-11-91		REVISED 11-20-91

L & M

40121001

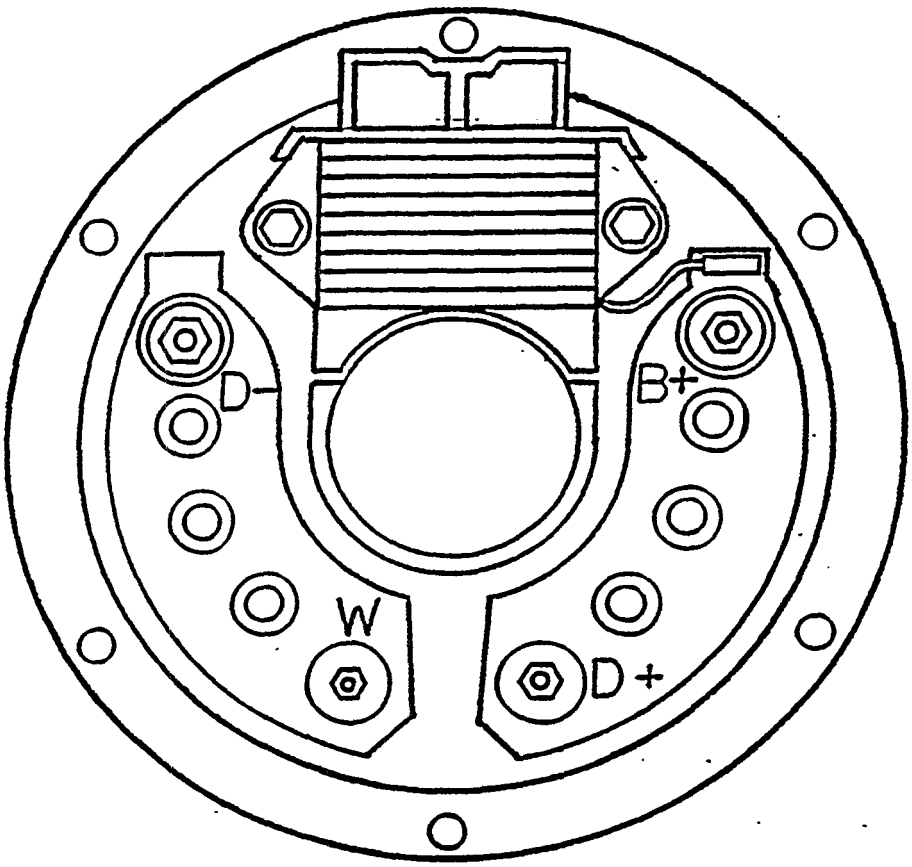
HATZ DIESEL of AMERICA, INC.

DRAWING NUMBER 99400188

8½ X 11 PRINTED ON NO. 1000H CLEARPRINT ®

WIRE TERMINAL CONNECTIONS FOR 99400383 AND 40121001 ALTERNATORS

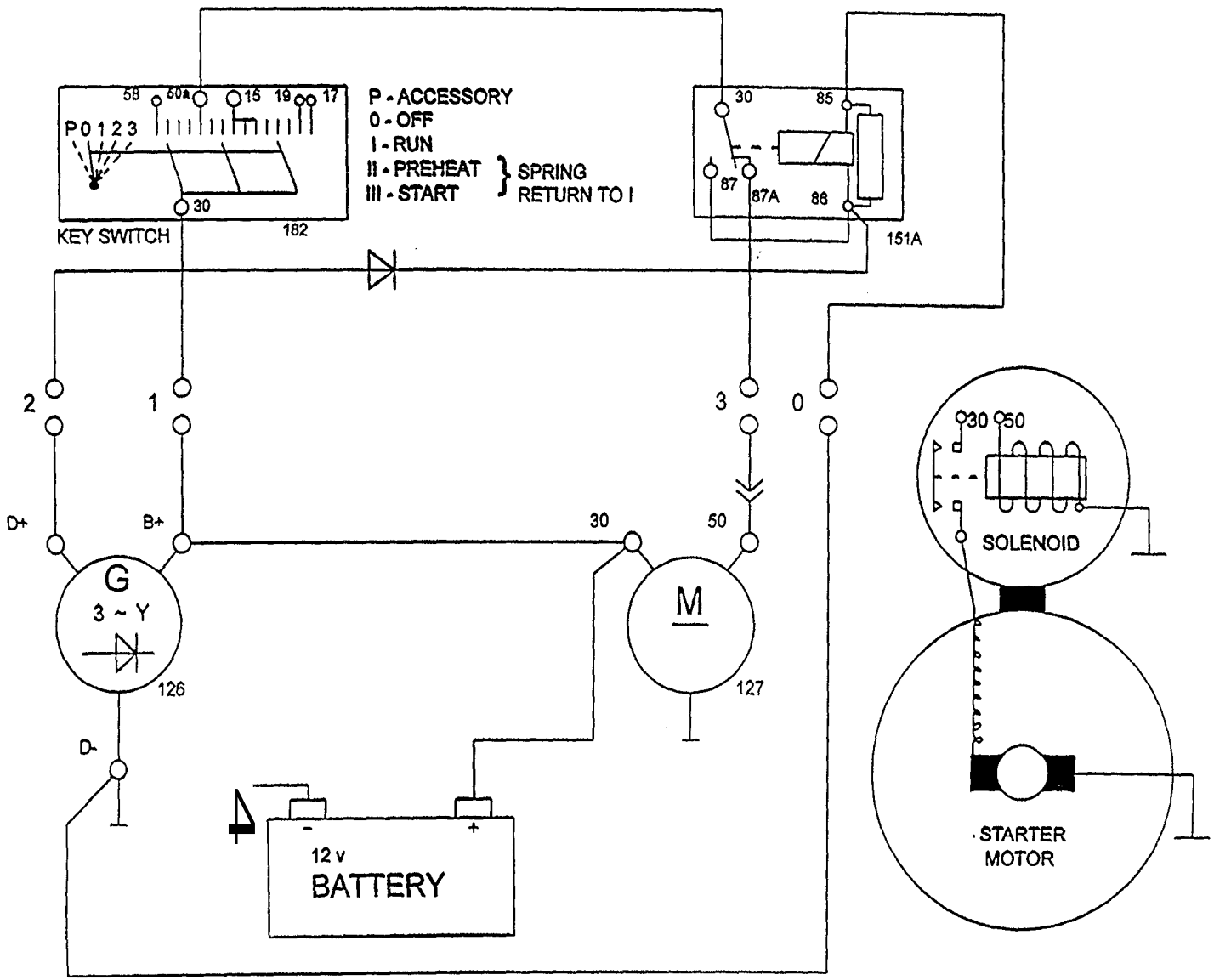
B+ Battery positive cable No. 1
D+ To indicator lamp cable No. 2
D- Ground connection cable No. 0
W Tachometer connection cable No. 22



NOTE: If the bulb circuit (cable 2) is not functioning correctly, or the bulb is burned out, the D+ circuit will not excite alternator. (Alternators will not charge if bulb is burned out.)
Replacement bulb is P/N 40009700, the rating is 2 watt.
Do not attempt to bypass bulb circuit.

COMMON CAUSES OF ALTERNATOR FAILURE

- **Interchange positive** and **negative** battery **cables**
- Disconnect **of battery with engine running**
- **Short of positive cables** *to* **frame**
- **Burned out bulb**
- **Welding on chassis without disconnecting** (B+ D-) alternator
- **Water, dust contamination**
- **Use of solenoid devices without use of clamping diodes**



STARTING CIRCUIT

Starter Circuit

The starter motor is a 12-volt solenoid operated positive engagement pinion gear type. The starter protection relay is used to keep an operator from engaging the starter while the engine is running. Since it was introduced around the end of 1986, starter failures have decreased.

Major reasons for starter failure:

1). Keyswitch to start when the engine is running, causing starter pinion and ring gear damage. NOTE: Always inspect the ring gear teeth all the way around the gear before replacing a starter only.

2). Cranking the engine beyond the duty cycle, causing the starter motor windings *to* overheat and burn. NOTE: Duty Cycle: crank the engine a maximum of 15 to 20 seconds at one time, then allow 40 to 60 seconds for the starter motor to cool before cranking again.

3). Corrosion, dampness and rust in the starter;

A). Do not high-pressure wash directly on the starter motor or starter solenoid.

B). If a "sticky" starter is observed, the unit should go to the shop for maintenance.

We tend to see more starter failures in colder weather. The chart below indicates cranking power vs. temperature.

The amount of work *the* battery has to perform increases as the temperature is lowered. Due to stiff oil encountered at low temperatures, it requires 2% times as much torque or cranking power to turn an engine over at 0° F as compared *to* 80° F, see *Fig.* 2

FIG. 2 – RATIO OF ENGINE CRANKING POWER REQUIRED VS. TEMP.

The *charge* of *the* battery has an important bearing on the amount of work that the battery is capable of,

BATTERY CAPACITY (TEMPERATURE-SENSITIVE) vs. POWER NEEDED **TO START** ENGINE

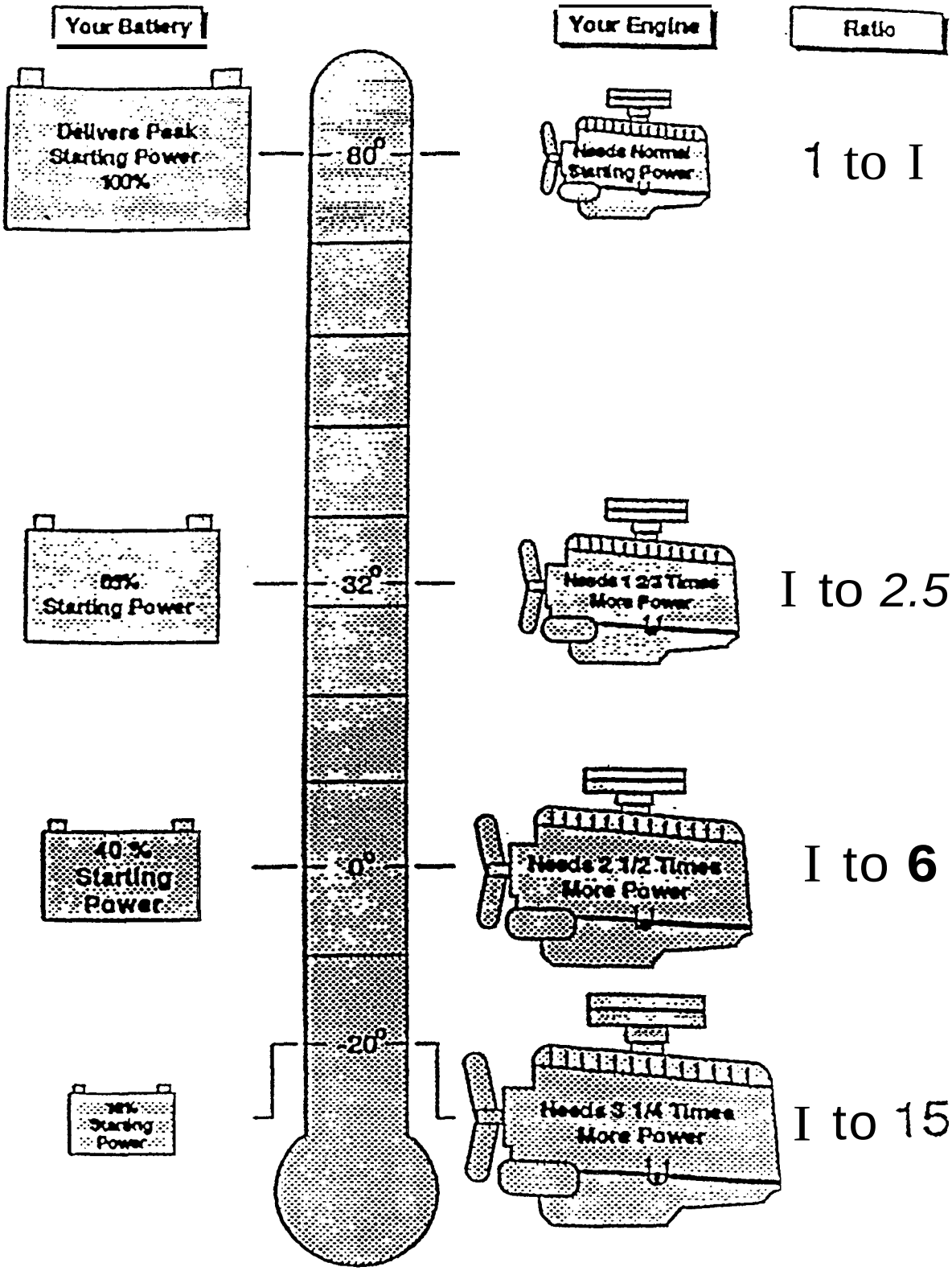
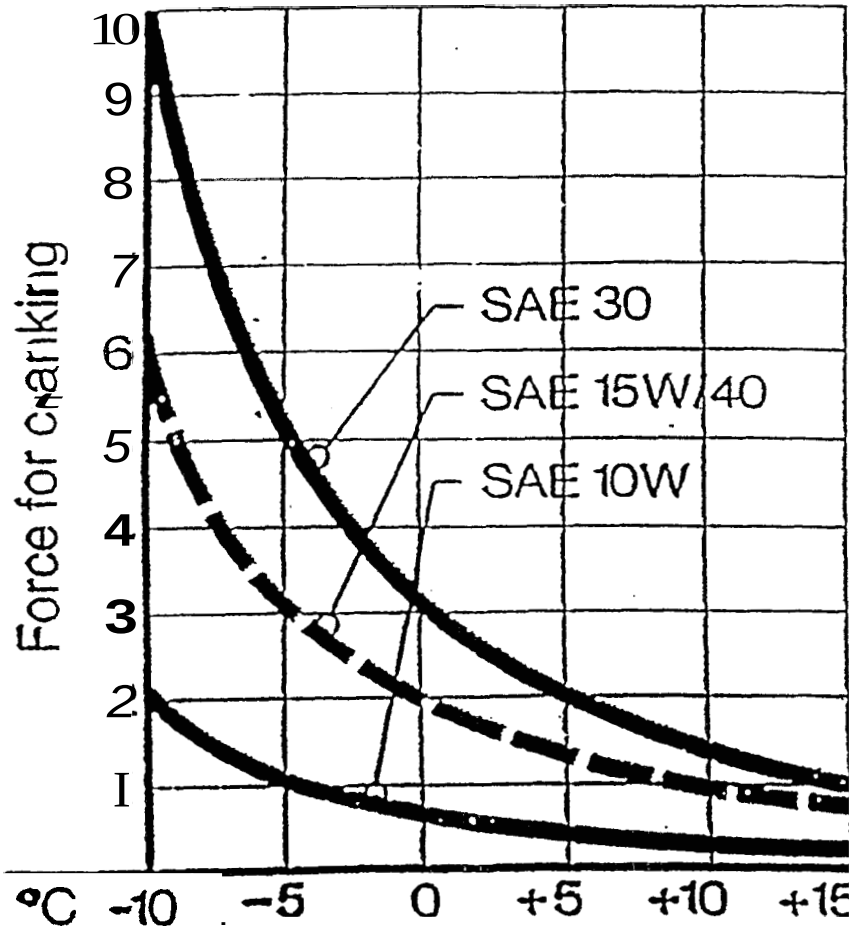


FIG. 4 – Engine oil viscosity has the greatest effect on changes in cranking speed. Battery capacity rating and cable resistance are also major factors as to whether or not an engine will crank fast enough to start.



Force of Cranking
vs.
Oil Viscosity

Battery **Size** Recommendations – 12 Volt System
Values Shown in **CCA** (cold crank amps)

Engine Model	At 68 F	At 32 F	At OF	Capacity of 12 V Starter in kW	Maximum Recommended Capacity of Battery
E 673	220	280	340	0.8	370
1 B20/30	220	280	340	0.8	370
E 75/79	220	280	340	0.8	370
1 D31/41	220	280	340	1.4	370
1 D81	280	340	410	1.5	430
2 G40	280	340	410	1.7	430
Z 790	310	410	600	**1.9**	680
2L41C/2M41	340	430	600	2.7	890
3L41C/3M41	430	550	680	2.7	890
4L41C/4M41	550	680	780	2.7	890

If approximate **Amp.** hour (Ah) ratings are required, divide cold cranking **Amp.** rating by 6. Example 890/6 = **148** Amp. hours.

The necessary capacity for a 24-volt battery is approximately 0.5 x capacity of the 12-volt **battery.**

When connecting batteries in series, ***the*** voltage **is** additive **and CCA** remains the same; connected in **parallel** voltage remains the same **and CCA is** additive.

Battery Cables
Recommended battery cable size **is** shown below.

Minimum Battery cable **Size *(Wire*** Gage) **for 1 Meter** Length

	Wire Gage
Single Cylinder	**4**
Two Cylinder	*2*
Three – Four cylinder	0

COLD WEATHER STARTING CHARACTERISTICS

- FUEL - DF1 below 32" F

- OIL - Multi-Viscosity
  15W40 above 32" F
  5W30 below 32" F

- BATTERY - 680 min. CCA
  890 max. CCA

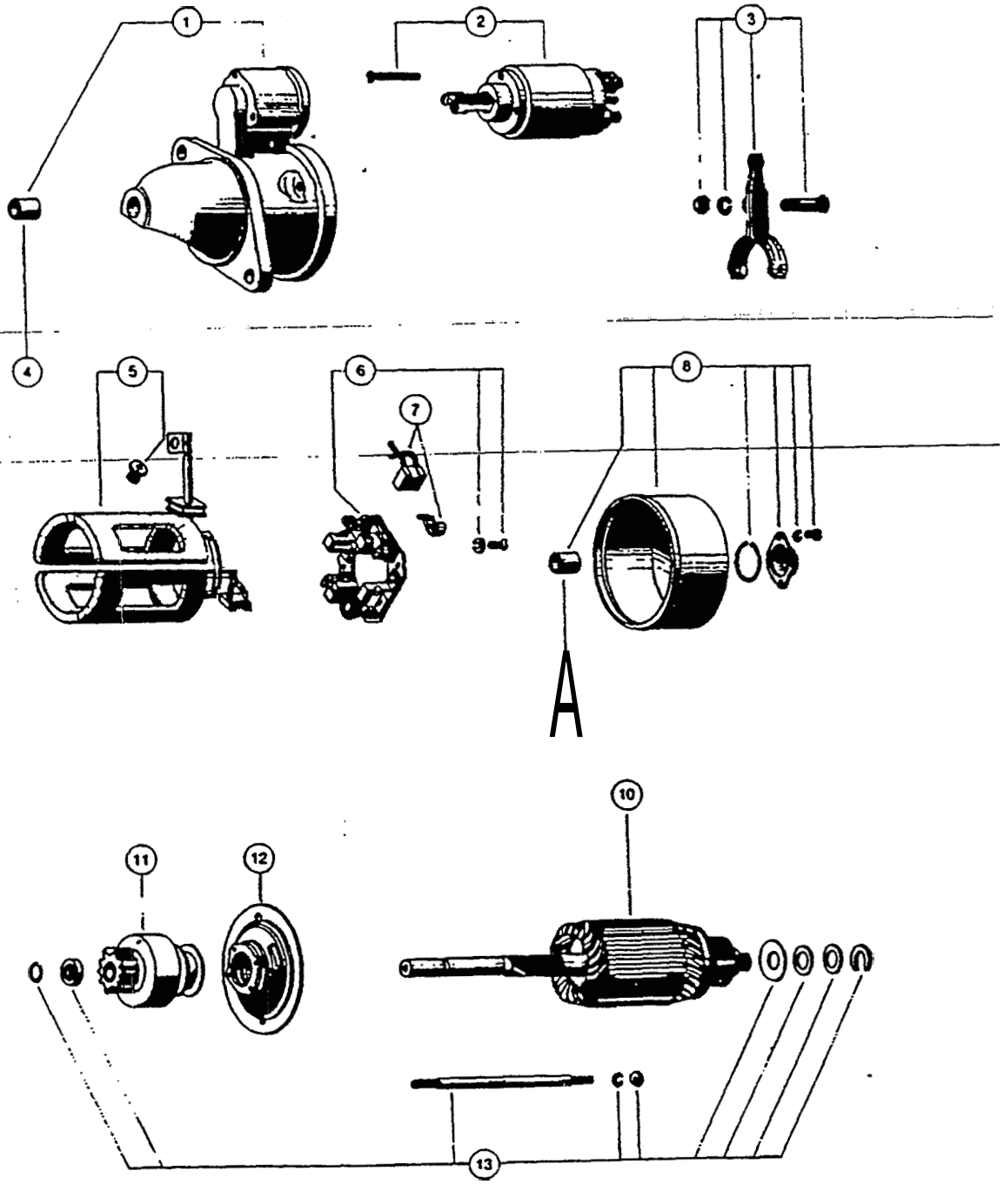
- BATTERY CABLE SIZE - 0 gauge

- GLOW PLUG - 2 – 3 minutes on while cranking

- THROTTLE - high speed position for start-up

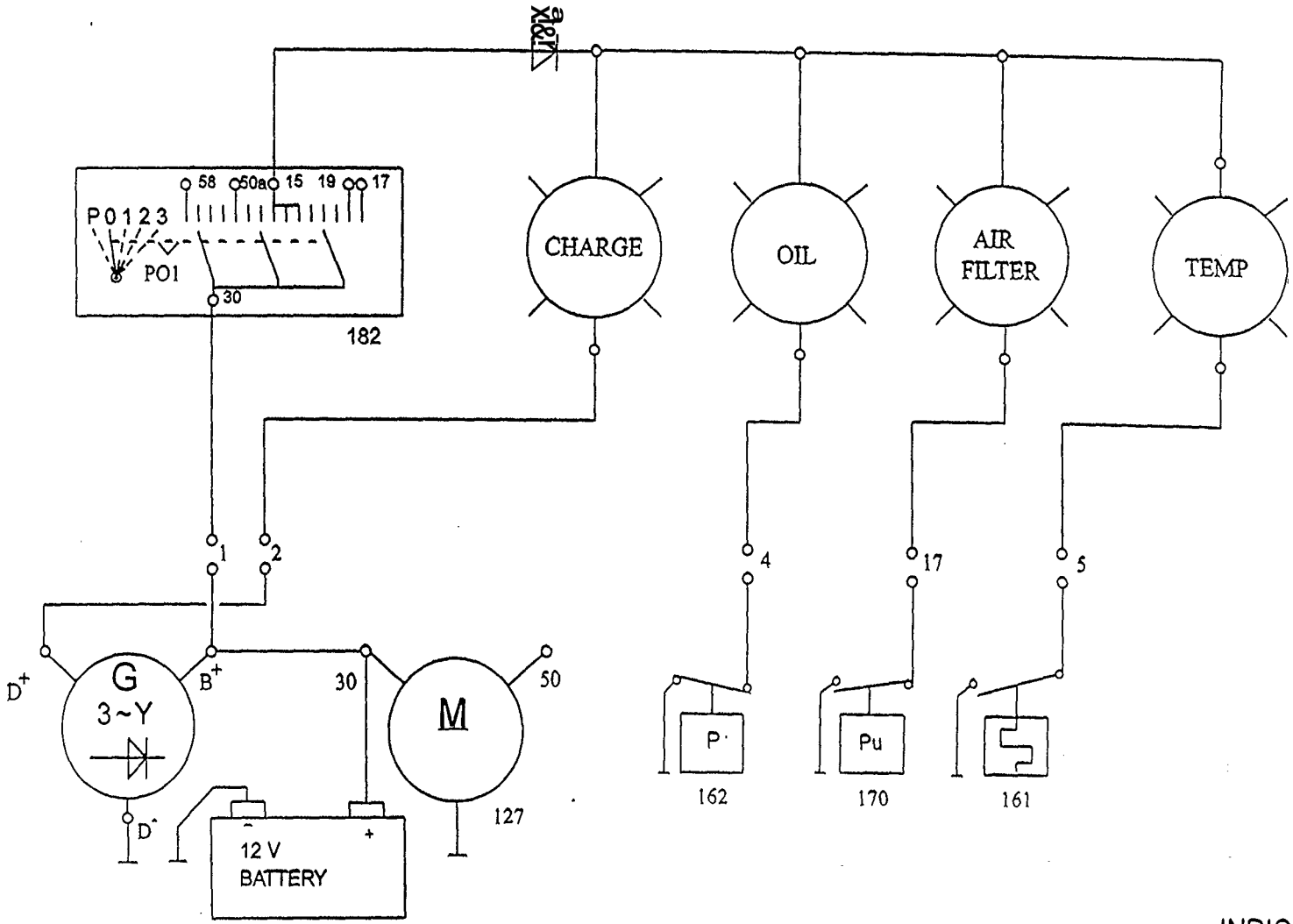
- REMOVE PARASITIC LOAD?

Elektrostarter ISKRA 12 V und 24 V
Spare Parts for Electric Starter ISKRA 12 V and 24 V
Prèces détachées pour démarreur électrique ISKRA 12 V et 24 V



Ersatzteile für Elektrostarter ISKRA
Spare Parts for Electric Starter ISKRA
Prèces détachées pour démarreur électrique ISKRA

Pos.	Benennung, description, désignation	Ident-Nr., No. ident. 12 V	24 V
0	Starter komplett starter motor unit démarreur complet	504 761 00	504 791 00
1	Frontgehäuse front end cover carter avant	490 716 00	90 716 00
2	Magnetschalter solenoid electro-aimant	490 717 00	90 718 00
3	Gabelsatz fork mechanism méconisme fourchu.	490 719 00	90 719 00
4	Lagerbuchse vorne front end bush douille de palier, avant	490 720 00	90 720 00
5	Wicklung coil bobine	490 721 00	190 722 00
6	Bürstenhalter brush holder porte-balai	490 723 00	190 724 00
7	Kohlebürsten carbon brushes balais de charbon	490 725 00	190 726 00
8	hinterer Deckel couvercle arrière	490 727 00	490 727 00
9	hinteres Lager rear end bearing palier arrière	490 728 00	490 728 00
10	Anker rotor rotor	490 729 00	490 730 00
11	Ritzel und Freilauf pinion gear engrenage à pignon	490 731 00	490 731 00
12	Mitteldeckel cover between couvercle central	490 732 00	490 732 00
13	Befestigungsteile fastening parts pièces de fixation	490 733 00	490 734 00



INDICATOR LIGHT
CIRCUIT

INDICATOR LIGHT CIRCUIT

THE CHARGE LIGHT

The charge light is controlled by the alternator. When the alternator starts to produce, the light will extinguish.

THE LOW OIL PRESSURE LIGHT

The oil light is controlled by the low oil pressure switch (162) which is normally closed. When oil pressure reaches about 0.7 bar, the switch opens.

THE AIR RESTRICTION LIGHT

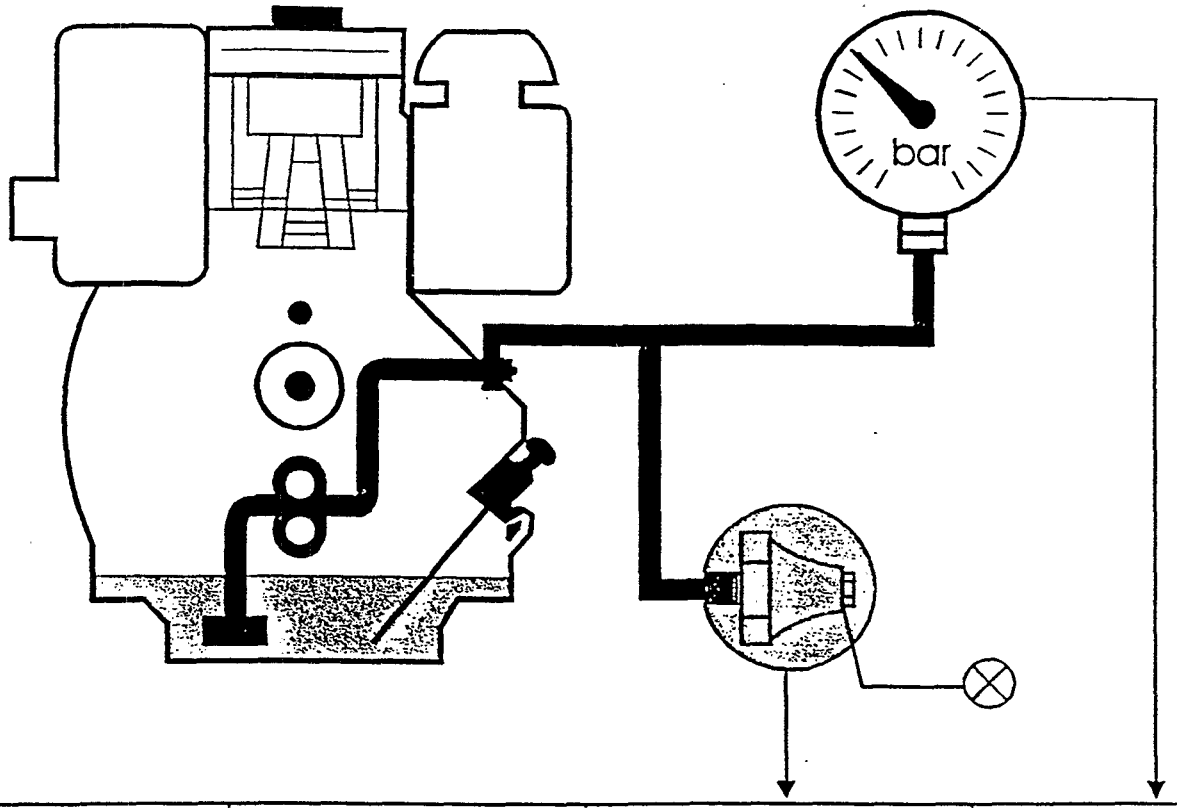
The air switch (170) is normally open and works by vacuum. A restricted air cleaner or obstructed air inlet will close the switch.

THE HIGH TEMPERATURE LIGHT (OPTIONAL)

The temperature light is controlled by a normally open switch (161). This switch will close at or near 220 degrees celsius.

Another optional warning light is the belt breakage light. Since all the engines are automatically protected from belt breakage, this light is not used.

Oldruckschalter-Bestuckung
Application of oil pressure switches



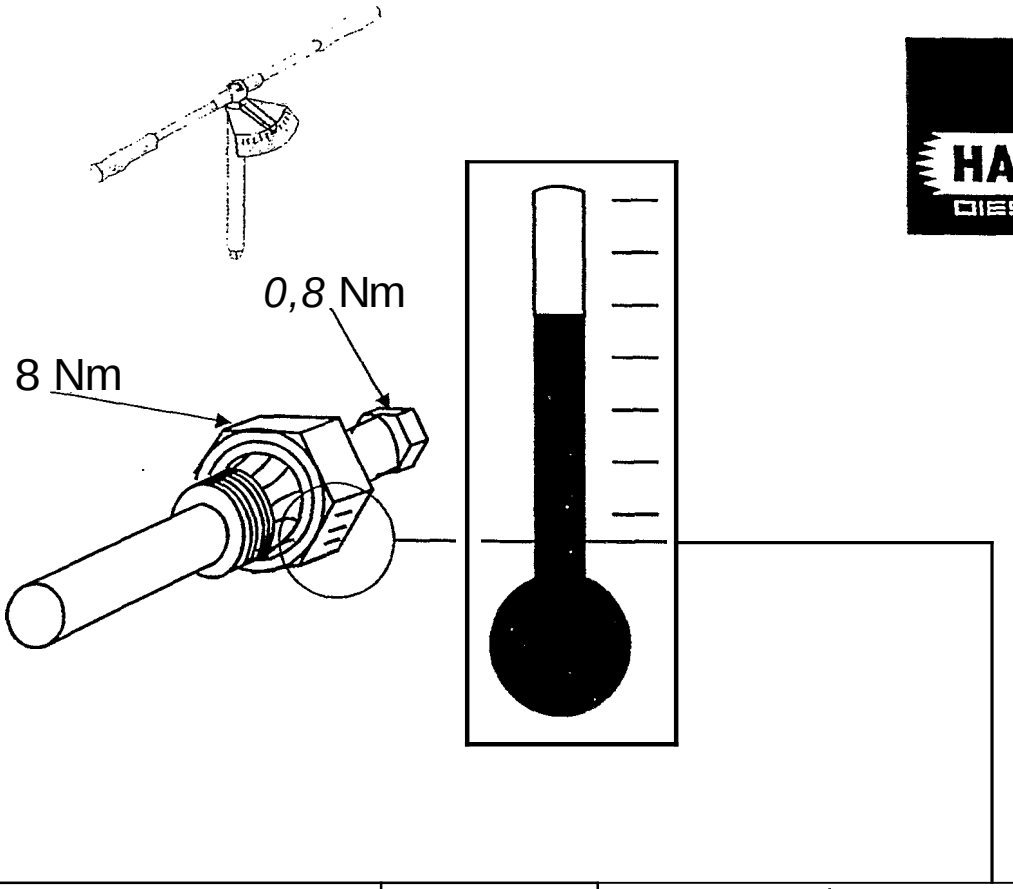
Motor Engine Moteur	Version	Ident-No.	bar (20 ± 5 oC)
1 B20 1 B 30		400 213 00 504 691 00	0,5 ... 0,8 0,3 ... 0,6
1 D 30...81	alle / all / tout	400 213 00 altern. 502 722 00	0,5 ... 0,8 0,8 ... 1,2[3]
2 G...	Standard	502 938 10	0,3 ... 0,6
	2-pol.	503 452 01	1,0 ± 0,2*
		400 213 00	0,5 ... 0.8
2 / 3 / 4 M 31 - 40 - 41	alle / all / tout	400 213 00[1]	0,5 ... 0,8
2 / 3 / 4 L 30 - 31 - 40 - 41	S - Z		
2 / 3 L 30 - 31 - 40 - 41	C		
4 L 40 - 41	C (n > 2300)	502 722 00[2]	0.8 ... 1,2

drift: 0.15 bar ↓ 40 °C

[1] Pos.: Kurbelgehause / crankcase

[2] Pos.: Ölkühler / oil cooler

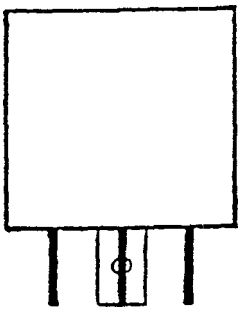
[3] Ölpumpe / Oil pump / pompe huile: 9,5 mm



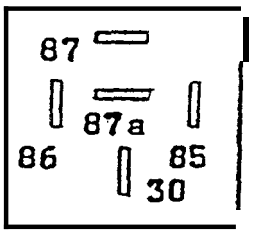
Motor / Engine / Moteur	Version	Ident-No.	°C
1 B...	---	502 686 00	220 ± 10
1 D 30 - 31 - 35 - 40 - 41	S - Z T - U	400 328 01	180 ± 5
1 D 30 - 31 - 41	C	503 445 00	230 ± 10(+10/-3)
1 D 60	S - Z T - U	400 328 01	180 ± 5
	C	503 445 00	230 ± 10(+10/-3)
1 D 80 / 81	S-Z-T-U	502 686 00	220 ± 10(+10/-3)
	C	502 686 00 +05027800	effect.: 250 ± 10
Z 7...	---	501 524 00	210 ± 10(+10/-3)
2 G 30 / 40	---	503 445 00	230 ± 10(+10/-3)
2... 4 L / M 30 - 31 - 40	S - Z C - K	502 686 00	220 ± 10(+10/-3)
2... 4 L 41	C - K	400 328 01 +05027800	180 ± 5
2... 4 M 41	---	502 686 00	220 ± 10(+10/-3)

HATZ RELAY (151)

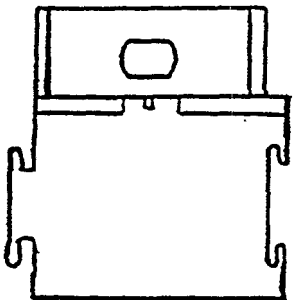
P.N. 50277701 - RELAY 92V
P.N. SO276000 - RELAY BASE
P.N. 50277801 - RELAY 24V
P.N. 40074700 - WIRE TERMINALS



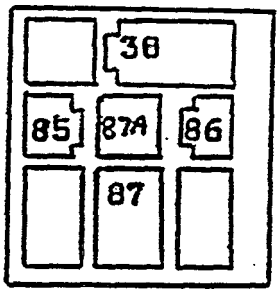
RELAY FRONT VIEW



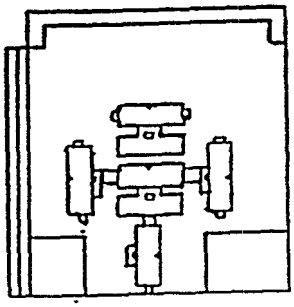
RELAY BOTTOM VIEW



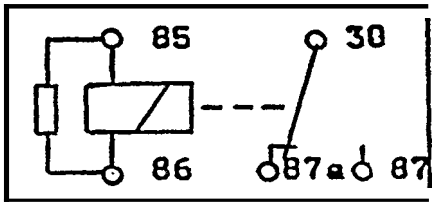
RELAY BASE FRONT VIEW



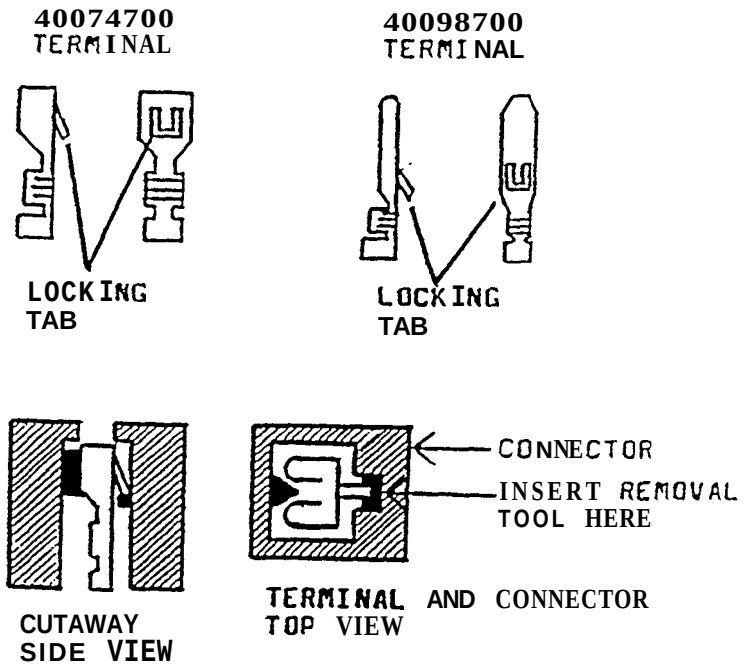
RELAY BASE BOTTOM VIEW



RELAY BASE TOP VIEW



WIRING DIAGRAM SYMBOL



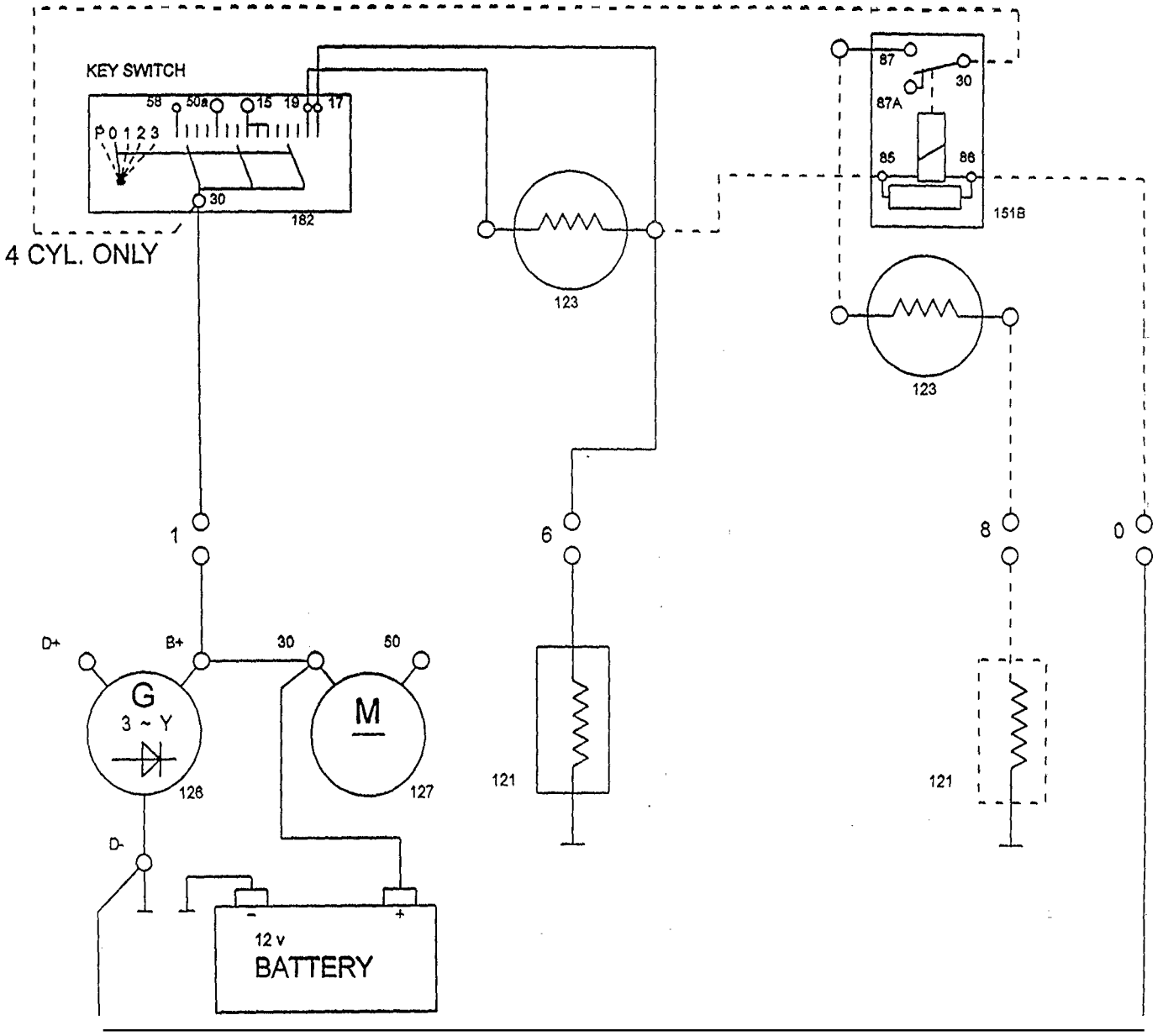
Open barrel terminals require special crimping pliers. After the terminal is crimped on the wire, check it. Give a little tug on *the* wire and terminal to make sure the connection is tight. If a proper connection cannot be achieved, solder the joint. This will insure that you have a good connection.

REMOVAL OF LOCKING BLADE TYPE TERMINALS

A small screwdriver or piece of flattened wire can be used as a removal tool.

Insert removal tool into the slot in *the* top of the connector. Then turn the tool 180 degrees, this should push in **the** locking **tab.** This procedure may need to be repeated before removal is possible. If this procedure fails, turn the tool *90* degrees and pry against **the** terminal. This should force the locking tab in.

NOTE:. It **helps** if **you push up** on the terminal while using the removal tool.


KEY SWITCH
58
50a
15
19
17
P 0 1 2 3
30
182
4 CYL. ONLY
123
87
30
87A
85
86
151B
123
1
6
8
0
D+
B+
30
50
G
3 ~ Y
126
M
127
121
121
D-
12 v
BATTERY
GLOW PLUG
CIRCUIT
wiringtm.pre 12/95 jk

GLOW PLUG CIRCUIT

The glow plugs utilized by HATZ in multi-cylinder engines are actually intake manifold preheaters. The dropping resistor (123) is used to limit current flow and not necessarily as an indicator. Terminal 19 of switch 182 is a low current contact, terminal 17 can handle the higher current which is needed during the starting mode, Four-cylinder engines require a relay to energize the second glow plug, which again protects the switch from too much current draw.

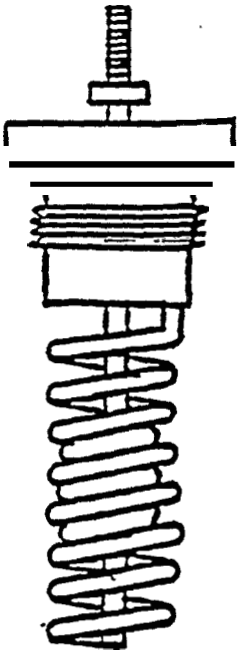
ENGINE PREHEAT EQUIPMENT

GLOW PLUG

E 71, *75, 79* and *780*

VOLTAGE RATING - 10.5 V
CURRENT DRAW --- 10 A
POWER OUTPUT --- 115 W

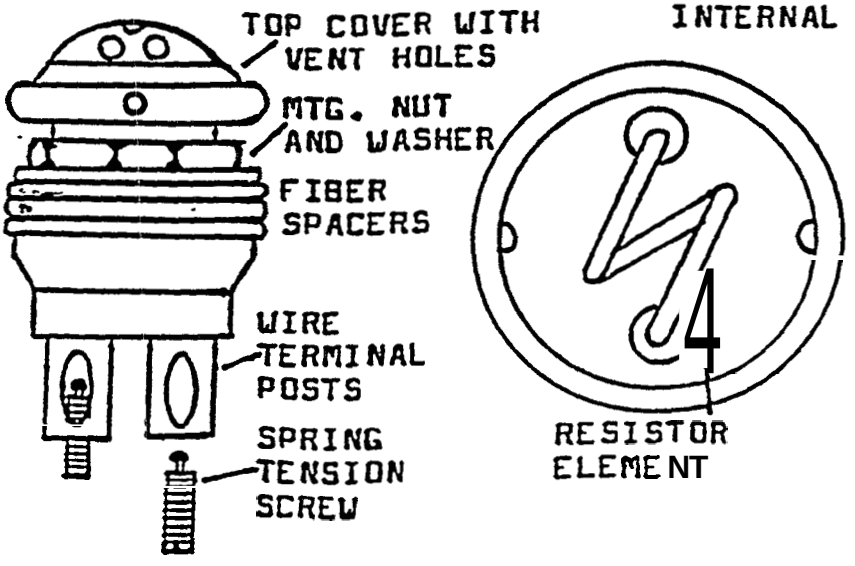
MANIFOLD PREHEATER

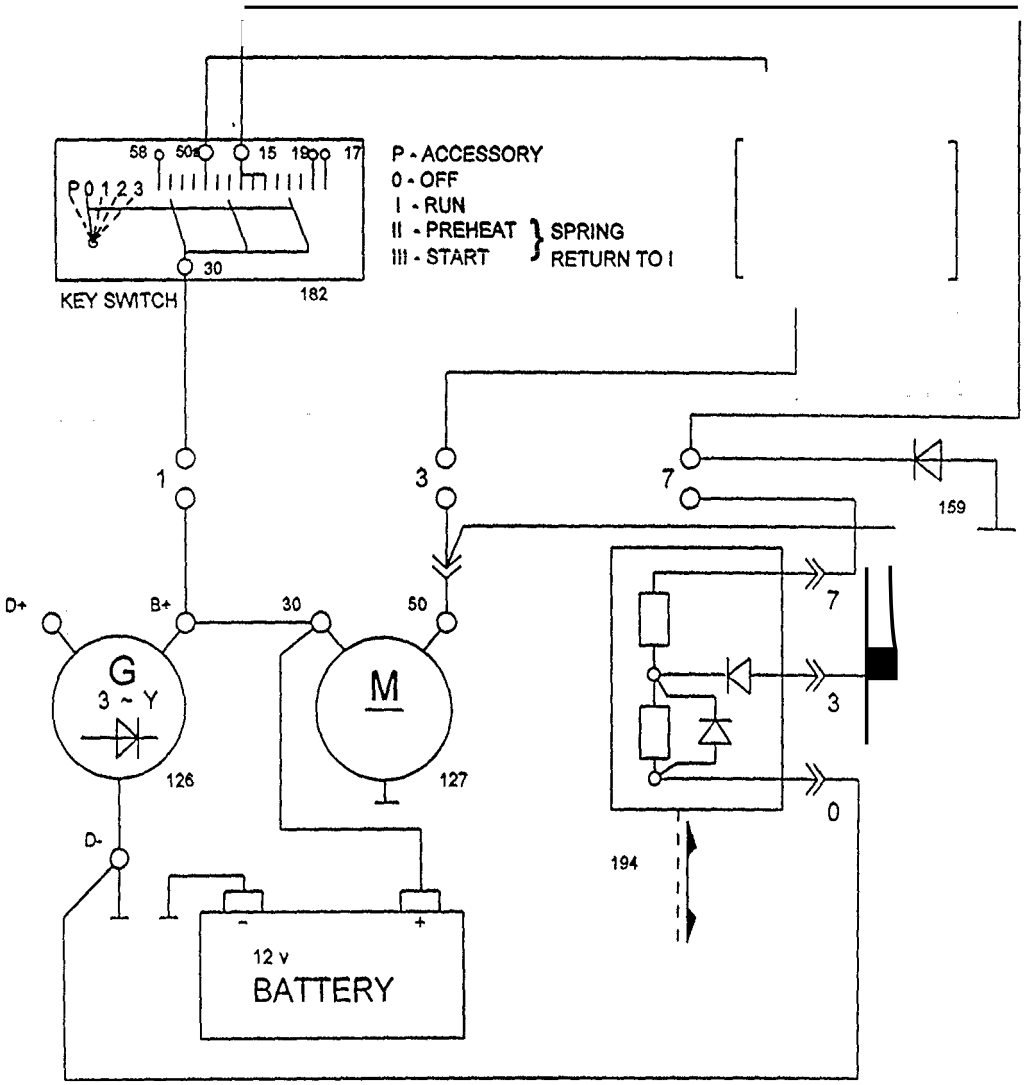


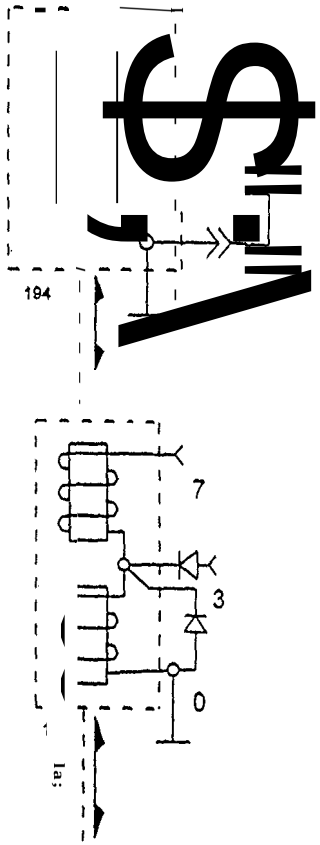
2G30, Z788, Z790, 2-4 L&M

VOLTAGE RATING - 11 V
CURRENT DRAW --- 50 to 60 A
POWER OUTPUT --- 600 W

DROPPING RESISTOR ASSEMBLY







STOP SOLENOID
CIRCUIT

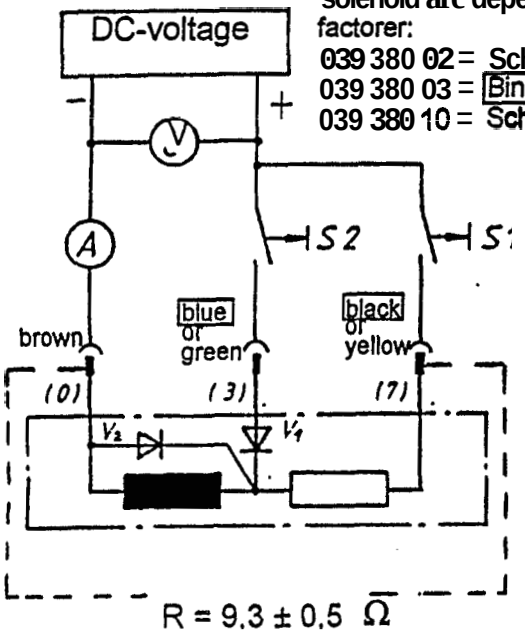
STOP SOLENOID

The stop solenoid indirectly controls the fuel control rack. This solenoid has two windings, the number 3 wire powers the pull in winding and the number 7 wire powers the hold winding.

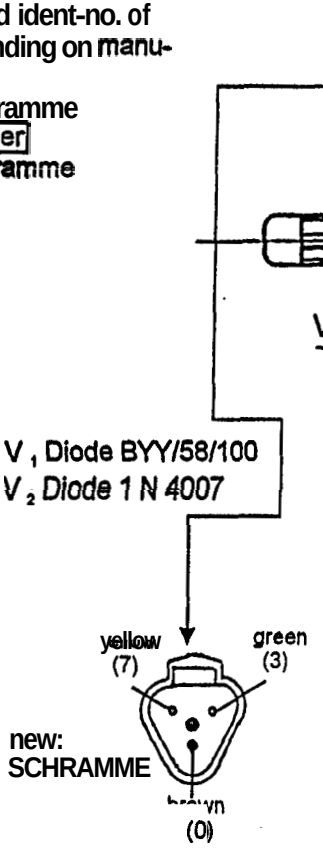
Two other stop solenoids are also shown from earlier wiring diagrams 03852302 and 01.

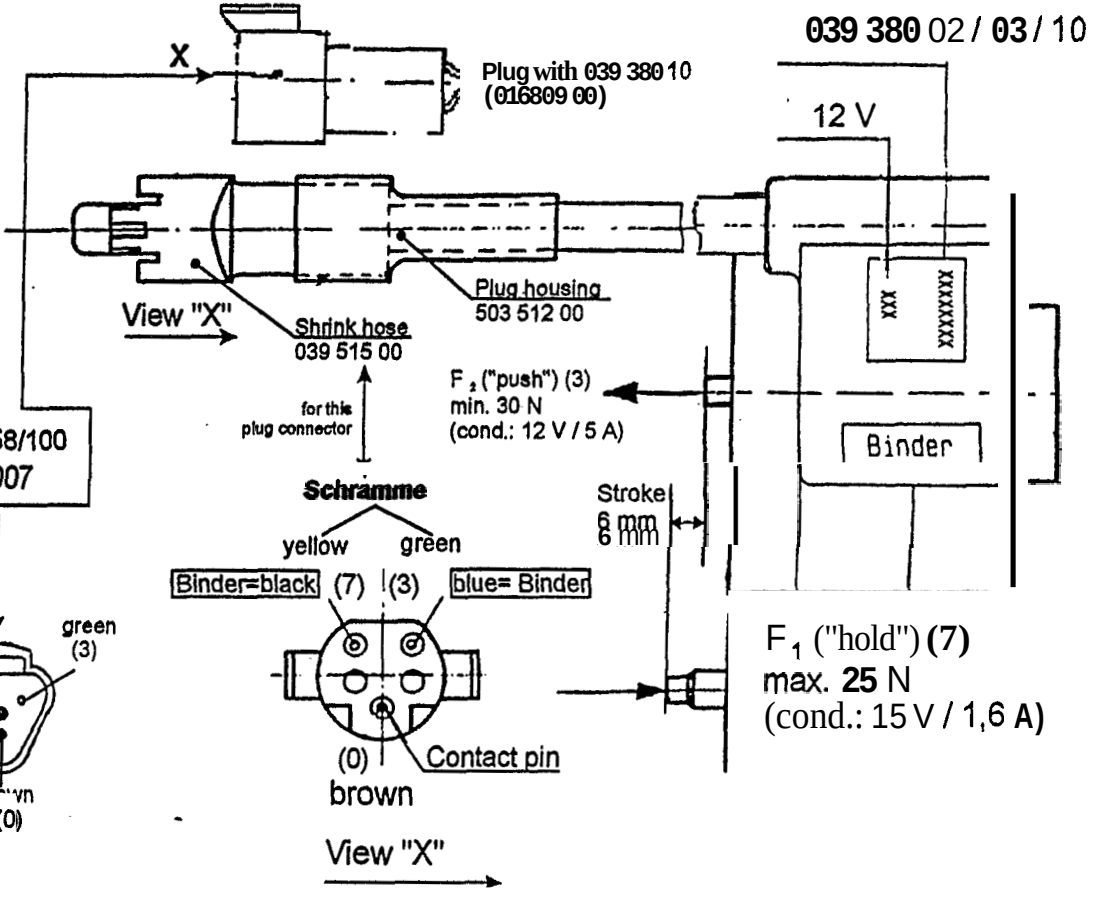
Electrical connection and test arrangement

Note:
Colour of leads and ident-no. of solenoid are depending on manufactorer:
039 380 02 = Schramme
039 380 03 = Binder
039 380 10 = Schramme



U = 11 V = const.
S1 : I = 1,2 ± 0,1 A
S2 : I = 8,5 ± 1 A
(max. 5 sec.)





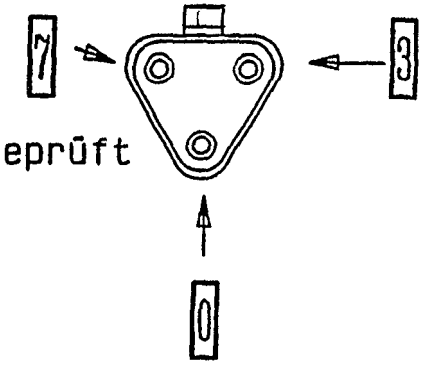
ENGINES
L / M 31 - 40 - 41

HATZ DIESEL

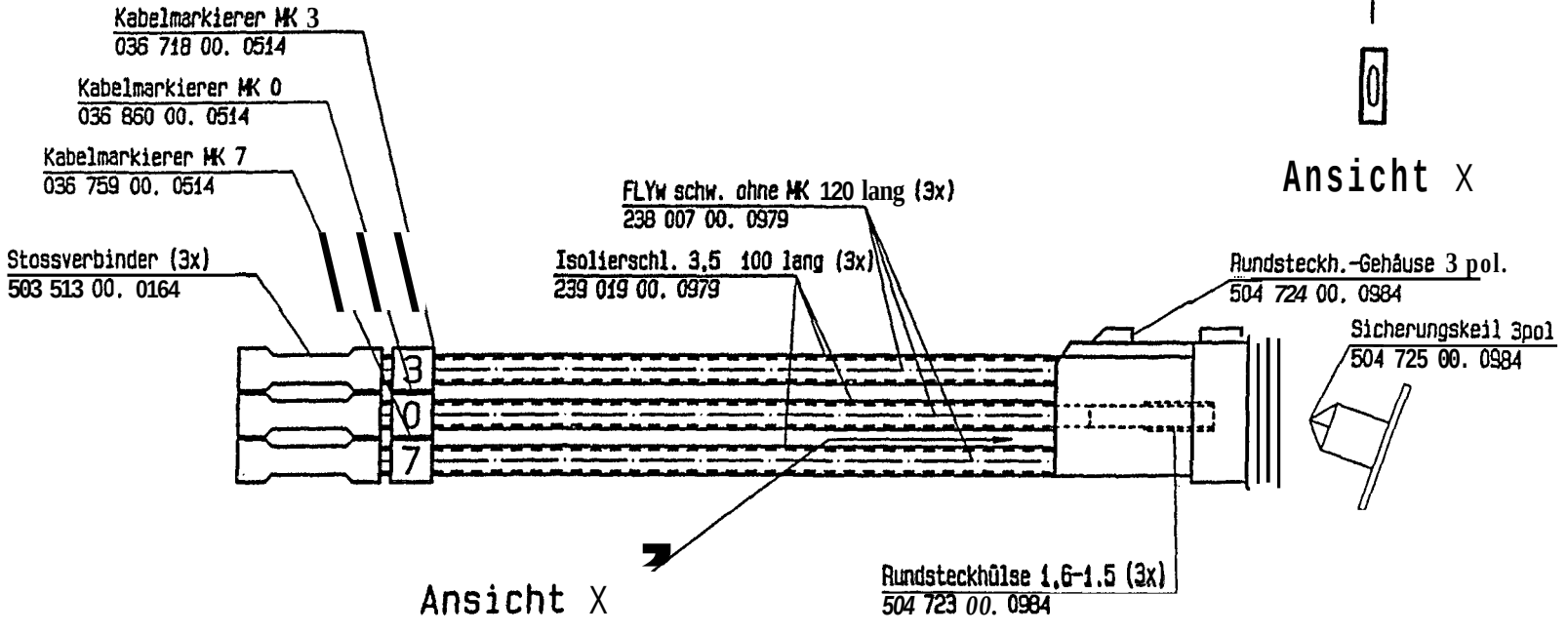
Start-Stop-Solenoid 12 V / desin No. 039 380 02 / 03 / 10
For spare part gets delivered: Ident-No. 016 609 00 (composed from 039 380 10 + adaptor lead 016 515 00 to connect to previous execution of engine side wiring)

Ed. 11,1999
MSS-schi-es

Stecker montiert **und** auf richtige Belegung **geprüft**
Sicherungskeil eingesetzt



Ansicht X



Ansicht X

0	15.09.99	HL	Mitt.
r.	Datum	Name	Änderung

NICHT MANUELL ÄNDERN

Oberflächenbeschaffenheit DIN ISO 1302 Reihe..2..
Werkstückkanten DIN 6784
Allgemeintoleranzen DIN 7168. mittel
Form- u. Lagetolerierung DIN ISO 1101
Schutzvermerk nach DIN 34 beachten

HATZ DIESEL
MOTORENFABRIK HATZ RUHSTORF-ROTT

Kabelstrang
Umbausatz Ventilmag. 12/24V
2-4 L/M 41

Maßstab/SCALE 1:1 (:) ISO E

CAD	Datum	Name	
Gez.	15.09.99	HL	
Gepr.	15.09.99	HL	

Werkstoff/ MATERIAL
–
–

Rohteil-Nr.: / RAW-PART No.
.

Fertigteil Nr.:/FINISH-PART No
0 1 6 5 1 5 0 0 .

Crimp connectors

HATZ

Ed. 09,99
MSK-sl-es

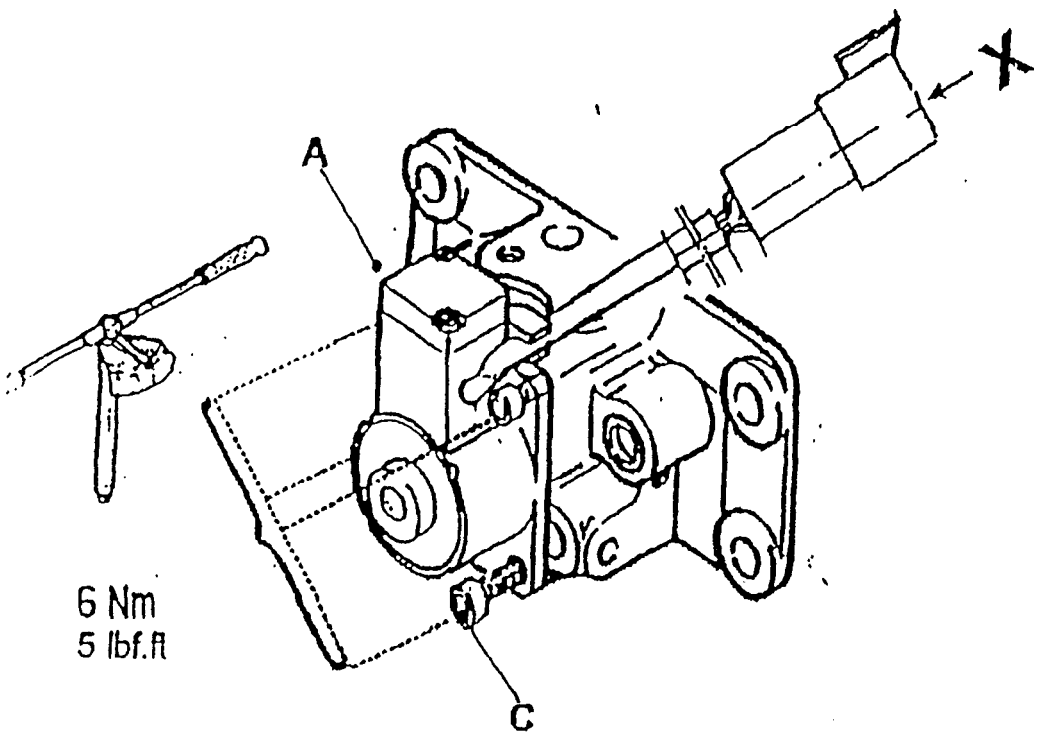
INSTALLATION PROCESS:

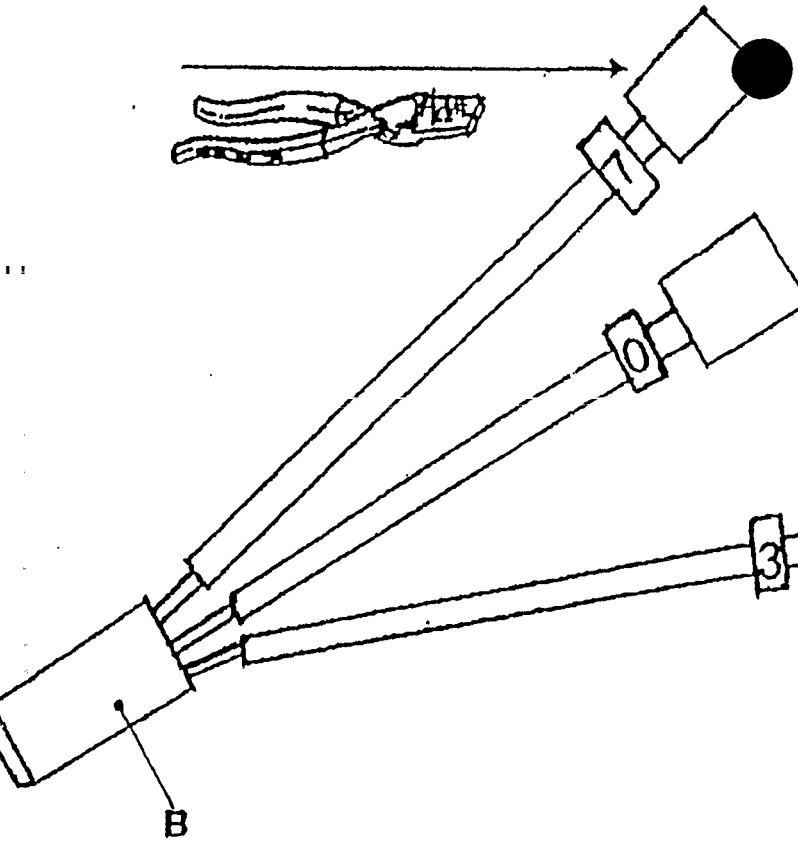
Cut *off* the multiplug from **wire-harness and** crimp cable connectors **firmly** to **adaptor.**

CAUTION:
Make **sure** wire **numbers** matching proper!

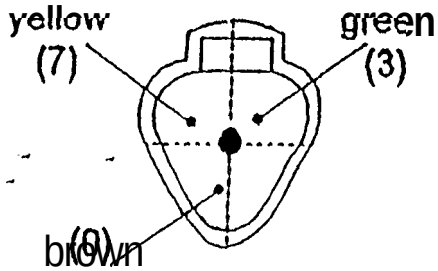
A = **039 380 10** magnet valve
B = 016 515 **00** installation kit
C = 501 **707 00** all. screw **M 6** x16

} 016 609 00 magnet valve 12 V

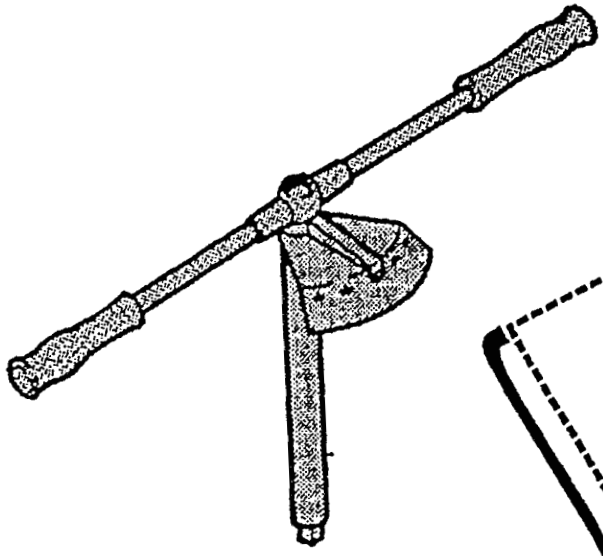


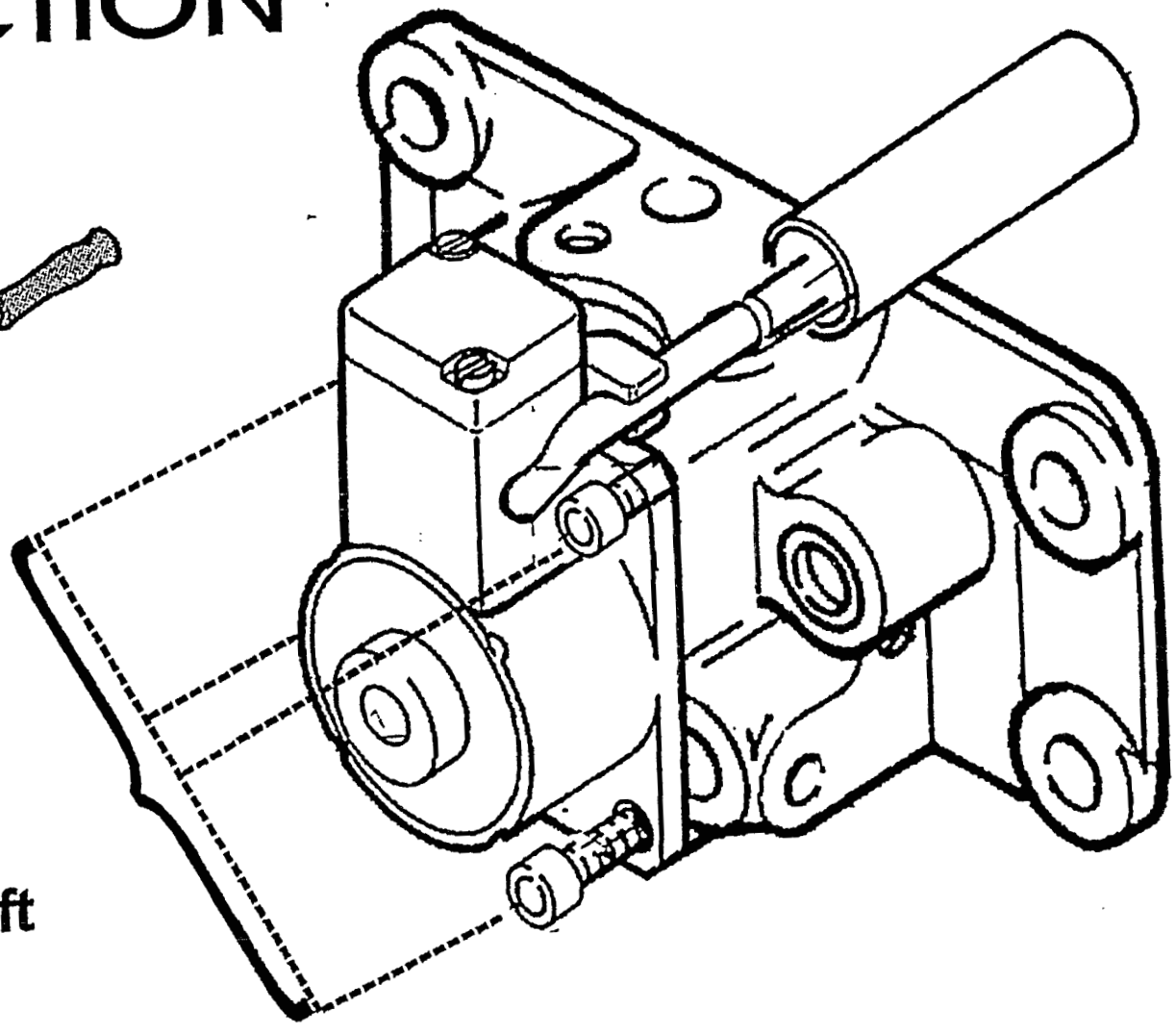


X = view



INSTRUCTION





6 Nm
5 lbf.ft

051 553 00.1054

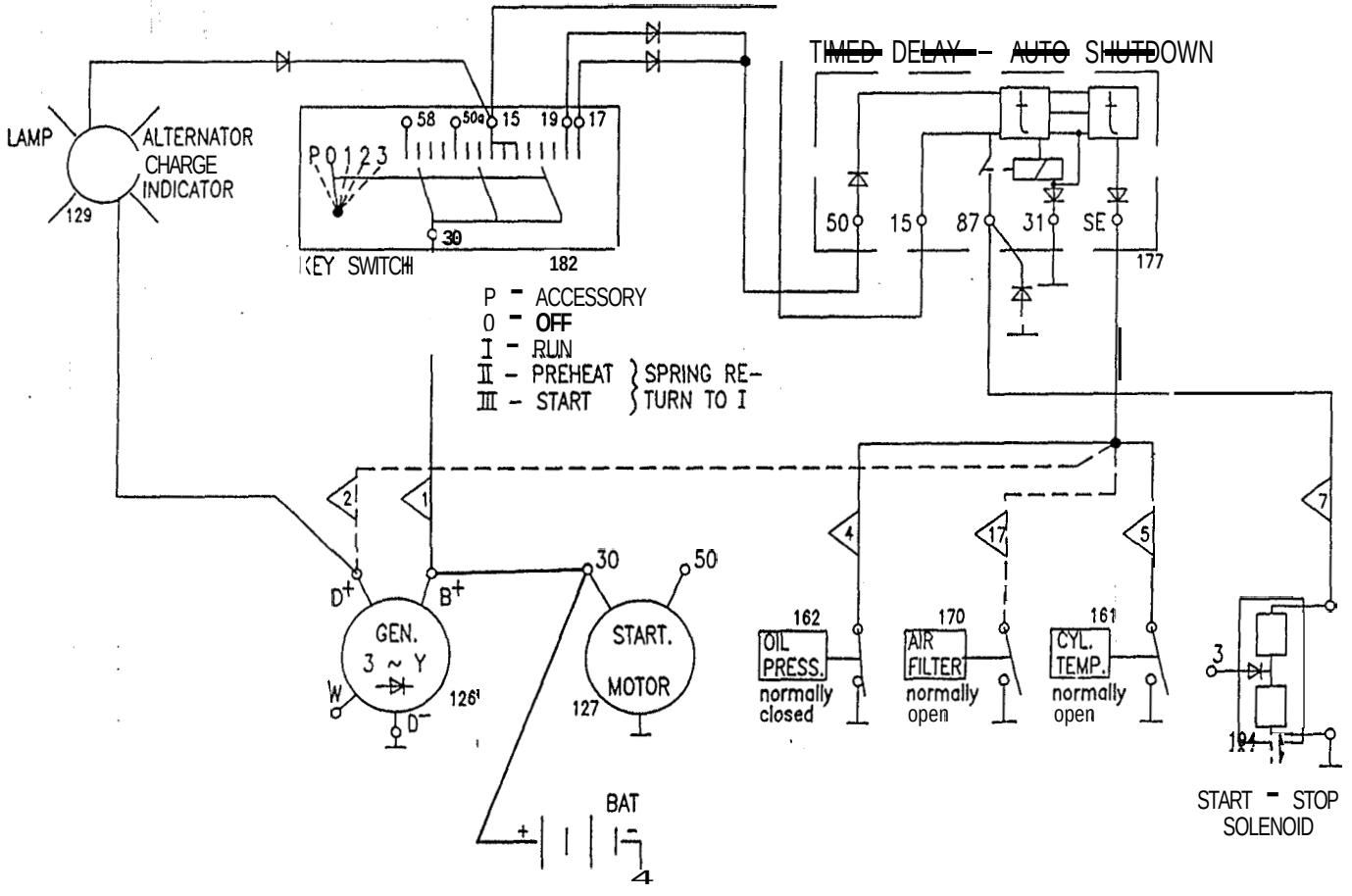
Ed: 05, 98
MSS-mh-es

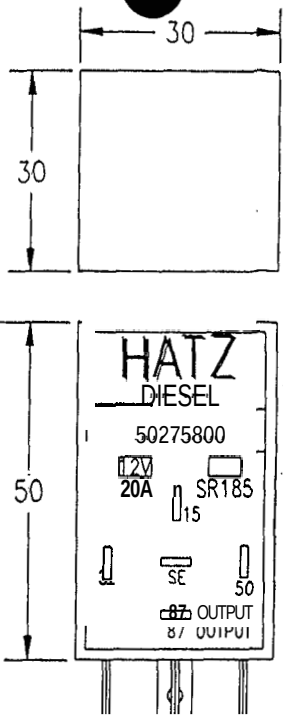
DESCRIPTION of FUNCTION:

Position I(term.15) - The output term.87 is activated for approx. 15sec.(T1) and the fuel valve opens and' remains open even if a failure signal exists at terminal SE.

Position II & III (term. 19 & 17) - The output term, 87 remains activated if the preheat and start phase *is* initated during the time period (T1). At the end of starting procedure and with the switch back at position I the time period T1 runs out and the relay supervises the engine.

A failure signal(low oil pressure, high cylinder head temperature,etc.)which exists longer than 3sec.(T2), will ground out the relay, deactivate the term.87, allow the fuel valve to close and will shut down the engine.





no flow

159 DIODE

-.... Optional fault signals.

ENGINE PROTECTION RELAY CIRCUIT

CAD #LT0479 BE 10/29/98

ENGINE PROTECTION RELAY

DESCRIPTION OF OPERATION

When the keyswitch is turned to position 1 output 87 and timer 1 (T1) are energized. T1 will hold output terminal 87 on for approximately 15 seconds, even though a failure signal exists at terminal SE. This ensures complete attraction of the relay and stop solenoid (attraction voltage 10V) before a voltage drop is caused by starting (hold on voltage 6V).

If the engine is preheated or started during period T1, the relay will remain activated during these phases. At the end of these procedures, T1 is disengaged. The relay will remain engaged if there is no failure signal.

In case of a failure signal (oil pressure, temperature, etc.) which exists longer than 3 seconds T2 will cause the relay to de-energize and the engine will shut down.

DESCRIPTION OF TERMINALS

Terminal 15 – Positive Input
Terminal 31 – Ground
Terminal 50 – Key Switch Input
Terminal 87 – N.O. Contact (output to stop solenoid)
Terminal 87A – N.C. Contact (output not used)
Terminal SE – Failure Indication Input

INSTALLATION RULES

Installation Location – must be free of any vibration
Installation Position – at convenience

TECHNICAL DATA

Max. perm. operating voltage V_{MAX}	:	16V
Pull in voltage Vp	:	9.3 V
Hold on voltage at terminal 15 V_H	:	5.2 V
Interference voltage at V_B = 12V	:	7.7 V
Induction voltage	:	6 Vss/50 HZ
Period of induction voltage	:	12KV
Voltage peak	:	100V/O.4ms every 10s, 50V/20s
Failure suppression 1 T1	:	8-15s
Failure suppression 2 T2	:	1.5-3s
Max. switching current 1_{MAX} (free of ind.)	:	20A
Max. resistance at SE R_{SE}	:	100
Max. Resistance at 31 R_{31}	:	10
Voltage interr. after pilot impulse	:	2.5s
Perm. ambient temperature T_{MIN}	:	-40C
Perm. ambient temperature T_{MAX}	:	+85 C

Testing Auto-Protection Relay

Part Number – 50275802

The following procedure checks for the approximate 15-second start-up delay and also for the 3-second shut-down fault delay.

Tools needed:
A). 12V test battery.
B). **4** test leads.
C). 1 test lead with indicator light.

Step One

A). Connect two test leads from battery negative to terminal "31" and terminal "SE" on the relay.

B). Connect a 12V indicator light from terminal "87" to the negative of the battery.

Step Two – Testing the 15-second timer (T1) in the relay

A). Connect a test lead from battery positive to terminal "15" on the relay. **Note** that the indicator light is now lit and will stay lit for approximately 8 – **15** seconds.

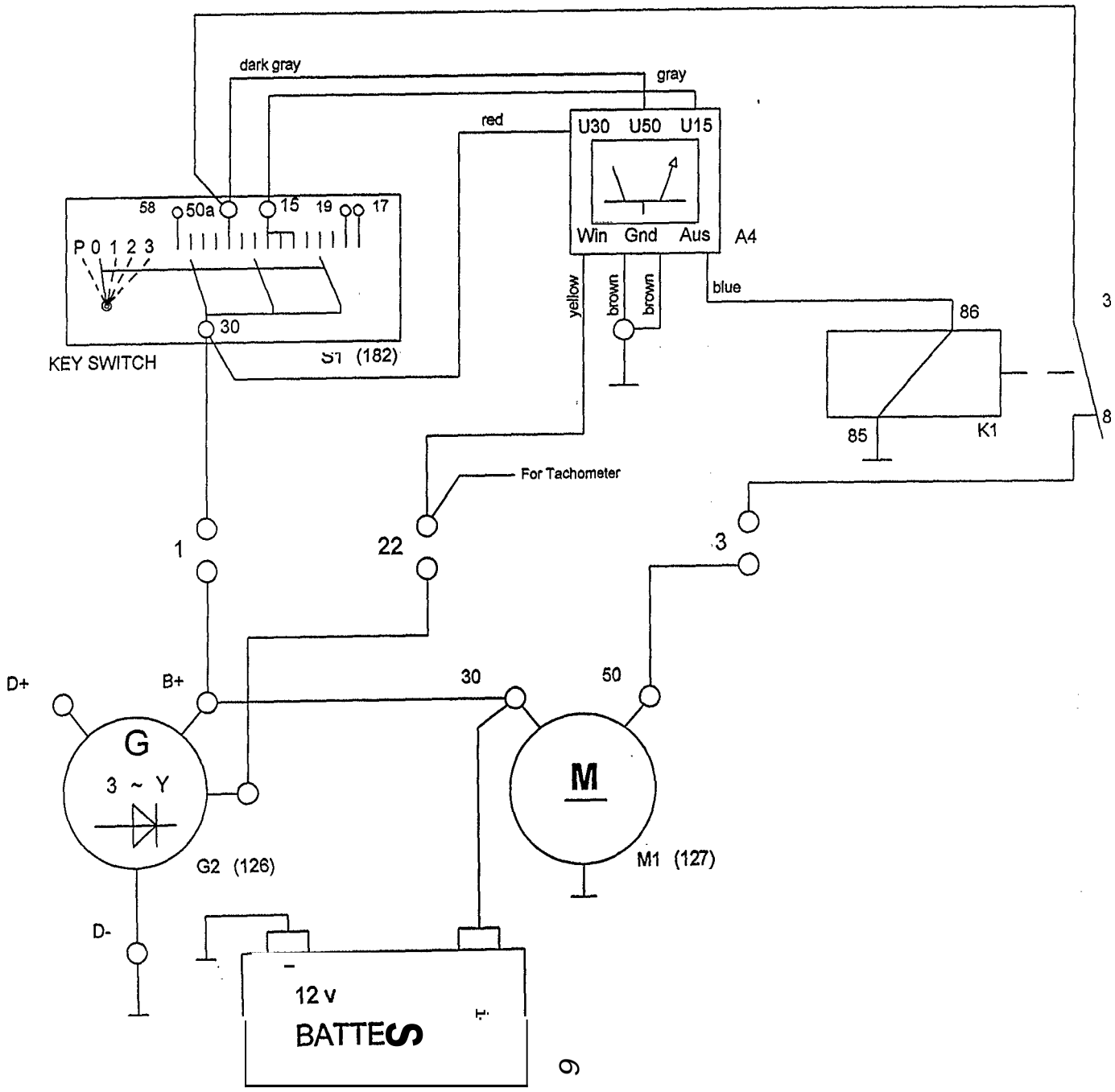
After the fight goes out this portion of the test is complete and the T1 timer is working properly.

Step Three – Testing the 3-second fault timer (T2) in the relay

A). With everything connected **as** above:

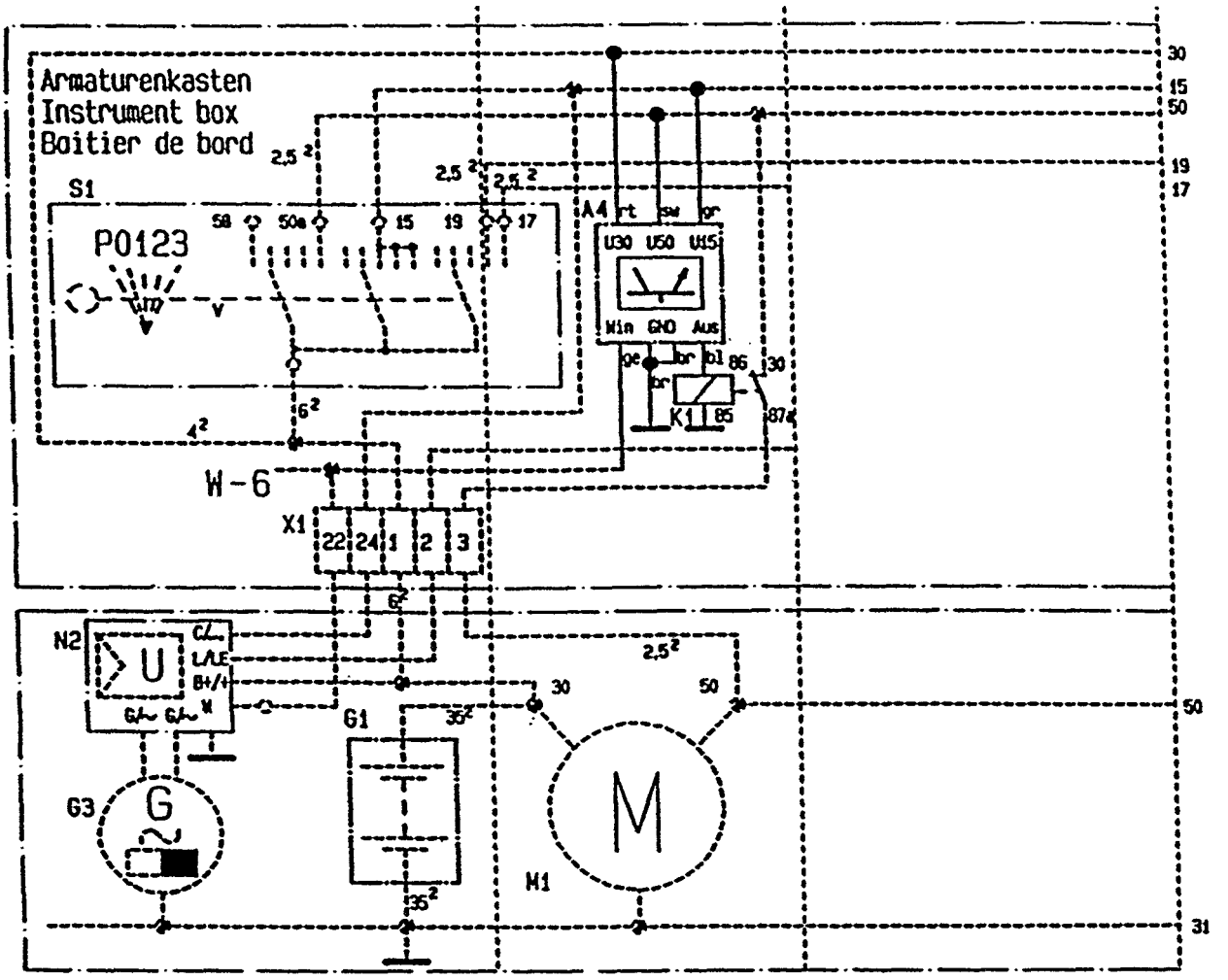
B). With your last test lead, apply a positive 12V momentary contact to terminal "50". **Note** the indicator light is lit and will stay lit for approximately 3 seconds.

After the light goes out this portion of the test is complete and the T2 timer is working properly.



STARTER PROTECTION CIRCUIT

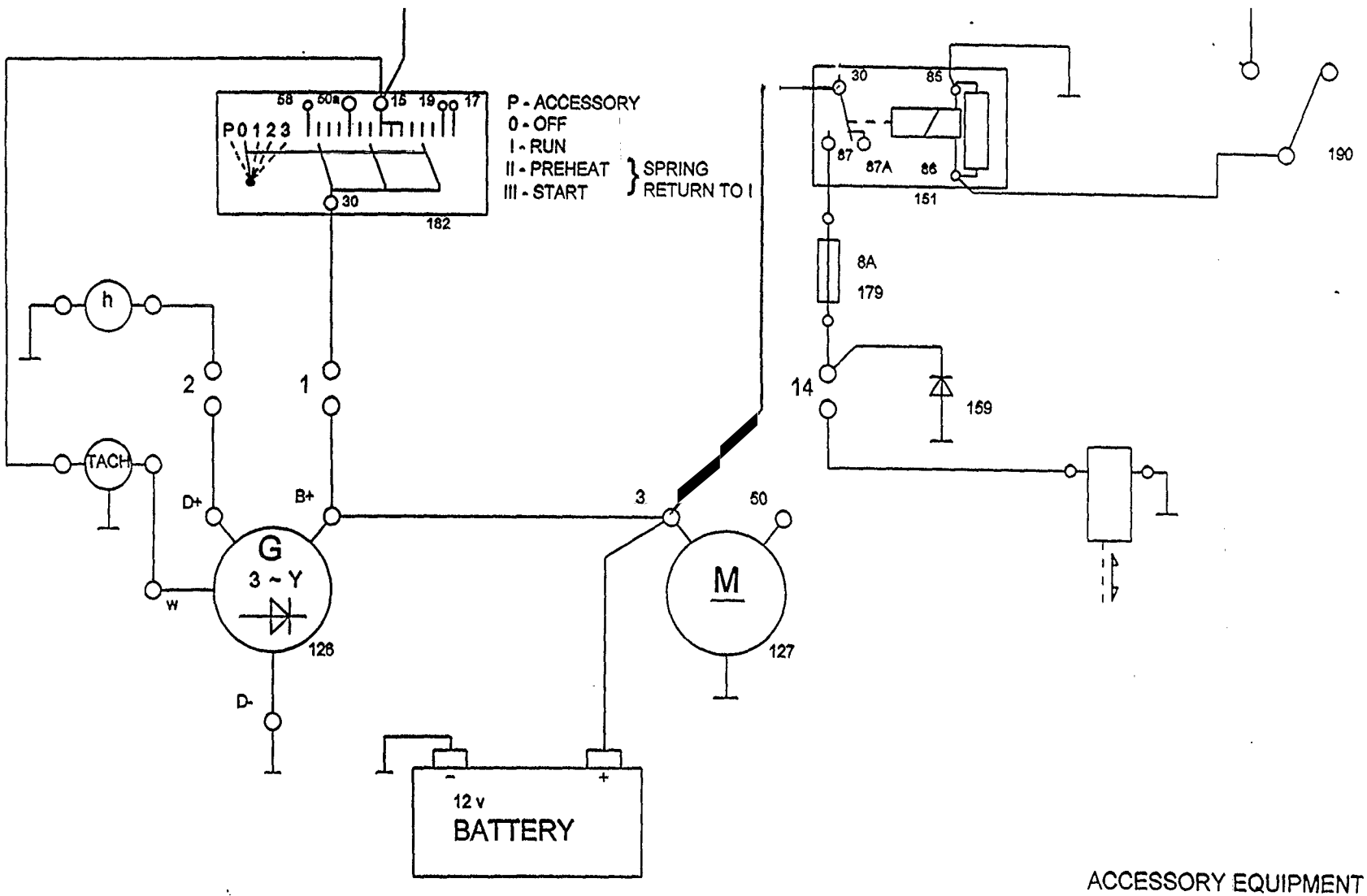
wiringlm.pre 12/95 jk



Sämtliche Leitungen ohne Querschnittsangabe sind 1^2.
All wires without conductor cross section data are 1^2.
Tout les cables sans indication de section sont de 1^2.

------ Verdrahtung kundenseits
------ wiring done by custumer
------ cablage par le client

Starter Protection Relay
Part Number – 05062402
Kit Number - 01536900


58
50a
15
19
17
P0123
30
182
P - ACCESSORY
0 - OFF
I - RUN
II - PREHEAT
III - START
SPRING RETURN TO I
30
85
87
87A
86
151
190
8A
179
14
159
h
TACH
2
1
D+
B+
3
50
G
3 ~ Y
W
126
M
127
D-
12 v
BATTERY
ACCESSORY EQUIPMENT
CIRCUIT
wiringim.pre 12/95 jk

8. Miscefianeous (rev counter, hours meter, interference suppression)

☞ Important notes

Rev counter

⇨Connect rev counter to terminal W of the 3-phase generator.
⇨Use a rev counter to match the type of alternator concerned.

$$f = \frac{n \times p \times ü}{60}$$

f = Frequency or speed of alternator
n = Speed of engine
p = Number of alternator pole pairs
ü = Transmission ratio between engine and alternator

. Revolution Counter

Motor	Frequenz F (Hz) = Pxn:60		Lichtmaschine - Charging alternator 12V					Drehzahlm.
Engine	je 1000 min-1	bei 3000 min-1	Make	Ident No.	Übers	Pole	Nominal(W)	Rev. Counter
	per	at			ratio	Paare	Leistg-Power	Ident No.
1B20	83,33	250	SAPRISA	013 194 00	1	5	200	050 710 00
1B30	83,33	250	SAPRISA	015 817 00	1	5	200	050 710 00
	0,00	0						
1D31/41S,Z.	200,00	600	HATZ	012 628 01	1	12	120	015 883 00
1D31/41C	200,00	600	HATZ	014 763 01	1	12	120	015 883 00
	0,00	0						
1D50S,Z	200,00	600	HATZ	016 100 00	1	12	120	015 883 00
	0,00	0						
1D60/81S,Z	233,33	700	HATZ	012 534 05	1	14	200	015 884 00
1D60/81S,Z	233,33	700	HATZ	015 492 00	1	14	350	
1D60/81C	233,33	700	HATZ	012 779 04	1	14	200	015 884 00
1D60/81C	233,33	700	HATZ		1	14	350	
	0,00	0						
1D90V/W	233,33	700	HATZ	016 181 00	1	14	200	015 884 00
	233,33	700	HATZ		1	14	350	
	0,00	0						
2G40	83,33	250	DUCATI	011 313 01	1	5	280	014 229 00
2G40	83,33	250	SAPRISA	016 254 00	1	5	330	050 710 00
2G40	210,00	630	BOSCH	011 976 00	2,1	6	660	050 709 00
	0,00	0						
Z790	83,33	250	DUCATI	011 058 01	1	5	280	014 229 00
	0,00	0						
2L41C	190,00	570	VALEO	008 064 01	1,9	6	700	014 053 00
3/4L41C	210,00	630	VALEO	008 064 01	2,1	6	730	014 227 00
	0,00	0						
2/3/4M41	210,00	630	VALEO	008 064 01	2,1	6	730	014 227 00

Bemerkung: fur 3/4L41C und 2/3/4M41: trotz D=138,8 der Scheibe 035 898 01 und d=63,8 der Scheibe 035 897 01 bei einer Profiltiefe von 2,1mm beträgt die gemessene Gebläsedrehzahl 6350 min-1 bei 3000min-1 an der Ölpumpenwelle.
d am 2L41C ist 71.8.

Installation Instructions for
L & M Two Speed Control Assembly

Part Numbers
12 Volt Solenoid – 00843802
24 Volt Solenoid – 00843902
2 Cylinder Mounting Kit – 00834902
3 & 4 Cylinder Mounting Kit – 00835002

See picture (1) for index and reference. Parts supplied in kit:

Quantity	Description	Part Number
1	Console Bracket	00793100
1	Guide Bracket	01141200
1	support	03650900
2	Tie Strap	50358400
2	Nut M8	50022900
1	Nut M5	50094300
1	Dust Boot	50180400
1	Clamp	03924700
2	Spacer	03116700
1	Pivot Block	03651520
4	Allen Screw M5X10	50049300
1	Electrical Wire Lead	01016500
1	Hex Bolt M6X30	50026000
1	Tension Spring	50324500
1	Roll Pin 4X16	50132000
1	Allen Capscrew M8X30	50268800
1	Lockwasher 8	50002800
1	Joint A21X26	50001500

Note: The only difference between the 2 cylinder and 3 & 4 cylinder mounting kits is the design of the solenoid console bracket.

Pre-Assembly Instructions

1). If the solenoid console bracket is to be painted, do not paint areas were solenoid, console, ground wire lead and engine block come in contact with one another. Proper ground connection is required for correct operation.

2). The solenoid is installed to the console bracket with three of the M5X10 allen screws. The ground wire (0) (supplied with the solenoid) is secured to the bracket with the bottom screw. The spring support (#10) is installed with the middle screw. See picture (2).

3). Assemble tension spring to the guide bracket (#18) using the last M5X10 allen screw and M5 jam nut. The spring must move freely. See picture (2).

4). Install guide bracket on solenoid using the two M8 nuts. One thread length of the solenoid control rod should protrude past the top jam nut. See picture (2).

Engine Preparation

1). Remove throttle lever. Remove the top locknut and stud, which secures the throttle friction plate. Remove the lower two plate bolts. Note: On **EPA** certified engines, use a 4.5mm dia. drill **to** remove the locking plug in the lower left flathead capscrew. If this capscrew is damaged on removal, order P/N-50470800. Discard rubber bumper and remove plate. Remove any paint from the throttle shaft. See picture (3).

2). On non-EPA engines, discard the plate and install P/N-03924700 clamp with the radius up and the bend facing towards the engine.

3). On **EPA** certified engines, modify the original friction plate to **look** like the plate in picture **(4).** Install friction plate. The lower **left** flathead capscrew must have **a** new tamperproof plug installed, order P/N-04 128900.

Final Installation

1). The solenoid mounts on the engine at the oil fill tube. Remove and discard the old oil fill tube mounting bolts. Note: Do not disturb or damage the oil fill tube gasket or oil leaks may occur.

2). Install the solenoid with the M8X30 capscrews, #8 lockwashers and the two P/N-03116700 spacers on the backside ***of*** the console. See picture *(5).* Plug the ground (0) and speed hold winding (14) wires into the solenoid. Install long wire through proper looming to switch control point.

3). Set proper high and low speed settings. On **EPA** certified engines, the high-speed setting is tamperproof. Attach spring to guide bracket as per picture (6).

4). Install the 4X16 roll pin into the P/N-03651520 pivot block, the roll **pin** protrudes out of the back side of the pivot block when **the** M6X30 hex bolt is on the right side of the throttle shaft. See picture (7). The roll pin must go through the slot in the guide bracket and contact the throttle assembly.

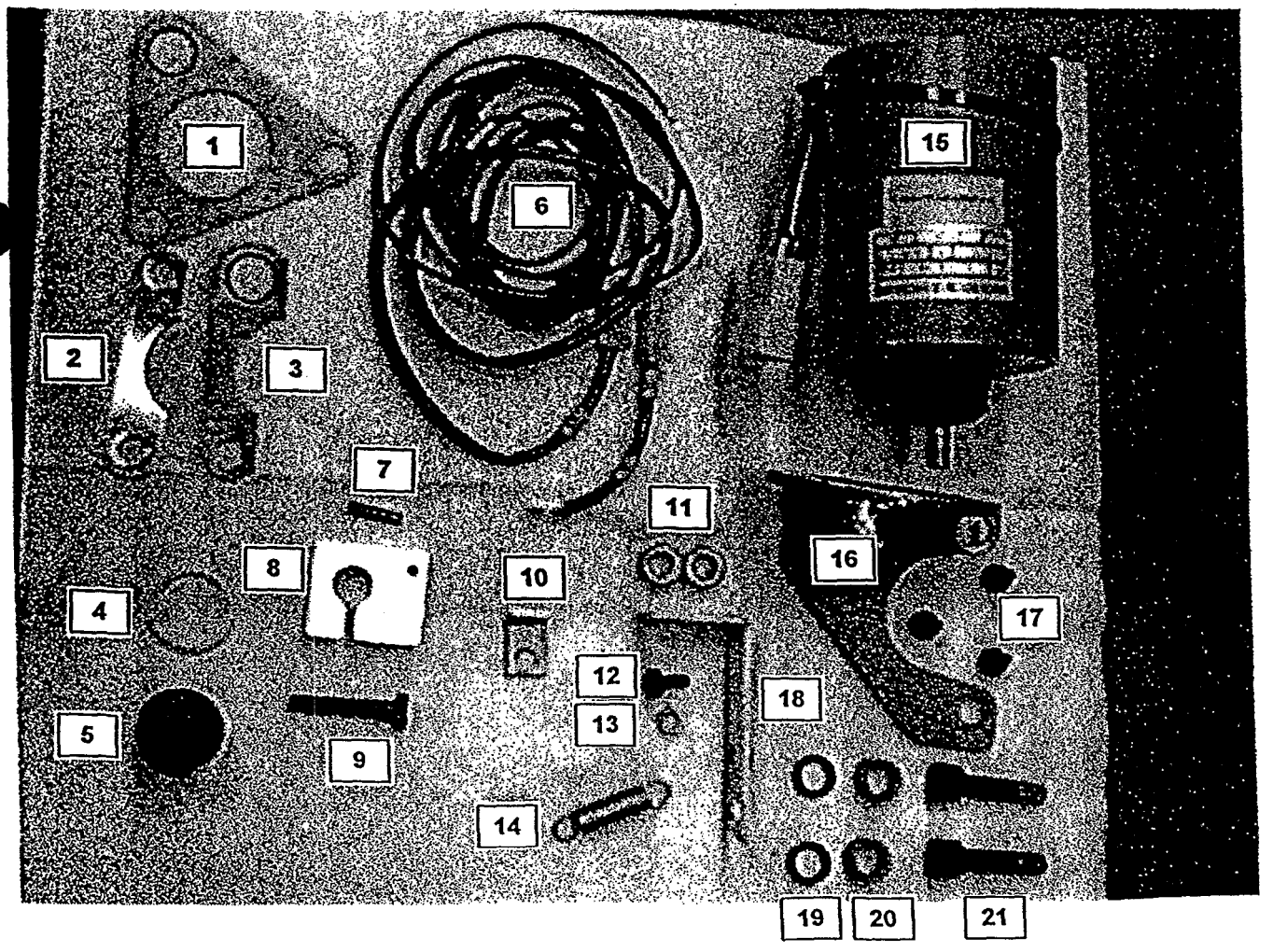
5). With the engine running at full throttle, energize solenoid. See picture **(8).** Tighten hex bolt on pivot block. Re-check for proper operation and speed settings. Do not adjust high-speed setting without re-adjusting pivot block. Solenoid must always be at end of stroke for proper operation.

6). Insert the A21X26 copper joint into the large end of the dust boot for **support.** Install dust boot over the throttle shaft with the large end facing away from the engine. Push on until boot meets pivot block. Use the wire ties to secure the electrical wire at convenient **points.**

09-16-99

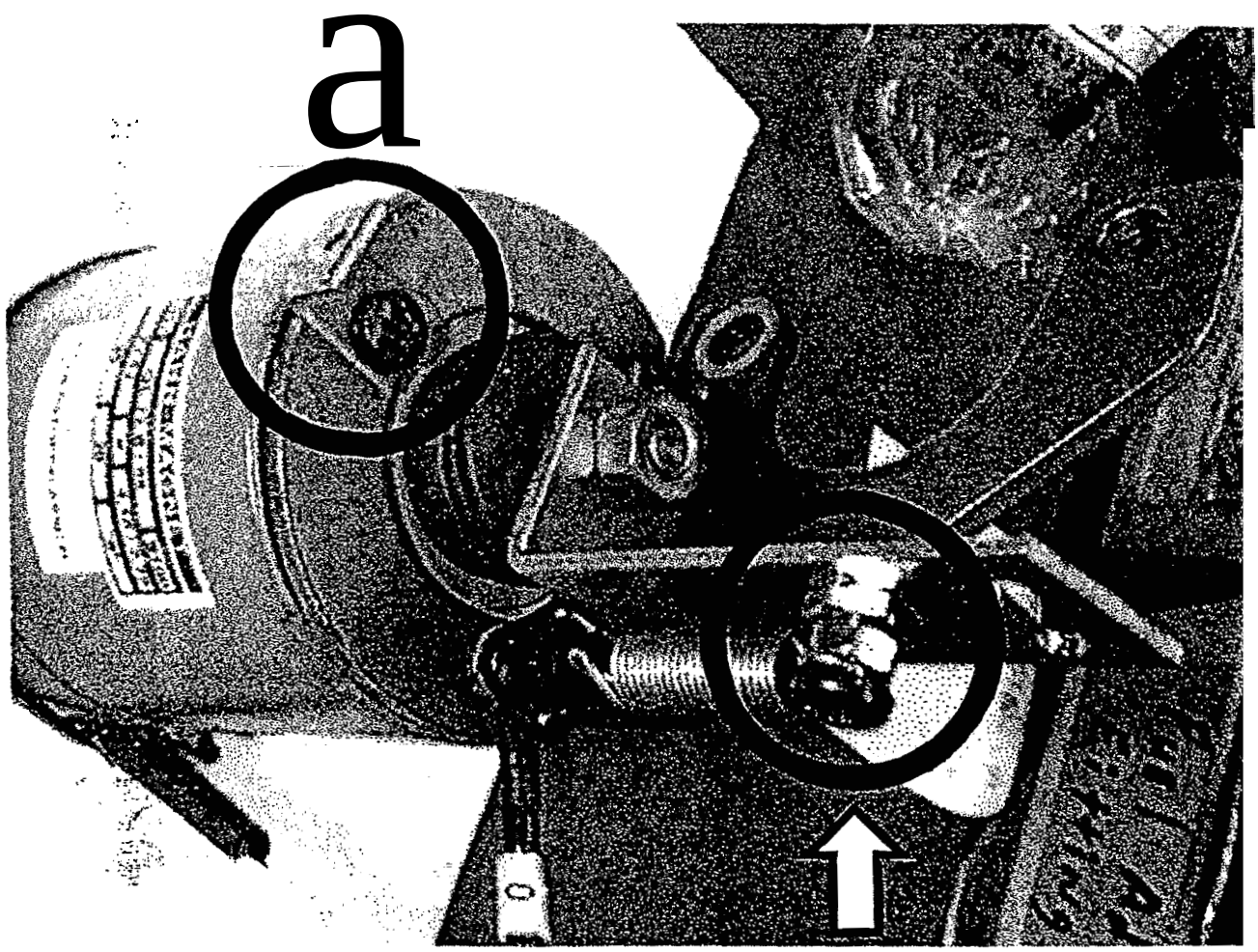
Picture Index #	Description	Part Number
	EPA Friction Plate	04131800
	Clamp	03924700
3	Modified EPA Friction Plate	
4	Joint A21X26	50001500
5	Dust Boot	50180400
6	Electrical Wire Lead	01016500
7	Roll Pin 4X16	50132000
8	Pivot Block	03651520
9	Hex Bolt M6X30	50026000
10	Spring Suppoit	03650900

Picture Index #	Description	Part Number
11	Nut M8	50022900
12	Allen Screw M5X10	50049300
13	Nut M5	50094300
14	Tension Spring	50324500
15	12V Solenoid	00843802
	24V Solenoid	00843902
16	2/3/4 Cyl. Console	
17	Allen Screw M5X10	50049300
18	Guide Bracket	01141200
19	Lockwasher #8	50002800
20	Spacer	03116700
21	Allen Screw M8X30	50268800



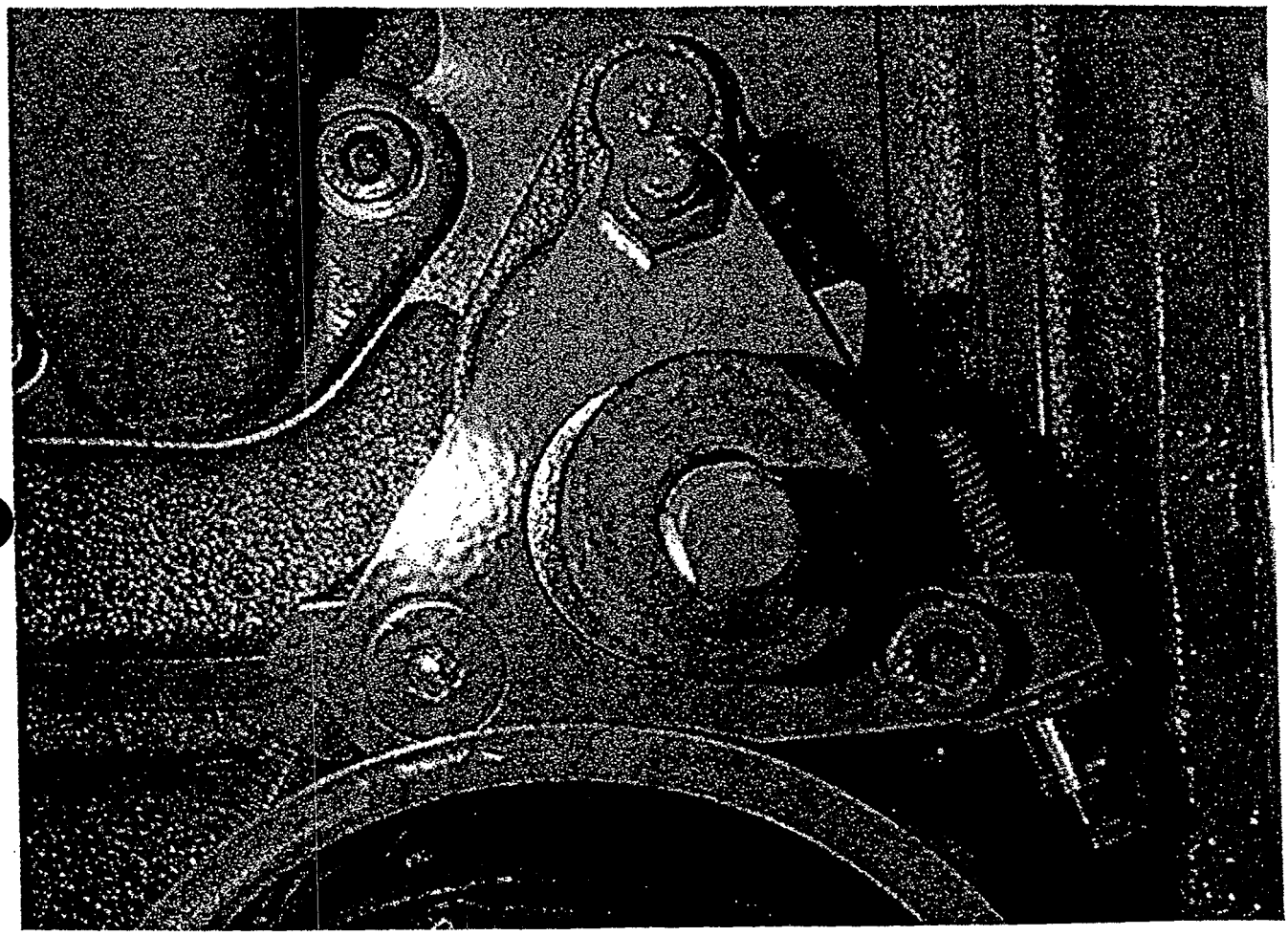
Picture (1)

-Step 2-

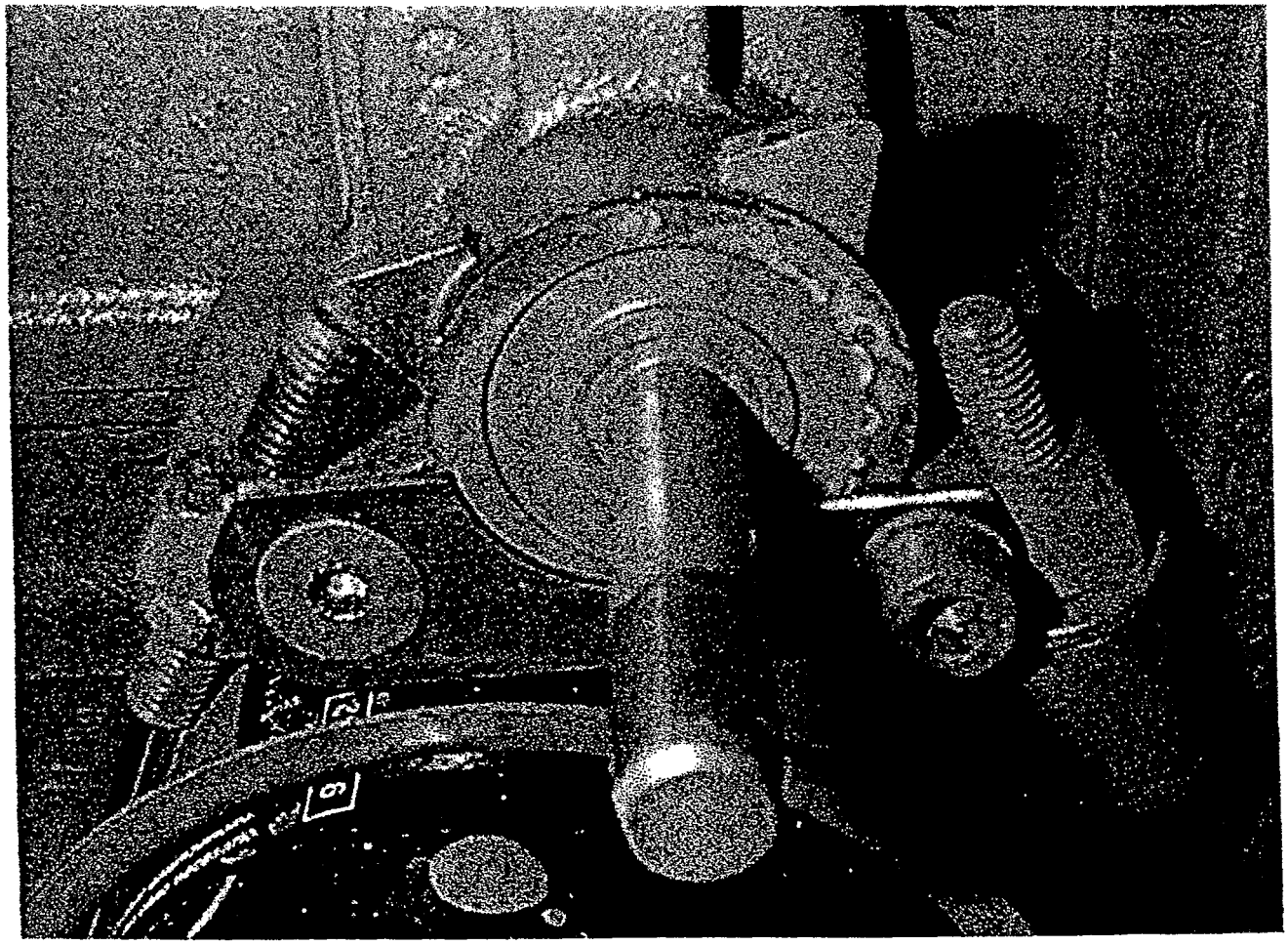


-Step 3-

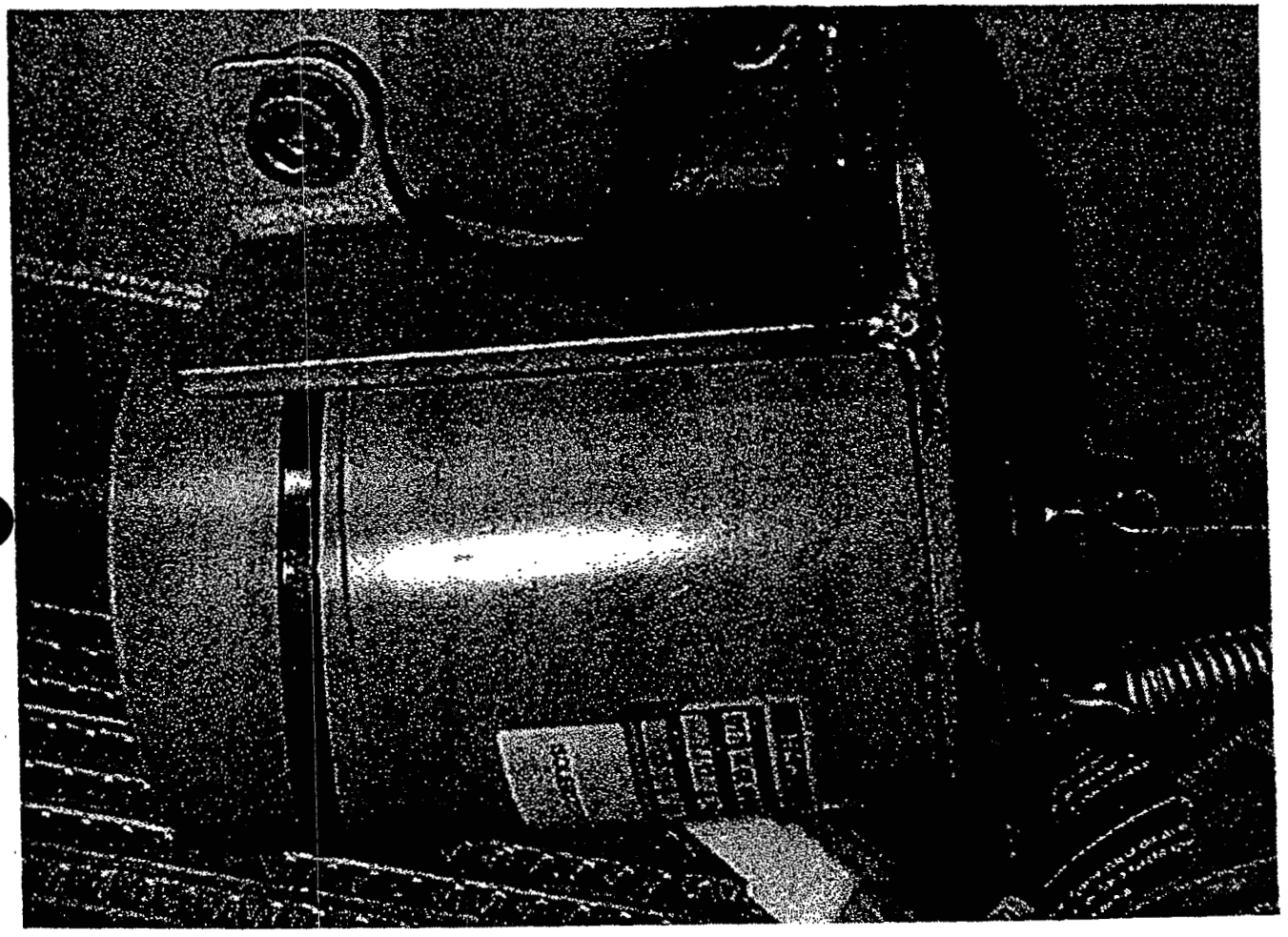
Picture *(2)*



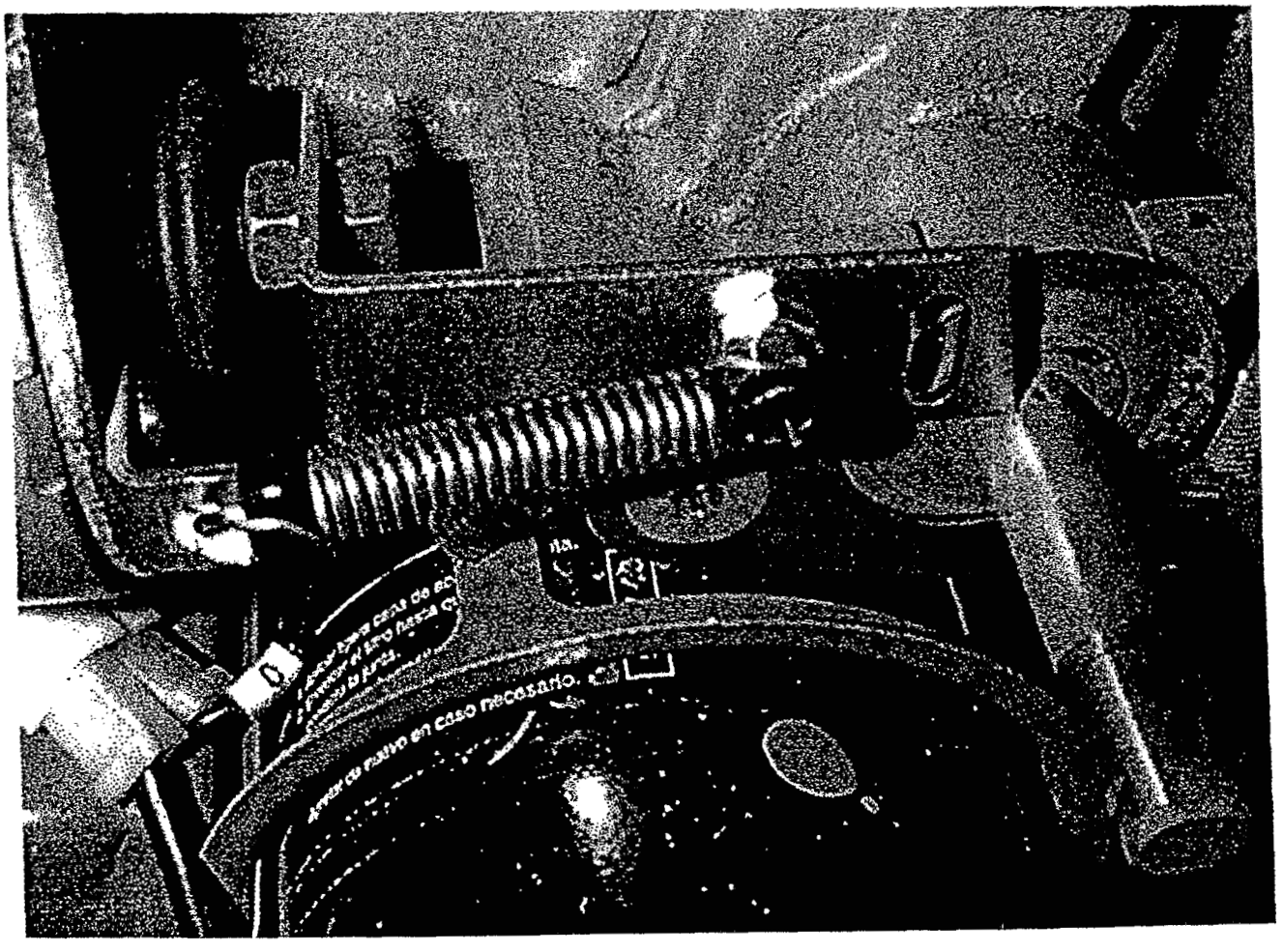
Picture **(3)**



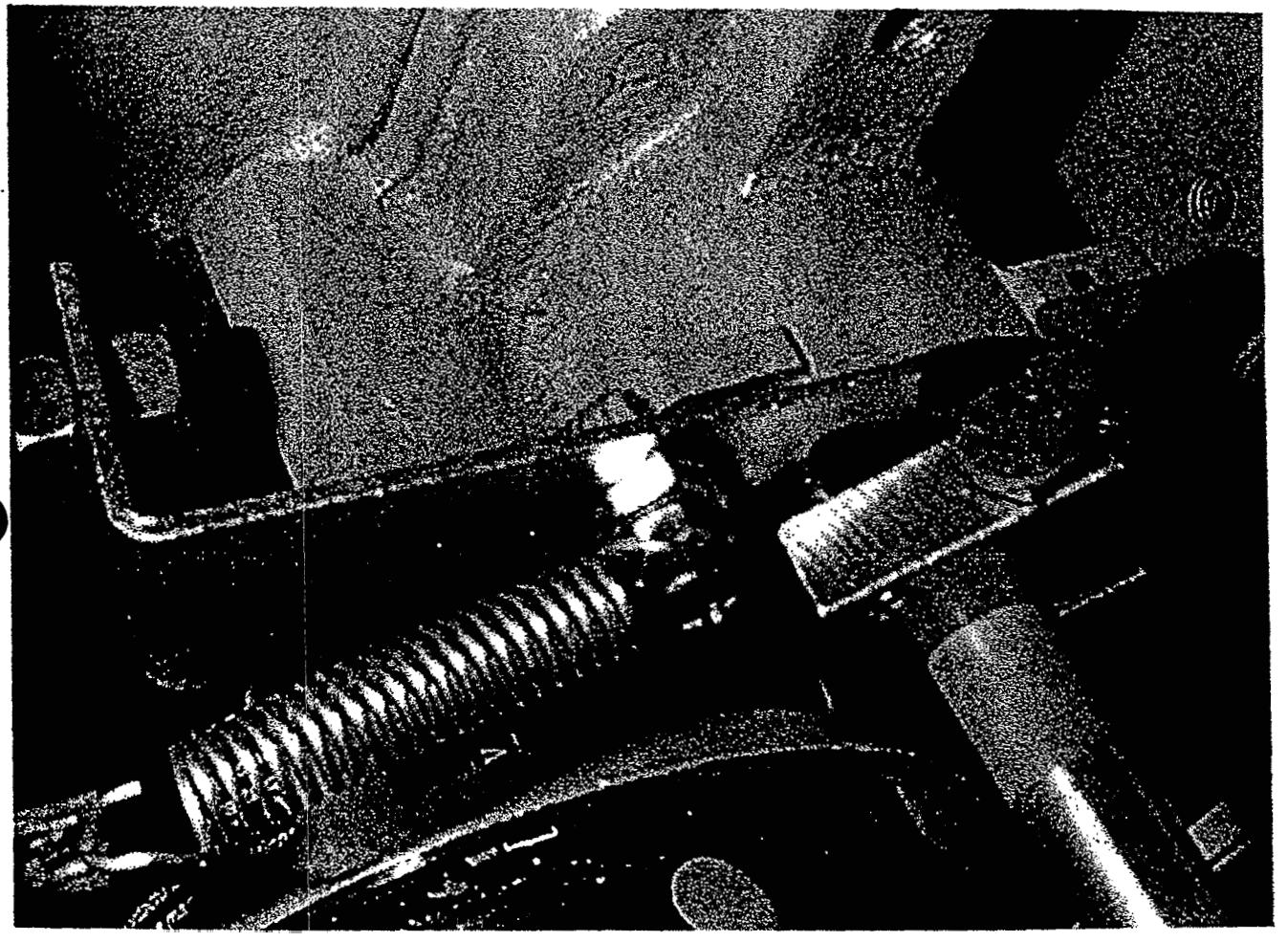
Picture (4)



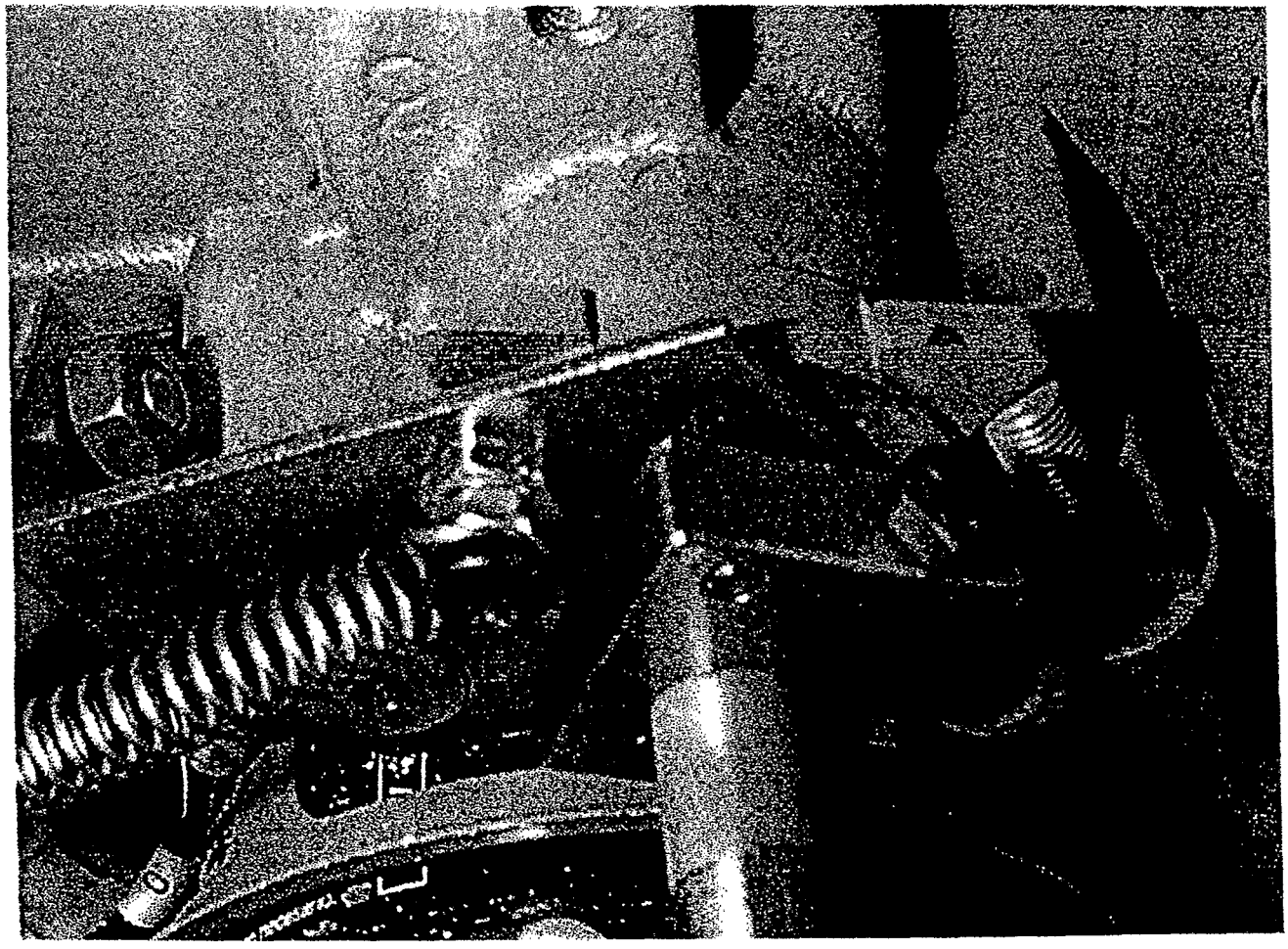
Picture *(5)*



Picture (6)



Picture (7)



Picture **(8)**

HATZ DIESEL

HATZ Diesel Engines

I D .. SUPRA
.L41 C SILENT PACK
.M41.

With the NEW electrical equipment for Man Lifts

Complete Starter Protection from Accidental restarting of engine

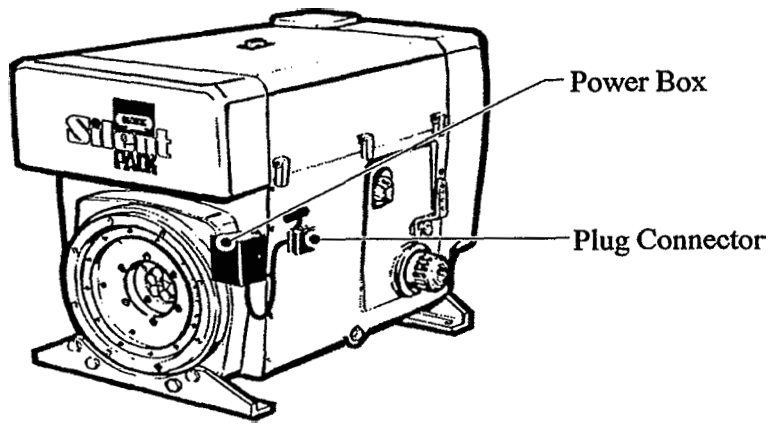
Less down time

Electrical protection against starter engagement during operation
and
Electrical protection against starter engagement up to complete engine stop.

From now on, HATZ Diesel Engines can be equipped with a new electrical system which consists out of a control part (Instrument Panel) and a load part (Power Box).

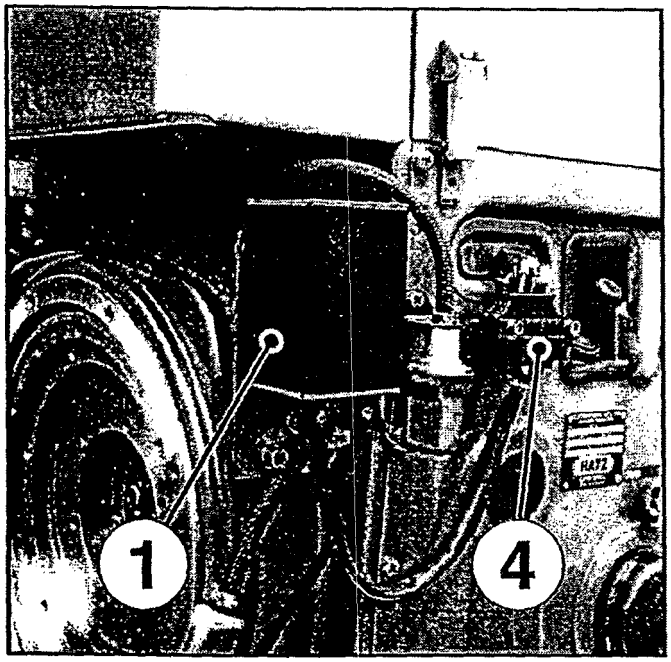
This new electrical setup does not only avoid restart of a running engine (Starter damage, Ring Gear damage, down time ...), it also senses any movement of the ring gear, which means that an engine slowly spinning to stop is electronically protected against restart and avoids damages due to
starter re-engagement into a still rotating ring gear.

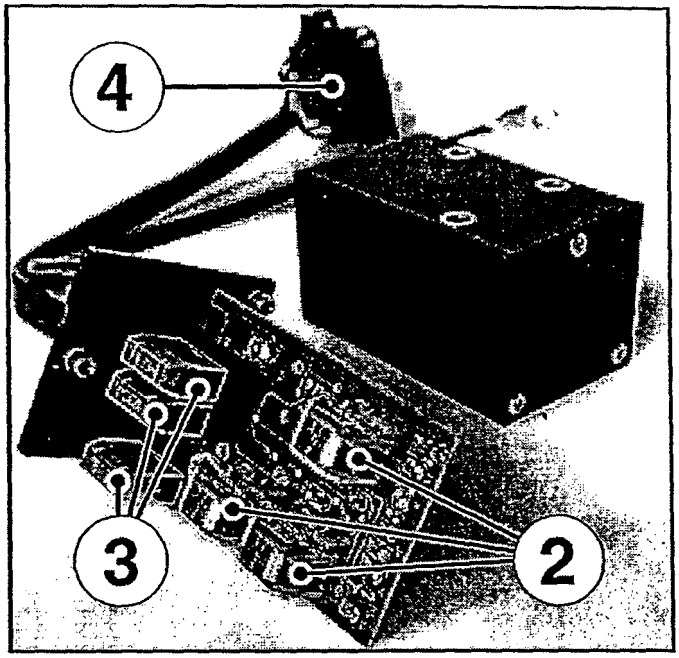
With this equipment from HATZ, the engine will offer a higher degree of reliability. The small cost for this equipment will pay for its self, in less down time and maintenance problems and increased customer satisfaction.



The main components are explained on the following pages.

The Power Box, the Load Circuit Board





The Power Box ① is the main switching station for all load devices. It is mounted along side the flywheel housing.

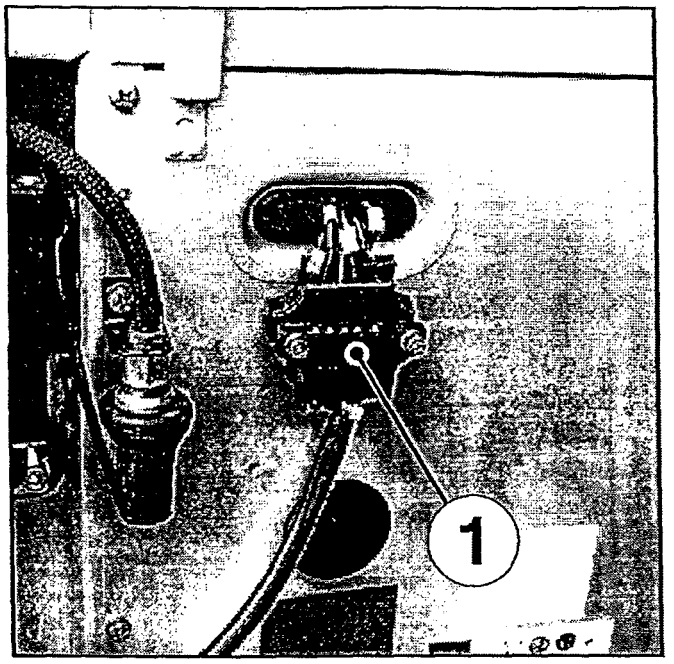
The relatively high current for the starter solenoid, motor, and glow plug system are activated within the power box, with very little voltage drop. ② Relays, ③ Removable fuses.

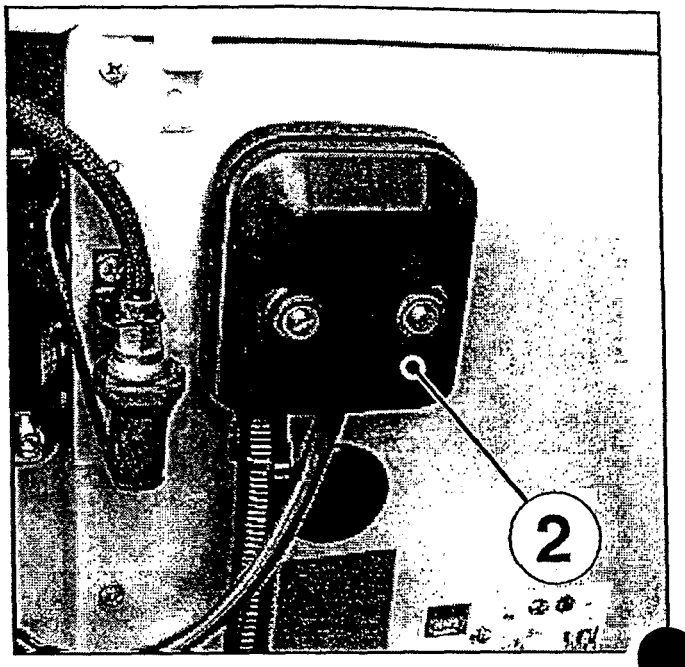
In the past without any relay box, the wiring was heavier & limited to 2-3 meter with a larger voltage drop.

The harness can now be much longer than in the old electrical system.

Easy plug connectors ④ are located at the engine

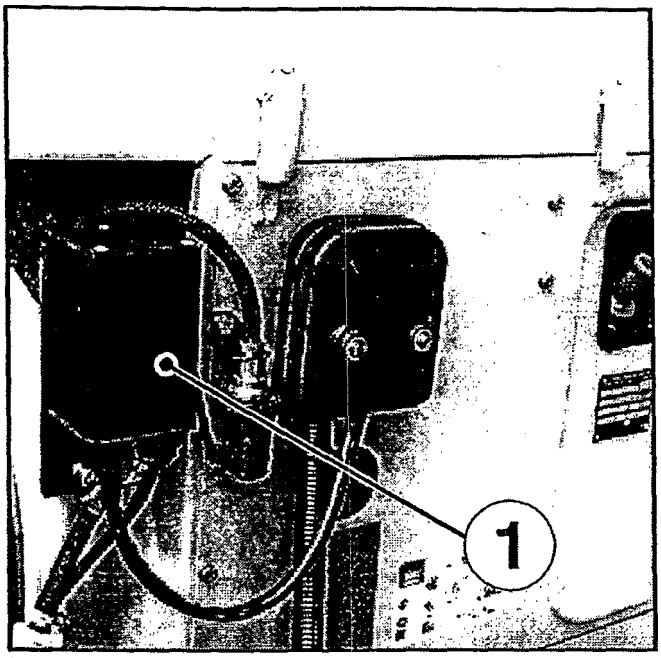
Plug Connection Cover

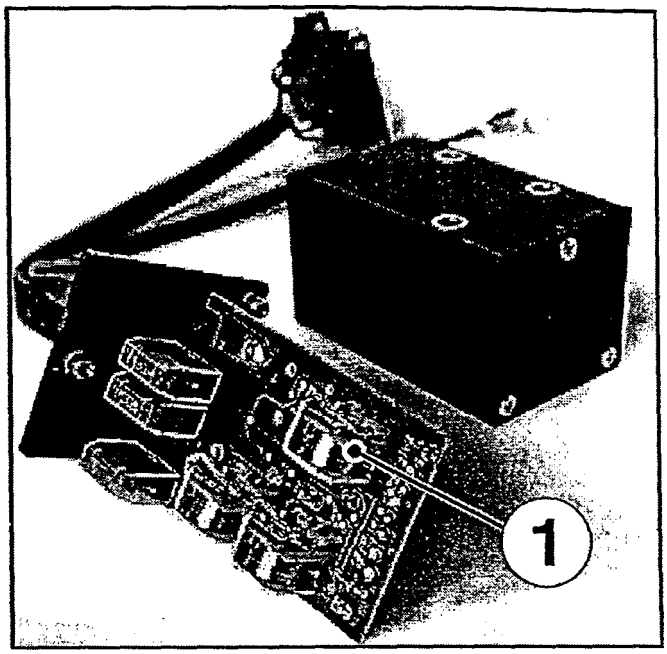




The electrical connector ① can be protected from dirt, moisture, and crrosion with a cover ②.

The Starter Protection Relay inside the Power Box



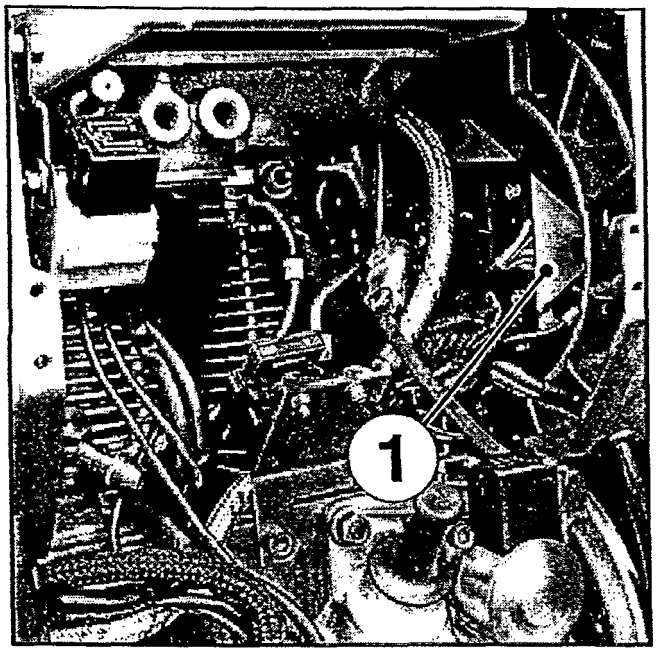


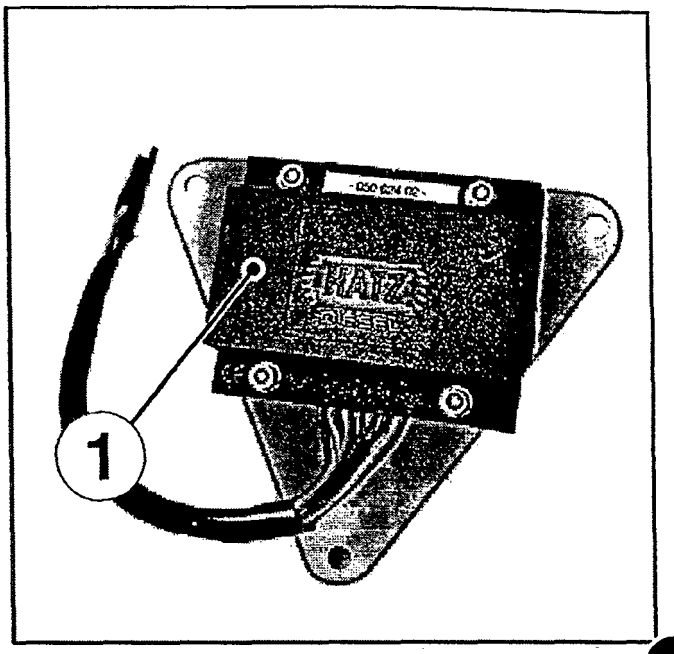
The starter protection relay ① **is** a standard feature to prevent restart on the key switch.

This feature is in addition to our anti-restart key switch.

The starter protection relay is integrated into the power box.

The Starter Protection Module





The starter protection module ① is specially used where the customer cannot hear his engine running. Especially important in the lift industry.

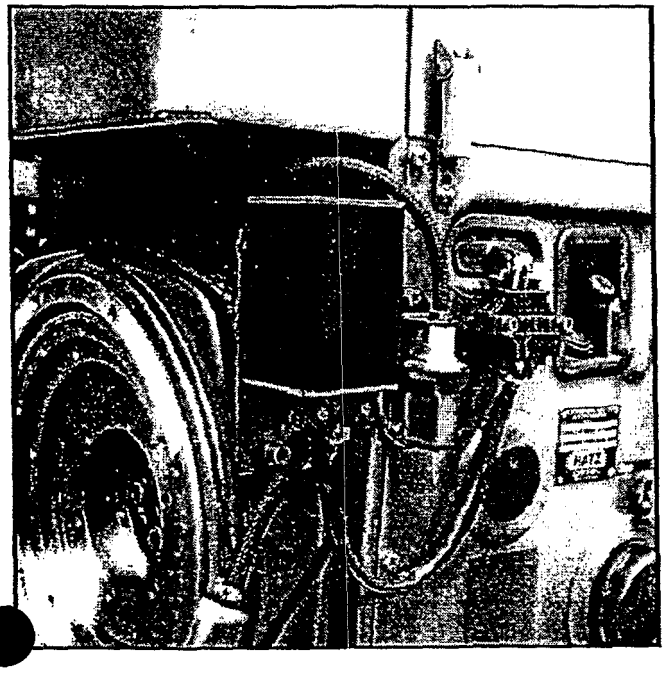
The starter protection module is used to sense engine revolution down to zero.

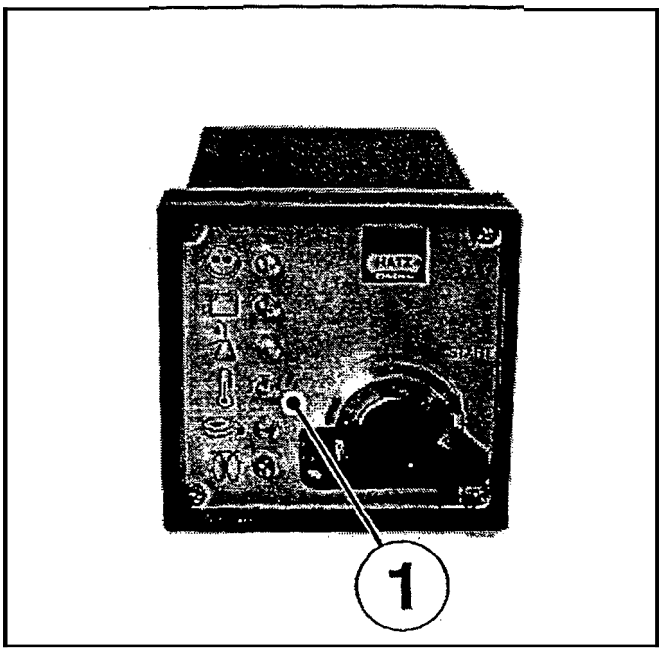
The module allows only restart with no engine movement for about 8 seconds.

The starter protection module is the **only reliable device** to protect the starter from mis-engaging.

Automatic Shut Down

The Starter protection Relay inside the Power Box



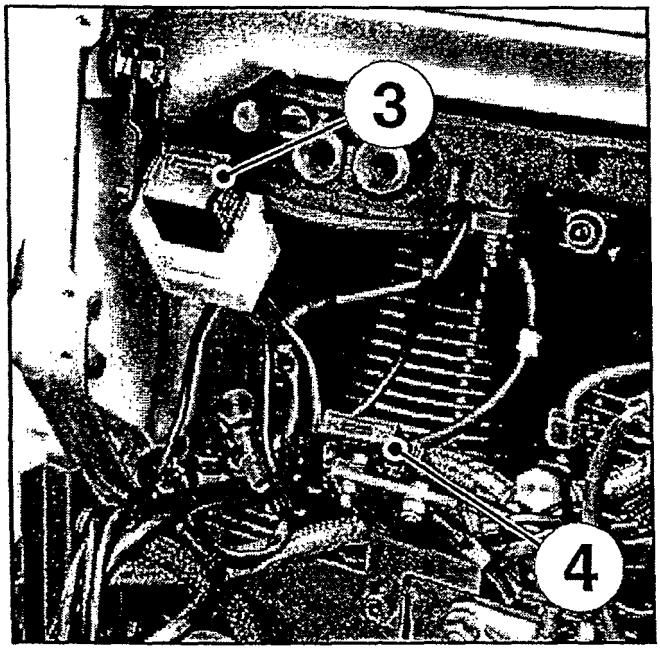


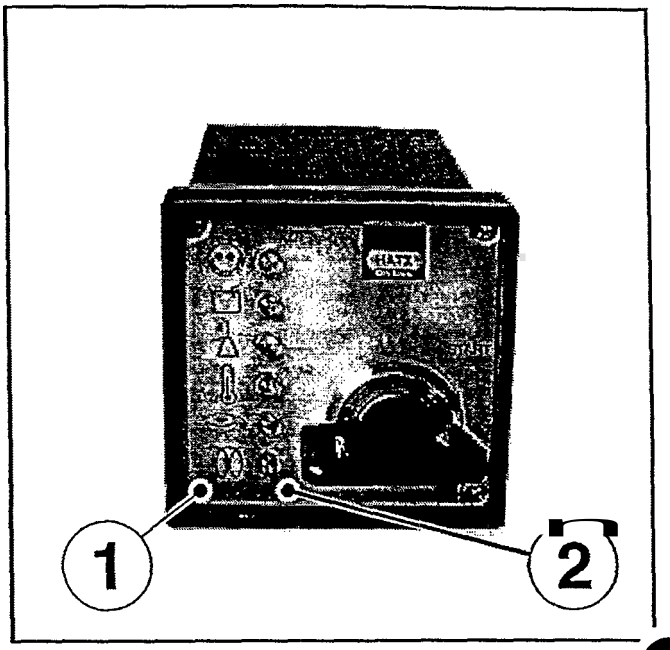
The shut down control panel includes the relay for the auto shut down feature.

This shut down control monitors cylinder head temperature and oil pressure and reacts if the tolerance limits are exceeded.

The starter protection relay has a timing circuit to protect against false signals and false shut down.

The Glow Start Timer





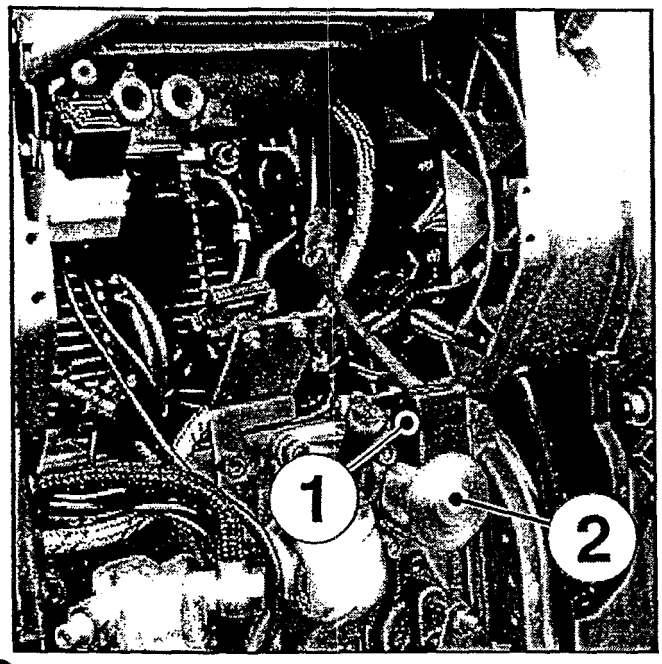
The glow start timing circuit ① senses temperature and allows for a longer or shorter glow time depending on ambient temperature.

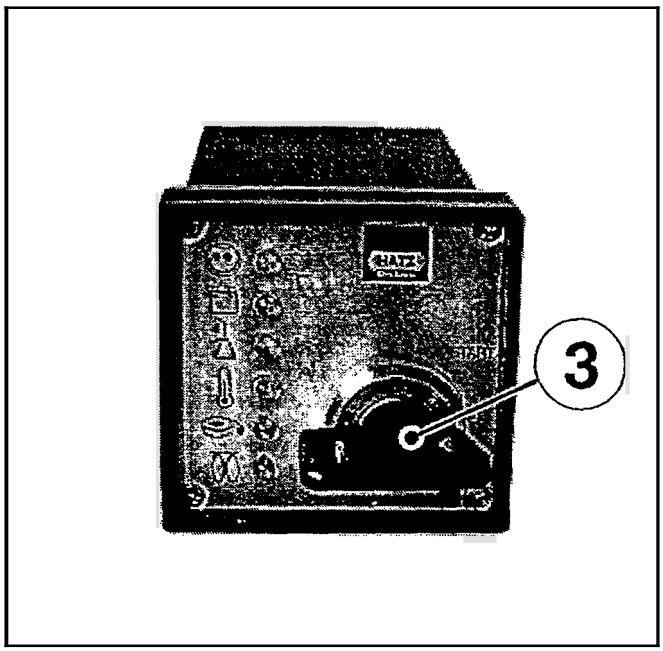
The key switch turned to "On" will start the timing for the glow process. When the indicator light ② goes off, the engine can be started.

The relatively high current for the glow plug at approximately 55 amps runs through a relay ③ which is mounted to the engine and protected by a fuse ④.

HATZ Diesel engines require pre heat only if the temperature is below –15°C (5°F)

The Shut Down Solenoid





The shut down solenoid ① is mounted on the mechanical oil pressure shut down device ②.
The solenoid is activated during operation (when key switch ③ is turned on). Deactivation of the solenoid will shut the engine down immediately.

The powerbox makes an engine shut down from a remote position possible.

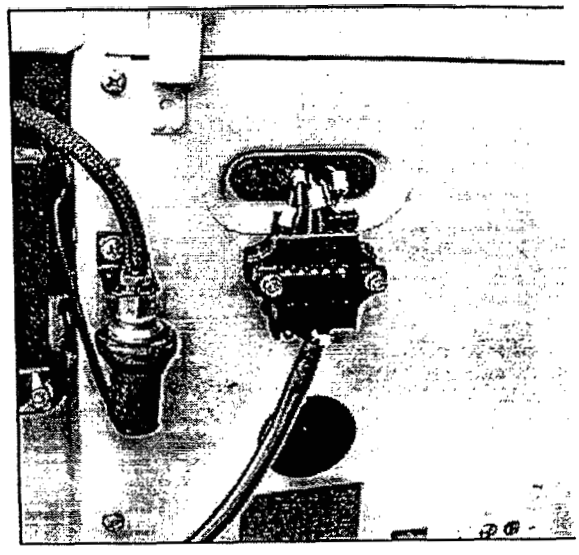
The Wiring Harness

6.5 ft

6.5 ft

10 ft

10 ft extension

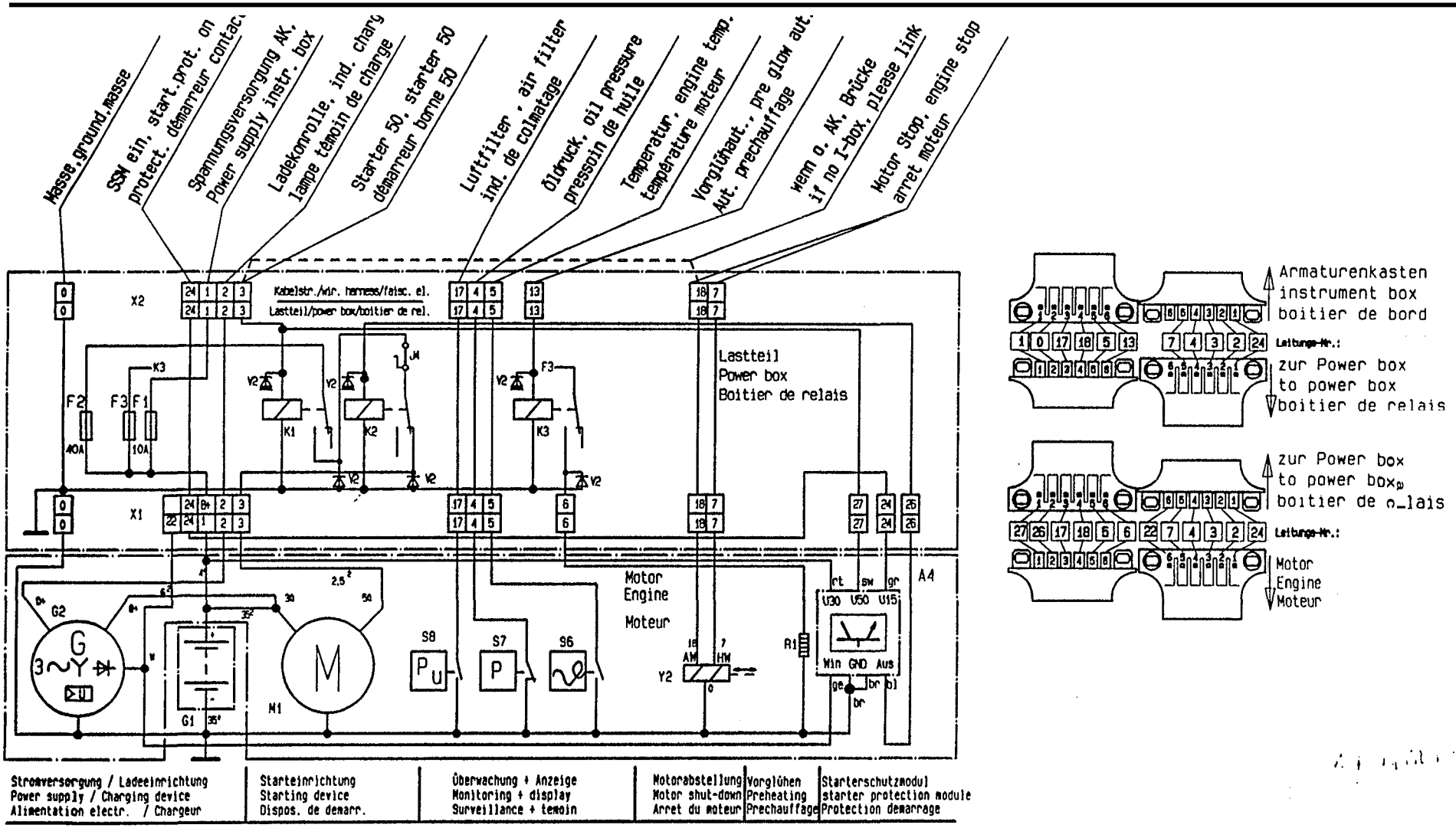


Standard harnesses available

New L/M 41 Electrical Circuit Relays

Relay Type	Function
Load switch relay	A). Start operation of starter solenoid B). Load circuit for pre-heating device C). Stop operation of starter solenoid THE POWERBOX CONTAINS THESE **RELAYS!**
Timing relay	An additional three second delay for the start-up of four cylinder engines after the shut-off of the starter solenoid signal. The timing relay is part of the new instrument box for automatic shut-off.
Engine protection relay	The engine protection relay is a combination of the load switch and timing relay. It is used for the automatic shut-off due to low oil pressure or overheating. The engine protection relay is part of the new instrument box for automatic shut-off.
Starter protection module	The starter protection module in conjunction with the load switch relay prevents the re-start of a running engine. From 600 rpm to 0 rpm plus a safety period. The starter protection module is installed on the engine and the load switch relay is located in the POWERBOX.

6-28-99



Nr.	Datum	Name	Änderung
00	07.04.98	HL	Mitt.

NICHT MANUELL ÄNDERN

* Oberflächenbeschaffenheit DIN ISO 1302 Reihe..2..

Werkstückkanten DIN 6784

Allgemeintoleranzen DIN 7168, mittel

Form- u. Lagetolerierung DIN ISO 1101

Schutzvermerk nach DIN 34 beachten

HATZ DIESEL

MOTORENFABRIK HATZ RUHSTORF-ROTT

Stromlaufplan
ohne AK, mit SSM
2-3 L/M 41

Maßstab/SCALE 1:1 (:)	CAD	Datum	Name
ISO E	Gez.	18.03.98	HL
	Gepr.	25.03.98	HL

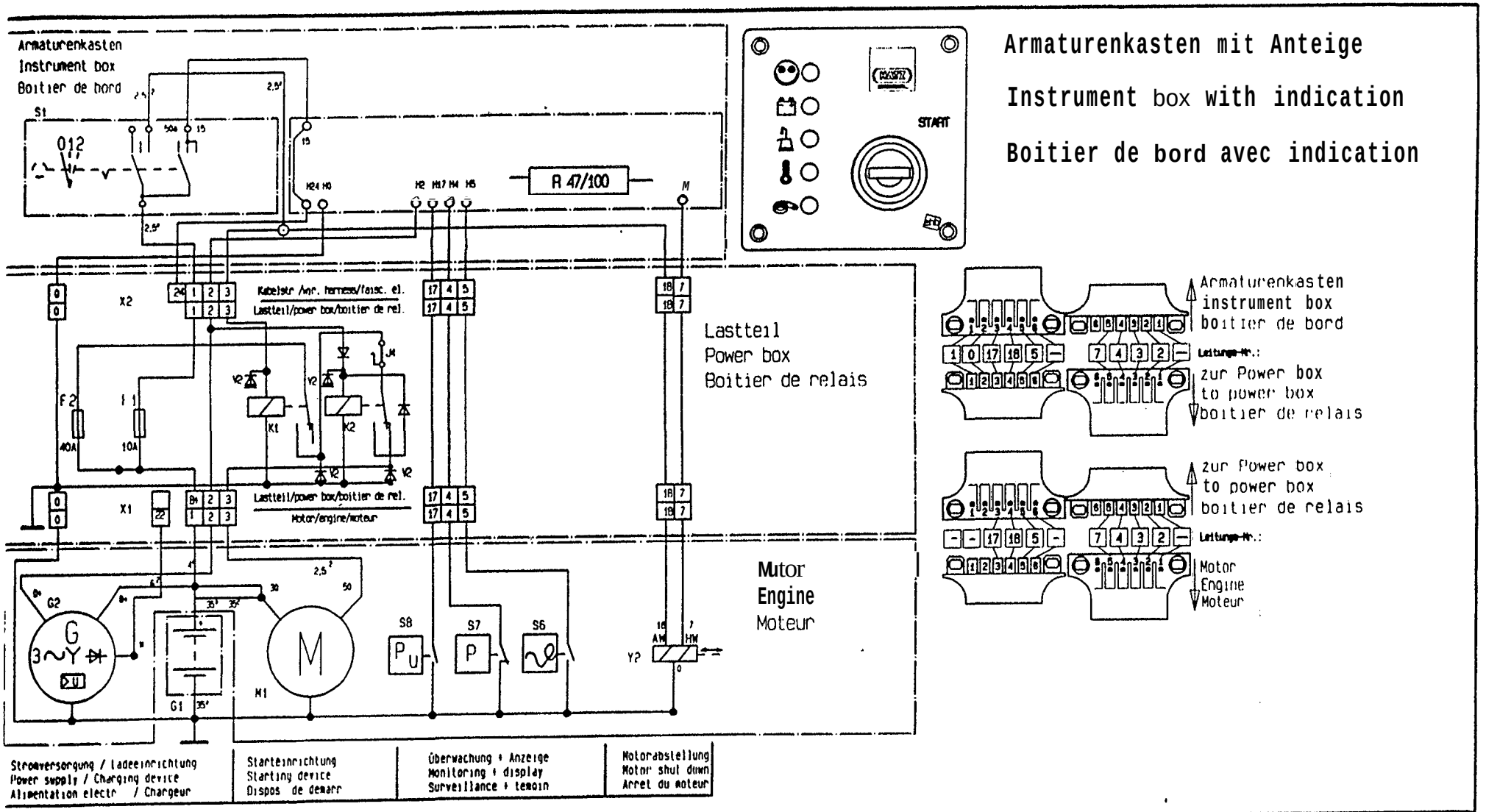
Werkstoff/ MATE IAL

–

Rohteil-Nr.: / RAW-PART No.

Fertigteil Nr.:/FINISH-PART No. Typ ZF

0 5 1 5 0 9 0 0 . 1 0 2 4



Armaturenkasten mit Anteige

Instrument box with indication

Boitier de bord avec indication

00	07.04.98	HL	Mitt.
Nr.	Datum	Name	Änderung

NICHT MANU… ÄNDERN

Oberflächenbeschaffenheit DIN ISO 1302 Reihe 2

Werkstückkanten DIN 6784

Allgemeintoleranzen DIN 7168 mittel

Form- u. Lagetolerierung DIN ISO 1101

Schutzvermerk nach DIN 34 beachten

HATZ DIESEL

MOTORENFABRIK HATZ RUHSTORF-ROTT

Stromlaufplan

Standard mit Anzeige

2-4 L/M 41

Maßstab/SCALE 1:1 (·)	CAD	Datum	Name
ISO E	Gez.	18.03.98	HL
	Gepr.	25.03.98	HL

Werkstoff/ MATERIAL

Rohteil-Nr. / RAW-PART No.

Fertigteil Nr.:/FINISH-PART No. Typ ZF

0515080101.0214

Power Boxes and Instrument Panels for HATZ
M41 & L41 Series

Power Box and Mounting

			Used With
01608800	Power box #1 used for all M & L engines.	Used for all instrument panels and glow plug.	Instrument panels shown below.
01609000	Power box #3 used for all M & L engines.	Special use only, used exclusively with the Zero RPM module.	Zero RPM module. (Consult Factory) **Factory** mounted part # 01642700.
01608600*	Mounting parts for power box. (For M series only).	Bracket bolts to side of bell housing, and has power cable from starter to electrical terminals on bracket.	For power box and for customer supplied instrument box. Positive & negative terminals provided.
50366200 50148000	Studs (3) Nuts (3)	Required for remote **fuel** filter mounting, M series.	Used with power box mounting kit # 01608600.
01608700	Mounting parts for power box. (for L series only).	**Mounts** power box to bell housing. (Bracket &hardware) Positive & negative are provided on capsule housing.	Used with power box.

* Included on sales standard engines.

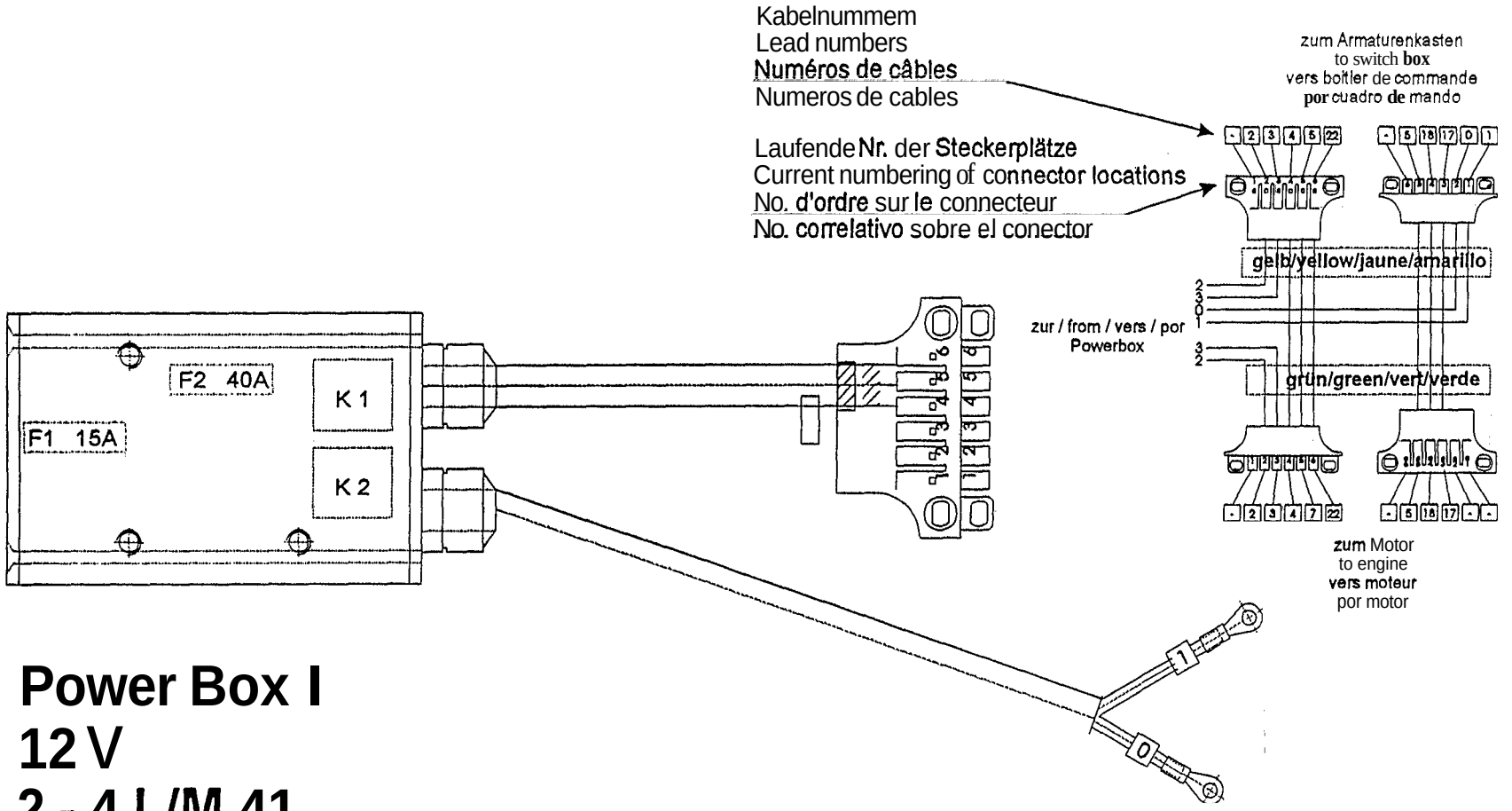
Instrument Panels

Part #	Description	Used For
		Indicators only. not for shutdown or glow plugs. **Note:** Replaces # 00817702.
01610700	Panel #2	**Used** for **auto** shutdown and for glow plugs. **Note:** replaces # 00824603.

01614200*	2M length (6.6 feet) Note: # 14 wire included for 2 **-speed.**	Murphy panel **or** customer panels using **HATZ** loose key switch and electrical relays.
01653400	3M (9.8 feet) harness (special application).	For customer panels (power box required).
01611600	2M extended harness, has connectors on both ends for easy connection to power box and to instrument panel.	Extends instrument panel further from power box.

Anlage / Annex / Annexe / Anexo	4.1.1	zu / to / à / para	WSI 2000.162

HATZ DIESEL



Power Box I
12 V
2 - 4 L/M 41

Ident-Nr. auf dem Typenschild
Ident-No. as indicated on label
No. ident sur la plaque signalétique
No. ident sobre la placa signaletica

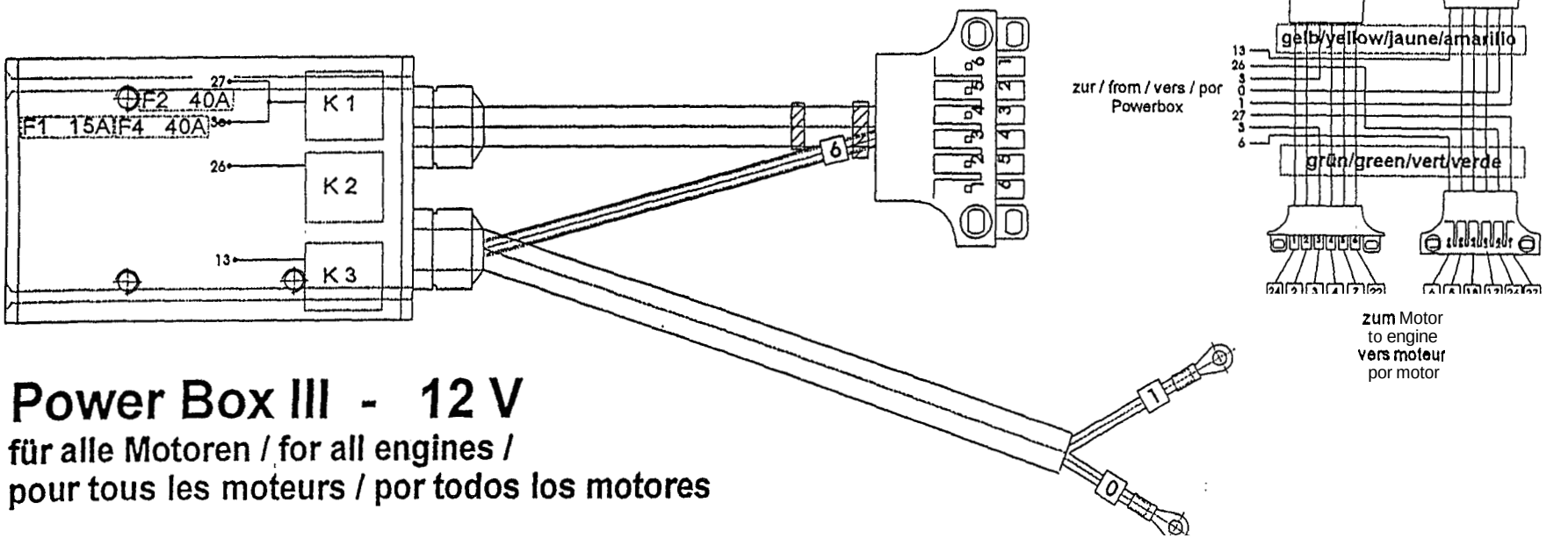
01597900,1023

Anlage Annex Annexe Anexo	4.3.1	zu to à para	WSI 2000.162	HATZ diesel

Kabeinummern
Lead numbers
Numéros de câbles
Numeros de cables

Laufende Nr. der Steckerplätze

Current numbering of connector locations
No, d'ordre sur le connecteur
No. correlativo sobre el conector



Power Box III - 12 V

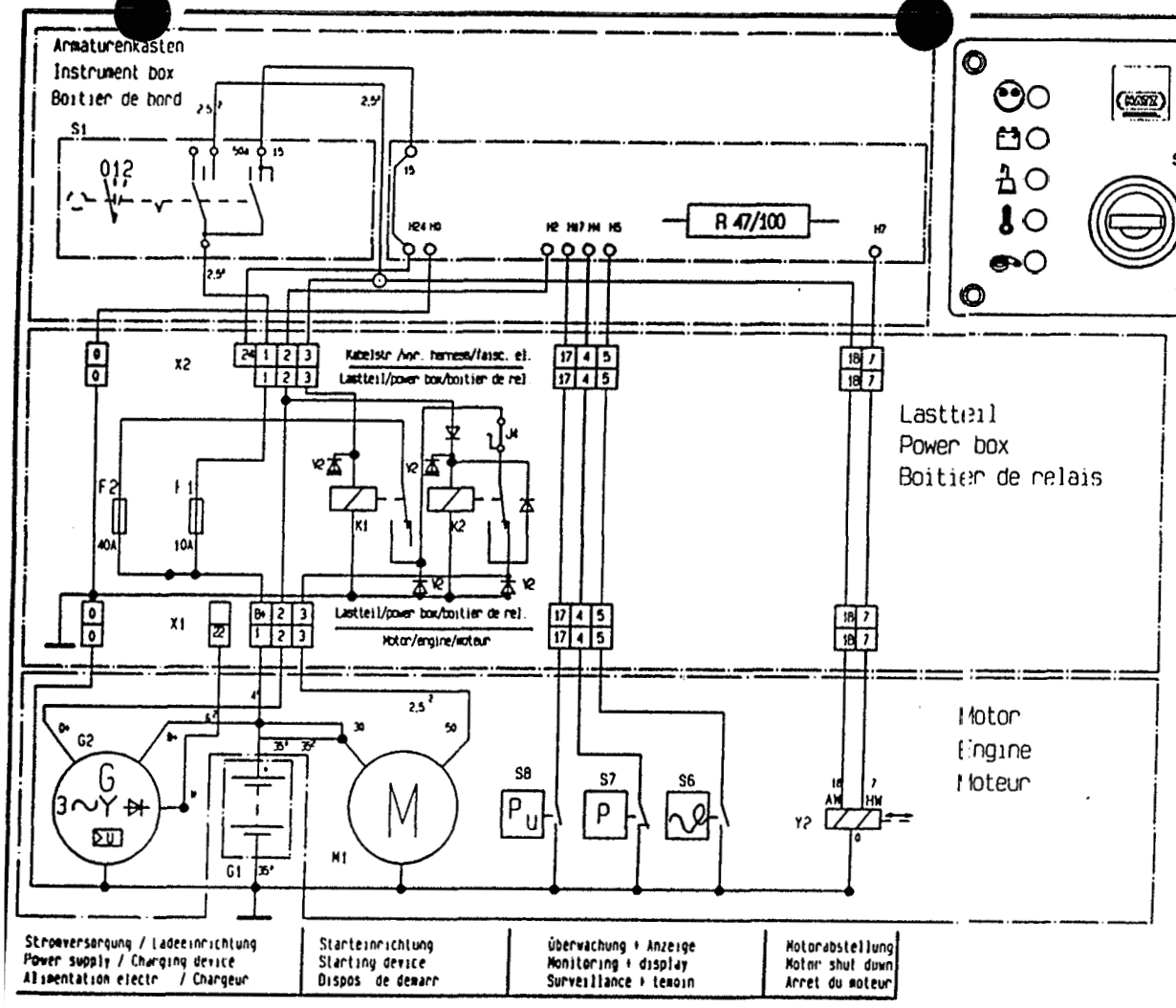
für alle Motoren / for all engines /
pour tous les moteurs / por todos los motores

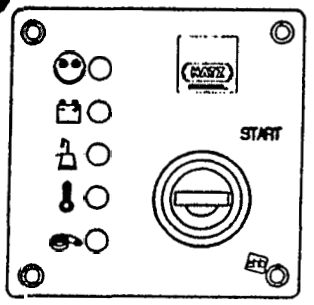
für Verwendung **mit Starterschutzmodul** *I*
for use with starter **protection module** *I*
avec **module** de protection **demarreur /**
por modulo de protección arranque

Ident-Nr. auf dem Typenschild
Ident-No. as Indicated on label
No. ident sur la plaque signalétique
No. ident sobre la placa signaletica

01591000,7023

Ed 12.99

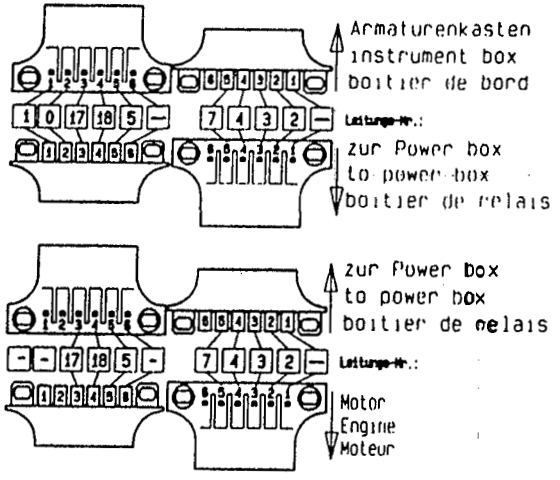




Armaturenkasten mit Anzeige

Instrument box with indication

Boitier de bord avec indication



				Oberflächenbeschaffenheit DIN ISO 1302 Reihe 2	HATZ DIESEL	Maßstab/SCALE 1:	( )
				Werkstückkanten DIN 6784			
				Allgemeintoleranzen DIN 7168, mittel			
00	07.04 98	HL	Mitt.	Form- u. Lagetolerierung DIN ISO 1101		ISO E	
Nr.	Datum	Name	Änderung	Schutzvermerk nach DIN 34 beachten	MOTORENFABRIK HATZ RUHSTORF-ROTT		
NICHT MANUELL ÄNDERN							

Stromlaufplan

Standard mit Anzeige

2-4 L/M 41

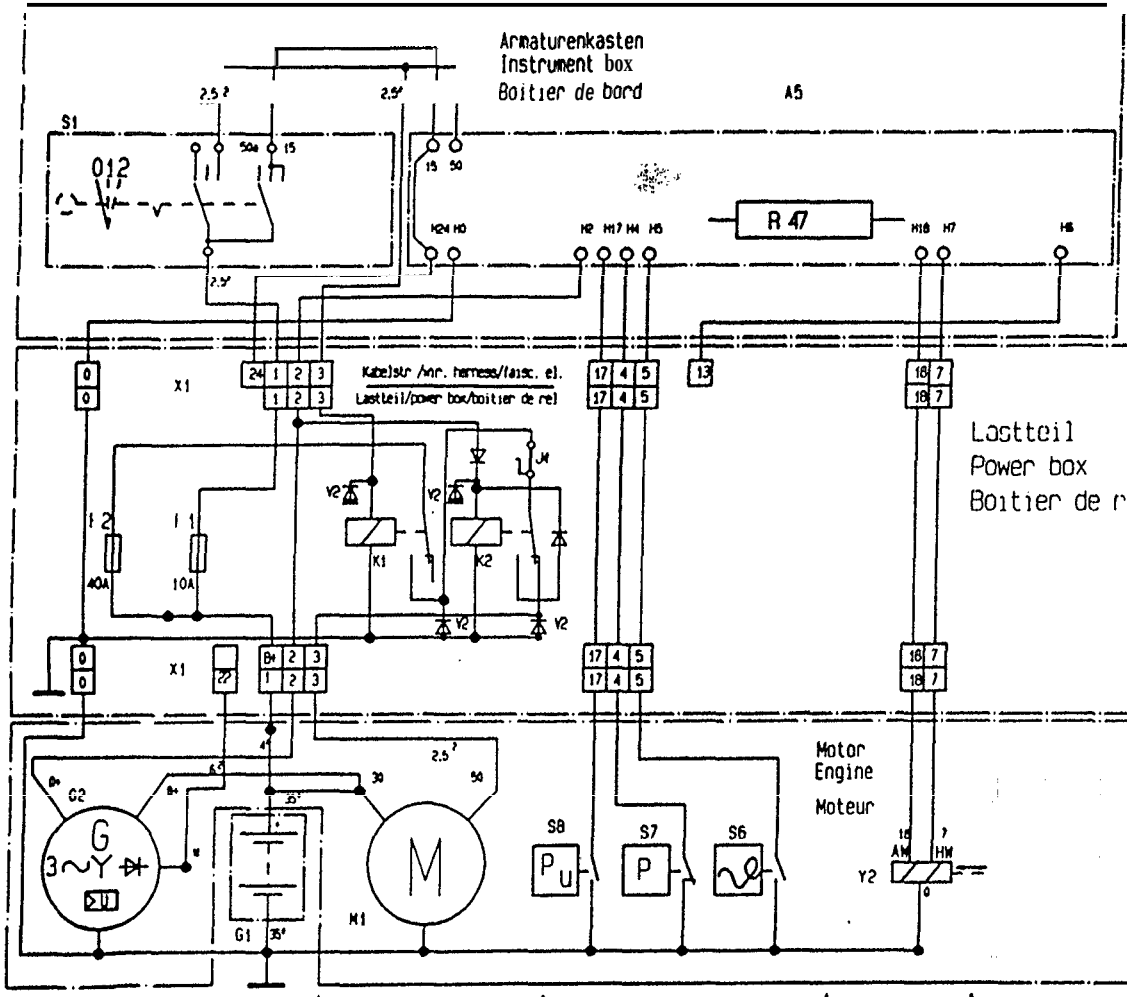
	CAD	Datum	Name
Gez.		18.03.98	HL
Gepr.		25.03.98	HL

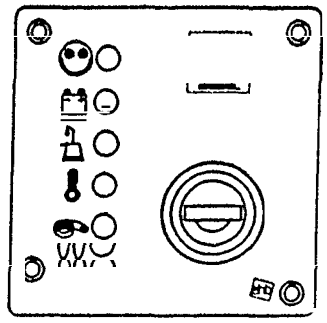
Werkstoff/ MATERIAL

Rohteil-Nr. / RAW-PART No.

Fertigteil Nr.: / FINISH-PART No. Typ ZF

0 5 1 1 5 0 8 0 0 1 . 1 0 2 4

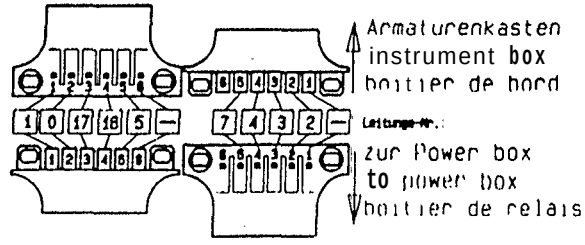


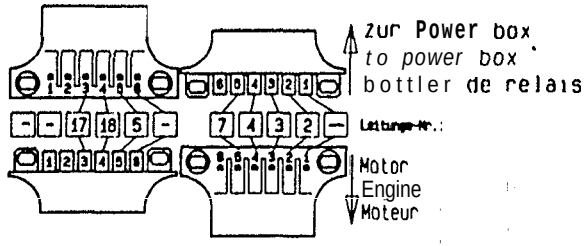


Armaturenkasten mit Vorglüh- und Abschaltautomatik

Instrument box with preheating and shut off automatic

Boitier de bord avec prechauff et arret automatique





Stromversorgung / Ladeeinrichtung Power supply / Charging device Alimentation electr. / Chargeur	Starteinrichtung Starting device Dispos. de demarr.	Überwachung + Anzeige Monitoring + display Surveillance + temoin	Motorabstellung Motor shut-down Arret du moteur

Nr.	Datum	Name	Änderung
00	28.04.98	HL	Mitt

NICHT MANUELL ÄNDERN

Oberflächenbeschaffenheit DIN ISO 1302 Reihe..2..

Werkstückkanten DIN 6784

Allgemeintoleranzen DIN 7168, mittel

Form- u. Lagetolerierung DIN ISO 1101

Schutzvermerk nach DIN 34 beachten

HATZ DIESEL

MOTORENFABRIK HATZ RUHSTORF-ROTT

Stromlaufplan

Standard mit Abschaltaut.

2-4 L/M 41

Maßstab/SCALE 1:1 (:)	CAD	Datum	Name
ISO E	Gez.	18.03.98	HL
	Gepr.	25.03.98	HL

Werkstoff/ MATERIAL

Rohteil-Nr.: / RAW-PART No.

Fertigteil Nr.:/FINISH-PART No. Typ ZF

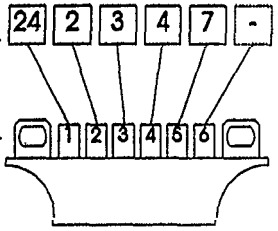
0|5|1|5|1|0|0|0| |1|0|2|4

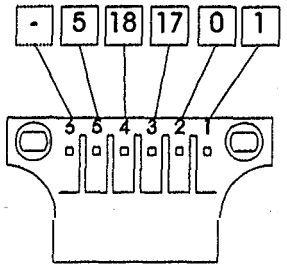
Anlage		zu		
Annex	3.1.1	to	WSI	2000.I62
Annexe		à		
Anexo		para		

= nicht belegt / not applied /

Lead numbers
Numéros de câbles
Numeros de los cables

Nummemreihe auf Gehäuse
Numbering on plug housing
Numérotation sur le connecteur
Numeración sobre el conector



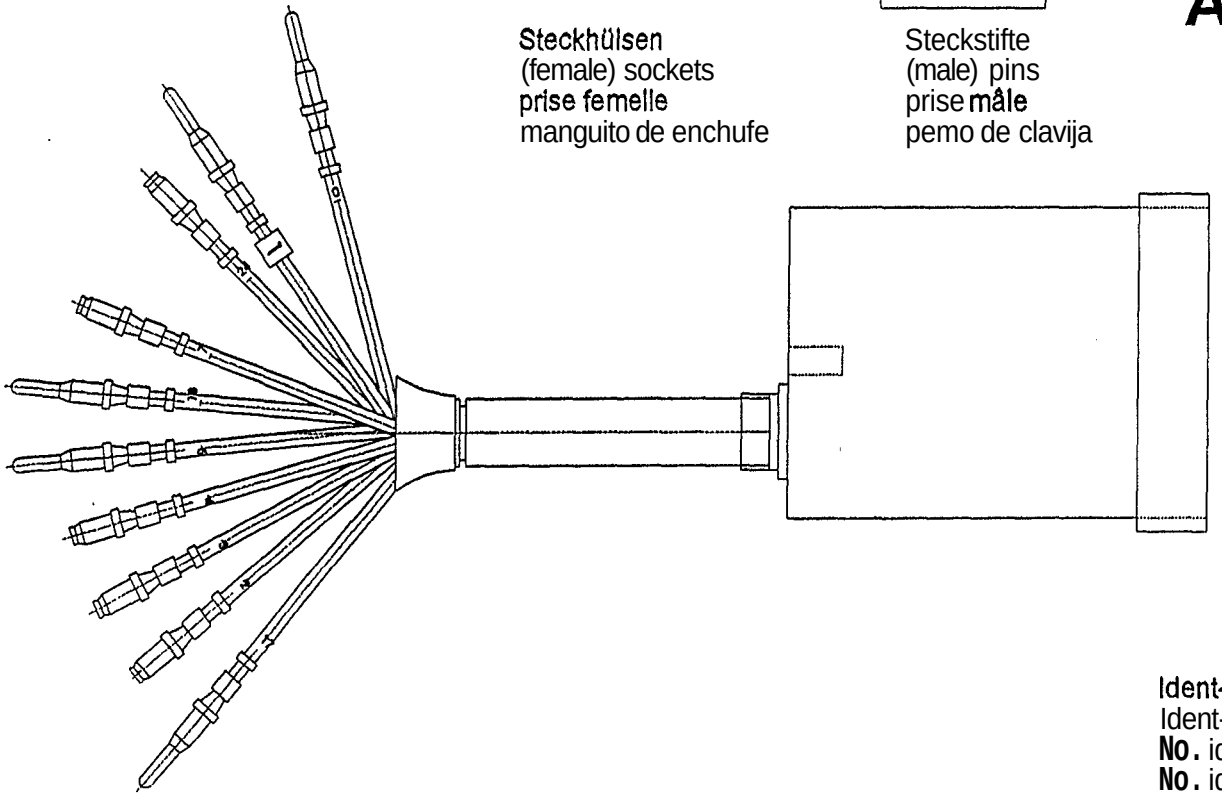


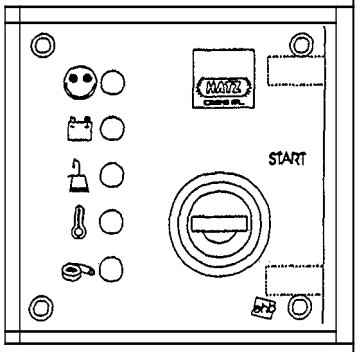
Steckhülsen
(female) sockets
prise femelle
manguito de enchufe

Steckstifte
(male) pins
prise mâle
pemo de clavija

Armaturenkasten
Switch box
Boitier de commande
Cuadro de mando

A I - 12 V





Ident-Nr. auf dem Typenschild
Ident-No. as indicated on label
No. ident sur la plaque signalétique
No. ident sobre la placa signaletica

01551802,1003

Ed. 12, 99
MSS-schi-es

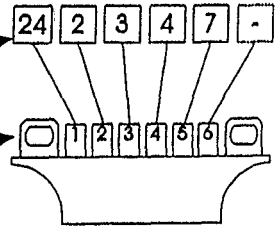
Anlage zu
Annexe 3.2.2 to WSI 2000.162
Anexo à para

HATZ DIESEL

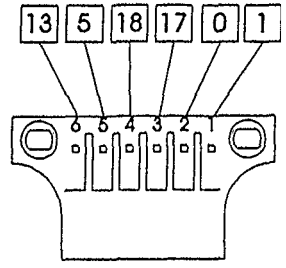
- = nicht belegt / not applied / non occupé / no ocupado

HATZ
Kabelnummern
Lead numbers
Numéros de cables
Numeros de los cables

Nummernreihe auf Gehäuse
Numbering on plug housing
Numkrotation sur le connecteur
Numeración sobre el conector



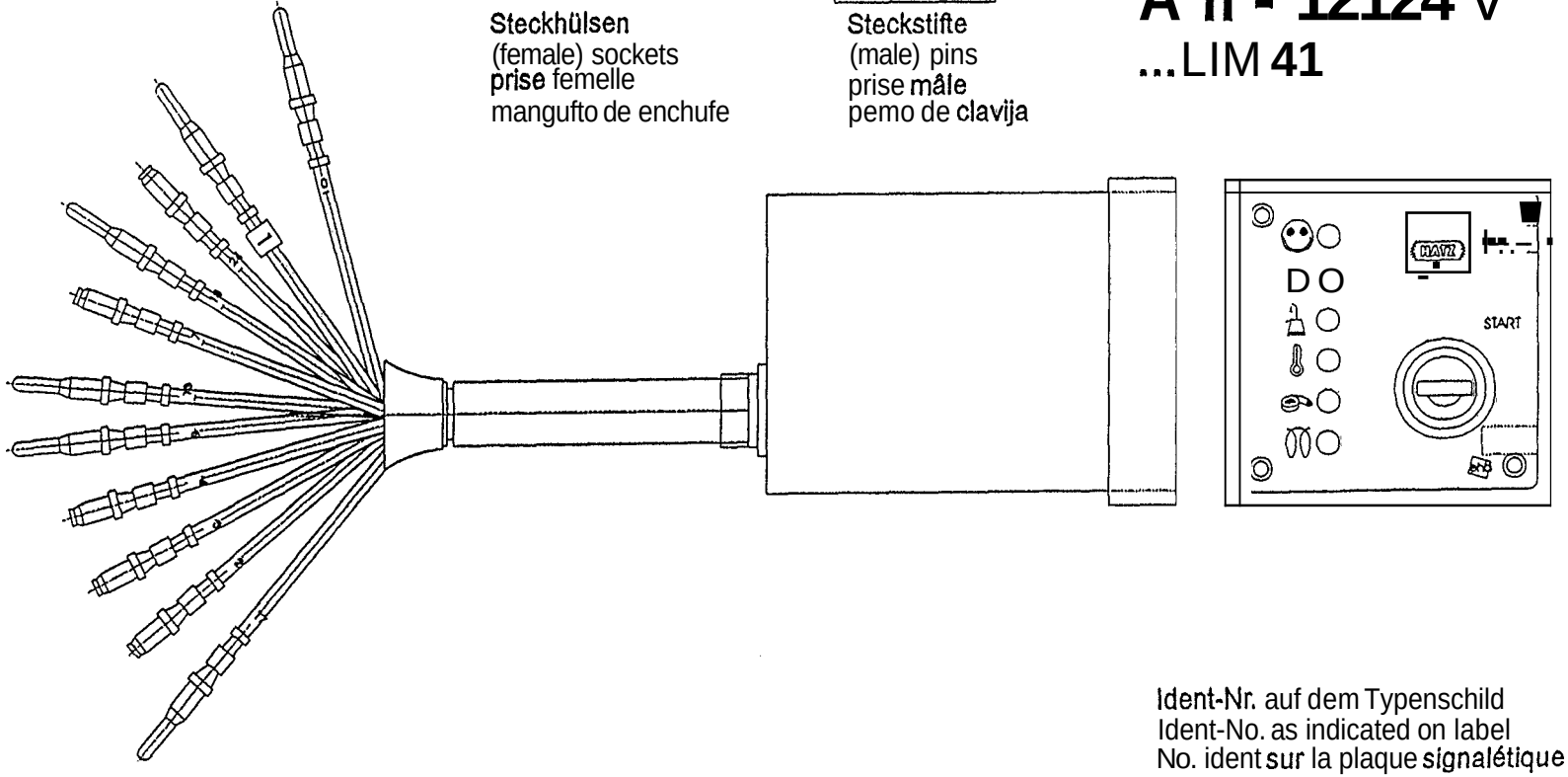
Steckhülsen
(female) sockets
prise femelle
mangufto de enchufe



Steckstifte
(male) pins
prise mâle
pemo de clavija

Armaturenkasten
Switch box
Boitier de commande
Cuadro de mando

A II - 12124 V
...LIM 41



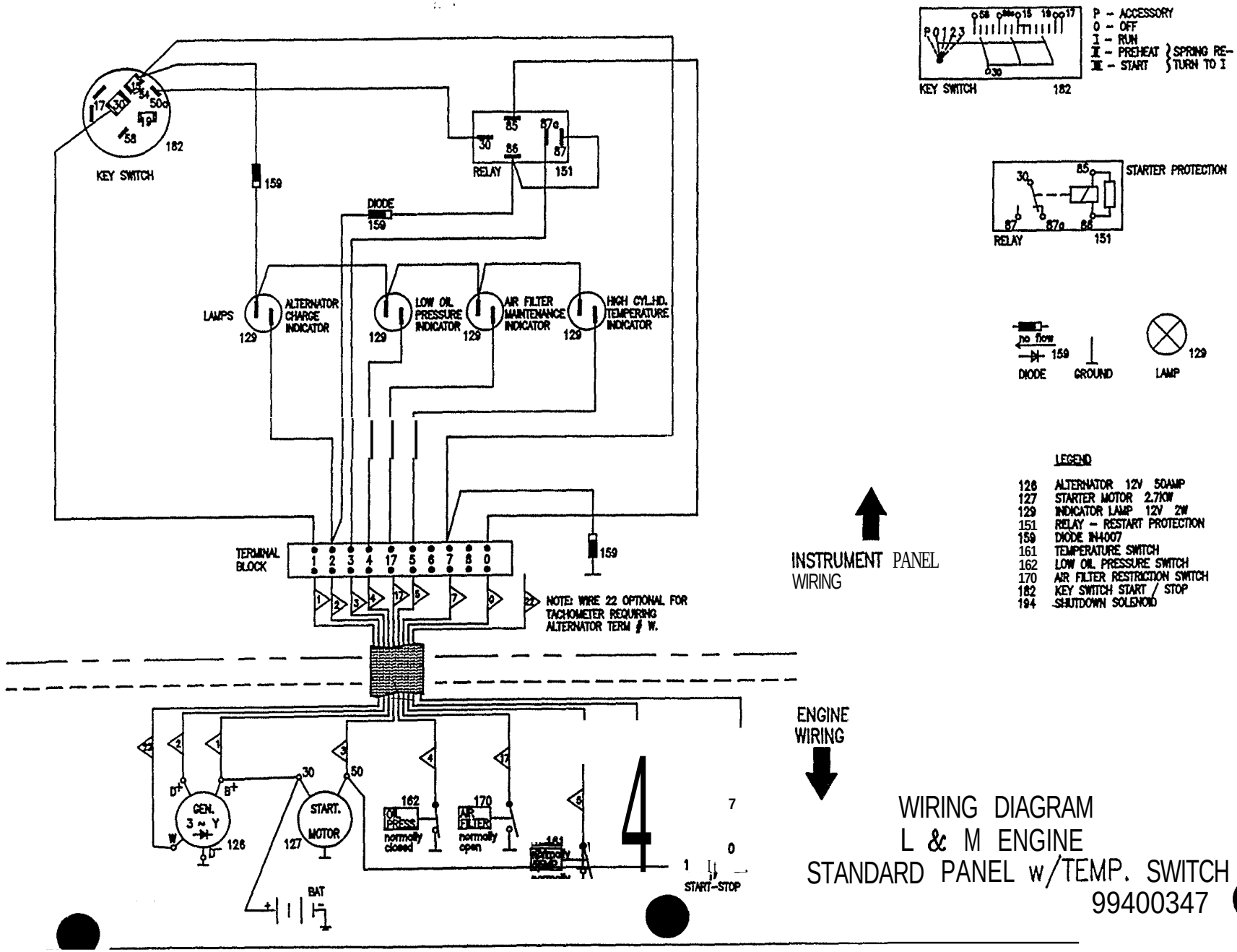
Ident-Nr. auf dem Typenschild
Ident-No. as indicated on label
No. ident sur la plaque signalétique
No. ident sobre la placa sfgnaletica

01590500.1023

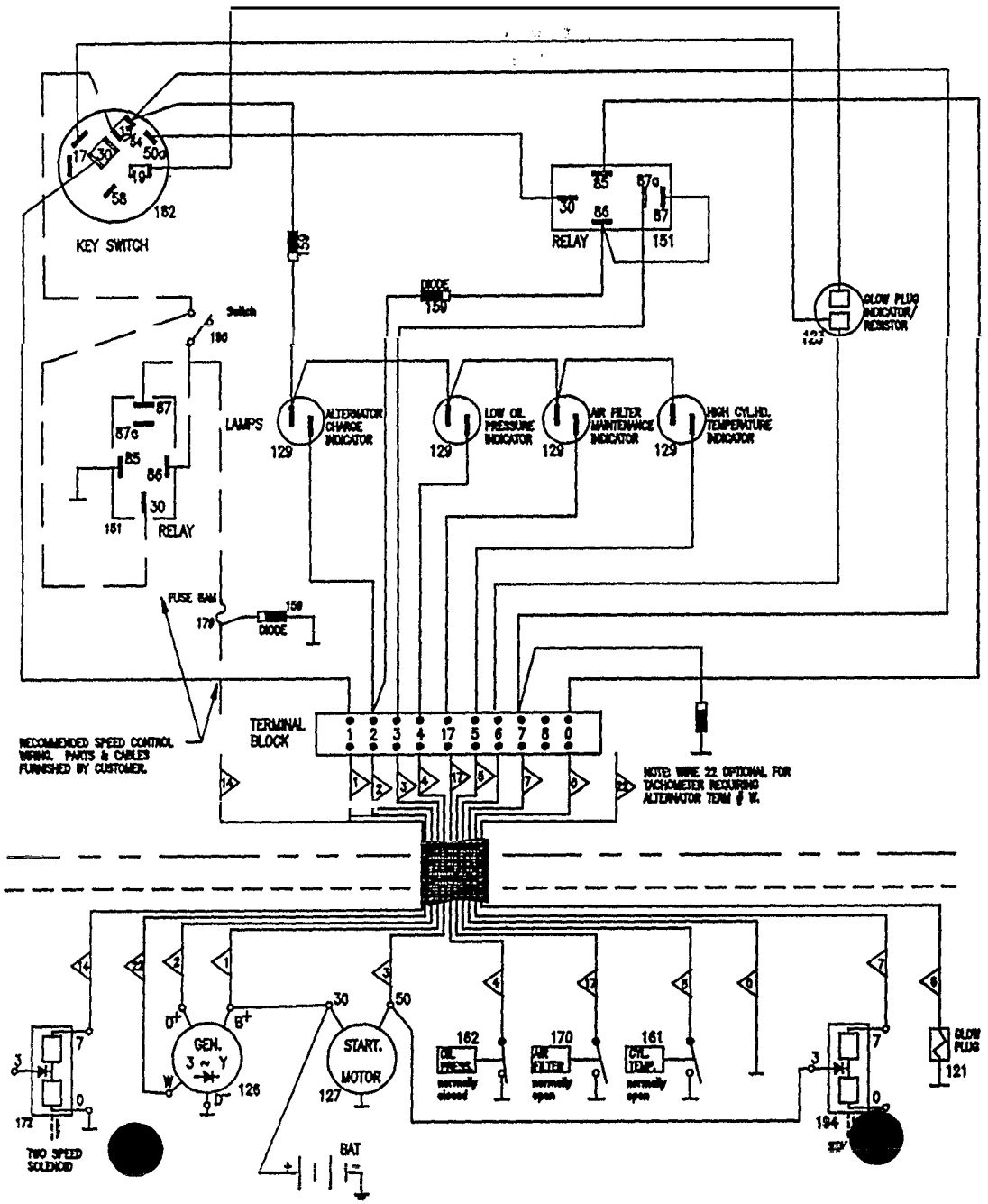
INDEX

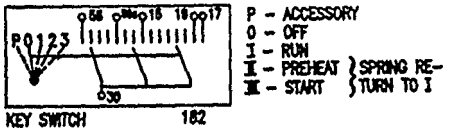
H.D.A. WIRING DIAGRAMS

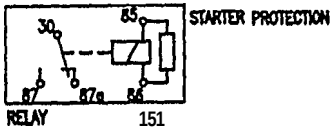
Engine	Description	Hatz No.	HDA
L & M	Standard Panel w/Temp Sw.	03852303	99400347
2 & 3 Cyl.	Standard Panel w/Temp. Sw. & G.P.	03852303	99400348
2 & 3 Cyl.	Standard Panel w/Temp. Sw. & G.P. & 2 Speed	03852303	99400369
4 Cyl.	Standard Panel w/Temp. Sw. & 2 G.P.	03852303	99400349
4 Cyl.	Standard Panel w/Temp. Sw. & 2 G.P. & 2 Speed	03852303	99400350
4 Cyl.	Auto Shut Down Panel w/T° Sw. & 2 G.P. & 2 Speed	03852603	99400351
4 Cyl.	Auto Shut Down Panel w/T° Sw. & 2 G.P.	03852603	99400352
2 & 3 Cyl.	Auto Shut Down Panel w/T° Sw. & G.P.	03852603	99400353
2 & 3 Cyl	Auto Shut Down Panel w/T° Sw. & G.P. & 2 Speed	03852603	99400366
L & M	Auto Shut Down Panel w/T° Sw.	03852603	99400354
	24 V		
L & M	Standard Panel w/Temp. Sw.	03852403	99400671
2 & 3 Cyl.	Auto Shut Down Panel w/Temp. Sw.	03852703	99400672
4 Cyl.	Auto Shit Down Panel w/Temp. Sw. & 2 G.P.	03852703	99400673
2 & 3 Cyl.	Auto Shut Down Panel w/Temp. Sw. G.P.	03852703	99400674

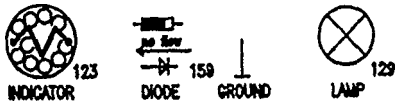


WIRING DIAGRAM
L & M ENGINE
STANDARD PANEL w/TEMP. SWITCH
99400347









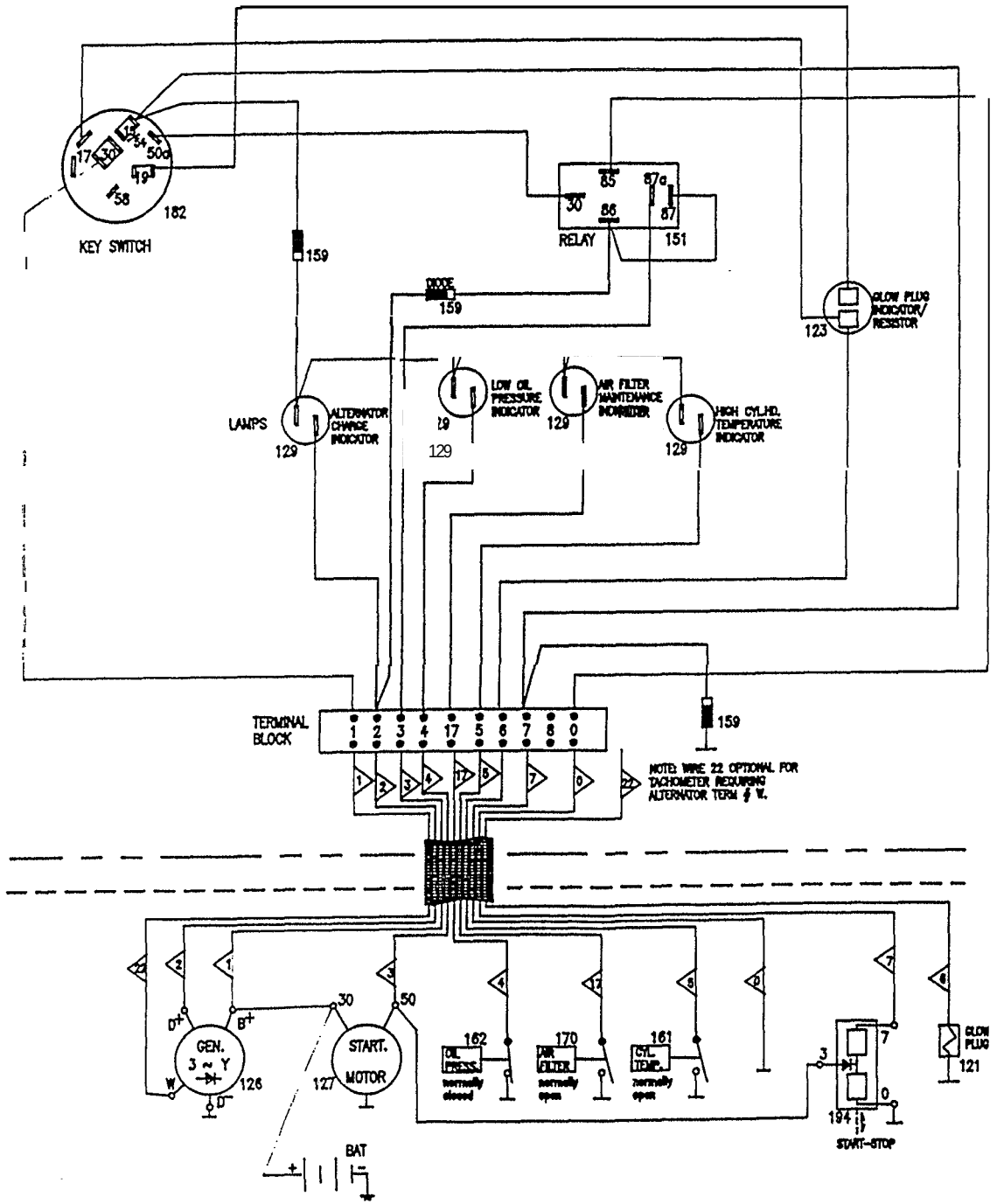
INSTRUMENT PANEL WIRING

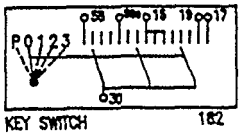
ENGINE WIRING

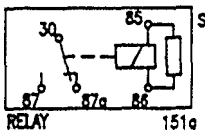
LEGEND

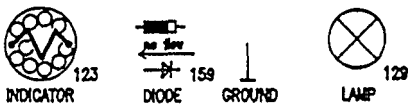
121	GLOW PLUG
123	INDICATOR/RESISTOR - GLOW PLUG
128	ALTERNATOR 12V 50AMP
127	STARTER MOTOR 2.7KW
129	INDICATOR LAMP 12V 2W
151	RELAY RESTART PROTECTION
159	DIODE 1N4007
161	TEMPERATURE SWITCH
162	LOW OIL PRESSURE SWITCH
170	AIR FILTER RESTRICTION SWITCH
172	TWO SPEED SOLENOID
182	KEY SWITCH START / STOP
194	SHUTDOWN SOLENOID

WIRING DIAGRAM
2&3 CYL, L & M ENGINE
STANDARD PANEL w/
TEMP. SW. & GLOW PLUG
& SPEED CONT'L SOLENOID,
99400369









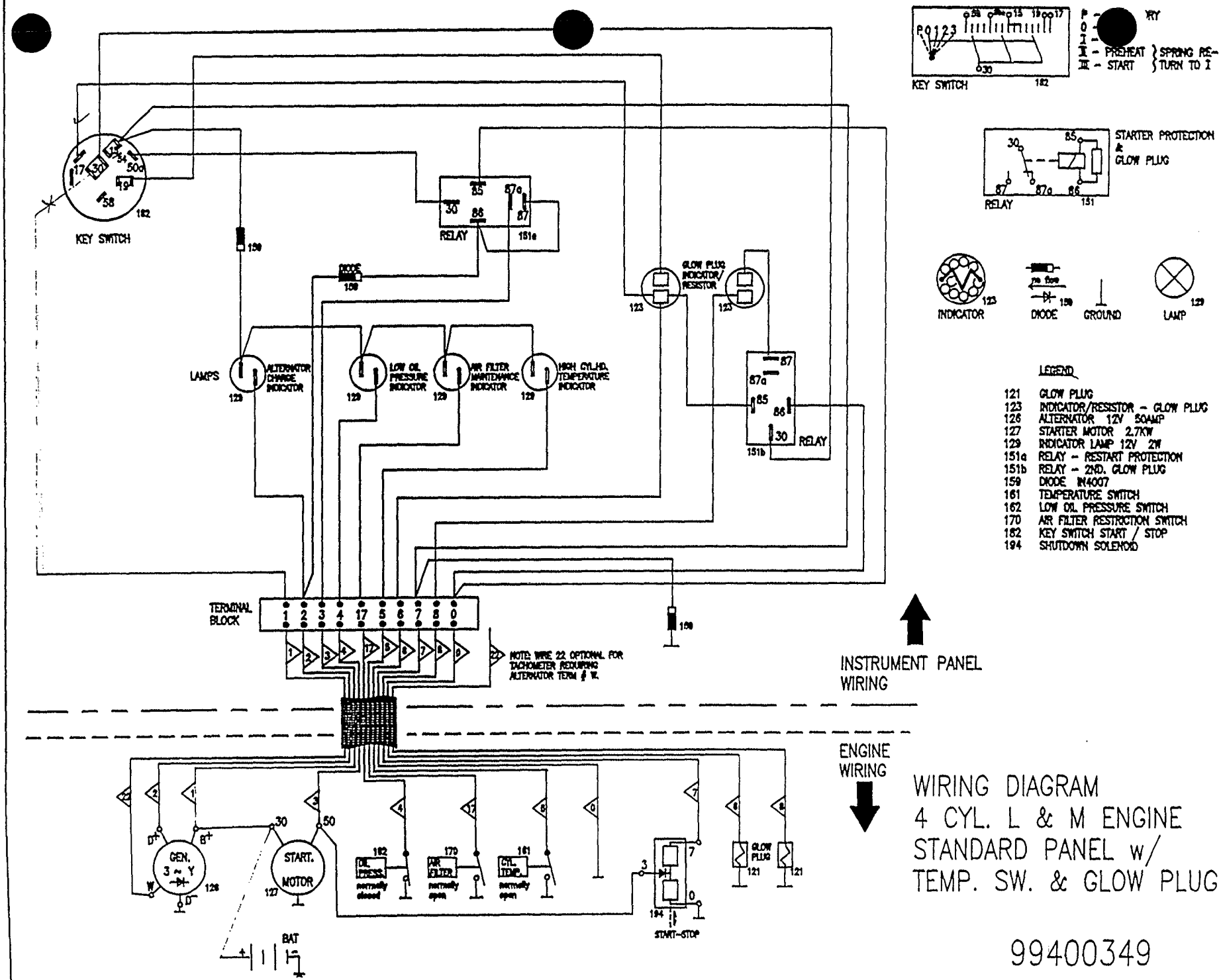
INSTRUMENT PANEL WIRING

ENGINE WIRING

121	GLOW PLUG
123	INDICATOR/RESISTOR - GLOW PLUG
126	ALTERNATOR 12V 50AMP
127	STARTER MOTOR 2.7KW
129	INDICATOR LAMP 12V 2W
151	RELAY - RESTART PROTECTION
159	DIODE IN4007
161	TEMPERATURE SWITCH
162	LOW OIL PRESSURE SWITCH
170	AIR FILTER RESTRICTION SWITCH
182	KEY SWITCH START / STOP
184	SHUTDOWN SOLENOID

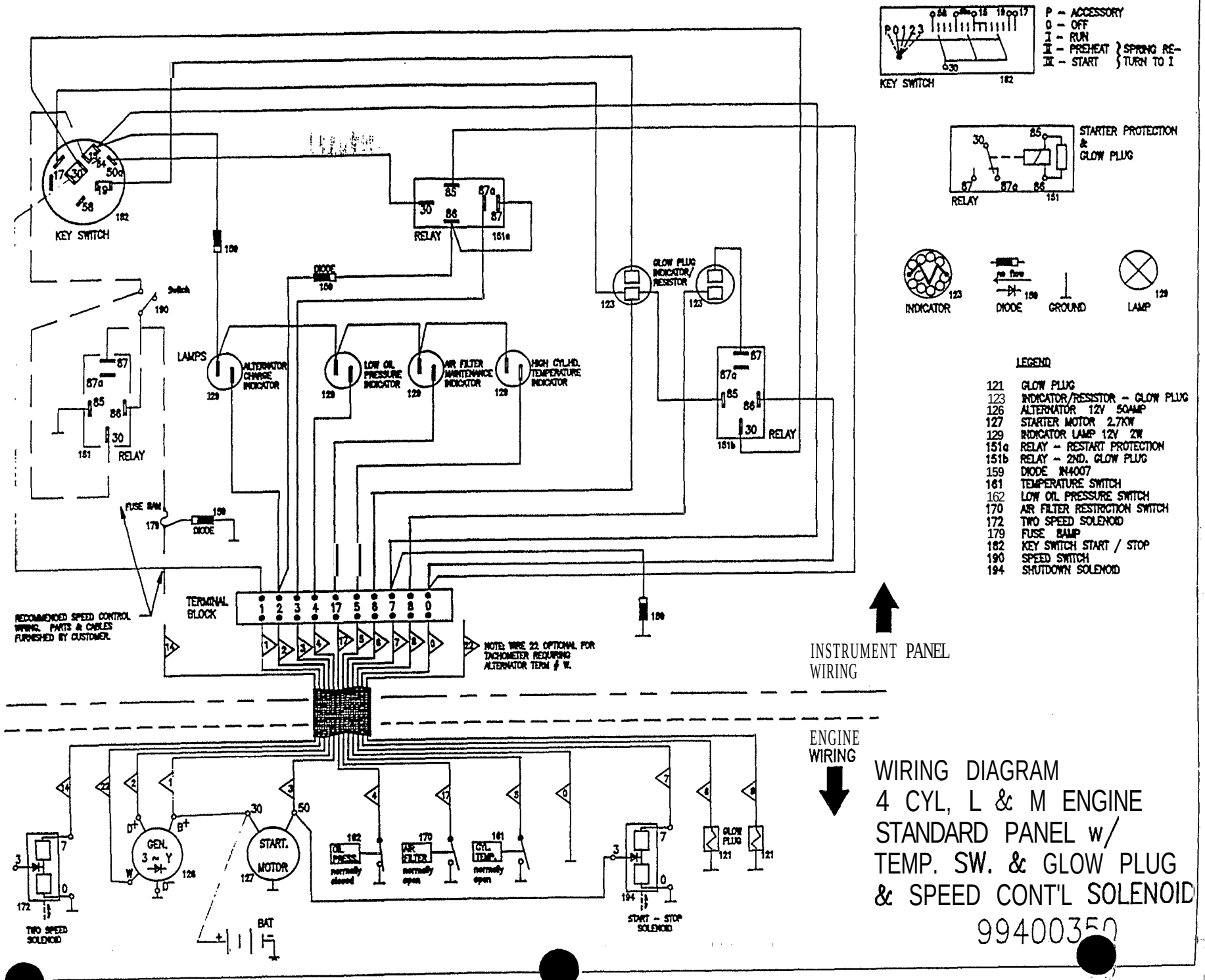
WIRING DIAGRAM
2&3 CYL, L & M ENGINE
STANDARD PANEL w/
TEMP, SW. & GLOW PLUG

9940348



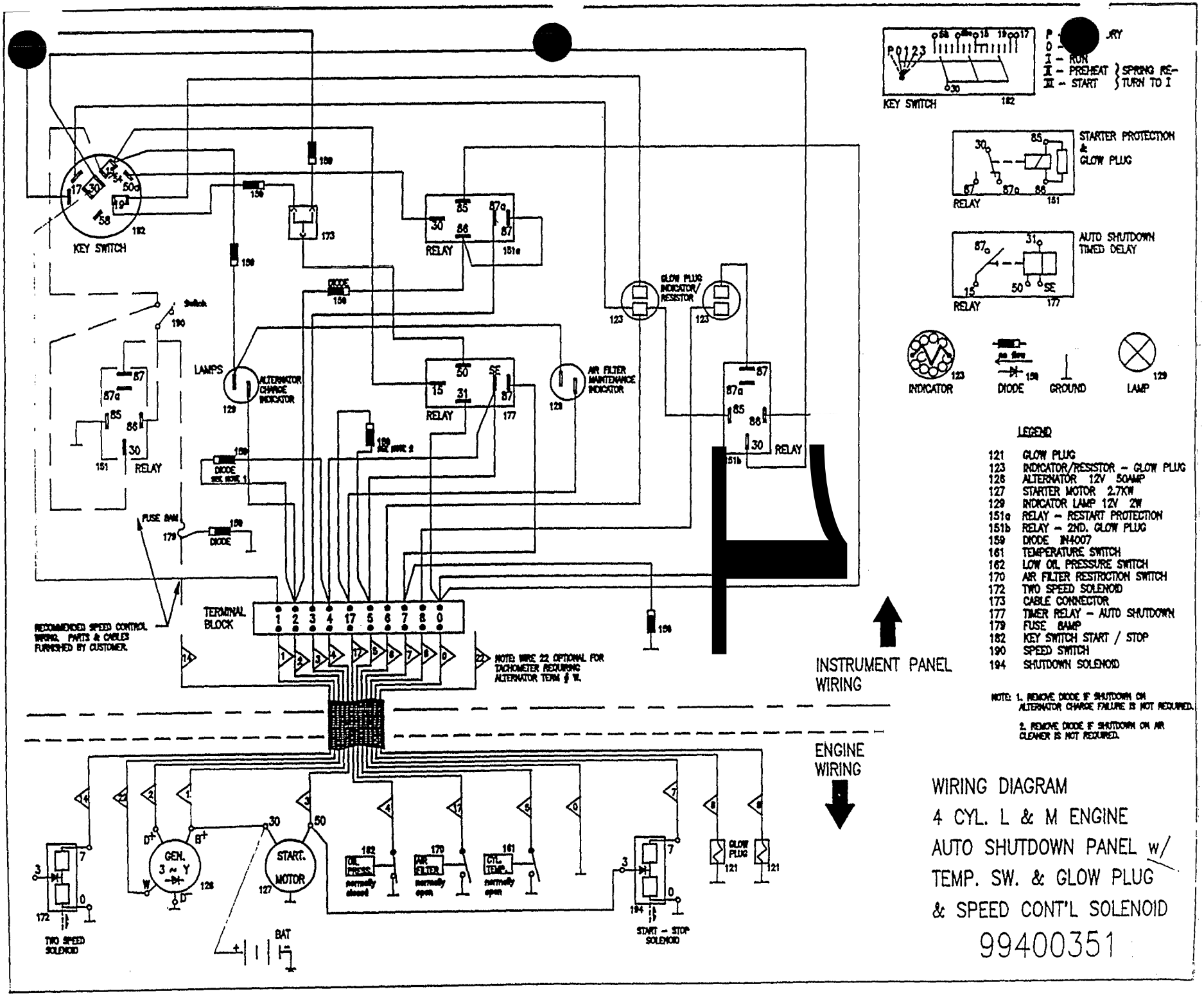
WIRING DIAGRAM
4 CYL. L & M ENGINE
STANDARD PANEL w/
TEMP. SW. & GLOW PLUG

99400349



WIRING DIAGRAM
4 CYL, L & M ENGINE
STANDARD PANEL w/
TEMP. SW. & GLOW PLUG
& SPEED CONT'L SOLENOID

99400350



LEGEND

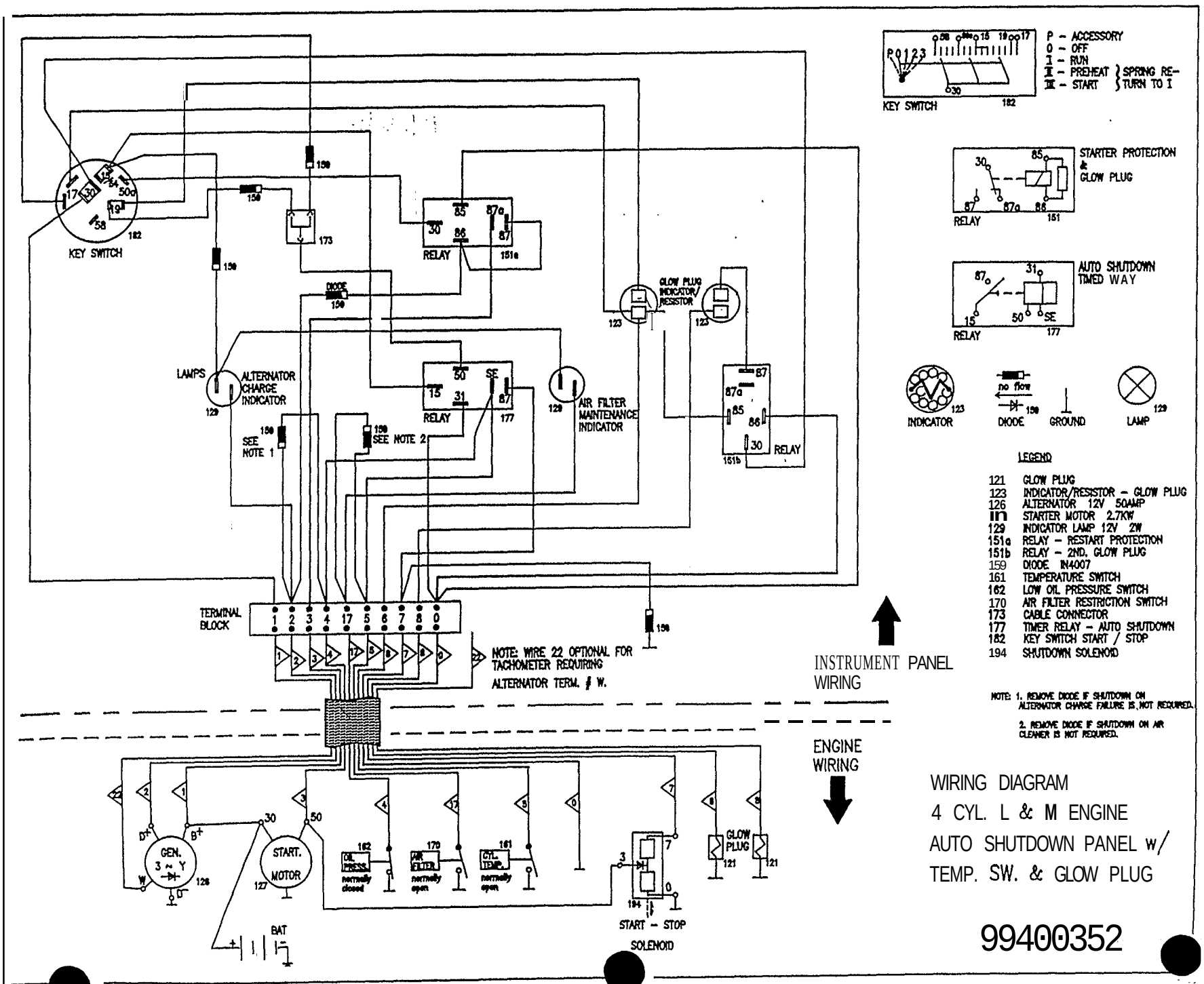
121	GLOW PLUG
123	INDICATOR/RESISTOR - GLOW PLUG
126	ALTERNATOR 12V 50AMP
127	STARTER MOTOR 2.7KW
129	INDICATOR LAMP 12V 2W
151a	RELAY - RESTART PROTECTION
151b	RELAY - 2ND. GLOW PLUG
159	DIODE IN4007
161	TEMPERATURE SWITCH
162	LOW OIL PRESSURE SWITCH
170	AIR FILTER RESTRICTION SWITCH
172	TWO SPEED SOLENOID
173	CABLE CONNECTOR
177	TIMER RELAY - AUTO SHUTDOWN
179	FUSE 8AMP
182	KEY SWITCH START / STOP
190	SPEED SWITCH
194	SHUTDOWN SOLENOID

NOTE: 1. REMOVE DIODE IF SHUTDOWN ON ALTERNATOR CHARGE FAILURE IS NOT REQUIRED.

2. REMOVE DIODE IF SHUTDOWN ON AIR CLEANER IS NOT REQUIRED.

WIRING DIAGRAM
4 CYL. L & M ENGINE
AUTO SHUTDOWN PANEL w/ TEMP. SW. & GLOW PLUG & SPEED CONT'L SOLENOID

99400351



LEGEND

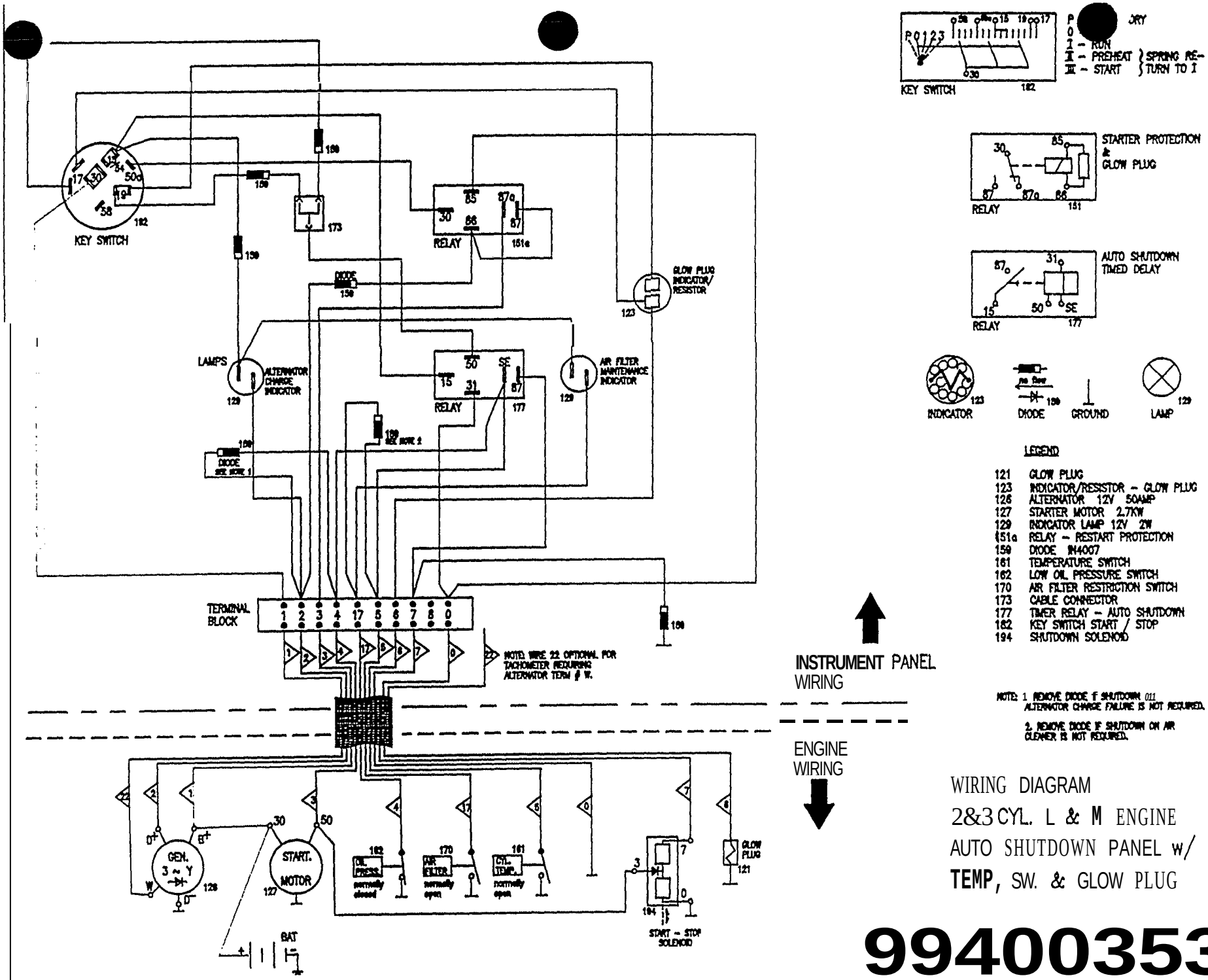
121	GLOW PLUG
123	INDICATOR/RESISTOR – GLOW PLUG
126	ALTERNATOR 12V 50AMP
in	STARTER MOTOR 2.7KW
129	INDICATOR LAMP 12V 2W
151a	RELAY – RESTART PROTECTION
151b	RELAY – 2ND. GLOW PLUG
159	DIODE IN4007
161	TEMPERATURE SWITCH
162	LOW OIL PRESSURE SWITCH
170	AIR FILTER RESTRICTION SWITCH
173	CABLE CONNECTOR
177	TIMER RELAY – AUTO SHUTDOWN
182	KEY SWITCH START / STOP
194	SHUTDOWN SOLENOID

NOTE: 1. REMOVE DIODE IF SHUTDOWN ON ALTERNATOR CHARGE FAILURE IS NOT REQUIRED.

2. REMOVE DIODE IF SHUTDOWN ON AIR CLEANER IS NOT REQUIRED.

WIRING DIAGRAM
4 CYL. L & M ENGINE
AUTO SHUTDOWN PANEL w/ TEMP. SW. & GLOW PLUG

99400352



LEGEND

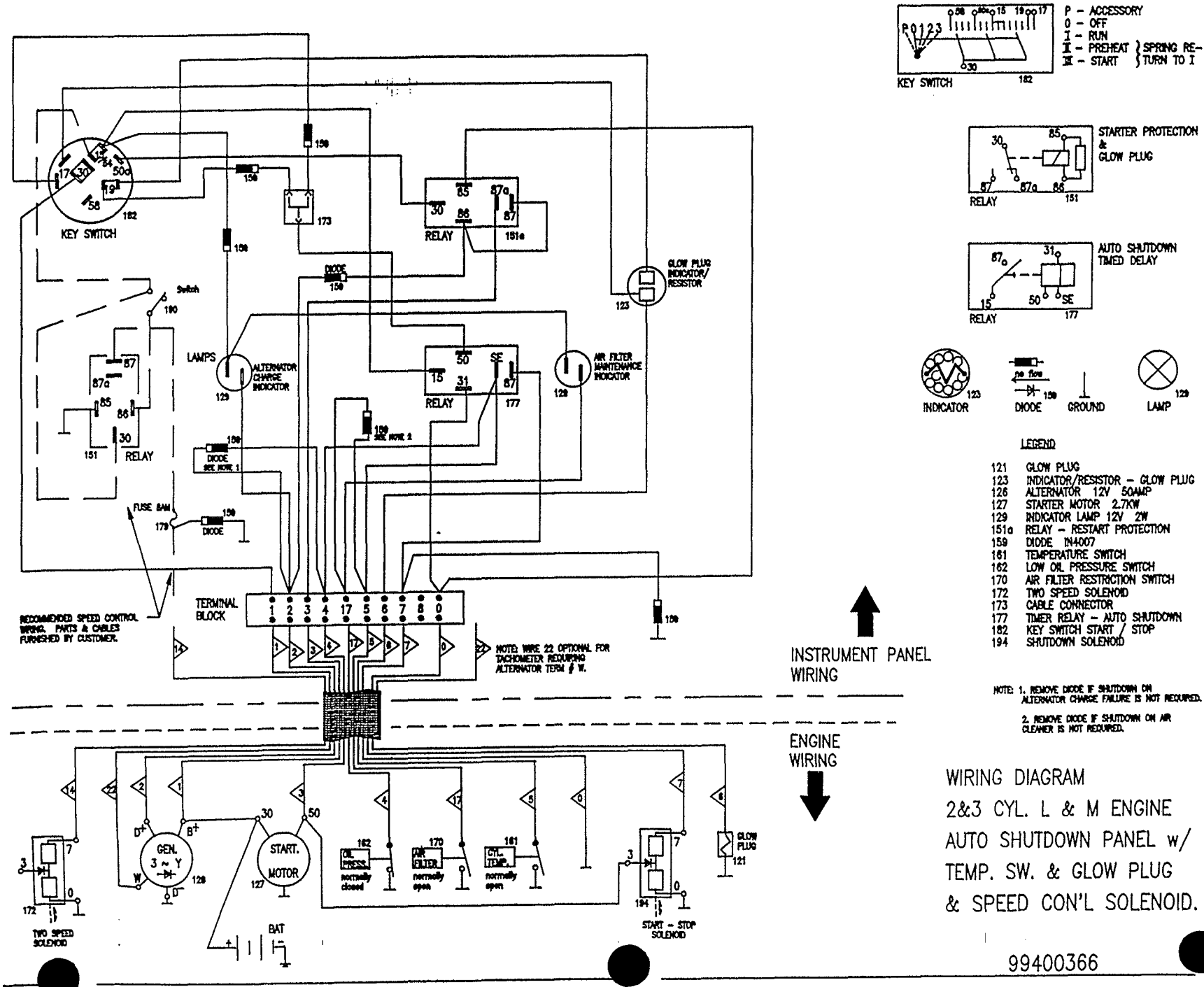
121	GLOW PLUG
123	INDICATOR/RESISTOR - GLOW PLUG
126	ALTERNATOR 12V 50AMP
127	STARTER MOTOR 2.7KW
129	INDICATOR LAMP 12V 2W
151a	RELAY - RESTART PROTECTION
150	DIODE IN4007
161	TEMPERATURE SWITCH
162	LOW OIL PRESSURE SWITCH
170	AIR FILTER RESTRICTION SWITCH
173	CABLE CONNECTOR
177	TIMER RELAY - AUTO SHUTDOWN
182	KEY SWITCH START / STOP
194	SHUTDOWN SOLENOID

NOTE: 1. REMOVE DIODE IF SHUTDOWN ON ALTERNATOR CHARGE FAILURE IS NOT REQUIRED.

2. REMOVE DIODE IF SHUTDOWN ON AIR CLEANER IS NOT REQUIRED.

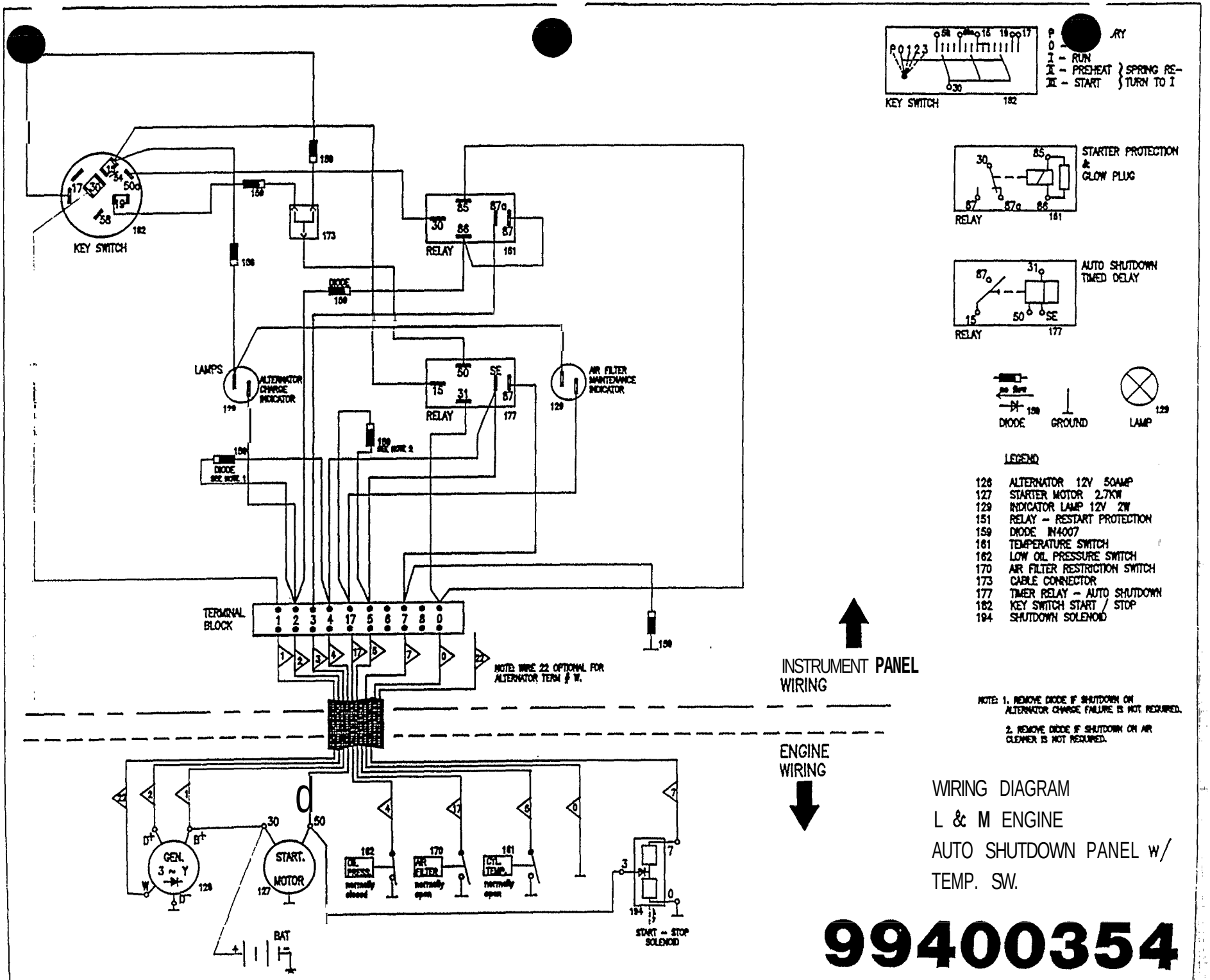
WIRING DIAGRAM
2&3 CYL. L & M ENGINE AUTO SHUTDOWN PANEL w/ TEMP, SW. & GLOW PLUG

99400353



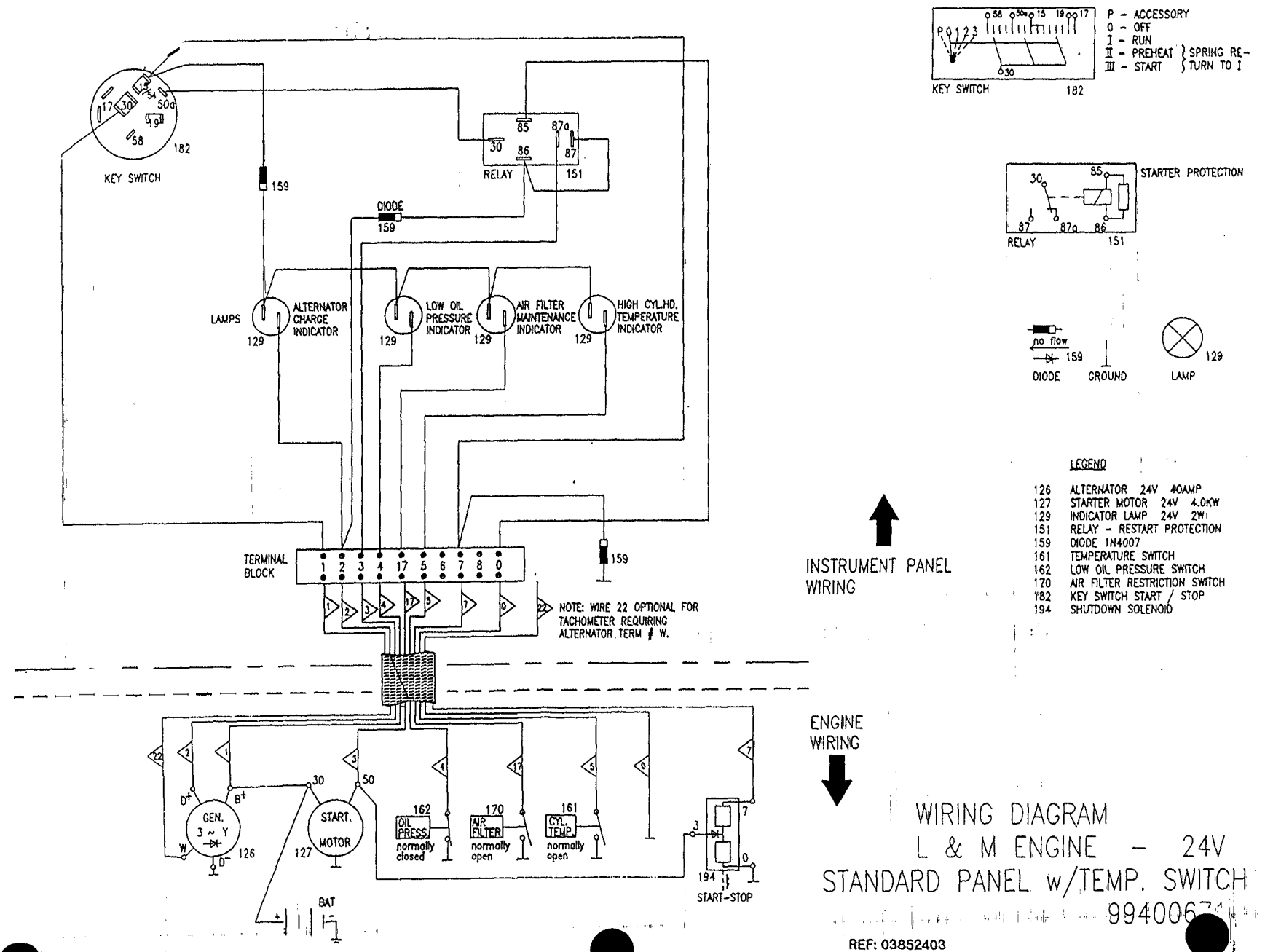
WIRING DIAGRAM
2&3 CYL. L & M ENGINE AUTO SHUTDOWN PANEL w/ TEMP. SW. & GLOW PLUG & SPEED CON'L SOLENOID.

99400366



WIRING DIAGRAM
L & M ENGINE
AUTO SHUTDOWN PANEL W/
TEMP. SW.

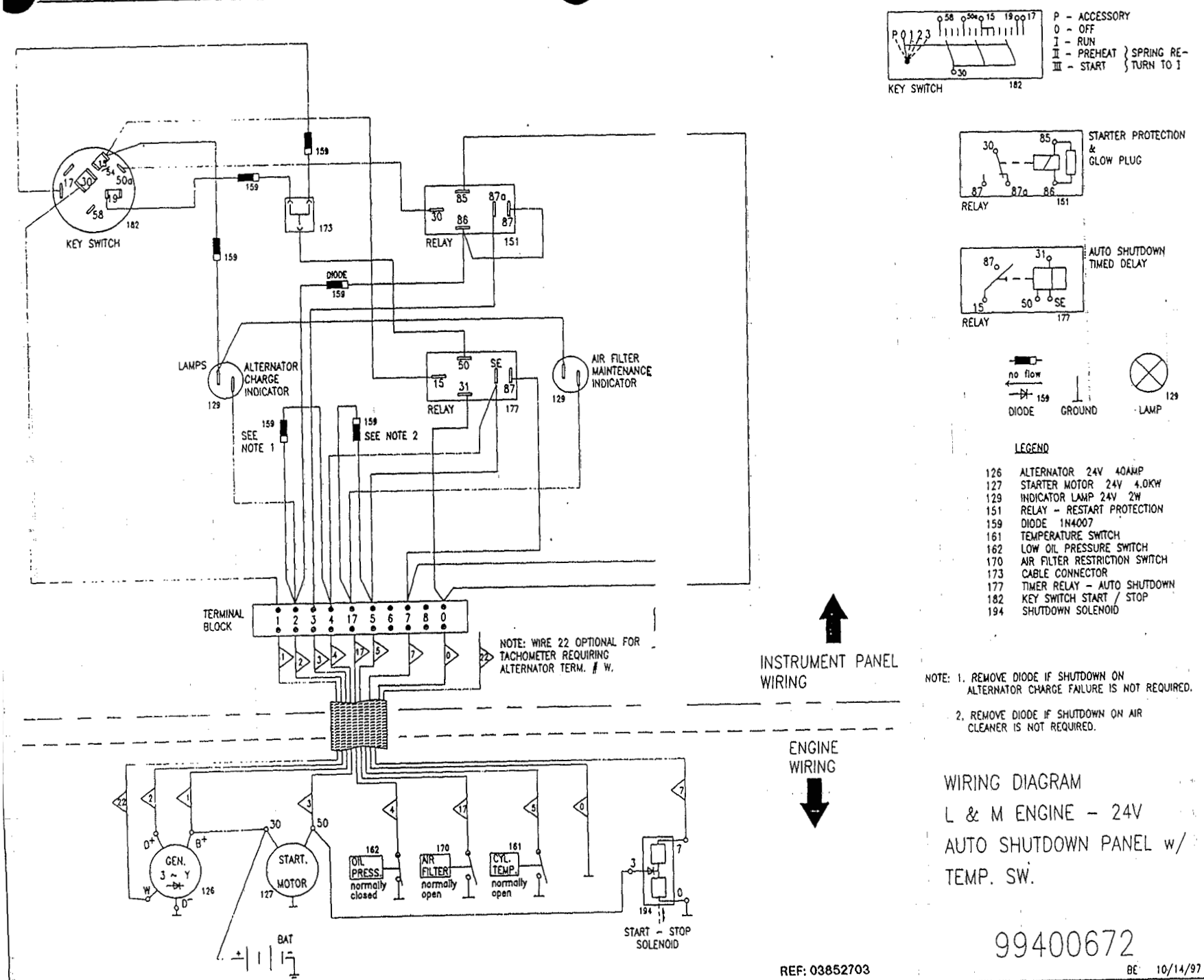
99400354

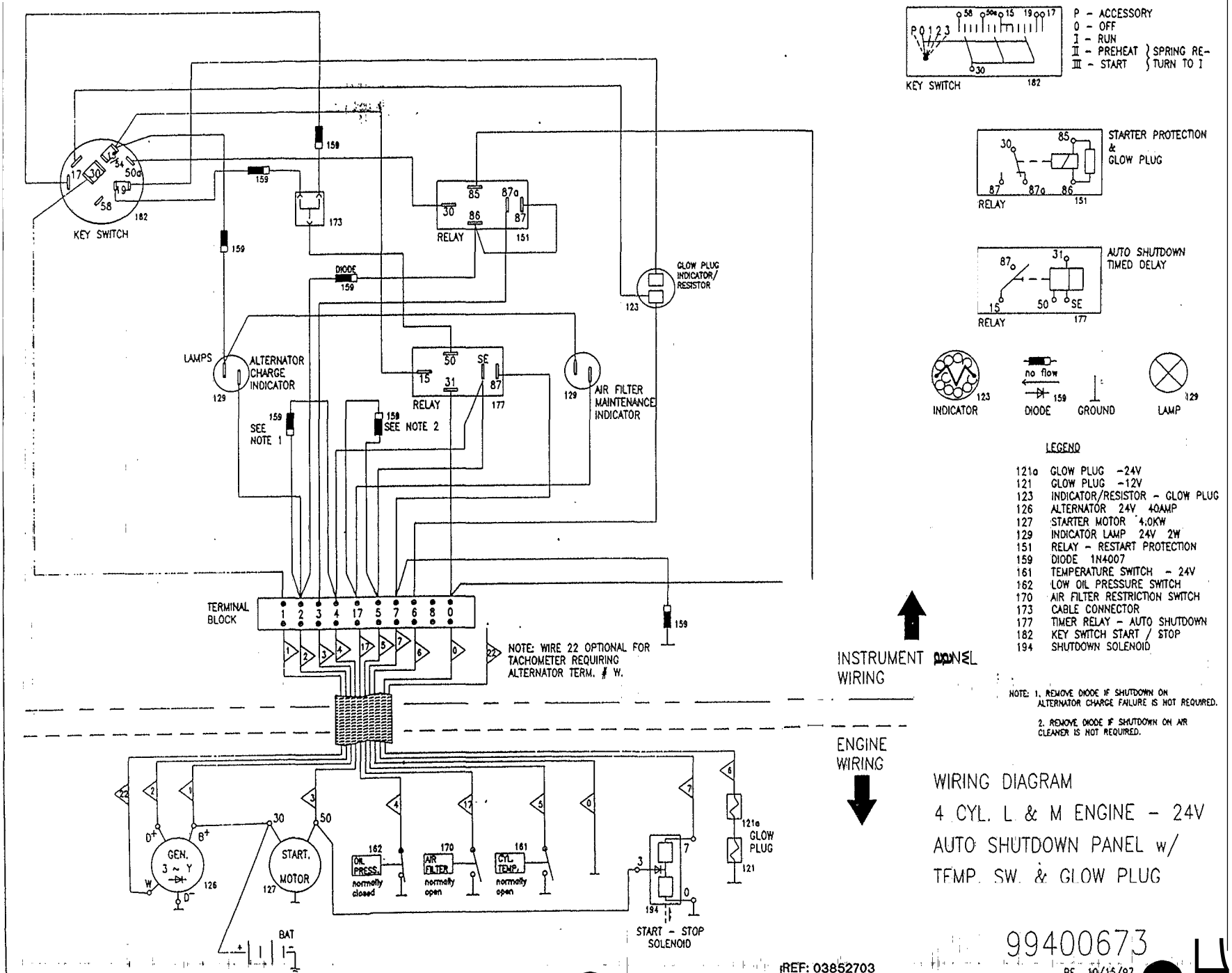


WIRING DIAGRAM
L & M ENGINE - 24V
STANDARD PANEL w/TEMP. SWITCH

9940067

REF: 03852403


KEY SWITCH
182
RELAY
151
173
159
DIODE
159
LAMPS
ALTERNATOR CHARGE INDICATOR
129
RELAY
177
AIR FILTER MAINTENANCE INDICATOR
129
SEE NOTE 1
SEE NOTE 2
TERMINAL BLOCK
1 2 3 4 17 5 6 7 8 0
NOTE: WIRE 22 OPTIONAL FOR TACHOMETER REQUIRING ALTERNATOR TERM. # W.
INSTRUMENT PANEL WIRING
ENGINE WIRING
GEN. 3 ~ Y
126
START. MOTOR
127
BAT
OIL PRESS. 162 normally closed
AIR FILTER 170 normally open
CYL. TEMP. 161 normally open
START - STOP SOLENOID
194
P - ACCESSORY
0 - OFF
I - RUN
II - PREHEAT } SPRING RE-
III - START } TURN TO I
KEY SWITCH
STARTER PROTECTION & GLOW PLUG
RELAY
AUTO SHUTDOWN TIMED DELAY
RELAY
no flow
DIODE
GROUND
LAMP
LEGEND
126 ALTERNATOR 24V 40AMP
127 STARTER MOTOR 24V 4.0KW
129 INDICATOR LAMP 24V 2W
151 RELAY - RESTART PROTECTION
159 DIODE 1N4007
161 TEMPERATURE SWITCH
162 LOW OIL PRESSURE SWITCH
170 AIR FILTER RESTRICTION SWITCH
173 CABLE CONNECTOR
177 TIMER RELAY - AUTO SHUTDOWN
182 KEY SWITCH START / STOP
194 SHUTDOWN SOLENOID
NOTE: 1. REMOVE DIODE IF SHUTDOWN ON ALTERNATOR CHARGE FAILURE IS NOT REQUIRED.
2. REMOVE DIODE IF SHUTDOWN ON AIR CLEANER IS NOT REQUIRED.
WIRING DIAGRAM
L & M ENGINE - 24V
AUTO SHUTDOWN PANEL w/
TEMP. SW.
99400672
REF: 03852703
BE 10/14/97



LEGEND

121a	GLOW PLUG -24V
121	GLOW PLUG -12V
123	INDICATOR/RESISTOR - GLOW PLUG
126	ALTERNATOR 24V 40AMP
127	STARTER MOTOR 4.0KW
129	INDICATOR LAMP 24V 2W
151	RELAY - RESTART PROTECTION
159	DIODE 1N4007
161	TEMPERATURE SWITCH - 24V
162	LOW OIL PRESSURE SWITCH
170	AIR FILTER RESTRICTION SWITCH
173	CABLE CONNECTOR
177	TIMER RELAY - AUTO SHUTDOWN
182	KEY SWITCH START / STOP
194	SHUTDOWN SOLENOID

NOTE: 1. REMOVE DIODE IF SHUTDOWN ON ALTERNATOR CHARGE FAILURE IS NOT REQUIRED.

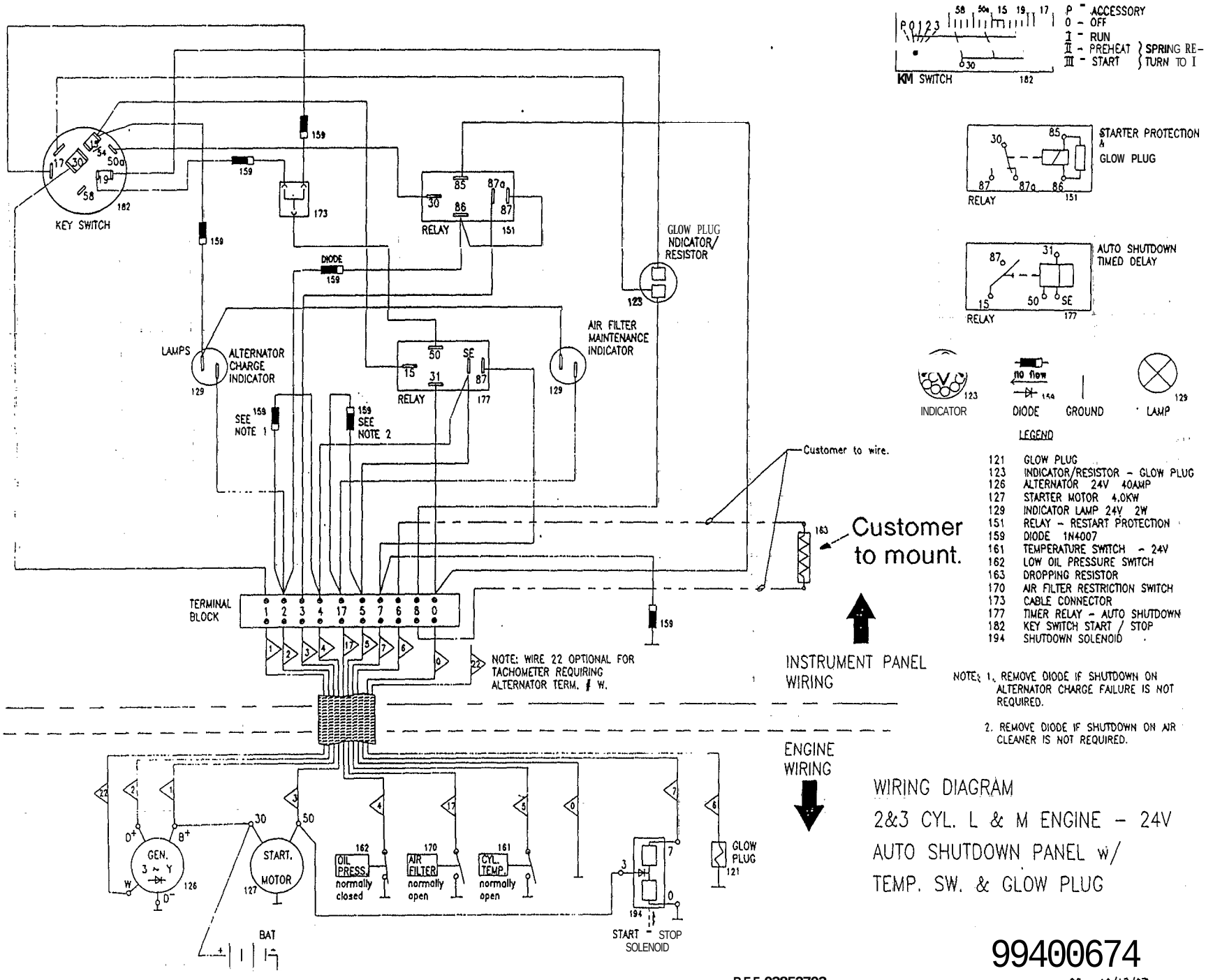
2. REMOVE DIODE IF SHUTDOWN ON AIR CLEANER IS NOT REQUIRED.

WIRING DIAGRAM
4 CYL. L & M ENGINE - 24V
AUTO SHUTDOWN PANEL w/ TEMP. SW. & GLOW PLUG

99400673

REF: 03852703

BE 10/15/97



LEGEND

121	GLOW PLUG
123	INDICATOR/RESISTOR - GLOW PLUG
126	ALTERNATOR 24V 40AMP
127	STARTER MOTOR 4.0KW
129	INDICATOR LAMP 24V 2W
151	RELAY - RESTART PROTECTION
159	DIODE 1N4007
161	TEMPERATURE SWITCH - 24V
162	LOW OIL PRESSURE SWITCH
163	DROPPING RESISTOR
170	AIR FILTER RESTRICTION SWITCH
173	CABLE CONNECTOR
177	TIMER RELAY - AUTO SHUTDOWN
182	KEY SWITCH START / STOP
194	SHUTDOWN SOLENOID

NOTE: 1. REMOVE DIODE IF SHUTDOWN ON ALTERNATOR CHARGE FAILURE IS NOT REQUIRED.

2. REMOVE DIODE IF SHUTDOWN ON AIR CLEANER IS NOT REQUIRED.

WIRING DIAGRAM
2&3 CYL. L & M ENGINE - 24V
AUTO SHUTDOWN PANEL w/ TEMP. SW. & GLOW PLUG

99400674

REF 03852703

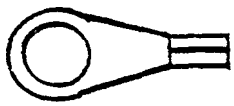
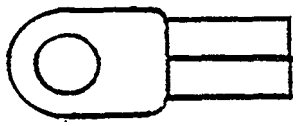
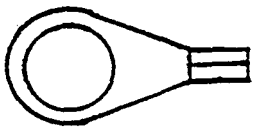
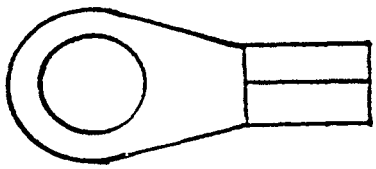
BE 10/17/97

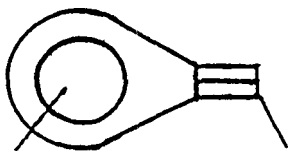
ELECTRICAL HARDWARE PARTS LIST

HATZ DIESEL OF AMERICA, INC.
W229 N1645 WESTWOOD DRIVE
P.O. BOX 258
WAUKESHA, WI 53187-0258

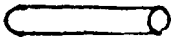
August *2000*

Ring Terminals

Stud *Size*	Wire Size	American Gage Size	Part Number	Sample
4	1,4	16	50074200	
4	2,4	12-14	50112700	
5	1,4	16	50006600	
5	2,5	12-14	50006700	
5	3,4	6-8	50006900	
5	16	4-6	50196400	
6	1	16	50137100	
6	2,5	12-14	50007100	
6	3,4	6-8	50007200	
8	2,5	12-14	50007400	
8	6	10	50007500	
8	10	6	50167200	
10	*6*	10	50007700	
12	9,5		50063400	

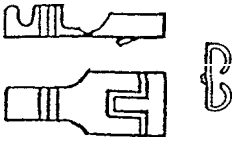


Terminals

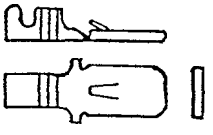


Butt Connector
P/N – 50189200 – 15 X 1mm

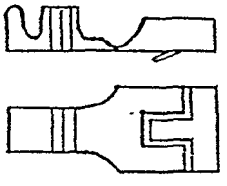
Open Barrel Tab Terminals



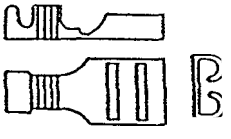
Locking Tab – Female "A" Terminal
P/N – 50331100 – 6,3 X 1mm
P/N – 40074700 – 6,3 X 1-4mm
P/N – 50196700 – 6,3 X 6mm



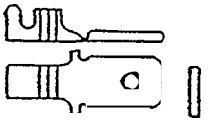
Locking Tab – Male "B" Terminal
P/N – 40103200 – 6,3 X 1mm
P/N – 40098700 – 6,3 X 1-4mm



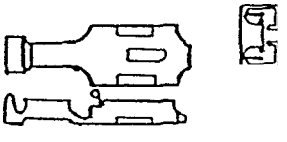
Locking Tab – Female "C" Terminal
P/N – 50276800 – 9,5 X 6mm



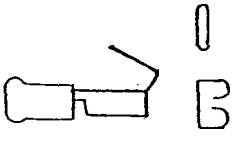
Female – "D" Terminal
P/N – 40043200 – 6,3 X 1,4mm
P/N – 50162000 – 6,3 X 6mm



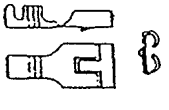
Male – "E" Terminal
P/N – 50184000 – 6,3 X 1-4mm



Dual Locking – Female "F" Terminal
P/N – 50350100 – 6,3 X 1mm
P/N – 50350200 – 6,3 X 2,5mm

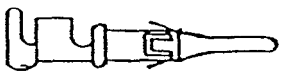


Open Barrel Type – Female and Male "G" Terminal
P/N – 50135300 – 6,3 X 1-4mm

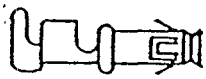


Locking Tab – Female "H" Terminal
P/N – 50157500 – 3,2 X 1-4mm

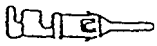
Pin & Socket Terminals



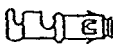
Pin – "I" Terminal
P/N – 50374100 – 2,5 X 2,5mm
P/N – 50374300 – **2,5** X 2,5-4mm



Socket – "J" Terminal
P/N – 50373800 – **2,5** X 0,5-1mm
P/N – 50373900 – 2,5 X 1,5-2,5mm
P/N – 50374000 – 2,5 X **2,5-4mm**



Pin – "K" Terminal
P/N – 50351000 – 1,5X 0,75-1,5mm

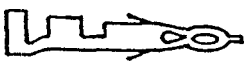


Socket – "L" Terminal
P/N – **50350900 – 1,5 X** 0,75-1,5mm

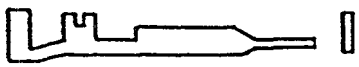
Pin – "M" Terminal
P/N – 50352600 – **3,5** X **2,5-4mm**

Socket – "N" Terminal
P/N – 50352500 – 3,5 X 2,5-4mm

Spade – "O" Terminal
(Murphy Gauge Panel Terminal)
P/N – 99400198
P/N – 99400199

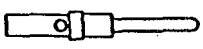


Pin – "P" Terminal
(Princeton Forklift Terminal)
P/N – 50393700 – **3/32** X **16g.**



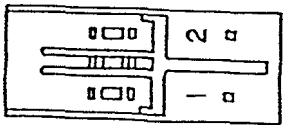
Spade – "Q" Terminal
(Princeton Forklift Terminal)
P/N – 50393800 – ¼ X **10-14g.**

Socket – "R" Terminal
P/N – 50472300 – 1,5 X **1,0-1,5mm**

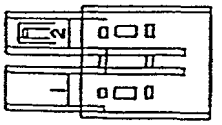


Pin – "S" Terminal
P/N – 50407000 – 1,5X 1,0-1,5mm

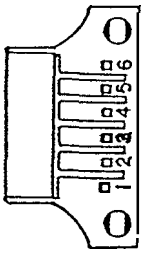
Connector Plugs



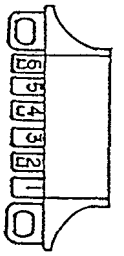
P/N – 50379700
Uses "I" Terminals



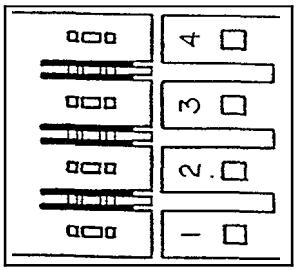
P/N – 50379800
Uses "J" Termipals



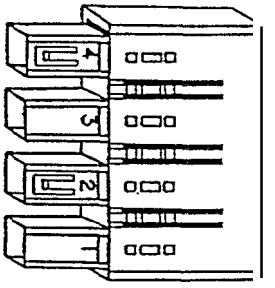
P/N – 50373600
Uses "I" Terminals



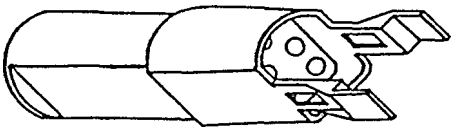
P/N – 50373700
Uses "J" Terminals



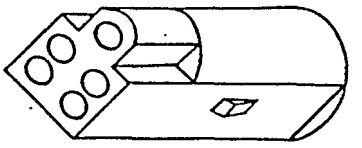
P/N – 50402000
Uses "I" Terminals



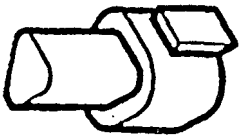
P/N – 50402100
Uses "J" Terminals



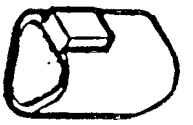
PAY-50351200
Uses "K" Terminals



P/N – 50351100
Uses "L" Terminals

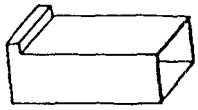


P/N – 50498500
Uses "S" Terminals

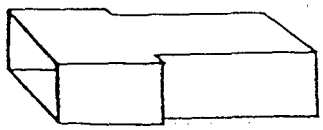


P/N – 50472400
Uses "R" Terminals

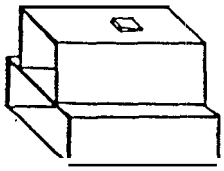
Connector Plugs



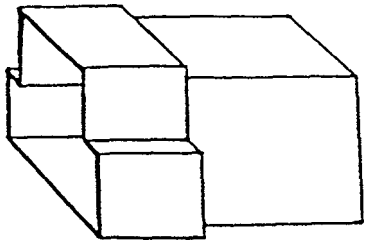
Phi–40103300
Uses "A" Terminals



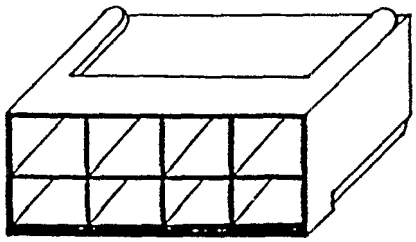
P/N – 40098800
Uses "B" Terminals



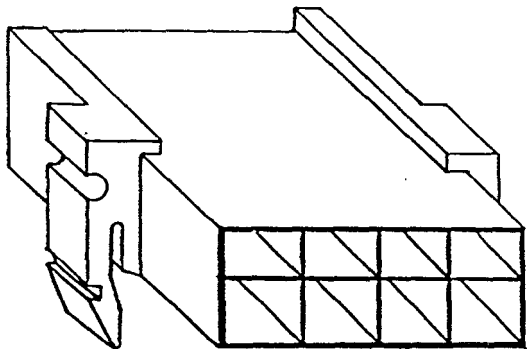
P/N – 40103400
Uses "A" Terminals



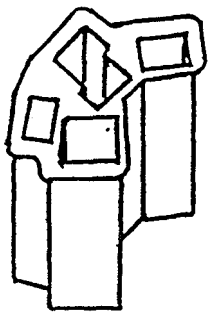
P/N – 40103500
Uses "B" Terminals



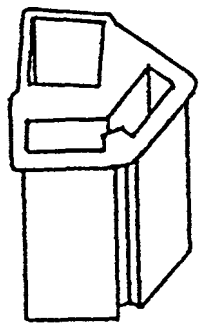
P/N – 50324600
Uses "A" Terminals



P/N – 50324700
Uses "B" Terminals

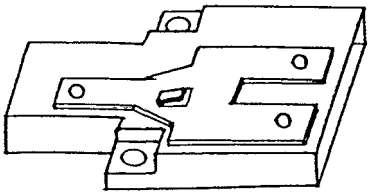


P/N – 50276700
Uses "A" Terminals



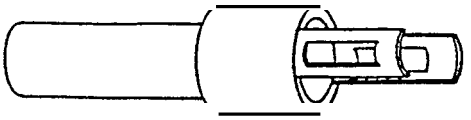
P/N – 50276600
Uses "C" Terminals

Connector Plugs

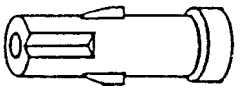


P/N – 50190700
Uses "D" terminals

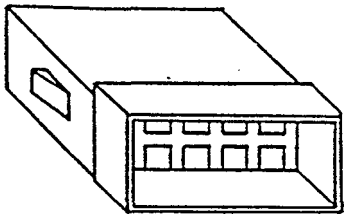
P/N – 50350300
Uses "F" Terminals



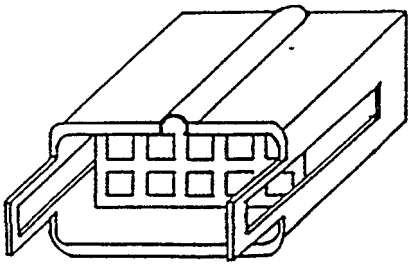
PIN – 50352700
Uses "M" Terminals



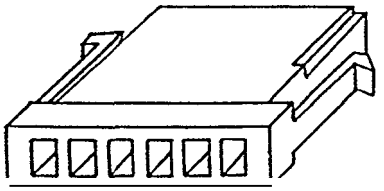
P/N – 50352800
Uses "N" Terminals



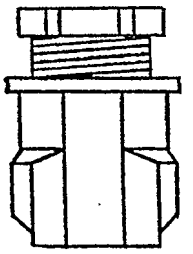
P/N – 99400196
Uses "O" Terminals
For Murphy Gauge Panel



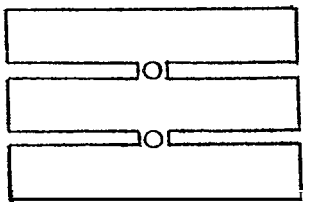
P/N – 99400197
Uses "O" Terminals
For Murphy Gauge Panel



P/N – 50283900
Uses "A" Terminals
Voltage Regulator Plug –
70 Series

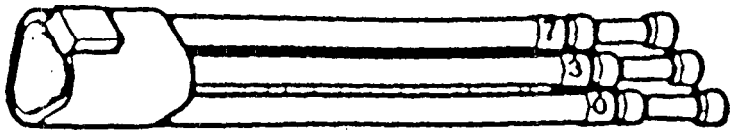


P/N – 50159011 Socket
P/N – 50159100 Nut



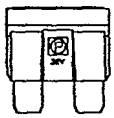
P/N – 50434000
Uses "A" Terminals

Pigtail Assemblies

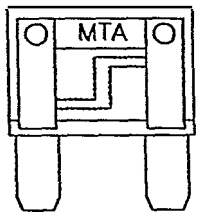


P/N – 01651500
Complete Pigtail Assembly

Fuses

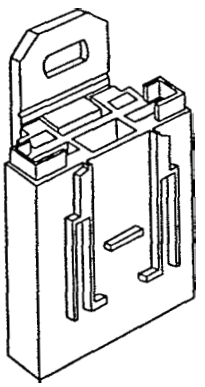


10 amp – P/N – 50459300
30 amp – P/N – 50430700
40 amp – P/N – 50433000

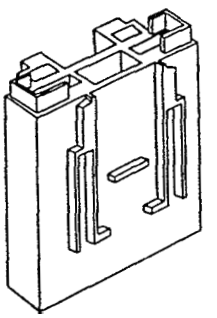


20 amp – P/N – 50486900
50 amp – P/N – 50485400

Fuse Holders

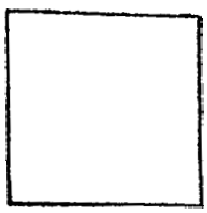


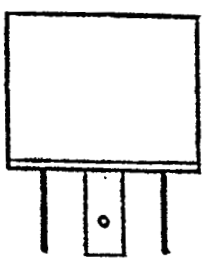
P/N – 50485900 Mounting Bracket (on backside of fuse holder) with P/N – 50485800 Fuse Holder

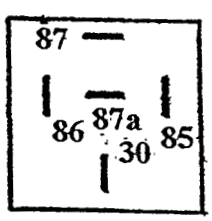


P/N – 50485800 Fuse Holder

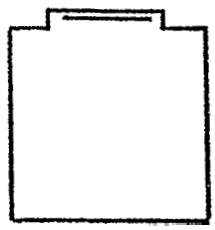
Relays and Bases

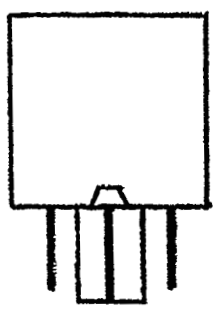


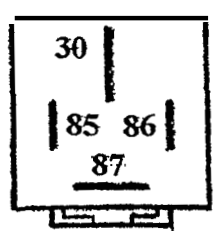




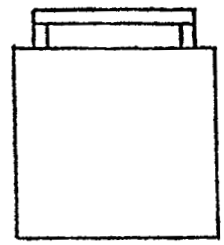
Relay
12V 20/30A P/N – 50277701
24V 10/20A P/N – 50277801

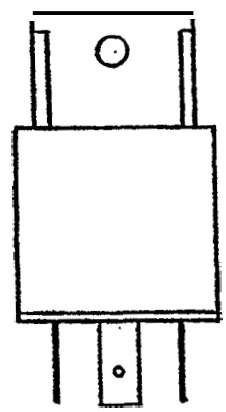


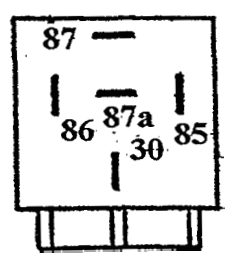




Relay
12V 70A PN-50432700
24V 40A P/N – 50454000

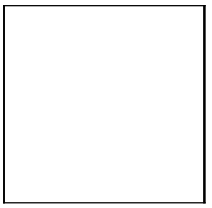


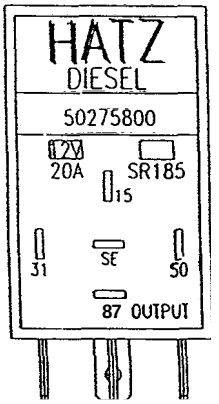




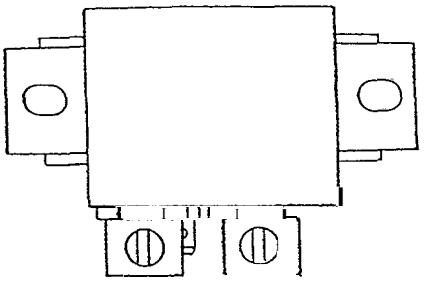
Relay
12V 20/30A P/N – 50162100

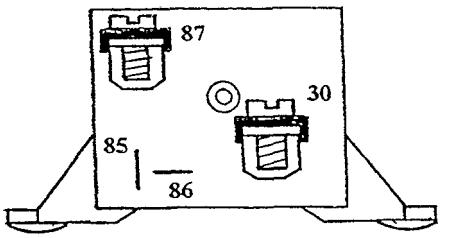
Relays and Bases

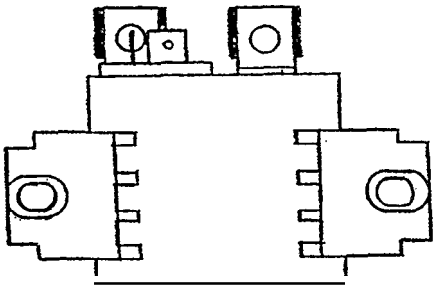




Relay
12V 20A P/N – 50275802
24V 20A P/N – 50275902

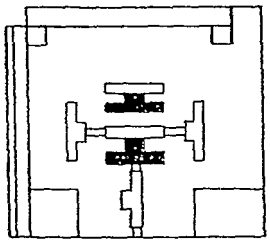


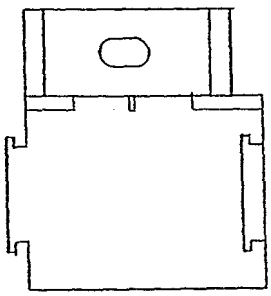


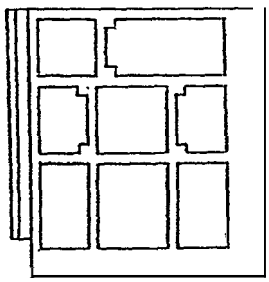


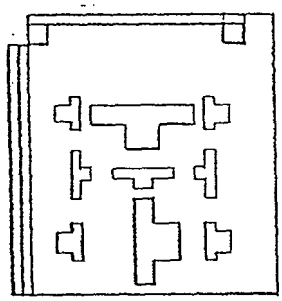
Relay
12V 75A P/N – 40100200

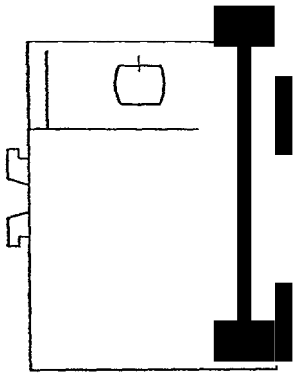
Relays and Bases

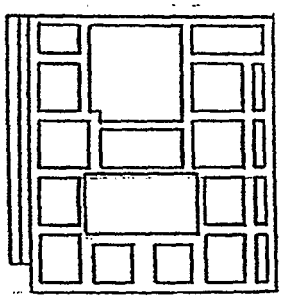










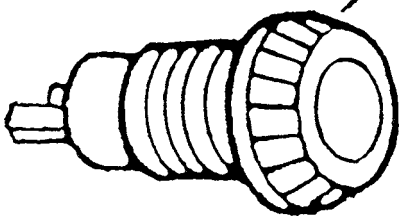


Relay Base
P/N – 50276000
Uses "A" Terminals
To be used with:
12V 20/30A P/N – 50277701 relay
24V 10/20A P/N – 50277801 relay

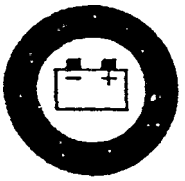
Relay Base
P/N – 50432800
To be used with:
12V 70A P/N – 50432700 relay
24V 40A P/N – 50454000 relay

Indicator Lights

Light Socket Assembly



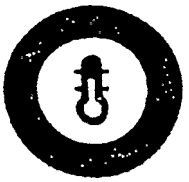
Bulb
P/N – 40009700 12V-2W
P/N – 40009800 24V-2W



Charging Indicator Socket
PN–50176500

Air Restriction Socket
P/N – 50182400

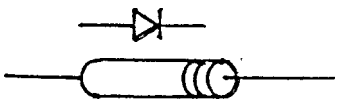
Low Oil Pressure Socket
P/N- 50176600



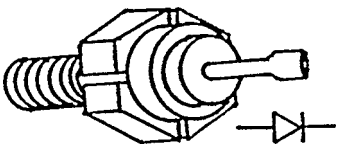
High Head Temperature Socket
P/N - 50176400

Diodes

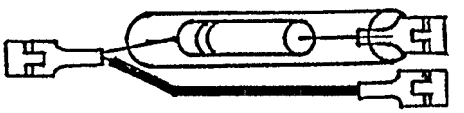
Symbol



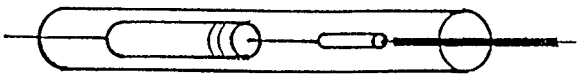
Diode
P/N – 50344400



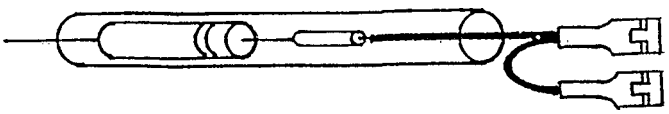
Diode M8 X 1.25 Thread
P/N – 40027900



Diode Assembly – Length = 90mm
P/N – 01178700



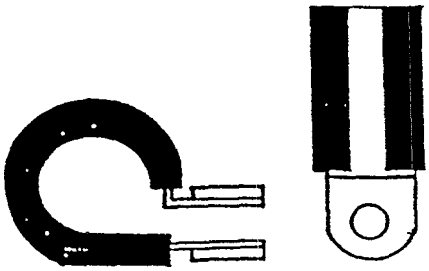
Diode Assembly – Length = 185mm
P/N – 01150101



Diode Assembly – Length = 320mm
P/N - 01154901

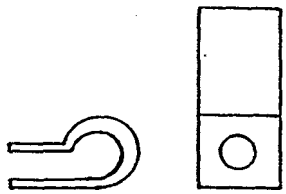
Cable Fastening Hardware

Insulated Cable Clamps



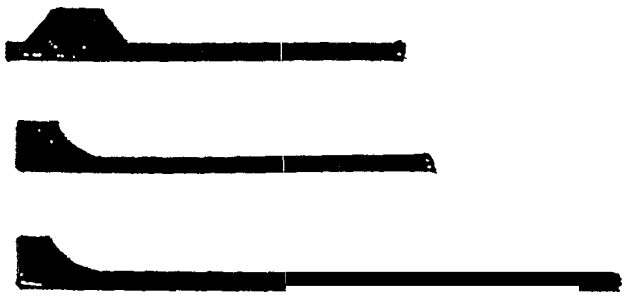
Bolt Hole Size	Clamp Area	Part Number
M6	10mm	50173500
M6	14mm	50158400
M6	21mm	50190310
M8	21mm	50197010

Non-insulated Cable Clamps



Bolt Hole Size	Clamp Area	Part Number
M8	12mm	03165500
M10	12mm	03538000

Wire Ties

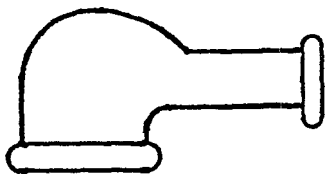


P/N – 40092700
120mm long X 5mm wide

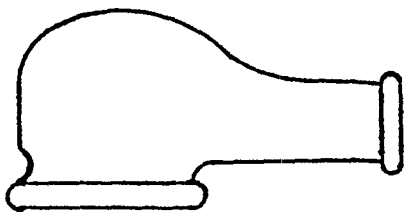
P/N – 50358400
180mm long X 5mm wide

P/N – 50167400
290mm long X 5mm wide

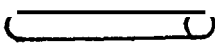
R omp ents



Rubber Boot
P/N – 40026700



Rubber Boot
P/N – 40026600



Rubber Sleeves
P/N – 50160300 2mm dia. X 20mm long
P/N – 50160500 3mm dia. X 25mm long

LETTER SYMBOLS AND ABBREVIATIONS

A - Ampere

ac - Alternating current

Ah - Ampere hour

Alt - Alternator

am - Ammeter

amp - Ampere

ampl - Amplifier

assy - Assembly

auto - Automatic

aux - Auxiliary

avg - Average

AWG - American Wire Gauge

B - Base

B - Battery terminal

B+ - Positive battery terminal or wire

Batt - Battery

C - Capacitor

C - Capacitance

LETTER SYMBOLS AND ABBREVIATIONS (cont.)

C - Collector

cal - Calibrate

cap - Capacitor

cm - Centimeter

cmil - Circular mil

CMOS - Complementary metal-oxide semiconductor

dB - Decibel

dc - Direct current

DF - Alternator field terminal or wire

DF - Generator field terminal or wire

Disc - Disconnect

D- - Ground terminal or wire

dp - Double-pole

dpdt - Double-pole, double-throw

dpst - Double-pole, single-throw

D+ - Alternator excitation terminal or wire

dt - Double-throw

DTL - Diode-transistor logic

LETTER SYMBOLS AND ABBREVIATIONS (cont.)

DVOM - Digital voltohm meter

E - Voltage

E - Electromotive force

E - Emitter

F - Farad (Capacitor value)

fb - Fuse block

FET - Field-effect transistor

fil - Filament

fu - Fuse

G - Generator

G - Ground

G - Gelb (yellow)

G - Giga (10^9)

g - Wire gauge

g - Grounded

gnd - Ground

hv - High voltage

Hz - Hertz

LETTER SYMBOLS AND ABBREVIATIONS (cont.)

I - Current

I - Input

IC - Integrated circuit

incr - Increase

ind lp - Indicating Lamp

inp - Input

insp - Inspect

inst - Install

inst - Installation

instr - Instrument

insul - Insulate

insul - Insulation

jb - Junction box

jct - Junction

K - Kilo (10^3)

K^ - Kilohm (1,000)

kV - Kilovolt

kW - Kilowatt

LETTER SYMBOLS AND ABBREVIATIONS (cont.)

lim sw - Limit switch

lr - Load resistor

M - Mega (10^6)

M - Motor

m - Meter or Milli (10^{-3})

M - Megohm (1,000,000)

M^2 - Square meter

mA - Milliamp (.001)

mag - Magnet

mm - Millimeter

mm^2 - Square millimeter

ms - Millisecond

mV - Millivolt (.001)

mW - Milliwatt (.001)

n - Nano (10^{-9})

N-m - Neuton meter

nc - Normally closed

nc - No connection

nc - No coil

LETTER SYMBOLS AND ABBREVIATIONS (cont.)

neut - Neutral

no - Normally open

opr - Operator

out - Output

P - Pico (10^{-12})

p - Pole

pc - Printed circuit

pF - Picofarad

ph - Phase

pos - positive (+)

pwr - Power

R - Resistance

res - Resistor:

rect - Rectifier

rgltr - Regulator

rly - Relay

rpm - Revolutions per minute

S - Signal power

s - Second (time)

sig - Signal

snsr - Sensor

sol - Solenoid

sw - Switch

t sw - Temperature switch

t - Temperature

t - Time

tb - Terminal board

tm - Temperature meter

TTL - Transistor-transistor logic

V - Volt

vac - Vacuum

wm - Voltmeter

vr - Voltage regulator

W - Watt

wdg - Winding

wg - Wire gauge

wm - Wattmeter

LETTER SYMBOLS AND ABBREVIATIONS (cont.)

wrg - Wiring

wtrprf - Waterproof

µ - Micro (10^{-6})

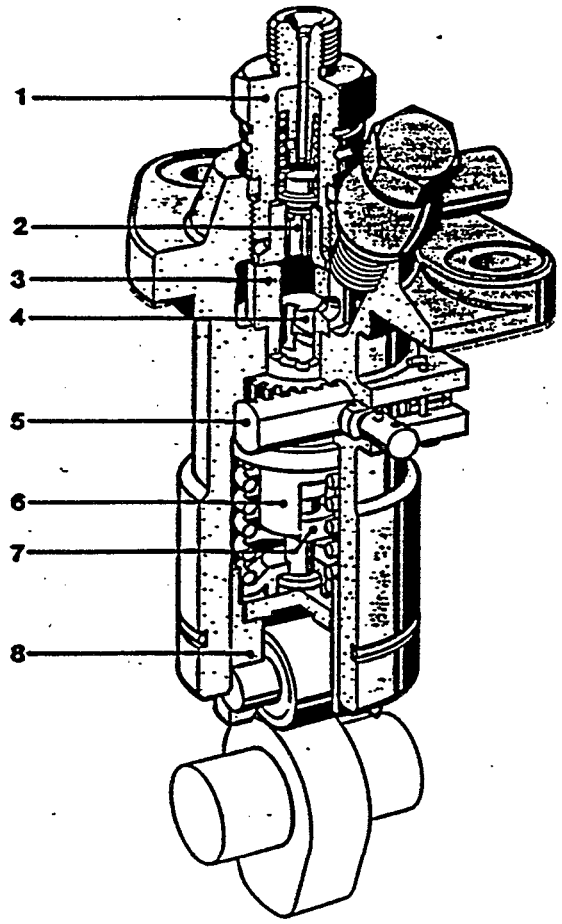
µa - Microamp (.000001)

µf - Microfarad (.000001)

µv - Microvolt

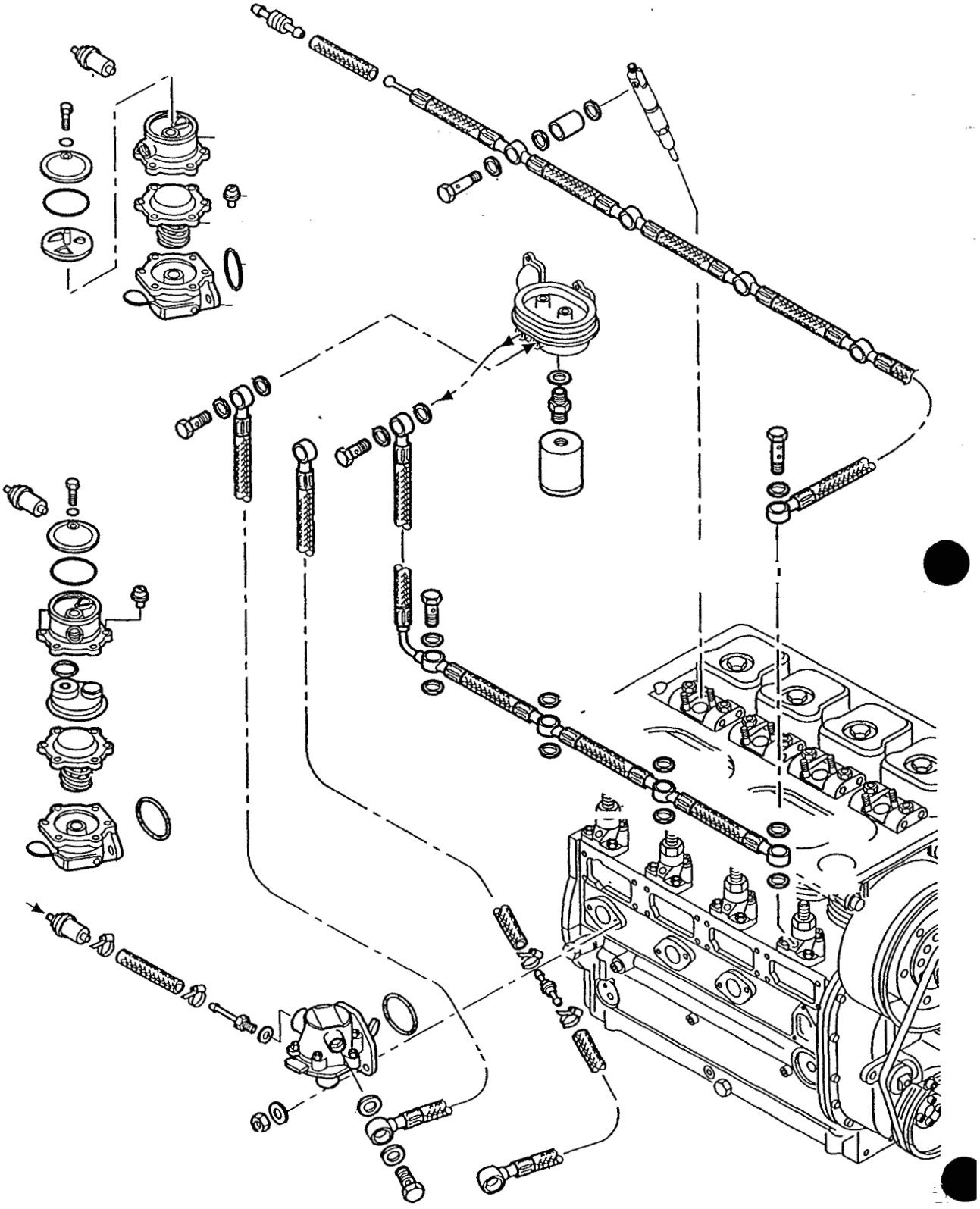
µw - Microwatt

FUEL SYSTEMS.

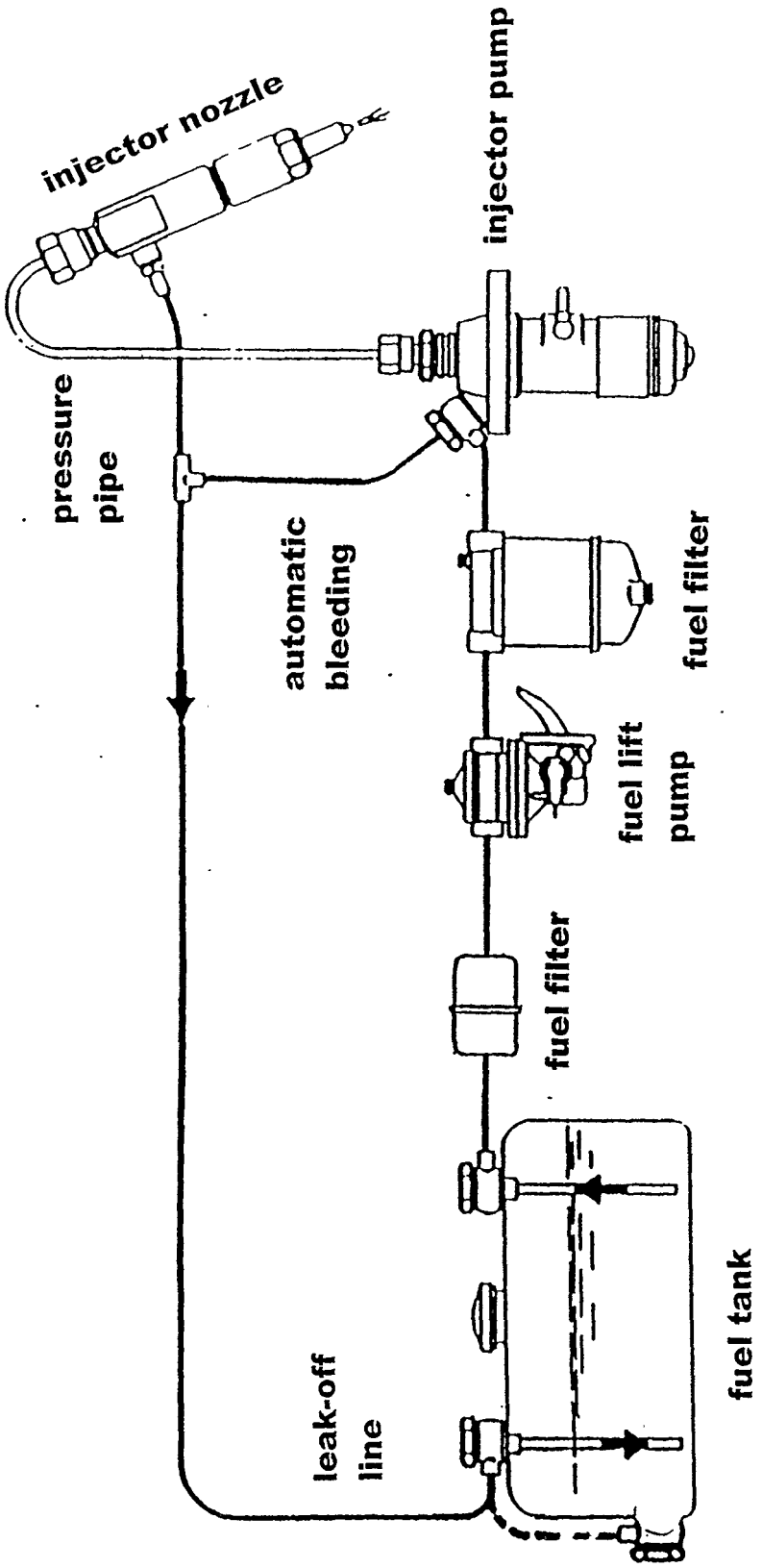


Section through Type PFR 1 K.
1 Delivery-valve holder. 2 Delivery valve, 3 Pump barrel, 4 Pump plunger. 5 Control rod, 6 Control sleeve, 7 Plunger control arm, 8 Roller tappet.

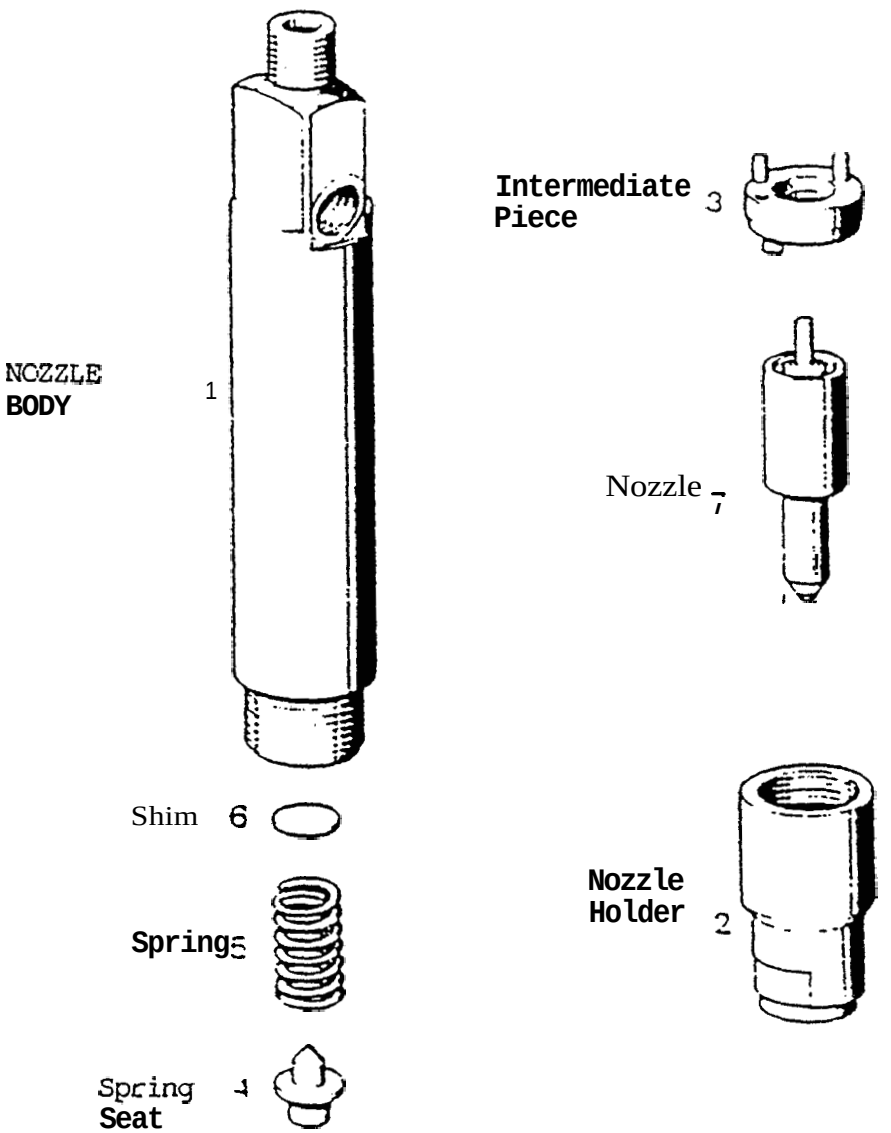
L/M Series Fuel System



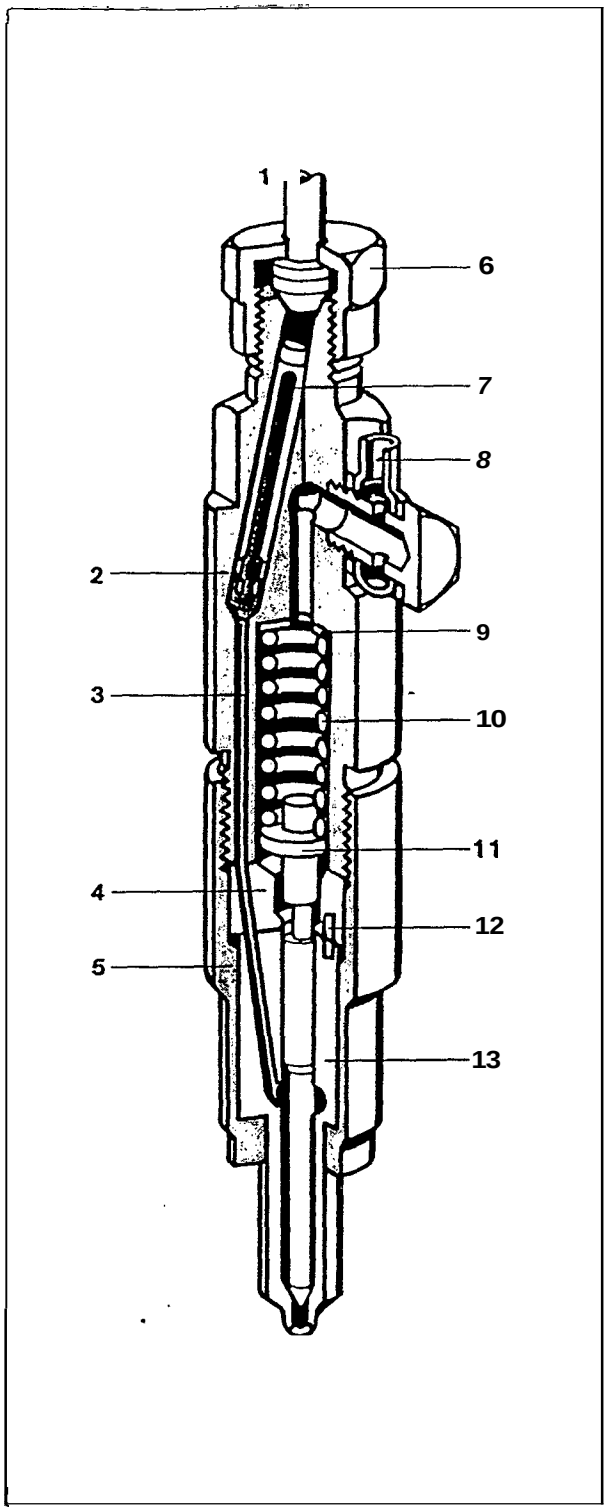
FUEL CIRCUIT



INJECTOR


NOZZLE
BODY
1
Intermediate
Piece
3
Nozzle
7
Shim
6
Nozzle
Holder
2
Spring
5
Spring
Seat
4

NOZZLE AND HOLDER ASSEMBLY



1 Inlet, 2 Holder body, 3 Pressure channel, 4 Intermediate disc, 5 Nozzle-retaining nut, 6 Union nut for fuel-injection tubing, 7 Edge-type filter, 8 Leak-off port, 9 Pressure-adjusting shims, 10 Pressure spring, 11 Pressure spindle, 12 Locating pins (locating the nozzle), 13 Injection nozzle.

Nozzle-Holder Assembly Operation

The nozzle-holder assembly is used for fastening the injection nozzle in the cylinder head of the engine. It establishes the connection with the injection tubing and contains a spring which determines the nozzle-opening pressure.

Construction

The nozzle-and-holder assembly consists of the nozzle holder and injection nozzle together. The nozzle holder consists of the holder body, intermediate disc and nozzle-retaining nut as well as the pressure spindle, pressure spring, pressure-adjusting shims and locating pins (not in the case of pintle nozzles.

The injection nozzle is fastened centrally in the holder body with the nozzle-retaining nut. When the holder body and the nozzle-retaining nut are screwed together the intermediate disc is pressed against the flat face of the holder body. The pressure spindle, pressure spring and pressure-adjusting shims are located in the holder body. The pressure spring is guided by the pressure spindle while the pressure spindle itself is guided by the nozzle needle.

In the holder body the pressure channel leads to the inlet bore of the nozzle body and thus connects the nozzle to the fuel-injection tubing of the injection pump. Depending on the area of application of the nozzle holder an edge-type filter may be installed in the pressure channel of the holder body.

Operation

The pressure spring in the holder body presses on the nozzle needle via the pressure spindle. The initial tension of this spring determines the opening pressure of the injection nozzle. The opening pressure is adjusted by means of pressure-adjusting shims. The fuel reaches the nozzle seat via the respective inlet bore in the holder body, intermediate disc and injection nozzle. During injection the injection pressure lifts up the nozzle needle and the fuel flows into the combustion chamber through the blind hole and the spray holes. When the injection pressure drops the spring forces the nozzle needle back onto its seat, thus terminating the injection of fuel.

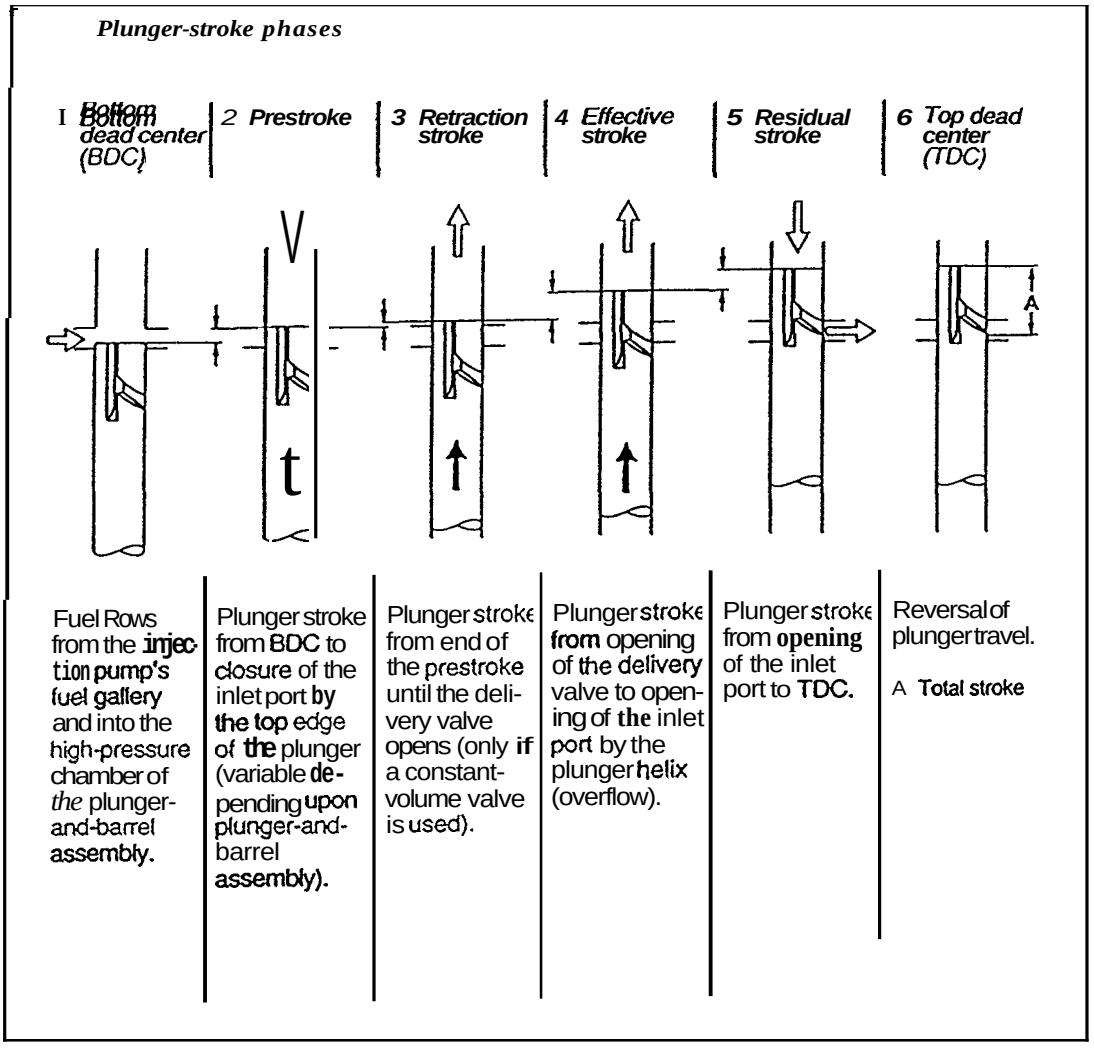
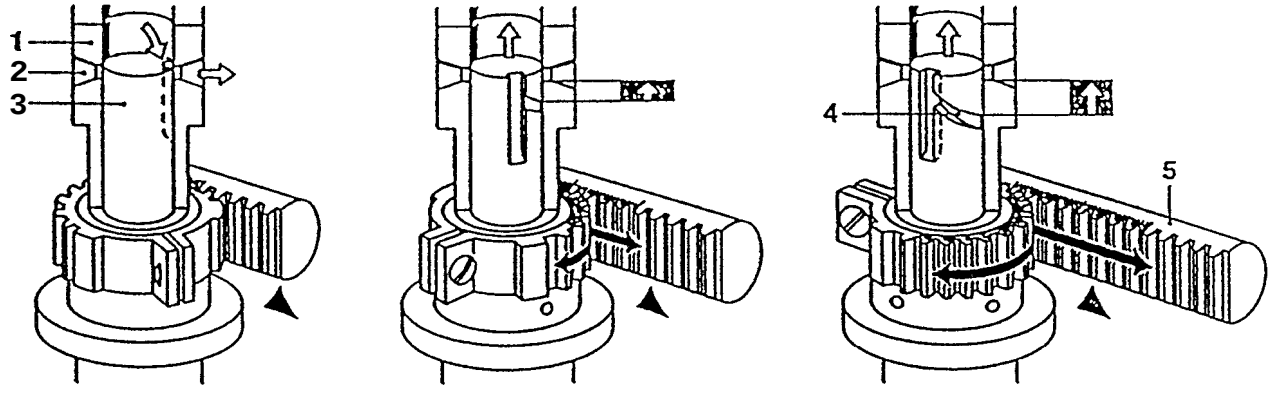

Plunger-stroke phases
1 Bottom dead center (BDC)
2 Prestroke
3 Retraction stroke
4 Effective stroke
5 Residual stroke
6 Top dead center (TDC)
t
A
Fuel flows from the injection pump's fuel gallery and into the high-pressure chamber of the plunger-and-barrel assembly.
Plunger stroke from BDC to closure of the inlet port by the top edge of the plunger (variable depending upon plunger-and-barrel assembly).
Plunger stroke from end of the prestroke until the delivery valve opens (only if a constant-volume valve is used).
Plunger stroke from opening of the delivery valve to opening of the inlet port by the plunger helix (overflow).
Plunger stroke from opening of the inlet port to TDC.
Reversal of plunger travel.
A Total stroke

Figure 4

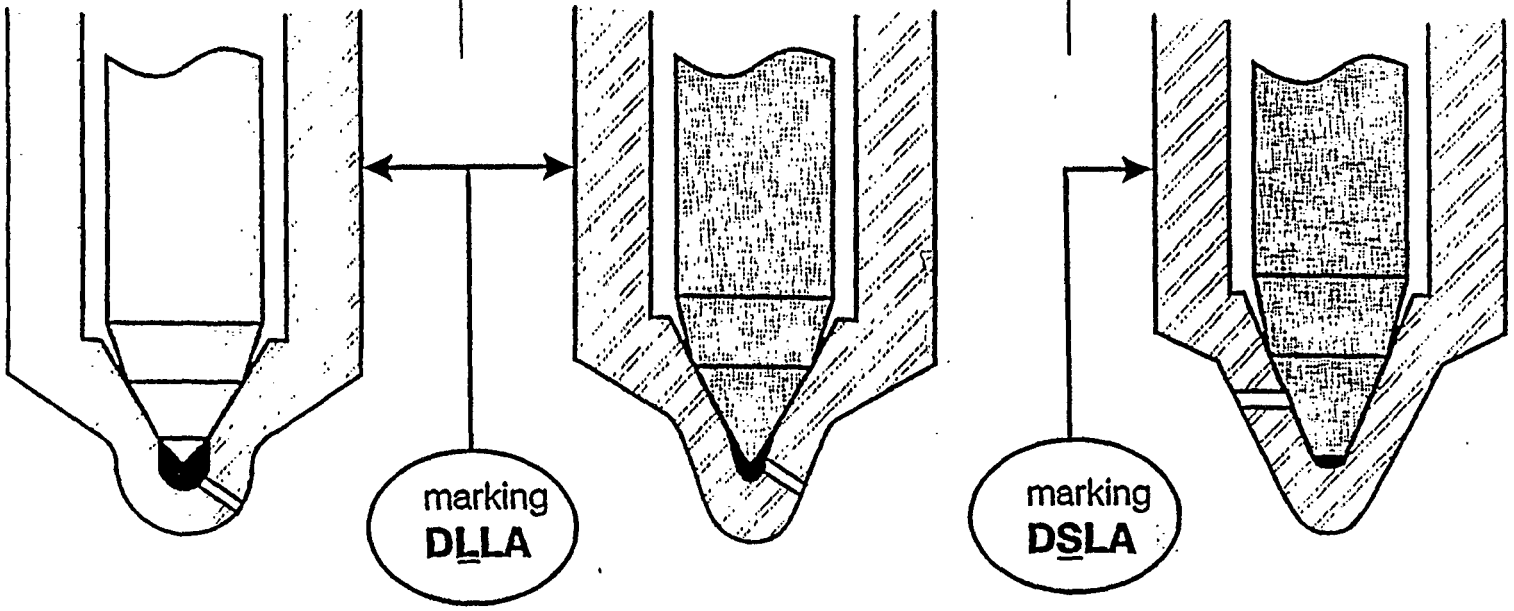
Fuel-delivery control

Using a toothed control rack. a) Zero delivery, b) Partial delivery, c) Maximum delivery.
1 Pump barrel, 2 Inlet port, 3 Pump plunger, 4 Helix, 5 Control rack.

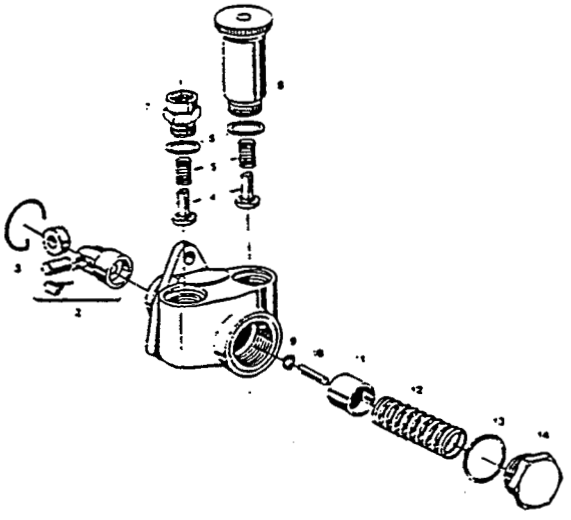


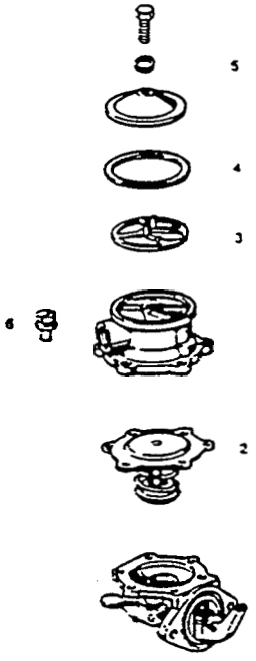
Executions'of direct injection (multi-hole) nozzles

A	B	C
Standard sac-hole nozzle 1D 30 - 35 - 40 - 60 - **80** 2 **G.. / Z7...** L / M 30 - 31 - 40	**Sac-hole nozzle** **wfth reduced sac-volume** 1D31**/41**	**Seat-hole nozzle** 1D81 L / M 41



FUEL PUMP

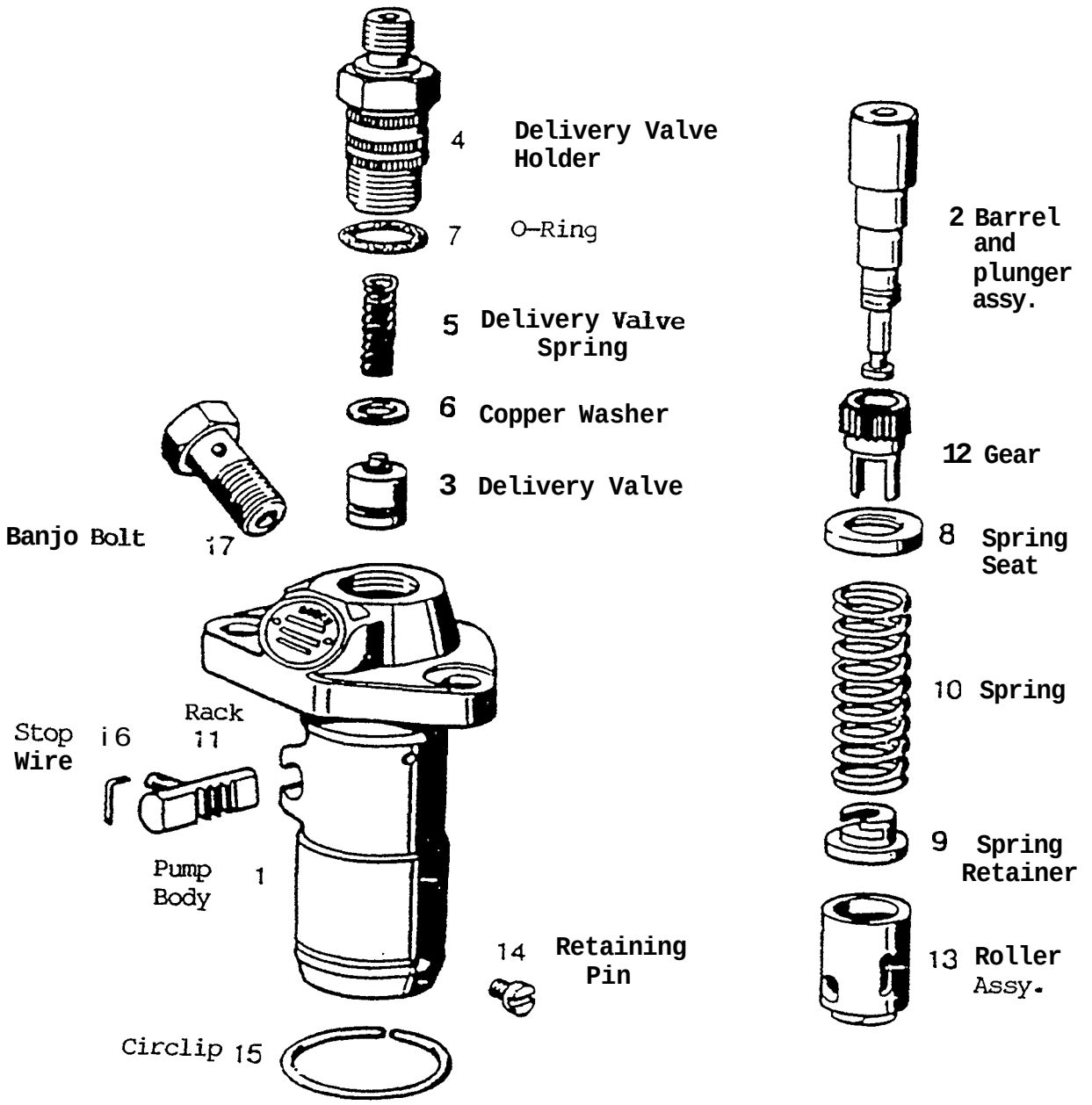




Piston style fuel pump
P/N **50242400**
Used with JET FUELS
JP4,JP5,&JP8
Pressure range Approx.
40 p.s.i. (2.75 bar)

Diaphragm style fuel pump
P/N – 01562700
Used with DIESEL FUELS:
Diesel 1 and Diesel 2
Pressure range of approx.
4 to 6 p.s.i. (0.3 to 0.4 bar)

INJECTION PUMP



On the subject of injection pumps:

Why individual injection pumps ?

The system of individual injection pumps is an outstanding characteristic of the HATZ multi-cylinder series L31, L40, M40, L41 and M41.

The logistic advantages

- **One single type of pump:** All types of engines from these series are equipped with the same injection pump irrespective of the power and speed,
- *One* **single type of governor:** Easily adjustable to all control requirements. All engines are equipped with the same speed control governor,
- **One single type of pressure pipe for all cylinders:** The extremely short lengths of lines are an additional advantage - the pumps are installed directly in front of the cylinders. More precise injection for the entire range of speed and load, The results is economic use of the fuel with the minimum thermal and mechanical loading of the engine.

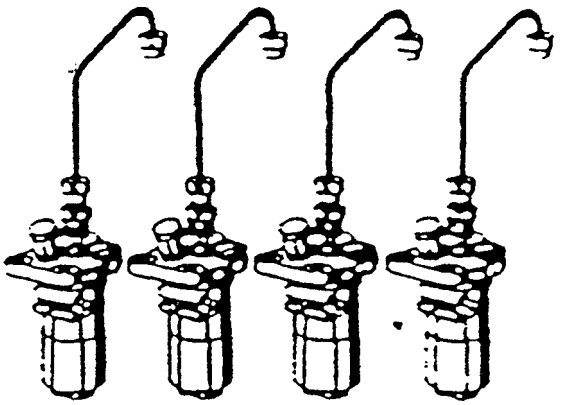
The service advantages

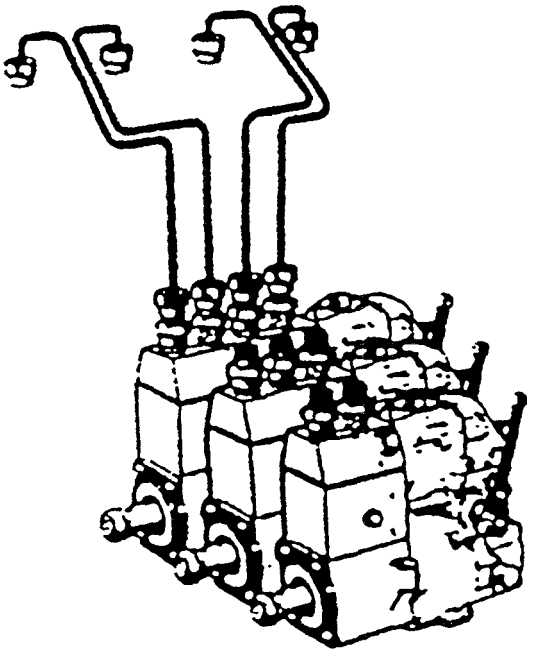
-No special tools or special knowledge is necessary for the exchange of injection pumps,
- The time taken for the exchange of pumps is 1/3 of the time necessary for in-line pumps.
- The danger of incorrect fuel adjustment, exhaust and noise emission is eliminated by a simple exchange.
- New or exchange pumps are ready for installation. The previous adjustment at the test bench is unnecessary because full load and speed are adjusted on the engine,
- Immediate availability, because of the low cost of storage the injection pumps may be stored by the user himself. In-line pumps are usually not stored for economic reasons but are repaired. This could mean considerable waiting times.
- In the case of failure of one pump element only this individual pump must be changed.
- In the case of in-line pumps, all elements must be changed and and the engine is out of action.

The financial advantages

- Three new injection pumps for a three cylinder engine cost approx. 40% of a corresponding in-line pump.
- When only one element is faulty the costs are reduced to a third for the injection pump. For the in-line pump the costs remain the same, as in every case all elements have to be changed.
- Even on changes of pumps alone, there is a time-savings of approx. 2 hours, which results in saving on costs.
- The immediate availability of pumps, the shorter time needed for the replacement, and the fact that an adjustment at the test bench is not needed, reduces the non-productive times for machines and the consequential costs.

The HATZ system of injection pumps simplifies storage, reduces labor and the non-productive times for machines - it is an economic solution and *easy* for maintenance.





HATZ DIESEL OF AMERICA, INC.
W229 N1645 WESTWOOD DRIVE
P.O. BOX 258
WAUKESHA, WI 53186-0258
PHONE: (414) 544-0254

Service Bulletin

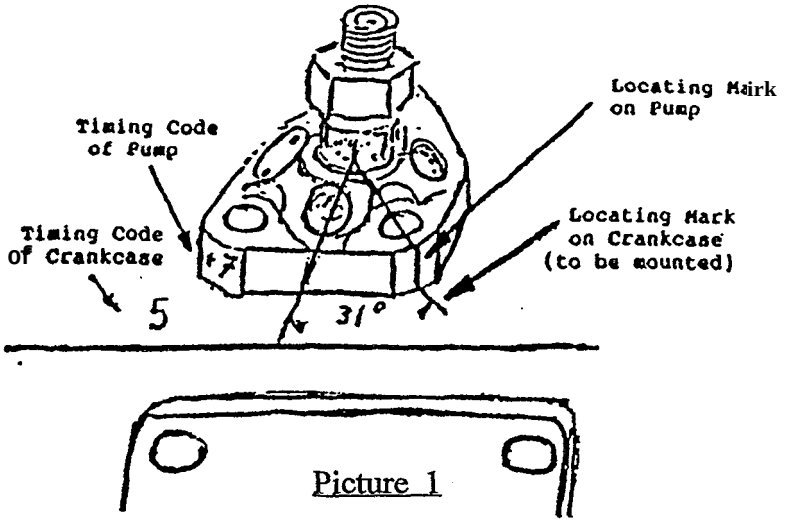
SPL 112A

SUBJECT: Adjustment of Injection Pump Timing for Models Using Number ~~50263000~~* Injection Pumps Marked PFR 1K90A498

Models affected:

2M40	beginning	with	Series	13
3M40	"	"	"	13
4M40	"	"	"	13
2L40	beginning	with	Series	17
3L40	"	"	"	16
4L40	"	"	"	16
2L31	all			
3L31	all			
4L31	all			

Sample serial number:
791385000226



Picture 1

*NOTE: Kit P/N 01268500 includes fuel injection pump, shims, and instructions.

Spill timing is no longer possible with these injection pumps. To determine the correct shim pack to time the engine proceed as follows:

1) Take the number on the injection pump (+7). See Picture 1.
2) Add it to the number stamped in the crankcase (5). Example 7+5=12
3) Move decimal point one place to the left. Example 12= 1.2
4) Your correct shim pack for timing will be 1.2mm thick.
5) When mounting the injection pump to the crankcase, push the pump towards the cylinders and make sure the locating marks are lined up at the right mounting hole. See Picture 1.

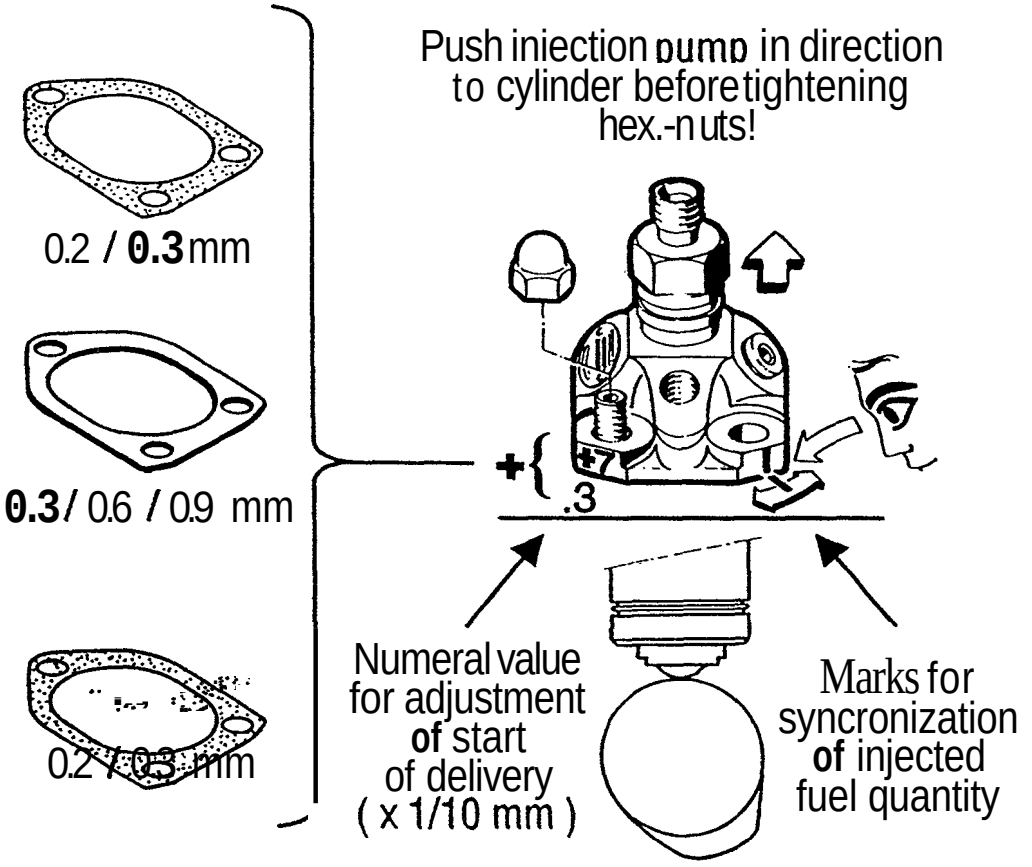
NOTE: Do not break the paint seal at the delivery valve holder or pump calibration could be affected. Also do not mix injection pumps between the old and new style systems.

Also see parts bulletin IMT 85.445

Installation of injection pumps

Adjustment of begin of delivery
Synchronization of injected fuel quantity

2 / 3 / 4 L 31 as from serial No. 10
2 / 3 / 4 L 40 as from serial No. 17/16/16
2 / 3 / 4 M 31 as from serial No. 13
2 / 3 / 4 M 40 as from serial No. 13



Adjustment of start of delivery

Numerical value on injection **pump** housing (Example 7) and crankcase **(Example** .3) have to be added to obtain the **correct** amount of thickness required and combined **by** either **one** shim with **two** gaskets or **one** or **two** gaskets only.

MOTORENFABRIK
HATZ GmbH & Co KG
D-94099 RUHSTORF

Technical advice 95050400

information

☐ SALES
☐ ENGINEERING
☒ SERVICE
☐ PARTS

Bulletin No. **SE 12**

Date **01/14/93**

PRESSURE TEST ADAPTER

In order to rule out an injection pump that is suspected of leaking diesel fuel into the crankcase, it is necessary to pressure test the injection pump.

Air pressure (approximately 30 p.s.i.) is applied through the fuel supply port while the pump is submerged in test oil or fuel.

Additional test instructions are provided in the Hatz Troubleshooting Guide, P/N 00000103.

We are now able to supply a test adapter for this purpose, which is equipped with an "industrial" style quick disconnect fitting, which allows it to be used with your shop air supply.

This adapter has the correct thread for testing all Hatz injection pumps.

Part No.	Description
99400372	Pressure Test Adapter

Price listed is subject to your normal parts discount.

Keith Kichefski
Manager, Service & Product Ed.

BOSCH F.I.P. TYPE DESIGNATION
AS USED WITH HATZ ENGINES

P — Pump

F — External Control

R / E — Roller (R) - Plain Tappet (E)

2 — Double Unit

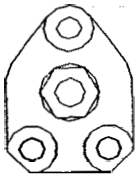
Single Unit

K / A / Q — 3 Screw Housing (4 w/double unit pump)

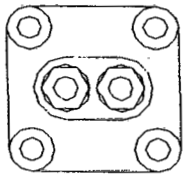
55
60
65
70
75
80
90 — Plunger Dia. (75 = 7.5 mm)

(A) — Not Currently Used

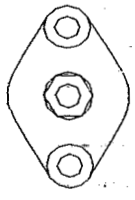
332/1
498
2005 — Specific Build And Tune



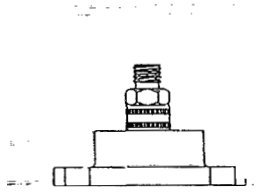
1K



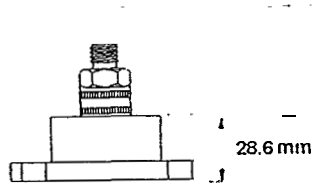
2K



1Q and 1A



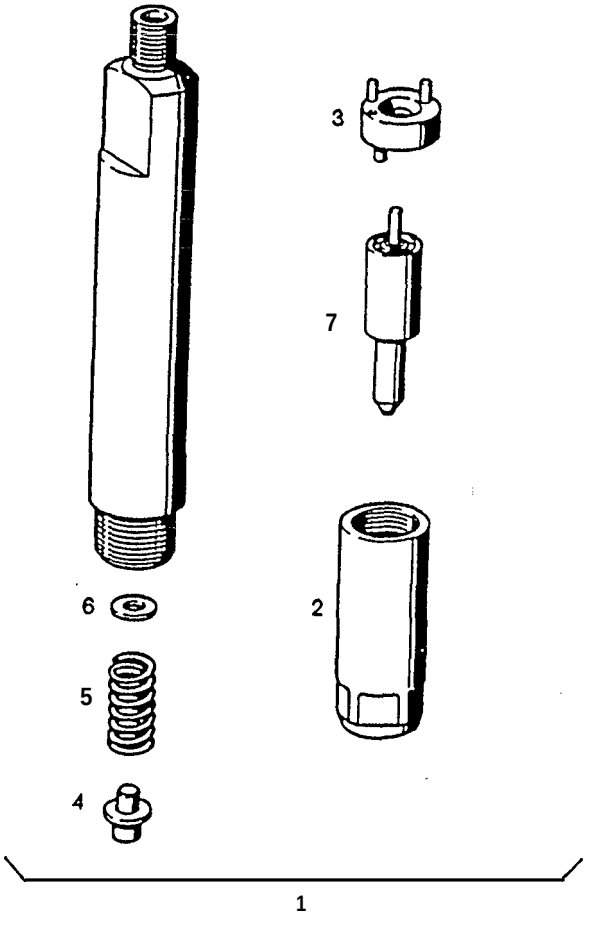
1Q



1A

L/M41

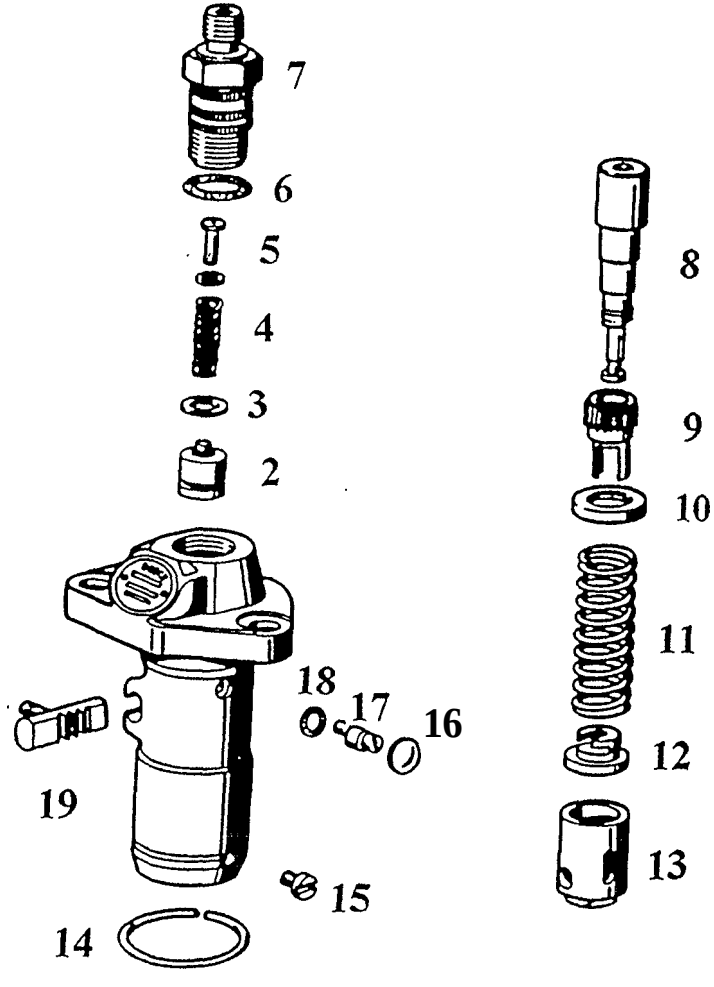
FIG	HATZ PART #	BOSCH PART#	DESCRIPTION
1	504 440 00	0 432 193 722	INJECTOR L/M41
2	490 707 00	2 433 314 053	NOZZLE HOLDER
3	490 709 00	2 430 136 166	INTERNED. DISK
4	490 708 00	2433 124445	PRESSURE SPINDLE
5	490 403 00	2 434 619 040	PRESSURE SPRING
6	490 404 00	2430 101 170	SHIM 1,00
6	490 405 00	2430101 172	SHIM 1,04
6	490 406 00	2430 101 175	SHIM 1,10
6	490 407 00	2430 101 177	SHIM 1,14
6	490 408 00	2 430 101 180	SHIM 1,20
6	490 409 00	2430 101 182	SHIM 1,24
6	490 410 00	2430 101 185	SHIM 1,30
6	490411 00	2430 101 187	SHIM 1,34
6	490 412 00	2 430 101 190	SHIM 1,40
6	490 413 00	2430 101 192	SHIM 1,44
6	490 414 00	2 430 101 195	SHIM 1,50
6	490 415 00	2430 101 197	SHIM 1,54
6	490 416 00	2 430 101 200	SHIM 1,60
6	490 417 00	2 430 101 202	SHIM 1,64
6	490 418 00	2 430 101 205	SHIM 1,70
6	490 419 00	2 430 101 207	SHIM 1,74
6	490 420 00	2 430 101 210	SHIM 1,80
6	490421 00	2 430 101 212	SHIM 1,84
6	490 422 00	2430 101 215	SHIM 1,90
6	490 423 00	2 430 101 217	SHIM 1,94
7	504441 00	0 433 175 130	NOZZLE **DSLA** 150P645 L/M41



L/M41

PFR 1K90A546

FIG	HATZ PART#	BOSCH PART#	DESCRIPTION
1	015 448 00	0414 191 010	INJECTION PUMP L/M41
2	490 739 00	3 418 520 004	DELIVERY VALVE
3	490 044 00	1 410 105 001	COPPER SEAL RING
4	490 036 00	1 414 613 013	DEL. VALVE SPRING
5	490 557 00	1413 121 016	GUIDING PIN
6	504 765 00	1410210017	O-RING 17 X 2
7	490 552 00	3 413 372 020	CONNECTOR
8	490 740 00	9412 038 356	DELIVERY VALVE
9	490 553 00	341630000'1	CONTROL SLEEVE
10	490 050 00	1 410 501 000	SPRING PLATE
11	490 554 00	3 414 619 005	PLUNGER SPRING
12	490 741 00	9 411 030 530	SPRING PLATE
13	503 315 01	3 418 700004	ROLLER TAPPET CPL.
14	490 327 00	3 414 603 002	LOCKING RING
15	490 557 00	3413 121 016	GUIDING PIN
16	504 776 00	4 70 AL	JOINT WASHER
17	490 090 00	3413 180000	ECCENTRIC PIN
18	490 091 00	3 410 210 004	O-RING
19	490 742 00	3 416 001 029	CONTROL RACK



information

HATZ DIESEL

☐ SALES
☐ ENGINEERING
■ SERVICE
☐ **PARTS**

Bulletin No. ~~SE18C~~

Date **04/01/98**

Subject: Fuel Injection Pump Rebuild Program for HATZ L&M Engines

This new Information No. SE18C should be placed in your information file to replace SE18B (Please discard old SE18B)

NOTE: This program applies only to PFR1K90A498 injection pumps. Older PFRlK80---- pumps are not part of this program.

PFR1K90A498 fuel injection pumps for L&M engines require special injection calibration equipment for proper timing and fuel delivery. This specialized equipment is only available at Bosch, Broadview, Illinois and Hatz Diesel of America.

HATZ PROGRAM

Order a rebuilt pump kit from HDA under P/N 99400410. This kit contains a rebuilt injection pump, shims, gaskets, and installation instructions. **A** core charge under P/N 99400408 will also be applied.

The core charge will be credited when the old core is received at HDA. For credit:

1) The core must be serviceable. *
2) A copy of the original invoice for the rebuilt injector pump and core must accompany the core.
3) **Mark** the outside of the shipping carton "Injection Pump Core for Credit".

NOTE: all shipping charges are the responsibility of the distributor. Normal distributor discounts apply to the rebuilt pump **and** core (no stocking orders). Please issue a separate purchase order for rebuilt components.

*If the core is not rebuildable, a new replacement injection pump is generally more economical than a rebuilt one. Hatz supplies it **as** a kit with shims, gaskets, and instructions under P/N 01268500.

Reference the attached Parts Price List for current pricing.

David Carlson
Service Manager

REBUILT L/M INJECTION PUMPS*

HATZ P/N	DESCRIPTION	LIST PRICE *
01268500	Injection **pump,** new PFR1K90A498	324.14
99400410	Injection pump, rebuilt PFR1K90A498	238.83
99400408	Core charge	86.37

* Prices effective 4/1/98 and are subject to change.

HATZ Protection and Start/Stop System

Automatic engine protection device for multi-cylinder series L40, M40, L41 and M41.

This device protects the engine against operating- and maintenance failures. It automatically stops the engine in case of too low oil pressure.
Possible failures could be: Lack of oil, choice of wrong oil viscosity. exceeding the permissible tilting position, etc. Thus, the owner of the engine is protected against economical loss.
The HATZ automatic engine protection device
- is included in the standard equipment
- is delivered without additional cost
- does not require additional engine components and electric control – and switch elements, thus eliminates additional potential failure areas.

The HATZ automatic engine protection device can be utilized for most different engine applications:

1) In case engine operates with visible or or acoustic oil pressure control, the engine stops if operator does not react to signals.

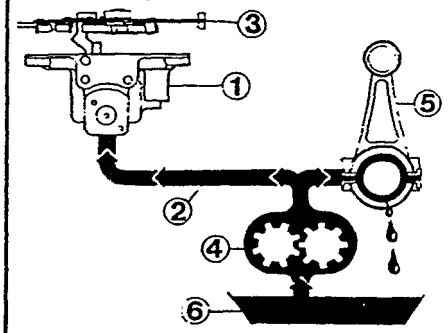
2) If engine is not equipped with warning signals, the automatic engine protection device reacts immediately and shuts off the engine without any pre-warning.

3) Additional control devices, for example for cylinder temp., cylinderhead temp., and exhaust temperature, speed, contamination degree of airfilter, oil temperature, etc. can be combined with the HATZ engine protection system.

4) Also control devices of driven machines can be adopted to the HATZ automatic engine protection device (for example excess temperature of compressors, level controll or run-dry of pumps, excess speed of hydraulic drives).

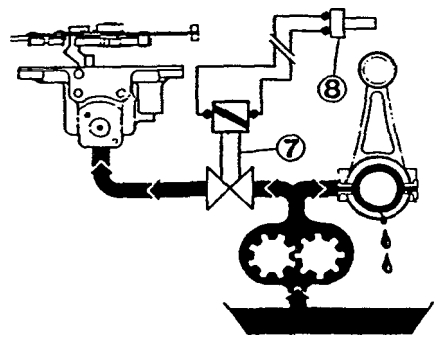
5) Furthermore the stop of the engine via the ignition lock can be linked with the HATZ automatic engine protection.
Thus, start/stop automatics are made considerably more simple and considerably cheaper in price.

HATZ-automatic engine protection device for normal engine application
1) with oil pressure control
2) without oil pressure control



The pressure of the engine oil (2) determines the control function of the servo piston (1) which is integrated in the governor (3). The scheme shows also luboil pump (4) – luboil circuit (5) – oil sump (6).

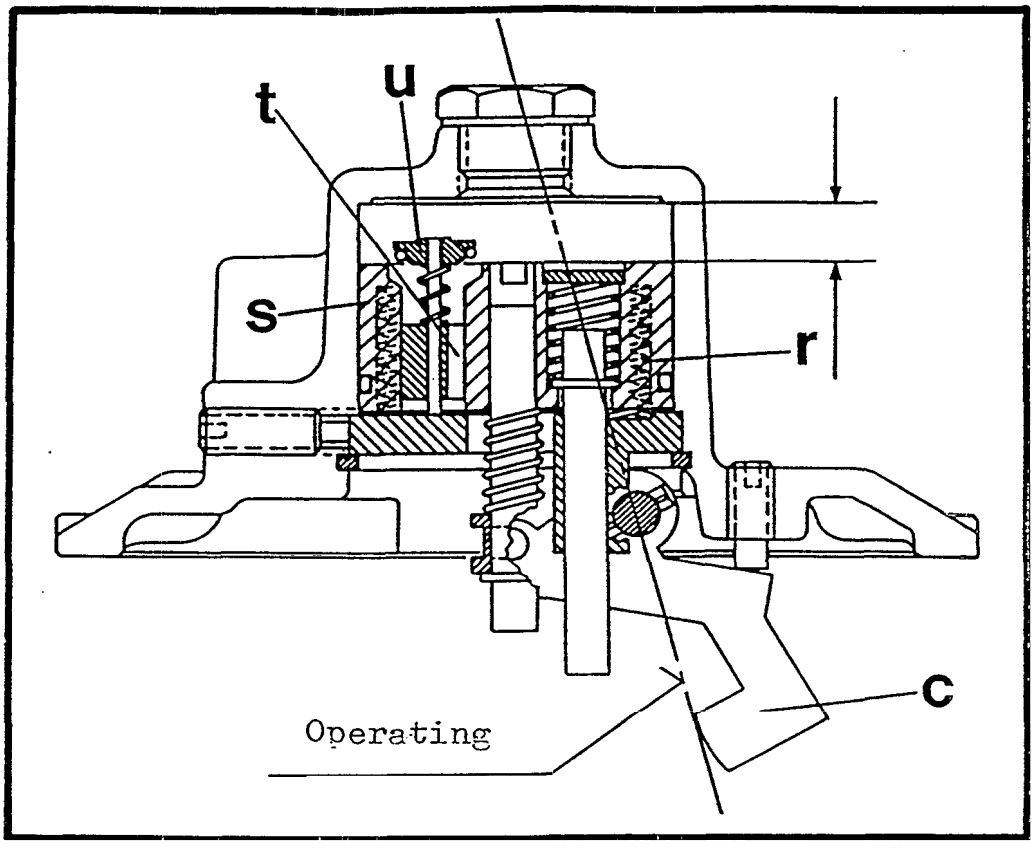
HATZ-automatic engine protection device combined with
3) additional control of engine
4) control of driven machine
5) start/stop-function



External limit switch (8) which governs the servo piston electrically by magnet valve (7).

M 5.85.2

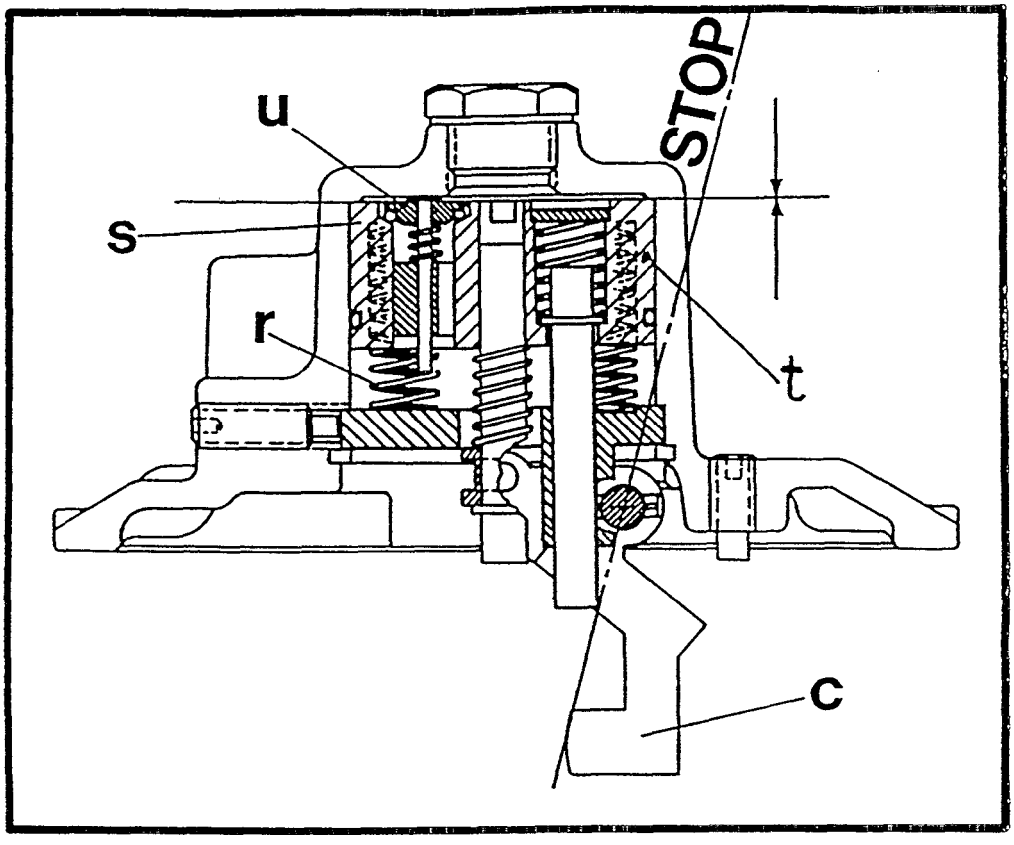
Extra Fuel Device



Operating Position

When the engine is cranking and oil pressure of 4.25 psi is obtained, the piston assembly "t" moves towards the engine. When *the* piston assembly is forward half way, lever "c" moves the governor rack from the "stop" position to the "start" position. After the engine has started, the increased oil pressure moves the piston to the end of the bore. A small control valve *opens* the by-pass bore "t". The steady oil flow through this bore keeps the oil pressure against the piston at approx. 4-25 to 7.25 psi lower the pressure in the whole lubrication oil system of the engine.

Extra Fuel Device



Stop Position

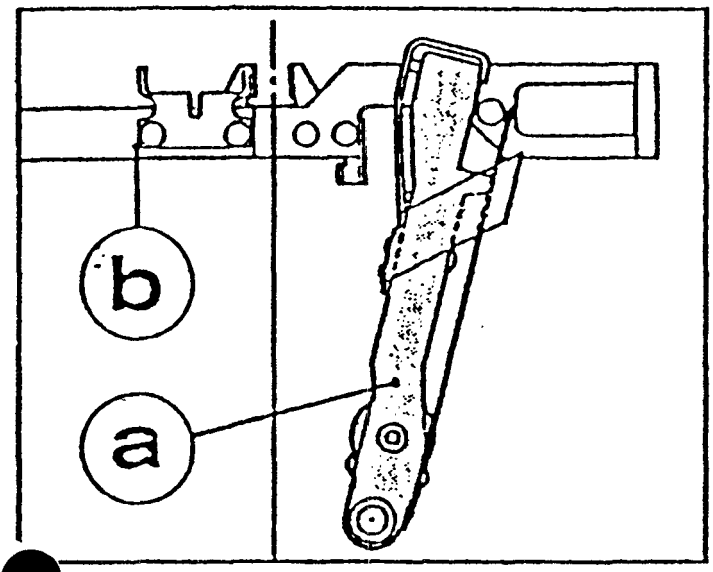
When the oil pressure *in the* engine lubrication system drops below approx. 10 psi, *the* oil pressure inside the control housing drops below 4.25 psi and this causes the spring loaded piston assembly "t" to move backwards.

When the piston assembly is back half way, the lever "c" pushes the governor rack into *the* "stop" position. At this time the small spring loaded valve "u" is pushed into its seat. The bypass bore "t" is out of function. Oil pressure of 4.25 psi is needed to actuate the whole *system* when the engine is started.

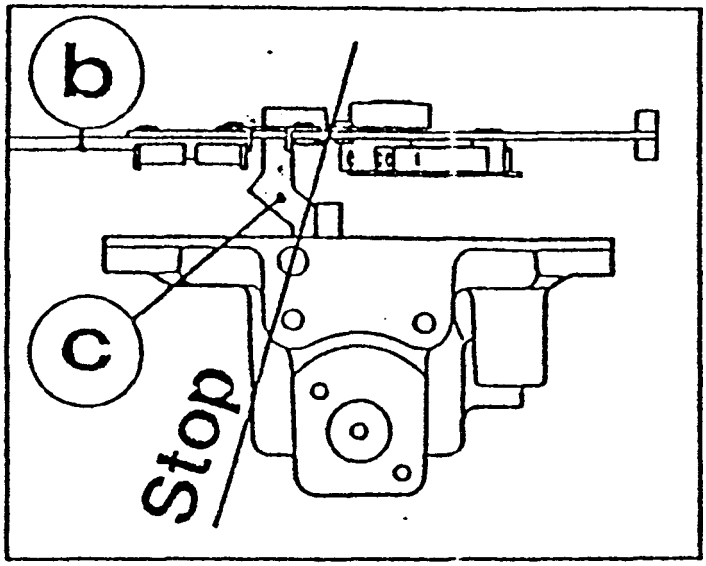
Extra Fuel Device - Step 1

Engine stopped, throttle lever in "Stop" position.

A - Side View



B - Tap View



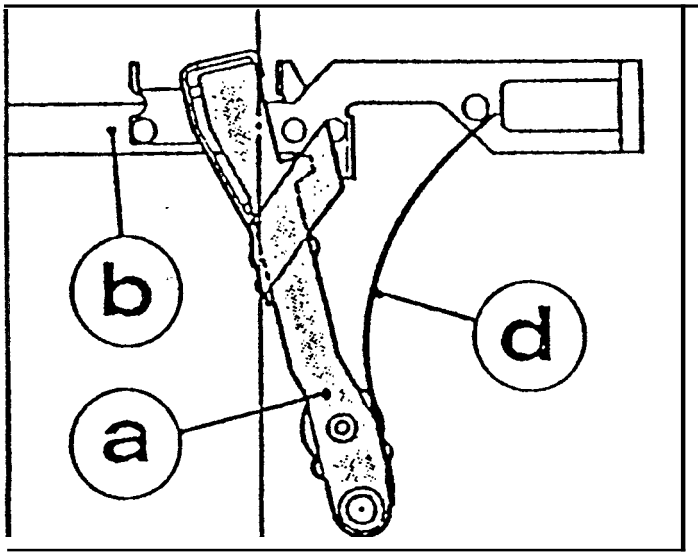
A). The governor lever "a" and the governor rack "b" are in the "Stop" position. The engine gets no injection.

B). The piston holds the governor rack through lever "c" in the "Stop" position.

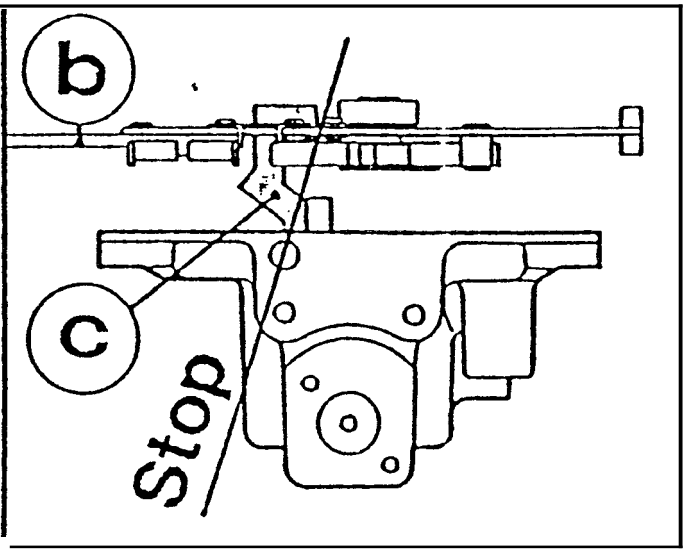
Extra Fuel Device - Step 2

Engine stopped, throttle lever in "Start" position.

A - Side View



B - Top View



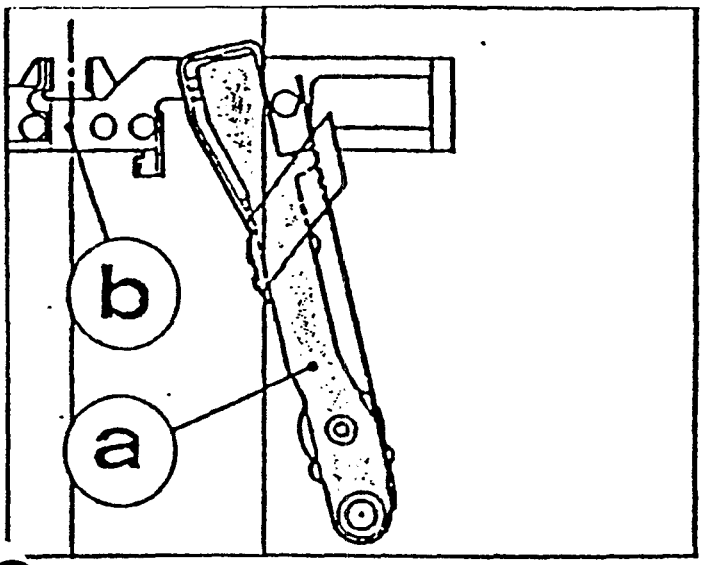
A). The throttle lever has moved the governor lever into the "Start" position. The governor rack "b" is still in the "Stop" position.

B). The governor rack "b" is still in the "Stop" position because no oil pressure has been built up. Therefore the lever "c" is holding the governor rack "b" in the "Stop" position.

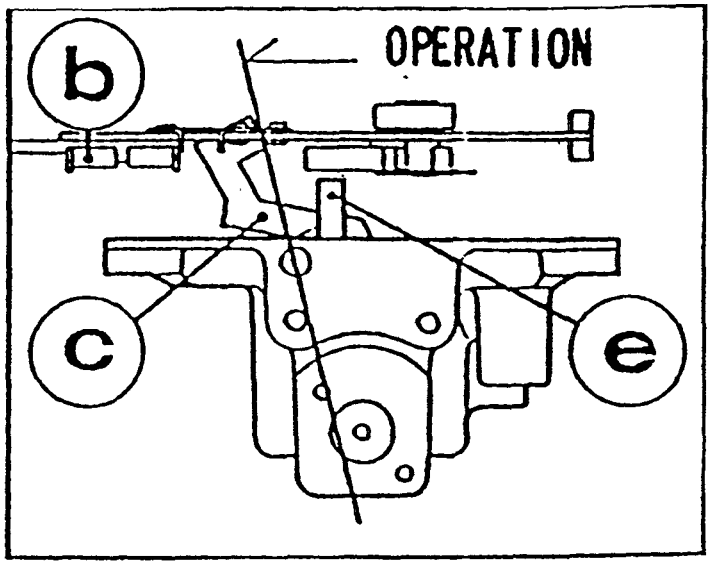
Extra Fuel Device - Step 3

Starter motor cranks the engine.

A - Side View



B - Top View



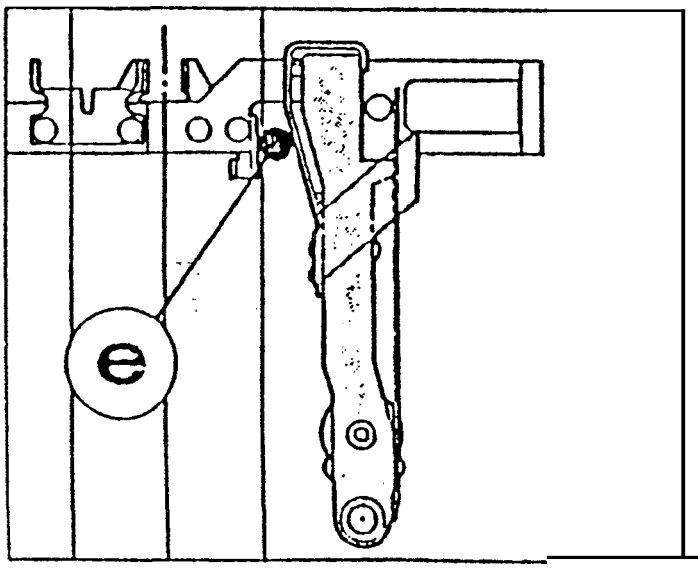
A). The governor lever "a" and governor rack "b" are in the "Start" position because lever "c" has released the rod. The engine starts.

B). The increase of oil pressure moves the piston, this allows lever "c" to release the governor rack "b" for start and operation of engine. The spring 'b" moves the governor rack "b" to the "Start" position. The full load locking pin "e" moves toward the governor lever and touches it.

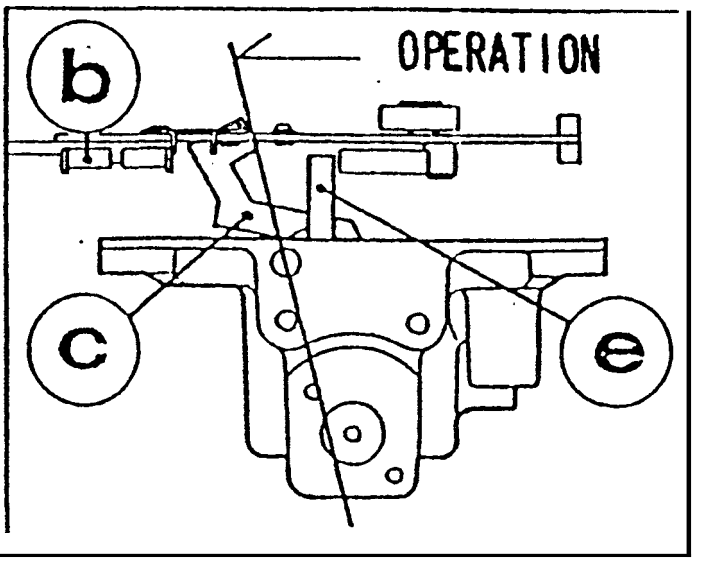
Extra Fuel Device - Step 4

The engine is running.

A - Side View



B - Top View



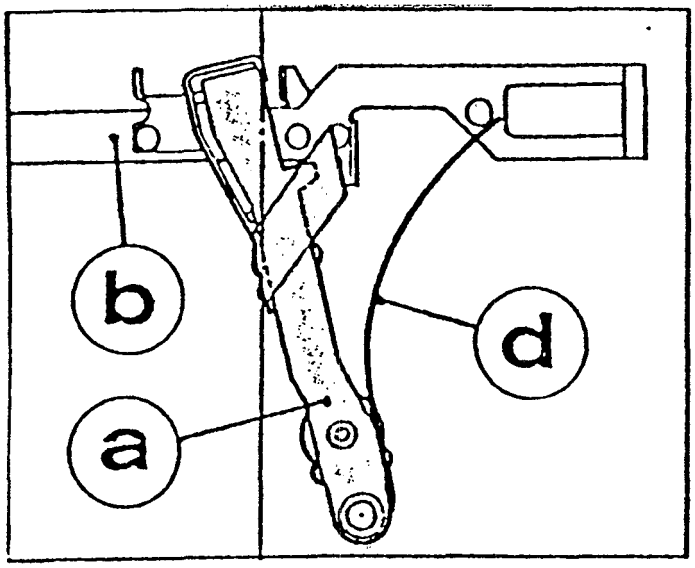
A). The governor lever "a" contacts the full load locking pin "e" if the engine *is* under full load.

B). The force of the governor has moved the governor lever from its "Start" position into normal load position. Therefore the full load locking pin "e" can move into the top end position and now limits the quantity of fuel to be injected at full load.

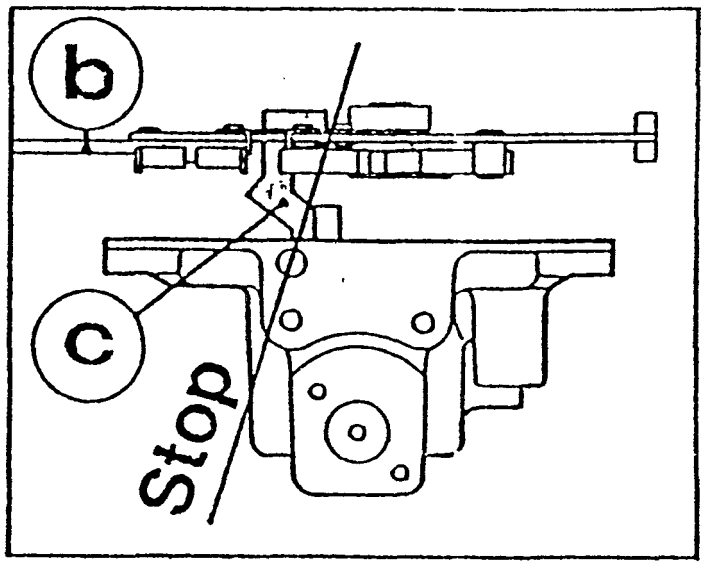
Extra Fuel Device - Step 5

Oil pressure decreases.

A - Side View



B - Top View



B). The spring loaded piston is moved backwards. Now lever "c" pulls the governor rack "b" into the "Stop" position, no matter which position the throttle lever is in.

Explanation on the auto-protection device of the L/M-range engines as shown on the attached list

This list indicates all basic versions and executions of the auto-shut-off-block with all incorporated functions and side matters worthwile to be known.

The sheet is devided into three columns, indicating:

Version I:

The old system which was used on the L 30 and the first executions of the L-M 40 engines.

Execution "a" was acting as an oil-pessure operated excessive fuel device with no other functions.

Execution "b" had a stop-solenoid incorporated which the engine either stopped by turning the switch-key (line 5) or by utilizing the signals of failure sensors (line 7).

Note:
This block was used together with injection pump of the PFR 1K 80..type only (line 21.

Version II was the first version of the auto-protection device which was used and available in four different executions:

"a":
With this execution the auto-shut-off was de-activated which means that by using a closing plug with a spiral pin of about 22 mm of length on the front side of the block the internal piston was held in half-way position. The only basic function of this execution is to give excessive fuel during starting.

"b" *Auto-shut-off + start release device:*
Originally dedicated to handstarted engines or engines with a spring type starter, this device later-on was used with electrically started engines as well. This execution had the oil pressure operated auto-shut-off activated (line 6), also handstart was possible because the fuel-pressure operated device on top of the auto-shut-off block was holding the internal piston in start position even with no oil pressure. Immediately after the engine starting, this additional device became disengaged through the supply pressure of the fuel feed pump.

"c":
This execution originally was dedicated for electrically started engines for the oil pressure shut-off activated and additionally allowing to stop the engine via the switch key and through signals from electrical failure sensors with the engine or the attached equipment (lines 5, 6, 7).

However, with this device the starting time (Line 8) could reach some 3 - 5 or even more seconds, depending on the viscosity of oil and the cranking speed.

To overcome this disadvantage of the extended starting time finally the execution "d" was generally used when an engine was supplied with the auto-shut-off system activated.

This execution "d" is nothing else than the combination of "b" and "c" and consequently was holding all advantages at once. Even hand- or spring-type starter use was possible *in* case that the battery of the engine was dead.

version III

is the one that has been used in serial production from about 1988 onwards. The execution exists in four versions as well.

"a":
The auto-shut-off is deactivated, the block acts as an automatic excessive fuel device only.

"b":
This version has the oil pressure operated auto-shut-off activated (line 6) but is additionally equipped with the fuel pressure operated start release device (same as II "b") to enable hand- or spring-type starter start.

"c":
This version is the one used with electrically started engines, and with the hydraulic- as well as electric auto-shut-off (lines 5, 6, 7).

With this version the start solenoid acts not only as a shut-off-valve for electric stop of the engine but also is giving a first push of the internal piston into starting position. That's why the time for starting the engine is "0" (line 8).

Due *to* the fact that this block is additionally equipped with a hand lever for emergency start or -operation, also hand start is possible in case that the battery has become dead.

"d":
This version is a combination of versions "b" and "c" and is used if an engine is normally started electrically, but in parallel needs to be capable of hand- or spring-type start as well.

Let's now Look for additional functions incorporated to these blocks. and let's also look for some other details (refers to blocks of versions II and III only)!

Line 9:
In all cases where excessive fuel during starting is not required to the whole extend, it can be reduced by turning the respective adjusting screw as it is done with engines for bus-airconditioners and Maco-Meudon compressors.

Line 10:
Specially for gen.-set application the so-called governor stabilizing spring gets activated through a special adjusting screw. This shortens drastically the time which the governor needs to stabilize the top idle speed after switching off the load.

Line 11:
Together with the blocks II or III a special governor lever has been used with the possibility to adjust a tailor-made torque characteristic if such is required with particular applications.

Line 12:
Whenever the so called start-release device is fitted, one has to take care that the pressure on the inlet side of the fuel feed pump does not exceed 0.2 bar. Otherwise the start release device remains active and overrides the auto-shut-off system.

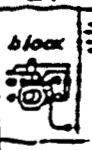
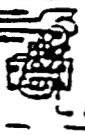
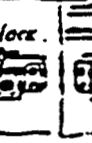
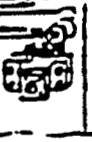
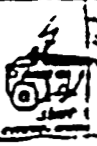
Line 13:
Together with the start-release device on 4-cylinder engines only the connecting piece at the end of the engine-side fuel return hose has a bore of 1.5 mm diameter (compared to 4 mm with the 2- and 3-cylinder engines) to guarantee sufficient back-pressure of the fuel for proper function of the start-release device.

Line 14:
Again with engines equipped with the start-release device it is recommended to use the fuel feed pump made by IMSA instead of the one made by APG for a more stabilized pressure level.

Ed. 12/90
MFS-schi-es

FOR ALL L&M MODEL HATZ ENGINES

NOTE: SEE "EXPLAINATION ON AUTO PROTECTION DEVICE" SHEET.

	Aus-führung	VERSION I a)	VERSION I b)	VERSION II a)	VERSION II b)	VERSION II c)	VERSION II d)	VERSION III a)	VERSION III b)	VERSION III c)	VERSION III d)
1											
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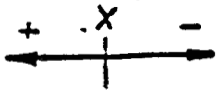
3	„NH"										
4	Start	+	−	+	+	−	+	+	+	− (+)	+
5	Stop comm.	−	+	−	−	+	+	−	−	+	+
6	Stop auxm. hyr.	−	−	−	+	+	+	−	+	+	+
7	Stop autom. electr.	−	+	−	−	+	+	−	−	+	+
8	Start [sec]	0	0	0	0	3-5	0	0	0	0	0
9	funct. seat:	−	−	+	+	+	+	+	+	+	+
10		−	−	+	+	+	+	+	+	+	+
11	Md n	−	−	+	+	+	+	+	+	+	+
12	P max. [bar]	−	−	−	0,2	−	0,2	−	0,2	−	0,2 (−)
13	cyl.	−	−	−	+	−	+	−	+	−	+
14	464 304 00	−	−	−	+	−	+	−	+	−	+

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Auto-shut-off-systems; basic executions and versions
Protection automatique; executions de base et versiones

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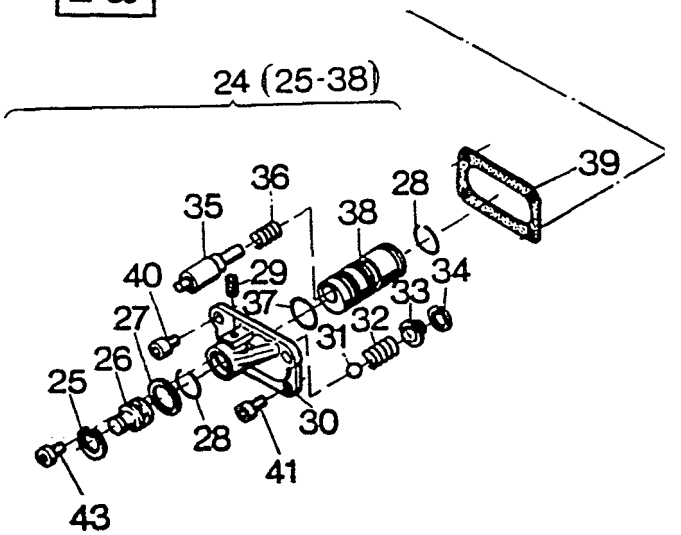

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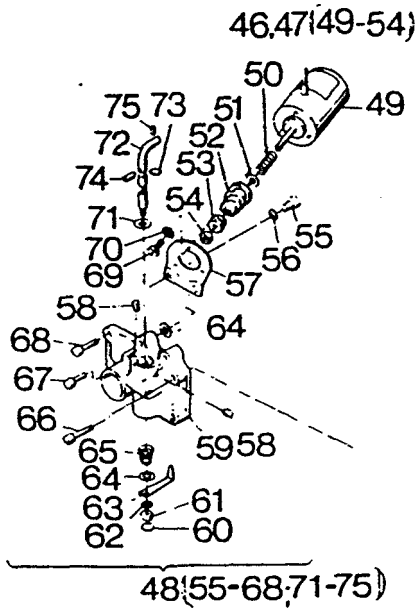

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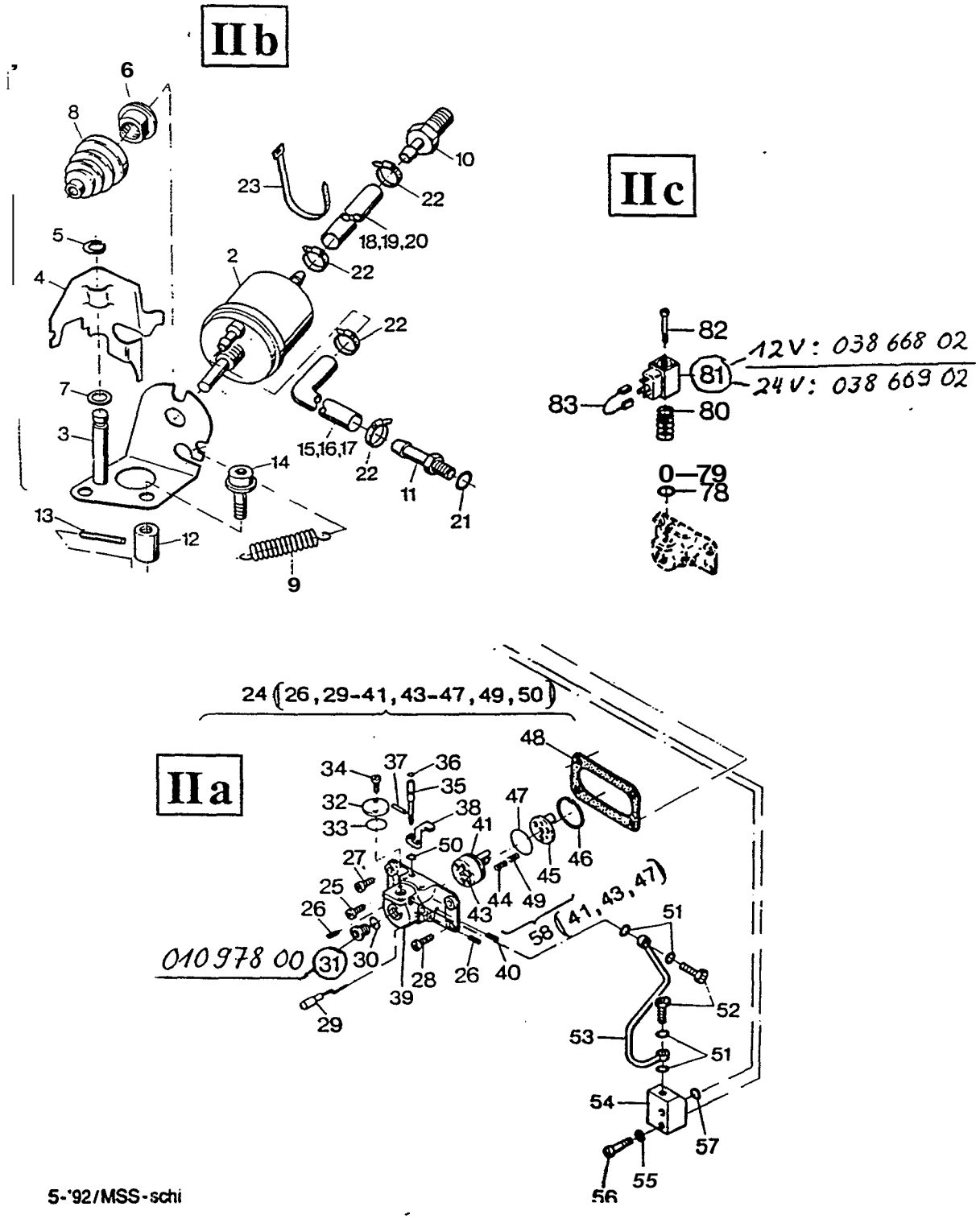

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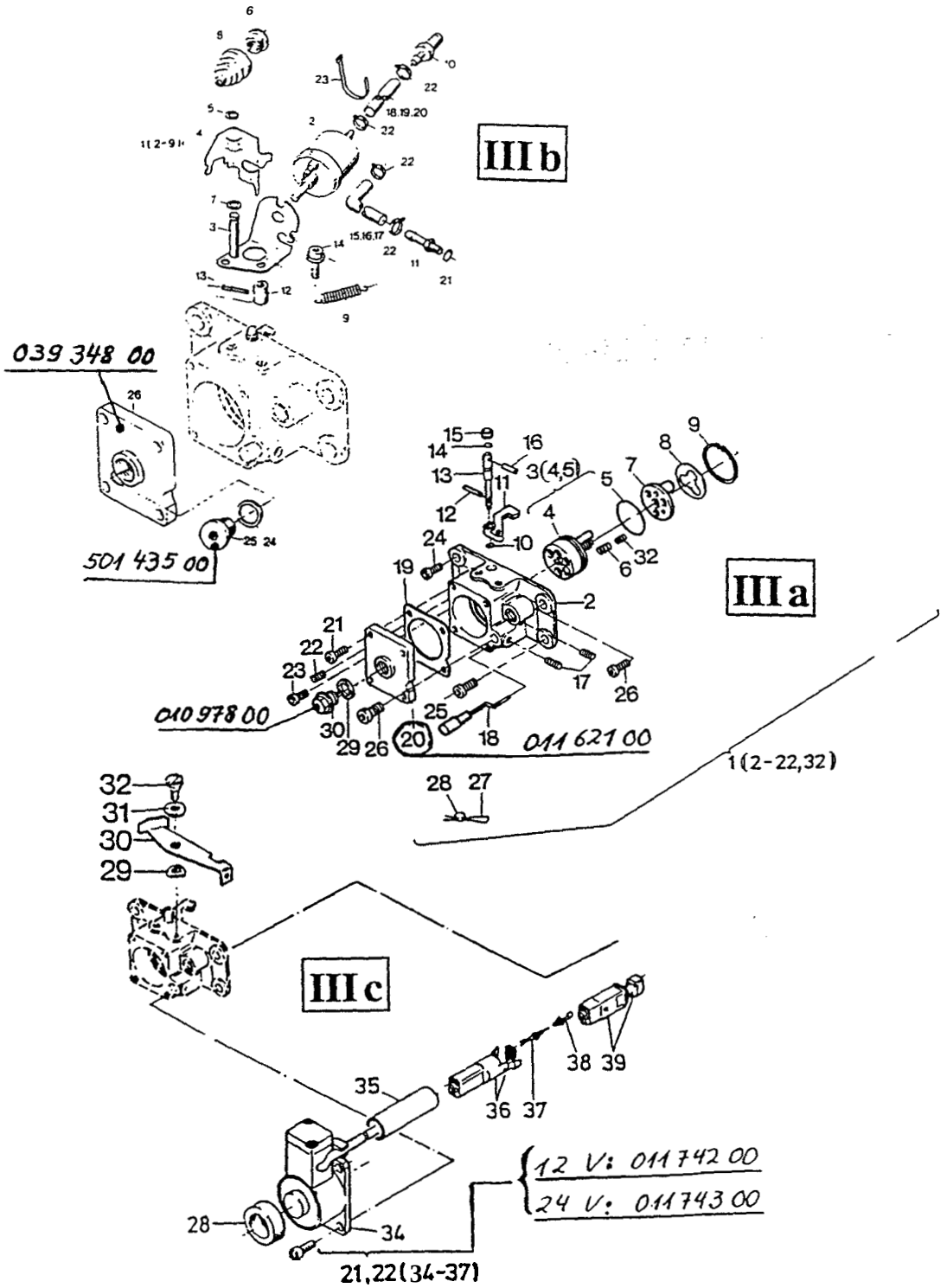
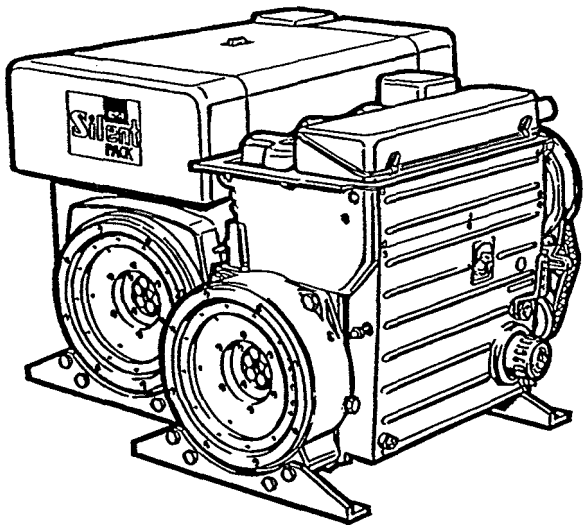


HATZ
TROUBLESHOOTING GUIDE
L/M SERIES ENGINE



Dec. 1999

L and M BASIC TROUBLESHOOTING

Malfunction	Possible Causes	Remedy
1) The engine does not start or is hard to start, but can be turned over with the starter motor.	-Speed control lever is in the "Stop" position.	-Move the lever to Start/Run" position.
	-Start/Stop solenoid is not energizing.	-Check electrical system for faults.
	-Broken or stretched fan belt.	-Replace belt.
	-No oil in crankcase.	-Fill with oil.
	-Auto protection device malfunctioning.	-Repair as necessary.
	-No fuel to the injection pump-	-Check tank for fuel and refill.
		-Check for kinked lines - replace as necessary.
		-Check for clogged fuel filter - replace.
		-Check feed pump operation; check top screen, replace as necessary.
	-Extremely slow cranking speed.	-Find cause.
	Insufficient compression:	
	-Wrong valve clearance.	Check valve clearance, adjust if necessary.
	-Valves worn.	-Requires repair or overhaul.
	-Worn cylinder and/or piston Rings.	" "
	-Worn rod bearings.	" "
1A) At low temperatures.	-Below the start limit temperature.	-Observe cold start recommendations in the instruction book.
		-Operate pre-heat equipment.
	-High parasitic load.	-Check for malfunction in hydraulic system.
		-Wrong weight oil in hydraulic system.
		-Disengage manual clutch.

Malfunction	Possible Causes	Remedy
	-Fuel waxing due to inadequate cold stability.	-Pull off the fuel line and check whether clear, uncloudy fuel comes out. Operate feed pump. -If the fuel is waxing, either warm up the engine or drain off the complete fuel supply system. Refill with temperature resistant fuel mixture. Example: Diesel No. 1.
	Starting speed too low:	
	-Oil too heavy.	-Drain and refill with correct viscosity.
	-Battery inadequately charged, or too small.	-Check the battery. Recharge if necessary.
	-Direct coupled load too great.	-Disconnect if possible.
1B) With auto protection.	-Auto protection device solenoid unserviceable or discrepancies in the electrical system.	-Repair or replace as necessary.
2) Starter motor does not operate, so engine does not turn over.	-Battery and/or other cable connections.	Check the electrical system and components. Repair or replace as necessary.
	-Loose and/or corroded cable connections.	" "
	-Battery defective and/or not charged.	" "
	-Starter motor defective.	" " "
	-Starter solenoid defective.	" " "
	-Key switch defective.	" " "
3) Engine fires but stops running as soon as the starter motor is disengaged.	-Unit not disengaged.	-Disengage the engine from the unit if possible.
	-Fuel filter clogged.	-Replace fuel filter.
	-Auto protection device solenoid not not remaining energized.	-Check and repair electrical circuit.
	-Low oil level.	-Refill crankcase.
	-Key switch faulty.	-Replace as necessary.

Malfunction	Possible Causes	Remedy
4) Engine shuts down independently during operation	-Tank ran dry.	-Fill up with fuel.
	-Fuel filter clogged.	-Replace fuel filter.
	-Fuel feed pump defective.	-Check entire fuel supply system.
	-Broken fan belt.	-Replace belt.
	-Speed control lever slipping.	-Re-adjust tension.
	-No oil or oil pressure.	-Repair as necessary.
	-Mechanical malfunctions.	-Repair as necessary.
	-Electrical malfunctions.	-Repair as necessary.
	-Overloading.	-Find cause and correct.
4A) For engines with fuel stop valve.	-Loose wire connections.	-Correct as required.
	-Auto protection solenoid defective.	-Replace.
	-Auto protection malfunctioning.	-Find cause of fault signal.
5) Drop off in performance and speed of engine, no black smoke from the exhaust.	-No fuel in tank.	-Fill up with fuel.
	-Fuel filter clogged.	-Replace fuel filter.
	-Inadequate tank ventilation.	-Ensure adequate ventilation of the tank.
	-Fuel line connections leaky.	-Check fuel supply connections for leaks.
	-Speed control lever does not remain in the required position.	-Readjust the speed control.
	-Auto protection device partially closing.	-Check oil supply system and/or mechanical faults.
6) Drop-off in engine performance and speed, black smoke from the exhaust.	-Air filter contaminated.	-Clean air filter.
	-Incorrect tappet clearance.	-Adjust tappet clearance.
	-Injector(s) unserviceable.	-Check nozzle function.
	-Excessive load.	-Find cause.
	-Thin air due to high altitude.	-Reduce load.
	-Seized bearing or piston.	-Repair as required.

Malfunction	Possible Causes	Remedy
	-Restricted muffler.	-Replace.
7) Engine runs very hot.	-Too much oil in engine.	-Drain off oil to the upper marking on the dipstick.
	-Contamination in the entire area of the cooling fins and blower fan.	-Clean the cooling air system.
	-Excessive load.	-Find cause.
	-Improper ventilation.	-Check application and correct.
	-Improper or malfunctioning temperature sending unit.	-Verify and replace.
8) Poor combustion of fuel.	-Wrong fuel.	-Drain and refill.
	-Water in fuel.	-Drain and refill.
	-Air in fuel system.	-Check vent valve.
	-Extremely cold intake air.	-Consult factory.
	-Carbon buildup.	-Repair as necessary.
	-Injection timiig incorrect.	-Readjust.
	-Injector faulty.	-Repair or replace.
	-Restricted muffler.	-Replace.
9) Unusual knocks and noises.	-Loose mounting bolts.	-Tighten/replace.
	-Misalignment of engine to drive unit.	-Realign.
	-Engine overloaded.	-Find cause.
	-Loose or unbalanced flywheel.	-Tighten/replace.
	-Worn or damaged bearings or incorrect clearance.	-Repair as necessary.
	-Damaged gear teeth.	-Repair as necessary.
	-Broken crankshaft.	-Replace.
	-Incorrect timing.	-Readjust.
	-Carbon buildup.	-Repair as necessary.

Malfunction	Possible Causes	Remedy
	-Broken or deteriorated rubber isolator(s).	-Replace.
	-Capsule touching engine (C version).	-Reposition.
10) Engine missing.	-Air in fuel system.	-Check vent valve, fuel lines and connections.
	-Poor quality or improper fuel.	-Drain and refill.
	-Dirty or damaged injector.	-Repair/replace.
	-Sticking governor.	-Find cause and repair.
	-Damaged or weak valve springs.	-Replace.
	-Sticking or burned valves.	-Repair/replace.
	-Injection pump damaged.	-Replace.
	-Feed pump sucking air.	-Replace.
	-Loose valve guides.	-Replace.
	-Seized injection pump.	-Repair/replace.
11) Excessive oil consumption.	-High oil temperature.	-Find cause.
	-Oil too thin.	-Drain and refill.
	-Piston rings worn.	-Replace.
	-Piston ring grooves worn or drain holes clogged.	-Replace.
	-Engine overloaded.	-Find cause.
	-Oil leaks.	-Repair as required.
	-Worn valve guides.	-Replace as necessary.
	-Damaged crankcase breather diaphragm	-Repair as required.
12) Charging system inoperative.	-Bad bulb or socket.	-Replace.
	-Charge light stays on and engine takes a longer period of time to stop.	-Diode from key switch to charge light bad.
	-Bad voltage regulator.	-Test and replace as required.

Malfunction	Possible Causes	Remedy
	-Bad alternator.	-Test and replace as required.
	-Wiring harness faulty.	-Repair as necessary.
13) Fuel in oil.	-Ruptured fuel pump diaphragm.	-Replace.
	-Damaged injection pump.	-Pressure test and replace as required.
	-Dripping injector nozzle.	-Replace.
	-Normal condition from blow-by.	-Change oil.

L AND M SERIES TROUBLESHOOTING

Specific Model Related Items:

1) Auto protection shaft sticking.
2) Governor can sleeve binding.
3) Oil coolers bursting.
4) Governor rack spring coming off.
5) Main bearings wear more rapidly than rod bearings.
6) Rocker arm wear.
7) Push rod tube oil leaks.
8) Timing cover oil seal leaking.
9) Alternator will not function with bad charge bulb.
10) Broken belt tensioner ears.
11) Injection pump o-ring leaks.
12) Improper fan belt replacement problems.
13) Dipsticks blowing out.
14) IMSA fuel pump arms.
15) Air entering fuel at top lift pump screw.
16) Fuel filter plugging.
17) Broken exhaust manifolds.
18) Starter armature explosions.
19) Starter solenoid corrosion.
20) Smoking.
21) Combustion knocks.
22) False starts.
23) Blown alternator diodes.
24) Cold weather starting.
25) Wet stacking.
26) Diesel fuel in oil.
27) Oil pickup tube separating.
28) Oil pickup tube bloating and blockage.
29) Governor rack bowing and coming off rollers, or pump jumping out.
30) Mechanical start release kit not functioning - IMSA fuel pump.
31) Alternator slip ring wear.
32) Failure to shut down.
33) Key switches.
34) Governor hunting.

1) Rust and corrosion at the shaft of the automatic protection system could cause this device to stick resulting in either a no-start condition, or a no-stop condition. See service bulletin SPL114 for details. On later units the internal o-ring on the shaft was repositioned to keep out moisture, reducing or eliminating the need for the additional v-ring seal.

2) Governor hunting in some rare instances has been traced to a seizing or galling governor sleeve, which is part of the camshaft assembly on the injection pump drive cam.

3) Oil coolers, generally of the Steeb brand could bloat and burst as a result of high oil pressure. This type of failure is usually a result of starting a cold engine with heavy oil at full throttle and letting it rev way up to high idle. Normally once an engines starts, it should be throttled back for a brief warm-up period.

4) The small spring on the end of the governor rack applies light tension towards the full speed direction of the governor rack. Failure to start or a lack of proper governor function could be the result of a broken or disconnected spring.

5) When doing an overhaul, the condition of the main bearings should also be inspected. Assuming that the main bearings will be OK. Because the rod bearings appear serviceable is not a good indicator. Usually the main bearings will show copper before the rod bearings.

6) Rocker arm wear at the point of contact with the valve stem can in most cases be traced to a failure to maintain the proper valve clearance. Too much clearance results in unnecessary wear.

7) Push rod tube oil leaks can sometimes be corrected by twisting the push rod tube back and forth very slightly with a pliers. This will sometimes help seat an o-ring and stop a tube leak. If this does not work, the cylinder head does not necessarily need to be removed. It is possible to remove the valve springs after putting the piston on top dead center. The rocker arm box can be removed from the head separately. With the rocker arm box removed, the push rod tube O-rings can be replaced.

8) Timing gear cover oil seal leaks that cannot be corrected by properly installing a new seal, may benefit from a repair sleeve which will compensate for a worn shaft in the seal area. The Speedy-sleeve is Hatz part no. 50289400.

9) The alternator relies upon a functioning charge bulb for rotor excitation. An alternator will not charge if the bulb is blown because the rotor is not energized.

10) The upper mounting ears or tabs on the belt tensioner support the lower mounting points for the blower/alternator assembly. Improper replacement of the fan belt without removing the lower pulley each time *can* put unnecessary strain on these "ears" and can cause breakage. Out-of-balance conditions of the fan *can* also cause mounting breakage. Out-of-balance conditions are usually traced to mud or concrete on the inside of the blower blade.

11) Injection pump o-ring leaks should be left up to an injection pump repair center for repair. Loosening of the delivery valve, in order to change the o-ring can result in calibration changes within the pump itself. This will cause either underfueling or overfueling with the affected injection pump.

12) Fan belts that are pried over the pulleys usually fail in short order. Cord breakage and shredding are usually the results. **Sharp** edges or nicks on the pulleys can also cause premature belt failures. The lower pulley must be removed each time for proper replacement. The correct procedure is shown in the Hatz instruction booklet.

13) Dipsticks that blow out are **a** result of excess crankcase pressure. Scored pistons and broken rings are usually the major cause. Excessive ring wear **as** a result of a dusted engine will also demonstrate this condition.

14) Engines that will *carry* a load, or properly maintain **high** rpms *can* be affected by malfunctioning fuel lift pumps. Insufficient pump stroke *can* be **caused** by excessive play in the pump arm. Any play **usually** indicates **a** problem. Pumps **marked IMSA** could be suspect. **A** plugged fuel filter should not be ruled out because the symptoms are the same.

15) The top screw and cover of the fuel **lift** pump is operating at a vacuum. Air *can* be **drawn** in at this point and **external** fuel leaks are unlikely. **Air** in the fuel results in intermittent missing and skipping, sometimes with puffs of white smoke. **To** help diagnose air in the fuel, **a** piece of **clear,** plastic hose *can* be inserted on the inlet and outlet fuel connections of the engine. This **will allow** you to see the **air** bubbles. **Pin** holes between the fuel tank and the fuel lift pump also **allows** air to be drawn in.

16) Restricted filters will cause fuel starvation and loss **of** power. Just because **you** see fuel **coming** out of the **return** line does not guarantee an unrestricted filter.

17) Broken exhaust manifolds may be the result of a broken or missing lower support bracket **on** the muffler.

18) Starter armature explosions from overspeeding are usually the result of operator error from not releasing the switch soon enough, as the engine revs up. Engaging the starter while the engine is running is another reason.

19) Starter solenoid corrosion is a result of wash water or road spray entering the solenoid. The water drain hole in the starter nose housing casting helps to drain water.

20) Engine smoking needs to be classified by the color of the smoke:

Black smoke is an indication of plenty of fuel, but a lack of combustion air. The inability of an engine to breath properly results in black smoke and can be caused by:

A) Restricted air cleaner.
B) Plugged muffler or too much back pressure.
C) Loose valve adjustment.
D) An injector not atomizing the fuel properly.
E) Overloading.
F) Poor fuel, etc.

White smoke or bluish white smoke is usually the result of one or more problems:

A. Weak compression.
B. Very cold weather.
C. Air in fuel - usually accompanied by missing or skipping.
D. Incorrect head gasket (too thick).
E. Valve seats cut too deep (lowering compression ratio).
F. Weak valve springs (made worse by item E, acts like item C at high idle).
G. Governor does not operate smoothly or sticks.
H. Low quality of fuel (sometimes summer blends of fuel used in winter).
I. Rust pitted cylinder.

Heavy blue smoke sometimes bluish black, is the result of oil entering the cylinder and can be caused by:

A. Faulty breather valve.
B. Worn or broken oil rings.
C. Plugged oil holes in the piston behind the oil ring.
D. Stuckrings.
E. Rust pitted cylinder.
F. Worn valve guides.
G. Valve stem seals broken (if so equipped).
H. Preservation oil added to fuel tank.

21) In some engines a prominent cylinder *can* develop a combustion knock, even though the timing has not been altered. In a majority of the known cases, removing and swapping injection pumps from one location to another, will remedy the audible knock.

22) A false start is considered to be an engine that starts fine, runs about 5-10 seconds and stops. This problem is most likely a fault in the electrical circuit of the fuel stop valve/auto protection device.

23) We have some people that still do not know that all Hatz engines are negative ground. Battery positive always goes to terminal B+ or on the diagram as position "30". On the starter this is the largest terminal towards the bottom.

24) Glow plugs which preheat intake manifold air are meant for cold weather operation, and are not a proper cure for engines with weak compression or other starting problems. Consult the operator's instruction booklet for starting procedures and guidelines.

25) Wet stacking is a condition that **looks,** for all practical purposes, like the engine is throwing raw oil out of the exhaust. Usually when this condition exists, the oil level seldom drops, and if anything, actually rises, due to fuel contamination. Wet stacking is the result of an engine that does not come up to operating temperature. In almost all cases, this is due to insufficient load on the engine. The longer an engine is allowed to wet stack before an adequate load is applied, the longer, if ever, it will take to reverse the condition. This is especially critical in new or recently rebuilt engines that have not had a chance for the rings to seat. The cylinders become glazed and in severe cases the engine must be disassembled and have the glaze mechanically removed with a glaze breaker.

It is suicide to rebuild (or take a new engine) and run it more than 10 minutes without a load. Air-cooled diesels must be run under a load to bring them up to operating temperature. Blocking the *air* inlet, while not recommended, is only a partial cure.

26) Some diesel fuel enters the oil in the form of blowby past the piston rings. Diesel fuel, once in the crankcase, does not evaporate like gasoline entering in the same manner. **Maintaining regular** scheduled **oil** changes are very important. Fuel entering from other sources is rare, but could be traced to a torn, cracked or porous diaphragm in the lift pump. This *can* be checked by disassembly of the pump and an inspection of the diaphragm. Injection pumps seldom leak fuel into the crankcase, but in order to rule out this possibility, the pump must be removed from the engine. *An* air supply (approx. **30 p.s.i.)** is connected to the fuel supply hole. The pump is then submerged in test oil or diesel fuel. Initially a few bubbles may escape as the casting fills up with oil, but should stop and remain stopped after that. No additional bubbles means no leakage. Poorly functioning and dripping injector nozzles *can* cause contamination of the oil in the same manner as blowby previously mentioned, only faster. Incorrectly plumbed injector return lines *can* cause fuel in the crankcase if the tank is mounted higher than the engine, and the return line is connected near the bottom of the tank. Gravity flow past the nozzles will leak past the piston rings and remain in the crankcase.

27) With the introduction of the oil pressure controlled safety shutdown system, the oil pickup tube was modified to include a one-way flap valve. This valve was intended to keep the tube full of oil to enable faster starting due to a faster buildup of oil pressure. On early tubes, generally produced in 1985, these tubes were soldered together at the check valve end. This solder joint could separate disabling the check valve. Behind the check valve, a short, clear piece of hose was used to act as a spring to keep the valve closed. When this tube separated, it was possible for the short piece of hose to be sucked into the oil pump and get ground up. These ground-up pieces would lodge into the steel pipe and fittings between the oil cooler and the automatic shutdown system. A blockage anywhere in this tube would not allow the engine to start. Also, see service bulletin SPL 113.

28) From approximately 1986 onwards, the oil pickup tube with the check valve were crimped together and were no longer soldered. If the engine rotated in the reverse direction while stopping or for other reasons, this tube would bloat from internal oil pressure. When this tube became bloated, the check valve and clear plastic spring hose would slide off its locating pin. The spring hose could also block the supply tube to the automatic shutdown device, as in point 1. In addition, the flap valve could be sucked up against the end of the oil pickup tube causing the automatic shutdown system to stop the engine. Also, see service bulletin SPL 113.

Notes to point 1 and 2. A redesigned oil pump was installed in later engines, and the oil tube check valve was eliminated. This redesigned oil pump had a new casting which had a trap built into the pump. This trap would keep the oil pump gears submerged in oil, and kept the pump primed for faster oil pick-up.

29) Injection pump governor rack bowing *can* occur primarily on four cylinder models, which would have the longest injection pump governor control rack. This rack *can* flex or bow. Sometimes one of the injection pumps will jump out of its slot in the governor rack. Overspeeding *can* sometimes occur as a result of this occurrence.

Note: A successful field fix involves drilling and tapping the center side cover to accept a snubber screw and lock nut. The snubber screw should be backed away from the rack about a half turn before locking the lock nut.

30) A *start* release kit that fails to extend during the first few seconds after initial engine start-up, *can* sometimes be traced to the fuel lift pump. This *start* release kit operates on fuel pressure from the rear, and fuel suction from the front or bellows side. Insufficient suction can sometimes be traced to the filter screen inside the IMSA brand lift pump. This filter screen *can* in some cases block the suction hole in the top cover screw. Modifying the screen so that the screw hole is not blocked will remedy the problem.

31) Alternator slip ring wear was a problem on early Paris-Rhone alternators when operating in a contaminated environment. Current Valeo alternators have improved slip ring material which reduces or eliminates abnormal wear.

32) Engines equipped with electrical shutoff. The small square cube solenoid mounted on top of the automatic protection device could sometimes malfunction. This solenoid is basically an electro-magnet which interrupts oil flow to the protection device stopping the engine. The oil supply tube brings up unfiltered oil from the oil cooler to the automatic protection device. Sometimes metal particles that are attracted to the magnet lodge the magnet piston in either the up position (run), or the down position (stop). Cleaning these parts restores proper function.

33) Key switches can become intermittent from moisture and in some cases vibration. This will cause starting problems, unwanted engine stopping, dead batteries, etc. Problems can be reduced by improved mounting methods, removing the key when not in use and shutting the protection flap. Most water enters the switch through the keyhole.

34. Governor "hunting" can be caused by the following: sticking fuel injection pump(s), bent or misaligned control rack, worn governor weight pivot bushings and/or thrust bearings, elongated hole on center governor rod, worn bushings and/or **pin** connecting rod *to* spool on camshaft. See #2 and #29.

DEALER WARRANTY POLICY

March 1999

HATZ DIESEL
PREMIER
LIMITED ENGINE WARRANTY

HATZ **DIESEL** OF AMERICA, INC., hereinafter referred to as "HATZ" warrants each new 4-cycle air-cooled diesel engine with automatic low oil pressure shutoff device and sold by Hatz to be free from defects in material and workmanship, under normal use and service, for a period of twenty-four (24) months or 2,000 operating hours after the date of delivery to the original retail purchaser, or twenty-eight **(28)** months after the date of invoice by Hatz, whichever occurs first, and Hatz will, at their option, repair or replace at Hatz's sales headquarters, or at a point designated by Hatz, any part or parts which shall appear to the satisfaction of Hatz upon inspection at such point, to have been defective in material or workmanship. This Warranty does not obligate Hatz to bear any transportation charges in connection with the repair or replacement of defective parts and such charges shall be borne by the original retail purchaser.

In order to obtain service under this Warranty, the original retail purchaser shall give notice in writing to Hatz within ten **(10)** days of the time that the defect becomes apparent. Repairs must be completed in a timely manner. Claims must be received at Hatz no later than thirty **(30)** days after repair date.

This warranty shall not apply to any engine which shall have been installed or operated in a manner **not** recommended by Hatz; nor to any engine which shall have been repaired, altered, neglected or used in **any** way which, in the opinion of Hatz, adversely affects its performance; nor to any engine in which parts not authorized by Hatz have been used, which parts or the use of which have damaged, caused defects in, or otherwise adversely affected the engine or its performance; nor to any accessories installed on the engine where the accessory manufacturer has **its own** warranty; nor to normal maintenance services or replacement of normal service items.

Hatz reserves the right to modify, alter and improve any engine or parts without incurring **any** obligation to replace any engine or parts previously sold without such modified, altered or improved engine or **parts.**

Hatz reserves the right to require that any engine upon which warranty service is sought be made available **to** Hatz at Hatz's sales headquarters or point designated by Hatz free and clear of any liens and other encumbrances.

THIS LIMITED ENGINE WARRANTY, AND THE OBLIGATION OF HATZ HEREUNDER, ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, and all other obligations or liabilities, including actual, special, direct, indirect, incidental or consequential damages, lost profits, lost sales, lost time, lost use, or contingent liabilities arising out of the failure of any engine or part to operate properly. No person is authorized to give any other warranty or to assume any additional obligation on behalf of Hatz unless made in writing and signed by an officer of Hatz.

HATZ DIESEL
LIMITED ENGINE WARRANTY

HATZ **DIESEL OF** AMERICA, INC., hereinafter referred to **as** "HATZ, warranty each new 4-cycle air-cooled diesel engine without, automatic low oil shutoff device and sold by Hatz to be free from defects in material and workmanship, under normal use and service, for a period of twelve **(12)** months or 2,000 operating hours after the date of delivery to the original retail purchaser, or sixteen **(16)** months after the date of invoice by Hatz, whichever occurs first, and Hatz will, at their option, repair or replace at Hatz's sales headquarters, or at a point designated by Hatz, any part or parts which shall appear to the satisfaction of Hatz upon inspection at such point, to have been defective in material or workmanship. This Warranty does not obligate Hatz to bear any transportation charges in connection with the repair or replacement of defective parts and such charges shall be borne by the original retail purchaser.

In order to obtain service under this Warranty, the original retail purchaser shall give notice in Writing to Hatz within ten **(10)** days of the time that the defect becomes apparent. Repairs must be completed in **a** timely manner. Claims must be received at Hatz no later than thirty **(30)** days after repair date.

This Warranty shall not apply to any engine which shall have been installed or operated in a manner not recommended by Hatz; nor to any engine which shall have been repaired, altered, neglected or used in any way which, in the opinion of Hatz, adversely affects its performance; nor to any engine in which parts not authorized by Hatz have been used, which parts **or** the use of which have damaged, caused defects in, or otherwise adversely affected the engine or its performance; nor to any accessories installed on the engine where the accessory manufacturer has its own warranty; nor to normal maintenance services or replacement **or** normal service items.

Hatz reserves the right to modify, alter and improve any engine or parts without incurring any obligation to replace any engine or **parts** previously sold without such modified, altered or improved engine or parts.

Hatz reserves the right to require that any engine upon which warranty service is sought be made available to Hatz at Hatz's sales headquarters or point designated by Hatz free and **clear** of any liens and other encumbrances.

THIS LIMITED ENGINE WARRANTY, AND **THE OBLIGATION OF HATZ HEREUNDER, ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING** *ANY* **WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE,** and all other obligations or liabilities, including actual, special, direct, indirect, incidental or consequential damages, lost profits, lost sales, lost time, lost use, or contingent liabilities arising out of the failure of any engine or part to operate properly. No person is authorized to give any other warranty or to assume additional obligation on behalf of Hatz unless made in writing and signed by an officer of Hatz.

HATZ DIESEL
LIMITED PARTS WARRANTY

HATZ DIESEL OF AMERICA, INC., hereinafter referred to as "HATZ", warrants each new spare part sold by Hatz to be free from defects in material and workmanship, under normal use and service, for a period of six *(6)* months after the date of delivery to the original retail purchaser, and Hatz will, at their option, repair or replace at Hatz's sales headquarters, or at a point designated by Hatz, any part or parts which shall appear to the satisfaction of Hatz upon inspection at such point, to have been defective in material or workmanship. This Warranty does not obligate Hatz to bear any labor or transportation charges in connection with the repair or replacement of defective parts and such charges shall be borne by the original retail purchaser.

In order to obtain service under this Warranty, the original retail purchaser shall give notice in writing to Hatz within ten (10) days of the time the defect becomes apparent. Claims must be received at Hatz no later than thirty **(30)** days after part defect date.

This Warranty shall not apply to any parts which shall have been installed or used in a manner not recommended by Hatz; nor to any part which shall have been repaired, altered, neglected or used in any way which, in the opinion of Hatz, adversely affects its performance; nor to any part which is not a genuine Hatz part, the use of which will damage, cause defects in, or otherwise adversely affect the engine or its performance; nor to any accessories installed where the accessory manufactured has its own warranty; nor to normal maintenance services or replacement of normal service items.

Hatz reserves the right to require that any part upon which warranty service is sought be made available to Hatz at Hatz's sales headquarters or point designated by Hatz free and clear of any liens and other encumbrances.

THIS LIMITED PARTS WARRANTY, AND THE OBLIGATION OF HATZ HEREUNDER, ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING *ANY* WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, and all other obligations or liabilities, including actual, special, direct, indirect, incidental or consequential damages, lost profits, lost sales, lost time, lost use, or contingent liabilities arising out of the failure of any part to operate properly. No person is authorized to give any other warranty or to assume any additional obligation on behalf of Hatz unless made in writing and signed by an officer of Hatz.

WARRANTY EXCLUSIONS

The following items will not **be** covered in the second year under the Premier Engine Warranty:

- Electrical components.
- Hoses.
- Belts.
- Sealants.
- Sealing compounds.
- Adhesives.
- Gaskets.
- Clutches.
- Hydraulic components.
- Injection nozzles.
- Gear Cases.
- Incidental expenses: travel time, mileage, and freight.
- Components functionally dependent on the oil circuit on engines without low oil pressure shutoff devices.

ITEMS NOT COVERED BY WARRANTY

- Lubricants, **fuels,** shop towels, and supplies.
- Phone/Fax/Communication costs.
- Deterioration caused **by** poor or prolonged storage of an engine such **as** rust, corrosion or gum **and** varnish **caused** by deteriorating fuel.
- Any sales taxes.
- Diagnostic and/or cleaning time.
- Overtime **labor.**
- Damage caused by the use of any starting aid **or** fluid.