

For

BRISBANE CITY COUNCIL

At

BRISBANE WATER

SEWAGE PUMP STATION

SP049 KIANAWAH ROAD

Manuals Prepared by:

S E Power Equipment 47 Proprietary Street Tingalpa, Qld 4173 Phone No. 07 3890 1744

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REVISION B: July 2003



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В	30/07/03	JP	

Prepared by: Jim Pringle	Date:	/_	/	
Reviewed			_	
Project Manager:	Date:	/	/	

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Section 1 - Instructions of Use



INSTRUCTIONS FOR USE

- 1. Units placed on site using "Hook Truck" (Cleanaway Type) over cable pit.
- 2. Cable pit to be under switchboard section of unit (rear).
- 3. Attach hold down / anti-theft chains to location points at rear of unit (beside switchboard).
- 4. Check engine lube oil level.
- 5. Check engine coolant level.
- 6. Check the battery is connected and the electrolyte level is correct.
- 7. Connect cables to plugs via colour-coded sequence.
- 8. Connect power inlet socket (240V).
- 9. Connect communication socket.
- 10. Connect pump station control socket.
- 11. Check fuel level (mechanical gauge beside fill point).
- 12. Refer to section 6, Functional Description for start/run and connection procedure.
- 13. Remember **SAFETY** is important **ALWAYS** wear your Personal Protection Equipment (PPE)

SP049

Section 2 - John Deere Operation Manual

Power Units for Gensets (Saran) 2.9L/4039/4.5/6.8L (128/008/158/258)

OPERATOR'S MANUAL



John Deere Usine de Saran OMCD16564 (03JAN00)

Printed in Germany
ENGLISH





Introduction

THIS MANUAL COVERS the following engines for generator sets:

ENGINE FAMILY

300-SERIES

CD3029DF128

CD4039DF008

CD4039TF008

POWERTECH®

CD4045DF158

CD4045TF158

CD4045TF158

CD4045TF258

CD6068HF158

CD6068TF158

CD6068TF258

READ THIS MANUAL carefully to learn how to operate and service your engine correctly. Failure to do so could result in personal injury or equipment damage.

THIS MANUAL SHOULD BE CONSIDERED a permanent part of your engine and should remain with the engine when you sell it.

MEASUREMENTS IN THIS MANUAL are given in metric. Use only correct replacement parts and fasteners. Metric and inch fasteners may require a specific metric or inch wrench.

WRITE ENGINE SERIAL NUMBERS and option codes in the spaces indicated in the Record Keeping Section. Accurately record all the numbers. Your dealer also needs these numbers when you order parts. File the identification numbers in a secure place off the engine or machine.

RIGHT-HAND AND LEFT-HAND sides are determined by standing at the drive or flywheel end (rear) of the engine and facing toward the front of the engine.

SETTING FUEL DELIVERY beyond published factory specifications or otherwise overpowering will result in loss of warranty protection for this engine.

Information relative to emissions regulations

Depending on final destination, this engine can meet the emissions regulations according to the US Environmental Protection Agency (EPA), California Air Resources Board (CARB) and for Europe, the Directive 97/68/EC relating the measures against the emissions of gaseous and particulates pollutants from internal combustion engines. In this case an emission label is stuck on the engine.

Emission regulations prohibit tampering with the emission-related components listed below which would render that component inoperative or to make any adjustment on the engine beyond published specifications. It is also illegal to install a part or component where the principal effect of that component is to bypass, defeat, or render inoperative any engine component or device which would affect the engine conformance to the emissions regulations. To summarize, it is illegal to do anything except return the engine to its original published specifications.

List of emission-related components:

- Fuel injection pump
- · Intake manifold
- Turbocharger
- · Charge air cooling system
- Piston

CALIFORNIA PROPOSITION 65 WARNING
Diesel engine exhaust and some of its constituents are known to
the State of California to cause cancer,
birth defects and other reproductive harm.

POWERTECH is a trademark of Deere & Company

DPSG,CD03523,1 -19-01JUL99-1/1

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Engine serial number plate	Maintenance/1000 hours/1 year Cleaning crankcase vent tube
Safety	(300-SERIES ENGINES)
Fuels, Lubricants and Coolant Diesel Fuel	Maintenance/2000 hours/2 years Check and adjust engine valve clearance (POWERTech ENGINE)

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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European Office Mannheim
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A John Deere ILLUSTRUCTION® Manual

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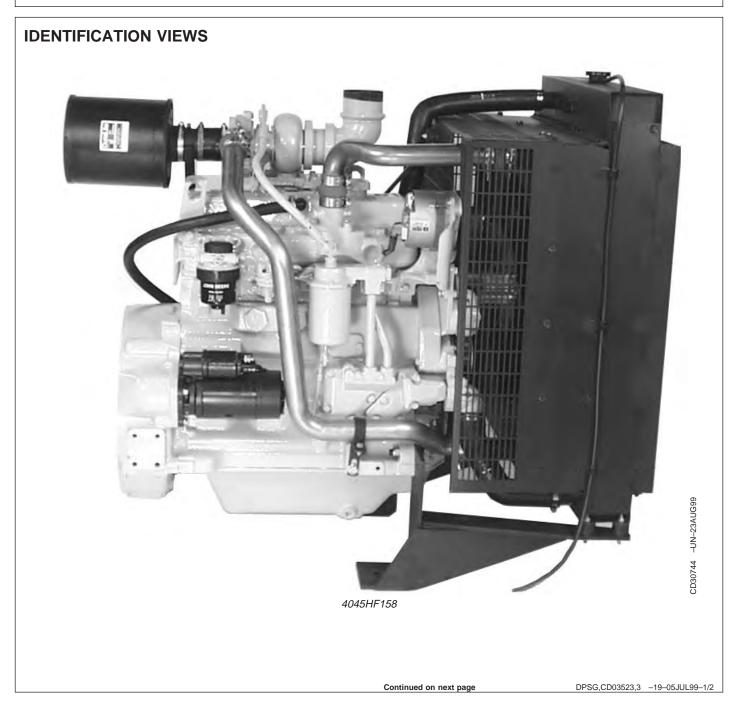
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Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power) **Identification Views**



01-1

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Identification Views



01-2

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USING MAINTENANCE RECORDS

To obtain the best performance, economy and service life from your engine, ensure service is carried out according to this present manual and recorded in the following pages. It is recommended that your engine Distributor or your Dealer carry out this service work and stamp the appropriate case.

Keeping an accurate account of all service performed on your engine will give more value to the machine when you resell it. John Deere oils and coolants have been formulated to give maximum protection and performance to your engine. We recommend only genuine John Deere service products and replacement parts.

To protect your rights under the warranty ensure all scheduled services are carried out and recorded. If your engine is covered by extended warranty, it is important to maintain this record for the duration of the warranty.

DPSG,CD03523,6 -19-05JUL99-1/1

100 HOURS OF OPERATIO)N	
☐ Engine oil, replace		
☐ Engine oil filter, replace		
☐ Hose connections, check		
Number of hours:	Comments:	Dealer or distributor stamp
Date:		
Job done by:		

02-1

500 HOURS OF OPERATION		
☐ Engine oil, replace ☐ Engine oil filter, replace		
☐ Fuel filter, replace		
☐ Belt, check tension and wear (300-Series an manual tensioner)	d POWERTech with	
☐ Valve clearance, adjust (300-Series)		
Number of hours:	Comments:	Dealer or distributor stamp
Date:		
Job done by:		
		DPSG,CD03523,8 -19-05JUL99-1/1
1000 HOURS OF OPERATION		
☐ Engine oil, replace	☐ Air intake system, cl	neck
☐ Engine oil filter, replace		
☐ Fuel filter, replace		
☐ Check belt and tensioning system		
☐ Crankcase vent tube, clean		
Number of hours:	Comments:	Dealer or distributor stamp
Date:		
Job done by:		
		DPSG,CD03523,9 -19-05JUL99-1/1

02-2 112699 PN=8

1500 HOURS OF OPERATION					
☐ Engine oil, replace					
☐ Engine oil filter, replace					
□ Fuel filter, replace					
☐ Belt, check tension and wear (300-Series a manual tensioner)	nd POWERTech with				
□ Valve clearance, adjust (300-Series)					
Number of hours:	Comments:		Dealer or distributor stamp		
Date:					
Job done by:					
	1				
	ı				
			DPSG,CD03523,10 -19-05JUL99-1/1		
2000 HOURS OF OPERATION					
☐ Engine oil, replace		☐ Cooling system, drai	in and flush (if COOL-GARD is not used)		
☐ Engine oil filter, replace		☐ Valve clearance, adj	ust (POWERTech)		
☐ Fuel filter, replace		☐ Air intake system, ch	neck		
☐ Check belt and tensioning system		☐ Vibration damper, ch	neck		
☐ Crankcase vent tube, clean					
Number of hours:	Comments:		Dealer or distributor stamp		
Date:					
lah daga hu					
Job done by:					
	1				
	'				
			DPSG,CD03523,59 -19-16AUG99-1/1		

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2500 HOURS OF OPERATION		
☐ Engine oil, replace	☐ Cooling system, drai	n and flush (if COOL-GARD is used)
☐ Engine oil filter, replace		
☐ Fuel filter, replace		
☐ Belt, check tension and wear (300-Series ar manual tensioner)	nd POWERTech with	
□ Valve clearance, adjust (300-Series)		
Number of hours:	Comments:	Dealer or distributor stamp
Date:		
Job done by:		
		DPSG,CD03523,60 -19-16AUG99-1/1
3000 HOURS OF OPERATION		
☐ Engine oil, replace	☐ Air intake system, ch	neck
☐ Engine oil filter, replace		
☐ Fuel filter, replace		
☐ Check belt and tensioning system		
☐ Crankcase vent tube, clean		
Number of hours:	Comments:	Dealer or distributor stamp
Date:		
Job done by:		
		DPSG,CD03523,61 -19-16AUG99-1/1

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PN=10

3500 HOURS OF OPERATION	ON		
☐ Engine oil, replace			
☐ Engine oil filter, replace			
☐ Fuel filter, replace			
☐ Belt, check tension and wear (300-Serie manual tensioner)	es and POWERTech with	ı	
☐ Valve clearance, adjust (300-Series)			
Number of hours:	Comments:		Dealer or distributor stamp
Date:			
Job done by:			
		1	
		ı	
			DPSG,CD03523,62 -19-16AUG99-1/1
4000 HOURS OF OPERATION	ON		
☐ Engine oil, replace		☐ Cooling system, dra	in and flush (if COOL-GARD is not used)
☐ Engine oil filter, replace		☐ Valve clearance, ad	just (POWERTech)
☐ Fuel filter, replace		☐ Air intake system, cl	heck
☐ Check belt and tensioning system		☐ Vibration damper, cl	heck
☐ Crankcase vent tube, clean			
Number of hours:	Comments:		Dealer or distributor stamp
Date:			
Job done by:			

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4500 HOURS OF OPERATION				
☐ Engine oil, replace		☐ Vibration damper, re	place (6 cyl.)	
☐ Engine oil filter, replace				
☐ Fuel filter, replace				
☐ Belt, check tension and wear (300-Series ar manual tensioner)	nd POWERTech with			
☐ Valve clearance, adjust (300-Series)				
Number of hours:	Comments:		Dealer or distributor stamp	
Date:				
Job done by:				
			DPSG,CD03523,64 -19-16AUG99-1/1	
			J. 00,0000000000000000000000000000000000	
5000 HOURS OF OPERATION				
☐ Engine oil, replace	☐ Injection nozzles, replace			
☐ Engine oil filter, replace		☐ Air intake system, ch	neck	
☐ Fuel filter, replace		☐ Cooling system, drai	in and flush (if COOL-GARD is used)	
☐ Check belt and tensioning system				
☐ Crankcase vent tube, clean				
Number of hours:	Comments:		Dealer or distributor stamp	
Date:				
Job done by:				
			DPSG,CD03523,65 -19-16AUG99-1/1	

02-6112699
PN=12

☐ Engine oil, replace			
☐ Engine oil filter, replace			
☐ Fuel filter, replace			
☐ Belt, check tension and wear (300-Series ar manual tensioner)	nd POWERTech with		
☐ Valve clearance, adjust (300-Series)			
Number of hours:	Comments:		Dealer or distributor stamp
Date:			
Job done by:			
			DPSG,CD03523,66 -19-16AUG99-1/1
6000 HOURS OF OPERATION			
☐ Engine oil, replace		☐ Cooling system, drai	in and flush (if COOL-GARD is not used)
☐ Engine oil filter, replace	☐ Valve clearance, adjust (POWERTech)		
1		☐ Valve clearance, adj	ust (POWERTech)
☐ Fuel filter, replace		☐ Valve clearance, adj ☐ Air intake system, ch	
☐ Fuel filter, replace ☐ Check belt and tensioning system			neck
		☐ Air intake system, ch	neck
☐ Check belt and tensioning system	Comments:	☐ Air intake system, ch	neck
☐ Check belt and tensioning system ☐ Crankcase vent tube, clean	Comments:	☐ Air intake system, ch	neck
☐ Check belt and tensioning system ☐ Crankcase vent tube, clean Number of hours:	Comments:	☐ Air intake system, ch	neck

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6500 HOURS OF OPERATION	6500 HOURS OF OPERATION			
☐ Engine oil, replace				
☐ Engine oil filter, replace				
☐ Fuel filter, replace				
☐ Belt, check tension and wear (300-Series ar manual tensioner)	nd POWERTech with			
□ Valve clearance, adjust (300-Series)				
Number of hours:	Comments:	Dealer or distributor stamp		
Date:				
Job done by:				
		DPSG,CD03523,68 -19-16AUG99-1/1		
7000 HOURS OF OPERATION				
☐ Engine oil, replace	☐ Air intake system, cl	neck		
☐ Engine oil filter, replace				
☐ Fuel filter, replace				
☐ Check belt and tensioning system				
☐ Crankcase vent tube, clean				
Number of hours:	Comments:	Dealer or distributor stamp		
Date:				
Job done by:				
	·			

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7500 HOURS OF OPERATION			
☐ Engine oil, replace	Engine oil, replace		n and flush (if COOL-GARD is used)
☐ Engine oil filter, replace			
☐ Fuel filter, replace			
☐ Belt, check tension and wear (300-Series ar manual tensioner)	nd POWERTech with		
☐ Valve clearance, adjust (300-Series)			
Number of hours:	Comments:		Dealer or distributor stamp
Date:			
Job done by:			
			DPSG,CD03523,70 -19-16AUG99-1/1
8000 HOURS OF OPERATION			
☐ Engine oil, replace		☐ Cooling system, drai	n and flush (if COOL-GARD is not used)
☐ Engine oil filter, replace		☐ Valve clearance, adj	ust (POWERTech)
☐ Fuel filter, replace		☐ Air intake system, ch	neck
☐ Check belt and tensioning system		☐ Vibration damper, ch	neck
☐ Crankcase vent tube, clean			
Number of hours:	Comments:		Dealer or distributor stamp
Date:			
Job done by:			
			DPSG,CD03523,71 -19-16AUG99-1/1

02-9112699
PN=15

☐ Engine oil, replace		
☐ Engine oil filter, replace		
□ Fuel filter, replace		
☐ Belt, check tension and wear (300-Semanual tensioner)	eries and POWERTech with	
□ Valve clearance, adjust (300-Series)		
Number of hours:	Comments:	Dealer or distributor stamp
Date:		
lob done by:		
		DPSG,CD03523,72 -19-16AUG98
000 HOURS OF OPERAT	ΓΙΟΝ	DPSG,CD03523,72 -19-16AUG99
		DPSG,CD03523,72 -19-16AUG999999999999999999999999999999999999
3 Engine oil, replace	□ Ai	
1 Engine oil, replace 1 Engine oil filter, replace	□ Ai	ir intake system, check
D Engine oil, replace D Engine oil filter, replace D Fuel filter, replace	□ Ai	ir intake system, check
D Engine oil, replace D Engine oil filter, replace D Fuel filter, replace D Check belt and tensioning system	□ Ai	ir intake system, check
D Engine oil, replace D Engine oil filter, replace D Fuel filter, replace D Check belt and tensioning system D Crankcase vent tube, clean	□ Ai	ir intake system, check
D Engine oil, replace D Engine oil filter, replace D Fuel filter, replace D Check belt and tensioning system D Crankcase vent tube, clean	□ Ai	ir intake system, check ibration damper, replace (6 cyl.)
Engine oil, replace Engine oil filter, replace Fuel filter, replace Check belt and tensioning system Crankcase vent tube, clean Number of hours:	□ Ai	ir intake system, check ibration damper, replace (6 cyl.)
O00 HOURS OF OPERAT Engine oil, replace Engine oil filter, replace Fuel filter, replace Check belt and tensioning system Crankcase vent tube, clean Number of hours: Date:	□ Ai	ir intake system, check ibration damper, replace (6 cyl.)

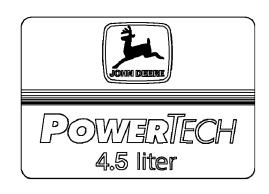
02-10 112699 PN=16

☐ Engine oil, replace			
☐ Engine oil filter, replace			
☐ Fuel filter, replace			
☐ Belt, check tension and wear (300-Series a manual tensioner)	nd POWERTech with		
□ Valve clearance, adjust (300-Series)			
Number of hours:	Comments:		Dealer or distributor stamp
Date:			
Job done by:			
			DPSG,CD03523,74 -19-16AUG99-1/
☐ Engine oil, replace	N	☐ Cooling system, dra	
☐ Engine oil, replace ☐ Engine oil filter, replace	N	☐ Valve clearance, adj	in and flush iust (POWERTech)
☐ Engine oil, replace ☐ Engine oil filter, replace ☐ Fuel filter, replace	N	☐ Valve clearance, adj	in and flush iust (POWERTech)
☐ Engine oil, replace ☐ Engine oil filter, replace ☐ Fuel filter, replace ☐ Check belt and tensioning system	N	☐ Valve clearance, adj ☐ Thermostat, replace ☐ Vibration damper, cl	in and flush iust (POWERTech) neck
☐ Engine oil, replace ☐ Engine oil filter, replace ☐ Fuel filter, replace	N	☐ Valve clearance, adj	in and flush just (POWERTech) neck
☐ Engine oil, replace ☐ Engine oil filter, replace ☐ Fuel filter, replace ☐ Check belt and tensioning system ☐ Crankcase vent tube, clean	N	☐ Valve clearance, adj ☐ Thermostat, replace ☐ Vibration damper, cl	in and flush just (POWERTech) neck
☐ Engine oil, replace ☐ Engine oil filter, replace ☐ Fuel filter, replace ☐ Check belt and tensioning system ☐ Crankcase vent tube, clean	N Comments:	☐ Valve clearance, adj ☐ Thermostat, replace ☐ Vibration damper, cl	in and flush just (POWERTech) neck
□ Engine oil, replace □ Engine oil filter, replace □ Fuel filter, replace □ Check belt and tensioning system □ Crankcase vent tube, clean □ Air intake system, check		☐ Valve clearance, adj ☐ Thermostat, replace ☐ Vibration damper, cl	in and flush just (POWERTech) neck place
☐ Engine oil filter, replace ☐ Fuel filter, replace ☐ Check belt and tensioning system ☐ Crankcase vent tube, clean ☐ Air intake system, check Number of hours:		☐ Valve clearance, adj ☐ Thermostat, replace ☐ Vibration damper, cl	in and flush just (POWERTech) neck place

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PN=17

POWERTECH® MEDALLION

A medallion is located on the rocker arm cover which identifies each engine as a John Deere POWERTECH® engine.

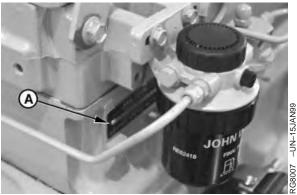


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POWERTECH is a trademark of Deere & Company

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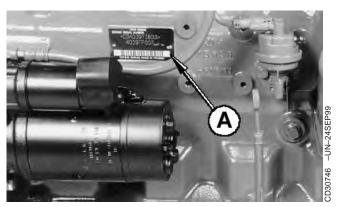
ENGINE SERIAL NUMBER PLATE



POWERTech engine

Each engine has a 13–digit John Deere serial number. The first two digits identify the factory that produced the engine:

"CD" indicates the engines was built in Saran, France.



300-Series engine

Your engine's serial number plate (A) is located on the right-hand side of cylinder block behind the fuel filter for POWERTech engines and near the fuel supply pump on 300–Series engines.

DPSG,CD03523,12 -19-05JUL99-1/1

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RECORD ENGINE SERIAL NUMBER

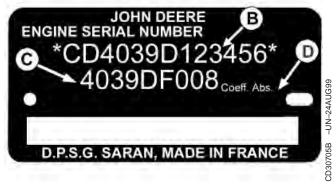
Record all of the numbers and letters found on your engine serial number plate in the spaces provided below.

This information is very important for repair parts or warranty information.

Engine Serial Number (B)

Engine Model Number (C)

Coefficient of Absorption Value (D)



300-Series engine plate



POWERTech engine plate

DPSG,CD03523,13 -19-05JUL99-1/1

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ENGINE OPTION CODES



Engine option code label

In addition to the serial number plate, OEM engines have an engine option code label affixed to the rocker arm cover. These codes indicate which of the engine options were installed on your engine at the factory. When in need of parts or service, furnish your authorized servicing dealer or engine distributor with these numbers.

An additional sticker may be also delivered (in a plastic bag attached to the engine or inserted in the machine documentation). It is recommended to stick this option code list sticker either:

On this page of your Operator's manual below this section.

٥r

 On the "Engine Owner's Warranty" booklet under the title OPTION CODES (Engine manufacturing configuration).

NOTE: The Machine Manufacturer may have already stuck it at a specific accessible place (inside the enclosure or close to a maintenance area).

The engine option code label includes an engine base code (A). This base code must also be recorded along with the option codes. At times it will be necessary to furnish this base code to differentiate two identical option codes for the same engine model.

The first two digits of each code identify a specific group, such as alternators. The last two digits of each code identify one specific option provided on your engine, such as a 12-volt, 55-amp alternator.

NOTE: These option codes are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

If an engine is ordered without a particular component, the last two digits of that functional group option code will be 99, 00, or XX. The list on the next page shows only the first two digits of the code numbers. For future reference such as ordering repair parts, it is important to have these code numbers available. To ensure this availability, enter the third and fourth digits shown on your engine option code label in the spaces provided on the following page.

NOTE: Your engine option code label may not contain all option codes if an option has been added after the engine left the producing factory.

If option code label is lost or destroyed, consult your servicing dealer or engine distributor selling the engine for a replacement.

Continued on next page

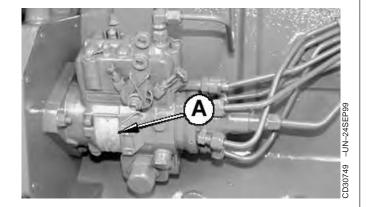
DPSG,CD03523,14 -19-05JUL99-1/2

Option Codes	Description	Option Codes	Description
Engine Base Code:_			
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 35 36 37 39 40 41 43 44 43 44	Rocker Arm Cover Oil Filler Neck Crankshaft Pulley Flywheel Housing Flywheel Fuel Injection Pump Air inlet Air cleaner Oil pan Coolant pump Thermostat Cover Thermostat Fan Drive Fan Belt Fan Engine Coolant Heater Radiator Exhaust Manifold Ventilator System Starting Motor Alternator Instrument Panel Fuel Filter Front Plate Fuel Transfer Pump Thermostat Housing Oil Dipstick Belt Driven Front Auxiliary Drive Starting Aid Timing Gear Cover with Gears	45 46 47 48 49 50 51 52 54 55 56 57 59 60 62 64 65 68 69 74 75 76 86 87 88 91 97 98	Balancer Shaft Cylinder Block With Liners and Camshaft Crankshaft and Bearings Connecting Rods and Pistons Valve Actuating Mechanisms Oil Pump Cylinder Head With Valves Auxiliary Gear Drive Oil heater Shipping stand Paint Option Coolant Inlet Oil Cooler Add-on Auxiliary Drive Pulley Alternator Mounting Exhaust Elbow Turbocharger Temperature Switch Electronic Tachometer Sensor Damper Engine Serial Number Plate Air Conditioning System Compressor Mounting Air Restriction Indicator Oil Pressure Switch Fan Pulley Automatic Belt Tensioner Oil Filter Special Equipment (Factory Installed) Special Equipment (Field Installed) Shipping

03-4 112699 PN=21

RECORD FUEL INJECTION PUMP MODEL NUMBER

•	ction pump model and serial nthe serial number plate (A).
Model No	RPM
Manufacturer's No.	
Serial No	



DPSG,CD03523,15 -19-07JUL99-1/1

03-5112699
PN=22

Safety

RECOGNIZE SAFETY INFORMATION

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.



DX,ALERT -19-29SEP98-1/1

UNDERSTAND SIGNAL WORDS

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

A DANGER

A WARNING

A CAUTION

187 -19-30SEP8

DX,SIGNAL -19-03MAR93-1/1

05-1

112699 PN=23

Safety

ENGINE LIFTING PROCEDURE



CAUTION: The only recommended method for lifting the engine is with JDG23 Engine Lifting Sling (A) and safety approved lifting straps (B) that come with engine. Use extreme caution when lifting and NEVER permit any part of the body to be positioned under an engine being lifted or suspended.

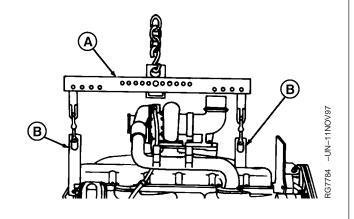
Lift engine with longitudinal loading on lifting sling and lifting straps only. Angular loading greatly reduces lifting capacity of sling and straps.

NOTE: If engine does not have lifting straps, universal straps can be procured through service parts under part numbers JD-244-1 and JD-244-2.

- 1. If not equipped, install lifting straps and torque to 200 N•m (145 lb-ft).
- 2. Attach JDG23 Engine Lifting Sling (A) to engine lifting straps (B) and overhead hoist.

IMPORTANT: Lifting straps are designed to lift the engine and accessories such as radiator, air filter and other small components. If larger components, such as power take-off, transmission, generator air compressor... etc, are attached to engine, the lifting straps provided with engine or through parts channel are not intended for this purpose. Technician is responsible for providing adequate lifting devices under these situations. See machine manuals for additional information on removing engine from machine.

3. Carefully move engine to desired location.



DPSG,CD03523,95 -19-06OCT99-1/

05-2

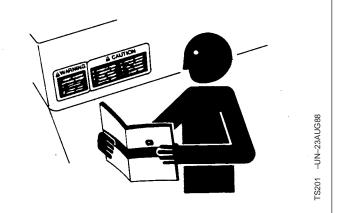
FOLLOW SAFETY INSTRUCTIONS

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.



DX,READ -19-03MAR93-1/1

PREVENT MACHINE RUNAWAY

Avoid possible injury or death from machinery runaway.

Do not start engine by shorting across starter terminals. Machine will start in gear if normal circuitry is bypassed.

NEVER start engine while standing on ground. Start engine only from operator's seat, with transmission in neutral or park.



DX,BYPAS1 -19-29SEP98-1/1

Safety

HANDLE FUEL SAFELY—AVOID FIRES

Handle fuel with care: it is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks.

Always stop engine before refueling machine. Fill fuel tank outdoors.

Prevent fires by keeping machine clean of accumulated trash, grease, and debris. Always clean up spilled fuel.



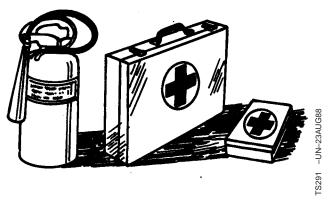
DX,FIRE1 -19-03MAR93-1/1

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



DX,FIRE2 -19-03MAR93-1/1

HANDLE STARTING FLUID SAFELY

Starting fluid is highly flammable.

Keep all sparks and flame away when using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location.

Do not incinerate or puncture a starting fluid container.



TS1356 -UN-18MAR92

DX,FIRE3 -19-16APR92-1/1

05-4

112699 PN=26

Safety

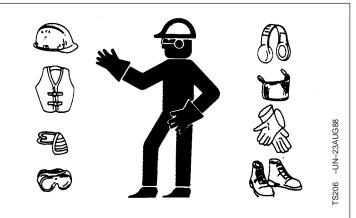
WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.

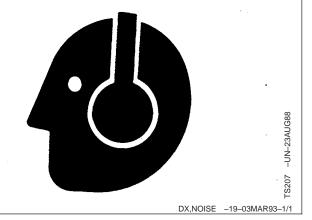


DX,WEAR -19-10SEP90-1/1

PROTECT AGAINST NOISE

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



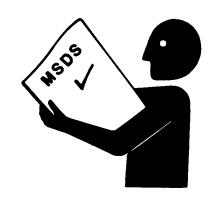
HANDLE CHEMICAL PRODUCTS SAFELY

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)



132 -UN-26NOV90

DX,MSDS,NA -19-03MAR93-1/1

STAY CLEAR OF ROTATING DRIVELINES

Entanglement in rotating driveline can cause serious injury or death.

Keep master shield and driveline shields in place at all times. Make sure rotating shields turn freely.

Wear close fitting clothing. Stop the engine and be sure the PTO driveline is stopped before making adjustments or performing any type service on the engine or PTO-driven equipment.



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CD,PTO -19-12SEP95-1/1

Safety

PRACTICE SAFE MAINTENANCE

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.

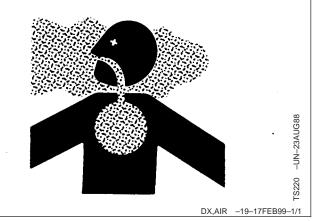


DX,SERV -19-17FEB99-1/1

WORK IN VENTILATED AREA

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area



05-7

AVOID HIGH-PRESSURE FLUIDS

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



DX,FLUID -19-03MAR93-1/1

AVOID HEATING NEAR PRESSURIZED FLUID LINES

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area.



DX,TORCH -19-03MAR93-1/1

05-8

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REMOVE PAINT BEFORE WELDING OR HEATING

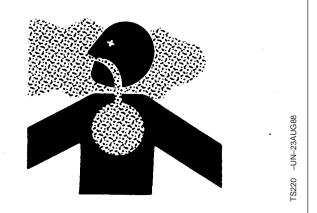
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- If you sand or grind paint, avoid breathing the dust.
 Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.



DX,PAINT -19-03MAR93-1/1

SERVICE COOLING SYSTEM SAFELY

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



Safety

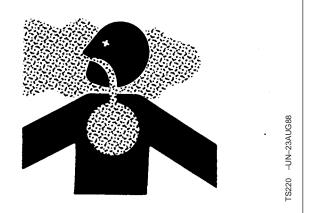
AVOID HARMFUL ASBESTOS DUST

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos.

Keep bystanders away from the area.



DX,DUST -19-15MAR91-1/1

DISPOSE OF WASTE PROPERLY

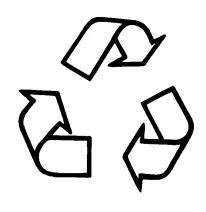
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.



FS1133 -UN-26NOV90

DX,DRAIN -19-03MAR93-1/1

DIESEL FUEL

Consult your local fuel distributor for properties of the diesel fuel available in your area.

In general, diesel fuels are blended to satisfy the low temperature requirements of the geographical area in which they are marketed.

Diesel fuels specified to EN 590 or ASTM D975 are recommended.

In all cases, the fuel shall meet the following properties:

Cetane number of 40 minimum. Cetane number greater than 50 is preferred, especially for temperatures below -20°C (-4°F) or elevations above 1500 m (5,000 ft).

Cold Filter Plugging Point (CFPP) below the expected low temperature OR **Cloud Point** at least 5°C (9°F) below the expected low temperature.

Fuel lubricity should pass a minimum of 3100 gram load level as measured by the BOCLE scuffing test.

Sulfur content:

- Sulfur content should not exceed 0.5%. Sulfur content less than 0.05% is preferred.
- If diesel fuel with sulfur content greater than 0.5% sulfur content is used, reduce the service interval for engine oil and filter by 50%.
- DO NOT use diesel fuel with sulfur content greater than 1.0%.

Bio-diesel fuels may be used ONLY if the fuel properties meet DIN 51606 or equivalent specification.

DO NOT mix used engine oil or any other type of lubricant with diesel fuel.

DX,FUEL1 -19-17FEB99-1/1

HANDLING AND STORING DIESEL FUEL



CAUTION: Handle fuel carefully. Do not fill the fuel tank when engine is running.

DO NOT smoke while you fill the fuel tank or service the fuel system.

Fill the fuel tank at the end of each day's operation to prevent condensation and freezing during cold weather. IMPORTANT: The fuel tank is vented through the filler cap. If a new filler cap is required, always replace it with an original vented cap.

When fuel is stored for an extended period or if there is a slow turnover of fuel, add a fuel conditioner to stabilize the fuel and prevent water condensation. Contact your fuel supplier for recommendations.

DX,FUEL4 -19-18MAR96-1/

10-1 112699 PN=33

ENGINE BREAK-IN OIL

New engines are filled at the factory with John Deere ENGINE BREAK-IN OIL. During the break-in period, add John Deere ENGINE BREAK-IN OIL as needed to maintain the specified oil level.

Change the oil and filter after the first 100 hours of operation of a new or rebuilt engine.

After engine overhaul, fill the engine with John Deere ENGINE BREAK-IN OIL.

If John Deere ENGINE BREAK-IN OIL is not available, use a diesel engine oil meeting one of the following during the first 100 hours of operation:

• API Service Classification CE

ACEA Specification E1

After the break-in period, use John Deere PLUS-50® or other diesel engine oil as recommended in this manual.

IMPORTANT: Do not use PLUS-50 oil or engine oils meeting API CG4, API CF4, ACEA E3, or ACEA E2 performance levels during the first 100 hours of operation of a new or rebuilt engine. These oils will not allow the engine to break-in properly.

PLUS-50 is a registered trademark of Deere & Company.

DX,ENOIL4 -19-100CT97-1/1

10-2 112699 PN=34

DIESEL ENGINE OIL

Use oil viscosity based on the expected air temperature range during the period between oil changes.

The following oil is preferred:

• John Deere PLUS-50®

The following oil is also recommended:

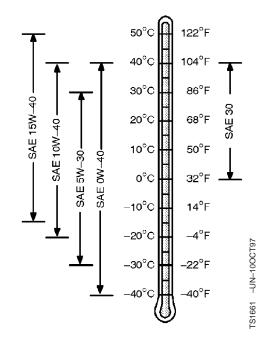
 John Deere TORQ-GARD SUPREME TORQ-GARD SUPREME®

Other oils may be used if they meet one or more of the following:

- API Service Classification CG-4
- API Service Classification CF-4
- ACEA Specification E3
- ACEA Specification E2

Multi-viscosity diesel engine oils are preferred.

If diesel fuel with sulfur content greater than 0.5% is used, reduce the service interval by 50%.



PLUS-50 is a registered trademark of Deere & Company. TORQ-GARD SUPREME is a trademark of Deere & Company

CD,ENOIL -19-100CT97-1/1

LUBRICANT STORAGE

Your equipment can operate at top efficiency only when clean lubricants are used.

Use clean containers to handle all lubricants.

Whenever possible, store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation. Make certain that all containers are properly marked to identify their contents.

Properly dispose of all old containers and any residual lubricant they may contain.

DX,LUBST -19-18MAR96-1/1

MIXING OF LUBRICANTS

In general, avoid mixing different brands or types of oil. Oil manufacturers blend additives in their oils to meet certain specifications and performance requirements.

Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

Consult your John Deere dealer to obtain specific information and recommendations.

DX,LUBMIX -19-18MAR96-1/1

DIESEL ENGINE COOLANT

The engine cooling system is filled to provide year-round protection against corrosion and cylinder liner pitting, and winter freeze protection to -37°C (-34°F).

John Deere COOL-GARD is preferred for service.

If John Deere COOL-GARD is not available, use a low silicate ethylene glycol base coolant concentrate in a 50% mixture of concentrate with quality water.

The coolant concentrate shall be of a quality that provides cavitation protection to cast iron and aluminum parts in the cooling system. John Deere COOL-GARD meets this requirement.

A 50% mixture of ethylene glycol engine coolant in water provides freeze protection to -37°C (-34°F). If protection at lower temperatures is required, consult your John Deere dealer for recommendations.

Water quality is important to the performance of the cooling system. Distilled, deionized, or demineralized

water is recommended for mixing with ethylene glycol base engine coolant concentrate.

IMPORTANT: Do not use cooling system sealing additives or antifreeze that contains sealing additives.

COOLANT DRAIN INTERVALS

Drain the factory fill engine coolant, flush the cooling system, and refill with new coolant after the first 3 years or 3000 hours of operation. Subsequent drain intervals are determined by the coolant used for service. At each interval, drain the coolant, flush the cooling system, and refill with new coolant.

When John Deere COOL-GARD is used, the coolant drain interval is 3 years or 3000 hours of operation.

If COOL-GARD is not used, the drain interval is reduced to 2 years or 2000 hours of operation.

DX,COOL8 -19-12FEB99-1/1

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OPERATING IN WARM TEMPERATURE CLIMATES

John Deere engines are designed to operate using glycol base engine coolants.

Always use a recommended glycol base engine coolant, even when operating in geographical areas where freeze protection is not required.

IMPORTANT: Water may be used as coolant in emergency situations only.

Foaming, hot surface aluminum and iron corrosion, scaling, and cavitation will occur when water is used as the coolant, even when coolant conditioners are added.

Drain cooling system and refill with recommended glycol base engine coolant as soon as possible.

DX,COOL6 -19-18MAR96-1/1

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PN=37

Operating the Engine

BREAK-IN PERIOD

Within first 100 hours of operation

During the first 100 hours of operation, avoid overloading, excessive idling and no-load operation.

See ENGINE BREAK-IN OIL for eventual addition of oil.

NOTE: During the break-in period a higher-than-usual oil consumption should be considered as normal.

After first 100 hours of operation

After the first 100 hours, drain the crankcase and

change the oil filter (see CHANGING ENGINE OIL AND FILTER). Fill crankcase with seasonal viscosity grade oil (see DIESEL ENGINE OIL).

Check tension of alternator belt.

Check connections of air intake hoses.

Check for proper tightening of cap screws all around the engine.

DPSG,CD03523,17 -19-09JUL99-1/1

STARTING THE ENGINE



CAUTION: Before starting engine in a confined building, install proper outlet exhaust ventilation equipment. Always use safety approved fuel storage and piping.

NOTE: If temperature is below 0°C (32°F), it may be necessary to use cold weather starting aids (See COLD WEATHER OPERATION).

1. Perform all prestarting checks outlined in Maintenance/Daily Section.

- 2. Open the fuel supply shut-off valve, if equipped.
- 3. Activate the starter motor switch to crank the engine and release it as soon as engine starts.

NOTE: Do not operate the starter motor more than 20 seconds at a time.

DPSG.CD03523.18 -19-09JUL99-1/1

COLD WEATHER OPERATION

Depending on equipment, various cold weather starting aids are available to assist in starting the engine at temperatures below 0°C (32°F).

Continued on next page

DPSG,CD03523,19 -19-09JUL99-1/4

15-1

112699 PN=38

Operating the Engine

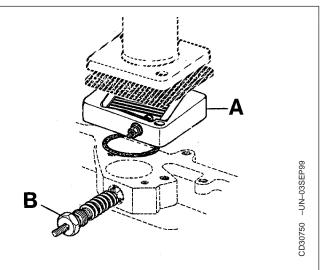
Air intake heater

Air intake heater is either a grid-type (A) for POWERTech engines or a glow plug-type (B) for 300-Series engines installed in the air intake channel.



CAUTION: NEVER use Ether Starting Fluid when air intake heater is used to start the engine.

Activate the heating element (preheater position) for 30 seconds maximum then start the engine.

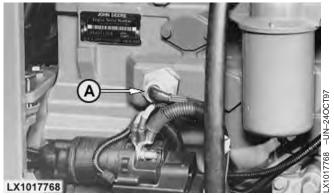


DPSG,CD03523,19 -19-09JUL99-2/4

Coolant heater

Connect plug of coolant heater (A) to a power source (110 or 220 V).

At an ambient temperature of -15°C (5°F), the heating process takes approximatively 2 hours. Extend heating period if ambient temperature is lower.



DPSG,CD03523,19 -19-09JUL99-3/4

Fuel preheater

Fuel preheater (A) switches ON and OFF automatically in relation to the ambient temperature.



DPSG,CD03523,19 -19-09JUL99-4/4

USING A BOOSTER BATTERY OR CHARGER

A 12-volt booster battery can be connected in parallel with battery(ies) on the unit to aid in cold weather starting. ALWAYS use heavy duty jumper cables.



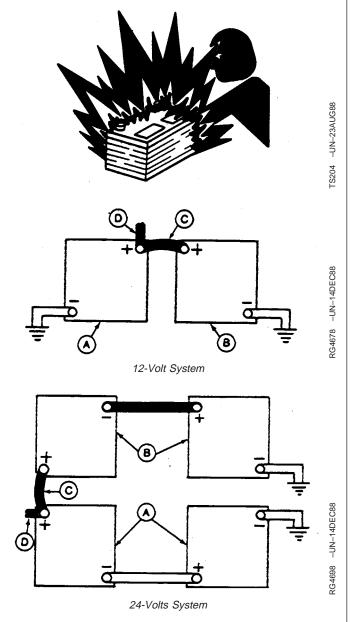
CAUTION: Gas given off by batteries is explosive. Keep sparks and flames away from batteries. Before connecting or disconnecting a battery charger, turn charger off. Make last connection and first disconnection at a point away from battery. Always connect NEGATIVE (–) cable last and disconnect this cable first.

IMPORTANT: Be sure polarity is correct before making connections. Reversed polarity will damage electrical system. Always connect positive to positive and negative to ground. Always use 12-volt booster battery for 12-volt electrical systems and 24-volt booster battery/ batteries for 24-volt electrical systems.

1. Connect booster battery or batteries to produce the required system voltage for your engine application.

NOTE: To avoid sparks, DO NOT allow the free ends of jumper cables to touch the engine.

- 2. Connect one end of jumper cable to the POSITIVE (+) post of the booster battery.
- 3. Connect the other end of the jumper cable to the POSITIVE (+) post of battery connected to starter.
- 4. Connect one end of the other jumper cable to the NEGATIVE (–) post of the booster battery.
- ALWAYS complete the hookup by making the last connection of the NEGATIVE (–) cable to a good ground on the engine frame and away from the battery(ies).
- Start the engine. Disconnect jumper cables immediately after engine starts. Disconnect NEGATIVE (–) cable first.



- A—12-Volt Machine battery/batteries
- B—12-Volt Booster battery/batteries
- C-Booster cable
- D-Cable to starter motor

DPSG.CD03523.20 -19-09JUL99-1/1

Operating the Engine

ENGINE OPERATION

Warming engine

Operate engine at high idle for 1 to 2 minutes before applying the load.

NOTE: This procedure does not apply to standby generator sets where the engine is loaded immediately upon reaching rated speed.

Normal engine operation

Compare engine coolant temperature and engine oil pressure with specifications below:

Minimum oil pressure at full load rated speed¹—Specification

Coolant temperature range—Specification

Stop engine immediately if coolant temperature is above or oil pressure below specifications or if there are any signs of part failure. Symptoms that may be early signs of engine problems could be:

• Sudden loss of power

- Unusual noise or vibration
- Excessive black exhaust fumes
- Excessive fuel consumption
- Excessive oil consumption
- Fluid leaks

Recommendation for turbocharger engines

Should the engine stall when operating under load, IMMEDIATELY restart it to prevent overheating of turbocharger components.

Idling engine

Avoid excessive engine idling. Prolonged idling may cause the engine coolant temperature to fall below its normal range. This, in turn, causes crankcase oil dilution, due to incomplete fuel combustion, and permits formation of gummy deposits on valves, pistons and piston rings. It also promotes rapid accumulation of engine sludge and unburned fuel in the exhaust system. If an engine will be idling for more than 5 minutes, stop and restart later.

NOTE: Generator set applications have the governor locked at a specified speed and do not have a slow idle function. These engines idle at no load governed speed (fast idle).

¹Oil at normal operating temperature of 115°C (240°F).

DPSG.CD03523.21 -19-09JUL99-1/1

STANDBY POWER UNITS

To assure that your engine will deliver efficient standby operation when needed, start engine and run at rated speed (with 50%—70% load) for 30 minutes every

2 weeks. DO NOT allow engine to run an extended period of time with no load.

DPSG,CD03523,22 -19-09JUL99-1/

PN=41

Operating the Engine

STOPPING THE ENGINE

- 1. Before stopping, run engine for at least 2 minutes at fast idle and no load.
- 2. Stop the engine.

DPSG,CD03523,23 -19-09JUL99-1/1

Maintenance

OBSERVE SERVICE INTERVALS

Using hour meter as a guide, perform all services at the hourly intervals indicated on following pages. At each scheduled maintenance interval, perform all previous maintenance operations in addition to the ones specified. Keep a record of hourly intervals and services performed using charts provided in Maintenance Records Section.

IMPORTANT: Recommended service intervals are for normal operating conditions.

Service MORE OFTEN if engine is operated under adverse conditions.

Neglecting maintenance can result in

failures or permanent damage to the

engine.

DPSG,CD03523,24 -19-09JUL99-1/1

USE CORRECT FUELS, LUBRICANTS AND COOLANT

IMPORTANT: Use only fuels, lubricants, and coolants meeting specifications outlined in Fuels, Lubricants, and Coolant Section when servicing your John Deere

Engine.

Consult your John Deere engine distributor, servicing dealer or your nearest John Deere Parts Network for recommended fuels, lubricants, and coolant. Also available are necessary additives for use when operating engines in tropical, arctic, or any other adverse conditions.



DPSG,CD03523,25 -19-09JUL99-1/1

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112699 PN=43

Q-Pulse Id TMS554 Active 13/12/2013 Page 49 of 959

Maintenance

MAINTENANCE INTERVAL CHART

Item	10 H / daily	500 H	1000 H / 1 year	2000 H / 2 years	2500 H / 3 years	As required
Check engine oil and coolant level	•					
Check air filter restriction indicator ^a	•					
Change engine oil and filter ^b		•				
Replace fuel filter element		•				
Check belt tension and automatic tensioner ^c		•	•			
Check and adjust valve clearanced			•	•		
Clean crankcase vent tube			•			
Check air intake hoses, connections and system			•			
Check vibration damper (6 cyl.)e				•		
Check engine speed and speed droop governor				•		
Drain and flush cooling system ^f				•	•	
Drain water and sediment from fuel filter						•
Clean filter element (see note a)						•
Test thermostat and injection nozzles (see your dealer) ^g						•

^aClean air filter element when restriction indicator is red. Replace filter element after 6 cleanings or once a year.

bChange oil and filter after the first 100 hours of operation, then every 500 hours thereafter. Change oil and filter at least once a year.

^cCheck belt tension every 500 hours on 300-Series engines and on POWERTech engines with manual tensioner. Check automatic belt tensioner every 1000 hours/1 year on POWERTech engines when equipped.

^dHave your authorized servicing dealer or engine distributor adjust valve clearance as follows. After the first 500 hours of operation then every 1000 hours thereafter on 300-Series engines. Every 2000 hours on POWERTech engines.

eHave your authorized dealer or engine distributor replace the vibration damper every 4500 hours/5 years.

'Drain and flush cooling system every 2500 hours/3 years when John Deere COOL-GARD coolant is used. Otherwise every 2000 hours/2 years.

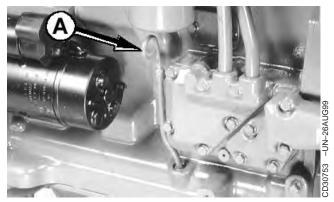
⁹Contact your dealer when thermostat or injection nozzles are suspected to be defective. Replace injection nozzles every 5000 hours and thermostat every 10000 hours.

DPSG,CD03523,26 -19-09JUL99-1/1

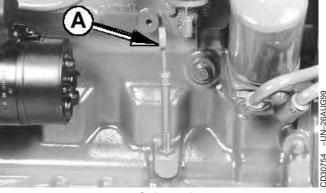
20-2 112699 PN=44

Maintenance/Daily or every 10 hours

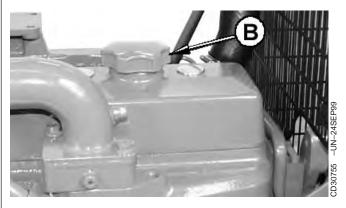
DAILY PRESTARTING CHECKS



POWERTech engine



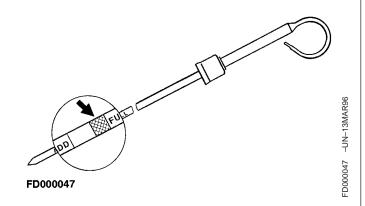
300-Series engine



Do the following BEFORE STARTING THE ENGINE for the first time each day:

IMPORTANT: DO NOT top up with fresh oil until the oil level is BELOW the add mark.

1. Check engine oil level on dipstick (A). Add as required, using seasonal viscosity grade oil. (See



DIESEL ENGINE OIL). Add oil at rocker arm cover filler cap (B).

IMPORTANT: DO NOT fill above the crosshatch area. Oil levels anywhere within crosshatch are considered in the acceptable operating range.

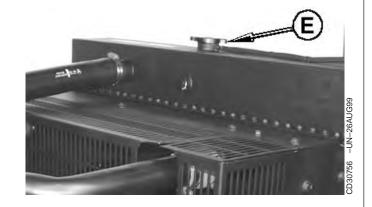
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DPSG,CD03523,27 -19-12JUL99-1/3

Maintenance/Daily or every 10 hours



3281 -UN-23AUG88



2. CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Only remove filler cap when engine is cold or when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

Remove radiator cap (E) and check coolant level which should be at bottom of filler neck. Fill radiator with proper coolant solution if level is low. (See DIESEL ENGINE COOLANT). Check overall cooling system for leaks.

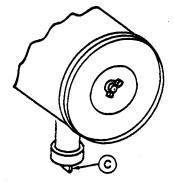
DPSG,CD03523,27 -19-12JUL99-2/3

- 3. If air filter has a dust unloading valve (C), squeeze valve tip to release any trapped dirt particles.
- 4. Check air intake restriction indicator (D). When indicator is red, air filter needs to be cleaned.

IMPORTANT: Maximum air intake restriction is 6.25 kPa (0.06 bar; 1.0 psi) (25 in. H₂O). A clogged air cleaner element will cause excessive intake restriction and a reduced air supply to the engine.

5. Make a thorough inspection of the engine compartment.

NOTE: Wipe all fittings, caps and plugs before performing any maintenance to reduce the chance of system contamination.



3G4687 -UN-20DEC88



DPSG,CD03523,27 -19-12JUL99-3/3

DPSG,CD03523,27 -19-

112699 PN=46

Maintenance/500 hours

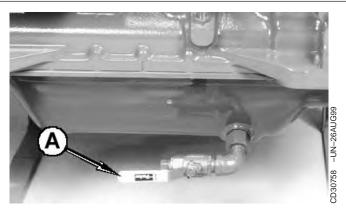
CHANGING ENGINE OIL AND FILTER

NOTE: Change engine oil and filter for the first time after 100 hours maximum of operation, then every 500 hours thereafter. Change oil and filter at least once a year.

- 1. Run engine approximately 5 minutes to warm up oil. Shut engine off.
- 2. Open oil pan drain valve (A).
- 3. Drain crankcase oil from engine while warm.
- 4. Remove and discard oil filter element (B) using a suitable filter wrench.
- 5. Remove oil filter packing and clean filter mounting pad.

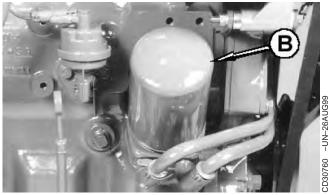
IMPORTANT: Filtration of oils is critical to proper lubrication. Always change filter regularly. Use filters meeting John Deere performance specifications.

- 6. Oil the new packing and install a new filter element. Hand tighten element according to values printed on filter element. If values are not provided, tighten element approximately 3/4 — 1-1/4 turn after packing contacts filter housing. DO NOT overtighten filter element.
- 7. Close oil pan drain valve.





POWERTEch engine



300-Series engine

Continued on next page

DPSG,CD03523,29 -19-12JUL99-1/2

30-1 112699 PN=47

Maintenance/500 hours

8. Fill engine crankcase with correct John Deere engine oil through rocker arm cover opening (C); see DIESEL ENGINE OIL.

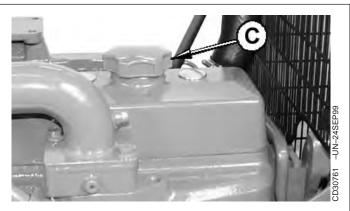
To determine the correct oil fill quantity for your engine, see "Engine Oil Quantities" in Specifications Section.

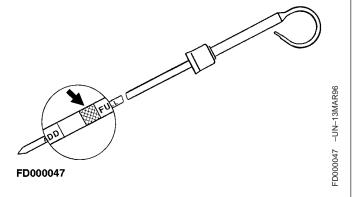
NOTE: Crankcase oil capacity may vary slightly.

ALWAYS fill crankcase to full mark or within crosshatch on dipstick, whichever is present. DO NOT overfill.

IMPORTANT: Immediately after completing any oil change, crank engine for 30 seconds without permitting engine to start. This will help insure adequate lubrication to engine components before engine starts.

- 9. Start engine and run to check for possible leaks.
- 10. Stop engine and check oil level after 10 minutes. If necessary, top up.

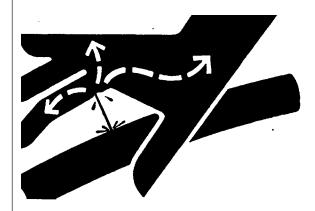




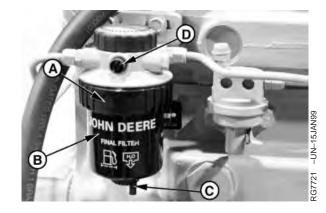
DPSG,CD03523,29 -19-12JUL99-2/2

30-2 112699 PN=48

REPLACING FUEL FILTER ELEMENT



811 -UN-23AUG88



A-Retaining ring

B—Filter element

C-Drain plug

D-Bleed plug

A

CAUTION: CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

- 1. Thoroughly clean fuel filter assembly and surrounding area.
- Loosen drain plug (C) and drain fuel into a suitable container.

NOTE: Lifting up on retaining ring as it is rotated helps to get it past raised locators.

 Firmly grasp the retaining ring (A) and rotate it clockwise 1/4 turn. Remove ring with filter element (B). IMPORTANT: Do not dump the old fuel into the new filter element. This could cause fuel injection problem.

A plug is provided with the new element for plugging the used element.

4. Inspect filter mounting base for cleanliness. Clean as required.

NOTE: Raised locators on fuel filter canister must be indexed properly with slots in mounting base for correct installation.

- Install new filter element dry onto mounting base.
 Be sure element is properly indexed and firmly seated on base. It may be necessary to rotate filter for correct alignment.
- Install retaining ring onto mounting base making certain dust seal is in place on filter base. Hand tighten ring (about 1/3 turn) until it "snaps" into the detent. DO NOT overtighten retaining ring.

NOTE: The proper installation is indicated when a "click" is heard and a release of the retaining ring is felt.

7. Bleed the fuel system.

DPSG.CD03523.30 -19-12JUL99-1/1

CHECKING BELT (300-SERIES ENGINES)

- 1. Inspect belt for cracks, fraying, or stretched out areas. Replace as necessary.
- 2. Check belt tension using one of following methods:
 - a) Use of JDG529 Tension Gauge (A)

Belt tension—Specification

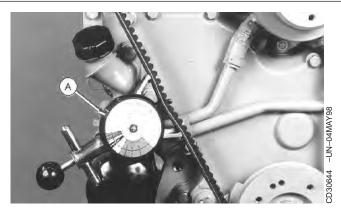
New belt	578—622 N (130—140 lb-force)
Used belt	378-423 N (85-94 lb-force)

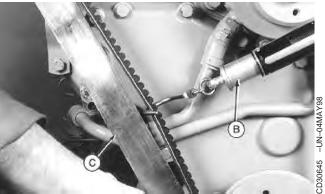
NOTE: Belt is considered used after 10 minutes of operation.

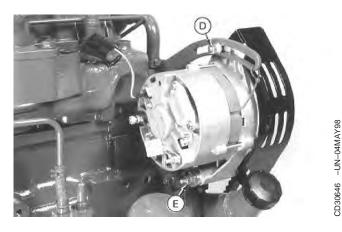
- **b)** Use of tension tester (B) and straight edge (C) A 89 N (20 lb) force applied halfway between pulleys should deflect belt by 19 mm (0.75 in.).
- 3. If adjustment is necessary, loosen alternator nuts (D) and (E). Pull alternator frame outward until belt is correctly tensioned.

IMPORTANT: Do not pry against the alternator rear frame. Do not tighten or loosen belts while they are hot.

- 4. Tighten alternator bracket nuts firmly.
- 5. Run engine for 10 minutes then recheck belt tension.







DPSG,CD03523,31 -19-12JUL99-1/1

30-4112699
PN=50

Maintenance/500 hours

CHECKING BELT (POWERTECH ENGINES WITH MANUAL TENSIONER)

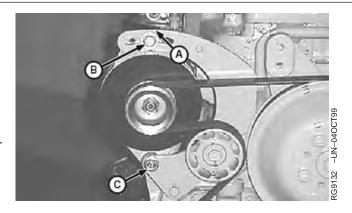
Inspect belt for cracks, fraying, or stretched out areas. Replace if necessary.

NOTE: Belt adjustment is measured using a gauge stamped on the top edge of the alternator bracket.

- 1. Loosen cap screws (B) and (C).
- 2. Slide alternator in slot by hand to remove all excess slack in belt.

IMPORTANT: Do not pry against alternator rear frame.

- Using the gauge (A) on the alternator bracket, stretch belt by prying outward on alternator front frame.
 Stretch the belt 1 gauge unit for a used belt and 1.5 gauge units for a new belt.
- 4. Tighten cap screws (B) and (C).



A—Belt gauge

B-Cap screw

C—Cap screw

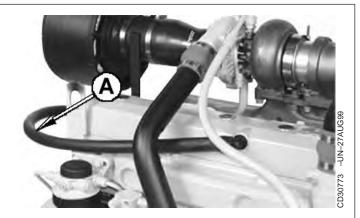
DPSG,CD03523,57 -19-16AUG99-1/1

30-5112699
PN=51

CLEANING CRANKCASE VENT TUBE

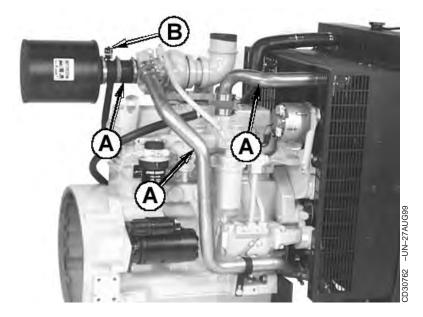
If you operate the engine in dusty conditions, clean the tube at shorter intervals.

- 1. Remove and clean crankcase vent tube (A).
- 2. Install the vent tube. Be sure the O-ring fits correctly in the rocker arm cover bore for elbow adapter. Tighten hose clamp securely.



DPSG,CD03523,32 -19-12JUL99-1/1

CHECKING AIR INTAKE SYSTEM



IMPORTANT: The air intake system must not leak.
Any leak, no matter how small, may result in engine failure due to abrasive dirt and dust entering the intake system.

- 1. Inspect all intake hoses (piping) for cracks. Replace as necessary.
- 2. Check clamps on piping (A) which connect the air filter, engine and, if present, turbocharger and air-to-air radiator. Tighten clamps as necessary.
- 3. Test air restriction indicator (B) for proper operation. Replace indicator as necessary.

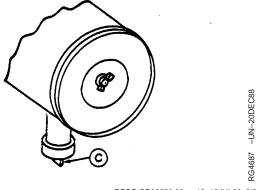
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DPSG,CD03523,33 -19-12JUL99-1/2

35-1

112699 PN=52

- 4. If engine has a rubber dust unloading valve (C), inspect the valve on bottom of air filter for cracks or plugging. Replace as necessary.
- 5. Service air filter as necessary.



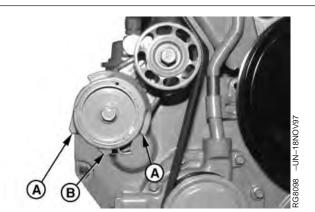
DPSG,CD03523,33 -19-12JUL99-2/2

CHECKING AUTOMATIC BELT TENSIONER (POWERTECH ENGINES)

Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioner is designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

Checking belt wear

The belt tensioner is designed to operate within the limit of arm movement provided by the cast stops (A) and (B) when correct belt length and geometry is used. If the tensioner stop on swing arm (A) is hitting the fixed stop (B), check mounting brackets (alternator, belt tensioner, idler pulley, etc.) and the belt length. Replace belt as needed (see REPLACING FAN AND ALTERNATOR BELTS).



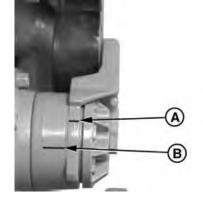
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DPSG,CD03523,34 -19-13JUL99-1/2

Checking tensioner spring tension

A belt tension gauge will not give an accurate measure of the belt tension when automatic spring tensioner is used. Measure tensioner spring tension using a torque wrench and procedure outlined below:

- a. Release tension on belt using a breaker bar and socket on tension arm. Remove belt from pulleys.
- b. Release tension on tension arm and remove breaker bar.
- c. Put a mark (A) on swing arm of tensioner as shown.
- d. Measure 21 mm (0.83 in.) from (A) and put a mark (B) on tensioner mounting base.
- e. Rotate the swing arm using a torque wrench until marks (A) and (B) are aligned.
- Record torque wrench measurement and compare with specification below. Replace tensioner assembly as required.



7977 -UN-14NOV97

Spring—Specification

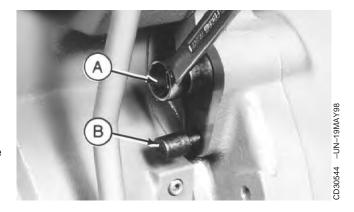
DPSG,CD03523,34 -19-13JUL99-2/2

CHECK AND ADJUST ENGINE VALVE CLEARANCE (300-SERIES ENGINES)

NOTE: Valve clearance must be adjusted after the first 500 hours of operation, then every 1000 hours thereafter.

Adjust engine valve clearance as follows or have your authorized servicing dealer or engine distributor adjust the engine valve clearance.

- 1. Remove rocker arm cover and crankcase vent tube.
- Using JDE83 or JDG820 Flywheel Turning Tool (A), rotate engine flywheel in running direction (clockwise viewed from water pump) until No.1 piston (front) has reached top dead center (TDC) on compression stroke. Insert timing pin JDE81-4 (B) into flywheel bore.



Continued on next page

DPSG,CD03523,35 -19-13JUL99-1/4

112699 PN=54

3. Check and adjust valve clearance to specifications according to following procedures.

Valve clearance (engine cold)—Specification

Intake 0.35 mm (0.014 in.) Exhaust 0.45 mm (0.018 in.)

NOTE: If rocker arm is equipped with adjusting screw and lock nut (A), tighten lock nut to 27 N•m (20 lb-ft) after adjusting valve clearance.

4. Reinstall rocker arm cover and crankcase vent tube.



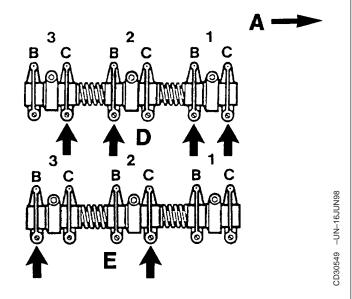


DPSG,CD03523,35 -19-13JUL99-2/4

• 3-Cylinder Engine:

NOTE: Firing order is 1-2-3.

- a. Lock No. 1 piston at TDC compression stroke (D).
- b. Adjust valve clearance on No. 1 and 2 exhaust valves and No.1 and 3 intake valves.
- c. Rotate flywheel 360°. Lock No. 1 piston at TDC exhaust stroke (E).
- d. Adjust valve clearance on No. 3 exhaust valve and No. 2 intake valve.



- A-Front of engine
- B-Exhaust valve
- C-Intake valve
- D-No.1 Piston at TDC compression stroke
- E-No.1 Piston at TDC exhaust stroke

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DPSG,CD03523,35 -19-13JUL99-3/4

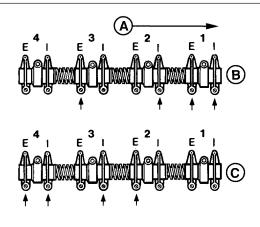
35-4

112699 PN=55

• 4-Cylinder Engine:

NOTE: Firing order is 1-3-4-2.

- a. Lock No. 1 piston at TDC compression stroke (B).
- b. Adjust valve clearance on No. 1 and 3 exhaust valves and No.1 and 2 intake valves.
- c. Rotate flywheel 360°. Lock No. 4 piston at TDC compression stroke (C).
- d. Adjust valve clearance on No. 2 and 4 exhaust valves and No. 3 and 4 intake valves.



A-Front of engine

B-No.1 Piston at TDC compression stroke

C-No.4 Piston at TDC compression stroke

E—Exhaust valve

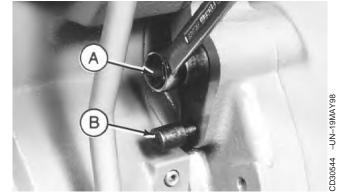
I-Intake valve

DPSG,CD03523,35 -19-13JUL99-4/4

CHECK AND ADJUST ENGINE VALVE CLEARANCE (POWERTECH ENGINE)

Adjust engine valve clearance as follows or have your authorized servicing dealer or engine distributor adjust the engine valve clearance.

- 1. Remove rocker arm cover and crankcase vent tube.
- 2. Using JDE83 or JDG820 Flywheel Turning Tool (A), rotate engine flywheel in running direction (clockwise viewed from water pump) until No.1 piston (front) has reached top dead center (TDC) on compression stroke. Insert timing pin JDE81-4 (B) into flywheel bore.

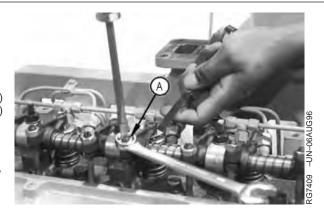


DPSG,CD03523,36 -19-13JUL99-1/4

3. Check and adjust valve clearance to specifications according to following procedures.

Valve clearance (engine cold)—Specification

- 4. If valves need adjusting, loosen the lock nut on rocker arm adjusting screw. Turn adjusting screw until feeler gauge slips with a slight drag. Hold the adjusting screw from turning with screwdriver and tighten lock nut to 27 N•m (20 lb-ft). Recheck clearance again after tightening lock nut. Readjust clearance as necessary
- 5. Reinstall rocker arm cover and crankcase vent tube.



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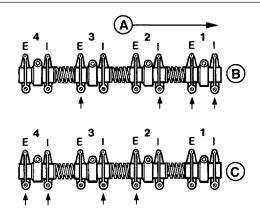
DPSG.CD03523.36 -19-13JUL99-2/4

40-1112699
PN=57

• 4-Cylinder Engine:

NOTE: Firing order is 1-3-4-2.

- a. Lock No. 1 piston at TDC compression stroke (B).
- b. Adjust valve clearance on No. 1 and 3 exhaust valves and No.1 and 2 intake valves.
- c. Rotate flywheel 360°. Lock No. 4 piston at TDC compression stroke (C).
- d. Adjust valve clearance on No. 2 and 4 exhaust valves and No. 3 and 4 intake valves.



A-Front of engine

B-No.1 Piston at TDC compression stroke

C-No.4 Piston at TDC compression stroke

E-Exhaust valve

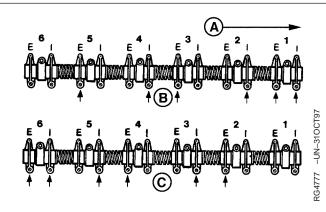
I-Intake valve

DPSG,CD03523,36 -19-13JUL99-3/4

• 6-Cylinder Engine:

NOTE: Firing order is 1-5-3-6-2-4.

- a. Lock No. 1 piston at TDC compression stroke (B).
- b. Adjust valve clearance on No. 1, 3, and 5 exhaust valves and No. 1, 2, and 4 intake valves.
- c. Rotate flywheel 360°. Lock No. 6 piston at TDC compression stroke (C).
- d. Adjust valve clearance on No. 2, 4, and 6 exhaust valves and No. 3, 5, and 6 intake valves.



A—Front of engine

B-No.1 Piston at TDC compression stroke

C-No.6 Piston at TDC compression stroke

E-Exhaust valve

I-Intake valve

DPSG,CD03523,36 -19-13JUL99-4/4

40-2

112699 PN=58

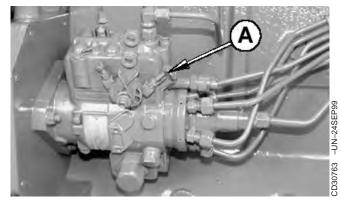
CHECKING ENGINE SPEED

NOTE: Most engines for generator set application (1500 rpm for 50 Hz or 1800 rpm for 60 Hz) run only at fast idle and therefore they do not have slow idle.

Fast idle—Specification

50 Hz Generator set	1550—1580 rpm
60 Hz Generator set	1865—1890 rpm

NOTE: Fast idle is settled by the factory then the idle adjusting screw (A) is sealed to prevent from tampering. Fast idle adjustment can only be done by an authorized fuel system agent.

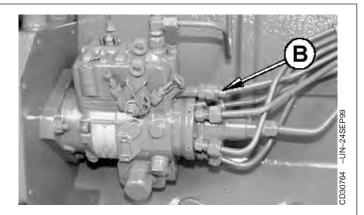


DPSG,CD03523,38 -19-13JUL99-1/1

ADJUST SPEED DROOP GOVERNOR

- 1. Warm engine to normal operating temperature.
- 2. Run engine at fast idle.
- 3. Apply full load.
- 4. If specified power cannot be obtained, turn screw (B) to adjust droop until the requested power is reached.

NOTE: If surging exists upon removing the load, turn screw (B) clockwise to eliminate.



DPSG,CD03523,39 -19-13JUL99-1/1

CHECKING CRANKSHAFT VIBRATION DAMPER (6-CYLINDER ENGINE ONLY)

- 1. Remove belts (shown removed).
- 2. Grasp vibration damper with both hands and attempt to turn it in both directions. If rotation is felt, damper is defective and should be replaced.

IMPORTANT: The vibration damper assembly is not repairable and should be replaced every 4500 hours or 5 years, whichever occurs first.

- Check vibration damper radial runout by positioning a dial indicator so probe contacts damper outer circumference.
- 4. With engine at operating temperature, rotate crankshaft using JDG820 or JDE83 Flywheel Turning Tool.
- 5. Note dial indicator reading. If runout exceeds specifications given below, replace vibration damper.

Damper—Specification





DPSG,CD03523,40 -19-13JUL99-1/1

40-4112699
PN=60

Maintenance/2500 hours/3 years

DRAIN AND FLUSH COOLING SYSTEM

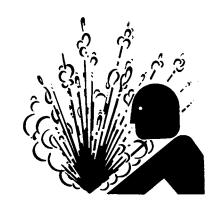
NOTE: Drain and flush cooling system every 2500 hours/3 years when John Deere COOL-GARD coolant is used. Otherwise every 2000 hours/2 years.



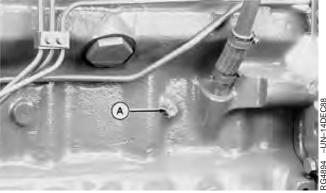
CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

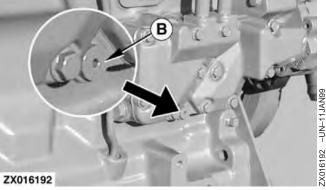
- 1. Slowly open the radiator cap.
- 2. Remove engine block drain plug (A).
- 3. On POWERTech engines, remove oil cooler housing drain plug (B).
- 4. Open radiator drain valve (C). Drain all coolant from radiator.
- 5. Close all drain orifices after coolant has drained.
- 6. Fill the cooling system with clean water. Run engine until water passes through the thermostat to stir up possible rust or sediment.
- 7. Stop engine and immediately drain the water from system before rust and sediment settle.
- 8. After draining water, close all drain orifices and fill the cooling system with clean water and TY15979 John Deere Heavy Duty Cooling System Cleaner or equivalent cleaner. Follow manufacturer's directions on label.
- 9. After cleaning the cooling system, drain cleaner and fill with water to flush the system. Run engine until water passes through the thermostat, then drain out flushing water.















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DPSG.CD03523.41 -19-13JUL99-1/3

Maintenance/2500 hours/3 years

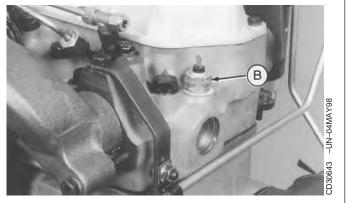
- 10. Check cooling system hoses for proper condition. Replace as necessary.
- 11. Close all drain orifices and fill the cooling system with specified coolant (see DIESEL ENGINE COOLANT).

Cooling system capacity—Specification

CD3029DF128	14.5 L (15.5 qt)
CD4039DF008	16.5 L (17.5 qt)
CD4039TF008	16.5 L (17.5 qt)
CD4045DF158	20 L (21 qt)
CD4045HF158	25 L (26.5 qt)
CD4045TF158	25 L (26.5 qt)
CD4045TF258	25 L (26.5 qt)
CD6068HF158	29 L (30.5 qt)
CD6068TF158	26 L (27.5 qt)
CD6068TF258	26 L (27.5 qt)

DPSG,CD03523,41 -19-13JUL99-2/3

- 12. When refilling cooling system, loosen temperature sensor (B) or plug at the rear of cylinder head to allow air to escape.
- 13. Run engine until it reaches operating temperature then check coolant level and entire cooling system for leaks.



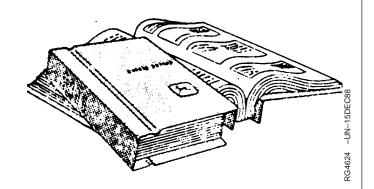
DPSG,CD03523,41 -19-13JUL99-3/3

Maintenance/As required

ADDITIONAL SERVICE INFORMATION

This manual does not allow a complete repair of your engine. If you want want more detailled service information the following publications are available from your regular parts channel.

- PC2451 Parts Catalog
- CTM3274 Component Technical Manual for 300-Series engines (English)
- CTM104 Component Technical Manual for POWERTech engines (English)
- CTM67 Component Technical Manual for OEM Engine accessories (English only)
- CTM77 Component Technical Manual for Alternators and Starter Motors (English only)



DPSG,CD03523,42 -19-15JUL99-1/1

DO NOT MODIFY FUEL SYSTEM

IMPORTANT: Modification or alteration of the injection pump, the injection pump timing, or the fuel injectors in ways not recommended by the manufacturer will terminate the warranty obligation to the purchaser.

> Do not attempt to service injection pump or fuel injectors yourself. Special training and special tools are required (see your authorized servicing dealer or engine distributor).



DPSG,CD03523,43 -19-15JUL99-1/1

50-1 112699 PN=63

Active 13/12/2013

Maintenance/As required

CLEAN OR REPLACE AIR FILTER (ONE-PIECE)

Clean air filter when restriction indicator (A) is red. Air filter can be cleaned up to six times. Thereafter, or at least once a year, it must be replaced.

Proceed as follows:

- 1. Thoroughly clean all dirt around air filter area.
- 2. Loosen clamp (B) then remove air filter.

IMPORTANT: Never reinstall an air filter which shows evidence of bad condition (punched, dented...) allowing no filtered air to enter the engine.

3. Clean air filter with compressed air working from "clean" to "dirty" side.

NOTE: Compressed air must not exceed 600 kPa (6 bar; 88 psi).

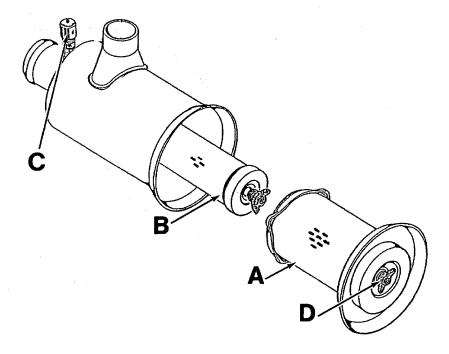
- 4. Mark air filter to keep track of each cleaning operation.
- 5. Fully depress air restriction indicator reset button and release to reset indicator.
- 6. Check air system entirely for proper condition (see CHECKING AIR INTAKE SYSTEM).





DPSG,CD03523,44 -19-15JUL99-1/1

CLEAN OR REPLACE AIR FILTER ELEMENT



J30772 -UN-27AUG99

A—Primary element B—Secondary (safety)

element

C—Air restriction indicator

D-Wing nut

Clean air filter when restriction indicator (C) is red. Replace both primary (A) and secondary (B) filter elements every 6 primary element cleaning or at least once a year.

Proceed as follows:

- 1. Thoroughly clean all dirt around air filter area.
- 2. Remove wing nut (D) and remove primary element (A) from canister.

IMPORTANT: Do not attempt to clean the secondary (safety) element (B). It must be only replaced as recommended.

3. Thoroughly clean all dirt from inside canister.

IMPORTANT: If primary element shows evidence of bad condition (punched,

dented...), replace both the primary and the secondary elements.

4. Clean primary element with compressed air working from "clean" to "dirty" side.

NOTE: Compressed air must not exceed 600 kPa (6 bar; 88 psi).

- 5. Mark air filter to keep track of each cleaning operation.
- 6. Fully depress air restriction indicator reset button and release to reset indicator.
- 7. Check air system entirely for proper condition (see CHECKING AIR INTAKE SYSTEM).

DPSG,CD03523,58 -19-16AUG99-1/1

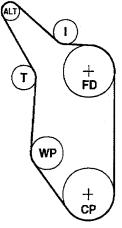
REPLACING FAN AND ALTERNATOR BELT (POWERTECH ENGINES)

NOTE: Refer to CHECKING BELT TENSIONER SPRING TENSION AND BELT WEAR for additional information on the belt tensioner.

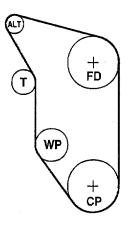
- 1. Inspect belts for cracks, fraying, or stretched out areas. Replace if necessary.
- 2. On engines with automatic belt tensioner, release tension on belt using a breaker bar and socket on tension arm.

On engines with manual tensioner, loosen cap screws holding the alternator.

- 3. Remove poly-vee belt from pulleys and discard belt.
- 4. Install new belt, making sure belt is correctly seated in all pulley grooves. Refer to belt routing at right for your application.
- 5. Apply tension to belt (see CHECKING BELT).
- 6. Start engine and check belt alignment.



Installation on 4 cyl. engines



Installation on 6 cyl. engines

ALT—Alternator
CP—Crankshaft Pulley
FD—Fan Drive
I—Idler Pulley
T—Tensioner
WP—Water Pump

DPSG,CD03523,45 -19-15JUL99-1/1

CD30770 -UN-01SEP99

CD30769 -UN-01SEP99

Maintenance/As required

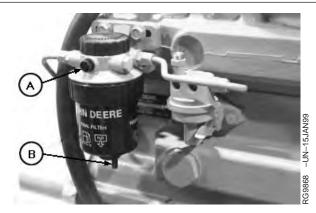
CHECKING FUEL FILTER

Periodically the fuel filter should be checked for water or debris.

IMPORTANT: Drain water into a suitable container and dispose of properly.

- Loosen drain plug (B) at bottom of fuel filter two or three turns.
- 2. Loosen air bleed plug two full turns (A) on fuel filter base and drain water from bottom until fuel starts to drain out.
- 3. When fuel starts to drain out, tighten drain plug securely.
- 4. After draining water from the fuel filter, the filter must be primed by bleeding all air from the fuel system. Operate primer lever of the fuel supply pump (C) until fuel flow is free from air bubbles.
- 5. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Push hand primer inward (toward engine) as far as it will go.

If the fuel system needs further bleeding of air, see BLEEDING THE FUEL SYSTEM.





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BLEEDING THE FUEL SYSTEM



CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

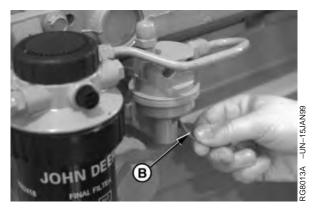
Whenever the fuel system has been opened up for service (lines disconnected or filters removed), it will be necessary to bleed air from the system.

- 1. Loosen the air bleed screw (A) two full turns by hand on fuel filter base.
- 2. Operate supply pump primer lever (B) until fuel flow is free from air bubbles.
- 3. Tighten bleed plug securely, continue operating hand primer until pumping action is not felt. Push hand primer inward (toward engine) as far as it will go.
- 4. Start engine and check for leaks.

If engine will not start, it may be necessary to bleed air from fuel system at fuel injection pump or injection nozzles as explained next.







Continued on next page

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50-6

112699 PN=68

-UN-23AUG88

Maintenance/As required

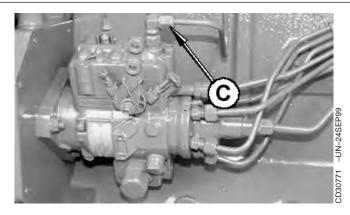
• At Fuel Injection Pump:

- a. Slightly loosen fuel return line connector (C) at fuel injection pump.
- b. Operate fuel supply pump primer lever until fuel, without air bubbles, flows from fuel return line connection.
- c. Tighten return line connector to 16 Nem (12 lb-ft).
- d. Leave hand primer in the inward position toward cylinder block.

• At Fuel Injection Nozzles:

- a. Using two open-end wrenches, loosen fuel line connection at injection nozzle.
- b. Crank engine over with starting motor (but do not start engine), until fuel free from bubbles flows out of loosened connection. Retighten connection to 27 N•m (20 lb-ft).
- Repeat procedure for remaining injection nozzles (if necessary) until all air has been removed from fuel system.

If engine still will not start, see your authorized servicing dealer or engine distributor.





DPSG,CD03523,46 -19-10AUG99-2/2

50-7

112699
PN=69

ENGINE TROUBLESHOOTING	G			
Symptom	Problem	Solution		
Engine cranks but will not start	Incorrect starting procedure.	Verify correct starting procedure.		
	No fuel.	Check fuel in tank and manual shut-off valve.		
	Exhaust restricted.	Check and correct exhaust restriction.		
	Fuel filter plugged or full of water.	Replace fuel filter or drain water from filter.		
	Injection pump not getting fuel or air in fuel system.	Check fuel flow at supply pump or bleed fuel system.		
	Faulty injection pump or nozzles.	Consult authorized diesel repair station for repair or replacement.		
Engine hard to start or will not start	Engine starting under load.	Remove load.		
	Improper starting procedure.	Review starting procedure.		
	No fuel.	Check fuel tank.		
	Air in fuel line.	Bleed fuel line.		
	Cold weather.	Use cold weather starting aids.		
	Slow starter speed.	See "Starter Cranks Slowly".		
	Crankcase oil too heavy.	Use oil of correct viscosity.		
	Improper type of fuel.	Consult fuel supplier; use proper type fuel for operating conditions.		
	Water, dirt or air in fuel system.	Drain, flush, fill and bleed system.		
	Clogged fuel filter.	Replace filter element.		
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.		

Continued on next page DPSG,CD03523,49 -19-10AUG99-1/5

55-1 112699 PN=70

Symptom	Problem	Solution			
	Injection pump shut-off not reset.	Turn key switch to "OFF" then to "ON".			
Engine knocks	Low engine oil level.	Add oil to engine crankcase.			
	Injection pump out of time.	See your authorized servicing dealer or engine distributor.			
	Low coolant temperature.	Remove and check thermostat.			
	Engine overheating.	See "Engine Overheats".			
Engine runs irregularly or stalls frequently	Low coolant temperature.	Remove and check thermostat.			
	Clogged fuel filter.	Replace fuel filter element.			
	Water, dirt or air in fuel system.	Drain, flush, fill and bleed system.			
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.			
Below normal engine temperature	Defective thermostat.	Remove and check thermostat.			
	Defective temperature gauge or sender.	Check gauge, sender and connections.			
Lack of power	Engine overloaded.	Reduce load.			
	Intake air restriction.	Service air cleaner.			
	Clogged fuel filter.	Replace filter element.			
	Improper type of fuel.	Use proper fuel.			
	Overheated engine.	See "Engine Overheats".			
	Below normal engine temperature.	Remove and check thermostat.			
	Improper valve clearance.	See your authorized servicing dealer or engine distributor.			
	Dirty or faulty injection nozzles.	Have authorized servicing dealer or engine distributor check injectors.			

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 DPSG,CD03523,49
 -19-10AUG99-2/5

Symptom	Problem	Solution
	Injection pump out of time.	See your authorized servicing dealer or engine distributor.
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.
	Leaking exhaust manifold gasket.	See your authorized servicing dealer or engine distributor.
	Defective aneroid control line.	See your authorized servicing dealer or engine distributor.
	Restricted fuel hose.	Clean or replace fuel hose.
	Low fast idle speed.	See your authorized servicing dealer or engine distributor.
Low oil pressure	Low oil level.	Add oil.
	Improper type of oil.	Drain and fill crankcase with oil of proper viscosity and quality.
High oil consumption	Crankcase oil too light.	Use oil of correct viscosity.
	Oil leaks.	Check for leaks in lines, gaskets, and drain plug.
	Restricted crankcase vent tube.	Clean vent tube.
	Defective turbocharger.	See your authorized servicing dealer or engine distributor.
Engine emits white smoke	Improper type of fuel.	Use proper fuel.
	Low engine temperature.	Warm up engine to normal operating temperature.
	Defective thermostat.	Remove and check thermostat.
	Defective injection nozzles.	See your authorized servicing dealer or engine distributor.
	Engine out of time.	See your authorized servicing dealer or engine distributor.
	Continued on next pag	pe DPSG,CD03523,49 -19-10AUG99-3/5

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 112699

112699 PN=72

Symptom	Problem	Solution				
Engine emits black or grey exhaust smoke	Improper type of fuel.	Use proper fuel.				
	Clogged or dirty air cleaner.	Service air cleaner.				
	Engine overloaded.	Reduce load.				
	Injection nozzles dirty.	See your authorized servicing dealer or engine distributor.				
	Engine out of time.	See your authorized servicing dealer or engine distributor.				
	Turbocharger not functioning.	See your authorized servicing dealer or engine distributor.				
Engine overheats	Engine overloaded.	Reduce load.				
	Low coolant level.	Fill radiator to proper level, check radiator and hoses for loose connections or leaks.				
	Faulty radiator cap.	Have serviceman check.				
	Stretched poly-vee belt or defective belt tensioner.	Check automatic belt tensioner and check belts for stretching. Replace as required.				
	Low engine oil level.	Check oil level. Add oil as required.				
	Cooling system needs flushing.	Flush cooling system.				
	Defective thermostat.	Remove and check thermostat.				
	Defective temperature gauge or sender.	Check coolant temperature with thermometer and replace, if necessary.				
	Incorrect grade of fuel.	Use correct grade of fuel.				
High fuel consumption	Improper type of fuel.	Use proper type of fuel.				
	Clogged or dirty air cleaner.	Service air cleaner.				

Continued on next page DPSG,CD03523,49 -19-10AUG99-4/5

	Solution
Engine overloaded.	Reduce load.
Improper valve clearance.	See your authorized servicing dealer or engine distributor.
Injection nozzles dirty.	See your authorized servicing dealer or engine distributor.
Engine out of time.	See your authorized servicing dealer or engine distributor.
Defective turbocharger.	See your authorized servicing dealer or engine distributor.
Low engine temperature.	Check thermostat.
	DPSG,CD03523,49 -19-10AUG99-5/5

55-5 112699 PN=74

ELECTRICAL TROUBLESHO	DOTING	
Symptom	Problem	Solution
Undercharged system	Excessive electrical load from added accessories.	Remove accessories or install higher output alternator.
	Excessive engine idling.	Increase engine rpm when heavy electrical load is used.
	Poor electrical connections on battery, ground strap, starter or alternator.	Inspect and clean as necessary.
	Defective battery.	Test battery.
	Defective alternator.	Test charging system.
Battery uses too much water	Cracked battery case.	Check for moisture and replace as necessary.
	Defective battery.	Test battery.
	Battery charging rate too high.	Test charging system.
Battery will not charge	Loose or corroded connections.	Clean and tighten connections.
	Sulfated or worn-out battery.	See your authorized servicing dealer or engine distributor.
	Stretched poly-vee belt or defective belt tensioner.	Adjust belt tension or replace belts.
Starter will not crank	Engine under load	Remove load
	Loose or corroded connections.	Clean and tighten loose connections.
	Low battery output voltage.	See your authorized servicing dealer or engine distributor.
	Faulty start circuit relay.	See your authorized servicing dealer or engine distributor.
	Blown fuse.	Replace fuse.

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 DPSG,CD03523,50
 -19-10AUG99-1/2

 55-6
 11265

Symptom	Problem	Solution				
Starter cranks slowly	Low battery output.	See your authorized servicing dealer or engine distributor.				
	Crankcase oil too heavy.	Use proper viscosity oil.				
	Loose or corroded connections.	Clean and tighten loose connections.				
Entire electrical system	Faulty battery connection.	Clean and tighten connections.				
	Sulfated or worn-out battery.	See your authorized servicing dealer or engine distributor.				
	Blown fuse.	Replace fuse.				
		DPSG,CD03523,50 -19-10AUG99-2/2				

55-7 112699 PN=76

Storage

ENGINE STORAGE GUIDELINES

- John Deere engines can be stored outside for up to three (3) months with no long term preparation IF COVERED BY WATERPROOF COVERING.
- 2. John Deere engines can be stored in a standard overseas shipping container for up to three (3) months with no long term preparation.
- 3. John Deere engines can be stored inside, warehoused, for up to six (6) months with no long term preparation.
- 4. John Deere engines expected to be stored more than six (6) months, long term storage preparation

- MUST BE taken. (See PREPARING ENGINE FOR LONG TERM STORAGE).
- 5. For John Deere engines not yet installed in machines, run a line from a container of AR41937 Nucle Oil (from AR41785 Engine Storage Kit) to the fuel transfer pump intake, and another line from the fuel return manifold to the tank, so that Nucle Oil is circulated through the injection system during cranking.

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USE AR41785 ENGINE STORAGE KIT

See your John Deere servicing dealer or engine distributor for an AR41785 Engine Storage Kit. Closely follow instructions provided with this kit.

IMPORTANT: Inhibitors can easily change to gas.

Seal or tape each opening immediately after adding inhibitor.



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60-1 112699 PN=77

Storage

PREPARING ENGINE FOR LONG TERM STORAGE

The following storage preparations are good for long term engine storage up to one year. After that, the engine should be started, warmed up, and retreated for an extended storage period.

IMPORTANT: Any time your engine will not be used for over six (6) months, the following recommendations for storing it and removing it from storage will help to minimize corrosion and deterioration. Use the AR41785 Engine Storage Kit. Follow recommended service procedure included with storage kit.

- Change engine oil and replace filter. Used oil will not give adequate protection. (See CHANGING ENGINE OIL AND FILTER).
- 2. Service air cleaner. (See CLEAN OR REPLACE AIR FILTER).
- Draining and flushing of cooling system is not necessary if engine is to be stored only for several months. However, for extended storage periods of a year or longer, it is recommended that the cooling system be drained, flushed, and refilled. Refill with appropriate coolant. (See DIESEL ENGINE COOLANT).
- Drain fuel tank and add 30 ml (1 oz) of inhibitor to the fuel tank for each 15 L (4 U.S. gal) of tank capacity. Completely drain fuel filter and close fuel valve, if equipped.

- 5. Add 30 ml (1 oz) of inhibitor to the engine crankcase for each 0.95 L (1 qt) of crankcase oil.
- 6. Disconnect air intake piping from the manifold. Pour 90 ml (3 oz) of inhibitor into intake system and reconnect the piping.
- 7. Crank the engine several revolutions with starter (do not allow the engine to start).
- 8. Remove fan/alternator belt, if desired.
- 9. Remove and clean battery. Store them in a cool, dry place and keep them fully charged.
- Clean the exterior of the engine with salt-free water and touchup any scratched or chipped painted surfaces with a good quality paint.
- 11. Coat all exposed (machined) metal surfaces with grease or corrosion inhibitor if not feasible to paint.
- 12. Seal all openings on engine with plastic bags and tape supplied in storage kit. Follow instructions supplied in kit.
- 13. Store the engine in a dry protected place. If engine must be stored outside, cover it with a waterproof canvas or other suitable protective material and use a strong waterproof tape.

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Storage

REMOVING ENGINE FROM LONG TERM STORAGE

Refer to the appropriate section for detailed services listed below or have your authorized servicing dealer or engine distributor perform services that you may not be familiar with.

- Remove all protective coverings from engine.
 Unseal all openings in engine and remove covering from electrical systems.
- 2. Remove the battery from storage. Install battery (fully charged) and connect the terminals.
- 3. Install fan/alternator belt if removed.
- 4. Fill fuel tank.
- 5. Perform all appropriate prestarting checks. (See DAILY PRESTARTING CHECKS).

IMPORTANT: DO NOT operate starter more than 30 seconds at a time. Wait at least 2 minutes for starter to cool before trying again.

- 6. Crank engine for 20 seconds with starter (do not allow the engine to start). Wait 2 minutes and crank engine an additional 20 seconds to assure bearing surfaces are adequately lubricated.
- 7. Start engine and run at no load for several minutes. Warm up carefully and check all gauges before placing engine under load.
- 8. On the first day of operation after storage, check overall engine for leaks and check all gauges for correct operation.

DPSG,CD03523,54 -19-10AUG99-1/1

60-3

112699
PN=79

GENERAL ENGINE SPECIFICATIONS								
ITEM	UNIT OF MEASURE	3029DF128	4039DF008	4039TF008				
Number of Cylinders		3	4	4				
Fuel		Diesel	Diesel	Diesel				
Bore	mm	106.5	106.5	106.5				
Stroke	mm	110	110	110				
Displacement	L	2.9	3.9	3.9				
Compression Ratio		17.8:1	17.8:1	17.8:1				
POWER ^a @ 1500 rpm (Prime)	kW (hp)	26 (35)	35 (48)	55 (75)				
POWER ^a @ 1500 rpm (Standby)	kW (hp)	30 (41)	38 (52)	61 (83)				
POWER ^a @ 1800 rpm (Prime)	kW (hp)	30 (41)	41 (56)	67 (91)				
POWER ^a @ 1800 rpm (Standby)	kW (hp)	34 (46)	47 (64)	73 (99)				
Width (overall)	mm	582	588	588				
Length (overall)	mm	888	1016	1016				
Height (overall)	mm	931	960	979				
Weight (dry) ^b	kg	345	410	455				
Engine oil quantity	L	6	12	12				
Engine coolant quantity	L	14.5	16.5	16.5				
^a With Fan ^b Approximate								

65-1 112699 PN=80

DPSG,CD03523,55 -19-10AUG99-1/3

Continued on next page

Specifications

ITEM	UNIT OF MEASURE	4045HF158	4045TF158	4045TF258	4045DF158
Number of Cylinders		4	4	4	4
Fuel		Diesel	Diesel	Diesel	Diesel
Bore	mm	106.5	106.5	106.5	106.5
Stroke	mm	127	127	127	127
Displacement	L	4.5	4.5	4.5	4.5
Compression Ratio		17.0:1	17.0:1	17.0:1	17.6:1
POWER ^a @ 1500 rpm (Prime)	kW (hp)	88 (120)	61 (83)	72 (98)	41 (56)
POWER ^a @ 1500 rpm (Standby)	kW (hp)	96 (131)	68 (92)	80 (109)	42 (57)
POWER ^a @ 1800 rpm (Prime)	kW (hp)	108 (147)	72 (98)	80 (109)	48 (65)
POWER ^a @ 1800 rpm (Standby)	kW (hp)	120 (163)	79 (107)	88 (120)	51 (69)
Width (overall)	mm	798	668	668	668
Length (overall)	mm	1356	1219	1219	1219
Height (overall)	mm	1136	1010	1010	1010
Weight (dry) ^b	kg	446	436	436	391
Engine oil quantity	L	12	12	12	8
Engine coolant quantity	L	25	25	25	20
With Fan Approximate					

Continued on next page

DPSG,CD03523,55 -19-10AUG99-2/3

Specifications

ITEM	UNIT OF MEASURE	6068HF158	6068TF158	6068TF258
Number of Cylinders		6	6	6
Fuel		Diesel	Diesel	Diesel
Bore	mm	106.5	106.5	106.5
Stroke	mm	127	127	127
Displacement	L	6.8	6.8	6.8
Compression Ratio		17.0:1	17.0:1	17.0:1
POWER ^a @ 1500 rpm (Prime)	kW (hp)	134 (182)	92 (125)	105 (143)
POWER ^a @ 1500 rpm (Standby)	kW (hp)	148 (201)	101 (137)	116 (158)
POWER ^a @ 1800 rpm (Prime)	kW (hp)	164 (223)	108 (147)	124 (169)
POWER ^a @1800 rpm (Standby)	kW (hp)	187 (254)	119 (162)	137 (186)
Width (overall)	mm	798	668	668
Length (overall)	mm	1476	1383	1383
Height (overall)	mm	1136	1032	1032
Weight (dry) ^b	kg	613	593	593
Engine oil quantity	L	19.5	19.5	19.5
Engine coolant quantity	L	29	26	26
^a With Fan ^b Approximate				

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DPSG,CD03523,55 -19-10AUG99-3/3

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES

SAE Grade and Head Markings	NO MARK	1 or 2 ^b	5 5.1 5.2	8.2
SAE Grade and Nut Markings	NO MARK	2		

	Grade 1					Gra	de 2 ^b		G	irade 5,	5.1, or 5	5.2		Grade	8 or 8.2	
Size	Lubri	cateda	Dr	ya	Lubri	cateda	Dr	'ya	Lubri	cateda	Di	'ya	Lubri	cateda	Di	rya
	N⋅m	lb-ft	N⋅m	lb-ft	N⋅m	lb-ft	N-m	lb-ft	N⋅m	lb-ft	N∙m	lb-ft	N⋅m	lb-ft	N∙m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750 .	1300	975
1-1/8	400	300	510	375	400	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

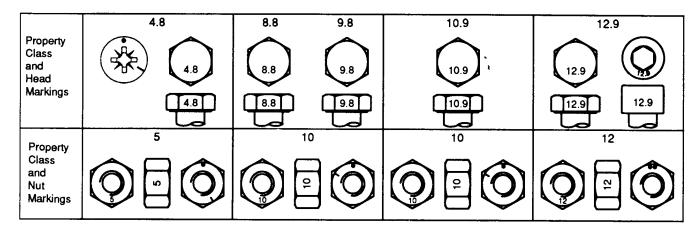
DX,TORQ1 -19-20JUL94-1/1

Active 13/12/2013

^a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

^b Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.

METRIC BOLT AND CAP SCREW TORQUE VALUES



Cla		Class 4.8			Class 8.8 or 9.8			Class 10.9			Class 12.9					
Size	Lubri	cateda	Di	'ya	Lubri	cateda	D	rya	Lubri	cateda	Di	rya	Lubri	cateda	D	rya
	N⋅m	lb-ft	N⋅m	lb-ft	N⋅m	lb-ft	N⋅m	lb-ft	N⋅m	lb-ft	N-m	lb-ft	N⋅m	lb-ft	N⋅m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	255	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	4 1 0
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800 .	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	1500 2000
						- 30	300	00	.300	. 200	2500	., 00		,000	2,00	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original. Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

DX,TORQ2 -19-20JUL94-1/1

TS1657 –19-

112699 PN=84

65-5

³ "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

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Fuel system Bleeding
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Storage10-3
Maintenance records
(300-Series)
Drain and flush cooling system

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Torque values Inch	-5 -6	

Index-2 112699 PN=2

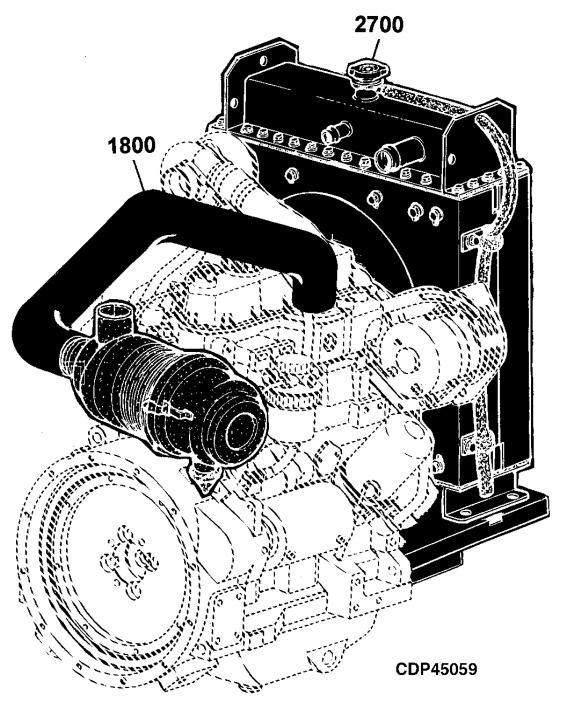
SP049

Section 3 - John Deere Spare Parts Manual

PRIMARY PICTORIAL INDEX INDEX PRINCIPAL HAUPTINDEX INDICE PRINCIPALE INDICE DE MATERIAS HUVUDFORTECKNING

CDP45059 -

-UN-13NOV01



1100 -1B12 1200 -1B18 1300 -<u>1C2</u> 1400 -1C10 1500 -1C16 1600 -1D3 1600 -1D4 1700 -1F14 1800 -1G2 1900 -1H8 2000 -1H19 2100 -112 2200 -119 2300 -1115 2400 -1120 2500 -**1J3** 2600 -1J15 2700 -2800 -1K10 2900 -1K20 3000 -3100 -2C7 3500 -2D2 3600 -2D14 3600 -2D15 3700 -2E2 3900 -4000 -2E11 4000 -2E12 4300 -2E20 4400 -2F9 4400 -2F10 4500 -2G2 4600 -2G7 4700 -2G21 4800 -2H7 4900 -213 5000 -2110 5100 -2116 5600 -2J3 5700 -**2J9** 5900 -2J14 5900 -2J15 6200 -2K4 6200 -6400 -2K11 6500 -2K20 6600 -6800 -3B21 7500 -3C2 7600 -3C6 8600 -3C12

3C19

3D10

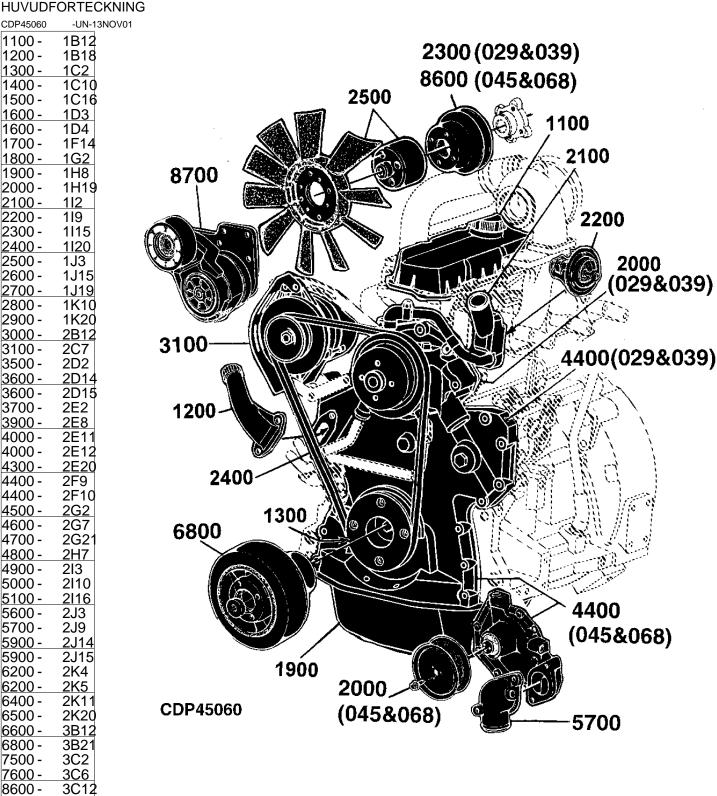
3D2

8700 -

- 0088

9700 -

PRIMARY PICTORIAL INDEX INDEX PRINCIPAL HAUPTINDEX INDICE PRINCIPALE INDICE DE MATERIAS



8700 -

8800 -

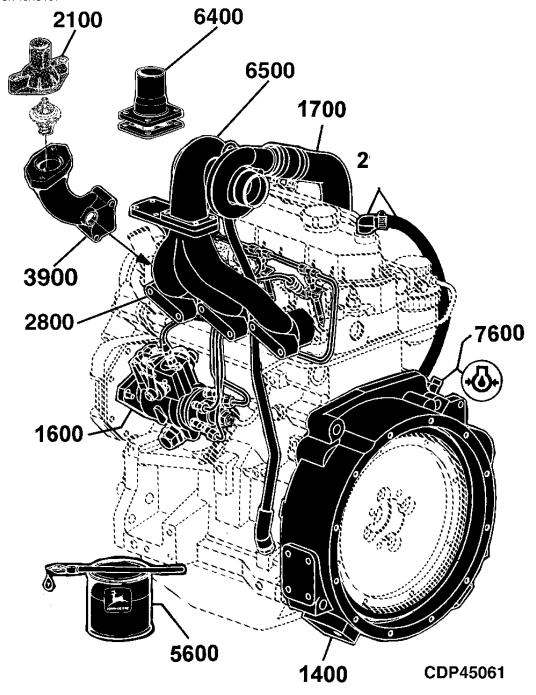
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PRIMARY PICTORIAL INDEX INDEX PRINCIPAL HAUPTINDEX INDICE PRINCIPALE INDICE DE MATERIAS HUVUDFORTECKNING

CDP45061 -UN-13NOV01



1100 -1B12 1200 -1B18 1300 -<u>1C2</u> 1400 -1C10 1500 -1C16 1600 -1D3 1600 -1D4 1700 -1F14 1800 -1G2 1900 -1H8 2000 -1H19 2100 -112 2200 -119 2300 -1115 2400 -2500 -1J3 2600 -1J15 2700 -2800 -2900 -1K20 3000 -3100 -2C7 3500 -2D2 3600 -3600 -2D15 3700 -2E2 3900 -4000 -2E11 4000 -2E12 4300 -4400 -2F9 4400 -2F10 4500 -2G2 4600 -2G7 4700 -2G21 4800 -2H7 4900 -213 5000 -2110 5100 -2116 5600 -2J3 5700 -**2J9** 5900 -2J14 5900 -2J15 6200 -2K4 6200 -6400 -6500 -6600 -6800 -3B21 7500 -3C2 7600 -3C6 8600 -3C12

3C19

<u>3D2</u> 3D10

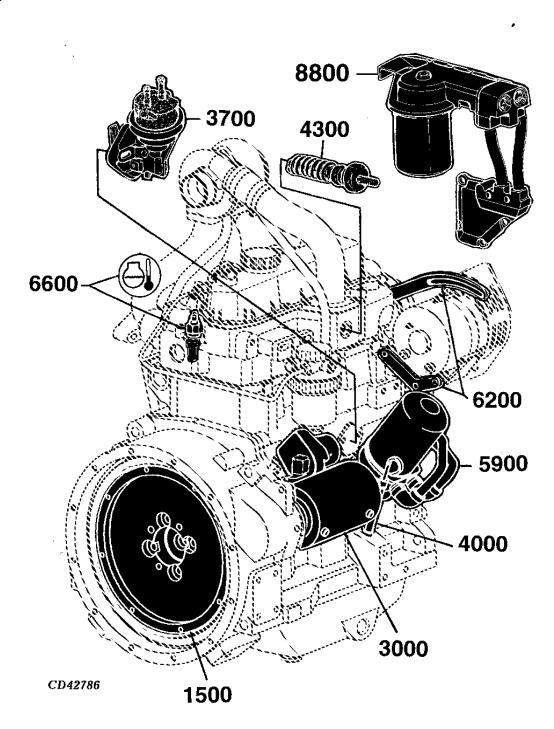
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- 0088

9700 -

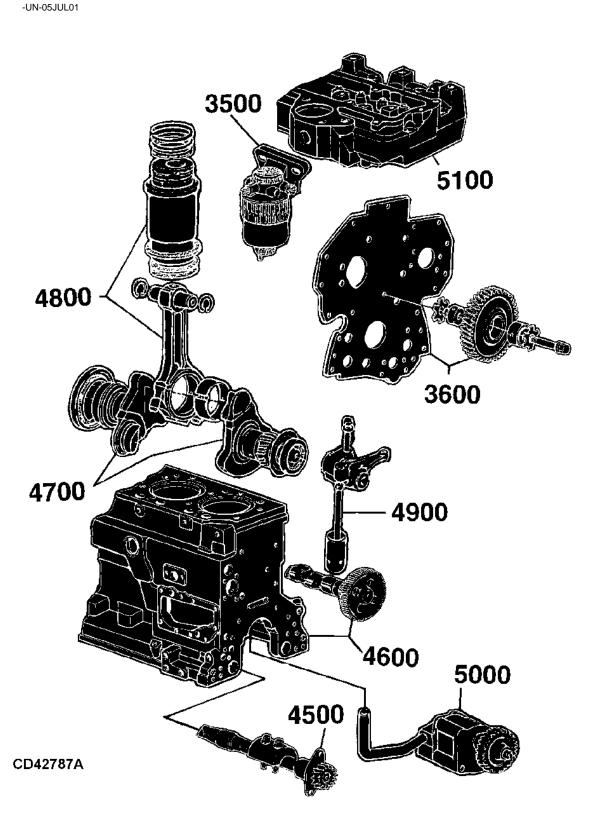
PRIMARY PICTORIAL INDEX INDEX PRINCIPAL HAUPTINDEX INDICE PRINCIPALE INDICE DE MATERIAS HUVUDFORTECKNING

INDICE	DE MATERI
	ORTECKNIN
CD42786	-UN-22FEB99
1100 - 1200 -	1B12
1200 -	1B18
1300 -	1C2
1400 -	1010
1500 -	1C16
1600 -	1D3
1600 - 1600 -	1D4
1700 -	1F14
1800 -	1G2
1800 - 1900 - 2000 - 2100 - 2200 -	1112
2000 -	11 10 1 1 1
2000 -	11119
2100 -	112
2200 - 2300 -	119
2300 -	1115
2400 -	
2500 - 2600 -	1J3
2600 -	1J15
2700 -	1J19
2800 -	1K10
2800 - 2900 -	1K20
3000 -	2R12
3100 -	2C7
3500 -	2D2
3600	202
3100 - 3500 - 3600 - 3600 -	2D14
3600 - 3700 -	2013
3700-	2E2
3900 -	2E8
4000 - 4000 -	2E11
4000 -	2E12 2E20
4300 -	2E20
4400 - 4400 -	2⊦9∣
4400 -	2F10
4500 -	2G2
4600 -	2G7
4600 - 4700 -	2G21
4800 -	2H7
4900 -	2H7 2I3
5000 -	2110
5100 -	2116
5600 -	2J3
5700 - 5900 -	2J9 2J14
<u> 5900 - </u>	2J14
5900 -	2J15 2K4 2K5
6200 -	2K4
6200 -	2K5
6400 -	2K11
6500 -	2K20
6600 -	3B12
6800 -	3B21
7500 -	3C2 3C6
7600 -	3C6
8600 -	3C12
8700 -	3C10
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9700 -	3D40
9700-	3D10



PRIMARY PICTORIAL INDEX INDEX PRINCIPAL **HAUPTINDEX** INDICE PRINCIPALE INDICE DE MATERIAS HUVUDFORTECKNING

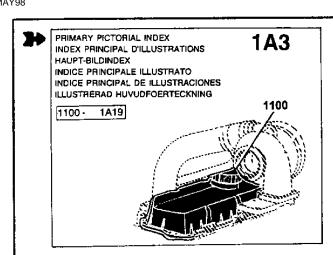
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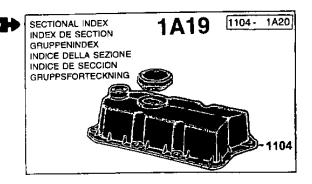
1100 -1B12 1200 -1B18 1300 -<u>1C2</u> 1400 -1C10 1500 -1C16 1600 -1D3 1600 -1D4 1700 -1F14 1800 -1G2 1900 -1H8 2000 -1H19 2100 -112 2200 -119 2300 -1115 2400 -2500 -1J3 2600 -1J15 2700 -2800 -2900 -3000 -3100 -2C7 3500 -3600 -3600 -2D15 3700 -2E2 3900 -4000 -4000 -2E12 4300 -4400 -2F9 4400 -2F10 4500 -2G2 4600 -2G7 4700 -2G21 4800 -2H7 4900 -213 5000 -2110 5100 -5600 -2J3 5700 -**2J9** 5900 -5900 -2J15 6200 -2K4 6200 -6400 -6500 -6600 -6800 -3B21 7500 -7600 -8600 -3C12 8700 -3C19 - 0088 3D2 9700 -3D10

GUIDELINES (WITH ORDERABLE OPTION CODES) GUIDE D'UTILISATION (AVEC CODES OPTIONS COMMANDABLES) GEBRAUCHSANWEISUNG (MIT BESTELLBARE ZUSATZAUSREUSTUNGEN) GUIDA PER L'USO (CON CODICI DI OPZIONE ORDINABILI) GUIA DE UTILIZATION (CON CODIGOS DE OPCIONES QUE PUEDEN PEDIRSE) RAACH FUER ANVAENDNING (MED BESTALLNINGSKODER)

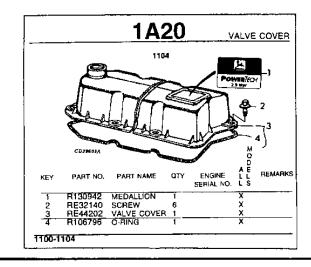
CD42169 -UN-26MAY98 1100 -1B12 1200 -1B18 1300 -<u>1C2</u> 1400 -1C10 1500 -1C16 1600 -1D3 1600 -1D4 1700 -1F14 1800 -1G2 1900 -1H8 2000 -1H19 2100 -112 2200 -119 2300 -1115 2400 -1120 2500 -1J3 2600 -1J15 2700 -1J19 2800 -1K10 2900 -1K20 3000 -2B12 3100 -2C7 3500 -2D2 3600 -2D14 3600 -2D15 3700 -2E2 3900 -<u> 2E8</u> 4000 -2E11 2E12 4000 -4300 -2E20 4400 -2F9 4400 -2F10 4500 -2G2 4600 -2G7 4700 -2G2 2H7 4800 -



Locate the part with the code
 Localiser la pièce avec le code
 Teil anhand des Codes bestimmen
 Determinare il pezzo con il codice
 Localizar la pieza por código
 Identifiera delen med hjälp av kod



Locate the grid by the code
 Localiser la grille par le code
 Koordinaten anhand des Codes bestimmen
 Determinare la griglia con il codice
 Localizar coordenadas por código
 Fastställ ruta med hjälp av kod



Locate the part
 Localiser la pièce
 Teil bestimmen
 Determinare il pezzo
 Localizar la pieza
 Identifiera delen

CD42169

4900 -

5000 -

5100 -

5600 -

5700 -

5900 -

5900 -

6200 -

6200 -

6400 -

6500 -

6600 -

6800 -

7500 -

7600 -

8600 -

8700 -

8800 -

213

2110

2l16

2J3

2J9

2J14

2J15

2K4

2K5

2K11

2K20

3B12

3B2⁻

3C2

3C6

3C12

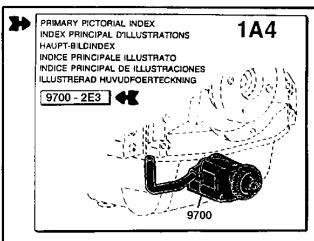
3C19

3D2

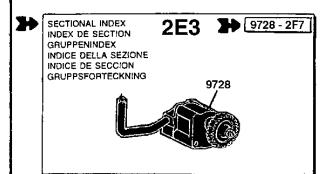
3D10

GUIDELINES (WITHOUT OPTION CODES) GUIDE D'UTILISATION (SANS CODES OPTIONS) GEBRAUCHSANWEISUNG (OHNE ZUSATZAUSREUSTUNGEN) GUIDA PER L'USO (SENZA CODICI DI OPZIONE) GUIA DE UTILIZATION (SIN CODIGOS DE OPCIONES) RAACH FUER ANVAENDNING (UTAN TILLVALSKODER)

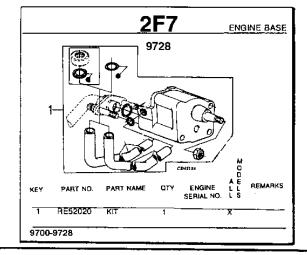
CD42170A -UN-15NOV01



 Locate the part with the code Localiser la pièce avec le code Teil anhand des Codes bestimmen Determinare il pezzo con il codice Localizar la pieza por código Identifiera delen med hjälp av kod



2. Locate the grid by the code Localiser la grille par le code Koordinaten anhand des Codes bestimmen Determinare la griglia con il codice Localizar coordenadas por código Fastställ ruta med hjälp av kod



3. Locate the part Localiser la pièce Teil bestimmen Determinare il pezzo Localizar la pieza Identifiera delen

CD42170A

1100 -1B12 1200 -1B18 1300 -1400 -1C10 1500 -1C16 1600 -1D3 1600 -1D4 1700 -1F14 1800 -1G2 1900 -1H8 2000 -1H19 2100 -112 2200 -119 2300 -1115 2400 -2500 -1J3 2600 -1J15 2700 -2800 -2900 -3000 -3100 -2D2 3500 -3600 -3600 -3700 -2E2 3900 -4000 -4000 -4300 -4400 -2F9 4400 -2F10 4500 -4600 -2G7 4700 -2G21 4800 -2H7 4900 -5000 -2110 5100 -5600 -2J35700 -**2J9** 5900 -5900 -2J15 6200 -2K4 6200 -6400 -6500 -6600 -6800 -7500 -7600 -8600 -3C12 3C19 8700 -

3D2

3D10

8800 -

9700 -

Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED

MEMORANDA

CODES USED IN "REMARKS" COLUMN

LVP454 -UN-23SEP94

	ENGLISH	FRANCAIS	DEUTSCH		
ALSO ORDER	ALSO ORDER	COMMANDER AUSSI	EBENSO BESTELLEN		
AMP	AMPERE	AMPERE	AMPERE		
AND	AND	ET	UND		
APPL	THIS APPLICATION ONLY	UNIQUEMENT POUR CETTE UTILISATION	NUR FUR DIESE ANWENDUNG		
AR	AS REQUIRED	SELON LE BESOIN	NACH BEDARF		
ASSY	COMPLETE ASSEMBLY	ENSEMBLE COMPLET	KOMPLETTE BAUQRUPPE		
COMPLETE	COMPLETE	COMPLET	VOLLSTANDIG		
FRONT	FRONT	AVANT	VORN		
HP	HORSEPOWER	PUISSANCE EN CH	PFERDESTARKE		
ID	INSIDE DIAMETER	DIAMETRE INTERIEUR	INNENDURCHMESSER		
INCL KEYS	INCLUDES KEYS	COMPREND LES REPERES	EINSCHLIEBLICH TEILE		
KIT	KIT	JEU DE PIECES	TEILESATZ		
LGTH	LENGTH	LONGUEUR	LANGE		
LH	LEFT-HAND	GAUCHE	LINKS		
LOW	LOWER	INFERIEUR	UNTEN		
MARKED	MARKED	MARQUE	MARKIERT		
MF	MAKE FROM	REALISER AVEC	HERSTELLEN VON		
MFWD	MECHANICAL FRONT WHEEL DRIVE	TRACTION AVANT MECANIQUE	MECHANISCHER FRONTRADANTRIEB		
NA	NOT USED THIS APPLICATION	NE SERT PAS POUR CETTE APPLICATION	IN DIESER ANWENDUNG NICHT BENUTZT		
NLA	NO LONGER AVAILABLE	EPUISE	NICHT MEHR LIEFERBAR		
NSEP	NOT SUPPLIED SEPARATELY	NON LIVRE SEPAREMENT	EINZELN NICHT LIEFERBAR		
OD	OUTSIDE DIAMETER	DIAMETRE EXTERIEUR	AUBENDURCHMESSER		
OR	OR	OU	ODER		
ORD	ORDER	COMMANDER	BESTELLÉ		
os	OVERSIZE	SURDIMENSIONNE	UEBERGROSSE		
PKG	PACKAGE	PAR PAQUET DE	VERPACKT ZU		
REAR	REAR	ARRIERE	HINTEN		
RH	RIGHT-HAND	DROIT	RECHTS		
STD	STANDARD	STANDARD	STANDARD		
SUB	REPLACED BY	REMPLACE PAR	ERSETZT DURCH		
SUB FOR	SUBSTITUTES FOR	REMPLACE	ERSATZ FUR		
TK	THICKNESS	EPAISSEUR	STARKE		
UP	UPPER	SUPERIEUR	OBEN		
บร	UNDERSIZE	SOUS-DIMENSIONNE	UNTERGROSSE		
USE WITH	USE WITH	A UTILISER AVEC	BENUTZEN MIT		
W/	WITH	AVEC	MIT		
W/O	WITHOUT	SANS	OHNE		
Z	GEAR AND SPROCKET TEETH NUMBER	NOMBRE DE DENTS DES PIGNONS	ZAHNEZAHL FUR KETTEN-UND ZAHNRAD		

LVP454

CODES USED IN "REMARKS" COLUMN

CD42164 -UN-13FEB98

	ITALIANO	ESPANOL.	SVENSKA		
ALSO ORDER	ORDINARE ANCHE	PEDIR TAMBIEN	BESTALL AVEN		
AMP	APMERE	AMPERIO	AMPERE		
AND	E	Υ	ОСН		
APPL	SOLO PER QUESTO	TAN SOLO PARA ESTE	ENDAST FOR DENNA		
	IMPIEGO	PROPOSITO	ANVANDNING		
AR	SECONDO NECCESSITA	SEGUN NECESIDAD	VID BEHOV		
ASSY	GRUPPO COMPLETO	CONJUNTO COMPLETO	KOMPLETT SATS		
COMPLETE	COMPLETO	COMPLETO	FULLSTANDIG		
FRONT	ANTERIORE	FRENTE	FRAM		
HP	PÖTENZA IN CAVALLI	POTENCIA	HASTKRAFT		
ID	DIAMETRO INTERNO	DIAMETRO INTERIOR	INRE DIAMETER		
INCL KEYS	CHIAVETTE INCLUSE	INCLUYE LAS POSICIONES	INKLUSIVE NYCKLAR		
KIT	SERIE PEZZI	JUEGO	SATS		
LGTH	LUNGHEZZA	LONGITUD	LANGD		
LH	SINISTRA	IZQUIERDA	VANSTER SIDA		
LOW	INFERIORE	MAS BAJO	NEDRE		
MARKED	MARCATO	MARCADO	MARKT		
MF	FABBRICARE DI	HACER DE	TILLVERKA AV		
MFWD	TRAZIONE ANTERIORE MECCANICA	TRACCION DELANTERA MECANICA	MEKANISK FRAMHJULSDRIFT		
NA	NON USATO IN QUESTA APPLICAZIONE	NO SE USA EN ESTA APLICACION	EJ ANVAND I DETTA SAMMANHANG		
NLA	NON PIU' DISPONIBILE	DESCONTINUADO	EJ LANGRE TILLGANGLIG		
NSEP	NON FORNITO SEPARATAMENTE	NO SE SUMINISTRA POR SEPARADO	KAN EJ ERHALLAS SEPARAT		
OD	DIAMETRO ESTERNO	DIAMETRO EXTERIOR	YTTRE DIAMETER		
OR	OPPURE	0	ELLER		
ORD	ORDINARE	PIDASE	ORDER, REKVISITION		
OS	EXTRA GRANDE	SOBRETAMANO	OEVERDIMENSIONERAD		
PKG	IN CONFEZIONE DA	POR PAQUETE DE	I SATS ELLER PAKET		
REAR	POSTERIORE	TRASERO	BAK, BAKRE		
RH	DESTRA	DERECHA	HOGER		
STD	STANDARD	NORMAL	STANDARD		
SUB	SOSTITUITO PER	SUSTITUIDO POR	ERSATT MED		
SUB FOR	SOSTITUISCE	SUSTITUCION PARA	ERSATTER		
TK	SPESSORE	ESPESOR	TJOCKLEK		
ŨΡ	SUPERIORE	SUPERIOR	OEVRE		
US	EXTRA PICCOLO	SUBTAMANO	UNDERDIMENSIONERAD		
USE WITH	USARE CON	USAR CON	ANVAND MED		
W/	CON	CON	MED, INKLUSIVE		
W/O	SENZA	SIN	UTAN, EXKLUSIVE		
Z	NO. DENTI CORONA O PIGNONE	NUMERO DE DIENTES DE LOS ENGRANAJES	ANTAL TANDER PA DREV OCH KUGGHJUL		

CD42164

ENGINE INFORMATION CD39701A -UN-20FEB96

PLUG, FITTING BOUCHON,RACCORD STOPFEN,FITTING TAPPO,RACCORDO TAPON,CONEXION PLUGG, KOPPLING	STANDARD THREAD PAS STANDARD STANDARD STEIGUNG PASSO STANDARD PASSO ESTANDARD STANDARD GAENGA	FINE THREAD PAS FIN FEINE STEIGUNG PASSO FINO PASSO FINO FIN GAENGA
CYLINDRICAL THREAD FILETAGE CYLINDRIQUE ZYLINDRISCHES GEWINDE FILETTATURA CILINDRICA		
ROSCADO CILINDRICO CYLINDRISK GAENGA	A = UNC	A = UNF / UNEF
TAPPERED THREAD		WATER,OIL / EAU,HUILE / WASSER,OEL / ACGUA,OLIO / AGUA,ACEITE / VATTEN,OLJA
FILETAGE CONIQUE KONISCHES GEWINDE FILETTATURA CONICA		
ROSCADO CONICO	A = NPT	A = NPTF
KONISK GAENGA	A = WFI	A - MFIF

CD39701A

SERIAL NUMBER LISTING INFORMATION

SERIAL NUMBER INFORMATION IS LISTED TO SHOW ON WHICH MACHINES EACH PART CAN BE USED. FOR EXAMPLE:

- THE PART CAN BE USED ON ALL MACHINES.

-000000 THE PART CAN BE USED ON ALL MACHINES UP TO AND INCLUDING

THE SERIAL NUMBER.

000000- THE PART CAN BE USED ON ALL MACHINES BEGINNING

WITH THE SERIAL NUMBER LISTED.

000000-000000 THE PART CAN BE USED ON ALL MACHINES BETWEEN AND INCLUDING THE SERIAL NUMBERS LISTED.

WHEN XXXXXX'S ARE LISTED IN PLACE OF SERIAL NUMBERS, A SERIAL NUMBER CHANGE WAS MADE BUT THE EXACT SERIAL NUMBER WAS NOT AVAILABLE WHEN THE CATALOG WAS PRODUCED.

BOX-ENCLOSED ILLUSTRATIONS

A KEY NUMBER, SHOWN IN THE PARTS LIST, IS ASSIGNED TO A BOX ENCLOSING ALL PARTS SOLD AS A SERVICE ASSEMBLY.

A BOX NOT KEYED INCLUDES NON-CURRENT PARTS.

CHANGE INDICATOR LINE

(MICROFICHE PARTS CATALOGS ONLY)

CHANGES AFFECTING THE ORDERING OF PARTS ARE IDENTIFIED BY VERTICAL LINES MARKED IN THE LEFT-HAND MARGIN OF REVISED PARTS LISTING IMAGES. A LINE IS ALSO AT THE LEFT-HAND EDGE OF THE SAME PART NUMBER IN THE NUMERICAL INDEX TO SHOW THE LOCATION OF REVISED INFORMATION.

BOLT AND CAP SCREW STRENGTH IDENTIFICATION

INCH DIMENSIONED PRODUCT: BOLTS AND CAP SCREWS REQUIRED TO HAVE HIGH-STRENGTH QUALITIES EQUIVALENT TO SAE GRADE 8 ARE IDENTIFIED THROUGHOUT THIS CATALOG BY THE DESCRIPTION SAE 8. ALL STANDARD BOLTS AND CAP SCREWS WHICH ARE SAE GRADE 5 OR LOWER ARE NOT INDICATED.

METRIC DIMENSIONED PRODUCT: BOLTS AND CAP SCREWS REQUIRED TO HAVE HIGH-STRENGTH QUALITIES EQUIVALENT TO PROPERTY CLASS 10.9 OR HIGHER ARE IDENTIFIED THROUGHOUT THIS CATALOG BY THE DESCRIPTION 10.9, 12.9 & 14.9. ALL STANDARDS BOLTS AND CAP SCREWS WHICH ARE PROPERTY CLASS 8.8 OR LOWER ARE NOT INDICATED.

1A13

POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED

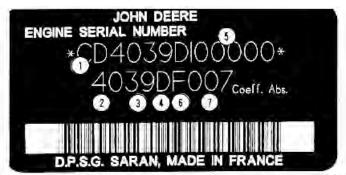
ENGINE GROUPING INFORMATION

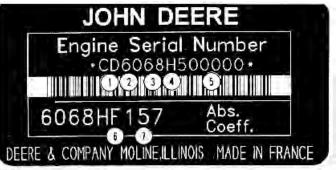
ENGINES IN THIS CATALOG ARE MANUFACTURED IN SARAN, THESE ENGINES COULD BE NATURALLY-ASPIRATED DIESEL OR TURBOCHARGED DIESEL OR AIR TO AIR INTERCOOLED.

TO ASSIST YOUR DEALER IN GIVING YOU PROMPT AND EFFICIENT SERVICE REFER TO THE ENGINE SERIAL NUMBER PLATE FOR PROPER ENGINE TYPE IDENTIFICATION.

ENGINE SERIAL NUMBER PLATE

CD42700 -UN-25NOV98





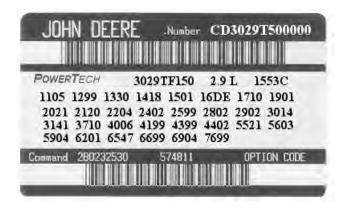
CD42700

- 1. DESIGNATES ENGINE MANUFACTURER
- 2. DESIGNATES NUMBER OF CYLINDERS
- 3. DESIGNATES TOTAL DISPLACEMENT (IN LITER)
- 4. DESIGNATES THE TYPE OF ASPIRATION
- 5. DESIGNATES ENGINE SERIAL NUMBER
- 6. DESIGNATES ENGINE USER
- 7. DESIGNATES ENGINE VERSION

- CD JOHN DEERE SARAN
- 3 OR 4 OR 6
- 029 (2.9 L) (BORE 106.5MM X STROKE 110MM)
- 039 (3.9 L) (BORE 106.5MM X STROKE 110MM)
- 045 (4.5 L) (BORE 106.5MM X STROKE 127MM)
- 068 (6.8 L) (BORE 106.5MM X STROKE 127MM)
- 000 (0.0 L) (BORE 100.31VIIVI X 31KORE 12/1VII
- D NATURALLY ASPIRATED DIESEL
- T TURBOCHARGED DIESEL
- H AIR TO AIR INTERCOOLER
- 123456 (SIX DIGITS)
- F (OEM)
- 007 (THREE DIGITS)
- 120 (THREE DIGITS)
- 150 (THREE DIGITS)
- 157 (THREE DIGITS)
- 250 (THREE DIGITS)

ENGINE OPTION CODE LABEL

CD30524 -UN-27MAY98



ENGINE OPTION CODES

IN ADDITION TO THE SERIAL NUMBER PLATE, OEM ENGINES HAVE AN ENGINE OPTION CODE LABEL AFFIXED TO THE ROCKER ARM COVER.

THESE CODES INDICATES WHICH OF THE ENGINE OPTIONS WERE INSTALLED ON YOUR ENGINE AT THE FACTORY. WHEN IN NEED OF PARTS OR SERVICE, FURNISH YOUR AUTHORIZED SERVICING DEALER OR ENGINE DISTRIBUTOR WITH THESE NUMBERS.

THE FIRST TWO DIGITS OF EACH CODE IDENTIFY A SPECIFIC GROUP, SUCH AS AN ALTERNATOR. THE TWO LAST DIGITS OF EACH CODE IDENTIFY ONE SPECIFIC OPTION PROVIDED ON YOUR ENGINE, SUCH AS A 12 VOLTS, 55 AMPERES ALTERNATOR.

IF AN ENGINE IS ORDERED WITHOUT A PARTICULAR COMPONENT, THE LAST TWO DIGITS OF THAT FUNCTIONAL GROUP OPTION CODE WILL BE 9.

MEMORANDA

ORDERABLE OPTION CODES FOR ENGINE MODEL CD3029DF128 (029D)

1500 MIN-1	1800 MIN-1
1103	1103
1299	1299
1312	1312
1418/1421	1418/1421
1501/1551	1501/1551
1641(12V)/1648(24V)	1603(12V)/1644(24V)
1710/1712	1710/1712
1804/1810/1818	1804/1810/1818
1910	1910
2034	2034
2129	2129
2204	2204
2402	2402
2512	2512
2710	2710
2806	2806
2902	2902
3008/3016(12V)	3008/3016(12V)
3025/3026(24V)	3025/3026(24V)
3121(24V)/3123(12V)	3121(24V)/3123(12V)
3561	3561
3601	3601
3710	3710
4004	4004
4303(12V)/4306(24V)/4399	4303(12V)/4306(24V)/4399
4499	4499
4607	4607
4710	4710
4809	4809
4903	4903
5001	5001
5105	5105
5601/5602/5603/5607	5601/5602/5603/5607
6218	6218
6418	6418
6610/6612/6699	6610/6612/6699
7503/7504	7503/7504
7622/7624	7622/7624
0700 OFD\//OF DADTO	OZOO CEDVICE DADTO

9700 - SERVICE PARTS

9700 - SERVICE PARTS

POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED ORDERABLE OPTION CODES FOR ENGINE MODEL CD4039DF008 (039D)

1500 MIN-1	1800 MIN-1
1104	1104
1299	1299
1317	1317
1421	1421
1505	1505
1641(12V)/1645(24V)	1603(12V)/1620(24V)
1710/1712	1710/1712
1802/1810/1811	1802/1810/1811
1908	1908
2026	2026
2109	2109
2204	2204
2308	2308
2408	2408
2501	2501
2711	2711
2803/2806	2803/2806
2902/2906	2902/2906
3009(12V)/3026(24V)	3009(12V)/3026(24V)
3106(12V)/3119(24V)	3106(12V)/3119(24V)
3567	3567
3601	3601
3704	3704
3909	3909
4003	4003
4303(12V)/4305(24V)/4399	4303(12V)/4305(24V)/4399
4499	4499
4603	4603
4708	4708
4802	4802
4901	4901
5001	5001
5101	5101
5601/5602/5603/5607	5601/5602/5603/5607
6218	6218
6410/6418	6410/6418
6608/6613/6699	6608/6613/6699
7503/7504	7503/7504
7622/7625	7622/7625
9700 - SERVICE PARTS	9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD4039TF008 (039T)

1500 MIN-1	1800 MIN-1
1104	1104
1299	1299
1317	1317
1421	1421
1505	1505
1635(24V)/1641(12V)	1603(12V)/1620(24V)
1735	1735
1805/1811/1812/1820	1805/1811/1812/1820
1908	1908
2027	2027
2112	2112
2204	2204
2308	2308
2408	2408
2532	2532
2711	2711
2803	2803
2902/2906	2902/2906
3009(12V)/3026(24V)	3009(12V)/3026(24V)
3106(12V)/3119(24V)	3106(12V)/3119(24V)
3567	3567
3602	3602
3704	3704
3909	3909
4003	4003
4302(12V)/4305(24V)/4397	4302(12V)/4305(24V)/4397
4499	4499
4603	4603
4708	4708
4802	4802
4901	4901
5001	5001
5101	5101
5601/5602/5603/5607	5601/5602/5603/5607
5906	5906
6218	6218
6411/6417	6411/6417
6576	6576
6608/6613/6699	6608/6613/6699
7503	7503
7622/7625	7622/7625
9700 - SERVICE PARTS	9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD4045DF158 (045D)

1101 1101 1299 1299 1301 1301 1433 1433 1503 1503	1500 MIN-1	1800 MIN-1
1301 1301 1433 1433		
1433 1433		
1603		
	1503	1503
16RB(12V)/16RC(24V) 1673(12V)/1674(24V)	, , , , , ,	, , , , , ,
1705/1723/1762 1810/1822 1810/1822		
1810/1822 1810/1822 1949 1949		
2002 2002		
2109 2109		
2201 2201		
2312 2312		
240B 240B		
2507 2507		2507
2715 2715	2715	2715
2826 2826	2826	2826
2904 2904	2904	2904
3052(12V)/3054(24V) 3052(12V)/3054(24V)	3052(12V)/3054(24V)	
3115(12V)/3114(24V) 3115(12V)/3114(24V)	, , , , ,	` , , , ,
3586 3586		
3601 3601		
3707 3707		
4017 4017		
4311(12V)/4312(24V)/4399 4311(12V)/4312(24V)/4399	, , , , ,	, , , , , ,
4401 4401 4502 4502		
4601 4601		
4701 4701		
4801 4801		
4901 4901		
5001 5001		
5102 5102	5102	5102
5601/5602/5603/5607 5601/5602/5603/5607	5601/5602/5603/5607	5601/5602/5603/5607
5702 5702	5702	5702
5904 5904	5904	5904
6211 6211		
6410 6410	• •	
6609/6612/6699 6609/6612/6699		
7503/7504 7503/7504		
7622/7625 7622/7625		
8604 8711		
8711 8711 8801 8801		
9700 - SERVICE PARTS 9700 - SERVICE PARTS		

ORDERABLE OPTION CODES FOR ENGINE MODEL CD4045DF150 (045D)

VARIABLE SPEED

1101

1299

1302

1433

1503

16GB(12V)/16EN(24V)

1705/1723/1762

1810/1822

1949

2002

2109

2201

2312

240B 2507/2545

2601/2602

2715

2822/2826

2904

3052(12V)/3054(24V)

3115(12V)/3114(24V)

3586

3601

3707

4017

4311(12V)/4312(24V)/4399

4401

4502

4601

4701

4801

4901

5002

5102

5601/5602/5603/5607

5702

5904

6211

6410

6609/6612/6699

7503/7504

7622/7625

8605

8711

8801

9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD4045TF158 (045T)

1500 MIN-1	1800 MIN-1
1101	1101
1299	1299
1301	1301
1433	1433
1503	1503
16MT(12V)/16MU(24V)	16LZ(12V)/16MA(24V)
1740	1740
1813/1816	1813/1816
1949	1949
2002	2002
2109	2109
2201	2201
2312	2312
240B	240B
2507/2534	2507/2534
2713/2715	2713/2715
2803	2803
2904	2904
3052(12V)/3054(24V)	3052(12V)/3054(24V)
3115(12V)/3114(24V)	3115(12V)/3114(24V)
3586	3586
3601	3601
3707	3707
4017	4017
4311(12V)/4312(24V)/4399	4311(12V)/4312(24V)/4399
4401	4401
4501	4501
4601	4601
4701	4701
4803	4803
4901	4901
5001	5001
5102	5102
5601/5602/5603/5607	5601/5602/5603/5607
5702	5702
5901	5901
6211	6211
6401/6412	6401/6412
6503	6503
6609/6612/6699	6609/6612/6699
7503	7503
7622/7625	7622/7625
8604/8634	8604/8634
8711	8711
8801	8801
9700 - SERVICE PARTS	9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD4045TF258 (045T)

1500 MIN-1	1800 MIN-1
1101	1101
1299	1299
1301	1301
1433	1433
1503	1503
16GQ(12V)/16LV(24V)	16MB(12V)/16MC(24V)
	16MV(12V)/16MW(24V)
1740	1740
1813/1816	1813/1816
1949	1949
2002	2002
2109	2109
2201	2201
2312 240B	2312
240B 2534	240B 2534
2713	2713
2803	2803
2904	2904
3052(12V)/3054(24V)	3052(12V)/3054(24V)
3115(12V)/3114(24V)	3115(12V)/3114(24V)
3586	3586
3601	3601
3707	3707
4017	4017
4311(12V)/4312(24V)/4399	4311(12V)/4312(24V)/4399
4401	4401
4501	4501
4601	4601
4701	4701
4809	4809
4901	4901
5001	5001
5102	5102
5601/5602/5603/5607	5601/5602/5603/5607
5702	5702
5901	5901
6211	6211
6401/6412	6401/6412
6577	6577
6609/6612/6699	6609/6612/6699
7503	7503
7622/7625	7622/7625
8604	8604
8711	8711
8801	8801
9700 - SERVICE PARTS	9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD4045TF250 (045T)

VARIABLE SPEED

1606(12V)/1683(24V)

1813/1816

240B

2510/2534

2601/2602

3052(12V)/3054(24V)

3115(12V)/3114(24V)

4311(12V)/4312(24V)/4399

5601/5602/5603/5607

6401/6412

6609/6612/6699

7622/7625

9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD4045HF158 (045H)

1500 MIN-1	1800 MIN-1
1101	1101
1299	1299
1301	1301
1433	1433
1503	1503
16GR(12V)/16LW(24V)	16QZ(12V)/16RA(24V)
1760	1760
1815/1816	1815/1816
1949	1949
2002 2109	2002 2109
2201	2201
2312	2312
240B/2408	240B/2408
2533	2533
2712	2712
2803	2803
2904	2904
3052(12V)/3054(24V)	3052(12V)/3054(24V)
3115(12V)/3114(24V)	3115(12V)/3114(24V)
3586	3586
3601	3601
3707	3707
4017	4017
4311(12V)/4312(24V)/4399	4311(12V)/4312(24V)/4399
4401	4401
4501	4501
4601	4601
4701	4701
4809 4901	4809 4901
5001	5001
5102	5102
5601/5602/5603/5607	5601/5602/5603/5607
5701/5702	5701/5702
5901	5901
6211	6211
6401/6413	6401/6413
6503	6503
6609/6612/6699	6609/6612/6699
7503	7503
7622/7625	7622/7625
8604/8634	8604/8634
8711	8711
8801	8801
9700 - SERVICE PARTS	9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD6068DF150 (068D)

VARIABLE SPEED

3052(12V)/3054(24V)

3115(12V)/3114(24V)

4311(12V)/4312(24V)/4399

5601/5602/5603/5607

6609/6612/6699

7622/7625

9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD6068TF150 (068T)

VARIABLE SPEED

6211

5702 5902

6401/6413

6522

6609/6612/6699

6801

7503

7622/7625

8605

8711

8802

9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD6068TF158 (068T)

1500 MIN-1	1800 MIN-1
1102	1102
1299	1299
1305	1305
1433	1433
1503	1503
16MX(12V)/16MY(24V)	16MG(12V)/16MH(24V)
1748	1748
1801/1817	1801/1817
1950	1950
2001	2001
2109	2109
2201	2201
2312	2312
2457	2457
2508	2508
2714	2714
2809	2809
2904	2904
3052(12V)/3054(24V)	3052(12V)/3054(24V)
3115(12V)/3114(24V)	3115(12V)/3114(24V)
3591	3591
3601	3601
3707	3707
4017	4017
4311(12V)/4312(24V)/4399	4311(12V)/4312(24V)/4399
4403	4403
4603	4603
4702	4702
4807	4807
4902	4902
5001	5001
5107	5107
5601/5602/5603/5607	5601/5602/5603/5607
5702	5702
5902	5902
6211	6211
6401/6413	6401/6413
6578	6592
6609/6612/6699	6609/6612/6699
6801	6801
7503	7503
7622/7625	7622/7625
8604	8604
8711	8711
8801	8801
9700 - SERVICE PARTS	9700 - SERVICE PARTS
STOU - SERVICE PARTS	STOU - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD6068TF258 (068T)

1500 MIN-1	1800 MIN-1
1102	1102
1299	1299
1305	1305
1433	1433
1503	1503
16GS(12V)/16LX(24V)	16MJ(12V)/16MK(24V)
1748	1748
1801/1817	1801/1817
1950	1950
2001	2001
2109	2109
2201	2201
2312	2312
2457	2457
2508	2508
2714	2714
2809	2809
2904	2904
3052(12V)/3054(24V)	3052(12V)/3054(24V)
3115(12V)/3114(24V)	3115(12V)/3114(24V)
3591	3591
3601	3601
3707	3707
4017	4017
4311(12V)/4312(24V)/4399	4311(12V)/4312(24V)/4399
4403	4403
4603	4603
4702	4703
4810	4810
4902	4902
5001	5001
5107	5107
5601/5602/5603/5607	5601/5602/5603/5607
5702	5702
5902	5902
6211	6211
6401/6413	6401/6413
6578	6592
6609/6612/6699	6609/6612/6699
6801	6803
7503	7503
7622/7625	7622/7625
8604	8604
8711	8711
8801	8801
9700 - SERVICE PARTS	9700 - SERVICE PARTS

ORDERABLE OPTION CODES FOR ENGINE MODEL CD6068HF158 (068H)

1500 MIN-1	1800 MIN-1
1102	1102
1299	1299
1305	1305
1433	1433
1503	1503
16GT(12V)/16LY(24V)	16ML(12V)/16MM(24V)
1760	1760
1801/1817	1801/1817
1950	1950
2001	2001
2109	2109
2201	2201
2312	2312
2457	2457
2531	2531
2704	2704
2809	2809
2904	2904
3052(12V)/3054(24V)	3052(12V)/3054(24V)
3115(12V)/3114(24V)	3115(12V)/3114(24V)
3591	3591
3601	3601
3707	3707
4017	4017
4311(12V)/4312(24V)/4399	4311(12V)/4312(24V)/4399
4403	4403
4603	4603
4702	4703
4810	4810
4902	4902
5001	5001
5107	5107
5601/5602/5603/5607	5601/5602/5603/5607
5701/5702	5701/5702
5902	5902
6211	6211
6401/6413	6401/6413
6579	6592
6609/6612/6699	6609/6612/6699
6801	6803
7503	7503
7622/7625	7622/7625
8634	8604
8711	8711
8801	8801
9700 - SERVICE PARTS	9700 - SERVICE PARTS

ALPHABETICAL INDEX

0010		5405	00/0		5405
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3D7 3D8	ADAPTER, COOLANT LINES (8806)		2H5	BEARING, THRUST (CRANKSHAFT) (4710) BEARINGS (CRANKSHAFT) (4708)	
	ADAPTER, COOLANT LINES (8808)		2H2	, , ,	
2K12	, , ,		2H5	BEARINGS (CRANKSHAFT) (4710)	
2K13	ADAPTER, EXHAUST (6410)		2H3	BEARINGS (4710)(029D)	
2K14	ADAPTER, EXHAUST (6411)		3D13	BEARINGS (9704)	
2K15	ADAPTER, EXHAUST (6412)		3D14	BEARINGS (9705)	
2K16	ADAPTER, EXHAUST (6413)		2H21	BEARINGS / CONNECTING ROD (029D)	
2K17	ADAPTER, EXHAUST (6417)		2H9	BEARINGS / CONNECTING ROD (045D)	
2K18	ADAPTER, EXHAUST (6418)		2H15	BEARINGS / CONNECTING ROD (045D)	
3D5	ADAPTER, OIL FILTER (8802)		2H13	BEARINGS / CONNECTING ROD (045TF150)	
3D4	ADAPTER, OIL LINES (8801)		2H17	BEARINGS / CONNECTING ROD (045TF150)	
3D6	ADAPTER,OIL FILTER (HIGH POSITION)(8806)		2G22	BEARINGS / CRANKSHAFT (4701) (045T&H)	
3D3	ADAPTER,OIL FILTER (8801)		2G23	BEARINGS / CRANKSHAFT (4702)	
2K9	ADJUSTING STRAP, ALTERNATOR (6218)		2G24	BEARINGS / CRANKSHAFT (4703) (068T&H)	4700 - 4703
2E25	AID, STARTING (4311)		2H1	BEARINGS / CRANKSHAFT - KIT (UNDERSIZED)	
2F1	AID, STARTING (4311)			(4708)	4700 - 4708A
2F2	AID, STARTING (4312)		2H4	BEARINGS / CRANKSHAFT - KIT (UNDERSIZED)	
2F3	AID, STARTING (4312)		_	4710	4700 - 4710A
1G3	AIR CLEANER (1801)		2G25	BEARINGS / CRANKSHAFT, KIT (4708)	
1G4	AIR CLEANER (1802)			(039D&T)	
1G6	AIR CLEANER (1804)		2H23	BEARINGS/ CONNECTING ROD (4809-045T&H)	
1G8	AIR CLEANER (1805)	1800 - 1805A	2H24	BEARINGS/ CONNECTING ROD (4809-045T&H)	
1G10	AIR CLEANER (1810)		2 1	BEARINGS/ CONNECTING ROD (4810-068T&H)	
1G12	AIR CLEANER (1811)	1800 - 1811A	2H11	BEARINGS/CONNECTING ROD (4802) (039D&T)	4800 - 4802A
1G11	AIR CLEANER (1811) (039T)	1800 - 1811	1121	BELT (045D,T&H)	
1G14	AIR CLEANER (1812)	1800 - 1812	1122	BELT (045D,T&H)	2400 - 240B
1G16	AIR CLEANER (1813)	1800 - 1813A	1123	BELT (2402)	2400 - 2402
1G18	AIR CLEANER (1815)	1800 - 1815A	1124	BELT (2408)	2400 - 2408
1G20	AIR CLEANER (1816)	1800 - 1816	1125	BELT (2409)	2400 - 2408A
1G21	AIR CLEANER (1817)	1800 - 1817A	1J1	BELT (2419)	2400 - 2457
1G23	AIR CLEANER (1818)	1800 - 1818	2G9	BLOCK, CYLINDER (4601) (045D,T&H)	4600 - 4601A
1G25	AIR CLEANER (1820) (039T)	1800 - 1820	2G15	BLOCK, CYLINDER (4603) (068T&H)	4600 - 4603D
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3C3	AIR RESTRICTION INDICATOR (7503)	7500 - 7503	3E5	BLOCK, SHORT ASSEMBLY (9720) (068T&H)	9700 - 9720
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2E17	OIL DIPSTICK (4017)		1C3	PULLEY, CRANKSHAFT (1301)		
1B21	OIL FILLER NECK, W/O, COVER (LH) - 270		1C4	PULLEY, CRANKSHAFT (1302)		
1B23	OIL FILLER NECK, W/O, COVER (LH) - 270		1C5	PULLEY, CRANKSHAFT (1305)	1300 -	1305
2E15	OIL FILTER (4003)	4000 - 4003	1C7	PULLEY, CRANKSHAFT (1312)	1300 -	1312
2E16	OIL FILTER (4004)		1C8	PULLEY, CRANKSHAFT (1317)		
3D3	OIL FILTER (8801)		1H20	PULLEY, WATER PUMP (2001)		
3D6	OIL FILTER (8806)		1H21	PULLEY, WATER PUMP (2002)		
3D6	OIL FILTER ADAPTER (HIGH POSITION)(8806)		2E5	PUMP, FUEL (2702)		
3D3 3D5	OIL FILTER ADAPTER (8801)OIL FILTER ADAPTER (8802)		2E3 2E4	PUMP, FUEL (3702) PUMP, FUEL (3704)		
3D3	OIL LINES, ADAPTER (8801)		1E11	PUMP, FUEL (3704)		
2K22	OIL LINES, TURBOCHARGER (6503)		1E12	PUMP, FUEL INJECTION		
2K24	OIL LINES, TURBOCHARGER (6522)		1E22	PUMP, FUEL INJECTION		
2L4	OIL LINES, TURBOCHARGER (6577)		1E24	PUMP, FUEL INJECTION		
2L6	OIL LINES, TURBOCHARGER (6578)		1D5	PUMP, FUEL INJECTION (16EN)	1600 -	16EN
2L8	OIL LINES, TURBOCHARGER (6579)	6500 - 6579A	1D6	PUMP, FUEL INJECTION (16GB)	1600 -	16GB
2L10	OIL LINES, TURBOCHARGER (6592)		1D7	PUMP, FUEL INJECTION (16GQ)		
1H10	OIL PAN (039D&T)		1D8	PUMP, FUEL INJECTION (16GR)		
1H9	OIL PAN (1908)		1D9	PUMP, FUEL INJECTION (16GS)		
1H11	OIL PAN (1910)		1D10	PUMP, FUEL INJECTION (16GT)		
1H12	OIL PAN (1910-029D)		1D11	PUMP, FUEL INJECTION (16LV)		
1H13 1H14	OIL PAN (1949) OIL PAN (1949)		1D12 1D13	PUMP, FUEL INJECTION (16LW)PUMP, FUEL INJECTION (16LX)		
1H15	OIL PAN (1949)		1D13	PUMP, FUEL INJECTION (16LX)		
1H16	OIL PAN (1950)		1D15	PUMP, FUEL INJECTION (16LZ)		
1H17	OIL PAN, (CONVERSION KIT) (1950)		1D16	PUMP, FUEL INJECTION (16MA)		
2112	OIL PUMP (5001-045T&H)		1D17	PUMP, FUEL INJECTION (16MB)		
2113	OIL PUMP (5001-068T&H)	5000 - 5001B	1D18	PUMP, FUEL INJECTION (16MC)	1600 -	16MC
2114	OIL PUMP (5002-045D)	5000 - 5002	1D19	PUMP, FUEL INJECTION (16MG)	1600 -	16MG
2111	OIL PUMP KIT (5001)	5000 - 5001	1D20	PUMP, FUEL INJECTION (16MH)		
			1D21	PUMP, FUEL INJECTION (16MJ)		
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2J6	PAINT (5603)		1E2	PUMP, FUEL INJECTION (16MV)		
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1H14	PAN, OIL (1949)		1E8	PUMP, FUEL INJECTION (16RB)		
1H15	PAN, OIL (1950)		1E9	PUMP, FUEL INJECTION (16RC)		
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1F4 SET OF FUEL INJECTION LINES 1600 - 1699D 2H5 THRUST BEARING (CRANKSHAFT) (4710) 4700 - 4710B 2G3 SHAFT, BALANCER (4501) (EARLY DESIGN) 4500 - 4501A 2H3 THRUST BEARINGS (4710)(029D) 4700 - 4710 2G4 SHAFT, BALANCER (4501) (LATE DESIGN) 4500 - 4501A 3D13 THRUST BEARINGS (9704) 9700 - 9705 3C13 SHEAVE, FAN (8604) 8600 - 8604 2F11 TIMING GEAR COVER (4401) 4400 - 4401 3C14 SHEAVE, FAN (8604) 8600 - 8604 2F11 TIMING GEAR COVER (4403) 4400 - 4403 3C15 SHEAVE, FAN (8605) 8600 - 8605 2F19 TIMING GEAR COVER (4409) 4400 - 4403 3C16 SHEAVE, FAN (8605) 8600 - 8605A 3D12 TIMING GEAR COVER (4499) 9700 - 9703 3C17 SHEAVE, FAN (8634) 8600 - 8604 2F20 TIMING GEAR COVER (4499) 4400 - 4409 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6803)	3C21 1F11 3B14 3B15 3B16 3B17	SENSOR, INJECTION PUMP	8700 - 8711A 1600 - 1699L 6600 - 6609 6600 - 6610 6600 - 6612 6600 - 6612A	218 1110 1111 1112 1113 114 115 113 116 117	TAPPET (4903)	
2G3 SHAFT, BALANCER (4501) (EARLY DESIGN) 4500 - 4501 2H3 THRUST BEARINGS (4710)(029D) 4700 - 4710 2G4 SHAFT, BALANCER (4501) (LATE DESIGN) 4500 - 4501A 3D13 THRUST BEARINGS (9704) 9700 - 9704 2G5 SHAFT, BALANCER (4502) 4500 - 4502 3D14 THRUST BEARINGS (9705) 9700 - 9705 3C13 SHEAVE, FAN (8604) 8600 - 8604 2F11 TIMING GEAR COVER (4401) 4400 - 4401 3C14 SHEAVE, FAN (8604) 8600 - 8604 2F15 TIMING GEAR COVER (4403) 4400 - 4403 3C15 SHEAVE, FAN (8605) 8600 - 8605 2F19 TIMING GEAR COVER (4409) 4400 - 4403 3C16 SHEAVE, FAN (8634) 8600 - 8605A 3D12 TIMING GEAR COVER (4499) 9700 - 9703 3C17 SHEAVE, FAN (8634) 8600 - 8634 2F20 TIMING GEAR COVER (4409) 9700 - 9703 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9718 3B22 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9718 3B23 TORSIONAL DAMPENER (6803) 6800 - 6	3C21 1F11 3B14 3B15 3B16 3B17 3B13	S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612)		218 1110 1111 1112 1113 114 115 113 116 117 2E9	TAPPET (4903)	
2G4 SHAFT, BALANCER (4501) (LATE DESIGN) 4500 - 4501A 3D13 THRUST BEARINGS (9704) 9700 - 9704 2G5 SHAFT, BALANCER (4502) 4500 - 4502 3D14 THRUST BEARINGS (9705) 9700 - 9705 3C13 SHEAVE, FAN (8604) 8600 - 8604 2F11 TIMING GEAR COVER (4401) 4400 - 4401 3C15 SHEAVE, FAN (8604) 8600 - 8604A 2F15 TIMING GEAR COVER (4403) 4400 - 4403 3C15 SHEAVE, FAN (8605) 8600 - 8605 2F19 TIMING GEAR COVER (9703-039D&T) 9700 - 9703 3C16 SHEAVE, FAN (8605) 8600 - 8605A 3D12 TIMING GEAR COVER (9703-039D&T) 9700 - 9703 3C17 SHEAVE, FAN (8634) 8600 - 8605A 3D12 TIMING GEAR COVER (9703-039D&T) 9700 - 9703 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9718 3B22 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6803) 6800 - 6803 3E12 STARTER (3008) 3000 - 3008 2K21 TURBOCHARGER (6503) 6500 - 6503 2B13 STARTER (3009) 3000 - 3009 2L	1F11 3B14 3B15 3B16 3B17 3B13 3B18	SENSOR, INJECTION PUMP		218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2	TAPPET (4903)	
2G5 SHAFT, BALANCER (4502) 4500 - 4502 3D14 THRUST BEARINGS (9705) 9700 - 9705 3C13 SHEAVE, FAN (8604) 8600 - 8604 2F11 TIMING GEAR COVER (4401) 4400 - 4401 3C14 SHEAVE, FAN (8604) 8600 - 8604A 2F15 TIMING GEAR COVER (4403) 4400 - 4403 3C15 SHEAVE, FAN (8605) 8600 - 8605A 2F19 TIMING GEAR COVER (4499) 4400 - 4499 3C16 SHEAVE, FAN (8605) 8600 - 8605A 3D12 TIMING GEAR COVER (9703-039D&T) 9700 - 9703 3C17 SHEAVE, FAN (8634) 8600 - 8634 2F20 TIMING GEAR COVER (H1 (4499) (039D&T) 4400 - 4499 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9718 3B22 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6803) 6800 - 6803 3E12 STARTER (3008) 3000 - 3008 2K21 TURBOCHARGER (6503) 6500 - 6503 2B13 STARTER (3009) 3000 - 3016 2L3 TURBOCHARGER (6576) 6500 - 6576	1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4	S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES		218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5	TAPPET (4903)	
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3C13 SHEAVE, FAN (8604) 8600 - 8604 2F11 TIMING GEAR COVER (4401) 4400 - 4401 3C14 SHEAVE, FAN (8604) 8600 - 8604A 2F15 TIMING GEAR COVER (4403) 4400 - 4403 3C15 SHEAVE, FAN (8605) 8600 - 8605 2F19 TIMING GEAR COVER (4499) 4400 - 4499 3C16 SHEAVE, FAN (8605) 8600 - 8605A 3D12 TIMING GEAR COVER (9703-039D&T) 9700 - 9703 3C17 SHEAVE, FAN (8634) 8600 - 86034 2F20 TIMING GEAR COVER (4499) 4400 - 4499 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9718 3B22 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6803) 6800 - 6803 3E11 STARTER (3008) 3000 - 3008 2K21 TURBOCHARGER (6503) 6500 - 6503 2B15 STARTER (3009) 3000 - 3008 2K23 TURBOCHARGER (6576) 6500 - 6576 2B17 STARTER (3026) 3000 - 3026 2L5 TURBOCHARGER (6579) 6500 - 6578 2B23 STARTER (3052) 3000 - 3052 2L5 TURBOCHARGER (6592) <t< td=""><td>1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4 2G3</td><td>S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES SHAFT, BALANCER (4501) (EARLY DESIGN)</td><td></td><td>218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5 2H3</td><td>TAPPET (4903)</td><td></td></t<>	1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4 2G3	S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES SHAFT, BALANCER (4501) (EARLY DESIGN)		218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5 2H3	TAPPET (4903)	
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3C15 SHEAVE, FAN (8605) 8600 - 8605 2F19 TIMING GEAR COVER (4499) 4400 - 4499 3C16 SHEAVE, FAN (8605) 8600 - 8605A 3D12 TIMING GEAR COVER (9703-039D&T) 9700 - 9703 3C17 SHEAVE, FAN (8634) 8600 - 8634 2F20 TIMING GEAR COVER KIT (4499) (039D&T) 4400 - 4499A 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9718 3B22 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6803) 6800 - 6803 1F12 SOLENOID, FUEL INJECTION PUMP 1600 - 1699M 2K21 TURBOCHARGER (6503) 6500 - 6503 2B13 STARTER (3008) 3000 - 3008 2K23 TURBOCHARGER (6522) 6500 - 6522 2B15 STARTER (3016) 3000 - 3009 2L1 TURBOCHARGER (6576) 6500 - 6576 2B17 STARTER (3025) 3000 - 3025 2L5 TURBOCHARGER (6578) 6500 - 6578 2B21 STARTER (3052) 3000 - 3052 2L7 TURBOCHARGER (6592) 6500 - 6592 2B25 STARTER (3052) 3000 - 3052B 2K22 TURBOCHARGER (6592) <td>1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4 2G3 2G4 2G5</td> <td>S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES SHAFT, BALANCER (4501) (EARLY DESIGN) SHAFT, BALANCER (4501) (LATE DESIGN) SHAFT, BALANCER (4502)</td> <td></td> <td>218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5 2H3 3D13 3D14</td> <td>TAPPET (4903)</td> <td></td>	1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4 2G3 2G4 2G5	S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES SHAFT, BALANCER (4501) (EARLY DESIGN) SHAFT, BALANCER (4501) (LATE DESIGN) SHAFT, BALANCER (4502)		218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5 2H3 3D13 3D14	TAPPET (4903)	
3C15 SHEAVE, FAN (8605) 8600 - 8605 2F19 TIMING GEAR COVER (4499) 4400 - 4499 3C16 SHEAVE, FAN (8605) 8600 - 8605A 3D12 TIMING GEAR COVER (9703-039D&T) 9700 - 9703 3C17 SHEAVE, FAN (8634) 8600 - 8634 2F20 TIMING GEAR COVER KIT (4499) (039D&T) 4400 - 4499A 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9718 3B22 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6803) 6800 - 6803 1F12 SOLENOID, FUEL INJECTION PUMP 1600 - 1699M 2K21 TURBOCHARGER (6503) 6500 - 6503 2B13 STARTER (3008) 3000 - 3008 2K23 TURBOCHARGER (6522) 6500 - 6522 2B15 STARTER (3016) 3000 - 3009 2L1 TURBOCHARGER (6576) 6500 - 6576 2B17 STARTER (3025) 3000 - 3025 2L5 TURBOCHARGER (6578) 6500 - 6578 2B21 STARTER (3052) 3000 - 3052 2L7 TURBOCHARGER (6592) 6500 - 6592 2B25 STARTER (3052) 3000 - 3052B 2K22 TURBOCHARGER (6592) <td>1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4 2G3 2G4 2G5</td> <td>S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES SHAFT, BALANCER (4501) (EARLY DESIGN) SHAFT, BALANCER (4501) (LATE DESIGN) SHAFT, BALANCER (4502) SHEAVE, FAN (8604)</td> <td></td> <td>218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5 2H3 3D13 3D14</td> <td>TAPPET (4903)</td> <td></td>	1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4 2G3 2G4 2G5	S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES SHAFT, BALANCER (4501) (EARLY DESIGN) SHAFT, BALANCER (4501) (LATE DESIGN) SHAFT, BALANCER (4502) SHEAVE, FAN (8604)		218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5 2H3 3D13 3D14	TAPPET (4903)	
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3C17 SHEAVE, FAN (8634) 8600 - 8634 2F20 TIMING GEAR COVER KIT (4499) (039D&T) 4400 - 4499A 3E3 SHORT BLOCK ASSEMBLY (9718-045T&H) 9700 - 9718 3B22 TORSIONAL DAMPENER (6801) 6800 - 6801 3E5 SHORT BLOCK ASSEMBLY (9720) (068T&H) 9700 - 9720 3B23 TORSIONAL DAMPENER (6803) 6800 - 6803 1F12 SOLENOID, FUEL INJECTION PUMP 1600 - 1699M 2K21 TURBOCHARGER (6503) 6500 - 6503 2B13 STARTER (3008) 3000 - 3008 2K23 TURBOCHARGER (6522) 6500 - 6522 2B15 STARTER (3016) 3000 - 3009 2L1 TURBOCHARGER (6576) 6500 - 6576 2B19 STARTER (3025) 3000 - 3025 2L5 TURBOCHARGER (6578) 6500 - 6578 2B21 STARTER (3026) 3000 - 3026 2L7 TURBOCHARGER (6592) 6500 - 6579 2B23 STARTER (3052) 3000 - 3052B 2K22 TURBOCHARGER (0592) 6500 - 6592 2B25 STARTER (3052) 3000 - 3052B 2K22 TURBOCHARGER (0503) 6500 - 6503A	3C21 1F11 3B14 3B15 3B16 3B17 3B13 3B18 1F4 2G3 2G4 2G5 3C13 3C14	S SENSOR, INJECTION PUMP SENSOR, WATER TEMPERATURE (6609) SENSOR, WATER TEMPERATURE (6610) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6612) SENSOR, WATER TEMPERATURE (6613) SENSOR, WATER TEMPERATURE (6613) SET OF FUEL INJECTION LINES SHAFT, BALANCER (4501) (EARLY DESIGN) SHAFT, BALANCER (4501) (LATE DESIGN) SHAFT, BALANCER (4502) SHEAVE, FAN (8604)		218 1110 1111 1112 1113 114 115 113 116 117 2E9 2H2 2H5 2H3 3D13 3D14 2F11 2F15	TAPPET (4903)	
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1H20 WATER PUMP PULLEY (2001) 2000 - 2001 1H21 WATER PUMP PULLEY (2002) 2000 - 2002 3B13 WATER TEMPERARURE SENSOR (6608) 6600 - 6608 3B14 WATER TEMPERARURE SENSOR (6609) 6600 - 6609 3B15 WATER TEMPERARURE SENSOR (6610) 6600 - 6610 3B16 WATER TEMPERARURE SENSOR (6612) 6600 - 6612 3B17 WATER TEMPERARURE SENSOR (6612) 6600 - 6612A 3B18 WATER TEMPERARURE SENSOR (6613) 6600 - 6613 1F11 WIRING HARNESS, FUEL INJECTION PUMP 1600 - 1699L 1B19 WITHOUT OIL FILLER NECK (1299) (3.9D) 1200 - 1299 3B19 WITHOUT SENSOR (WATER) (6699) 6600 - 6699 2F4 WITHOUT STARTING AID (4399) 4300 - 4397			
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3B13 WATER TEMPERARURE SENSOR (6608) 6600 - 6608 3B14 WATER TEMPERARURE SENSOR (6609) 6600 - 6609 3B15 WATER TEMPERARURE SENSOR (6610) 6600 - 6610 3B16 WATER TEMPERARURE SENSOR (6612) 6600 - 6612 3B17 WATER TEMPERARURE SENSOR (6612) 6600 - 6612A 3B18 WATER TEMPERARURE SENSOR (6613) 6600 - 6613 1F11 WIRING HARNESS, FUEL INJECTION PUMP 1600 - 1699L 1B19 WITHOUT OIL FILLER NECK (1299) (3.9D) 1200 - 1299 3B19 WITHOUT SENSOR (WATER) (6699) 6600 - 6699 2F4 WITHOUT STARTING AID (4399) 4300 - 4397		, ,	
3B14 WATER TEMPERARURE SENSOR (6609)			
3B15 WATER TEMPERARURE SENSOR (6610)		, ,	
3B16 WATER TEMPERARURE SENSOR (6612) .6600 - 6612 3B17 WATER TEMPERARURE SENSOR (6612) .6600 - 6612A 3B18 WATER TEMPERARURE SENSOR (6613) .6600 - 6613 1F11 WIRING HARNESS, FUEL INJECTION PUMP .1600 - 1699L 1B19 WITHOUT OIL FILLER NECK (1299) (3.9D) .1200 - 1299 3B19 WITHOUT SENSOR (WATER) (6699) .6600 - 6699 2F4 WITHOUT STARTING AID (4399) .4300 - 4397	_		
3B17 WATER TEMPERARURE SENSOR (6612)			
3B18 WATER TEMPERARURE SENSOR (6613)		` ,	
1F11 WIRING HARNESS, FUEL INJECTION PUMP			
1B19 WITHOUT OIL FILLER NECK (1299) (3.9D)			
3B19 WITHOUT SENSOR (WATER) (6699)			
2F4 WITHOUT STARTING AID (4399)4300 - 4397	1B19		
2F4 WITHOUT STARTING AID (4399)4300 - 4397	3B19		
	2F4	WITHOUT STARTING AID (4399)	4300 - 4397
	2F5		

2F6

WITHOUT STARTING AID (4399)4300 - 4399A

WITHOUT STARTING AID (4399)4300 - 4399B

VALVE COVER

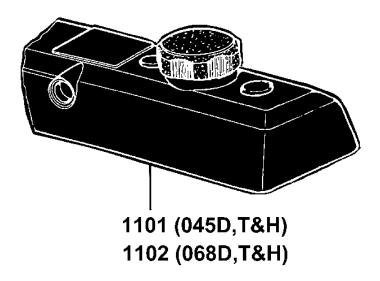
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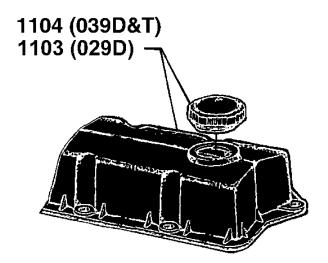
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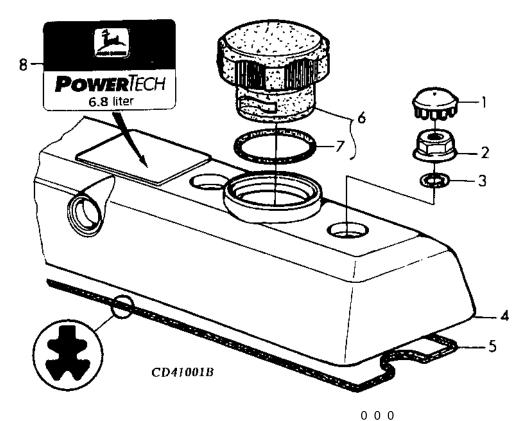
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		1101 1101 1101 1101 1101	
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CD42400

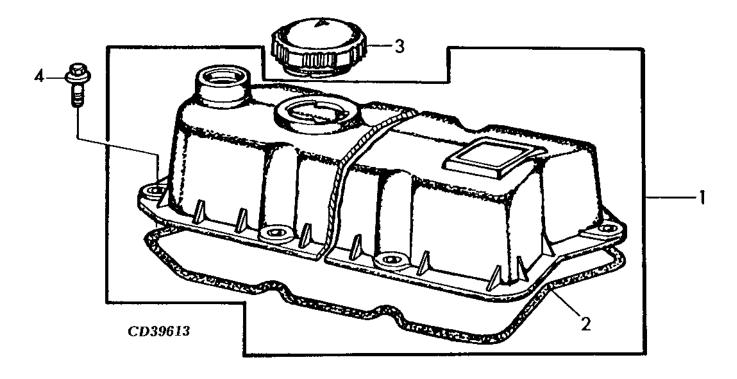
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	H23125	PLUG	4		XXX	
2	R123574	NUT	4		X X X	
3	R123575	O-RING	4		X X X	
4	RE70401	VALVE COVER	1		X X X	
5	R123542	GASKET	1		X X X	
6	RE500005	FILLER CAP	1		X X X	
7	R502902	PACKING	1		XXX	(SUB FOR R500001)
8	R116324	MEDALLION	1		X X X	

CD41001B -UN-25NOV98



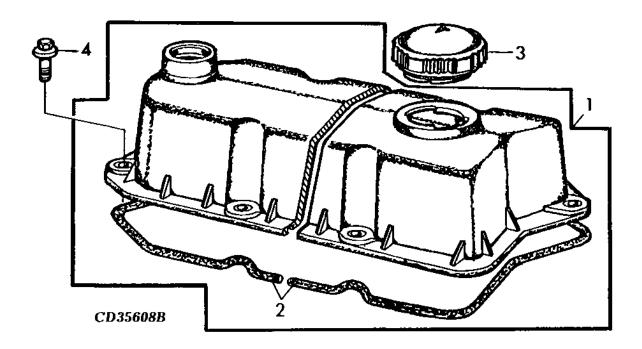
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS	
1	H23125	PLUG	6		XXX		
2	R123574	NUT	6		X X X		
3	R123575	O-RING	6		X X X		
4	RE70400	VALVE COVER	1		X X X		
5	R123543	GASKET	1		X X X		
6	RE500005	FILLER CAP	1		X X X		
7	R502902	PACKING	1		X X X (SUB FOR R500001)	
8	R121674	MEDALLION	1		XXX		

CD39613 -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS
1	RE44188	VALVE COVER	1		Х	
2	R106796	O-RING	1		Χ	LGTH 1256MM, CUT TO LENGTH, COUPER A
						LONGUEUR, ABLAENGEN, TAGLIARE SU MISURE,
						CORTAR A LONGITUD, AVSKARE EFTER MATT
3	RE42762	FILLER CAP	1		Χ	
4	RE32140	SCREW, WITH WASHER	6		Χ	

CD35608B -UN-21FEB96



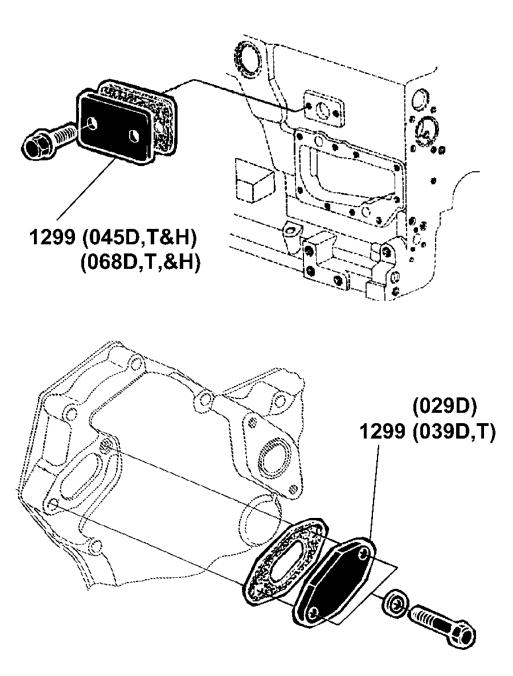
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS
1	RE44205	VALVE COVER	1		ХХ	
2	R106796	O-RING	1		ХХ	LGTH 1256MM, CUT TO LENGTH, COUPER A
						LONGUEUR, ABLAENGEN, TAGLIARE SU
						MISURE, CORTAR A LONGITUD, AVSKARE
						EFTER MATT
3	RE42762	FILLER CAP	1		ХХ	
4	RF32140	SCREW WITH WASHER	8		XX	

VALVE COVER

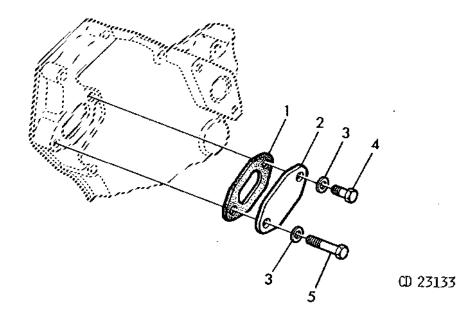
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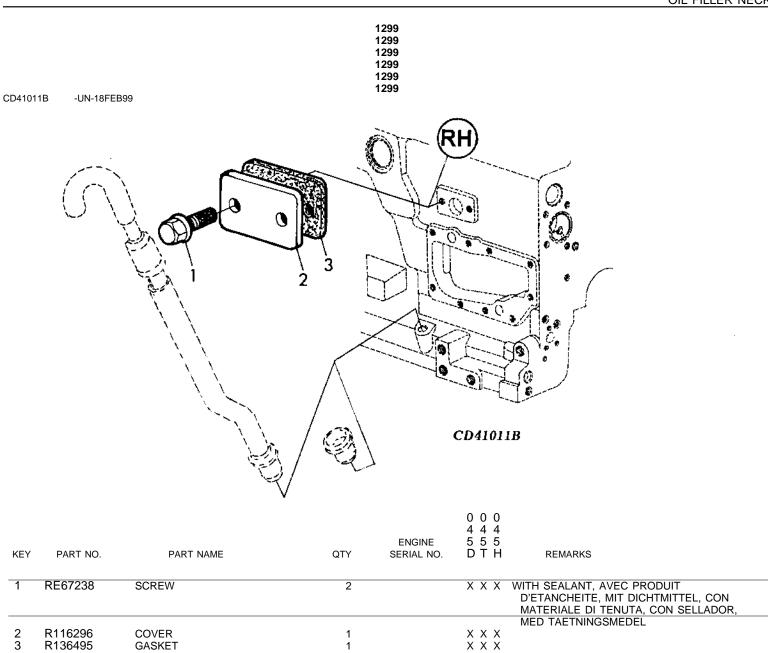
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1299 -	1B19
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1299 -	1B21
1299 -	1B22
1299 -	1B23



CD23133 -UN-01JAN94



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	0 0 0 2 3 3 9 9 9 D D T REMARKS
1	R97352	GASKET	1	XXX
2	T23260	COVER	1	XXX
3	24M7106	WASHER	2	X X X 10 X 18 X 2.500 MM
4	19H2284	CAP SCREW	1	X X X 3/8" X 7/8"
5	19H1164	CAP SCREW	1	X X X 3/8" X 2-1/4"



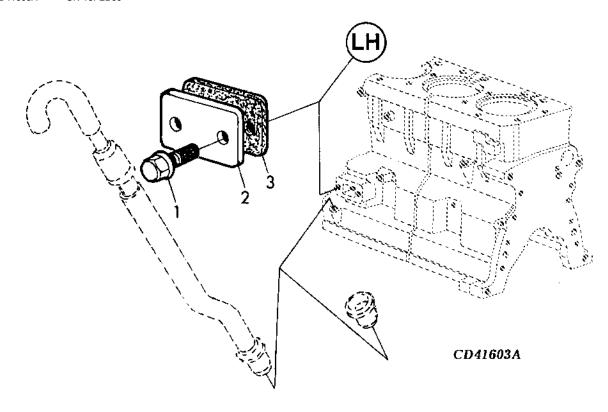
R136495

GASKET

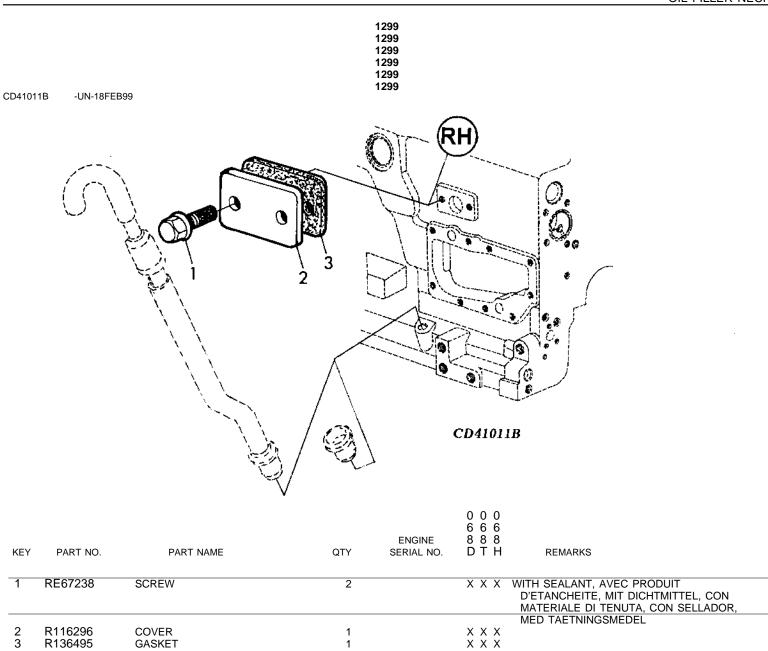
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1299 - FORTS

-UN-18FEB99 CD41603A



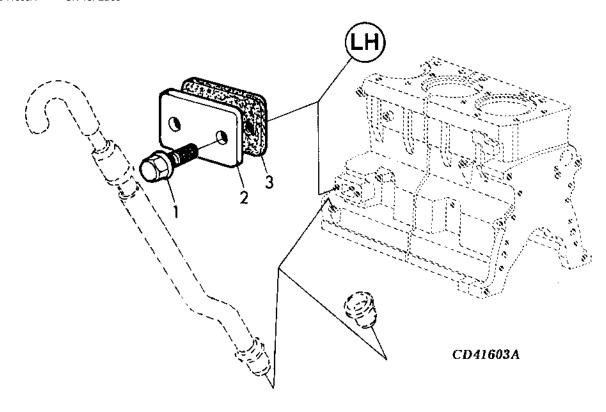
KEY	PART NO.	PART NAME	QTY	ENGINE 5 5 SERIAL NO. D	4
1	RE67238	SCREW	2	X X	X WITH SEALANT, AVEC PRODUIT
					D'ETANCHEITE, MIT DICHTMITTEL, CON
					MATERIALE DI TENUTA, CON SELLADOR,
					MED TAETNINGSMEDEL
2	R116296	COVER	1	Χ >	(X
3	R136495	GASKET	1	Χ >	(X



1299 - CONTINUED 1299 - SUITE 1299 - FORTSETZUNG 1299 - SEGUITO 1299 - CONTINUACION

1299 - FORTS

CD41603A -UN-18FEB99



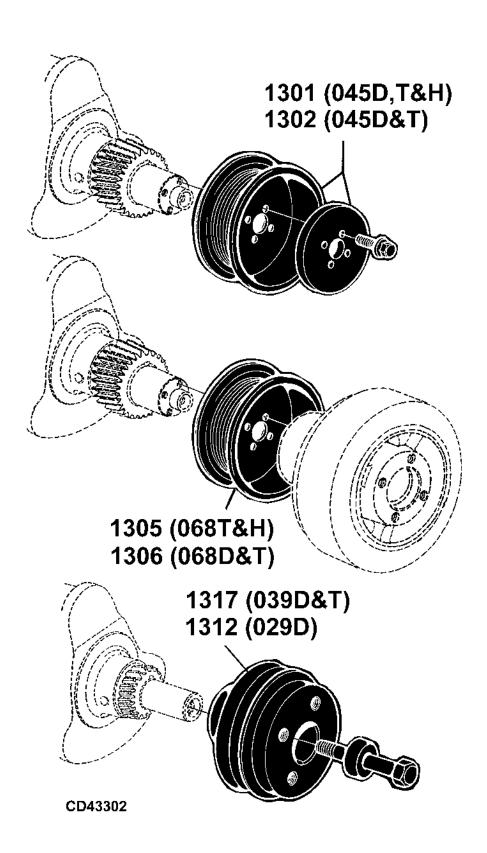
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	RE67238	SCREW	2		XXX	WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITÉ, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR,
						MED TAETNINGSMEDEL
2	R116296	COVER	1		X X X	
3	R136495	GASKET	1		X X X	

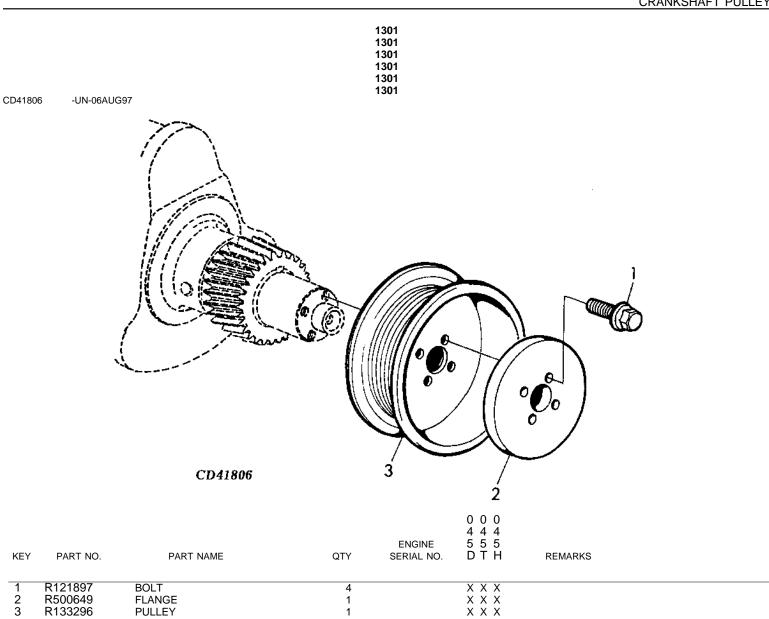
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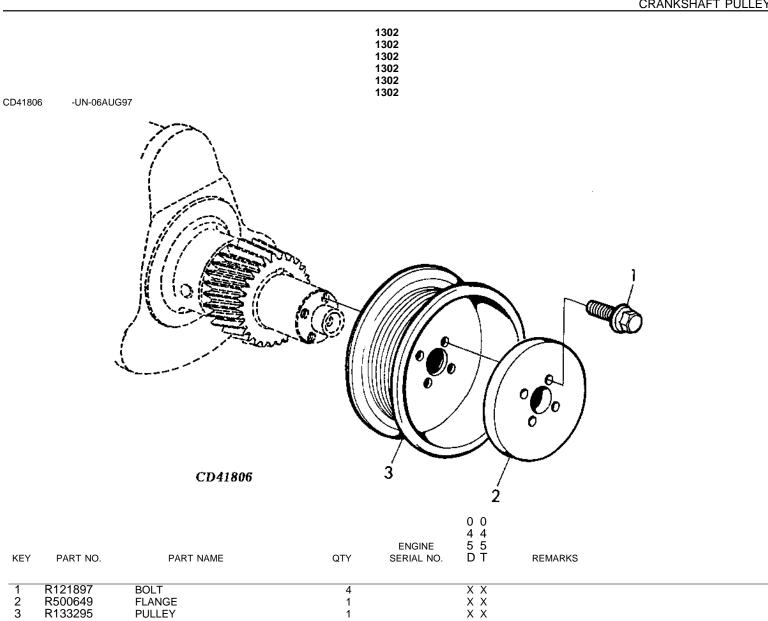
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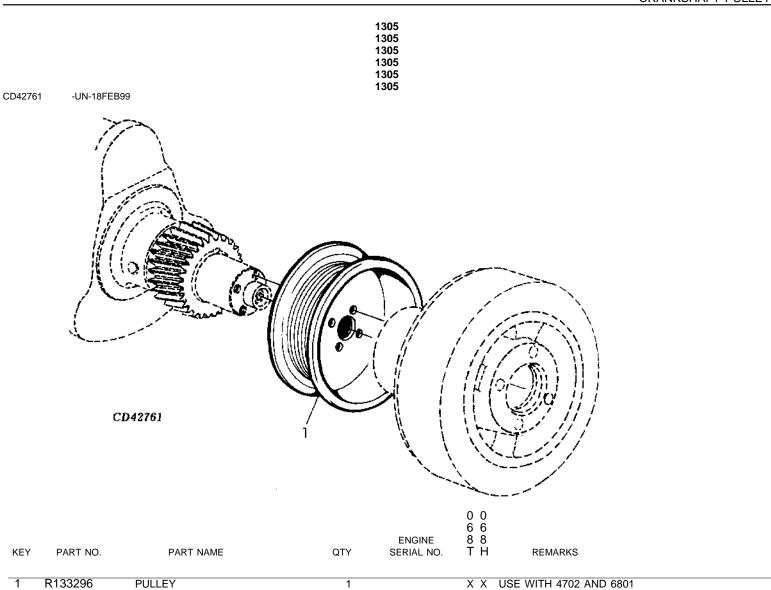
1312 - 1C7 1317 - 1C8

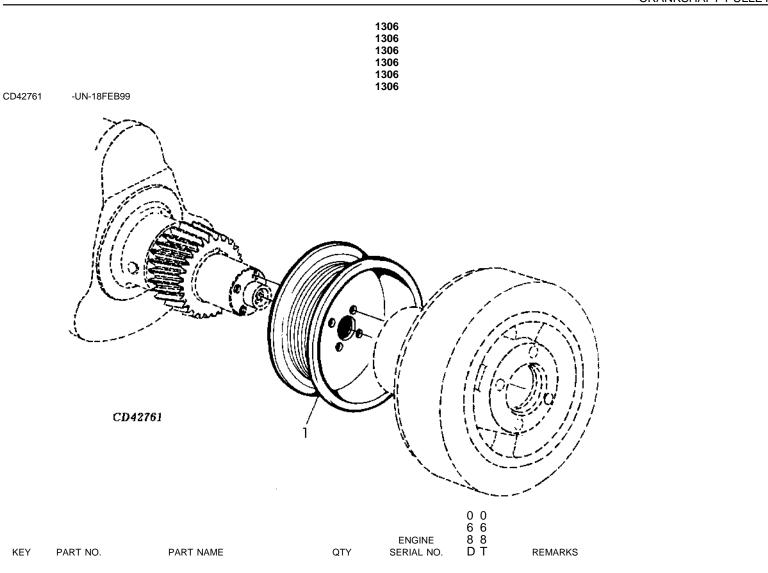






CRANKSHAFT PULLEY





R133295

PULLEY

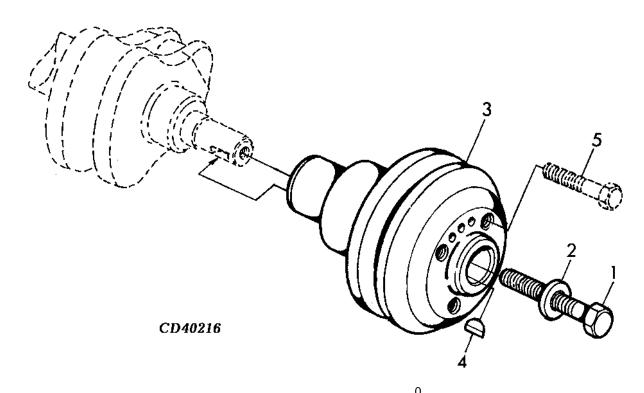
X X USE WITH 4702 AND 6803

CRANKSHAFT PULLEY

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1312

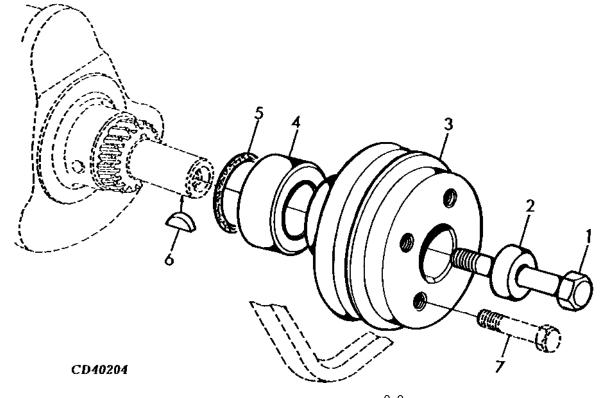
CD40216 -UN-07MAY96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS	
1	19H2473	CAP SCREW	1		Х	1/2" X 1-3/4", (SAE 8)	
2	R109086	SPACER	1		Χ	13 X 44 X 10 MM	
3	R501222	SHEAVE	1		Χ	11/16" X OD 171MM	
4	26H27	SHAFT KEY	1		Х	5/16" X 1-1/8"	
5		CAP SCREW	AR		Χ	3/8"-16UNC	

1317	
1317	
1317	
1317	
1317	

CD40204 -UN-23MAY95



KEY	PART NO.	PART NAME		3 3 NGINE 9 9 IAL NO. D T	REMARKS	
1	19H2473	CAP SCREW	1	ХХ	1/2" X 1-3/4", (HS, SAE 8)	
2	R109086	SPACER	1		TK 10MM, OD 44MM	
3	R119220	PULLEY	1	ΧX	OD 171.5MM	
4	R81989	SLEEVE	1	ХХ		
5	H35244	RING	1	ΧX		
6	26H27	SHAFT KEY	1	XX	5/16" X 1-1/8"	
7		CAP SCREW	AR	ХХ	7/16"-14UNC, ON DIAMETER = 99.6MM	

Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

CRANKSHAFT PULLEY

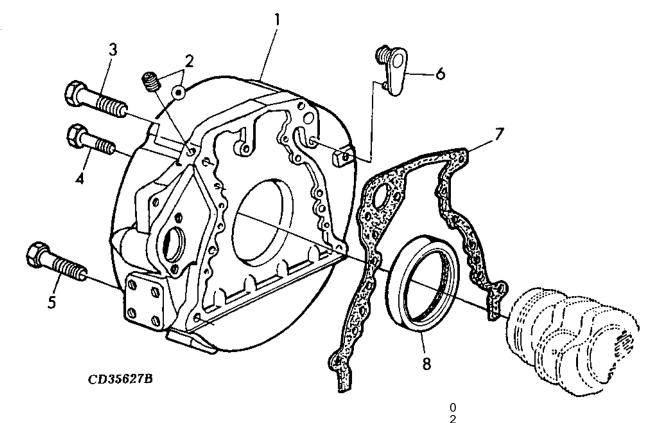
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-1418 (029D) 1421 (029D&T/039D&T) 1433 (045D,T&H/068T&H)

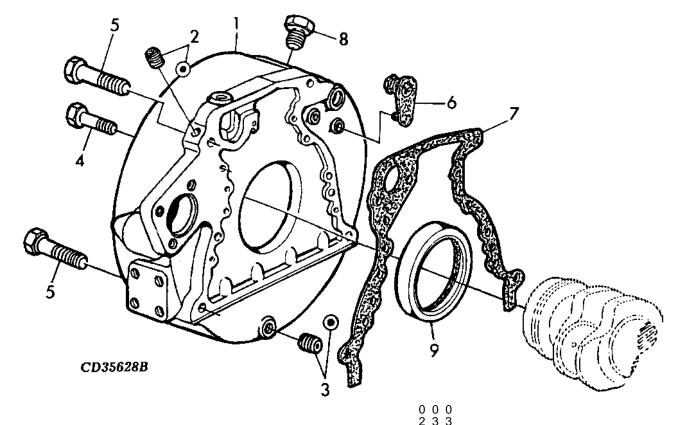
CDP45063

CD35627B -UN-21APR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	9 D	REMARKS
1	R64100	HOUSING	1		Х	
2	R104592	PIPE PLUG	AR		Χ	1/8"-27NPTF, WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITE, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR, MED
						TAETNINGSMEDEL
3	19H1439	CAP SCREW	2		Χ	5/8" X 3", (SAE8)
4	19H3219	CAP SCREW	8		Χ	3/8" X 1-3/8", (SAE 8)
5	19H3340	CAP SCREW	2		Χ	5/8" X 5-1/2", (SAE 8)
6	R131765	PLUG	1		Χ	
7	R97351	GASKET	1		Х	
8	RE44574	SEAL	1		Χ	

CD35628B -UN-21APR98



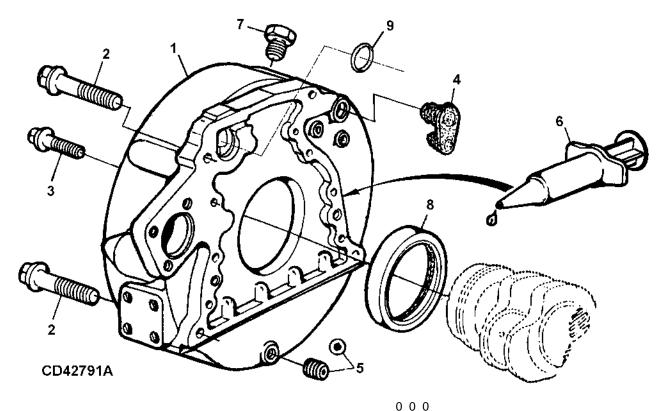
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	9 9 9 D D T	REMARKS
1	R120586	HOUSING	1		XXX	
2	R104592	PIPE PLUG	AR		XXX	1/8"-27NPTF, WITH SEALANT, AVEC PRODUIT
2	104332	FIFE FLOG	AIX		^ ^ ^	D'ETANCHEITE, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR,
						MED TAETNINGSMEDEL
3	15H584	PIPE PLUG	1		X X X	1/2"-14NPT
4	19H3219	CAP SCREW	8		XXX	3/8" X 1-3/8", (SAE 8)
5	19H1847	CAP SCREW	4		X X X	5/8" X 2-1/2", (SAE 8)
6	R131768	PLUG	1		X X X	
7	R97351	GASKET	1		XXX	
8	T22867	DRAIN PLUG	1		X X X	3/4"-16UNF
9	RF44574	SEAL	1		X X X	

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FLYWHEEL HOUSING

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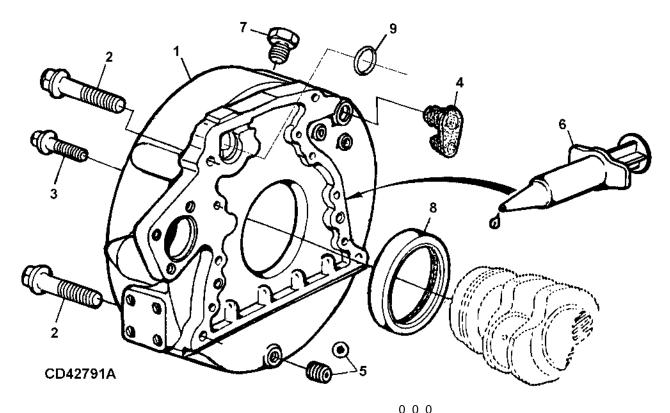
-UN-05JUL01 CD42791A



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS
1	R502272	HOUSING	1	548119-624635	ХХ	(ORDER R504272 AND R61467)
	R504272	HOUSING	1	624636-	X X X	,
2	19M8306	SCREW	4	548119-	X X X	M12 X 50
3	R135918	BOLT	8	548119-	XXX	
4	R131768	PLUG	1	548119-	X X X	OD 61MM
5	15H584	PIPE PLUG	1	548119-	X X X	1/2"-14NPT
6	DD15664	LIQUID GASKET	1	548119-	XXX	
7	R39112	FITTING	1	548119-	X X X	3/4"-16UNF
8	RE44574	SEAL	1	548119-	X X X	
9	R61467	O-RING	1	624636-	XXX	69.520 X 2.616 MM

1433

CD42791A -UN-05JUL01



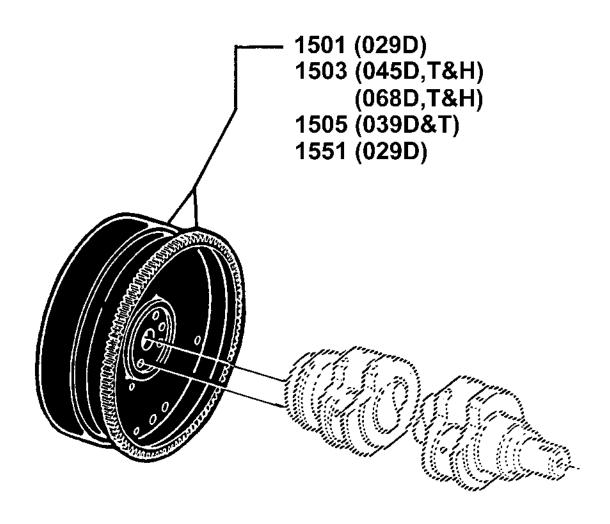
PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
R502272	HOUSING	1	548119-624635	ХХ	(ORDER R504272 AND R61467)
R504272	HOUSING	1	624636-	X X X	
19M8306	SCREW	4	548119-	X X X	M12 X 50
R135918	BOLT	8	548119-	X X X	
R131768	PLUG	1	548119-	X X X	OD 61MM
15H584	PIPE PLUG	1	548119-	X X X	1/2"-14NPT
DD15664	LIQUID GASKET	1	548119-	X X X	
R39112	FITTING	1	548119-	X X X	3/4"-16UNF
RE44574	SEAL	1	548119-	X X X	
R61467	O-RING	1	624636-	XXX	69.520 X 2.616 MM
	R502272 R504272 19M8306 R135918 R131768 15H584 DD15664 R39112 RE44574	R502272 HOUSING R504272 HOUSING 19M8306 SCREW R135918 BOLT R131768 PLUG 15H584 PIPE PLUG DD15664 LIQUID GASKET R39112 FITTING RE44574 SEAL	R502272 HOUSING 1 R504272 HOUSING 1 19M8306 SCREW 4 R135918 BOLT 8 R131768 PLUG 1 15H584 PIPE PLUG 1 DD15664 LIQUID GASKET 1 R39112 FITTING 1 RE44574 SEAL 1	PART NO. PART NAME QTY SERIAL NO. R502272 HOUSING 1 548119-624635 R504272 HOUSING 1 624636- 19M8306 SCREW 4 548119- R135918 BOLT 8 548119- R131768 PLUG 1 548119- 15H584 PIPE PLUG 1 548119- DD15664 LIQUID GASKET 1 548119- R39112 FITTING 1 548119- RE44574 SEAL 1 548119-	R502272 HOUSING 1 548119-624635 X X R504272 HOUSING 1 624636- X X X 19M8306 SCREW 4 548119- X X X R135918 BOLT 8 548119- X X X R131768 PLUG 1 548119- X X X DD15664 LIQUID GASKET 1 548119- X X X R39112 FITTING 1 548119- X X X R39112 FITTING 1 548119- X X X RE44574 SEAL 1 548119- X X X

FLYWHEEL HOUSING

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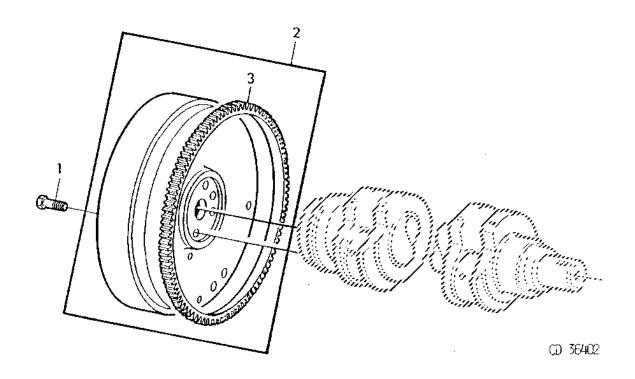
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Q-Pulse Id TMS554

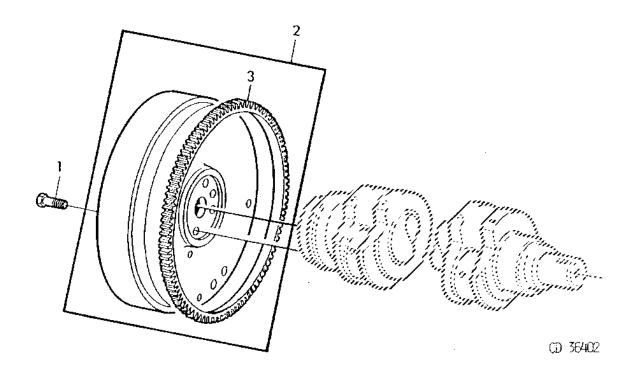


KI	EY PART NO.	PART NAME	ENGINE QTY SERIAL N		
1	19H2993	CAP SCREW	4	X 1/2" X 1-1/2", (SAE 8)	
2	RE68464	FLYWHEEL	1	X	
3	R114282	RING GEAR	1	X = 142	

FLYWHEEL

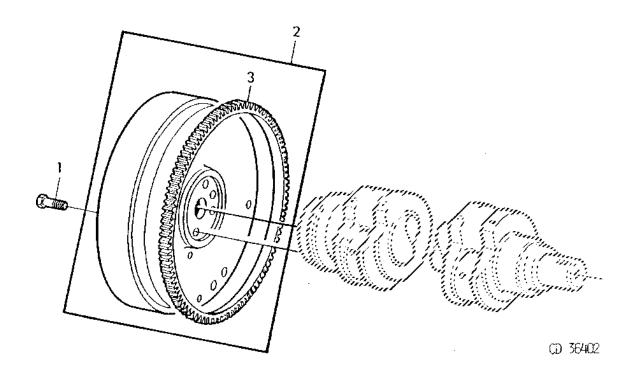
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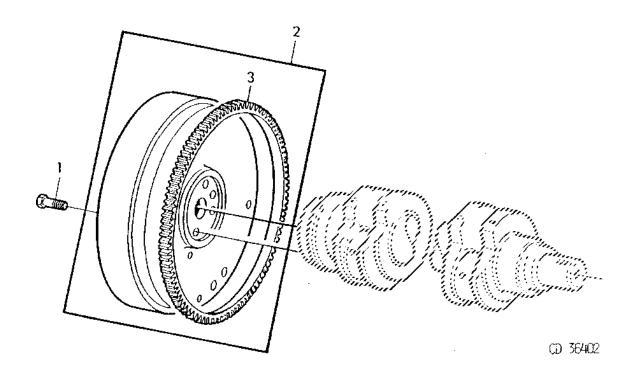
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS	
1	19H2993	CAP SCREW	4		X X X 1/2	2" X 1-1/2", (SAE 8)	
2	RE500398	FLYWHEEL	1		X X X		
3	R28811	RING GEAR	1		X X X Z	= 129	

CD36402 -UN-01JAN94



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS	
1	19H2993	CAP SCREW	4		X X X 1/	2" X 1-1/2", (SAE 8)	
2	RE500398	FLYWHEEL	1		X X X	,	
3	R28811	RING GEAR	1		X X X 7	= 129	

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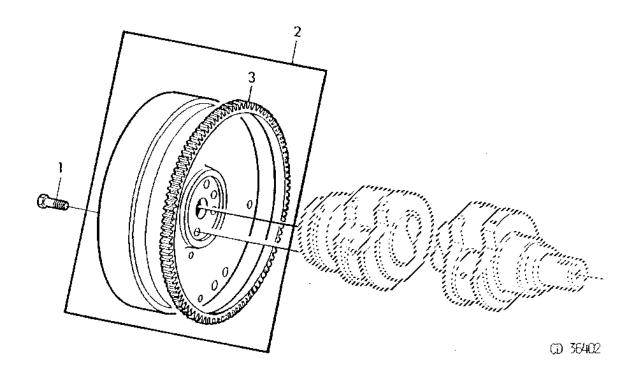


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS	
1	19H2993	CAP SCREW	4		ХХ	1/2" X 1-1/2", (SAE 8)	
2	RE500398	FLYWHEEL	1		ΧХ	,	
3	R28811	RING GEAR	1		ΧХ	Z = 129	

FLYWHEEL

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CD36402 -UN-01JAN94



ı	KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	9 D	REMARKS	
	1	19H2993	CAP SCREW	4		Х	1/2" X 1-1/2", (SAE 8)	
	2	RE502095	FLYWHEEL	1		Χ		
	3	R28811	GEAR	1		Χ	Z = 129	

FLYWHEEL

MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA

16EN - 1D5 16GB - 1D6

<u>16GQ - 1D7</u> 16GR - 1D8

16GS - 1D9

16LW - 1D12

16MA - 1D16

16MC - 1D18 16MG - 1D19

16MH - 1D20

16MJ - 1D21 16MK - 1D22 <u>16ML - 1D23</u> 16MM - 1D24

16MT - 1D25 16MU - 1E1

16MV - 1E2 16MW - 1E3 16MX - 1E4 16MY - 1E5 16QZ - 1E6 16RA - 1E7 16RB - 1E8 16RC - 1E9 1603 - 1E1 1613 - 1E1 1614 - 1E1 1635 - 1E1

1D11

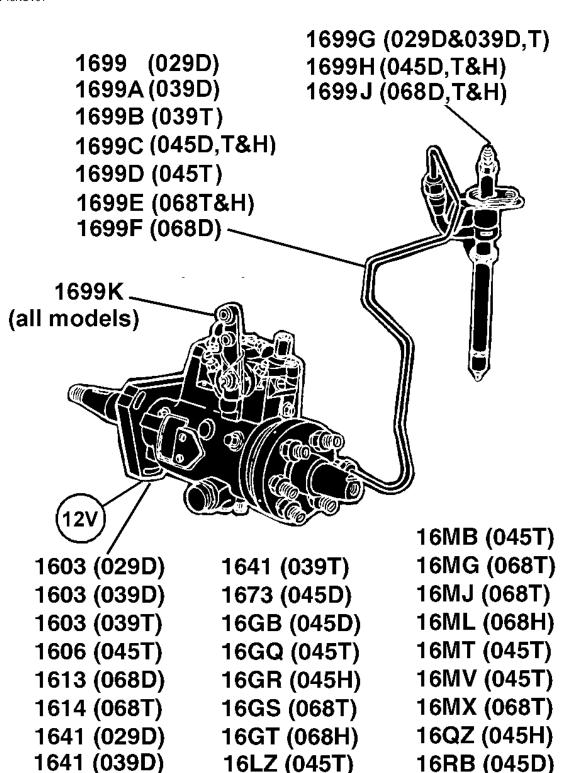
16LV -

16LX -

16LZ -

16MB -

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INDEX DE SECTION
GRUPPENINDEX
INDICE DELLA SEZIONE
INDICE DE SECCION
GRUPPSFORTECKNING
CDP45064 -UN-13NOV01



1644 -1645 -

<u> 1648 -</u> 1673 -

1674 -

1678 -

1680 -1683 -

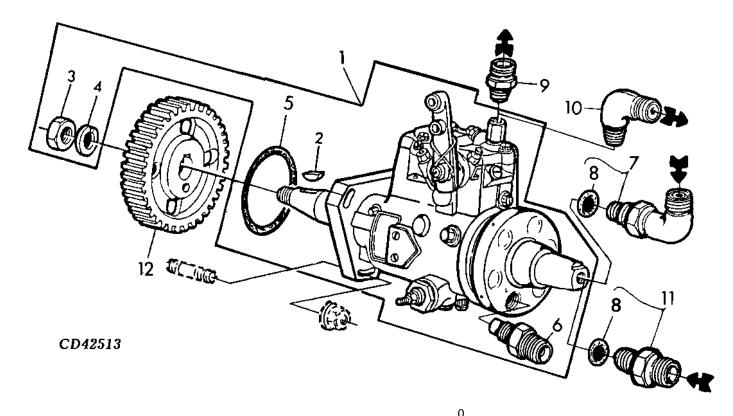
1699 -

CDP45064

1699K - 1F10 1699L - 1F11

SECTIONAL INDEX INDEX DE SECTION GRUPPENINDEX INDICE DELLA SEZIONE INDICE DE SECCION GRUPPSFORTECKNING CDP45065 -UN-13NOV01 16EN -1D5 16GB -1D6 1699G (029D&039D,T) 16GQ -1D7 16GR -1D8 1699 (029D) 1699H (045D,T&H) 16GS -1D9 1699A (039D) 1699J (068D,T&H) 1D1 16LW -1D12 1699B (039T) 1D13 1D14 1699C (045D,T&H) 16LZ -16MA -1D16 1699D (045T) 16MB -16MC -1699E (068T&H) 16MG -1D19 16MH -1D20 1699F (068D) ~ 16MJ -1D2 16MK -1D22 16ML -1D23 16MM -1699K 16MT -1D25 16MU -(all models) 16MV -16MW -1E3 1E5 1E6 1E7 16RB -1E8 16RC -1E9 1E10 1603 -1606 -1613 -1614 -1620 -1635 -1641 -16MC (045T) 1644 -1645 -1620 (039D) 16MH (068T) 1680 (068T) 1648 -1673 -1620 (039T) 1683 (045T) 16MK (068T) 1674 -1678 -16EN (045D) 16MM (068H) 1635 (039T) 1680 -1683 -16LV (045T) 1644 (029D) 16MU (045T) 1699 -1699A -1F1 16LW (045H) 16MW (045T) 1645 (039D) 1699B -1F2 1699C -16LX (068T) 16MY (068T) 1648 (029D) 1F4 1699D -1699E -16LY (068H) 16RA (045H) 1674 (045D) 1699F -1F6 16MA (045T) 1699G -1F7 16RC (045D) 1678 (068D) 1699H -1F8 1F9 CDP45065 1699K -1F10 1F11 1699L -

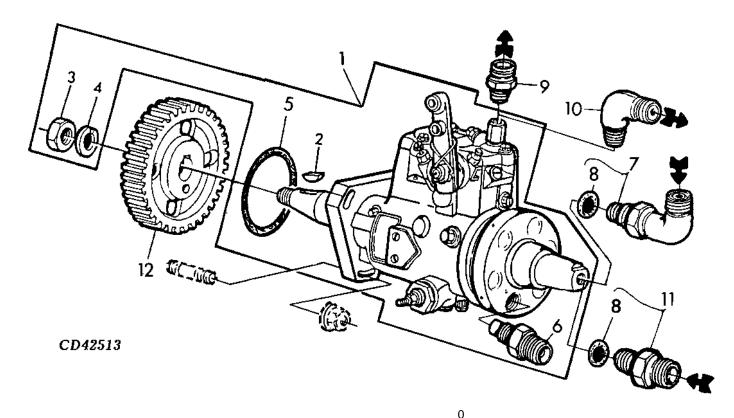
16EN 16EN **16EN** 16EN 16EN 16EN



KEY	PART NO.	PART NAME	QTY	ENGINE 5 SERIAL NO. C	REMARKS
1	RE502019	FUEL INJECTION PUMP	1	Х	((STANADYNE DB2, 60KW-2500MIN-1, 24V), W/ DF150
2	R56131	SHAFT KEY	1	X	(
3	R91360	NUT	1	Х	
4	R132874	WASHER	1	Х	(
5	R89944	PACKING	1	Х	C ID 50MM
6		FITTING	4	Х	NSEP
7		ELBOW FITTING	NA	Х	(
8	51M7040	O-RING	1	Х	(9.300 X 2.200 MM
9		FITTING	NA	Х	
10	R67364	ELBOW FITTING	1	Х	(1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1	Х	(M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1	Х	Z = 60

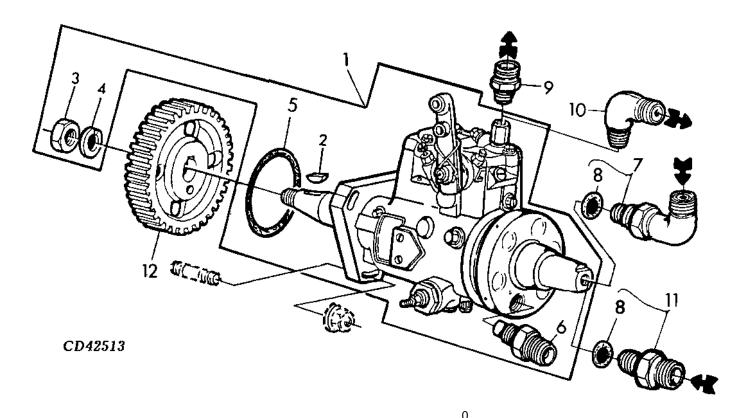
16GB 16GB 16GB 16GB

16GB



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 D	REMARKS
1	RE502711	FUEL INJECTION PUMP	1		Х	(STANADYNE DB2, 60KW-2500MIN-1, 12V), W/ DF150
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R89944	PACKING	1		Χ	ID 50MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

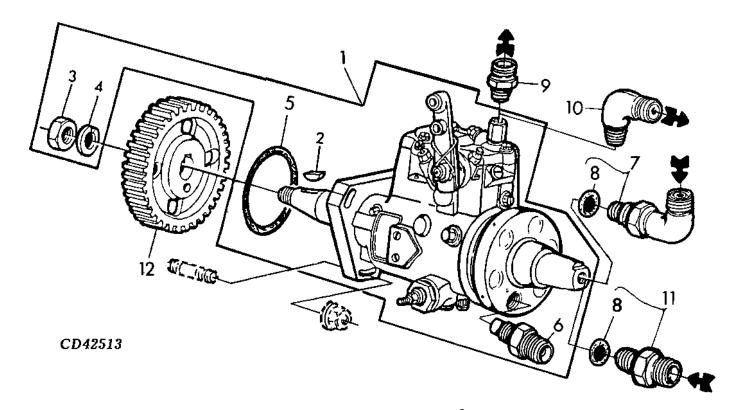
16GQ 16GQ 16GQ 16GQ 16GQ **16GQ**



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS
1	RE506544	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 83KW-1500MIN-1, 12V)
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Χ	Z = 60

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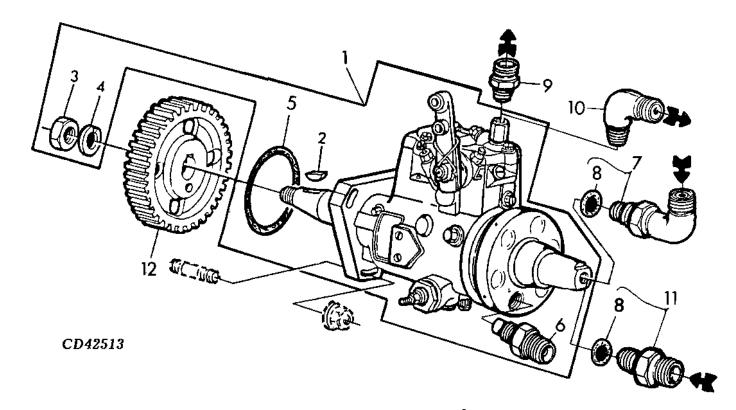
16GR 16GR 16GR 16GR 16GR



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 H	REMARKS
1	RE506965	FUEL INJECTION PUMP	1		X	(STANADYNE DB4, 100KW-1500MIN-1, 12V)
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

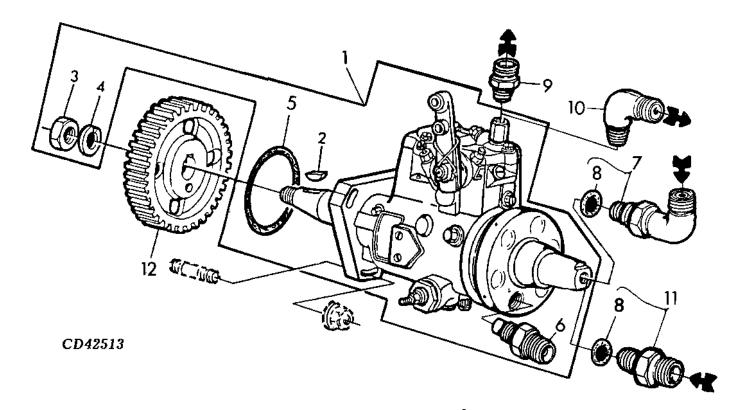
16GS 16GS **16GS** 16GS 16GS **16GS**

-UN-19MAR98 CD42513



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 T	REMARKS
1	RE503049	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 120KW-1500MIN-1, 12V)
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	6		Χ	NSEP
7		ELBOW FITTING	NA		Х	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7= 60

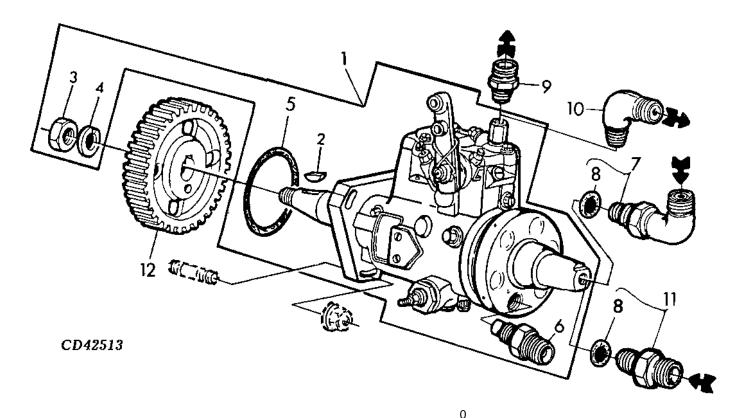
16GT 16GT 16GT 16GT 16GT 16GT



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 H	REMARKS
1	RE503051	FUEL INJECTION PUMP	1		X	(STANADYNE DB4, 153KW-1500MIN-1, 12V)
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	53MM
6		FITTING	6		Χ	NSEP
7		ELBOW FITTING	NA		Х	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

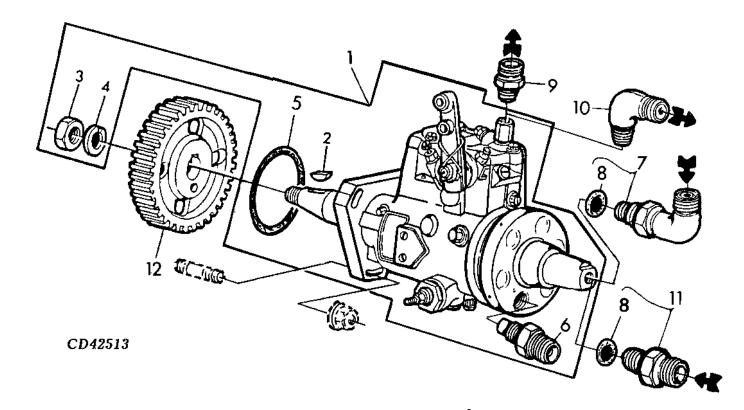
16LV 16LV 16LV 16LV

> 16LV 16LV



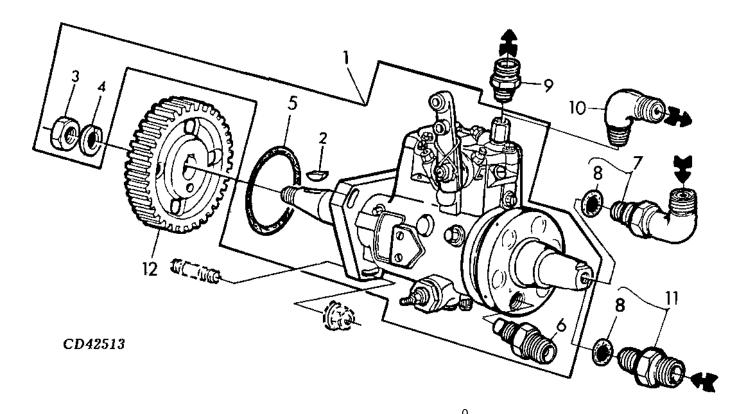
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS
1	RE506545	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 83KW-1500MIN-1, 24V), W/ TF258
_2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Χ	Z = 60

16LW 16LW 16LW 16LW 16LW 16LW



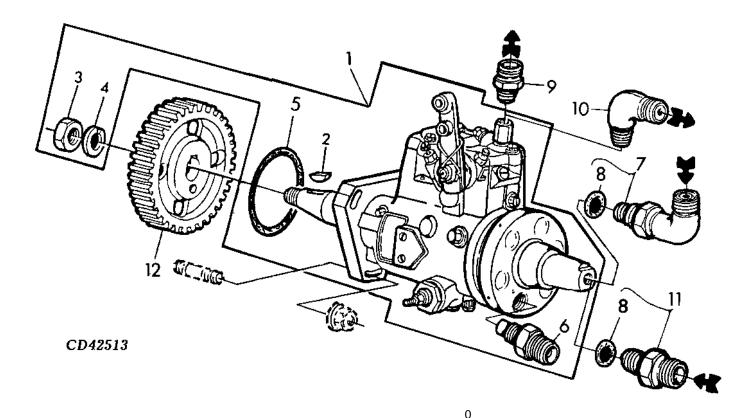
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 H	REMARKS
1	RE506966	FUEL INJECTION PUMP	1		X	(STANADYNE DB4, 100KW-1500MIN-1, 24V)
2	R56131	SHAFT KEY	1		Χ	(2
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Х	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

16LX 16LX 16LX 16LX 16LX 16LX



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	RE503834	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 120KW-1500MIN-1, 24V), W/ TF258
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

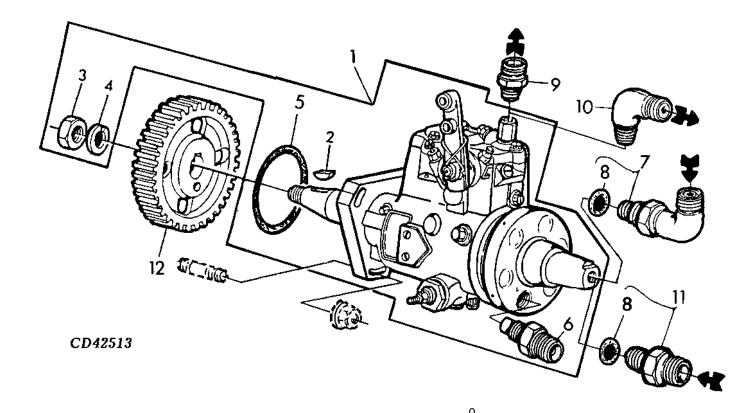
16LY 16LY 16LY 16LY 16LY 16LY



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 H	REMARKS
1	RE503836	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 153KW-1500MIN-1, 24V), W/ HF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		X	
5	R502076	PACKING	1		X	ID 53MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		X	
8	51M7040	O-RING	1		X	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		X	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

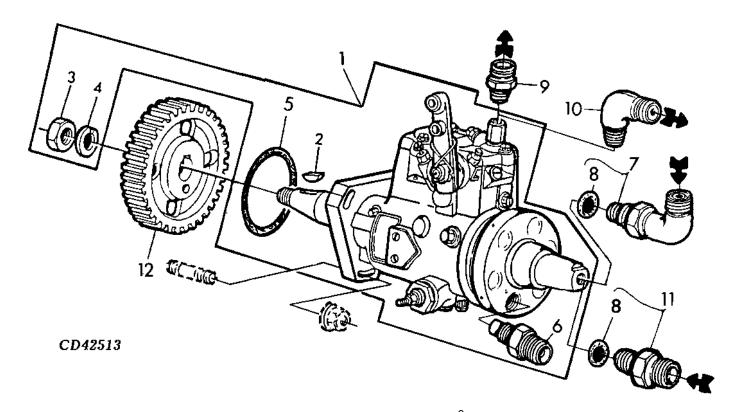
16LZ 16LZ 16LZ 16LZ 16LZ

16LZ



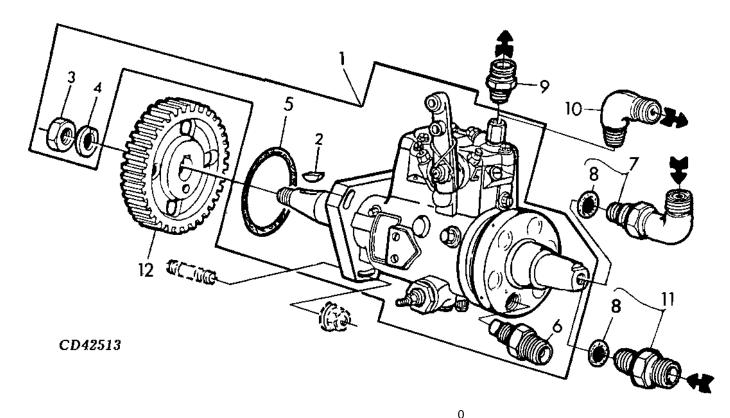
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS
1	RE503735	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 82KW-1800MIN-1, 12V), W/ TF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Х	Z = 60

16MA 16MA 16MA 16MA 16MA



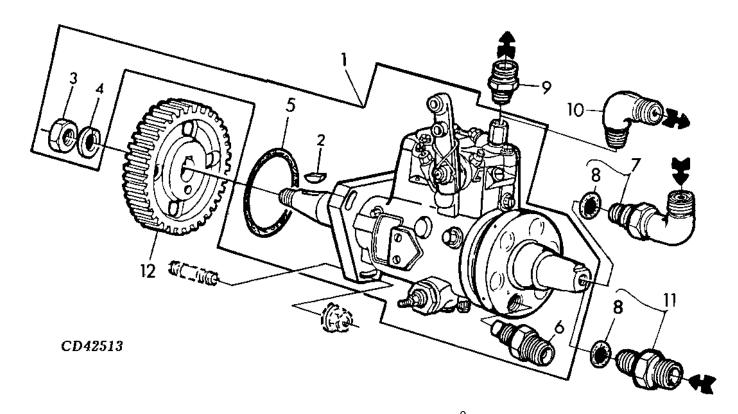
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS
KL I	FART NO.	FAIL NAIVIL	QII	SERIAL NO.	•	KEWAKKO
1	RE504931	FUEL INJECTION PUMP	1		Χ	(STANADYNE DB4, 82KW-1800MIN-1, 24V), W/ TF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
_5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Χ	Z = 60

16MB 16MB 16MB 16MB 16MB 16MB



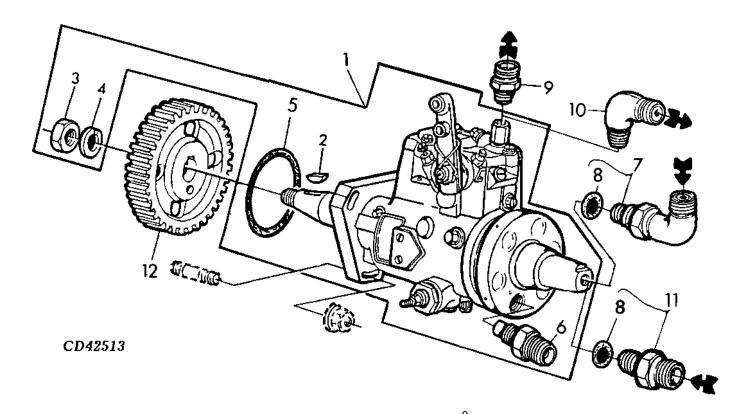
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS
1	RE503737	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 91KW-1800MIN-1, 12V), W/ TF258
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

16MC 16MC 16MC 16MC 16MC **16MC**



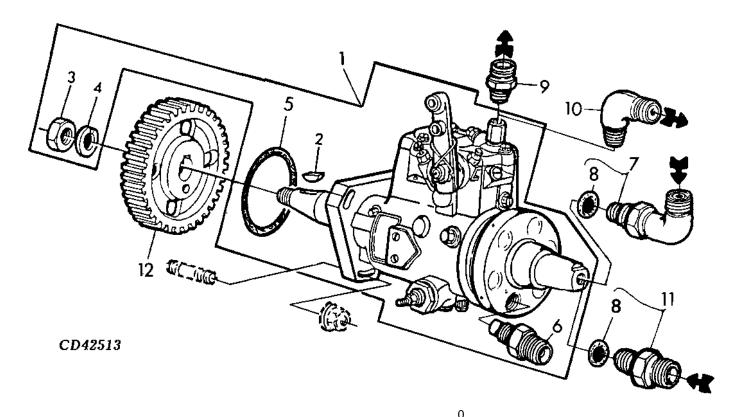
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS
1	RE504932	FUEL INJECTION PUMP	1		X	(STANADYNE DB4, 91KW-1800MIN-1, 24V), W/ TF258
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Х	Z = 60

16MG 16MG 16MG 16MG 16MG **16MG**



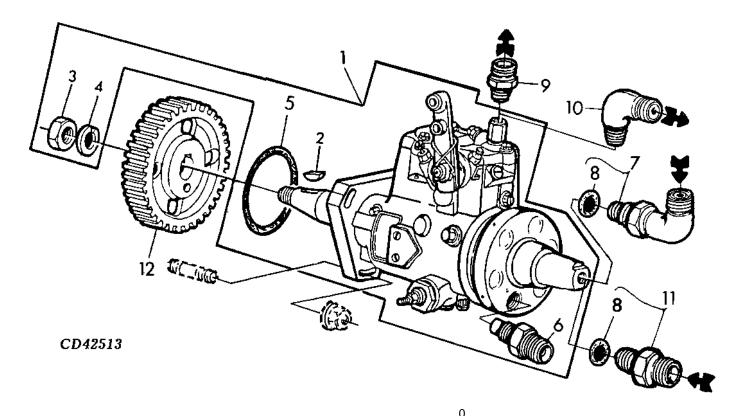
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 T	REMARKS
1	RE503742	FUEL INJECTION PUMP	1	Ż	X	(STANADYNE DB4, 120KW-1800MIN-1, 12V), W/ TF158
2	R56131	SHAFT KEY	1)	Χ	
3	R91360	NUT	1)	X	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4)	X	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA)	X	
10	R67364	ELBOW FITTING	1		X	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		X	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

16MH 16MH 16MH 16MH 16MH 16MH



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	RE504967	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 123KW-1800MIN-1, 24V), W/ TF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

16MJ 16MJ 16MJ 16MJ 16MJ 16MJ

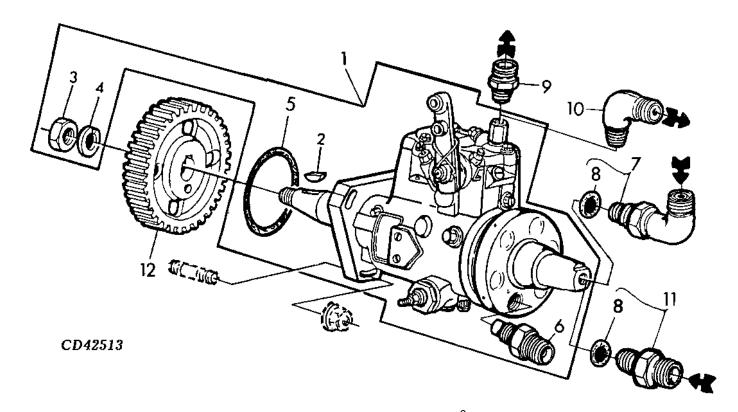


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	RE503744	FUEL INJECTION PUMP	1		X	(STANADYNE DB4, 142KW-1800MIN-1, 12V), W/ TF258
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		X	
5	R502076	PACKING	1		X	ID 53MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		X	
8	51M7040	O-RING	1		X	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60



16MK 16MK 16MK 16MK 16MK **16MK**

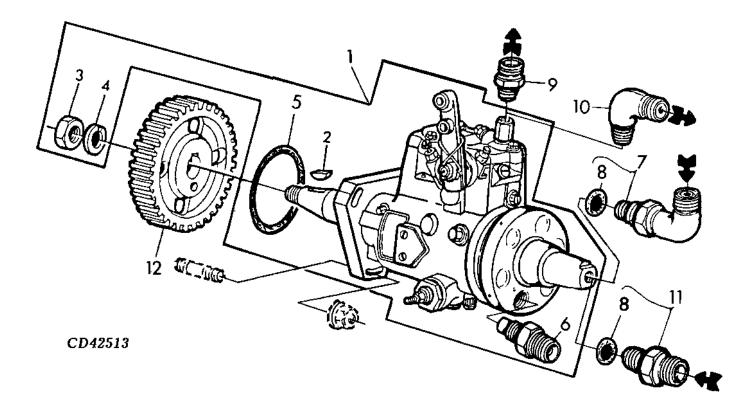
-UN-19MAR98 CD42513



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 T	REMARKS
1	RE504968	FUEL INJECTION PUMP	1		Χ	(STANADYNE DB4, 142KW-1800MIN-1, 24V), W/ TF258
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
_5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Χ	Z = 60

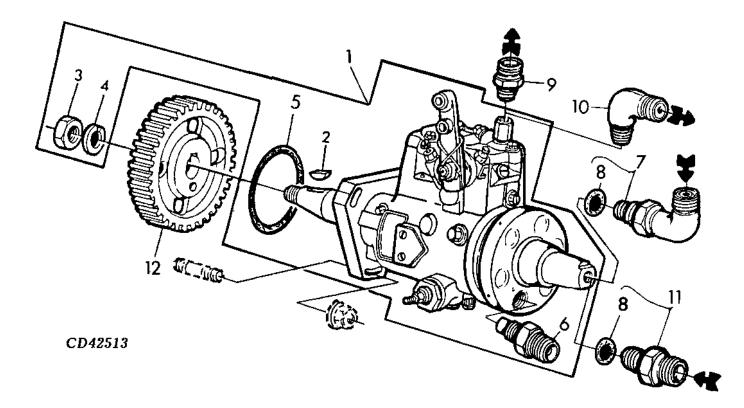
16ML 16ML 16ML 16ML 16ML 16ML

-UN-19MAR98 CD42513



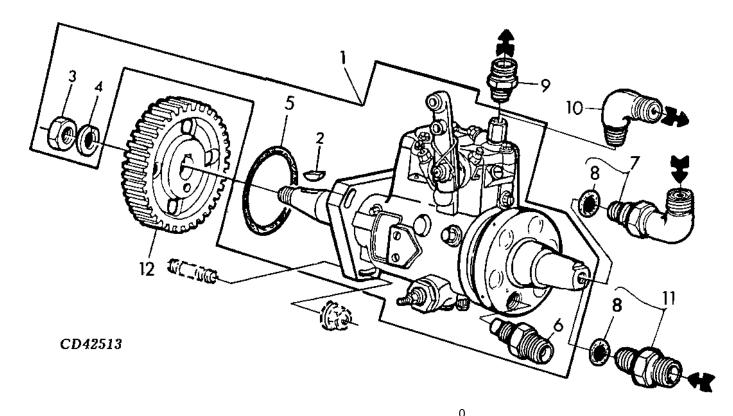
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 H	REMARKS
1	RE503746	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 187KW-1800MIN-1, 12V)
2	R56131	SHAFT KEY	1		Χ	,
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Х	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Х	Z = 60

16MM 16MM 16MM 16MM 16MM 16MM



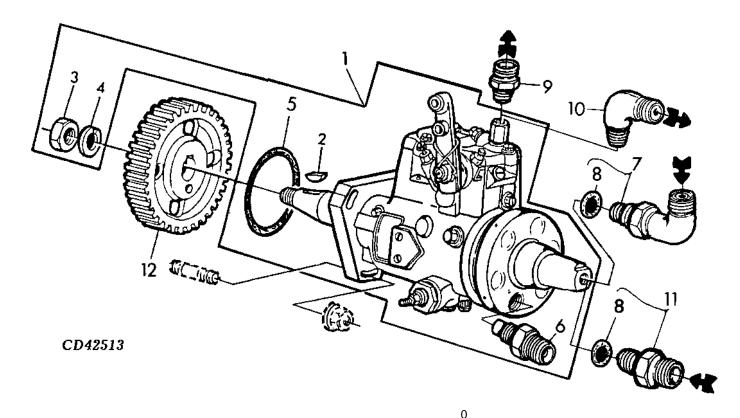
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 H	REMARKS
1	RE505049	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 187KW-1800MIN-1, 24V)
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Х	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

16MT 16MT 16MT 16MT 16MT 16MT



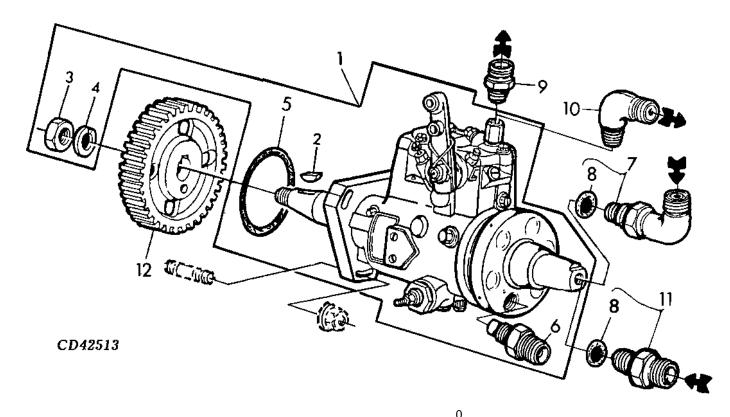
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS
1	RE506989	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 70KW-1500MIN-1, 12V), W/ TF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

16MU 16MU 16MU 16MU 16MU 16MU



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS
1	RE506990	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 70KW-1500MIN-1, 24V), W/ TF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Х	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		X	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

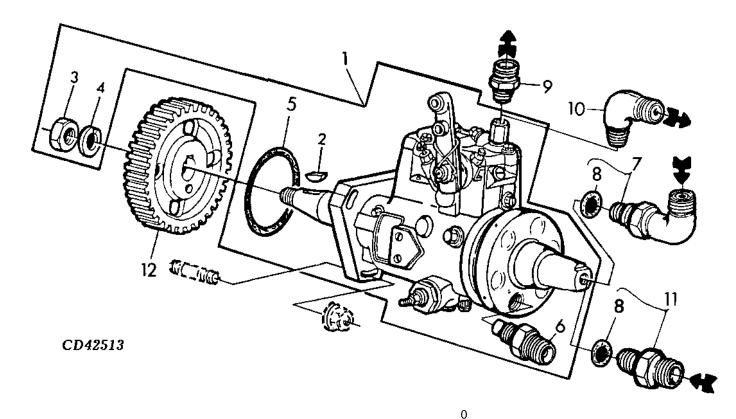
16MV 16MV 16MV 16MV 16MV 16MV



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS
1	RE503736	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 100KW-1800MIN-1, 12V), W/ TF258
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

16MW 16MW 16MW 16MW

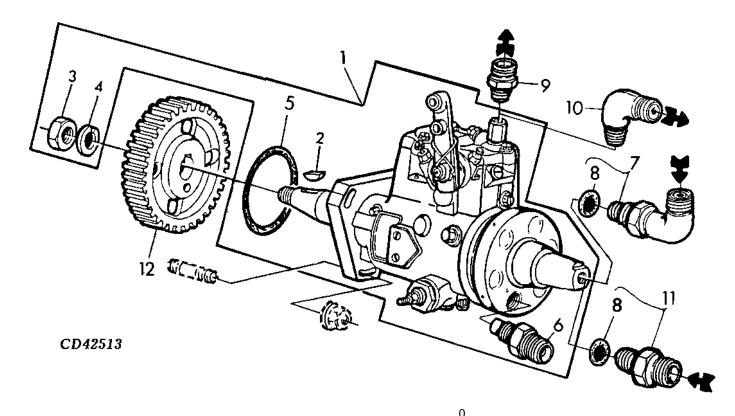
16MW 16MW



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS
1	RE505051	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 100KW-1800MIN-1, 24V), W/ TF258
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
_5	R502076	PACKING	1		Χ	
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

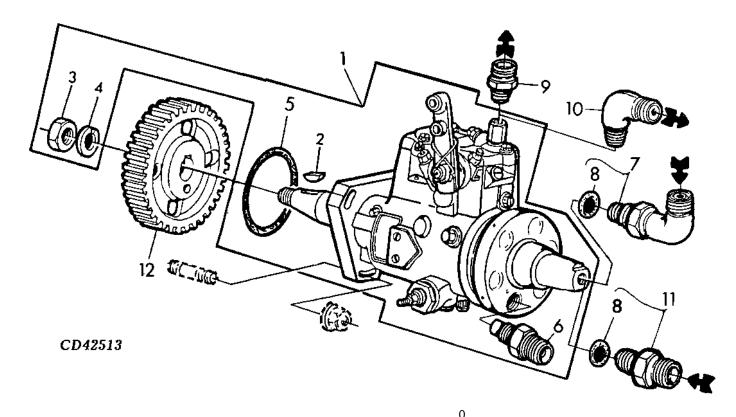


16MX 16MX 16MX 16MX 16MX 16MX



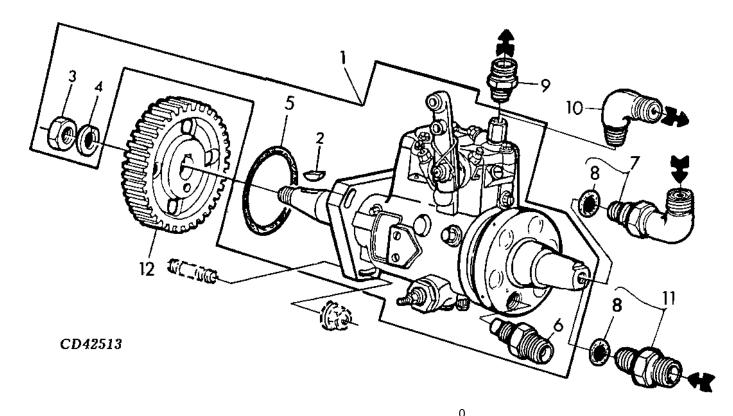
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	RE503740	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 105KW-1500MIN-1, 12V), W/ TF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

16MY 16MY 16MY 16MY 16MY



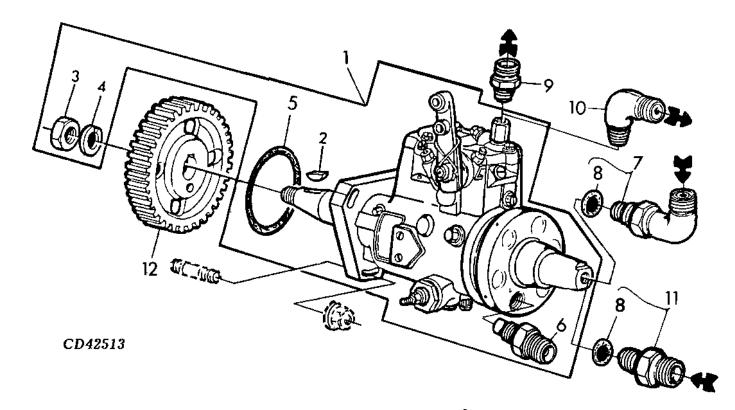
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	RE505052	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 105KW-1500MIN-1, 24V), W/ TF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

16QZ 16QZ 16QZ 16QZ 16QZ 16QZ



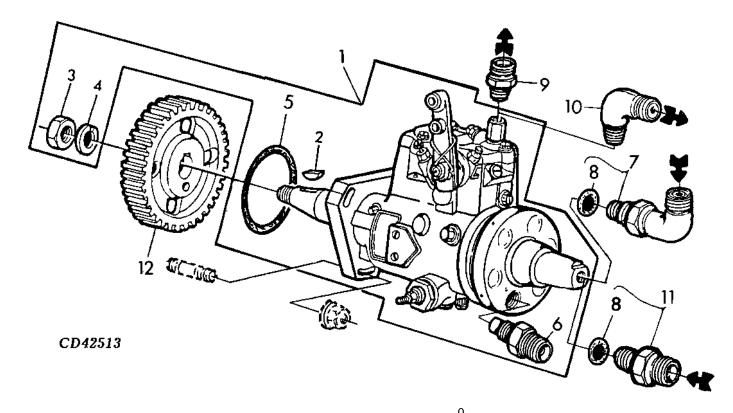
KEY	PART NO.	PART NAME	QTY	ENGINE 5 SERIAL NO. H	REMARKS
1	RE506965	FUEL INJECTION PUMP	1	X	(STANADYNE DB4, 111KW-1800MIN-1, 12V)
2	R56131	SHAFT KEY	1	X	
3	R91360	NUT	1	X	
4	R132874	WASHER	1	Х	
5	R502076	PACKING	1	X	ID 53MM
6		FITTING	4	X	NSEP
7		ELBOW FITTING	NA	Х	
8	51M7040	O-RING	1	X	9.300 X 2.200 MM
9		FITTING	NA	X	
10	R67364	ELBOW FITTING	1	Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1	X	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1	X	Z = 60

16RA 16RA 16RA 16RA 16RA 16RA



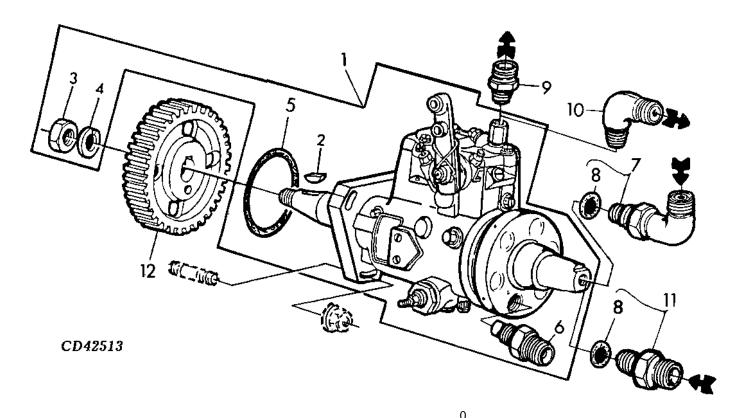
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 H	REMARKS
1	RE506966	FUEL INJECTION PUMP	1		X	(STANADYNE DB4, 111KW-1800MIN-1, 24V)
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

16RB 16RB 16RB 16RB 16RB 16RB



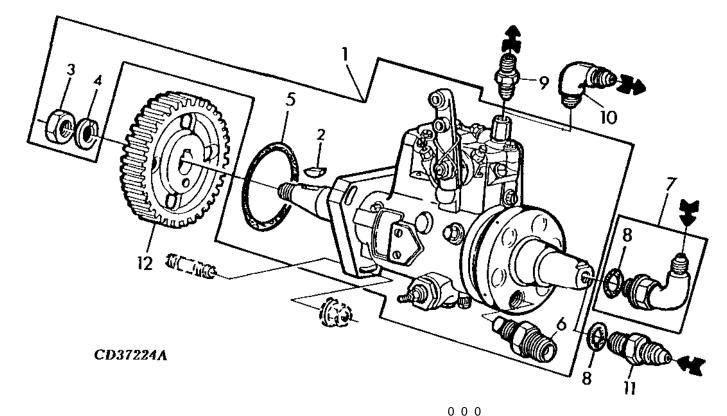
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS
1	RE503729	FUEL INJECTION PUMP	1		X	(STANADYNE DB4, 44KW-1500MIN-1, 12V), W/ DF158
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		Χ	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		Х	Z = 60

16RC 16RC 16RC 16RC 16RC 16RC



KEY	PART NO.	PART NAME	QTY :	ENGINE 5 SERIAL NO. D	D REMARKS
1	RE504693	FUEL INJECTION PUMP	1	Х	(STANADYNE DB4, 44KW-1500MIN-1, 24V), W/ DF158
2	R56131	SHAFT KEY	1	X	,
3	R91360	NUT	1	X	
4	R132874	WASHER	1	X	• •
5	R502076	PACKING	1	X	ID 53MM
6		FITTING	4	Х	NSEP
7		ELBOW FITTING	NA	X	• •
8	51M7040	O-RING	1	X	9.300 X 2.200 MM
9		FITTING	NA	X	
10	R67364	ELBOW FITTING	1	X	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1	X	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1	Х	Z = 60

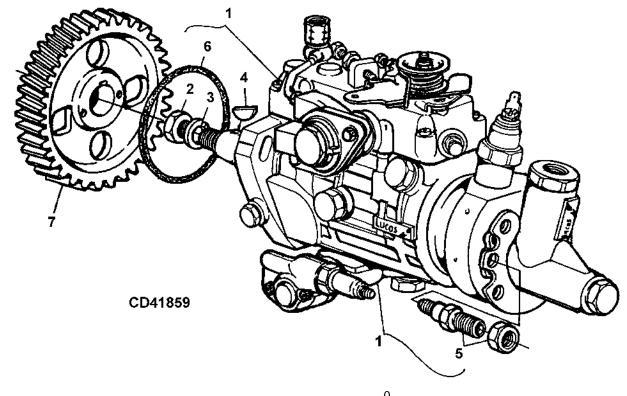
CD37224A -UN-17OCT94



				ENGINE	2 3 3 9 9 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DDT	REMARKS
1	RE53786	FUEL INJECTION PUMP	1		X	(STANADYNE DB2335-5100, 35KW-1800 MIN-1, 12V)
	RE47134	FUEL INJECTION PUMP	1		Χ	(STANADYNE DB2435-4942, 35KW-1800
	RE48154	FUEL INJECTION PUMP	1		Х	MIN-1, 12V) (STANADYNE DB4427-4838, 76KW-1800 MIN-1, 12V)
2	R56131	SHAFT KEY	1		XXX	, ,
3	R91360	NUT	1		X X X	
4	R132874	WASHER	1		X X X	
5	R89944	O-RING	1		XX	ID 50MM
	R502076	O-RING	1		X	ID 53MM
6		FITTING	NA		X X X	NSEP
7		ELBOW FITTING	NA		X	
	AT32333	ELBOW FITTING	1		ХХ	1/2"-20UNF X 1/2"-20UNF
8	R26286	O-RING	1		X X X	10.516 X 1.829 MM
9	R35352	FITTING	1		X	7/16"-20UNF X 1/8"-27NPT
		FITTING	NA		XX	
10		ELBOW FITTING	NA		X	
	T28850	ELBOW FITTING	1		XX	7/16"-20UNF X 1/8"-27NPT
11	RE59487	FITTING	1		X	1/2"-20UNF X 9/16"-24UNEF, INCL KEY 8
		FITTING	NA		ХХ	
12	R76964	HELICAL GEAR	1		XX	Z = 48
	R104907	HELICAL GEAR	1		X	Z = 48

1606

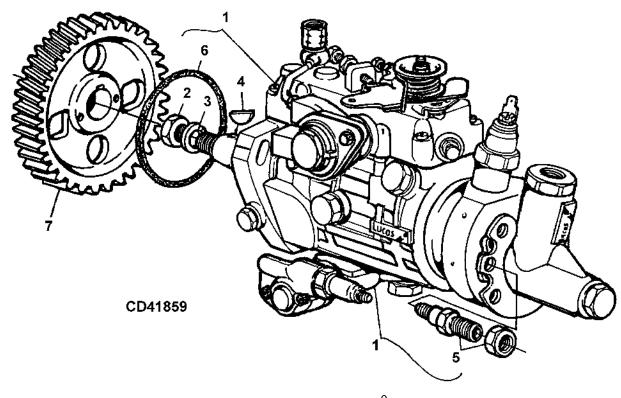
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KEY	PART NO.	PART NAME	QTY S	ENGINE 5 ERIAL NO. T	REMARKS
1	RE505927	FUEL INJECTION PUMP	1	Х	(DELPHI, LUCAS, DP203-93KW-2400 MIN-1, 12V) W/ TF250
2	R91360	NUT	1	X	
3	R132874	WASHER	1	X	
4	26H10	SHAFT KEY	1	X	
5		FITTING	4	X	NSEP
6	R128799	O-RING	1	X	
7	R132267	HELICAL GEAR	1	X	Z = 60

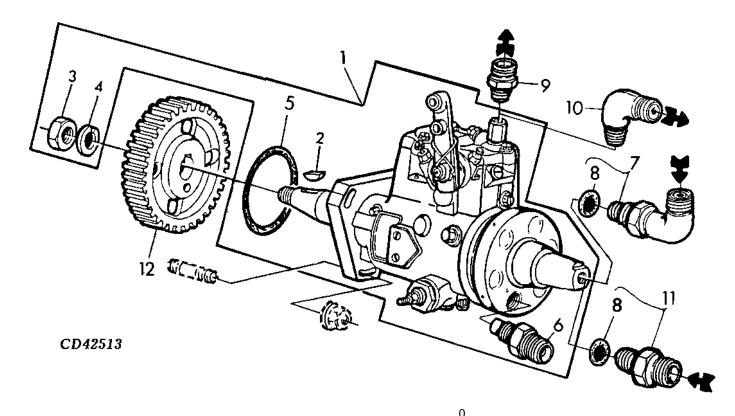
1613

CD41859 -UN-11AUG00



K	EY PART NO.	PART NAME		NGINE 8	REMARKS
7	1 RE505929	FUEL INJECTION PUMP	1	Х	(DELPHI, LUCAS, DP201-93KW-2500 MIN-1, 12V) W/ DF150
2	2 R91360	NUT	1	X	
-3	3 R132874	WASHER	1	Х	
4	4 26H10	SHAFT KEY	1	X	
- 5	5	FITTING	4	X	NSEP
-6	6 R128799	O-RING	1	X	
7	7 R132267	HELICAL GEAR	1	X	Z = 60

1614

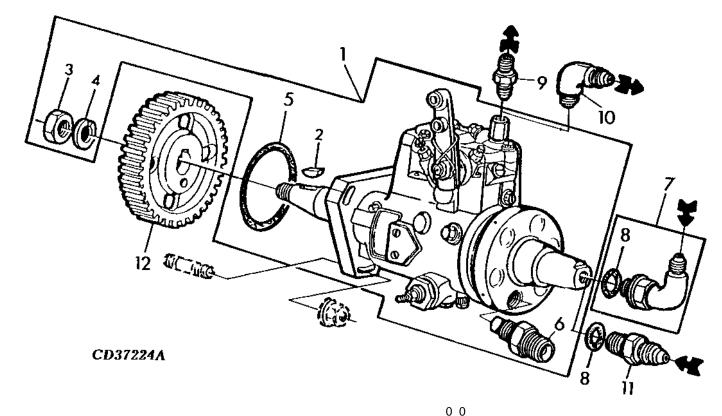


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	RE69789	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 127KW-2500MIN-1, 12V), W/ DF150
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R89944	PACKING	1		Χ	ID 50,4MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

FUEL INJECTION PUMP

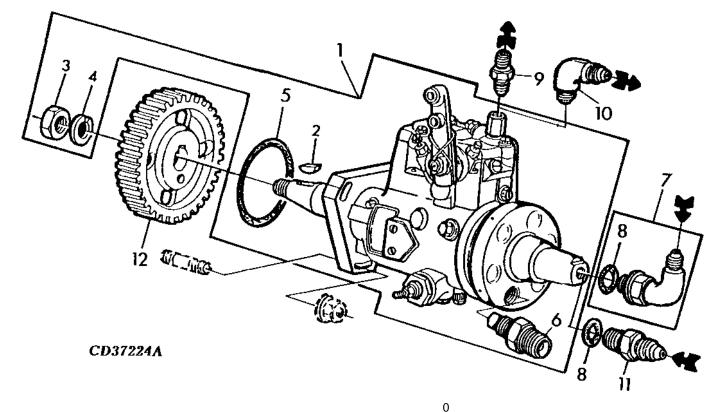
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KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 3 9 9 D T	REMARKS
			٠	02.112.1101		
1	RE47176	FUEL INJECTION PUMP	1		Х	(STANADYNE DB2435-5000, 49KW-1800 MIN-1, 24V)
	RE48155	FUEL INJECTION PUMP	1		X	(STANADYNE DB4427-4905, 76KW-1800 MIN-1,
						24V)
2	R56131	SHAFT KEY	1		ХХ	
3	R91360	NUT	1		ХХ	
4	R132874	WASHER	1		ХХ	
5	R89944	O-RING	1		Χ	ID 50MM
	R502076	O-RING	1		Χ	ID 53MM
6		FITTING	4		ΧХ	NSEP
7	AT32333	ELBOW FITTING	1		ХХ	1/2"-20UNF X 1/2"-20UNF
8	R26286	O-RING	1		ХХ	10.516 X 1.829 MM
9	R35352	FITTING	1		ХХ	7/16"-20UNF X 1/8"-27NPT
10		ELBOW FITTING	NA		ХХ	
11		FITTING	NA		ХХ	
12	R76964	HELICAL GEAR	1		X	Z = 48
	R104907	HELICAL GEAR	1		Χ	Z = 48

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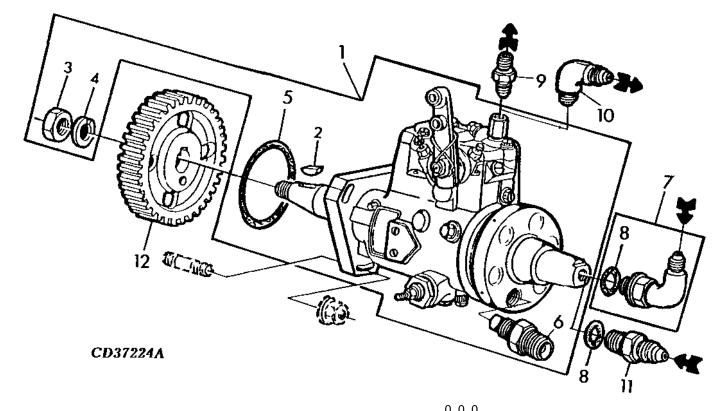
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 9 T	REMARKS
1	RE50808	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4427-5060, 63KW-1500 MIN-1, 24V), W/ TF008
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R502076	O-RING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7	AT32333	ELBOW FITTING	1		Χ	1/2"-20UNF X 1/2"-20UNF
8	R26286	O-RING	1		Χ	10.516 X 1.829 MM
9	R35352	FITTING	1		Χ	7/16"-20UNF X 1/8"-27NPT
10		ELBOW FITTING	NA		Χ	
11		FITTING	NA		Χ	
12	R104907	HELICAL GEAR	1		X	Z = 48

Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

FUEL INJECTION PUMP

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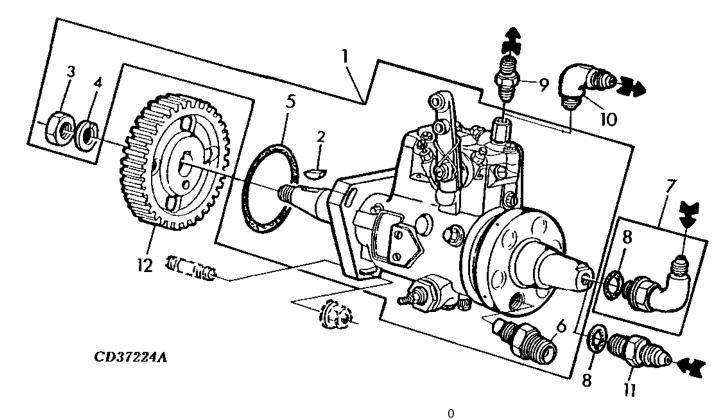
CD37224A -UN-17OCT94



					2 3 3	
				ENGINE	999	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DDT	REMARKS
1	RE64241	FUEL INJECTION PUMP	1		Х	(STANADYNE DB2335-5202, 31KW-1500
						MIN-1, 12V)
	RE64243	FUEL INJECTION PUMP	1		X	(STANADYNÉ DB2435-5199, 40KW-1500
						MIN-1, 12V)
	RE50809	FUEL INJECTION PUMP	1		X	(STANADYNE DB4427-5041, 63KW-1500
						MIN-1, 12V)
2	R56131	SHAFT KEY	1		X X X	
3	R91360	NUT	1		X X X	
_4	R132874	WASHER	1		X X X	
5	R89944	O-RING	1		ХХ	ID 50MM
	R502076	O-RING	1		X	ID 53MM
6		FITTING	AR		X	NSEP
7		ELBOW FITTING	NA		X	
	AT32333	ELBOW FITTING	1			1/2"-20UNF X 1/2"-20UNF
8	R26286	O-RING	1			10.516 X 1.829 MM
9	R35352	FITTING	1		X	7/16"-20UNF X 1/8"-27NPT
		FITTING	NA		XX	
10		ELBOW FITTING	NA		X	
	AT32333	ELBOW FITTING	1		XX	7/16"-20UNF X 1/8"-27NPT
11	RE59487	FITTING	1		X	1/2"-20UNF X 9/16"24UNEF, INCL KEY 8
		FITTING	NA		XX	
12	R76964	HELICAL GEAR	1		XX	Z = 48
	R104907	HELICAL GEAR	1		X	Z = 48

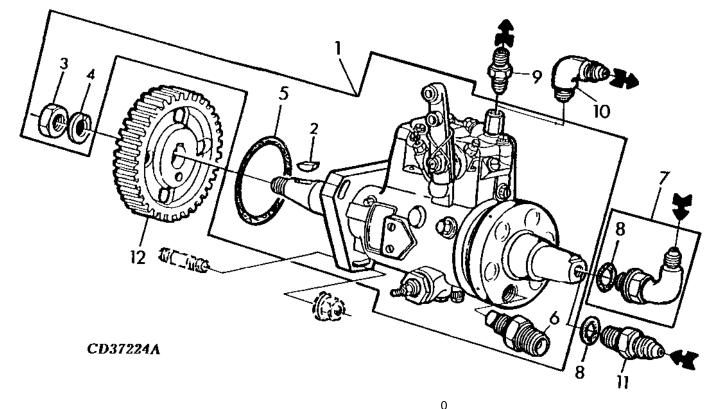
1644

CD37224A -UN-17OCT94



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS
1	RE41939	FUEL INJECTION PUMP	1		Х	(STANADYNE DB2335-4873, 34KW-1800 MIN-1, 24V)
2	R56131	SHAFT KEY	1		Χ	·
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R89944	O-RING	1		Χ	ID 50MM
6		FITTING	3		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	R26286	O-RING	1		Χ	10.516 X 1.829 MM
9	R35352	FITTING	1		Χ	7/16"-20UNF X 1/8"-27NPT
10		ELBOW FITTING	NA		Χ	
11	RE59487	FITTING	1		Χ	1/2"-20UNF X 9/16"24UNEF, INCL KEY 8
12	R76964	HELICAL GEAR	1		X	Z = 48

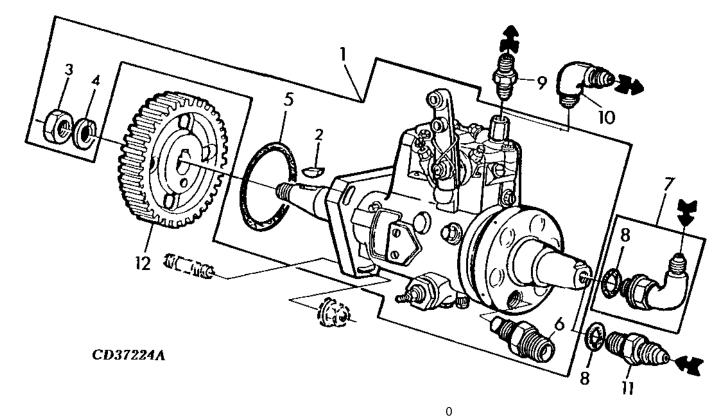
CD37224A -UN-17OCT94



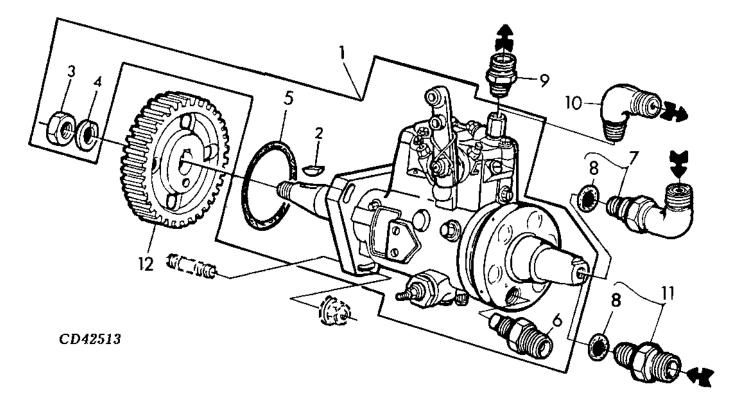
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 9 D	REMARKS
1	RE64244	FUEL INJECTION PUMP	1		Х	(STANADYNE DB2435-5200, 40KW-1500 MIN-1, 24V) W/ DF008
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Х	
4	R132874	WASHER	1		X	
5	R89944	O-RING	1		X	ID 50MM
6		FITTING	4		Х	NSEP
7	AT32333	ELBOW FITTING	1		X	1/2"-20UNF X 1/2"-20UNF
8	R26286	O-RING	1		X	
9	R35352	FITTING	1		X	
10		ELBOW FITTING	NA		X	7/16"-20UNF X 1/8"-27NPT
11		FITTING	NA		Χ	
12	R76964	HELICAL GEAR	1		X	7 = 48

1	1648
1	1648
1	1648
1	1648
1	1648
1	1648

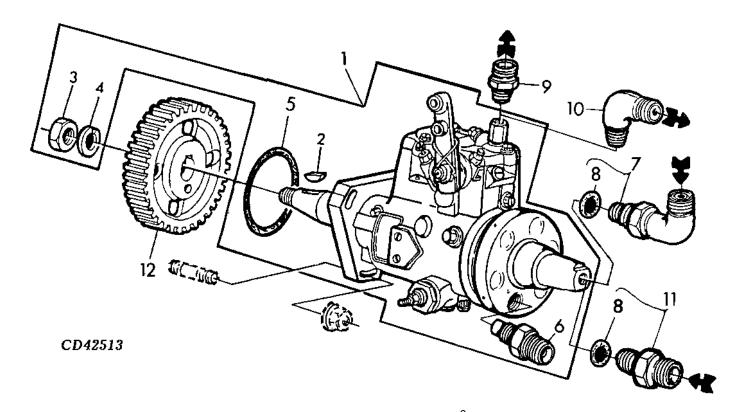
CD37224A -UN-17OCT94



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS
1	RE64242	FUEL INJECTION PUMP	1		Х	(STANADYNE DB2335-5201, 30KW-1500 MIN-1, 24V)
_2	R56131	SHAFT KEY	1		Χ	<u> </u>
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R89944	O-RING	1		Χ	ID 50MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	1/2"-20UNF X 1/2"-20UNF
8	R26286	O-RING	1		Χ	
9	R35352	FITTING	1		Χ	
10		ELBOW FITTING	NA		Χ	7/16"-20UNF X 1/8"-27NPT
11	RE59487	FITTING	1		Χ	
12	R76964	HELICAL GEAR	1		X	Z = 48



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS
1	RE506130	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 53KW-1800MIN-1, 12V),
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Х	
5	R502076	PACKING	1		Χ	ID 53MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Х	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Χ	
10	R67364	ELBOW FITTING	1		Х	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	Z = 60

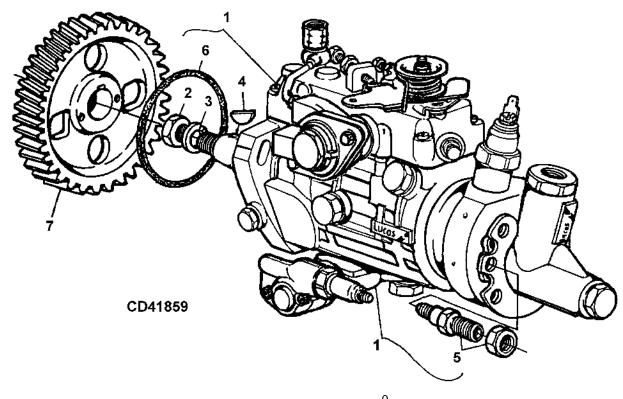


				0 4 ENGINE 5	
KEY	PART NO.	PART NAME	QTY	SERIAL NO. D	REMARKS
1	RE506131	FUEL INJECTION PUMP	1	Х	(STANADYNE DB4, 53KW-1800MIN-1, 24V), W/ DF158
2	R56131	SHAFT KEY	1	X	
3	R91360	NUT	1	X	
4	R132874	WASHER	1	X	
5	R502076	PACKING	1	X	ID 53MM
6		FITTING	4	X	NSEP
7		ELBOW FITTING	NA	X	
8	51M7040	O-RING	1	X	9.300 X 2.200 MM
9		FITTING	NA	X	
10	R67364	ELBOW FITTING	1	X	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1	X	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1	X	Z = 60

FUEL INJECTION PUMP

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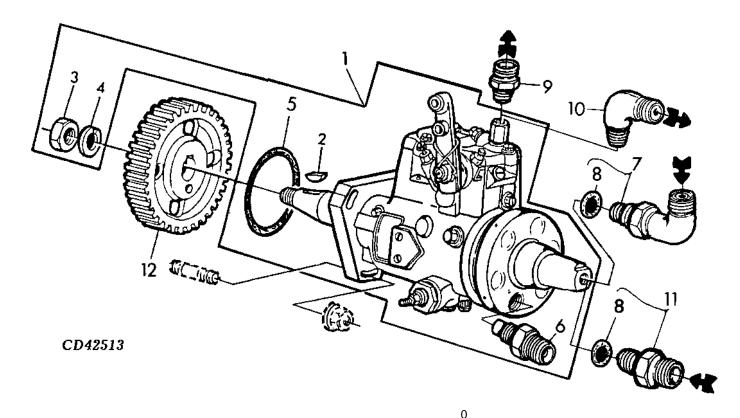


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 D	REMARKS
1	RE505960	FUEL INJECTION PUMP	1		Х	(DELPHI, LUCAS, DP201-93KW-2500 MIN-1, 12V) W/ DF150
2	R91360	NUT	1		Χ	
3	R132874	WASHER	1		Χ	
4	26H10	SHAFT KEY	1		Χ	
5		FITTING	4		Χ	NSEP
6	R128799	O-RING	1		Х	
7	R132267	HELICAL GEAR	1		Χ	Z = 60

FUEL INJECTION PUMP

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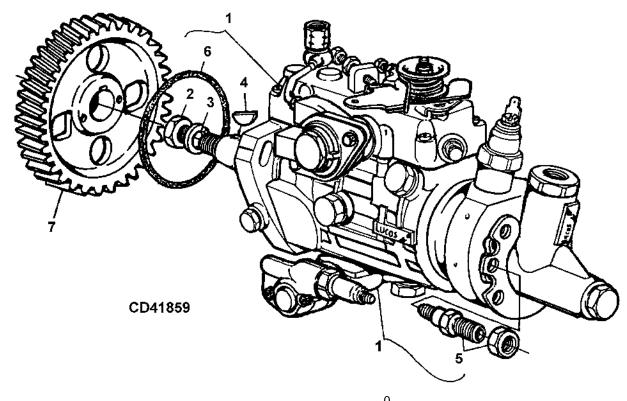
CD42513 -UN-19MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	RE69790	FUEL INJECTION PUMP	1		Х	(STANADYNE DB4, 127KW-2500MIN-1, 24V), W/ DF150
2	R56131	SHAFT KEY	1		Χ	
3	R91360	NUT	1		Χ	
4	R132874	WASHER	1		Χ	
5	R89944	PACKING	1		Χ	ID 50,4MM
6		FITTING	4		Χ	NSEP
7		ELBOW FITTING	NA		Χ	
8	51M7040	O-RING	1		Χ	9.300 X 2.200 MM
9		FITTING	NA		Х	
10	R67364	ELBOW FITTING	1		Χ	1/8"-27NPT X 1/2"-24UNS
11	RE60029	FITTING	1		Χ	M12 X 1.5 X 9/16"-24UNEF
12	R132267	HELICAL GEAR	1		X	7 = 60

1683

CD41859 -UN-11AUG00



KEY	PART NO.	PART NAME	QTY S	ENGINE 5 SERIAL NO. T	REMARKS
1	RE505926	FUEL INJECTION PUMP	1	Х	(DELPHI, LUCAS, DP201-93KW-2400 MIN-1, 24V) W/ TF250
2	R91360	NUT	1	X	
3	R132874	WASHER	1	X	
4	26H10	SHAFT KEY	1	X	
5.		FITTING	4	X	NSEP
6	R128799	O-RING	1	X	
7	R132267	HELICAL GEAR	1	X	Z = 60

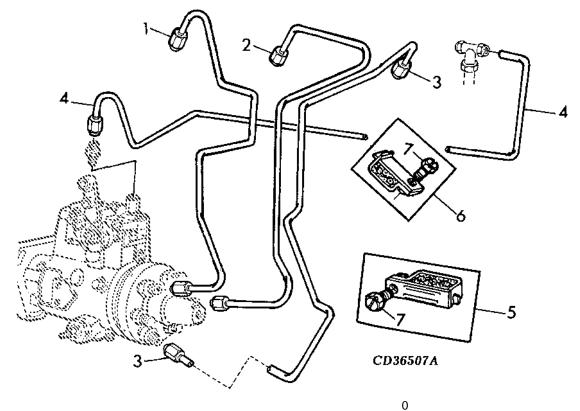
Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

FUEL INJECTION PUMP

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CD36507A -UN-28OCT97

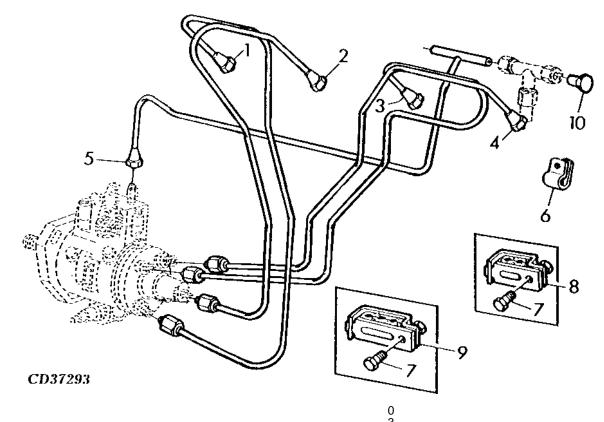




KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS	
1	RE20898	FUEL LINE	1		Х	NO.1	
2	RE20899	FUEL LINE	1		Χ	NO.2	
3	RE20900	FUEL LINE	1		Χ	NO.3	
4	AR89839	FUEL LINE	1		Х		
5	RE20901	CLAMP	1		X		
6	RE19797	CLAMP	1		Χ		
7	19M7923	CAP SCREW	1		Х	M6 X 12	

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CD37293 -UN-17FEB95

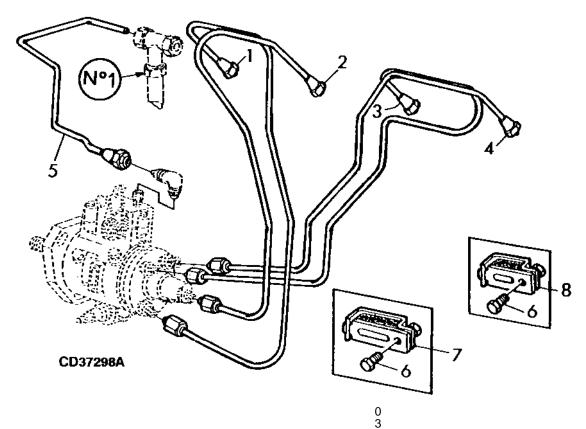


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	9 D	REMARKS	
1	RE43284	FUEL LINE	1		Х	NO.1	
2	RE43285	FUEL LINE	1		Χ	NO.2	
3	RE43286	FUEL LINE	1		Χ	NO.3	
4	RE43287	FUEL LINE	1		Х	NO.4	
5	AR89852	FUEL LINE	1		Χ	REAR	
6	T29969	CLAMP	AR		Χ		
7	19M7923	CAP SCREW	2		Х	M6 X 12, (10.9)	
8	RE19797	CLAMP	2		Χ		
9	RE19799	CLAMP	1		Χ		
10	16H658	RIVET	AR		X	1/4" X 5/8"	

1699B 1699B 1699B 1699B 1699B

1699B

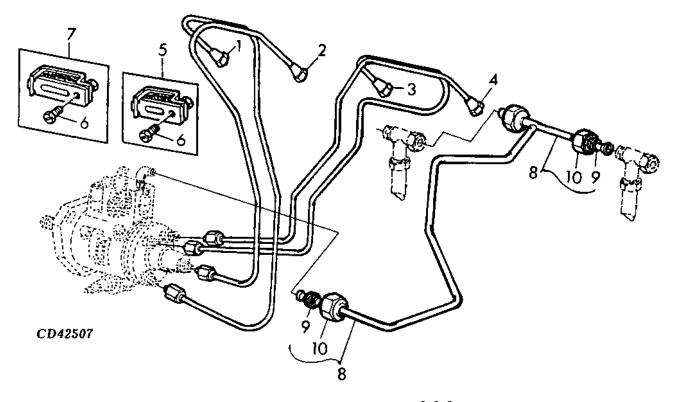
-UN-28NOV95 CD37298A



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	9 T	REMARKS
1	RE43284	FUEL LINE	1		Х	NO. 1
2	RE43285	FUEL LINE	1		Χ	NO. 2
3	RE43286	FUEL LINE	1		Χ	NO. 3
4	RE43287	FUEL LINE	1		Х	NO. 4
5	RE25933	FUEL LINE	1		Χ	
6	19M7923	CAP SCREW	1		Χ	M6 X 12, (10.9)
7	RE19799	CLAMP	1		Х	
8	RE19797	CLAMP	2		Χ	

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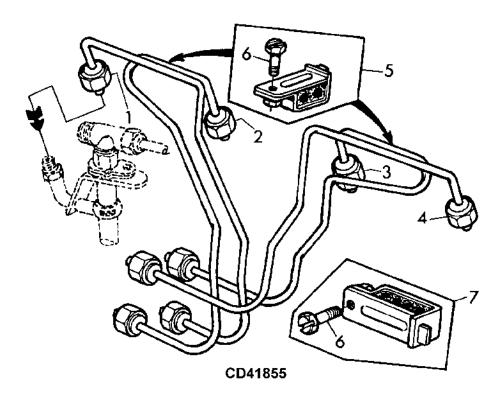
CD42507 -UN-03APR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS	
1	RE59447	FUEL LINE	1		X X X NO	D.1	
2	RE59448	FUEL LINE	1		XXX NO	D.2	
3	RE59449	FUEL LINE	1		XXX NO	D.3	
4	RE59450	FUEL LINE	1		XXX NO	D.4	
5	RE19797	CLAMP	2		X X X		
6	19M7923	CAP SCREW	1		XXX M	6 X 12, (10.9)	
7	RE19799	CLAMP	1		X X X		
8	RE70848	FUEL LINE	1		X X X		
9	R51936	WASHER	3		X X X		
10	R123593	TUBE NUT	3		X X X 1/2	2"-24UNS	

1699D 1699D 1699D 1699D 1699D 1699D

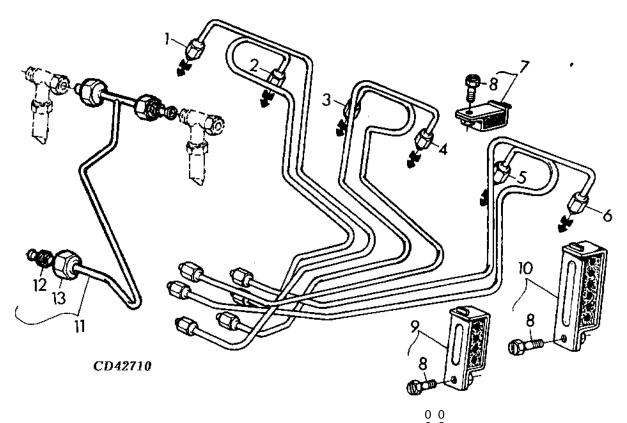
CD41855 -UN-05JUL00



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS
1	RE60042	FUEL LINE	1		Х	NO.1
2	RE60043	FUEL LINE	1		Χ	NO.2
3	RE60044	FUEL LINE	1		Χ	NO.3
4	RE60045	FUEL LINE	1		Χ	NO.4
5	RE19797	CLAMP	AR		Χ	
6	19M7923	CAP SCREW	1		Χ	M6 X 12, (10.9)
7	RE19799	CLAMP	1		Х	. ,
8	RE506072	FUEL LINE	1		Χ	
9	R51936	WASHER	2		Χ	
10	R123593	TUBE NUT	2		Х	1/2"-24UNS

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CD42710 -UN-24FEB99

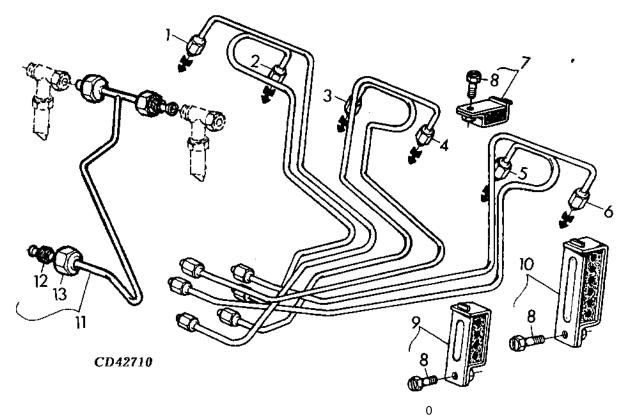


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 8 8 T H	REMARKS	
IXL	TAKT NO.	TAIL NAME	QII	SERIAL NO.		KLWAKKO	
1	RE60055	FUEL LINE	1		X X NC) 1	—
2	RE60056	FUEL LINE	1		X X NC		
3	RE60057	FUEL LINE	1		X X NC		
4	RE60058	FUEL LINE	1		X X NC	0.4	_
5	RE60059	FUEL LINE	1		X X NC	0.5	
6	RE60060	FUEL LINE	1		X X NC	0.6	
7	RE19797	CLAMP	5		ХХ		_
8	19M7923	CAP SCREW	1		X X M6	5 X 12, (10.9)	
9	RE19799	CLAMP	1		XX		
10	RE19800	CLAMP	1		XX		_
11	RE70848	FUEL LINE	1		XX		
12	R51936	WASHER	2		XX		
13	R123593	TUBE NUT	2		X X 1/2	"-24UNS	

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1699F

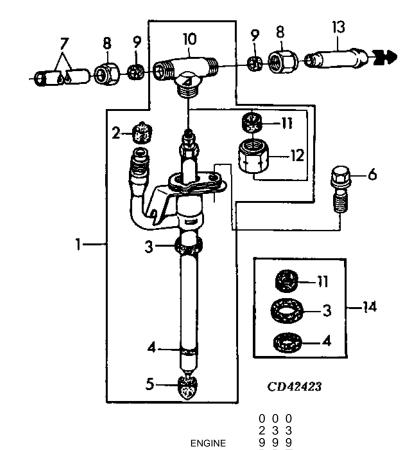
CD42710 -UN-24FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 D	REMARKS	
1	RE60049	FUEL LINE	1		Х	NO.1	
2	RE60050	FUEL LINE	1		Χ	NO.2	
3	RE60051	FUEL LINE	1		Χ	NO.3	
4	RE60052	FUEL LINE	1		Х	NO.4	
5	RE60053	FUEL LINE	1		Χ	NO.5	
6	RE60054	FUEL LINE	1		Χ	NO.6	
7	RE19797	CLAMP	5		Х		
8	19M7923	CAP SCREW	1		Χ	M6 X 12, (10.9)	
9	RE19799	CLAMP	1		Χ		
10	RE19800	CLAMP	1		Х		
11	RE506072	FUEL LINE	1		Χ		
12	R51936	WASHER	2		Χ		
13	R123593	TUBE NUT	2		Х	1/2"-24UNS	

1699G 1699G 1699G 1699G 1699G 1699G

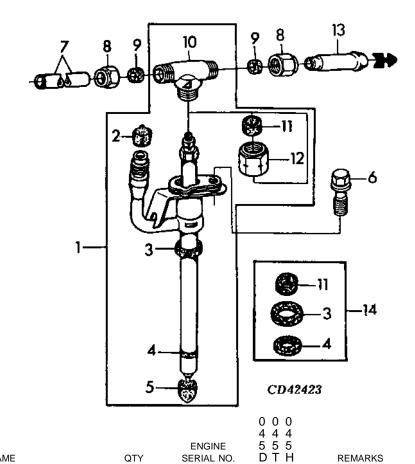
CD42423 -UN-26FEB98



ENGINE DDT KEY PART NO. PART NAME QTY SERIAL NO. **REMARKS** RE36935 INJECTION NOZZLE (MARKED 28480) XX 4 RE36939 INJECTION NOZZLE 4 (MARKED 28484) **PLUG** NA X X XХХ 3 TK 3MM, ORD RE65201 **PACKING** **PACKING** 1 Χ TK 1.9MM, ORD RE64292 X X X X X X X WASHER ORD RE65201 WASHER ORD RE64292 **PLUG** NA CAP SCREW R101201 3 R66090 TUBE 2 ХХ LGTH 108MM LGTH 108MM R66090 3 **TUBE** R123593 TUBE NUT 8 1/2"-24UNS XXX 9 R51936 WASHER 8 10 R71963 TEE FITTING 1 WASHER ХХ ORD RE65201 11 WASHER ORD RE64292 X X X X X X 12 R79604 TUBE NUT R500731 RE65201 13 HOSE FITTING REAR O-RING KIT AR RE64292 O-RING KIT AR Х

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CD42423 -UN-26FEB98



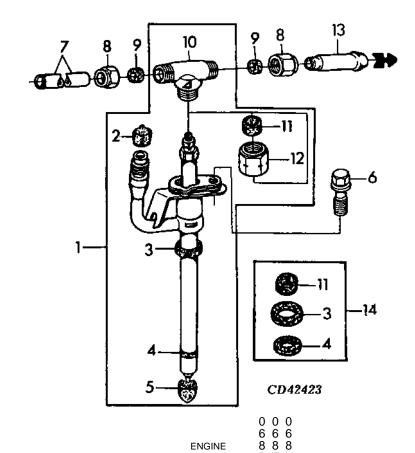
ENGINE

PART NAME KEY PART NO. QTY SERIAL NO. REMARKS RE60062 INJECTION NOZZLE (MARKED 29278) 4 RE48786 INJECTION NOZZLE 4 (MARKED 29279) **PLUG** NA 3 TK 1.9MM, ORD RE64292 **PACKING** WASHER ORD RE64292 **PLUG** NA R116366 6 7 8 9 SCREW 4 R66090 TUBE 2 LGTH 108MM R123593 TUBE NUT 6 X X X X X X X X X X X X R51936 WASHER 6 10 TEE FITTING R71963 1 WASHER ORD RE64292 R79604 12 TUBE NUT 1 R500731 13 HOSE FITTING REAR RE65201 14 O-RING KIT AR Χ RE64292 O-RING KIT ХХ AR

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1699J

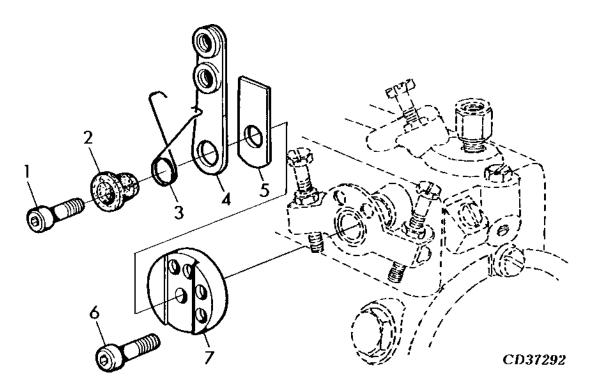
-UN-26FEB98 CD42423



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	8 8 8 D T H	REMARKS
1	RE60062	INJECTION NOZZLE	6		X	(MARKED 29279)
	RE48786	INJECTION NOZZLE	6		ΧХ	(MARKED 29279)
2		PLUG	NA		X X X	
3		PACKING	1		X X X	TK 1.9MM, ORD RE64292
4		WASHER	1		X X X	ORD RE64292
5		PLUG	NA		X X X	
6	R116366	SCREW	6		X	
7	R66090	TUBE	4		Χ	LGTH 108MM
8	R123593	TUBE NUT	10		X	
9	R51936	WASHER	10		X	
10	R71963	TEE FITTING	1		X X X	
11		WASHER	1		X X X	ORD RE64292
12	R79604	TUBE NUT	1		XXX	
13	R500731	HOSE FITTING	1		X X X	REAR
14	RE65201	O-RING KIT	AR		Χ	
	RE64292	O-RING KIT	AR		ХХ	

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CD37292 -UN-17FEB95



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	A L L	REMARKS
1	R70513	SCREW	1	Х	(A)
2	T17950	RETAINER	1	Χ	(A)
3	T17949	SPRING	1	Χ	(A)
4	T19858	LEVER	1	Х	(A)
5	T19860	STRAP	1	Χ	(A)
6	T11917	SCREW	1	Χ	(A)
7	T19861	SPACER	1	Х	(A)

- (A) SEE YOUR AUTHORIZED PUMP REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE POMPES POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON EINSPRITZPUMPE VETRETER BEZIEHEN
 (A) PER LE PARTI NON ELENCATE,RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE POMPA
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE BOMBA
- (A) RAADGOER MED EN AUTORISERAD PUMPSERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

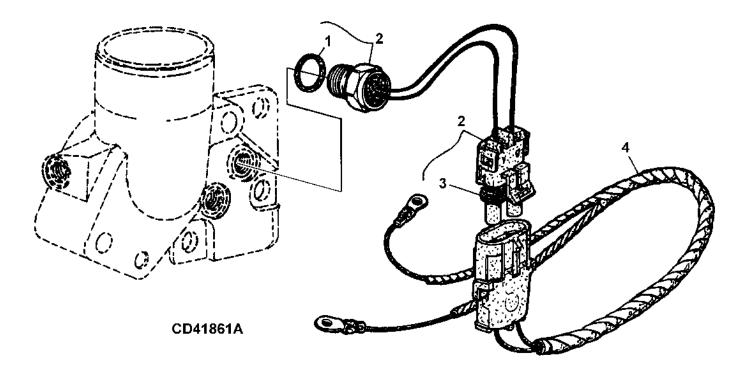
FUEL INJECTION PUMP

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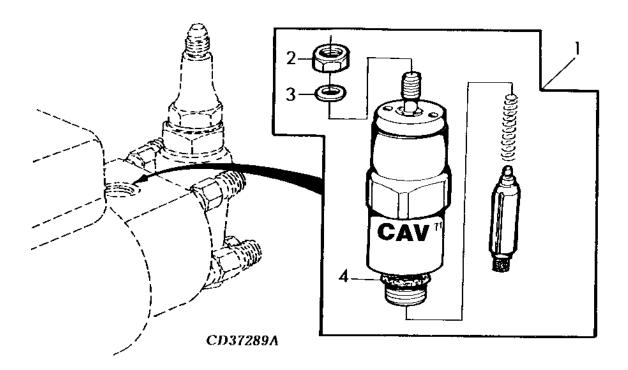


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 6 5 8 T D	REMARKS	
1	51M7041	O-RING	1		X X 11	.300 X 2.200 MM	
2	RE503243	SENSOR WIRING HARNESS	1		XX		
3	R78048	TERMINAL NIPPLE	1		XX		
4	RF66559	WIRING HARNESS	1		XX		

FUEL INJECTION PUMP

1699M 1699M 1699M 1699M 1699M 1699M

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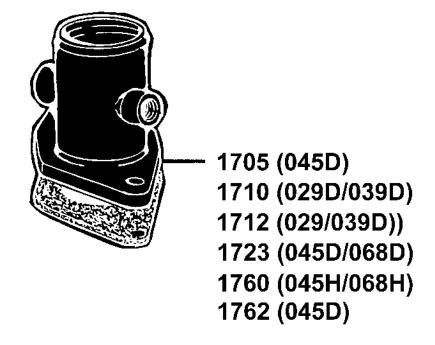


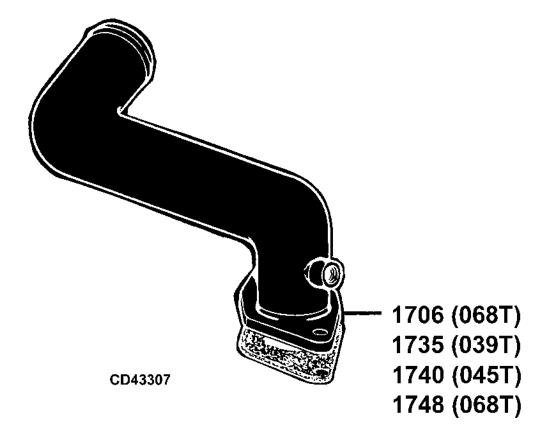
KEY	PART NO.	PART NAME		0 0 4 6 ENGINE 5 8 ERIAL NO. T D	REMARKS	
1	RE54064	SOLENOID	1	ΧX	(A) LUCAS, 12V	
	RE31855	KIT	1	ХХ	(A) LUCAS, 24V	
2	R67150	NUT	1	ХХ	(A) M5	
3	12M7060	WASHER	1	XX	(A) 5.300 MM	
4	R67147	O-RING	1	XX	(A)	

- (A) SEE YOUR AUTHORIZED PUMP REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER LE REPARATEUR AGREE DE POMPES POUR LES PIECES NON LISTEES (A) NICHT GEZEIGTE TEILE VON EINSPRITZPUMPE VERTRETER BEZIEHEN
- (A) CONSULTARE IL CONCESSIONARIO AUTORIZZATO DELLE POMPA D'INIEZIONE PER PARTI NON ELENCATI
- (A) CONSULTE CON SU PROVEDOR AUTORIZADO PARA REPARACIONES DE BOMBA EN LAS PIEZAS NO APUNTADAS
- (A) KONSULTERAS INSPRUTNINGSPOMPENS ATERFORSALJARE FOR DELAR EJ VISADE

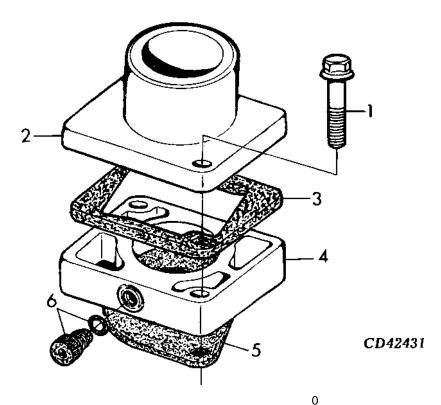
SECTIONAL INDEX INDEX DE SECTION GRUPPENINDEX INDICE DELLA SEZIONE INDICE DE SECCION GRUPPSFORTECKNING

CD43307	-UN-24OCT01
1705 -	1F15
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1710 -	1F17
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1723 -	1F19
1735 -	1F20
1740 -	1F21
1748 -	1F22
1760 -	1F23
1762 -	1F24

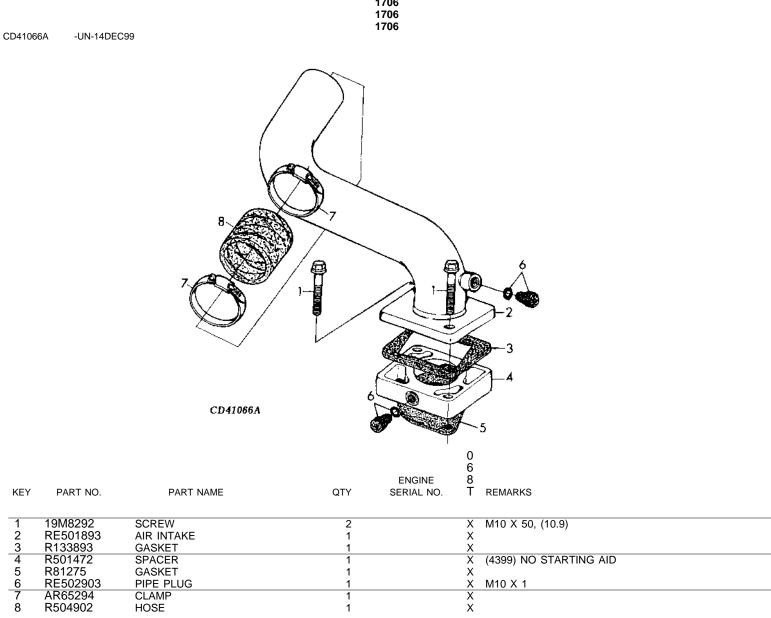




CD42431 -UN-10DEC99



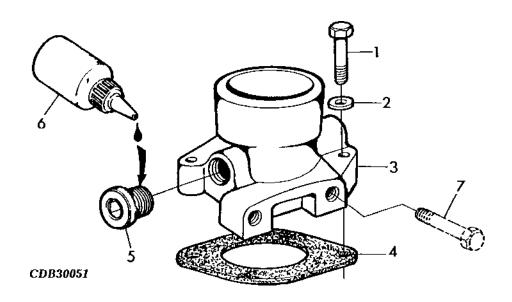
KEY	PART NO.	PART NAME	QTY S	4 ENGINE 5 SERIAL NO. D	REMARKS	
1	19M8292	SCREW	2	Х	M10 X 50, (10.9)	
2	R503512	INTAKE MANIFOLD	1	Х		
3	R133893	GASKET	1	Х		
4	R501472	SPACER	1	Х	(4399) NO STARTING AID	
5	R81275	GASKET	1	X		
6	DE502003	EITTING	1	V	M10 Y 1	



AIR DUCT

1710

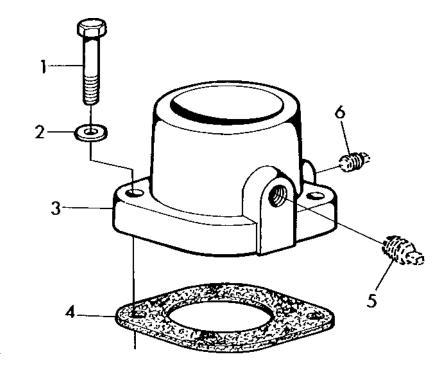
CDB30051 -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 2 3 9 9 D D	REMARKS
1	19H2552	CAP SCREW	2		ХХ	3/8" X 1-1/8", (SAE 8)
2	24M7096	WASHER	2		ХХ	10.500 X 18 X 1.600 MM
3		AIR INTAKE	1		ХХ	MARKED R128355, ORD R84992, T58477 AND
						TY9371 OR T43513, APPL
	R84992	AIR INTAKE	AR		ХХ	
4	R81275	GASKET	1		ХХ	
5	T58477	FITTING	AR		XX	7/8"-14UNF, (USE WITH R84992 AND TY9371
						OR T43513)
6	TY9371	SEALANT	AR		ХХ	LOCTITE 271, 6ML (0.2 OZ)
	T43513	SEALANT	AR		XX	LOCTITE 271, 50ML (1.7 OZ)
7		CAP SCREW	AR		XX	3/8"-16LINC

AIR DUCT

CD36569A -UN-20JUL95

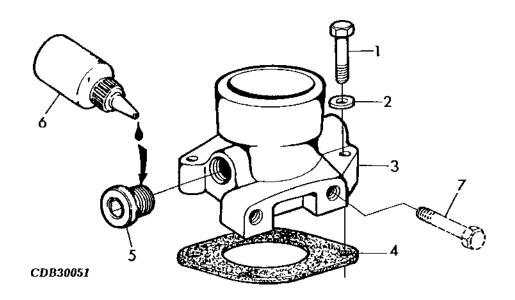


CD36569A

KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	0 0 2 3 9 9 D D REMARKS
1	19H2552	CAP SCREW	2	X X 3/8" X 1-1/8", (SAE 8)
2	24M7096	WASHER	2	X X 10.500 X 18 X 1.600 MM
3	R128602	AIR INTAKE	1	XX
4	R81275	GASKET	1	X X
5		PIPE PLUG	1	X X 3/8"-18NPT, (4398)
6		PIPE PLUG	1	X X 1/8"-27NPTF, (4398)
5	24M7096 R128602 R81275	WASHER AIR INTAKE GASKET PIPE PLUG	2 2 1 1 1 1	X X 10.500 X 18 X 1.600 MM X X X X X X 3/8"-18NPT, (4398)

1723

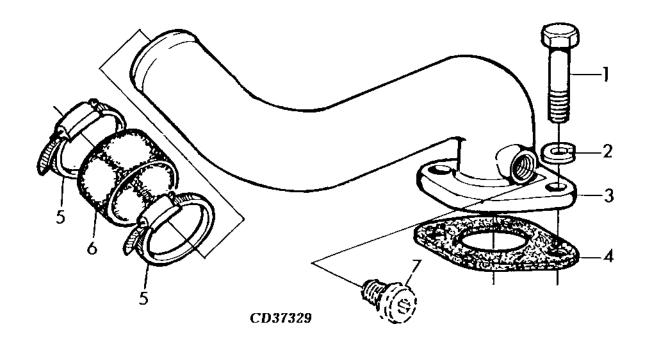
CDB30051 -UN-17AUG95



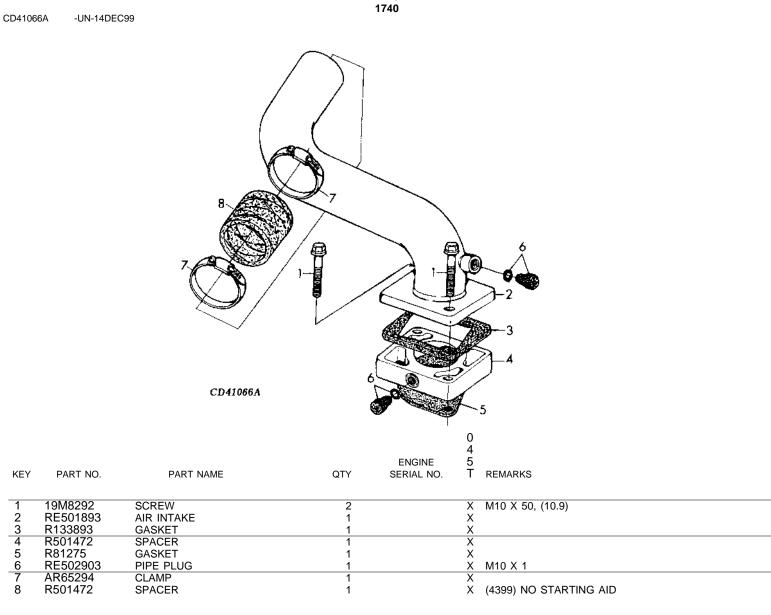
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 6 5 8 D D	REMARKS
1	19M7576	SCREW	2		ХХ	M10 X 30, (SAE 8)
2	24M7096	WASHER	2		ХХ	10.500 X 18 X 1.600 MM
3		AIR INTAKE	1		ХХ	MARKED R128355, ORD R84992, T58477 AND
						TY9371 OR T43513, APPL
	R84992	AIR INTAKE	AR		ХХ	
4	R81275	GASKET	1		ΧХ	
5	T58477	FITTING	AR		XX	7/8"-14UNF, (USE WITH R84992 AND TY9371
						OR T43513)
6	TY9371	SEALANT	AR		ХХ	LOCTITE 271, 6ML (0.2 OZ)
	T43513	SEALANT	AR		ХХ	LOCTITE 271, 50ML (1.7 OZ)
7		CAP SCREW	ΔR		ΧX	3/8"-16LINC

AIR DUCT

-UN-31AUG95 CD37329

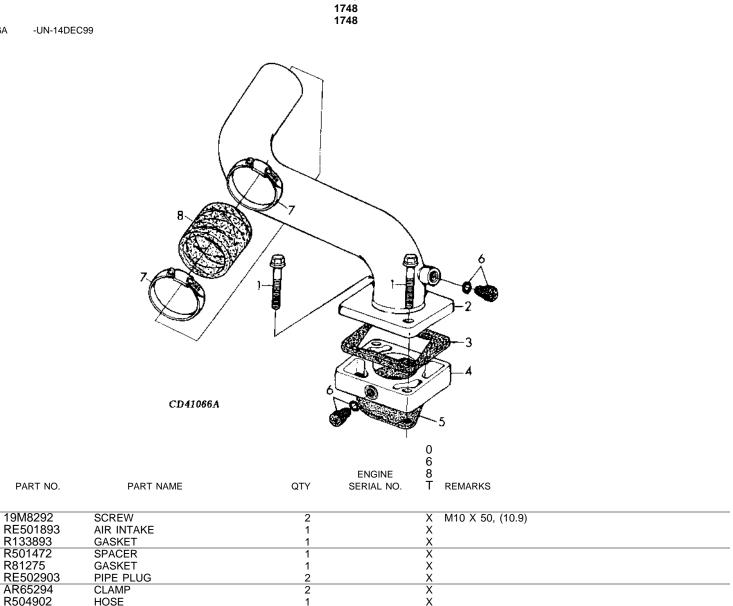


KEY	PART NO.	PART NAME	QTY S	0 3 ENGINE 9 SERIAL NO. T	REMARKS	
1	19H3483	CAP SCREW	2	Х	3/8" X 1-1/8", (SAE 8)	
2	12H304	LOCK WASHER	2	X	3/8"	
3	RE46784	AIR DUCT	1	X		
4	R81275	GASKET	1	X		
5	AR65294	CLAMP	2	X		
6	R504902	HOSE	1	X		
7		PIPE PLUG	1	X	7/8"-14UNF	



AIR DUCT

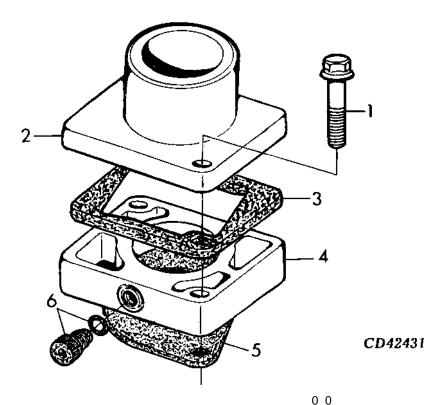
CD41066A



KEY

AIR DUCT

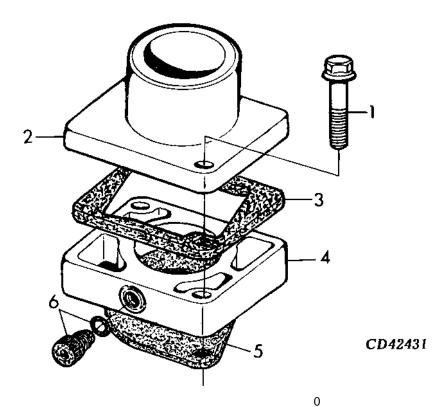
CD42431 -UN-10DEC99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 6 5 8 H H	REMARKS	
1	19M8292	SCREW	2		X X M	10 X 50, (10.9)	
2	RE505636	INTAKE MANIFOLD	1		XX	,	
3	R81275	GASKET	1		XX		
4	R501472	SPACER	1		XX		
5	R133893	GASKET	1		XX		
6	PE502003	EITTING	1		V V M	10 V 1	

AIR DUCT

CD42431 -UN-10DEC99

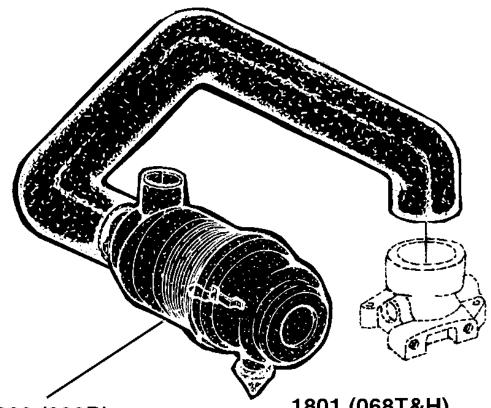


KEY	PART NO.	PART NAME		ENGINE 5 ERIAL NO. D	REMARKS
1	19M8292	SCREW	2	X	M10 X 50, (10.9)
2	R128602	INTAKE MANIFOLD	1	X	
3	R81275	GASKET	1	X	
4	R501472	SPACER	1	X	
5	R133893	GASKET	1	Χ	
6	RE502903	FITTING	1	X	M10 X 1

AIR DUCT

SECTIONAL INDEX INDEX DE SECTION GRUPPENINDEX INDICE DELLA SEZIONE INDICE DE SECCION GRUPPSFORTECKNING

CDP45066	-UN-13NOV01
1801 -	1G3
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1804 -	1G6
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1810 -	1G10
1811 -	1G11
1811 -	1G12
1812 -	1G14
1813 -	1G16
1815 -	1G18
1816 -	1G20
1817 -	1G21
1818 -	1G23
1820 -	1G25
1822 -	1H1
1832 -	1H3
1833 -	1H5

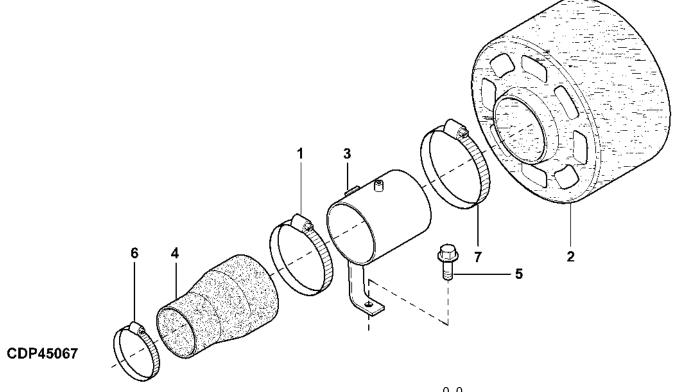


1801 (068T&H) 1802 (039D) 1805 (039T) 1804 (029D) 1811 (039T) 1810 (029D&039D&045D) 1812 (039T) 1811 (039D) 1813 (045T) 1814 (029D) 1815 (045H) 1822 (045D) 1816 (045T&H) 1833 (068D) 1817 (068T&H) 1820 (039T)

CDP45066

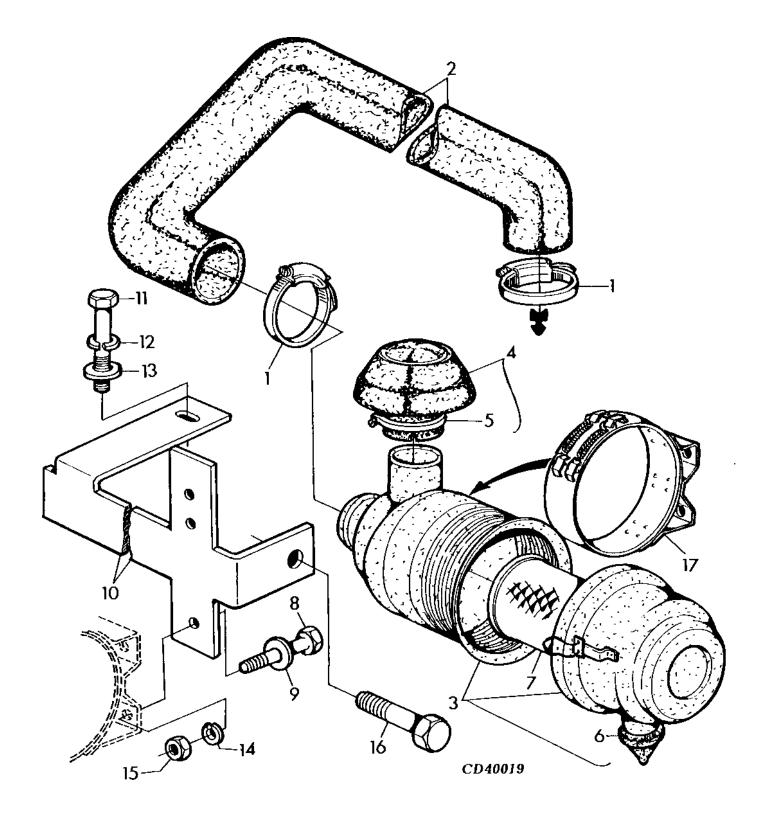
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CDP45067 -UN-13NOV01



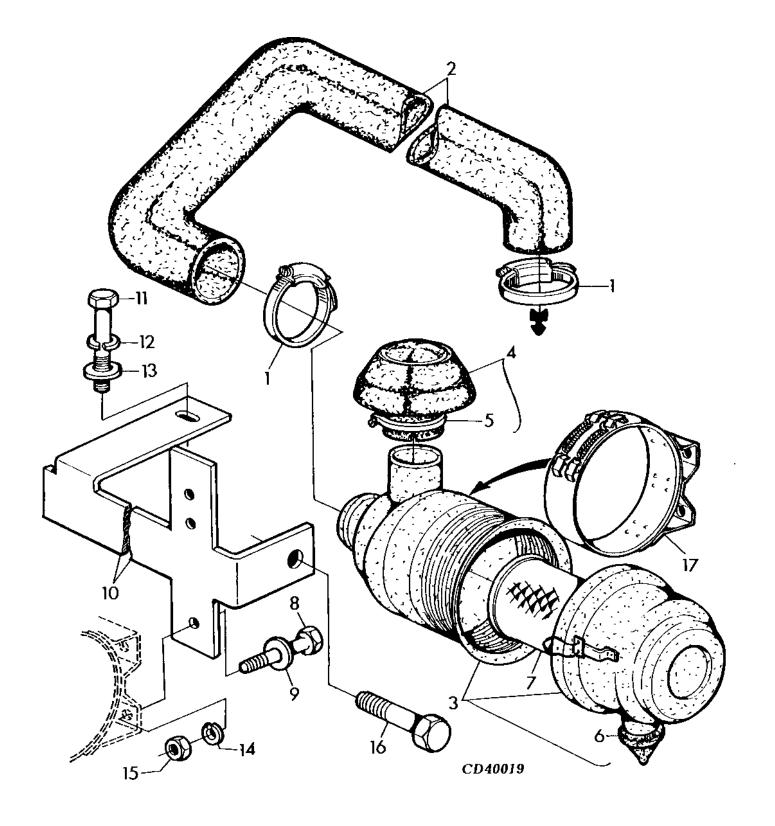
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 6 6 8 8 T H	REMARKS	
1	RE505799	CLAMP	1		ХХ		
2	RE503852	AIR CLEANER	1		ΧХ		
3	RE503875	REINFORCEMENT	1		ХХ		
4	R502176	REFRIGERANT HOSE	1		ХХ		
5	19M7785	SCREW	1		ΧХ	M10 X 25	
6	RE505651	CLAMP	1		ΧХ		
7	RE505650	CLAMP	1		ХХ		

1802



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 D	REMARKS
1	AT25242	HOSE CLAMP	2		Х	
2	R122843	HOSE	1		X	
3	RE58919	AIR CLEANER	1		X	ASSY,INCL.KEYS 6,7
4	RE35507	PRECLEANER	1		Х	
5	RE41931	CLAMP	1		X	
6	R132750	VALVE	1		X	
7	PE71011292	FILTER ELEMENT	1		Х	
8	19H2127	CAP SCREW	2		X	5/16" X 7/8"
9	24H1136	WASHER	2		X	11/32" X 11/16" X 0.065"
10	R502386	BRACKET	1		X	
11	19H2284	CAP SCREW	1		X	3/8" X 7/8"
12	12H304	LOCK WASHER	1		X	3/8"
13	24H1305	WASHER	1		X	13/32" X 13/16" X 0.065"
14	12M7056	LOCK WASHER	2		X	8 MM
15	14H785	NUT	2		X	5/16"
16		CAP SCREW	NA		X	
17	RE58918	CLAMP	1		Х	ID 182MM

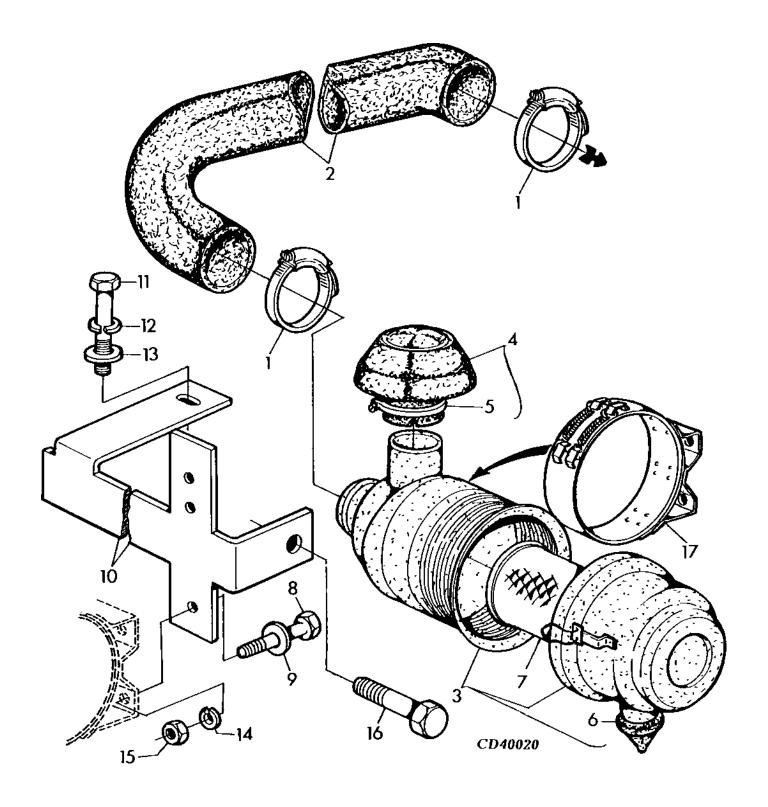
1804



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS
1	AT25242	HOSE CLAMP	2		Х	
2	R131129	HOSE	1		Χ	
3	RE58919	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6,7
4	RE35507	PRECLEANER	1		Х	
5	RE41931	CLAMP	1		Χ	
6	R132750	RELIEF VALVE	1		Χ	
7	PE71011292	FILTER ELEMENT	1		Х	
8	19H2127	CAP SCREW	2		Χ	5/16" X 7/8"
9	24H1136	WASHER	2		Χ	11/32" X 11/16" X 0.065"
10	R502386	BRACKET	1		Х	
11	19H2284	CAP SCREW	1		Χ	3/8" X 7/8"
12	12H304	LOCK WASHER	1		Χ	3/8"
13	24H1305	WASHER	1		Х	13/32" X 13/16" X 0.065"
14	12M7056	LOCK WASHER	2		Χ	8 MM
15	14H785	NUT	1		Χ	5/16"
16		CAP SCREW	NA		X	
17	RE58918	CLAMP	1		Χ	ID 182MM

1805

CD40020 -UN-22AUG95

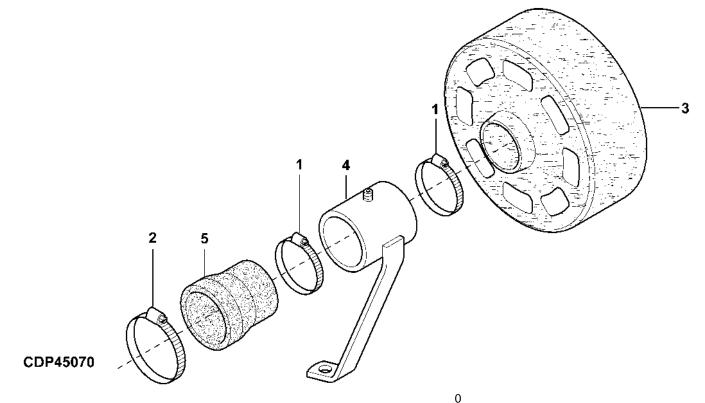


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 T	REMARKS
1	AR21842	CLAMP	2		Χ	
2	R124883	SUCTION HOSE	1		Χ	
3	RE61094	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6,7
4	RE33876	CAP	1		Х	
5	AT25242	HOSE CLAMP	1		Χ	
6	R132751	VALVE	1		Χ	
7	RE62220	FILTER ELEMENT	1		Х	
8	19M7866	SCREW	2		Χ	M8 X 20
9	R502166	SPACER	1		Χ	
10	R502386	BRACKET	1		Х	
11	19H2284	CAP SCREW	1		Χ	3/8" X 7/8"
12	12H304	LOCK WASHER	1		Χ	3/8"
13	24H1305	WASHER	1		Х	13/32" X 13/16" X 0.065"
14	12M7056	LOCK WASHER	2		Χ	8 MM
15	14H785	NUT	2		Χ	5/16"
16		CAP SCREW	NA		X	
17	RE505521	CLAMP	1		Χ	ID 212MM

				AIR CLEANER
CDP45068 -U	N-13NOV01	1810 1810 1810 1810 1810 1810		
CDP450	2 3	4		1
KEY PART	NO. PART NAME	ENGINE QTY SERIAL NO	0 0 0 2 3 4 9 9 5 D D D REMARKS	
1 RE5036 2 RE505 3 R50288 4 RE5056	694 FILTER ELEMENT 798 CLAMP 82 SPACER 851 CLAMP	1 1 1	X X X X X X X X X X X X	

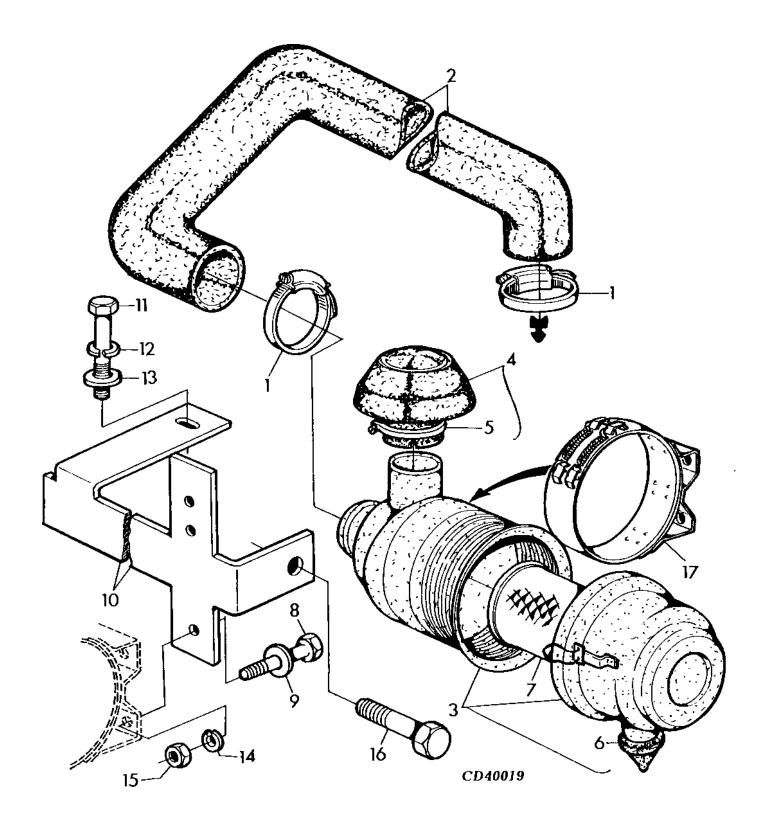
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1811	
1811	
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1811	
1811	

CDP45070 -UN-13NOV01



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	3 9 T REMARKS	
1	RE505798	CLAMP	2	Χ	
2	RE505651	CLAMP	1	Χ	
3	RE503694	FILTER ELEMENT	1	Χ	
4	RE503773	REINFORCEMENT	1	X	
5	R502137	HOSE	1	Χ	

1811

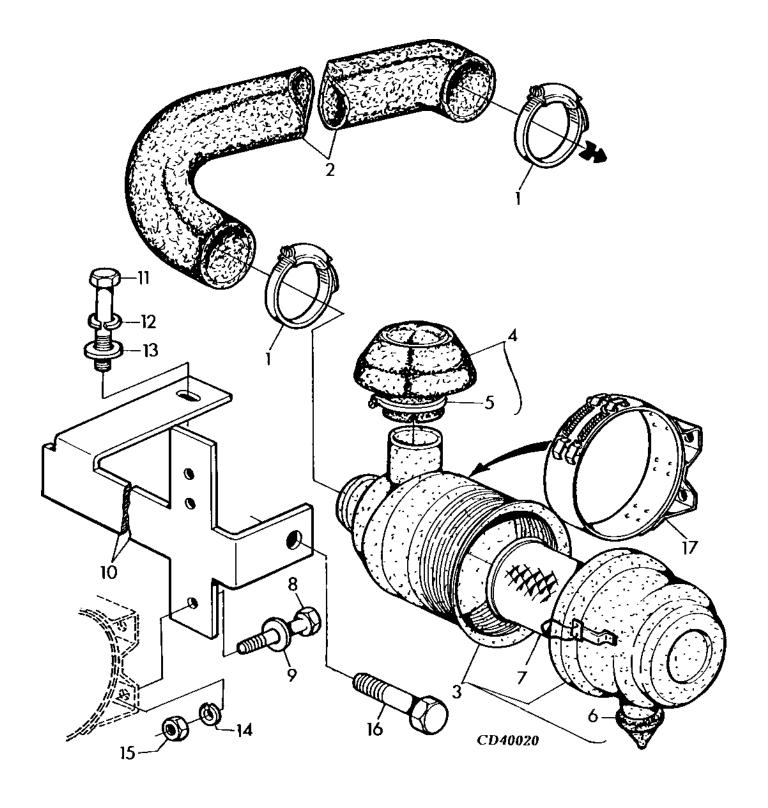


KEY	PART NO.	PART NAME		0 3 NGINE 9 RIAL NO. D	REMARKS	
1	AT25242	HOSE CLAMP	2	Х		
2	R122843	HOSE	1	Х		
3	RE58919	AIR CLEANER	1	Х	ASSY,INCL.KEYS 6,7	
4	RE35507	PRECLEANER	1	X		
5	RE41931	CLAMP	1	X		
6	R132750	RELIEF VALVE	1	X		
7	RE508449	FILTER ELEMENT	1	Х		
8	19H2127	CAP SCREW	2	X	5/16" X 7/8"	
9	24H1136	WASHER	2	X	11/32" X 11/16" X 0.065"	
10	R502386	BRACKET	1	Х		
11	19H2284	CAP SCREW	1	X	3/8" X 7/8"	
12	12H304	LOCK WASHER	1	X	3/8"	
13	24H1305	WASHER	1	X	13/32" X 13/16" X 0.065"	
14	12M7056	LOCK WASHER	2	X	8 MM	
15	14H785	NUT	1	X	5/16"	
16		CAP SCREW	NA	Х		
17	RE58918	CLAMP	1	X	ID 182MM	

1812 1812

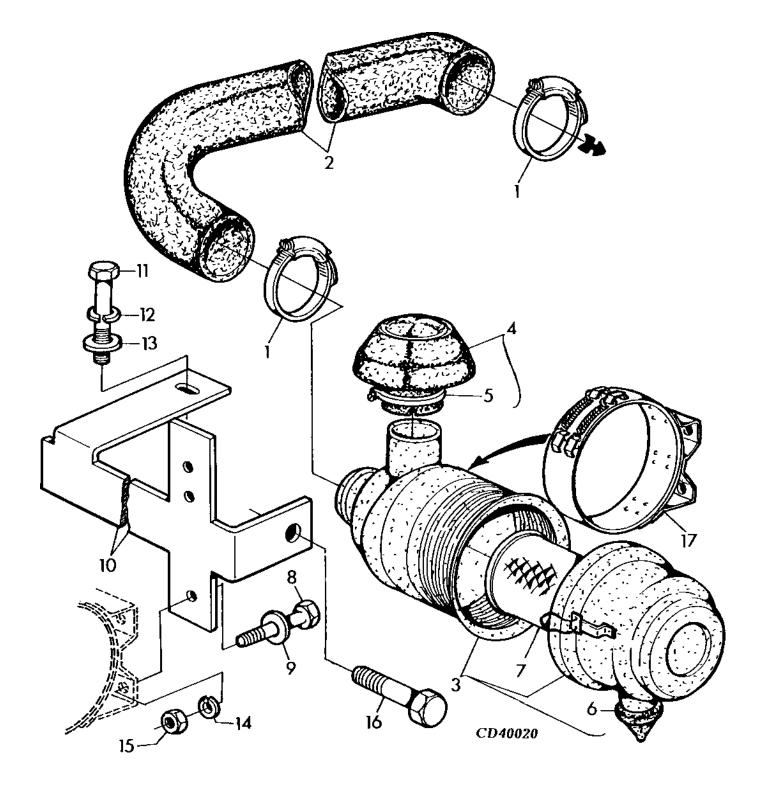
CD40020





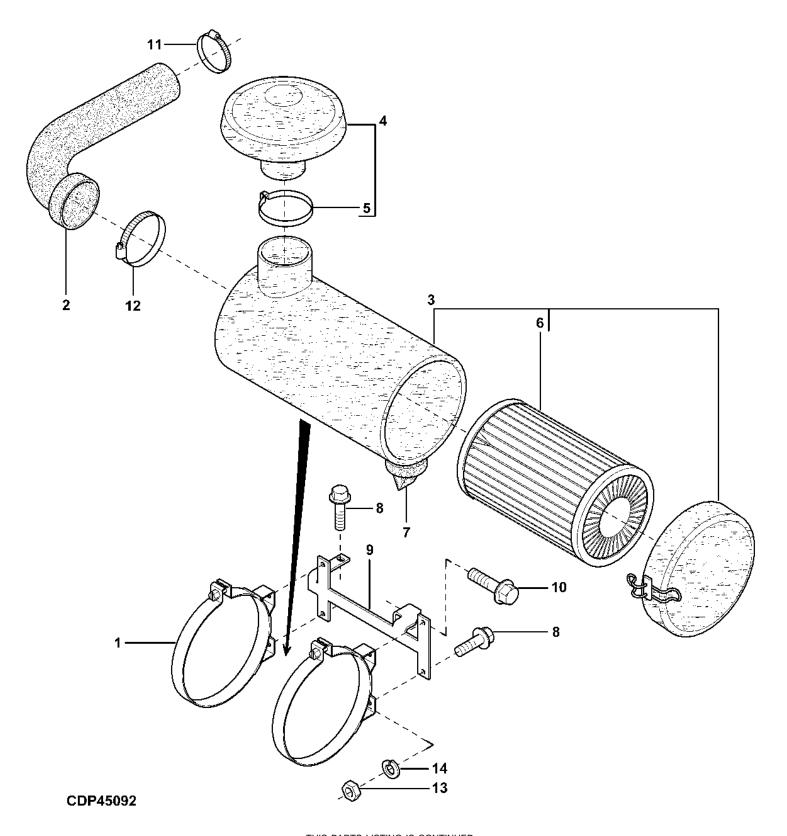
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 T	REMARKS
1	AR21842	CLAMP	2		Χ	
2	R124883	SUCTION HOSE	1		Χ	
3	RE61094	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6,7
4	RE33876	CAP	1		Х	
5	AT25242	HOSE CLAMP	1		Χ	
6	R132751	VALVE	1		Χ	
7	RE62220	FILTER ELEMENT	1		Х	
8	19M7866	SCREW	2		Χ	M8 X 20
9	R502166	SPACER	1		Χ	
10	R502386	BRACKET	1		Х	
11	19H2284	CAP SCREW	1		Χ	3/8" X 7/8"
12	12H304	LOCK WASHER	1		Χ	3/8"
13	24H1305	WASHER	1		Х	13/32" X 13/16" X 0.065"
14	12M7056	LOCK WASHER	2		Χ	8 MM
15	14H785	NUT	2		Χ	5/16"
16		CAP SCREW	NA		X	
17	RE505521	CLAMP	1		Χ	ID 212MM

CD40020 -UN-22AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS
1	AR21842	CLAMP	2		Х	
2	R124883	SUCTION HOSE	1		Χ	
3	RE61094	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6,7
4	RE33876	CAP	1		Χ	
5	AT25242	HOSE CLAMP	1		Χ	
6	R132751	VALVE	1		Χ	
7	RE62220	FILTER ELEMENT	1		Χ	
8	19M7866	SCREW	2		Χ	M8 X 20
9	R502166	SPACER	1		Χ	
10	R502386	BRACKET	1		Χ	
11	19M7784	SCREW	1		Χ	M10 X 20
12	12M7135	LOCK WASHER	1		Χ	10 MM
13		WASHER	NA		Χ	
14	12M7056	LOCK WASHER	2		Χ	8 MM
15	14M7298	FLANGE NUT	2		Χ	M8
16	19H1895	CAP SCREW	1		Χ	1/2" X 3/4"
17	RE505521	CLAMP	1		Χ	ID 212MM

CDP45092 -UN-15NOV01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 H	REMARKS
1	RE33880	CLAMP	2		X	
2	R502666	HOSE	1		Χ	
3	RE504849	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6&7
4	RE33881	CAP	1		X	
5	RE40172	CLAMP	1		Χ	
6	RE504850	FILTER ELEMENT	1		Χ	
7	R502667	TIRE VALVE STEM	1		X	
8	19M7784	SCREW	5		Χ	M10 X 20
9	R503372	BRACKET	1		Χ	
10	19M7789	SCREW	1		X	M12 X 30
11	RE505651	CLAMP	1		Χ	
12	RE505650	CLAMP	1		Χ	
13	14M7152	NUT	4		X	M10
14	12M7135	LOCK WASHER	4		Χ	10 MM

		1816 1816 1816 1816	
CD43359	-UN-13NOV01	1816 1816	
		1	

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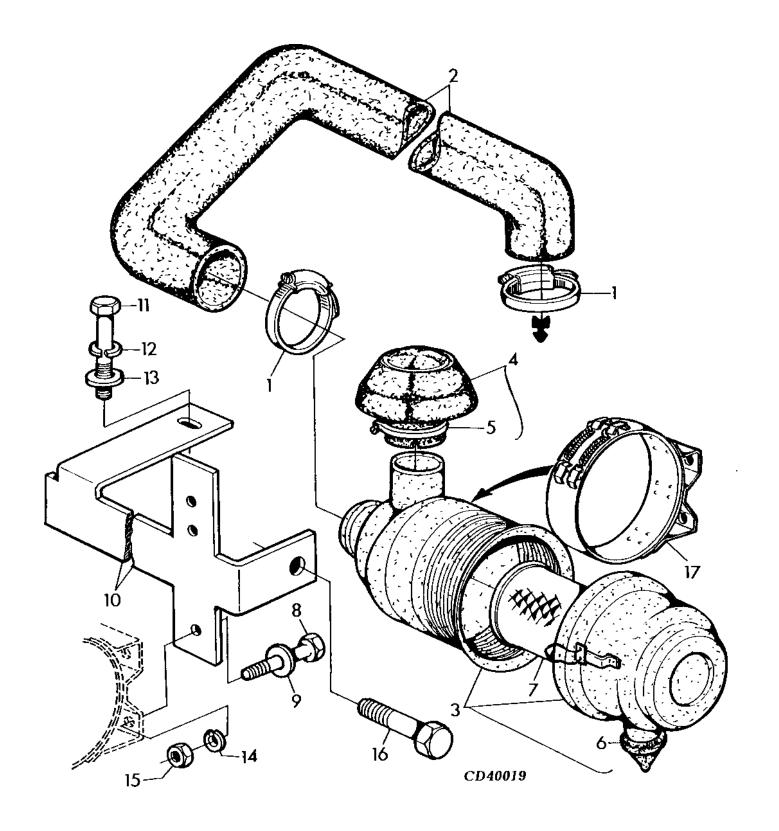
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 5 5 T H	REMARKS	
1	RE505651	CLAMP	3		ХХ		
2	RE504073	FILTER ELEMENT	1		ХХ		
3	RE505848	REINFORCEMENT	1		XX		
4	R502282	REFRIGERANT HOSE	1		ХХ		
5	19M7784	SCREW	1		X X M	110 X 20	

2

AIR CLEANER

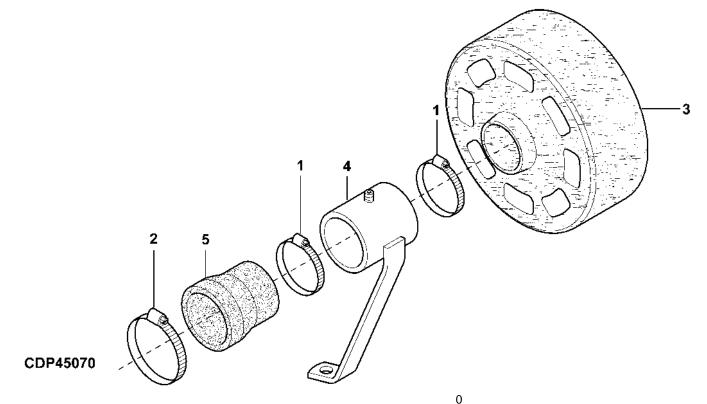
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KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 6 6 8 8 T H	REMARKS	
1	RE33880	CLAMP	2		ХХ		
2	R129131	HOSE	1		ΧХ		
3	RE504849	AIR CLEANER	1		ΧХ	ASSY,INCL.KEYS 6&7	
4	RE33881	CAP	1		XX		
5	RE40172	CLAMP	1		ΧХ		
6	RE504850	FILTER ELEMENT	1		ΧХ		
7	R502667	TIRE VALVE STEM	1		XX		
8	19M7784	SCREW	5		ΧХ	M10 X 20	
9	R503372	BRACKET	1		ΧХ		
10	19M7789	SCREW	1		XX	M12 X 30	
11	RE505651	CLAMP	1		ΧХ		
12	RE505650	CLAMP	1		ΧХ		
13	14M7152	NUT	4		XX	M10	
14	12M7135	LOCK WASHER	4		ΧХ	10 MM	



KEY	PART NO.	PART NAME	QTY	ENGINE 9 SERIAL NO.) 2 9	REMARKS
1	AT25242	HOSE CLAMP	2	Х	X	
2	R131129	HOSE	1	Х	X	
3	RE58919	AIR CLEANER	1	Х	Χ.	ASSY,INCL.KEYS 6,7
4	RE35507	PRECLEANER	1	Х	X	
5	RE41931	CLAMP	1	Х	X	
6	R132750	VALVE	1	Х	X	
7	RE508449	FILTER ELEMENT	1	Х	X	
8	19H2127	CAP SCREW	2	X	Χ :	5/16" X 7/8"
9	24H1136	WASHER	2	X	X ·	11/32" X 11/16" X 0.065"
10	R502386	BRACKET	1	Х	X	
11	19H2284	CAP SCREW	1	X	Χ :	3/8" X 7/8"
12	12H304	LOCK WASHER	1	X	Χ :	3/8"
13	24H1305	WASHER	1	Х	X	13/32" X 13/16" X 0.065"
14	12M7056	LOCK WASHER	2	X	X :	8 MM
15	14H785	NUT	2	X	Χ :	5/16"
16		CAP SCREW	NA	Х	Χ	
17	RE58918	CLAMP	1	X	X	ID 182MM

CDP45070 -UN-13NOV01



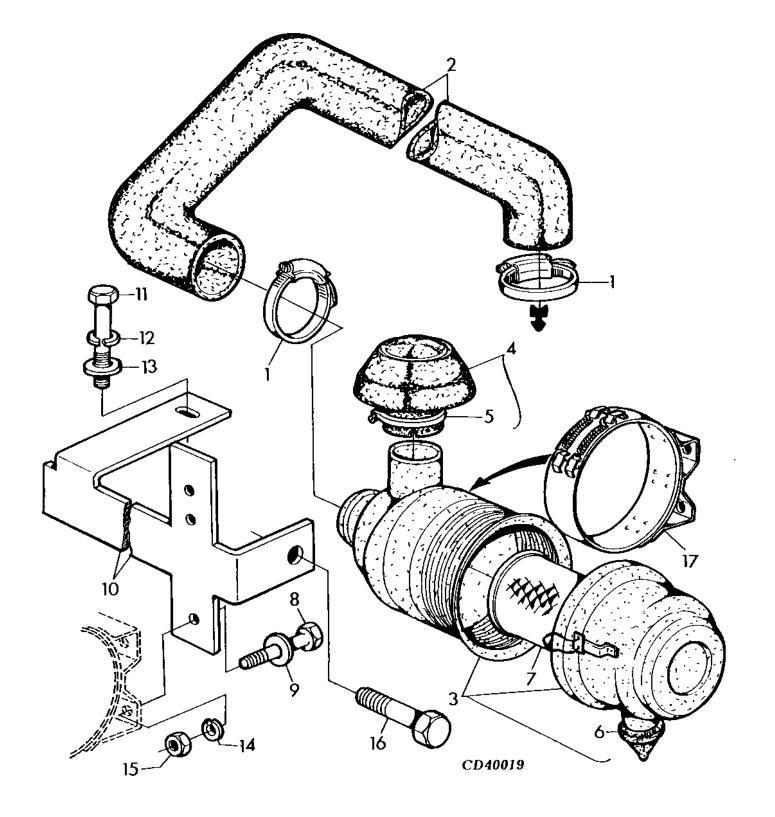
KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	3 9 T	REMARKS
1	RE505798	CLAMP	2	Х	
2	RE505651	CLAMP	1	X	
3	RE503694	FILTER ELEMENT	1	X	
4	RE503773	REINFORCEMENT	1	X	
5	R502137	HOSE	1	X	

AIR CLEANER

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1822

1822 1822 1822

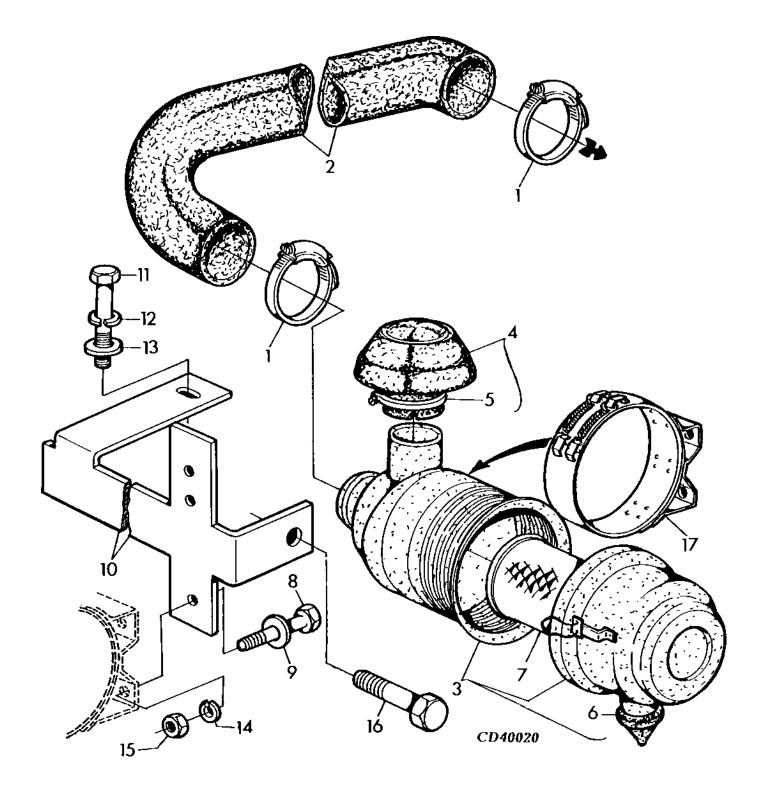


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS	
1	AT25242	HOSE CLAMP	2		Χ		
2	R122843	HOSE	1		Х		
3	RE58919	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6,7	
4	RE35507	PRECLEANER	1		Χ		
5	RE41931	CLAMP	1		Χ		
6	R132750	VALVE	1		Χ		
7	RE508449	FILTER ELEMENT	1		Χ		
8	19H2127	CAP SCREW	2		Χ	5/16" X 7/8"	
9	24H1136	WASHER	2		Χ	11/32" X 11/16" X 0.065"	
10	R502386	BRACKET	1		Χ		
11	19H2284	CAP SCREW	1		Χ	3/8" X 7/8"	
12	19M7866	SCREW	1		Χ	M8 X 20	
13	24H1305	WASHER	1		Х	13/32" X 13/16" X 0.065"	
14	12M7056	LOCK WASHER	2		Χ	8 MM	
15	14M7298	FLANGE NUT	2		Χ	M8	
16		CAP SCREW	NA		Х		
17	RE58918	CLAMP	1		Χ	ID 182MM	

1832

1832 1832 1832

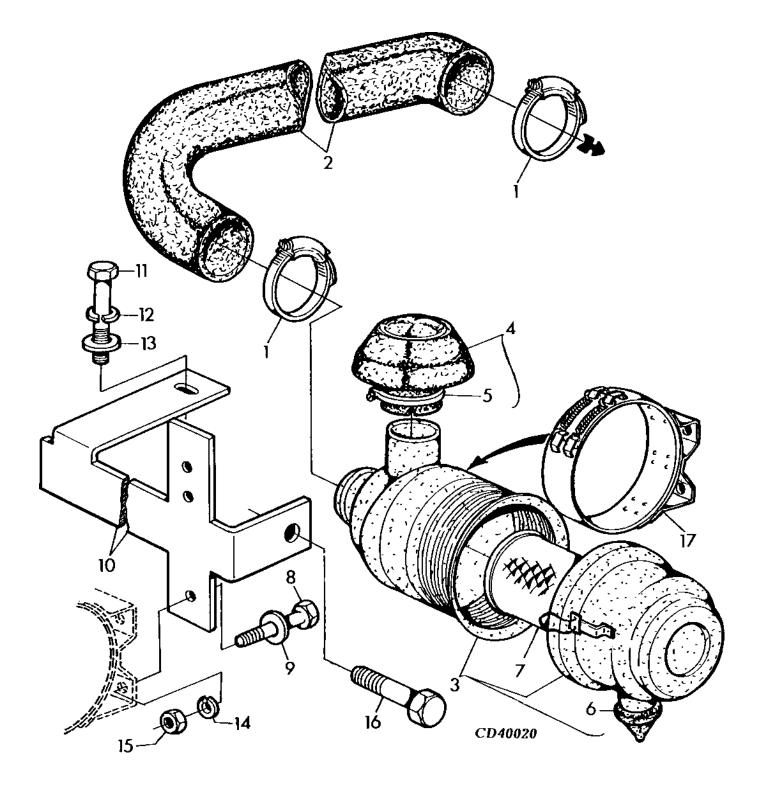
CD40020 -UN-22AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS	
1	AR21842	CLAMP	2		Х		
2	R504160	HOSE	1		Χ		
3	RE61094	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6,7	
4	RE33876	CAP	1		Х		
5	AT25242	HOSE CLAMP	1		Χ		
6	R132751	VALVE	1		Χ		
7	RE62220	FILTER ELEMENT	1		Χ		
8	19M7866	SCREW	2		Χ	M8 X 20	
9	R502166	SPACER	1		Χ		
10	R502386	BRACKET	1		Χ		
11	19M7784	SCREW	1		Χ	M10 X 20	
12	12M7135	LOCK WASHER	1		Χ	0.394"	
13	24H1305	WASHER	1		Χ	13/32" X 13/16" X 0.065"	
14	12M7056	LOCK WASHER	2		Χ	8 MM	
15	14M7298	FLANGE NUT	2		Χ	M8	
16		CAP SCREW	NA		X		
17	RE505521	CLAMP	1		Χ	ID 212MM	

1833 1833 1833

CD40020 -UN-22AUG95

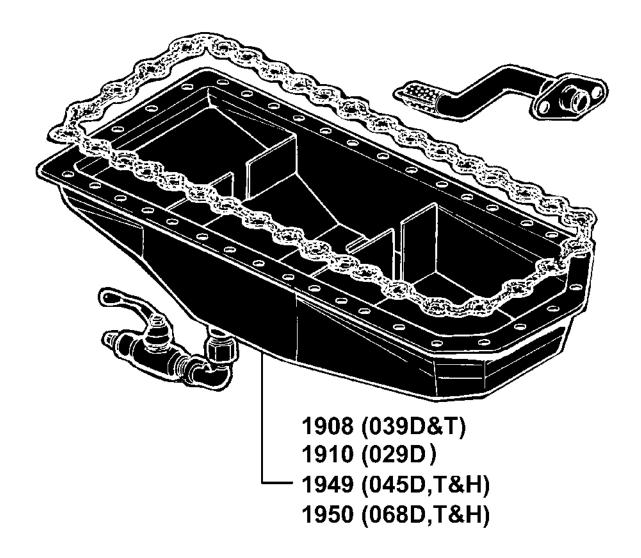


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 D	REMARKS
1	AR21842	CLAMP	2		Х	
2	R129130	HOSE	1		Χ	
3	RE61094	AIR CLEANER	1		Χ	ASSY,INCL.KEYS 6,7
4	RE33876	CAP	1		Χ	
5	AT25242	HOSE CLAMP	1		Χ	
6	R132751	VALVE	1		Χ	
7	RE62220	FILTER ELEMENT	1		Χ	
8	19M7866	SCREW	2		Χ	M8 X 20
9	R502166	SPACER	1		Χ	
10	R502386	BRACKET	1		Χ	
11	19M7784	SCREW	1		Χ	M10 X 20
12	12M7135	LOCK WASHER	1		Χ	0.394"
13	24H1305	WASHER	1		Χ	13/32" X 13/16" X 0.065"
14	12M7056	LOCK WASHER	2		Χ	8 MM
15	14M7298	FLANGE NUT	2		Χ	M8
16		CAP SCREW	NA		X	
17	RE505521	CLAMP	1		Х	ID 212MM

AIR CLEANER

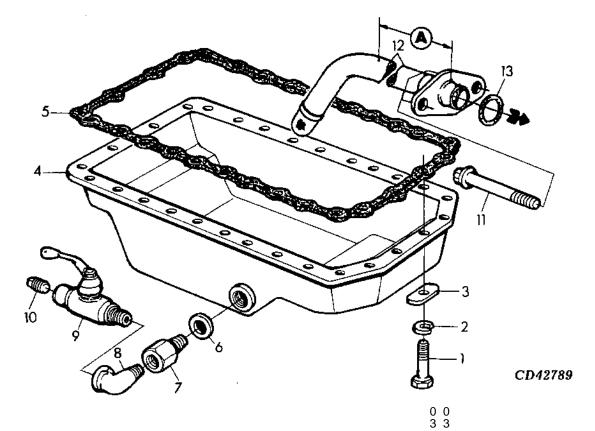
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INDICE DE SECCION
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1908 -	1H10
1910 -	1H11
1910 -	1H12
1949 -	1H13
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1950 -	1H15
1950 -	1H16
1950 -	1H17



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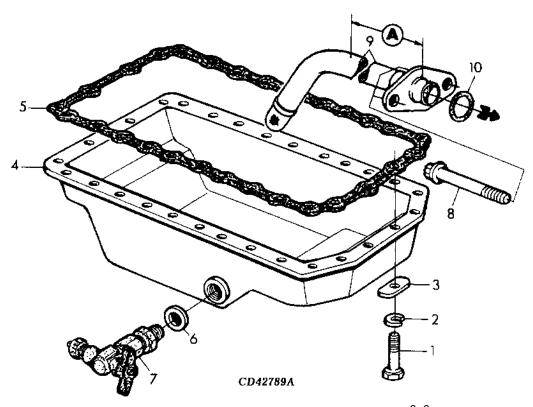


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	9 9 D T	REMARKS
1	19H2676	CAP SCREW	28	-423674	ХХ	3/8" X 1", (SAE 8)
2	12H304	LOCK WASHER	28	-423674	ХХ	3/8"
3	T30726	STRAP	28	-423674	ХХ	
4	RE57482	OIL PAN	1	-423674	XX	
5	R123352	GASKET	1	-423674	ХХ	
6	R120247	SEALING WASHER	1	-423674	ХХ	COPPER
7	R124128	ADAPTER	1	-423674	ХХ	M22 X 1.5MM X 1/2"-14NPT
8	15H602	ELBOW FITTING	1	-423674	ХХ	1/2"
9	RE503101	SHUT-OFF VALVE	1	-423674	ХХ	(SUB RE506656 AND R120247, THIS
						APPLICATION)
10	15H584	PIPE PLUG	1	-423674	ХХ	1/2"
11	R59409	CAP SCREW	2	-423674	ХХ	LGTH 102MM (SAE 8)
12	RE64211	OIL PUMP INTAKE	1	-423674	XX	A = 114MM, KIT, W/ INSTRUCTIONS
13	R61871	O-RING	1	-423674	ХХ	

CD42789

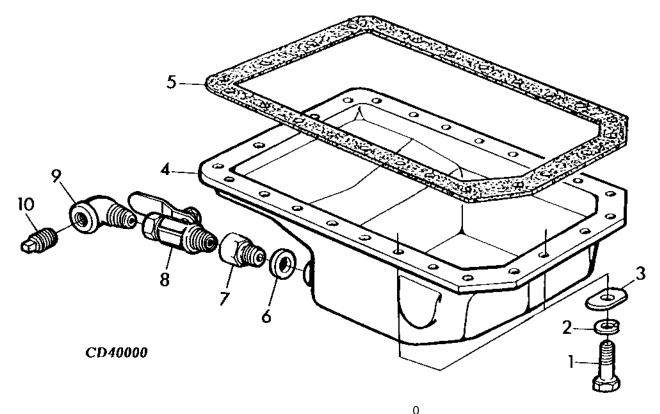
1908 - CONTINUED 1908 - SUITE 1908 - FORTSETZUNG 1908 - SEGUITO 1908 - CONTINUACTION 1908 - FORTS

CD42789A -UN-15FEB01



MARKS
(SAE 8)
5MM
2MM (SAE 8)
IM, KIT, W/ INSTRUCTIONS
3.531 MM
1



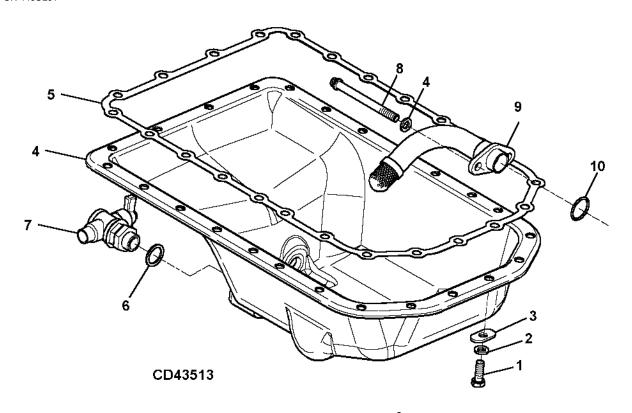


PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS
19H2676	CAP SCREW	24	-423674	Х	3/8" X 1"
12H304	LOCK WASHER	24	-423674	Χ	3/8"
T30726	STRAP	24	-423674	X	
RE59241	OIL PAN	1	-423674	Х	SHEET METAL,TOLE,BLECH,CHAPA,LAMERIA,PLAAT
R119359	GASKET	1	-423674	X	
R120247	RING	1	-423674	X	COPPER, CUIVRE, KUPFER, RAME, COBRE, KOPPAR
R124128	ADAPTER	1	-423674	Х	M22 X 1.5MM -1/2"-14NPT
RE503101	SHUT-OFF VALVE	1	-423674	X	
15H602	ELBOW FITTING	1	-423674	X	
15H584	PIPE PLUG	1	-423674	Х	1/2"-14NPT
	19H2676 12H304 T30726 RE59241 R119359 R120247 R124128 RE503101 15H602	19H2676 CAP SCREW 12H304 LOCK WASHER T30726 STRAP RE59241 OIL PAN R119359 GASKET R120247 RING R124128 ADAPTER RE503101 SHUT-OFF VALVE 15H602 ELBOW FITTING	19H2676 CAP SCREW 24 12H304 LOCK WASHER 24 T30726 STRAP 24 RE59241 OIL PAN 1 R119359 GASKET 1 R120247 RING 1 R124128 ADAPTER 1 RE503101 SHUT-OFF VALVE 1 15H602 ELBOW FITTING 1	PART NO. PART NAME QTY SERIAL NO. 19H2676 CAP SCREW 24 -423674 12H304 LOCK WASHER 24 -423674 T30726 STRAP 24 -423674 RE59241 OIL PAN 1 -423674 R119359 GASKET 1 -423674 R120247 RING 1 -423674 R124128 ADAPTER 1 -423674 RE503101 SHUT-OFF VALVE 1 -423674 15H602 ELBOW FITTING 1 -423674	PART NO. PART NAME QTY SERIAL NO. D 19H2676 CAP SCREW 24 -423674 X 12H304 LOCK WASHER 24 -423674 X T30726 STRAP 24 -423674 X RE59241 OIL PAN 1 -423674 X R119359 GASKET 1 -423674 X R120247 RING 1 -423674 X R124128 ADAPTER 1 -423674 X RE503101 SHUT-OFF VALVE 1 -423674 X 15H602 ELBOW FITTING 1 -423674 X

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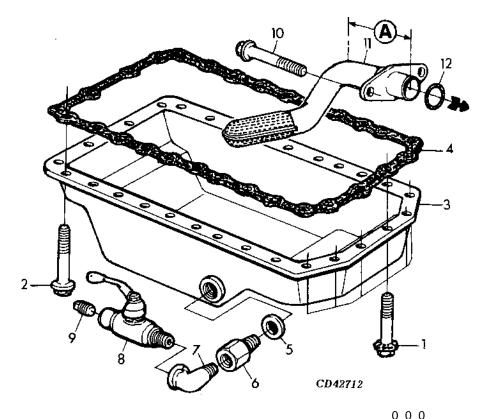
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CD43513 -UN-11JUL01



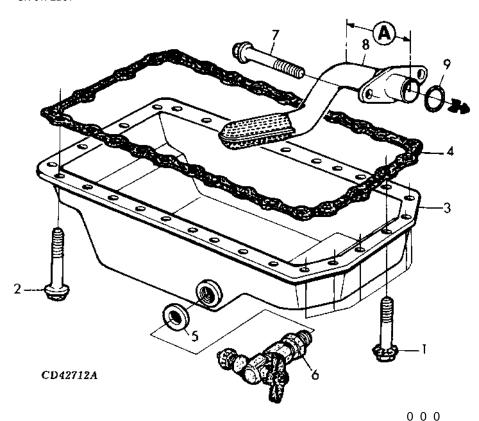
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS
1	19H2676	CAP SCREW	24	423675-	Х	3/8" X 1"
2	12H304	LOCK WASHER	26	423675-	X	3/8"
3	T30726	STRAP	24	423675-	Χ	
4	RE59241	OIL PAN	1	423675-	Х	SHEET METAL, TOLE, BLECH, CHAPA, LAMERIA, PLAAT
5	R119359	GASKET	1	423675-	X	
6	R120247	RING	1	423675-	Χ	COPPER, CUIVRE, KUPFER, RAME, COBRE, KOPPAR
7	RE506656	SHUT-OFF VALVE	1	423675-	Х	M22 X 1.5MM -1/2"-14NPT
8	R59409	CAP SCREW	1	423675-	X	3/8" X 4"
9	RE40473	OIL PUMP INTAKE	1	423675-	Χ	
10	R61871	O-RING	1	423675-	Х	63/64" X 0.139" 1/2"-14NPT

CD42712 -UN-15FEB99



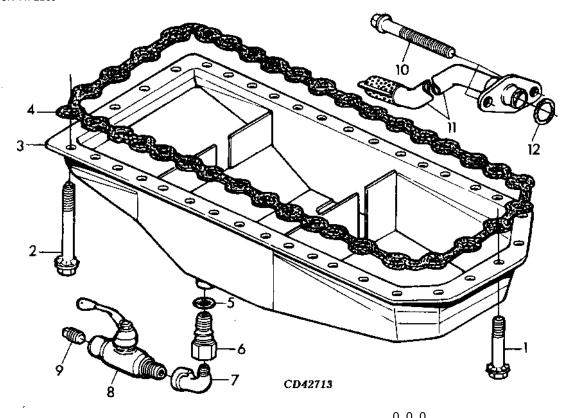
1949 - CONTINUED 1949 - SUITE 1949 - FORTSETZUNG 1949 - SEGUITO 1949 - CONTINUACTION 1949 - FORTS

CD42712A -UN-01FEB01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	19M7866	SCREW	6	618121-	XXX	M8 X 20, (10.9) ONE TIME USAGE	
2	19M7902	SCREW	22	618121-	X X X	M8 X 16, (12.9) ONE TIME USAGE	
3	RE57482	OIL PAN	1	618121-	X X X		
4	R123352	GASKET	1	618121-	X X X		
5	R120247	RING	1	618121-	X X X	COPPER	
6	RE506656	SHUT-OFF VALVE	1	618121-	X X X	M22 X 1.5MM	
7	19M7970	SCREW	2	618121-	X X X	M8 X 100, (10.9)	
8	RE57619	OIL PUMP INTAKE	1	618121-	X X X	A = 67MM, INCL. INSTRUCTIONS	
9	R61871	O-RING	1	618121-	X X X	24.994 X 3.531 MM	

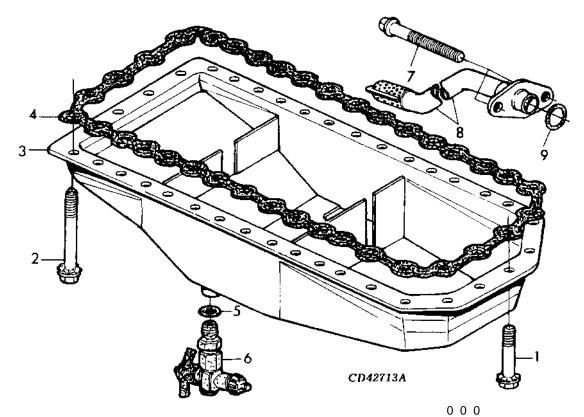
CD42713 -UN-11FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	19M7866	SCREW	6	-618269	XXX	M8 X 20, (10.9) ONE TIME USAGE
2	19M7902	SCREW	22	-618269	X X X	M8 X 16, (12.9) ONE TIME USAGE
_3		OIL PAN	1	-618269	X X X	MARKED RE500612, ORD RE503224
4	R500349	GASKET	1	-618269	X X X	
5	51M7045	O-RING	1	-618269	X X X	19.300 X 2.200 MM
_6	R501657	ADAPTER	1	-618269	X X X	M22 X 1.5 X 1/2"-14NPT
7	15H602	ELBOW FITTING	1	-618269	X X X	
8	RE503101	SHUT-OFF VALVE	1	-618269	XXX	1/2", (SUB RE506655 AND 51M7045, THIS APPLICATION)
9	15H584	PIPE PLUG	1	-618269	X X X	1/2"
10	19M8986	SCREW	2	-618269	X X X	M8 X 100, (10.9)
<u>11</u>	RE71143	OIL PUMP INTAKE	1	-618269	X X X	
12	R61871	O-RING	1	-618269	X X X	

1950 - CONTINUED 1950 - SUITE 1950 - FORTSETZUNG 1950 - SEGUITO 1950 - CONTINUACTION 1950 - FORTS

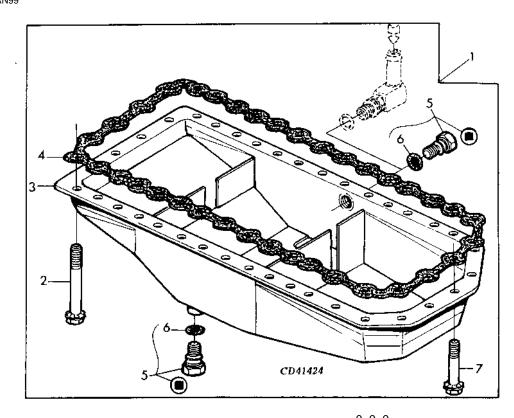
CD42713A -UN-15FEB01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	19M7866	SCREW	6	618270-	XXX	M8 X 20, (10.9) ONE TIME USAGE
2	19M7902	SCREW	22	618270-	X X X	M8 X 16, (12.9) ONE TIME USAGE
3		OIL PAN	1	618270-	X X X	MARKED RE500612, ORD RE503224
4	R500349	GASKET	1	618270-	XXX	
5	51M7045	O-RING	1	618270-	X X X	19.300 X 2.200 MM
6	RE506655	SHUT-OFF VALVE	1	618270-	X X X	M22 X 1.5 X 1/2"-14NPT
7	19M8986	SCREW	2	618270-	XXX	M8 X 100, (10.9)
8	RE71143	OIL PUMP INTAKE	1	618270-	X X X	
9	R61871	O-RING	1	618270-	X X X	

1950 - CONTINUED 1950 - SUITE 1950 - FORTSETZUNG 1950 - SEGUITO 1950 - CONTINUACTION 1950 - FORTS

CD41424 -UN-12JAN99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	RE503224	KIT	1		XXX	
2	19M7902	SCREW	30		X X X	M8 X 16, (12.9) ONE TIME USAGE
3		OIL PAN	1		X X X	MARKED RE500612, ORD RE503224
4	R500349	GASKET	1		XXX	
5	RE500611	HOSE FITTING	AR		X X X	M22 X 1.5
6	51M7045	O-RING	1		X X X	19.300 X 2.200 MM
7	19M7866	SCREW	6		XXX	M8 X 20, (10.9) ONE TIME USAGE

OIL PAN

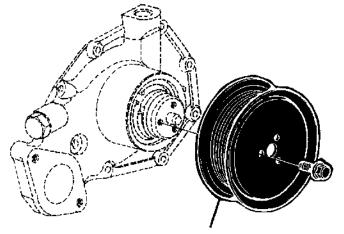
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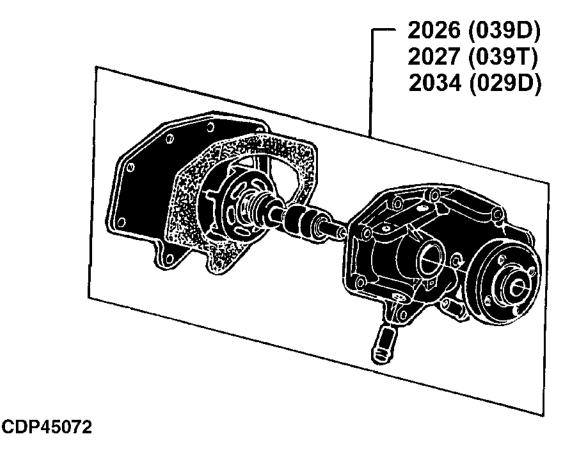
CDP45072 -UN-13NOV01 2001 - 1H20

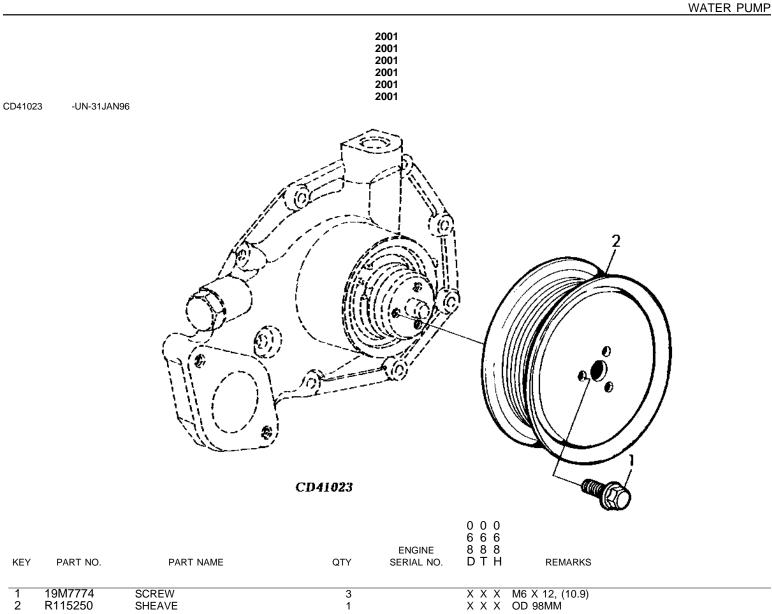
2002 - 1H21 2026 - 1H22

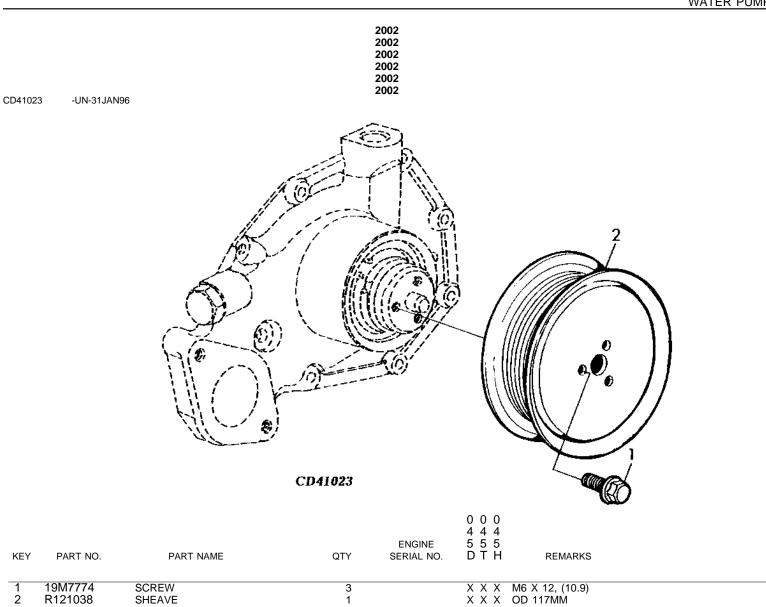
2027 - 1H23 2034 - 1H24



2001 (068D,T&H) 2002 (045D,T&H)





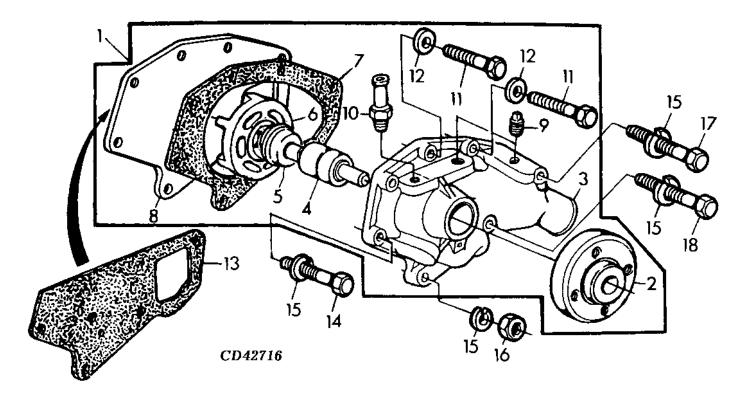


WATER PUMP

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CD42716 -UN-24FEB99

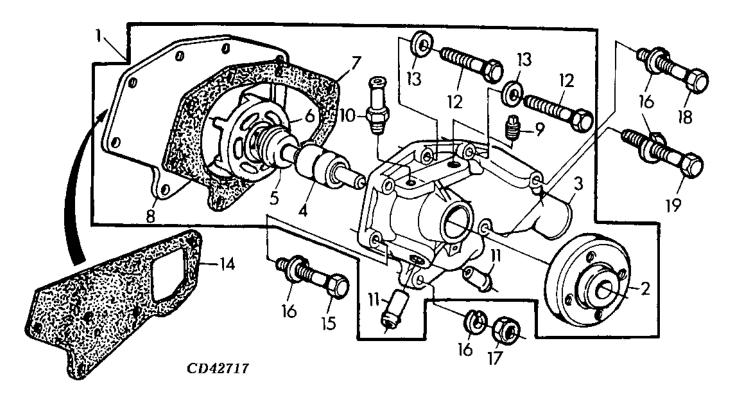




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				ENGINE	9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	Ď	REMARKS
1	RE503264	WATER PUMP	1		Χ	
2	R130586	HUB	1		Χ	
3		HOUSING	1		Χ	MARKED R67188, NSEP, ORD RE503264
4		BALL BEARING	1		Χ	(A) NSEP, ORD RE62658
5		SEAL	1		Χ	(A) NSEP, ORD RE62658
6		IMPELLER	1		Χ	(A) NSEP, ORD RE62658
7	R97455	GASKET	1		Χ	
8	R102901	COVER	1		Χ	TK 6MM
9	15H584	PIPE PLUG	2		Χ	1/2"-14NPT
10	T19651	HOSE FITTING	1		Χ	1/4"-18NPT, LGTH 40MM
11	19H3219	CAP SCREW	2		Χ	3/8" X 1-3/8", (SAE 8)
12	24M7096	WASHER	2		Χ	10.500 X 18 X 1.600 MM
13	T20243	GASKET	1		Χ	
14	19H3065	CAP SCREW	1		Χ	3/8" X 2", (SAE 8)
15	12H304	LOCK WASHER	4		Χ	3/8"
16	14H1076	NUT	1		Χ	3/8"
17	19H1912	CAP SCREW	1		Χ	3/8" X 3-1/2", (SAE 8)
18	19H3413	SCREW	1		Χ	3/8" X 3-1/4"

- (A) SEE SECTION 9700 (A) VOIR SECTION 9700
- (A) SIEHE ABSCHNITT 9700
- (A) VEDERE CAPITOLO 9700
- (A) VEA AL SECCION 9700
- (A) SE SEKTION 9700

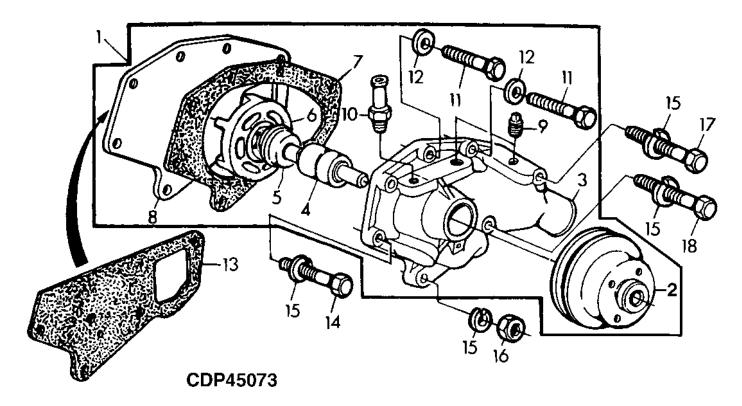
CD42717 -UN-24FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 T	REMARKS
1	RE503272	WATER PUMP	1		Χ	
2	R130586	HUB	1		Χ	
3		HOUSING	1		Χ	MARKED R73604, NSEP, ORD RE503272
4		BALL BEARING	1		Χ	(A) NSEP, ORD RE62658
5		SEAL	1		Χ	(A) NSEP, ORD RE62658
6		IMPELLER	1		Χ	(A) NSEP, ORD RE62658
7	R97455	GASKET	1		Χ	
8	R102901	COVER	1		Χ	TK 6MM
_9	15H584	PIPE PLUG	1			1/2"-14NPT
10	T19651	HOSE FITTING	1		Χ	1/4"-18NPT, LGTH 40MM
11	R48993	TUBE	2		Χ	OD 16MM
12	19H3219	CAP SCREW	2		Χ	3/8" X 1-3/8", (SAE 8)
13	24M7096	WASHER	2		Χ	10.500 X 18 X 1.600 MM
14	T20243	GASKET	1		Χ	
15	19H3065	CAP SCREW	1		Χ	3/8" X 2", (SAE 8)
16	12H304	LOCK WASHER	4		Χ	3/8"
17	14H1076	NUT	1		Χ	3/8"
18	19H1912	CAP SCREW	1		Χ	3/8" X 3-1/2"
19	19H3413	SCREW	1		Χ	3/8" X 3-1/4"

- (A) SEE SECTION 9900 REPAIR KITS
- (A) VOIR SECTION 9900 KITS DE REPARATION
- (A) SIEHE ABSCHNITT 9700
- (A) VEDERE CAPITOLO 9700
- (A) VEA AL SECCION 9700 (A) SE SEKTION 9700

CDP45073 -UN-13NOV01



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				ENGINE	9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	D	REMARKS
1	RE67036	WATER PUMP	1		X	
2	T23628	PULLEY	1		Χ	
3		HOUSING	1		Χ	MARKED R67188, NSEP, ORD RE67036
4		BALL BEARING	1		Х	ORD RE62658
5		SEAL	1		Χ	ORD RE62658
6		IMPELLER	1		Χ	ORD RE62658
7	R97455	GASKET	1		Χ	
8	R102901	COVER	1		Χ	TK 6MM
9	15H584	PIPE PLUG	2		Χ	1/2"-14NPT
10	L30291	UNION FITTING	1		Χ	1/4"-18NPT, LGTH 54MM
11	19H3219	CAP SCREW	2		Χ	3/8" X 1-3/8", (SAE 8)
12	24M7096	WASHER	2		Χ	10.500 X 18 X 1.600 MM
13	T20243	GASKET	1		Χ	
14	19H3065	CAP SCREW	1		Χ	3/8" X 2", (SAE 8)
15	12H304	LOCK WASHER	4		Χ	3/8"
16	14H1076	NUT	1		Χ	3/8"
17	19H1912	CAP SCREW	1		Χ	3/8" X 3-1/2", (SAE 8)
18	19H3413	SCREW	1		Χ	3/8" X 3-1/4"

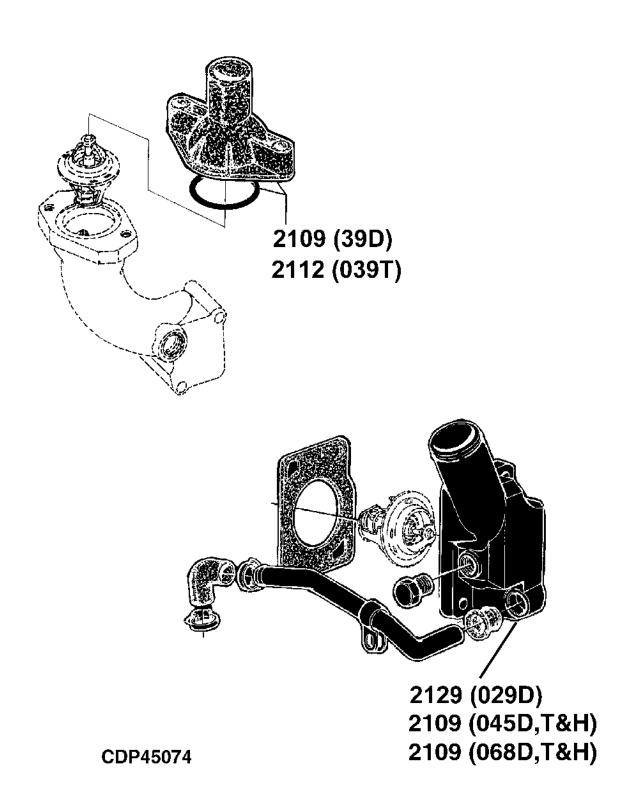
WATER PUMP

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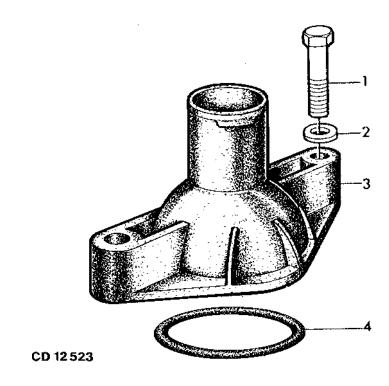
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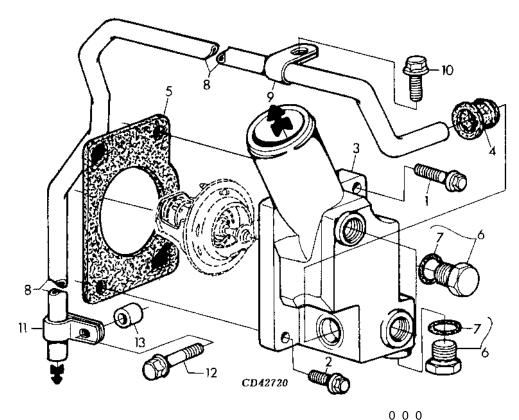


CD12523 -UN-01JAN94



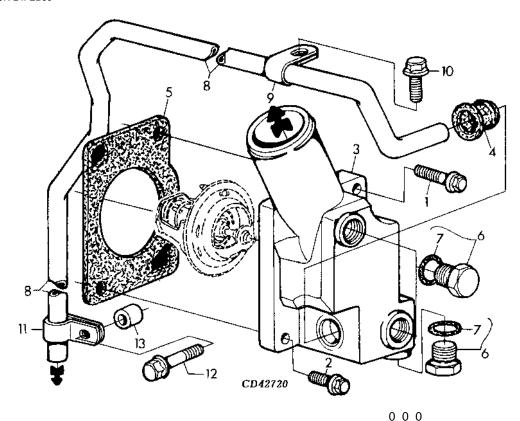
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 D	REMARKS	
1	19H2633	CAP SCREW	2		Х	3/8" X 1-1/2", (SAE 8)	
2	24M7106	WASHER	2		Χ	10 X 18 X 2.500 MM	
3	R97876	COVER	1		Χ		
4	R97877	O-RING	1		X		

CD42720 -UN-24FEB99



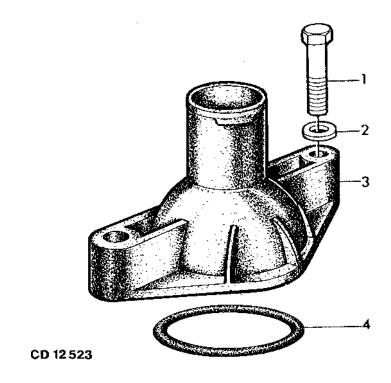
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS
1	19M7786	SCREW	1		XXX	(10.9)
2	19M7786	SCREW	1		X X X	(10.9)
3.		COVER	1		X X X	MARKED R131016, (ORDER R501130, RE46684
						AND (2) R123326)
	R501130	COVER	1		X X X	
4	R123326	GASKET	1		X X X	
5	R502814	GASKET	1		X X X	
6	RE46684	PLUG	AR		X X X	M14 X 1.5
_7	51M7041	O-RING	AR		X X X	
8	R135179	STRUCTURAL TUBING	1		X X X	(ALSO ORDER (2) 36106060)
9	R123323	CLAMP	1		X X X	
10	19M7788	SCREW	1		X X X	(10.9)
11	R123323	CLAMP	1		X X X	
12	19M8292	SCREW	1		X X X	(10.9)
13	28H860	WASHER	1		X X X	

-UN-24FEB99 CD42720



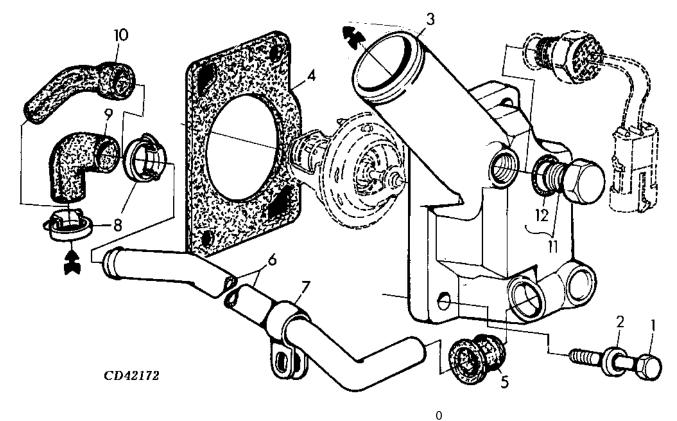
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	19M7786	SCREW	1		XXX	M10 X 30, (10.9)
2	19M7786	SCREW	1		X X X	M10 X 30, (10.9)
3		COVER	1		X X X	MARKED R131016, (ORDER R501130, RE46684
						AND (2) R123226)
	R501130	COVER	1		X X X	
4	R123326	GASKET	1		X X X	
5	R502814	GASKET	1		X X X	
6	RE46684	PLUG	AR		X X X	M14 X 1.5
7	51M7041	O-RING	AR		X X X	
8	R135179	STRUCTURAL TUBING	1		XXX	(ALSO ORDER (2) 36106060)
9	R123323	CLAMP	1		X X X	
10	19M7788	SCREW	1		X X X	M12 X 25, (10.9)
11	R123323	CLAMP	1		XXX	
12	19M8292	SCREW	1		X X X	M10 X 50, (10.9)
13	28H860	WASHER	1		X X X	

CD12523 -UN-01JAN94



KEY	PART NO.	PART NAME	ENG QTY SERIA	0 3 GINE 9 AL NO. T REMARKS	
1	19H2633	CAP SCREW	2	X 3/8" X 1-1/2", (SAE 8)	
2	24M7106	WASHER	2	X 10 X 18 X 2.500 MM	
3	R97876	COVER	1	Χ	
4	R97877	O-RING	1	X	

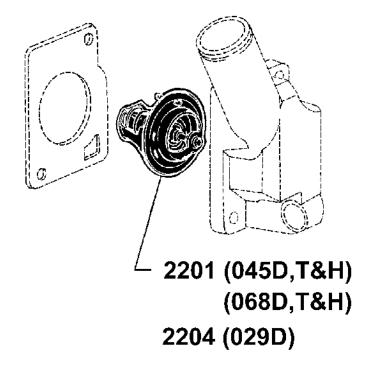
CD42172 -UN-31JUL98

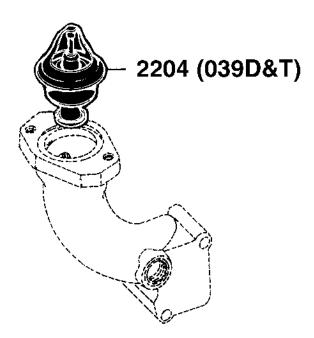


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS
1	19H1116	CAP SCREW	1		X	3/8" X 1-1/2", (SAE 8)
2	24M7106	WASHER	2		Χ	10 X 18 X 2.500 MM
3		COVER	1		Χ	MARKED R502182, (ORDER R501120, R502814,
						R123226 AND RE46684)
	R501120	COVER	1		Χ	
4	R502814	GASKET	1		Χ	
5	R123226	GASKET	1		Х	
6	R125407	LINE	1		Χ	(ALSO ORDER R123226)
7	R128415	CLAMP	1		Χ	
8	AR21837	CLAMP	2		X	
9	R99254	HOSE	1		Χ	
10		HOSE	NA		Χ	
11	RE46684	PLUG	AR		Х	M14 X 1.5
12	51M7041	O-RING	1		Χ	11.300 X 2.200 MM

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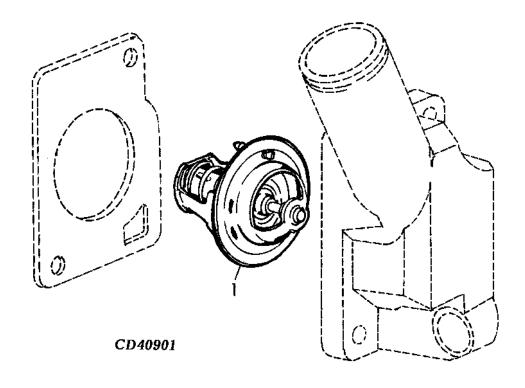




CDP45075

THERMOSTAT

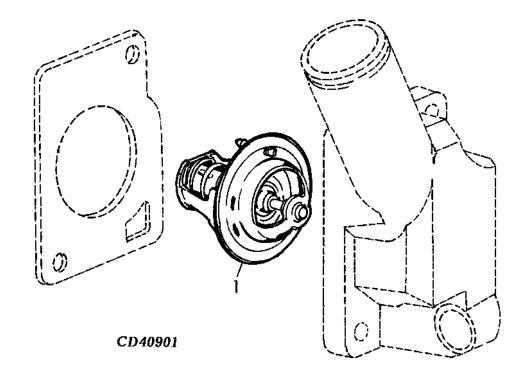
-UN-10SEP96 CD40901



0 0 0 4 4 4 5 5 5 D T H **ENGINE** QTY SERIAL NO. KEY PART NO. PART NAME **REMARKS** RE506300 THERMOSTAT X X X 82° C (180° F)

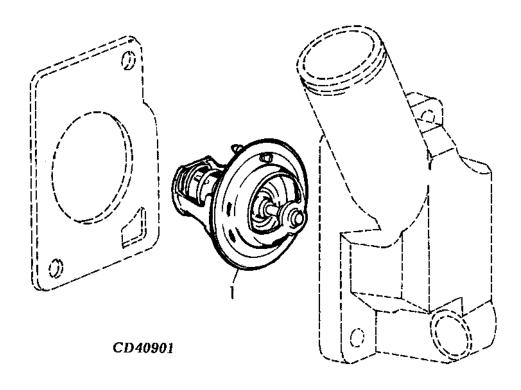
POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED PC2451 (19-NOV-01) Q-Pulse Id TMS554 Active 13/12/2013

CD40901 -UN-10SEP96



THERMOSTAT

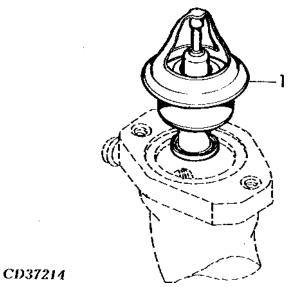
-UN-10SEP96 CD40901



0 2 9 D REMARKS **ENGINE** QTY SERIAL NO. KEY PART NO. PART NAME RE64354 THERMOSTAT X 82°C (180°F)

THERMOSTAT

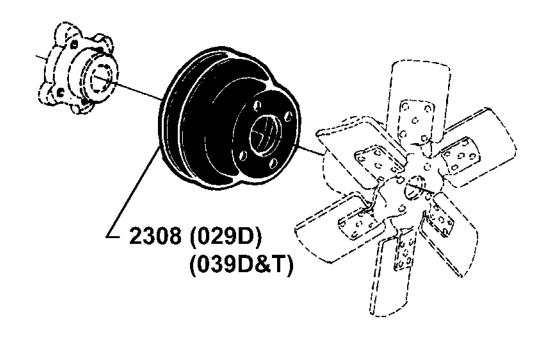
CD37214 -UN-01JAN94

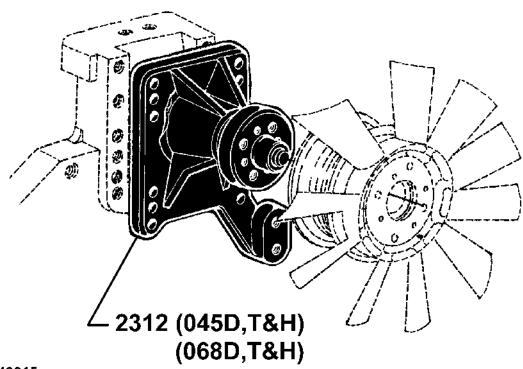


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS		
1	RE64354	THERMOSTAT	1		ХХ	82°C (180°F)		_

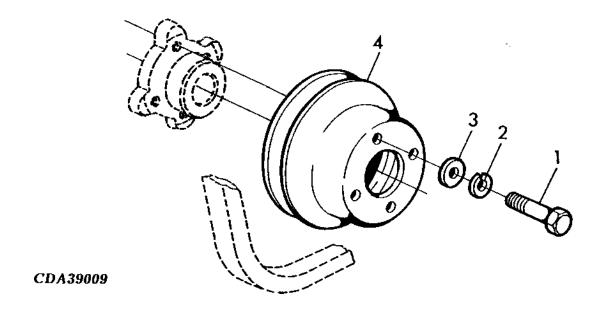
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CD43315 -UN-13NOV01

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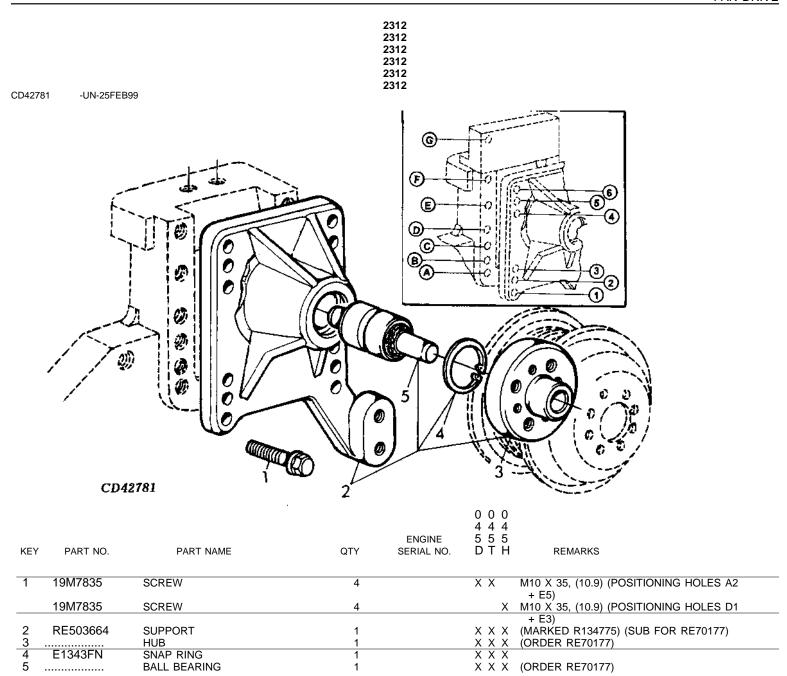
CDA39009 -UN-29SEP94



KEY	PART NO.	PART NAME	QTY	ENGINE 9	0 0 3 3 9 9 0 D T	REMARKS
1	19H2117	CAP SCREW	4	Х	ХХ	5/16" X 1-1/8"
2	12M7056	LOCK WASHER	4	X	XX	8 MM
3	24H1136	WASHER	4	X	XX	11/32" X 11/16" X 0.065"
4	R110081	SHEAVE	1	Х	XX	11/16" X OD 154MM

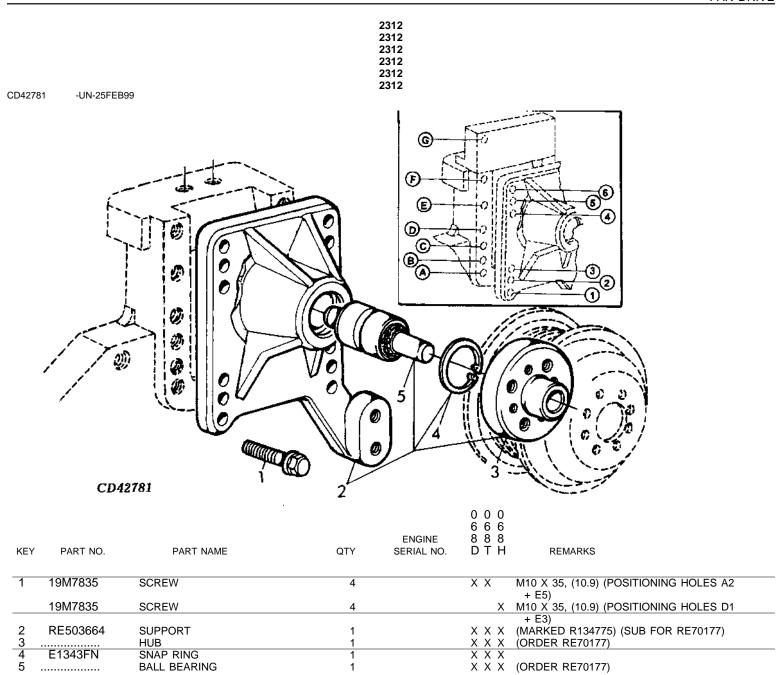
FAN DRIVE

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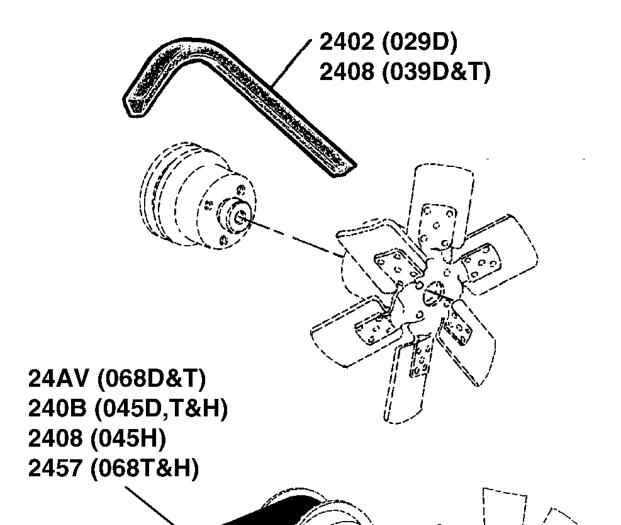
(ORDER RE70177)

BALL BEARING



FAN DRIVE

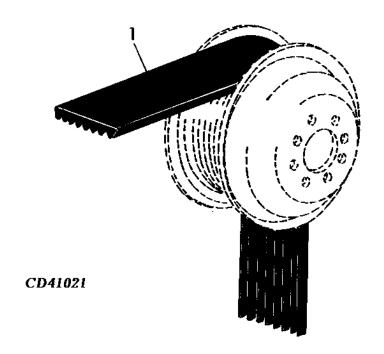
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CDP45076 -UN-13NOV01



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24AV 24AV 24AV 24AV 24AV 24AV

CD41021 -UN-31JAN96

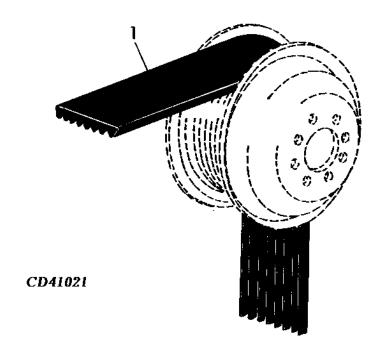


0 0 4 6 5 8 D D ENGINE & & T REMARKS

1 RE507768 BELT 1 X X LGTH 1490MM

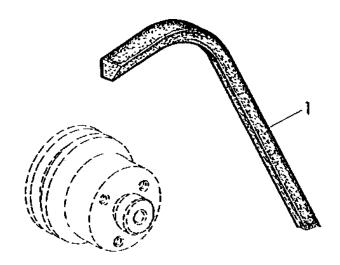
240B 240B 240B 240B 240B 240B

-UN-31JAN96 CD41021



0 0 0 4 4 4 5 5 5 D T H ENGINE QTY SERIAL NO. KEY PART NO. PART NAME **REMARKS** R123307 BELT X X X LGTH 1515MM

CD35109 -UN-01JAN94

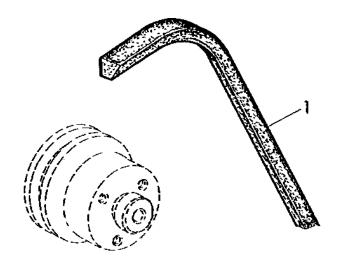


CD 35109

KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D REMARKS
1	T24473	BELT	1		X LGTH 1295MM

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CD35109 -UN-01JAN94



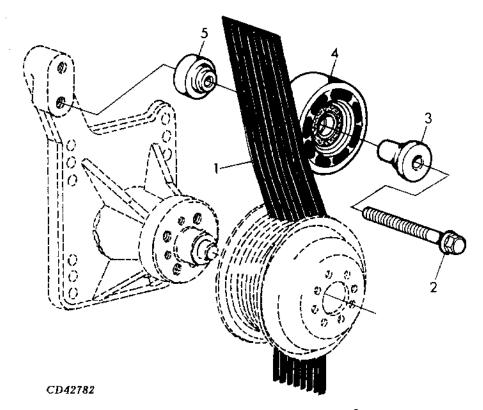
CD 35109

KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS		
1	R97939	BELT	1		X X L	GTH 1320MM		

2408
2408
2408
2408
2408
2408

-UN-25FEB99

CD42782



KEY	PART NO.	PART NAME	QTY	0 4 ENGINE 5 SERIAL NO. H	REMARKS	
1	R123441	BELT	1	Х	LGTH 1575MM	
2	19M7808	SCREW	1	X	M10 X 65, (10.9)	
3	R107749	SLEEVE	1	X		
4	RE68722	PULLEY	1	Х		
5	R500320	SPACER	1	X		

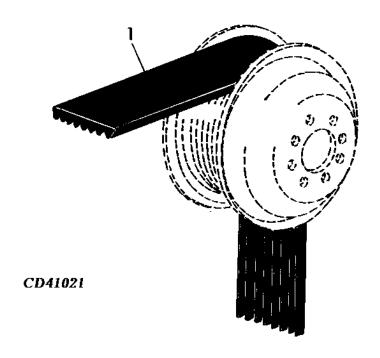
DRIVE BELT

DRIVE BELT

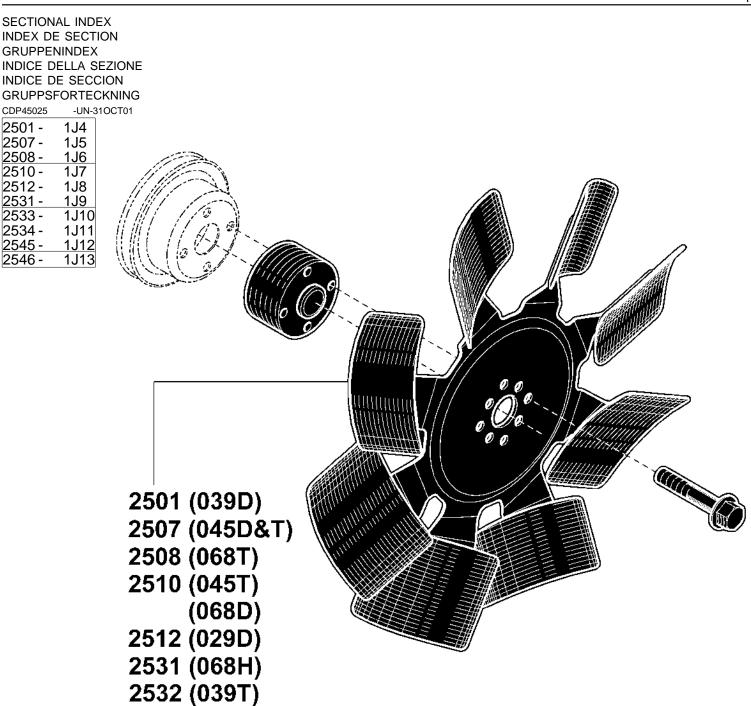
2457 2457 2457 2457 2457 2457

-UN-31JAN96

CD41021



0 0 6 6 8 8 T H **ENGINE** QTY SERIAL NO. KEY PART NO. PART NAME REMARKS R123454 BELT X X (A) LGTH 1500MM



CDP45025

2533 (045H)

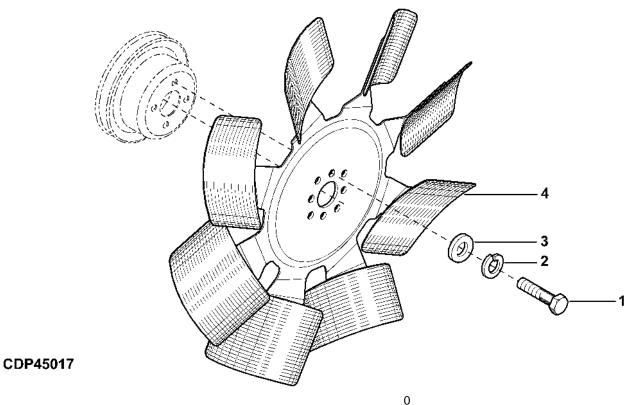
2534 (045T)

2545 (045D)

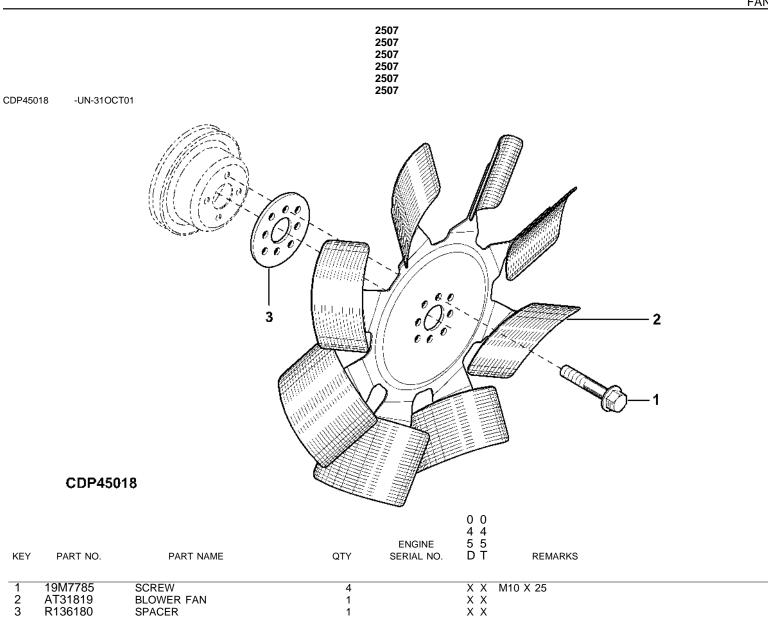
2546 (068T)

(068D)

CDP45017 -UN-31OCT01



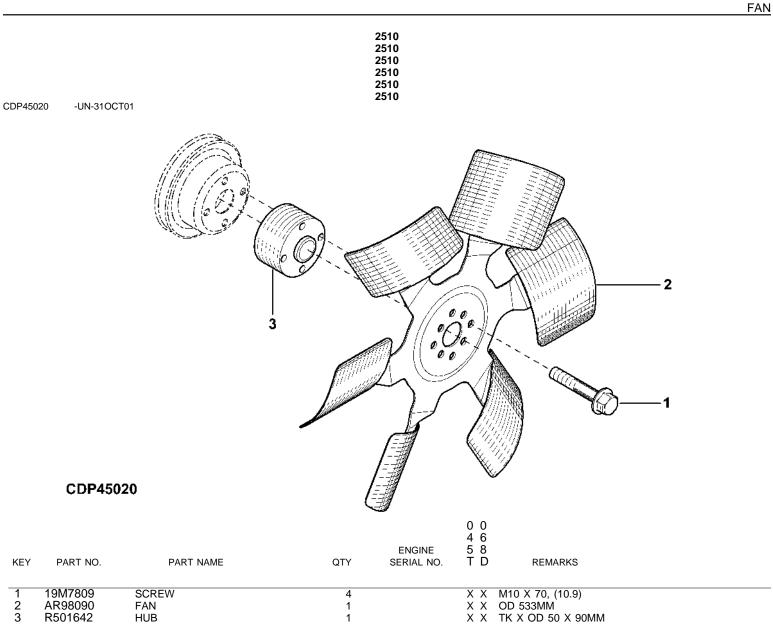
KEY	PART NO.	PART NAME		ENGINE 9 ERIAL NO. D	REMARKS	
1	19H2127	CAP SCREW	4	Х	5/16" X 7/8"	
2	12M7056	LOCK WASHER	4	X	8 MM	
3	24H1292	WASHER	4	X	11/32" X 3/4" X 0.120"	
4	AT31819	BLOWER FAN	1	Х	0D 533MM	

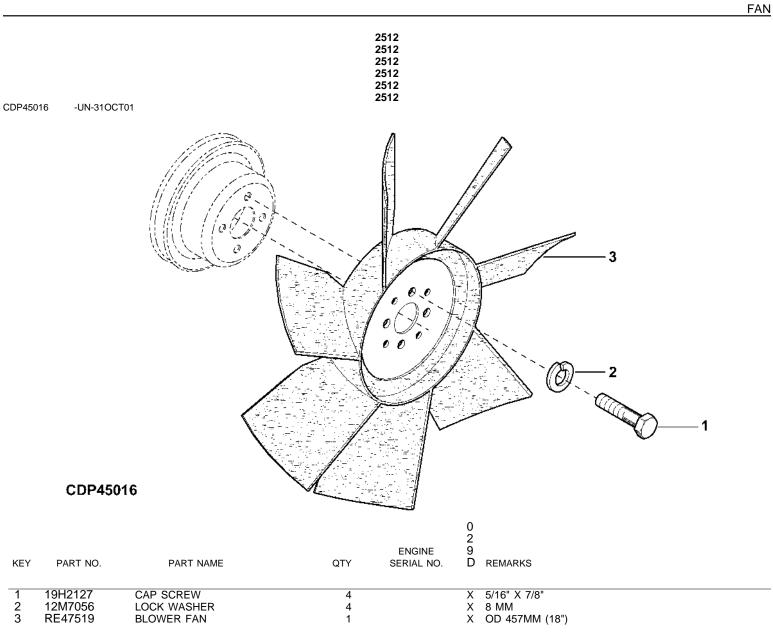


			FAN
CDP45019	-UN-31OCT01	2508 2508 2508 2508 2508 2508	
		1	

CI	٦P.	45	በ1	q

KEY	PART NO.	PART NAME		NGINE 8 RIAL NO. T	REMARKS	
1	19M7809	SCREW	4	X	M10 X 70, (10.9)	
2	AT24834	BLOWER FAN	1	X	OD 533MM	
3	R501642	HIIR	1	X	TK X OD 50 X 90MM	





							FAN
CDP4502	22 -UN-31OC	2T01	2 2 2 2	2531 2531 2531 2531 2531 2531			
	CDP450	3—				2	
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 H	REMARKS	
1 2 3	19M7812 AT24834 R128443	SCREW BLOWER FAN SPACER	4 1 1		X X X	M10 X 100 0D 533MM	

1	J	1	

							FAN
CDP450	21 -UN-310C	то1		2533 2533 2533 2533 2533 2533 2533			
	CDP450	21				2 ——1	
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 H	REMARKS	
1 2 3	19M7812 AT31819 R128443	SCREW BLOWER FAN SPACER	4 1 1		X X X	M10 X 100 0D 533MM	

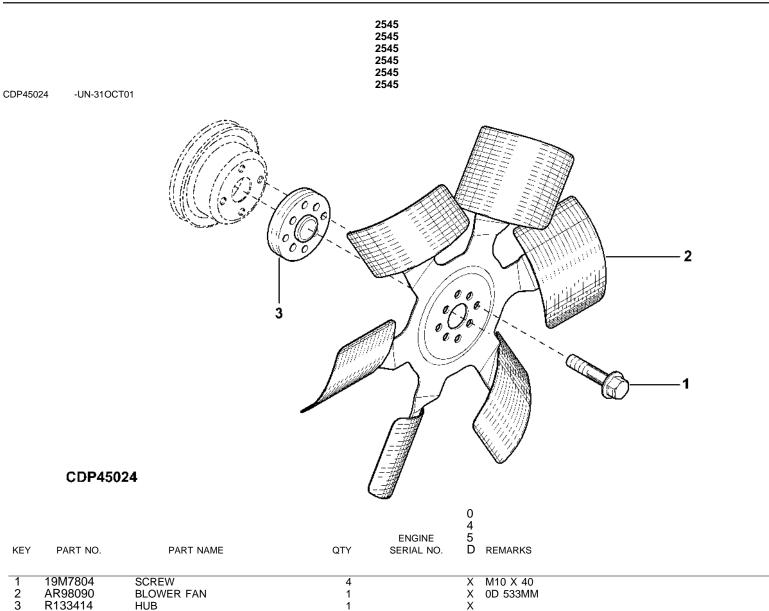
POWER UNITS FOR	GENSET APPLICATI	ONS AND FOR	VARIABLE SPEED	PC2451	(19-NOV-01)
O-Pulsa Id TMS55/	1			Active 13/	12/2013

					FAN
CDP4502	23 -UN-31OCT	T01	2534 2534 2534 2534 2534 2534		
	CDP450	23	3		
KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO	0 0 4 6 5 8 . T D REMARKS	
1 2 3	19M7809 AT31819 R501642	SCREW BLOWER FAN HUB	4 1 1	X X M10 X 70 X X 0D 533MM X X	

1	J]1	
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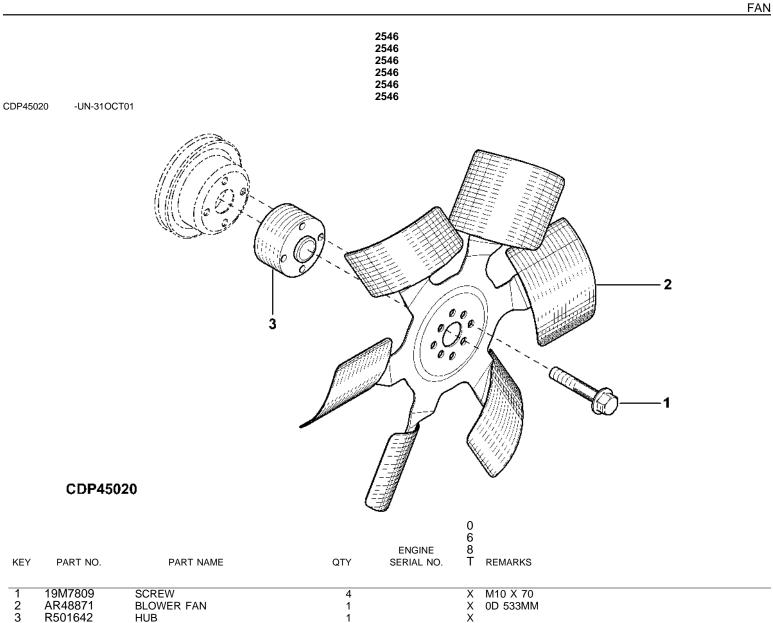
POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED PC2451

Q-Pulse Id TMS554



(19-NOV-01)

Active 13/12/2013

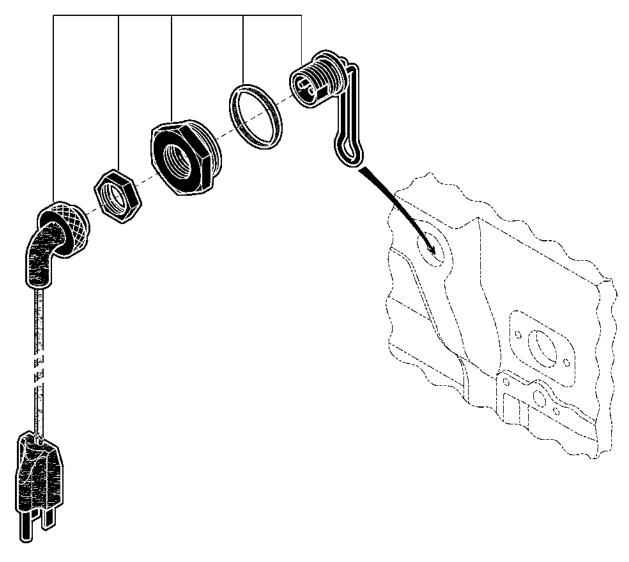


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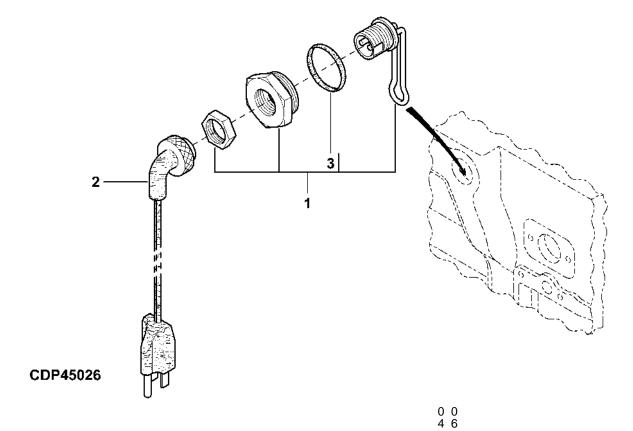
> 2601 (045D&T) (068D&T) 2602 (045D&T) (068D&T)



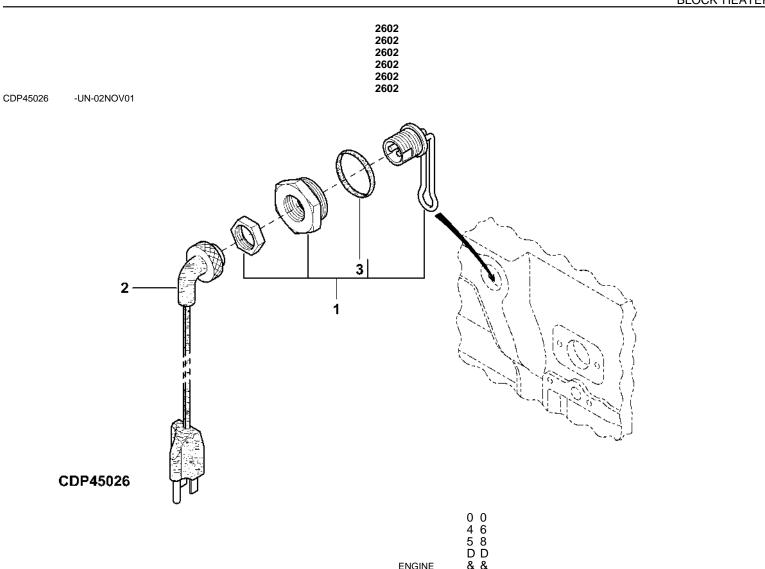
CDP45027

2601
2601
2601
2601
2601
2601

CDP45026

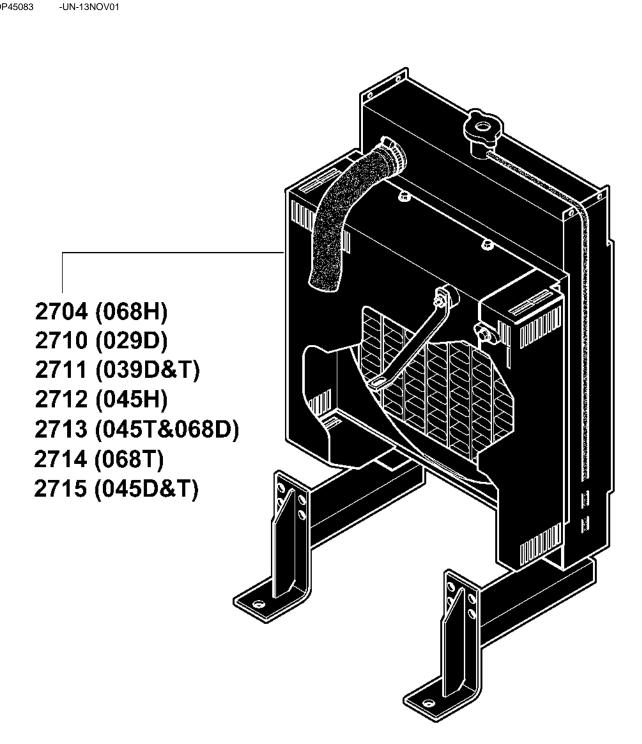


KEY	PART NO.	PART NAME	QTY S	5 8 D D ENGINE & & ERIAL NO. T T	REMARKS	
1	RE42138	COOLANT HEATER	1	X	(110V)	
2	AR50411	WIRING LEAD	1	X	,	
3	R501377	RING	1	X		



KEY	PART NO.	PART NAME		GINE & & AL NO. TT	REMARKS	
1	RE42140	COOLANT HEATER	1	X (2	220V)	
2	AR50411	WIRING LEAD	1	X	•	
3	R501377	RING	1	Χ		

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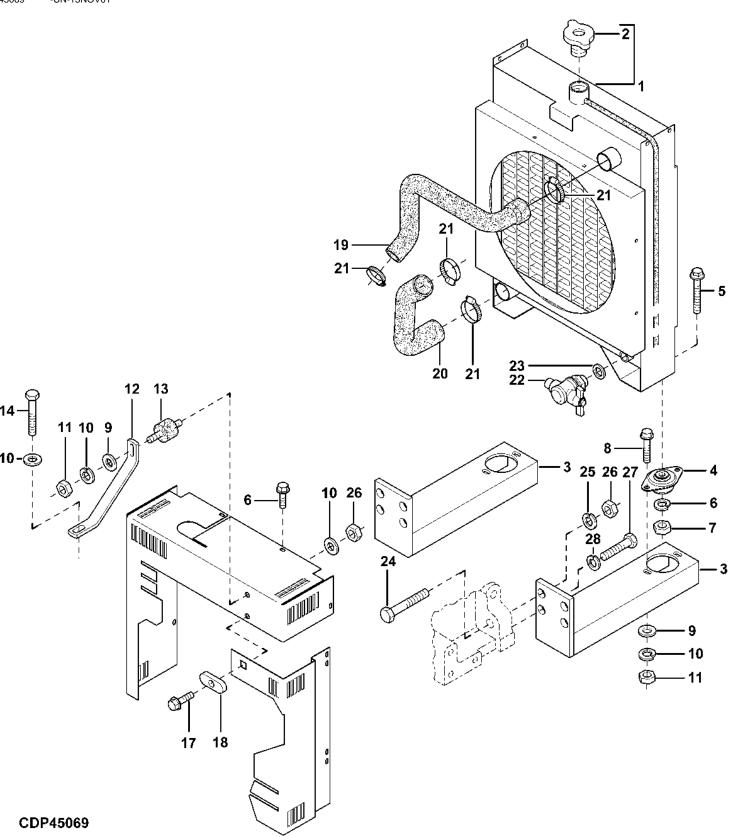
2704 - 1J20 2710 - 1J22 2711 - 1J24 2712 - 1K1 2713 - 1K3 2714 - 1K5

CDP45083

				ENGINE	0 6 8	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	H	REMARKS
1	RE507891	RADIATOR	1		Х	
2	RE62221	FILLER CAP	1		Χ	
3	RE504649	REINFORCEMENT	1		Χ	LH
4	RE504648	REINFORCEMENT	1		Х	RH
5	RE504533	RUBBER MOUNT	5		Χ	
6	24M7055	WASHER	10		Χ	
7	12M7056	LOCK WASHER	11		Χ	•
8	14M7273	NUT	11		Χ	M8
9	R502207	REINFORCEMENT	1_		X	
10	19M7791	SCREW	1		Χ	M12 X 40
11	RE507002	GRATE	1		Х	
12	R504045	GRATE	1_		X	
13	19M7964	CAP SCREW	16		Х	M8 X 12
14	T307266	STRAP	1		Х	
15	R502201	TUBE	1		X	
16	R502200	TUBE	1		Х	
17	R502198	HOSE	1		Х	
18	R502199	HOSE	1		X	
19	R502699	COUPLING	2		Х	
20	R502698	COUPLING	2		Х	
21	N10010	CLIP	3		X	
22	R502701	CLAMP	1		X	
23	R502700 19M7866	REINFORCEMENT	1		X	M0 V 00
24 25	24H1292	SCREW WASHER	1		X	M8 X 20 8.738 X 19.050 X 3.048 MM
26	19M7789	SCREW	 		X	
27	19M7769 12M7069	LOCK WASHER	5 2		X	16 MM
28	AR65294	CLAMP	4		$\frac{\hat{x}}{x}$	10 IVIIVI
29	RE505665	CLAMP	2		X	
30	RE505666	CLAMP	6		X	
31	RE506656	SHUT-OFF VALVE	1		$\frac{\hat{x}}{x}$	
32	R120247	RING	1		X	
33	19M8035	CAP SCREW	2		X	M16 X 35
55	101010000	OAI GOILEV	2		^	IVITO A GO

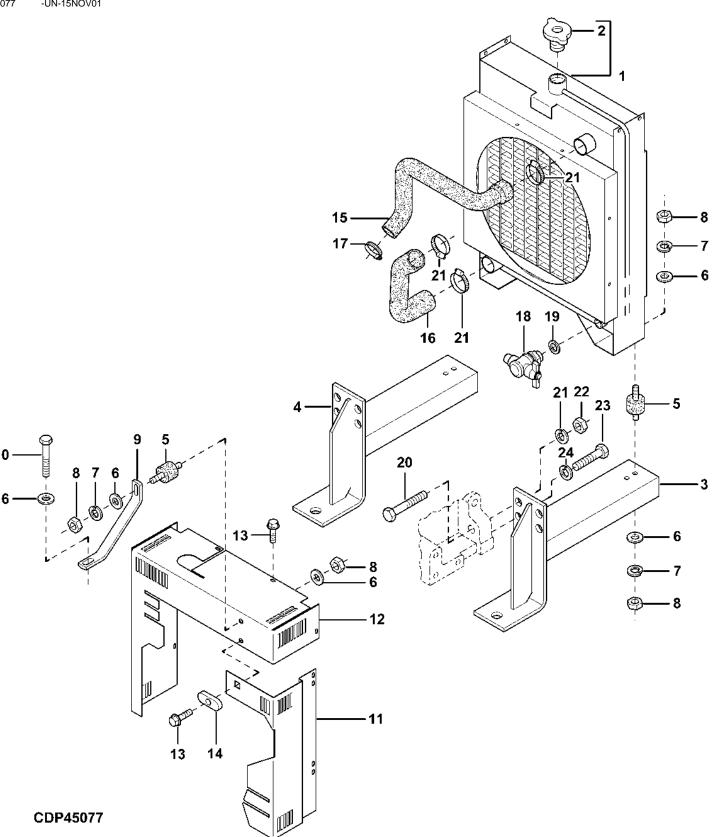
2710

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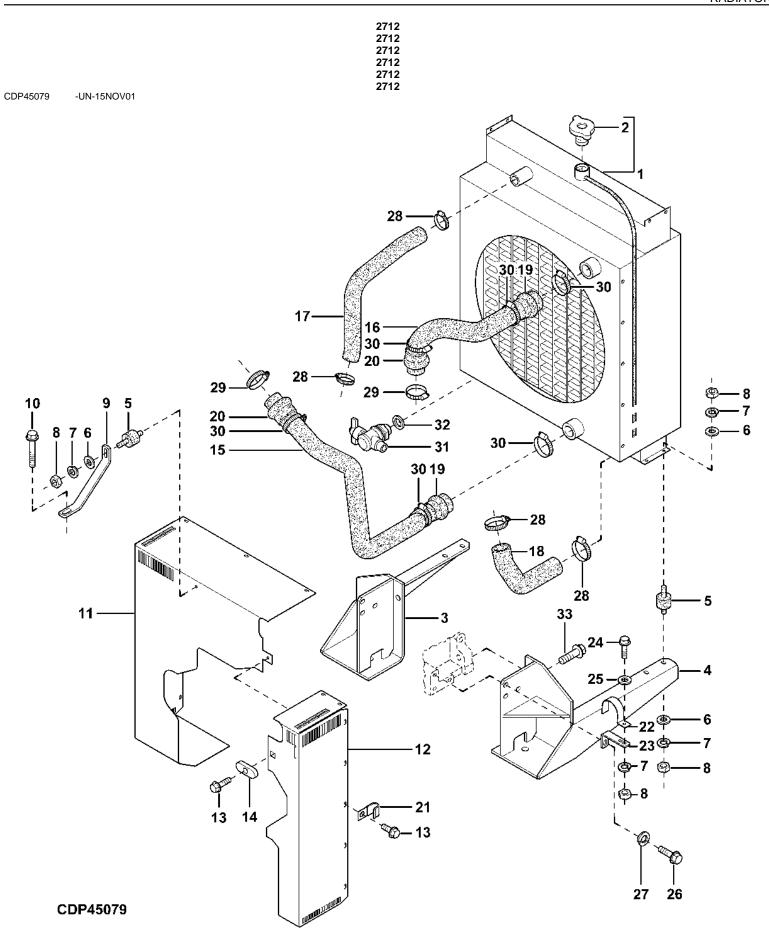


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS
1	RE507886	RADIATOR	1		Х	
2	RE62221	FILLER CAP	1		Χ	
3	RE503707	REINFORCEMENT	2		Χ	
4	RE503700	RUBBER MOUNT	2		Χ	
5	19M7807	SCREW	2		Χ	M10 X 60
6	12M7135	LOCK WASHER	2		Χ	10 MM
7	14M7274	NUT	2		Χ	M10
8	19M7284	CAP SCREW	4		Χ	M8 X 18
9	24M7055	WASHER	5			8.400 X 16 X 1.600 MM
10	12M7056	LOCK WASHER	5		Χ	8 MM
11	14M7273	NUT	5		Χ	M8
12	R502881	REINFORCEMENT	1		Χ	
13	RE503699	RUBBER MOUNT	1		Χ	
14	19H1792	CAP SCREW	1		Χ	12.700 X 25.400 MM
15	RE504882	GRATE	1		Χ	
16	R502680	GRATE	1		Χ	
17	19M7964	CAP SCREW	7		Χ	M8 X 12
18	T30726	STRAP	1		Χ	
19	R502096	HOSE	1		Χ	
20	R502679	HOSE	1		Χ	
21	AR65294	CLAMP	4		Χ	
22	RE506656	SHUT-OFF VALVE	1		Χ	
23	R120247	RING	1		Χ	
24	19H2358	CAP SCREW	2		X	
25	12H317	LOCK WASHER	2		Χ	
26	14H886	NUT	2		Χ	
27	19H1756	CAP SCREW	2		X	
28	12M7069	LOCK WASHER	2		X	0.630"

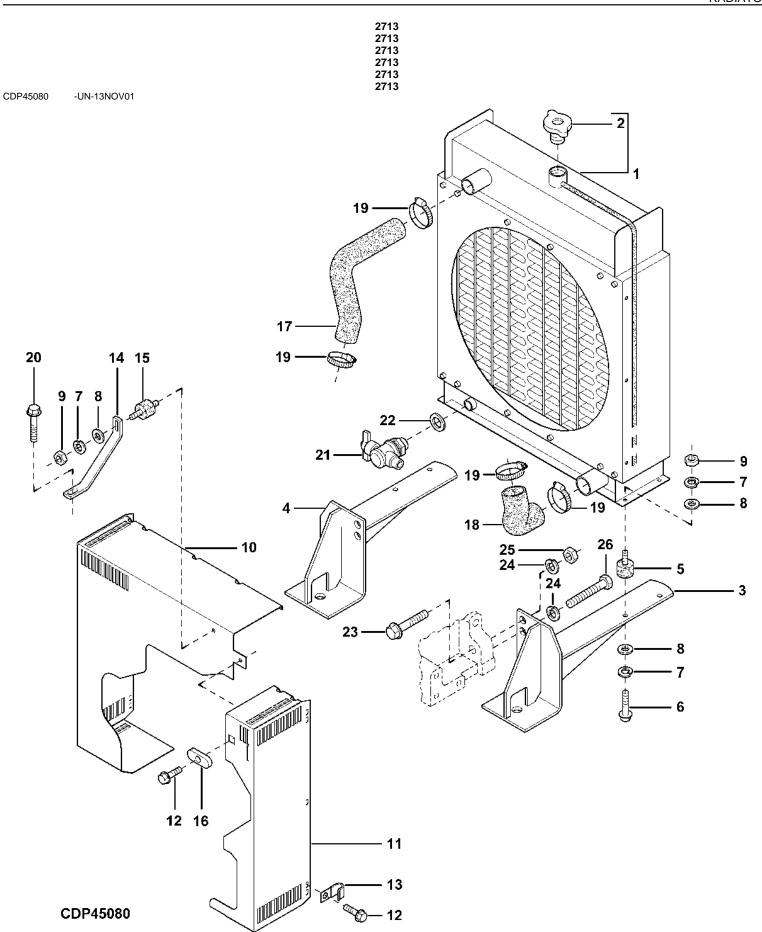
CDP45077 -UN-15NOV01



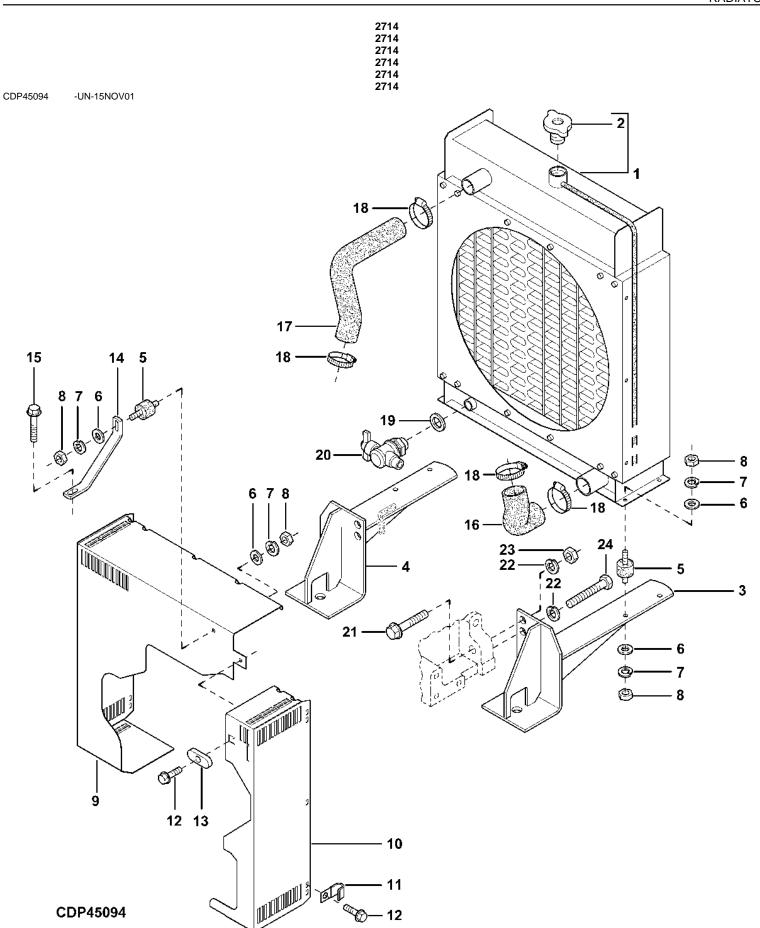
				ENGINE	0 0 3 3 9 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DΤ	REMARKS
1	RE507887	RADIATOR	1		ХХ	
2	RE62221	FILLER CAP	1		XX	
3	RE503771	REINFORCEMENT	1		XX	DLI
4	RE503771	REINFORCEMENT	1		$\frac{\wedge}{X}\frac{\wedge}{X}$	
5	RE503699	RUBBER MOUNT	2		XX	LII
6	24M7055	WASHER	6			8.400 X 16 X 1.600 MM
7	12M7056	LOCK WASHER	6			8 MM
8	14M7273	NUT	6		XX	
9	R502880	REINFORCEMENT	1		XX	WO
10	19H1792	CAP SCREW	1			1/2" X 1"
11	RE504883	GRATE	1		XX	<i>''- ''</i>
12	R502680	GRATE	1		XX	
13	19M7964	CAP SCREW	1		XX	M8 X 12
14	T30726	STRAP	1		ХХ	
15	R502132	HOSE	1		ΧХ	
16	R502134	HOSE	1		ХХ	
17	AR65294	CLAMP	3		ΧХ	
18	RE506656	SHUT-OFF VALVE	1		ΧХ	
19	R120247	RING	1		ХХ	
20	19H2358	CAP SCREW	2		ХХ	
21	12H317	LOCK WASHER	2		ХХ	9/16"
22	14H886	NUT	2		XX	9/16"
23	19H1756	CAP SCREW	2		ХХ	5/8" X 1-1/2"
24	12M7069	LOCK WASHER	2		ХХ	0.630"



					•	
					0	
				ENGINE	4	
14514	DART NO	DADT MAME	OT) (ENGINE	5 H	DEMARKO
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	П	REMARKS
1	RE507889	RADIATOR	1		Х	
2	RE62221	FILLER CAP	1		Χ	
3	RE504649	REINFORCEMENT	1		Χ	
4	RE504648	REINFORCEMENT	1		Χ	RH
5	RE504533	RUBBER MOUNT	5		Χ	
6	24M7055	WASHER	10		Χ	
7	12M7056	LOCK WASHER	11		Χ	
8	14M7273	NUT	11		Χ	M8
9	R502207	REINFORCEMENT	1		Χ	
10	19M7791	SCREW	1		Χ	M12 X 40
11	RE507002	GRATE	1		Χ	
12	R504045	GRATE	11		X	
13	19M7964	CAP SCREW	16		Χ	M8 X 12
14	T30726	STRAP	1		Χ	
15	R502283	TUBE	1_		X	
16	R502200	TUBE	1		Χ	
17	R502198	HOSE	1		Χ	
18	R502199	HOSE	1_		X	
19	R502699	COUPLING	2		Χ	
20	R502698	COUPLING	2		Χ	
21	N10010	CLIP	3		X	
22	R502701	CLAMP	1		Χ	
23	R502700	REINFORCEMENT	1		Χ	
24	19M7866	SCREW	1_		X	
25	24H1292	WASHER	1		Χ	
26	19M7789	SCREW	5		Χ	
27	12M7069	LOCK WASHER	2		X	16 MM
28	AR65294	CLAMP	4		Χ	
29	RE505665	CLAMP	2		Χ	
30	RE505666	CLAMP	6		X	
31	RE506656	SHUT-OFF VALVE	1		Χ	
32	R120247	RING	1		Χ	
33	19M8035	CAP SCREW	2		Χ	M16 X 35



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	5	6	REMARKS
1	RE507888	RADIATOR	1		Х	Х	
2	RE62221	FILLER CAP	1		Χ	Х	
3	RE505617	REINFORCEMENT	1		Χ	Χ	RH
4	RE505618	REINFORCEMENT	1				
5	RE506257	RUBBER MOUNT	4		Χ	Χ	
6	19M7284	CAP SCREW	4		Χ	Χ	M8 X 18
7	12M7056	LOCK WASHER	5				8 MM
8	24M7055	WASHER	5				8.400 X 16 X 1.600 MM
_9	14M7273	NUT	6				M8
10	RE506722	GRATE	1			Χ	
11	R504056	GRATE	1		Χ		
12	19M7964	CAP SCREW	7				M8 X 12
13	N10010	CLIP	1		Χ		
14	R503975	REINFORCEMENT	1		Χ		
15	RE504533	RUBBER MOUNT	1		Х		
16	T30726	STRAP	1			Χ	
17	R502357	RADIATOR HOSE	1		Χ		
18	R502394	RADIATOR HOSE	1			Χ	
19	AR65294	CLAMP	4			Χ	
20	19M7788	SCREW	1		Χ		
21	RE506656	SHUT-OFF VALVE	1		Х		
22	R120247	RING	1			Χ	
23	19M8035	CAP SCREW	2				M16 X 35
24	12M7069	LOCK WASHER	4				0.630"
25	14M7276	NUT	2			Χ	M16
26	19M7417	CAP SCREW	2		Х	Χ	M16 X 65



					0	
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	8 T	REMARKS
1	RE507890	RADIATOR	1		Х	
2	RE62221	FILLER CAP	1		Χ	
3	RE505615	REINFORCEMENT	1		Χ	RH
3 4	RE505616	REINFORCEMENT	1		Х	
5	RE504533	RUBBER MOUNT	5		Χ	
6	24M7055	WASHER	10		Χ	8.400 X 16 X 1.600 MM
7	12M7056	LOCK WASHER	10		Х	8 MM
8	14M7273	NUT	10		Χ	M8
9	RE506722	GRATE	1		Χ	
10	R504056	GRATE	1		Х	
11	N10010	CLIP	3		Χ	
12	19M7964	CAP SCREW	7		Χ	M8 X 12
13	T30726	STRAP	1		Х	
14	R503975	REINFORCEMENT	1		Χ	
15	19M7788	SCREW	1		Χ	M12 X 25
16	R502393	RADIATOR HOSE	1		Х	
17	R502394	RADIATOR HOSE	1		Χ	
18	AR65294	CLAMP	4		Χ	
19	R120247	RING	1		Х	
20	RE506656	SHUT-OFF VALVE	1		Χ	
21	19M8035	CAP SCREW	2		Χ	M16 X 35
22	12M7069	LOCK WASHER	4		Х	16 MM
23	14M7276	NUT	2		Χ	M16
24	19M7417	CAP SCREW	2		Χ	M16 X 65

					0 0		
					4 4		
				ENGINE	5 5		
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	D T		
1	RE507082	RADIATOR	1		ХХ		
2	RE62221	FILLER CAP	1		XX		
3	RE503771	REINFORCEMENT	1			RH	
4	RE503770	REINFORCEMENT	1		XX		
5	12M7056	LOCK WASHER	5			8 MM	
6	24M7055	WASHER	5			8.400 X 16 X 1.600 MM	
7	14M7273	NUT	<u>5</u>			M8	
8	RE507084	GRATE	1		XX		
9	R504075	GRATE	1		XX		
10	19M7964	CAP SCREW	7			M8 X 12	
11	T30726	STRAP	1		XX		
12	R504073	HOSE	1		XX		
13	R504074	HOSE	<u>.</u>		XX		
14	AR65294	CLAMP	4		XX		
15	R504084	REINFORCEMENT	1		ХХ		
16	RE503699	RUBBER MOUNT	3		ХХ		
17	RE506656	SHUT-OFF VALVE	1		ХХ		
18	R120247	RING	1		ХХ		
19	19M7788	SCREW	1			M12 X 25	
20	19M7417	CAP SCREW	2			M16 X 65	
21	12M7069	LOCK WASHER	4			16 MM	
22	14M7276	NUT	2			M16	
23	19M8035	CAP SCREW	2		ΧХ	M16 X 35	

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2803 (039D&T)

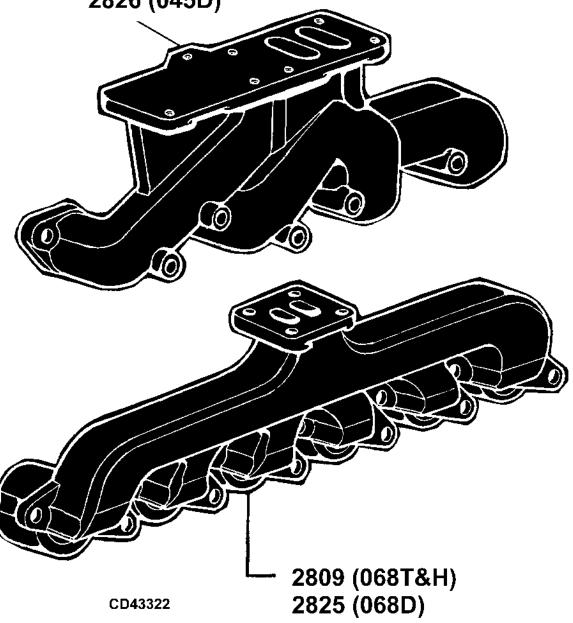
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2806 (029D)

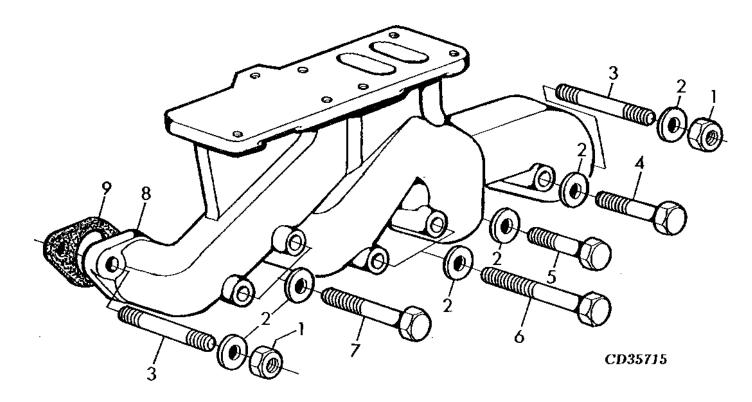
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2822 (045D)

2826 (045D)

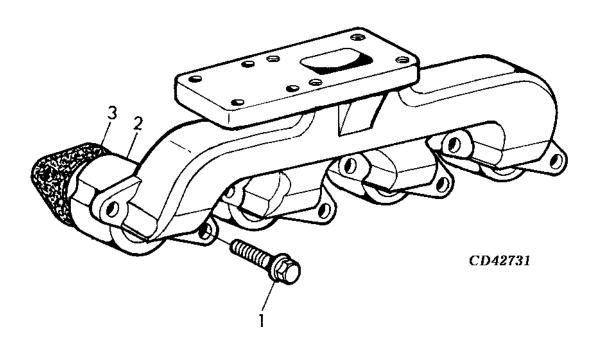


CD35715 -UN-01JAN94



KEY	PART NO.	PART NAME	QTY	;	0 0 3 3 9 9 D T	REMARKS	
1	14H812	NUT	2		ХХ	3/8"	
2	24M7106	WASHER	8		ΧХ	10 X 18 X 2.500 MM	
3	R106861	STUD	2		ΧХ		
4	19H3404	CAP SCREW	1		ХХ	3/8" X 4", (SAE 8)	
5	19H1732	CAP SCREW	1		ΧХ	3/8" X 1-1/4"	
6	19H2104	CAP SCREW	2		ΧХ	3/8" X 5"	
7	19H1925	CAP SCREW	2		ХХ	3/8" X 4-1/4"	
8	R52819	EXHAUST MANIFOLD	1		ΧХ		
9	R109985	GASKET	4		ΧХ		

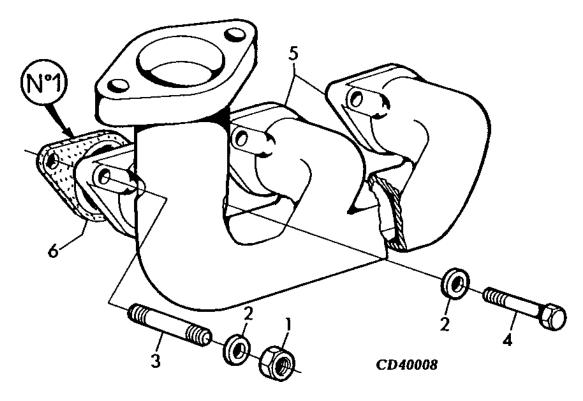
CD42731 -UN-24FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS	
1	19M7810	SCREW	8		XXI	M10 X 80, (10.9)	
2	R132373	EXHAUST MANIFOLD	1		ХХ		
3	R109985	GASKET	4		ХХ		

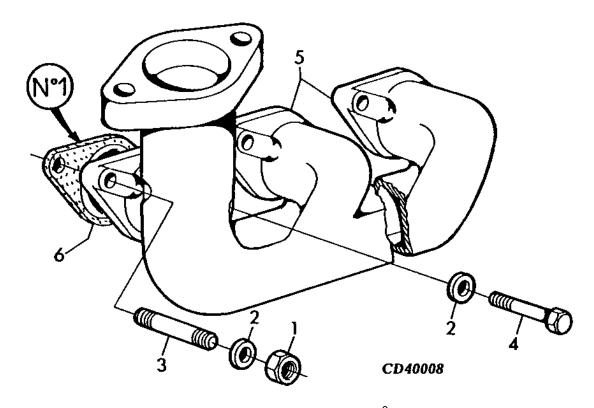
EXHAUST MANIFOLD

CD40008 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS	
1	14H812	NUT	2		Х	3/8"	
2	24M7106	WASHER	6		Χ	10 X 18 X 2.500 MM	
3	R106861	STUD	2		Χ	9.525 X 48.500 MM	
4	19H1732	CAP SCREW	4		Х	3/8" X 1-1/4", (SAE 8)	
5	T20257	EXHAUST MANIFOLD	1		Χ	,	
6	R109985	GASKET	3		X		

CD40008 -UN-20JUL95



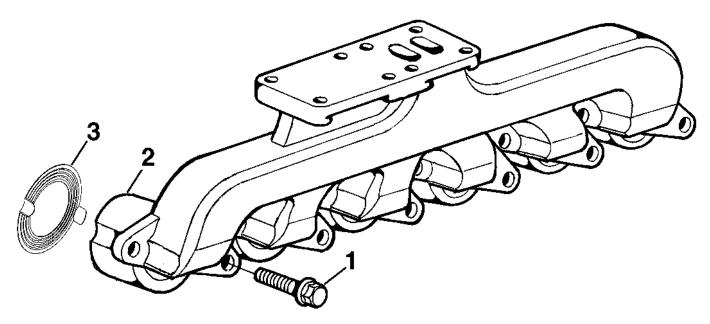
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 D	REMARKS	
1	14H812	NUT	2		Х	3/8"	
2	24M7106	WASHER	8		Χ	10 X 18 X 2.500 MM	
3	R106861	STUD	2		Χ	9.525 X 48.500 MM	
4	19H1732	CAP SCREW	6		Х	3/8" X 1-1/4", (SAE 8)	
5	T20255	EXHAUST MANIFOLD	1		Χ		
6	R109985	GASKET	4		Χ		

Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

EXHAUST MANIFOLD

EXHAUST MANIFOLD

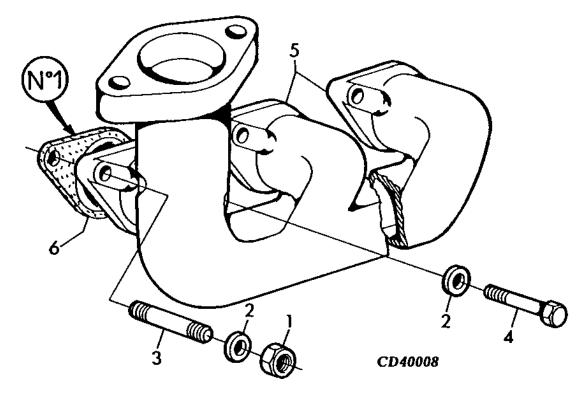
-UN-13NOV01 CDP45082



CDP45082

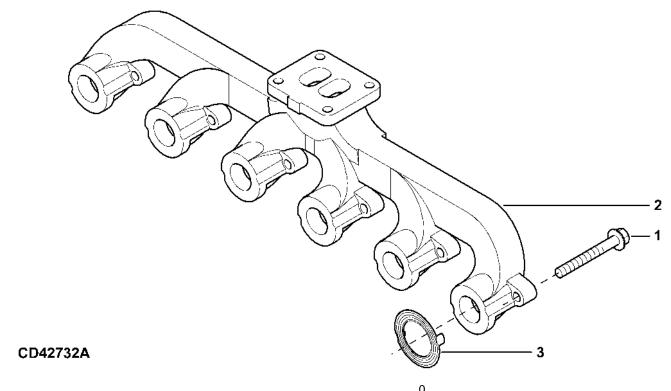
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 6 6 8 8 T H	REMARKS		
1	19M7810	SCREW	12		Х	M10 X 80, (10.9)		
2	R132262	EXHAUST MANIFOLD	1		Χ			
3	R119395	GASKET	6		Х			

CD40008 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS	
1	R133148	EXHAUST MANIFOLD	1		Х		
2	19M7786	SCREW	8		Χ	M10 X 30	
3	R56588	STRAP	1		Χ		
4	R90658	GASKET	4		Х		

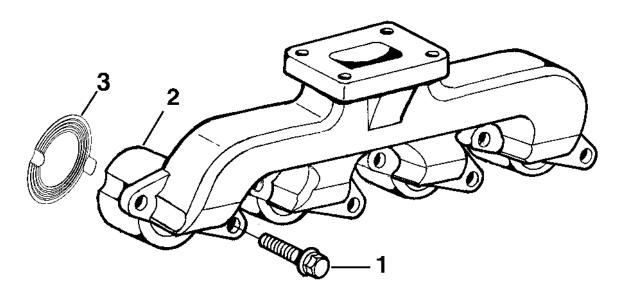
-UN-10OCT01 CD42732A



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 D	REMARKS	
1	R132203	EXHAUST MANIFOLD	1		Х		
2	19H3411	CAP SCREW	4		Χ	3/8" X 1-1/8"	
3	19M7810	SCREW	12		Χ	M10 X 80	
4	N10215	LOCK NUT	4		Х	3/8"	
5	R123572	GASKET	1		Χ		
6	R119395	GASKET	6		Х		

EXHAUST MANIFOLD

CDP45084 -UN-13NOV01

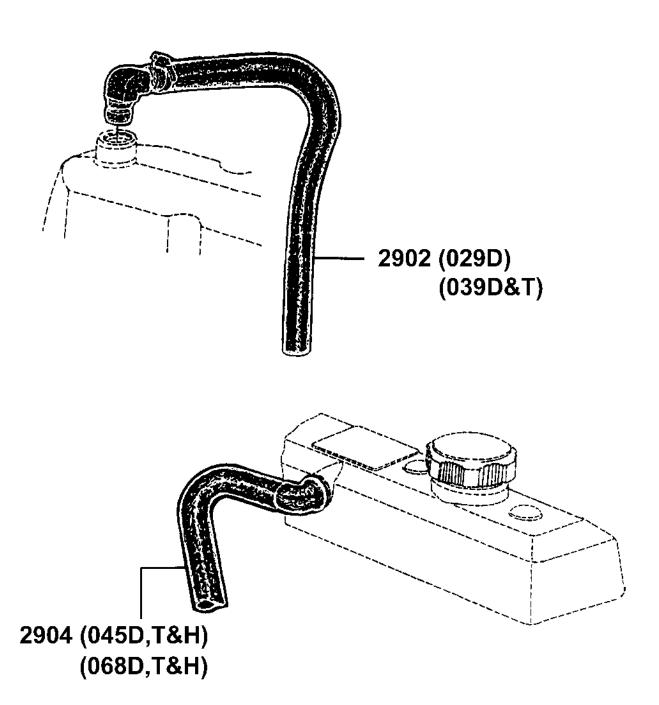


CDP45084

KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS	
1	R132260	EXHAUST MANIFOLD	1		Х		
2	19H3411	CAP SCREW	4		Χ	3/8" X 1-1/8"	
3	19M7810	SCREW	8		Χ	M10 X 80	
4	N10215	LOCK NUT	4		Х	3/8"	
5	R123572	GASKET	1		Χ		
6	R119395	GASKET	4		Χ		

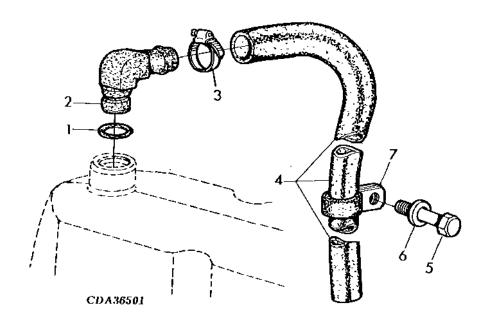
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CDP45091

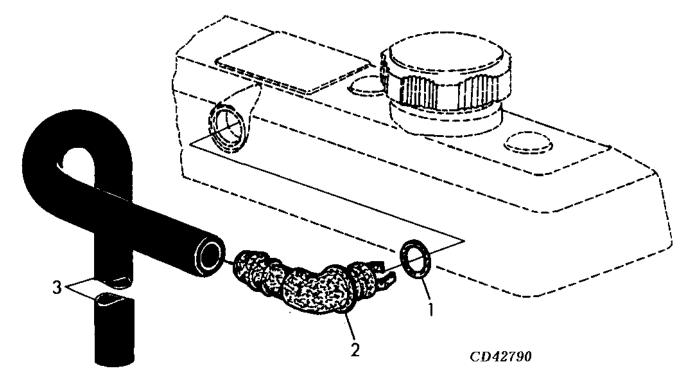
CDA36501 -UN-02DEC94



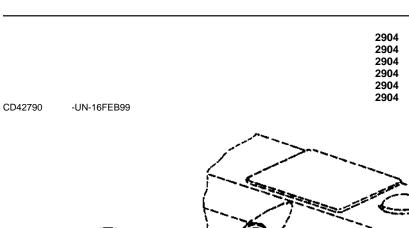
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 2 3 3 9 9 9 D D T	REMARKS
1	R56463	O-RING	1		XXX	
2	R92154	ELBOW FITTING	1		X X X	
3	AT18904	CLAMP	1		$X \times X$	
4	R122401	TUBE	1		XXX	LGTH 1290MM, CUT TO LENGTH, COUPER A
						LONGUEUR, ABLAENGEN, TAGLIARE SU
						MISURE, CORTAR A LONGITUD, AVSKARE
						EFTER MATT
5	19H2038	CAP SCREW	1		X X X	3/8" X 1/2"
_6	24M7096	WASHER	1		X X X	10.500 X 18 X 1.600 MM
7	T35699	CLAMP	1		X X X	

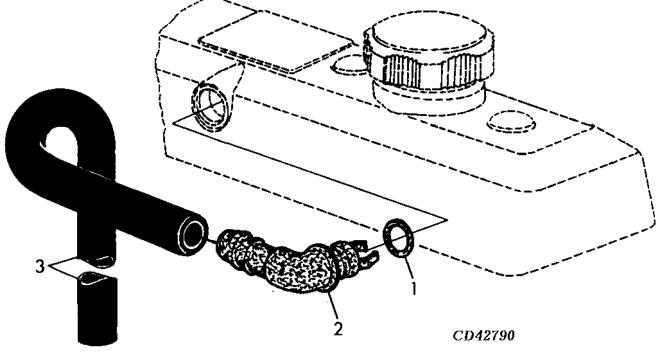
BREATHER





KEY	PART NO.	PART NAME	ENGIN QTY SERIAL I		REMARKS	
1	R72328	O-RING	1	XXX		
2	R120467	ELBOW FITTING	1	X X X 90°	0	
3	R122401	TUBE	1	X X X LG	TH 1290MM	





KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS	
1	R72328	O-RING	1		XXX		
2	R120467	ELBOW FITTING	1		X X X 90)°	
3	R122401	TUBE	1		X X X L	GTH 1290MM	

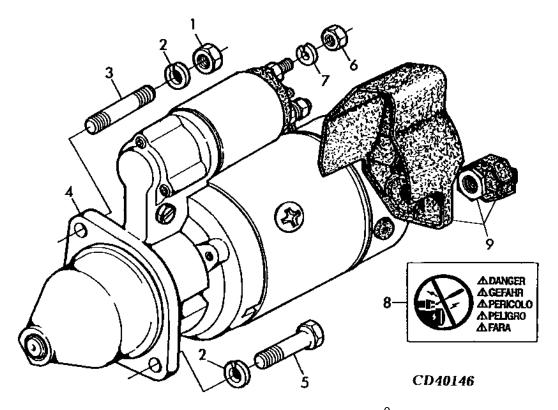
BREATHER

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CD40146 -UN-06DEC95

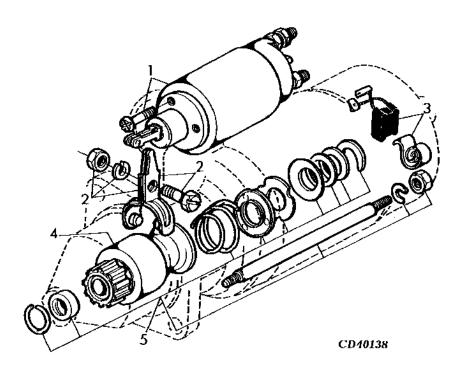


KEY	PART NO.	PART NAME		2 INGINE 9 RIAL NO. D	REMARKS
1	14H812	NUT	1	Х	3/8"
2	L39334	STUD	1	X	3/8" X LGTH 43MM
3	19H3239	CAP SCREW	1	X	3/8" X 1-1/4", (SAE 8)
4	RE500733	STARTER MOTOR	1	X	(ISKRA AZJ 3283, 12V - 3.1KW), ALSO ORDER
					RT7700040288 AND R116617
5	RT7700040288	COVER	AR	X	
6	14M7140	NUT	1	Х	M10
7	12M7066	LOCK WASHER	1	X	10 MM
8	R116617	LABEL	1	X	BYPASS START, DEMARRAGE COURT-CIRCUITE,
					ANILAGO CICHEDHEITOCHALTED ACCENCIONE IN

ANLASS-SICHERHEITSCHALTER,ACCENSIONE IN FOLLE,ARRANQUE POR DERIVACION,STARTSPEAR

3008 - CONTINUED 3008 - SUITE 3008 - FORTSETZUNG 3008 - SEGUITO 3008 - CONTINUACION 3008 - FORTS

CD40138 -UN-02DEC94



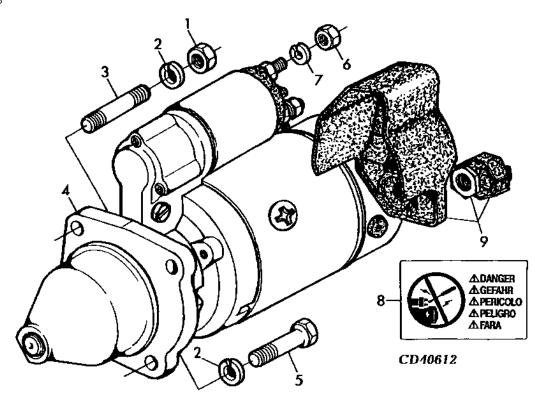
KEY	PART NO.	PART NAME	ENGIN QTY SERIAL		
1	RE501768	SOLENOID	1	X (A)	
2	RE62666	SHIFTER	1	X = (A)	
3	RE62667	KIT	1	X (A) W/ (2) CARBON BRUSH CONDUCTOR, BALAI,	
				KOHLEBUERSTE, SPAZZOLE DI CARBONE,	
				ESCOBILLA, KOLBORSTE	
4	RE62668	BENDIX DRIVE	1	X (A)	
5	RE62669	KIT	1	X (A)	

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

STARTER

CD40612

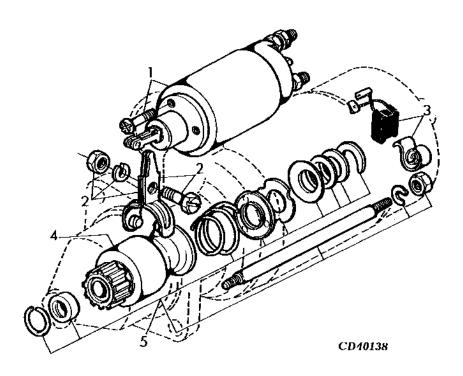
-UN-09FEB96



KEY	PART NO.	PART NAME	QTY	ENGINE 9 SERIAL NO. D	3	REMARKS
1	14H812	NUT	1	Х	Χ	3/8"
2	12H304	LOCK WASHER	3	X	Χ	3/8"
3	L39334	STUD	1	X	Χ	LGTH 43MM X 3/8"-16UNC
4	RE503093	STARTER MOTOR	1	Х	Χ	(ISKRA, 12V - 3.1KW) (ALSO ORDER
_						RT7700040288 AND R116617)
_5	19H1732	CAP SCREW	2			3/8" X 1-1/4"
6	14M7274	NUT	1	X	Χ	M10
7	12M7135	LOCK WASHER	1	X	Χ	10 MM
_8	R116617	LABEL	1	X	Χ	BYPASS START, DEMARRAGE COURT-CIRCUITE,
						ANLASS-SICHERHEITSCHALTER, ACCENSIONE IN
						FOLLE,ARRANQUE POR
						DERIVACION,STARTSPEAR
9	RT7700040288	COVER	1	X	Χ	

3009 - CONTINUED 3009 - SUITE 3009 - FORTSETZUNG 3009 - SEGUITO 3009 - CONTINUACION 3009 - FORTS

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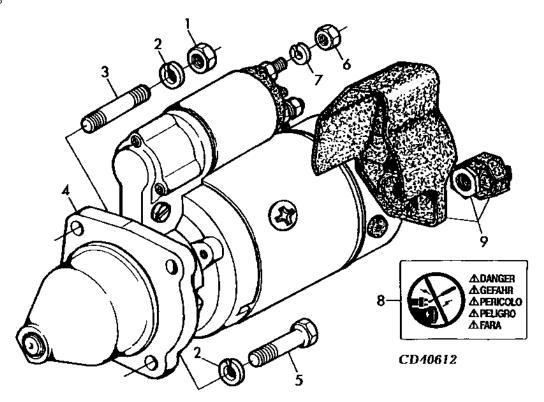
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS
1	RE503073	SOLENOID	1		X X (A	4)
2	RE62666	SHIFTER	1		X X (A	A)
3	RE62670	CARBON BRUSH CONDUCTOR	1		X X (A	A) W/ (2) CARBON BRUSH CONDUCTOR, BALAI,
					•	KOHLEBUERSTE, SPAZZOLE DI CARBONE,
						ESCOBILLA, KOLBORSTE
4	RE62672	BENDIX DRIVE	1		X X (A	A)
5	RE62673	KIT	1		X X (A	4)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

STARTER

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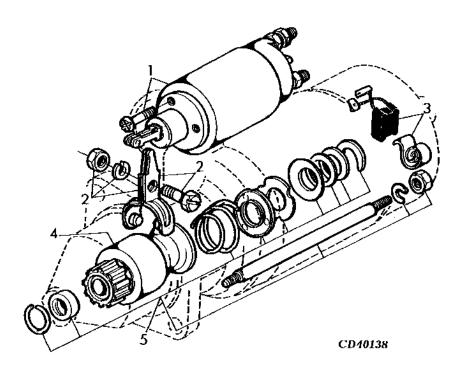


				0 2 ENGINE 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	REMARKS
1	14H812	NUT	1	Х	3/8"
2	12H304	LOCK WASHER	3	Х	3/8"
3	L39334	STUD	1	Х	3/8" X LGTH 43MM
4	RE59010	STARTER MOTOR	1	Х	(ISKRA AZJ 3190, 12V - 3KW) (ALSO ORDER
					RT7700040288 AND R116617)
5	19H3239	CAP SCREW	2	Х	3/8" X 1-1/4", (SAE 8)
6	14M7274	NUT	1	Х	M10
7	12M7135	LOCK WASHER	1	Х	10 MM
8	R116617	LABEL	1	Х	BYPASS START, DEMARRAGE COURT-CIRCUITE,
					ANLASS-SICHERHEITSCHALTER, ACCENSIONE IN
					FOLLE, ARRANQUE POR DERIVACION,
					STARTSPEAR
9	RT7700040288	COVER	1	X	

3000-3016

3016 - CONTINUED 3016 - SUITE 3016 - FORTSETZUNG 3016 - SEGUITO 3016 - CONTINUACION 3016 - FORTS

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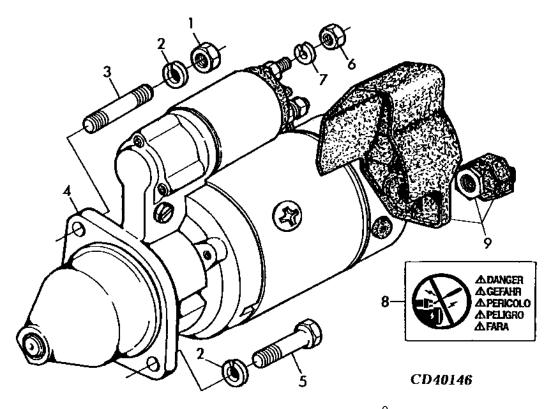


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS
1	RE62665	SOLENOID	1		Х	(A)
2	RE62666	SHIFTER	1		Χ	(A)
3	RE62670	CARBON BRUSH CONDUCTOR	1		Χ	(A) W/ (2) CARBON BRUSH CONDUCTOR, BALAI,
						KOHLEBUERSTE, SPAZZOLE DI CARBONE, ESCOBILLA, KOLBORSTE
4	RE62672	BENDIX DRIVE	1		Χ	(A)
5	RE62673	KIT	1		Х	(A)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

STARTER

-UN-06DEC95 CD40146

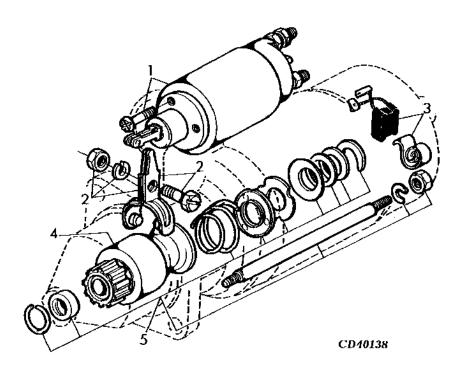


KEY	PART NO.	PART NAME		ENGINE 9 ERIAL NO. D	REMARKS
1	14H812	NUT	1	X	3/8"
2	12H304	LOCK WASHER	2	X	3/8"
3	L39334	STUD	1	X	3/8" X LGTH 43MM
4	RE503118	STARTER MOTOR	1	X	(ISKRA AZJ 3214, 24V - 4KW), (ALSO ORDER
					RT7700040288 AND R116617)
5	19H1732	CAP SCREW	1	X	3/8" X 1-1/4", (SAE 8)
6	14H812	NUT	1	Х	3/8"
7	12H304	LOCK WASHER	1	X	3/8"
8	R116617	LABEL	1	X	BYPASS START, DEMARRAGE COURT-CIRCUITE,
					ANLASS-SICHERHEITSCHALTER, ACCENSIONE IN
					FOLLE, ARRANQUE POR DERIVACION,
					STARTSPEAR
_	DT770004000	20 001/50			

9 RT7700040288 COVER Χ

3025 - CONTINUED 3025 - SUITE 3025 - FORTSETZUNG 3025 - SEGUITO 3025 - CONTINUACION 3025 - FORTS

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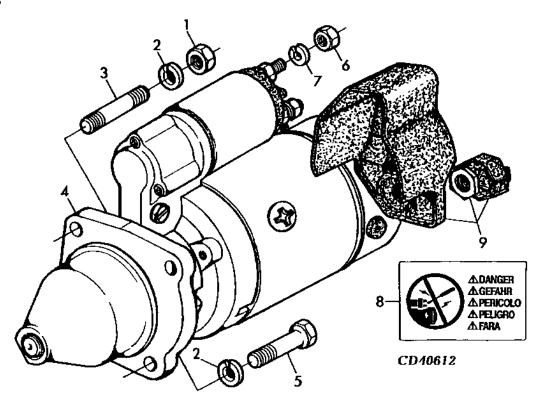
KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	0 2 9 D	REMARKS
1	RE500721	SOLENOID	1	Х	(A)
2	RE62666	SHIFTER	1	X	(A)
3	RE500722	KIT	1	X	(A) W/ (2) CARBON BRUSH CONDUCTOR, BALAI,
					KOHLEBUERSTE, SPAZZOLE DI CARBONE,
					ESCOBILLA, KOLBORSTE
4	RE62668	BENDIX DRIVE	1	X	(A)
5	RE62673	KIT	1	Х	(A)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

STARTER

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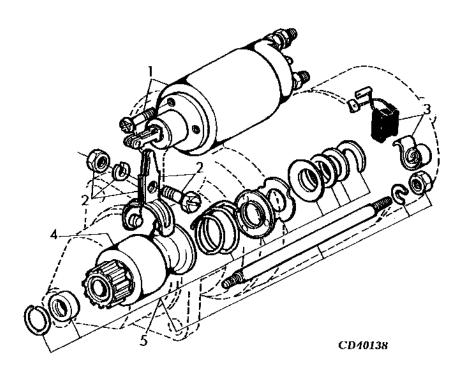
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			ENGINE	0 0 0 2 3 3 9 9 9	
PART NO.	PART NAME	QTY	SERIAL NO.	וטט	REMARKS
	NUT	1		X X X	3/8"
12H304	LOCK WASHER	3		X X X	3/8"
L39334	STUD	1		X X X	3/8" X LGTH 43MM
RE503119	STARTER MOTOR	1		X X X	(ISKRA AZJ 3225, 24V - 4KW) (ALSO ORDER
					RT7700040288 AND R116617)
19H1732	CAP SCREW	2		X X X	3/8" X 1-1/4", (SAE 8)
14H812	NUT	1		XXX	3/8"
12H304	LOCK WASHER	1		X X X	3/8"
R116617	LABEL	1		X X X	BYPASS START, DEMARRAGE COURT-CIRCUITE,
					ANLASS-SICHERHEITSCHALTER, ACCENSIONE
					IN FOLLE, ARRANQUE POR DERIVACION,
					STARTSPEAR
RT7700040288	COVER	1		XXX	
	RE503119 19H1732 14H812 12H304 R116617	14H812 NUT 12H304 LOCK WASHER L39334 STUD RE503119 STARTER MOTOR 19H1732 CAP SCREW 14H812 NUT 12H304 LOCK WASHER	14H812 NUT 1 12H304 LOCK WASHER 3 L39334 STUD 1 RE503119 STARTER MOTOR 1 19H1732 CAP SCREW 2 14H812 NUT 1 12H304 LOCK WASHER 1 R116617 LABEL 1	PART NO. PART NAME QTY SERIAL NO. 14H812 NUT 1 12H304 LOCK WASHER 3 L39334 STUD 1 RE503119 STARTER MOTOR 1 19H1732 CAP SCREW 2 14H812 NUT 1 12H304 LOCK WASHER 1 R116617 LABEL 1	PART NO. PART NAME QTY SERIAL NO. D D T 14H812 NUT 1 1 X X X X 12H304 LOCK WASHER 3 X X X X X X X X X X X X X X X X X X

3026 - CONTINUED 3026 - SUITE 3026 - FORTSETZUNG 3026 - SEGUITO 3026 - CONTINUACION 3026 - FORTS

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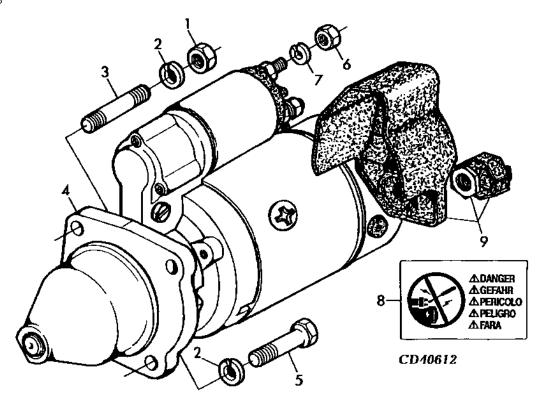


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 2 3 3 9 9 9 D D T	REMARKS
1	RE500721	SOLENOID	1		XXX	(A)
2	RE62666	SHIFTER	1		X X X	(A)
3	RE500722	CARBON BRUSH CONDUCTOR	1		X X X	(A) W/ (2) CARBON BRUSH CONDUCTOR,
						BALAI, KOHLEBUERSTE, SPAZZOLE DI
						CARBONE, ESCOBILLA, KOLBORSTE
4	RE62672	BENDIX DRIVE	1		X X X	(A)
5	RE62673	KIT	1		XXX	(A)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

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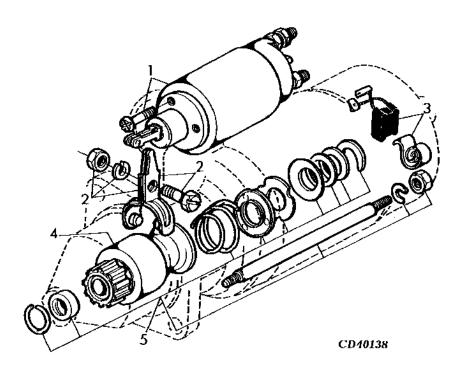


KEY	PART NO.	PART NAME		0 0 0 4 4 4 RIGINE 5 5 5 RIAL NO. D T H	REMARKS
1	14M7296	FLANGE NUT	1	XXX	M10, (10)
2	42M7058	STUD	1	X X X	M10 X 30
3	19M7786	SCREW	2	X X X	M10 X 30, (10.9)
4	RE504009	STARTER MOTOR	1	XXX	(ISKRA, 12V - 3.1KW) (ALSO ORDER RT7700040288 AND R116617)
5	RT7700040288	COVER	1	X X X	,
6	14M7274	NUT	1	XXX	M10
7	12M7135	LOCK WASHER	1	X X X	10 MM
8	R116617	LABEL	1	X X X	BYPASS START, DEMARRAGE COURT-CIRCUITE,
					ANI ASSISICHERHEITSCHALTER ACCENSIONE

ANLASS-SICHERHEITSCHALTER,ACCENSIONE IN FOLLE,ARRANQUE POR DERIVACION,STARTSPEAR **2B24**

3052 - CONTINUED 3052 - SUITE 3052 - FORTSETZUNG 3052 - SEGUITO 3052 - CONTINUACION 3052 - FORTS

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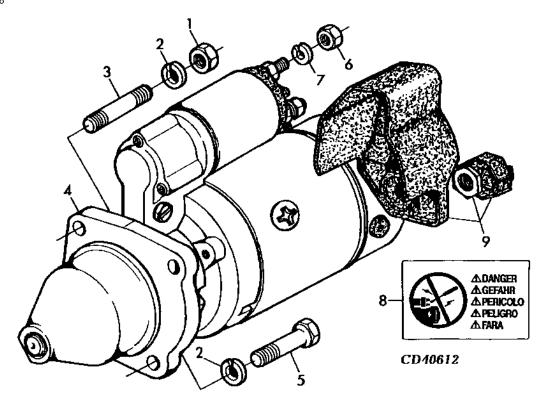


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	RE503073	SOLENOID	1		XXX	(A)
2	RE62666	SHIFTER	1		X X X	(A)
3	RE62670	CARBON BRUSH CONDUCTOR	1		X X X	(A) W/ (2) CARBON BRUSH CONDUCTOR,
						BALAI, KOHLEBUERSTE, SPAZZOLE DI
						CARBONE, ESCOBILLA, KOLBORSTE
4	RE62672	BENDIX DRIVE	1		X X X	(A)
5	RE62673	KIT	1		XXX	(A)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

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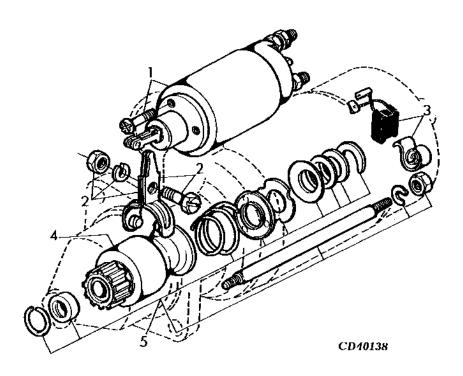


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	14M7296	FLANGE NUT	1		XXX	M10, (10)
2	42M7058	STUD	1		X X X	M10 X 30
3	19M7786	SCREW	2		X X X	M10 X 30, (10.9)
4	RE504009	STARTER MOTOR	1		XXX	(ISKRA, 12V - 3.1KW) (ALSO ORDER RT7700040288 AND R116617)
5	RT7700040288	COVER	1		X X X	1017700040200 7ND 10170017)
6	14M7274	NUT	1		XXX	M10
7	12M7135	LOCK WASHER	1		X X X	10 MM
8	R116617	LABEL	1		X X X	BYPASS START, DEMARRAGE COURT-CIRCUITE,
						ANI ASS-SICHERHEITSCHALTER ACCENSIONE

ANLASS-START, DEMARKAGE COURT-CIRCUITE
ANLASS-SICHERHEITSCHALTER, ACCENSIONE
IN FOLLE, ARRANQUE POR
DERIVACION, STARTSPEAR

3052 - CONTINUED 3052 - SUITE 3052 - FORTSETZUNG 3052 - SEGUITO 3052 - CONTINUACION 3052 - FORTS

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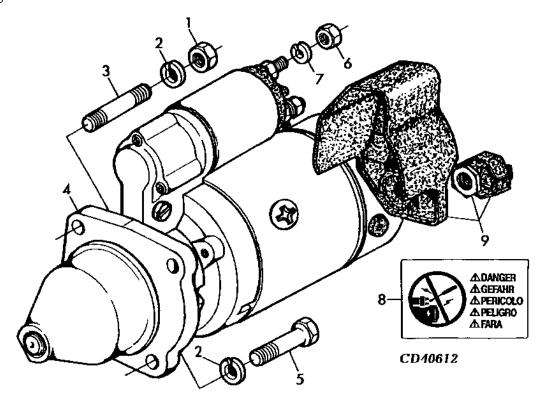


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	RE503073	SOLENOID	1		XXX	(A)
2	RE62666	SHIFTER	1		X X X	(A)
3	RE62670	CARBON BRUSH CONDUCTOR	1		X X X	(A) W/ (2) CARBON BRUSH CONDUCTOR,
						BALAI, KOHLEBUERSTE, SPAZZOLE DI
						CARBONE, ESCOBILLA, KOLBORSTE
4	RE62672	BENDIX DRIVE	1		X X X	(A)
5	RE62673	KIT	1		XXX	(A)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

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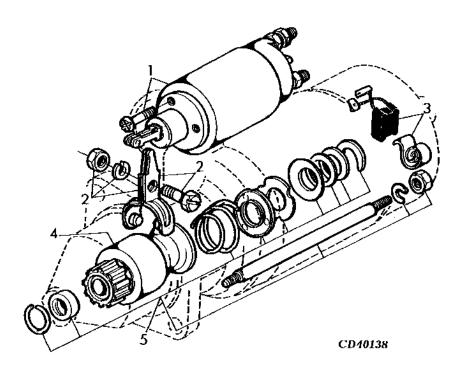
-UN-09FEB96



KEY	PART NO.	PART NAME	ENGINI QTY SERIAL N		REMARKS
1	14M7296	FLANGE NUT	1	XXX	M10, (10)
2	42M7058	STUD	1	X X X	M10 X 30
3	19M7786	SCREW	2	X X X	M10 X 30, (10.9)
4	RE503119	STARTER MOTOR	1	XXX	(ISKRA, 24V - 4KW) (ALSO ORDER RT7700040288 AND R116617)
5	RT7700040288	COVER	1	X X X	,
6	14M7274	NUT	1	XXX	M10
7	12M7135	LOCK WASHER	1	X X X	10 MM
8	R116617	LABEL	1	X X X	BYPASS START, DEMARRAGE COURT-CIRCUITE,
					ANI ASSISICHERHEITSCHALTER ACCENSIONE

ANLASS-SICHERHEITSCHALTER,ACCENSIONE IN FOLLE,ARRANQUE POR DERIVACION,STARTSPEAR 3054 - CONTINUED 3054 - SUITE 3054 - FORTSETZUNG 3054 - SEGUITO 3054 - CONTINUACION 3054 - FORTS

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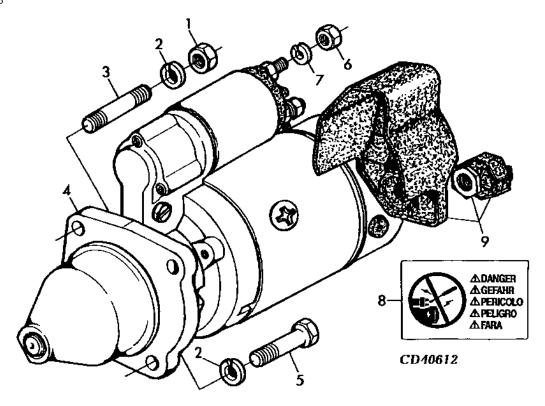


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	RE503073	SOLENOID	1		XXX	(A)
2	RE62666	SHIFTER	1		X X X	(A)
3	RE62670	CARBON BRUSH CONDUCTOR	1		X X X	(A) W/ (2) CARBON BRUSH CONDUCTOR,
						BALAI, KOHLEBUERSTE, SPAZZOLE DI
						CARBONE, ESCOBILLA, KOLBORSTE
4	RE62672	BENDIX DRIVE	1		X X X	(A)
5	RE62673	KIT	1		XXX	(A)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

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-UN-09FEB96

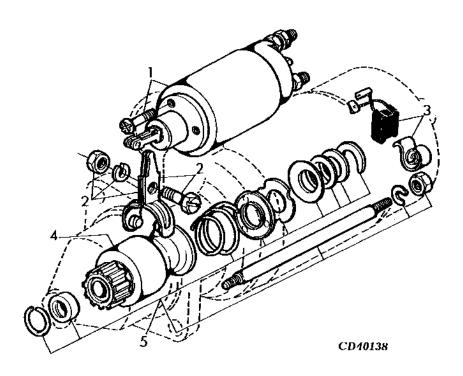


KEY	PART NO.	PART NAME	ENGINE QTY SERIAL N	0 0 0 6 6 6 8 8 8 D. D T H REMARKS	
1	14M7296	FLANGE NUT	1	X X X M10, (10)	
2	42M7058	STUD	1	X X X M10 X 30	
3	19M7786	SCREW	2	X X X M10 X 30, (10.9)	
4	RE503119	STARTER MOTOR	1	X X X (ISKRA, 24V - 4KW) (ALSO O RT7700040288 AND R11661	
5	RT7700040288	COVER	1	XXX	,
6	14M7274	NUT	1	X X X M10	
7	12M7135	LOCK WASHER	1	X X X 10 MM	
8	R116617	LABEL	1	X X X BYPASS START, DEMARRAGE	E COURT-CIRCUITE,
				ANI ASS-SICHERHEITSCHAI	TER ACCENSIONE

ANLASS-START, DEMARKAGE COURT-CIRCUITE
ANLASS-SICHERHEITSCHALTER, ACCENSIONE
IN FOLLE, ARRANQUE POR
DERIVACION, STARTSPEAR

3054 - CONTINUED 3054 - SUITE 3054 - FORTSETZUNG 3054 - SEGUITO 3054 - CONTINUACION 3054 - FORTS

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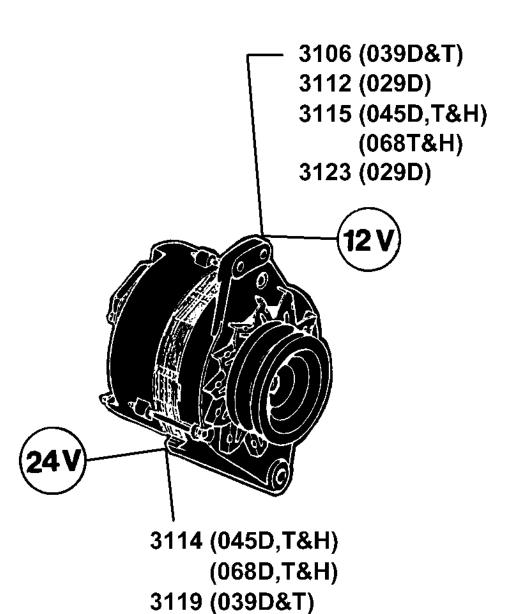


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	RE503073	SOLENOID	1		XXX	(A)
2	RE62666	SHIFTER	1		X X X	(A)
3	RE62670	CARBON BRUSH CONDUCTOR	1		X X X	(A) W/ (2) CARBON BRUSH CONDUCTOR,
						BALAI, KOHLEBUERSTE, SPAZZOLE DI
						CARBONE, ESCOBILLA, KOLBORSTE
4	RE62672	BENDIX DRIVE	1		X X X	(A)
5	RE62673	KIT	1		XXX	(A)

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAFFANDE EJ UPPTAGNA

STARTER

MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA SECTIONAL INDEX
INDEX DE SECTION
GRUPPENINDEX
INDICE DELLA SEZIONE
INDICE DE SECCION
GRUPPSFORTECKNING
CD43325 -UN-240CT01

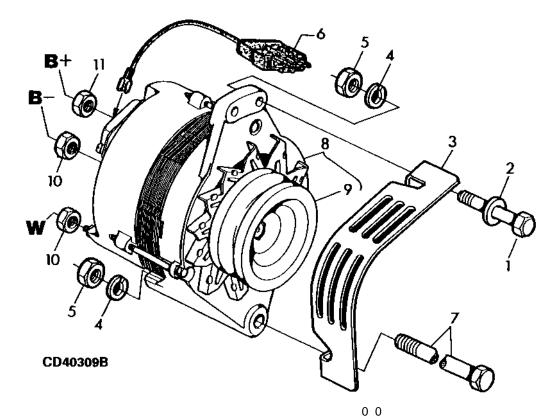


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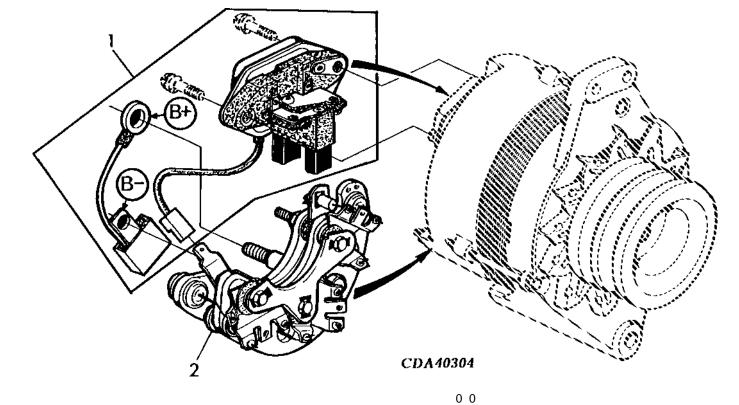
CD40309B -UN-28NOV95



				ENGINE	3 3 9 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DΤ	REMARKS
4	40110004	04B 00BEW			V V	F/40 V 4 0/0
1	19H2661	CAP SCREW	1		XX	
2	24H1292	WASHER	1		ХХ	11/32" X 3/4" X 0.120"
3		SHIELD	NA		ΧХ	
4	12M7056	LOCK WASHER	2		XX	8 MM
5	14H785	NUT	1		ХХ	5/16"
6	RE503815	CONNECTOR	1	-426526	ХХ	(SUB FOR RE62627) 47 OHMS
	RE506322	CONNECTOR	1	426527-	ХХ	(USE WITH RE506197) 47 OHMS
7	19H1897	CAP SCREW	1		ΧХ	5/16" X 3-3/4"
8	RE57960	ALTERNATOR	1	-426526	ХХ	(SUB RE506197) (ALSO ORDER RE506322)
						(MAGNETON, 12V - 55A)
	RE506197	ALTERNATOR	1	426527-	ХХ	(SUB FOR RE57960) (ALSO ORDER RE506322)
						(MAGNETON, 12V - 55A)
9	R134417	SHEAVE	1		ХХ	11/16" X OD 88MM
10	14M7265	LOCK NUT	2		ΧХ	M5
11	14M7165	LOCK NUT	1		Х	M6

3106 - CONTINUED 3106 - SUITE 3106 - FORTSETZUNG 3106 - SEGUITO 3106 - CONTINUACTION 3106 - FORTS

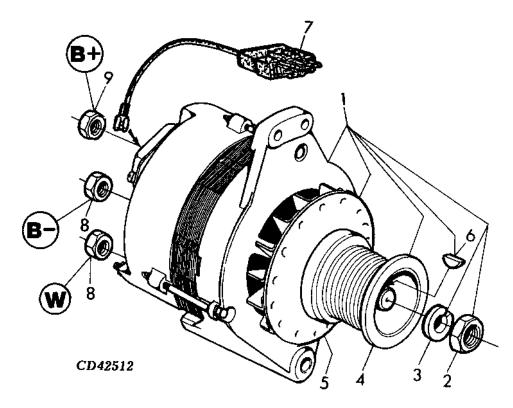
CDA40304 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 3 9 9 D T	REMARKS
1	RE63497	REGULATOR	1		ХХ	(A) STD, 12V
2	RE58515	DIODE	1		ХХ	(A) 12V

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

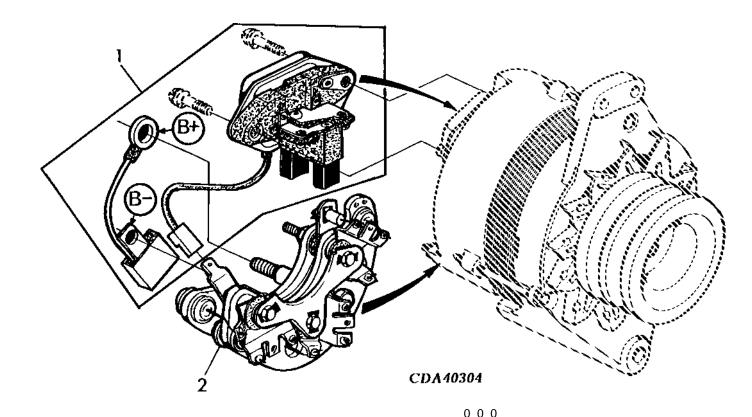
CD42512 -UN-18MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	RE503543	ALTERNATOR	1		XXX	(MAGNETON 443113516971, 24V - 40A)
2	14M7156	NUT	1		X X X	M14
3	12H317	LOCK WASHER	1		X X X	9/16"
4	R501192	SHEAVE	1		XXX	
5	T158584	FAN	1		X X X	
6		SHAFT KEY	1		X X X	
7	RE71583	CONNECTOR	1		XXX	82 OHMS
8	14M7360	LOCK NUT	2		X X X	M5
9	14M7165	LOCK NUT	1		X X X	M6

3114 - CONTINUED 3114 - SUITE 3114 - FORTSETZUNG 3114 - **SEGUITO** 3114 - CONTINUACION 3114 - FORTS

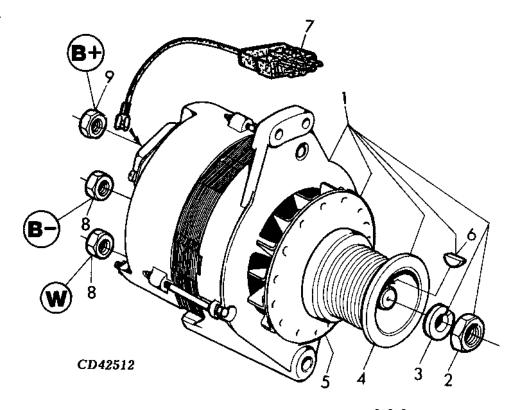
CDA40304 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	RE500068	REGULATOR	1		XXX (A	(24V)	
2	RE500066	DIODE	1		XXX (A	(24V)	

- (A) SEE YOUR AUTHORIZED ALTERNATOR REPAIR STATION FOR PARTS NOT LISTED (A) CONSULTER VOTRE REPARATEUR AGREE D'ALTERNATEUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON DREHSTROMGENERATOR VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE ALTERNATORE
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE ALTERNADOR
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

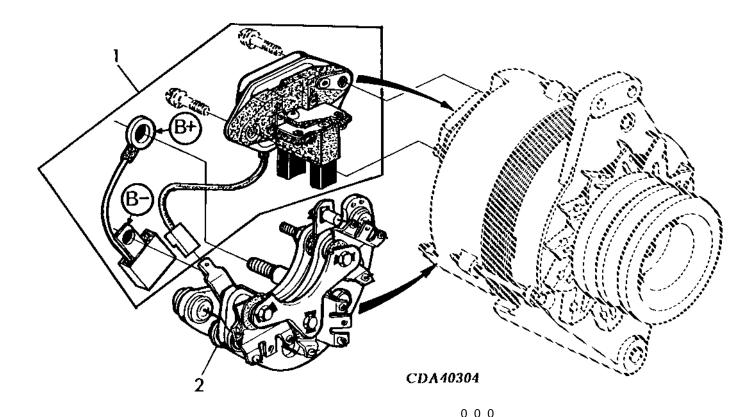
CD42512 -UN-18MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	RE503543	ALTERNATOR	1		XXX	(MAGNETON 443113516971, 24V - 40A)
2	14M7156	NUT	1		X X X	M14
3	12H317	LOCK WASHER	1		X X X	9/16"
4	R501192	SHEAVE	1		XXX	
5	T158584	FAN	1		X X X	
6		SHAFT KEY	1		X X X	
7	RE71583	CONNECTOR	1		XXX	82 OHMS
8	14M7360	LOCK NUT	2		X X X	M5
9	14M7165	LOCK NUT	1		X X X	M6

3114 - CONTINUED 3114 - SUITE 3114 - FORTSETZUNG 3114 - **SEGUITO** 3114 - CONTINUACION 3114 - FORTS

CDA40304 -UN-20JUL95



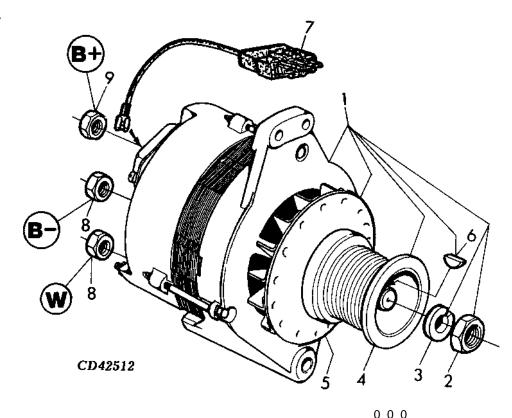
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS	
1	RE500068	REGULATOR	1		X X X (A	(24V)	
2	RE500066	DIODE	1		X X X (A	(24V)	

- (A) SEE YOUR AUTHORIZED ALTERNATOR REPAIR STATION FOR PARTS NOT LISTED (A) CONSULTER VOTRE REPARATEUR AGREE D'ALTERNATEUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON DREHSTROMGENERATOR VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE ALTERNATORE
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE ALTERNADOR
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

ALTERNATOR

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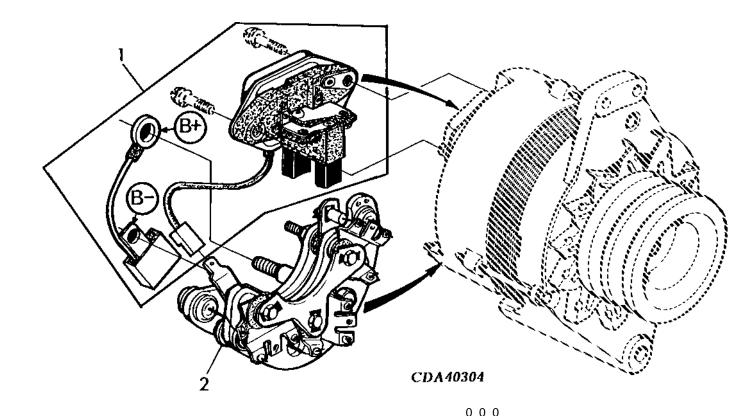
CD42512 -UN-18MAR98



				ENGINE	4 4 4 5 5 5 5	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	ĎТН	REMARKS
1	RE501634	ALTERNATOR	1	-626484	X X X	(MAGNETON, 12V - 55A) (SUB RE506196)
						(ALSO ORDER RE506322)
	RE506196	ALTERNATOR	1	626485-	X X X	
						RE501634) (ALSO ORDER RE506322)
2	14M7156	NUT	1		X X X	M14
3	12H317	LOCK WASHER	1		X X X	9/16"
4	R501192	SHEAVE	1		X X X	·
5	T158584	FAN	1		X X X	
6		SHAFT KEY	1		X X X	
7	RE62627	CONNECTOR	1	-626484	X X X	(SUB RE506322) 47 OHMS
	RE506322	CONNECTOR	1	626485-	X X X	(USE WITH RE506196) 47 OHMS
8	14M7360	LOCK NUT	2		X X X	M5
9	14M7165	LOCK NUT	1		X X X	M6

3115 - CONTINUED 3115 - SUITE 3115 - FORTSETZUNG 3115 - SEGUITO 3115 - CONTINUACTION 3115 - FORTS

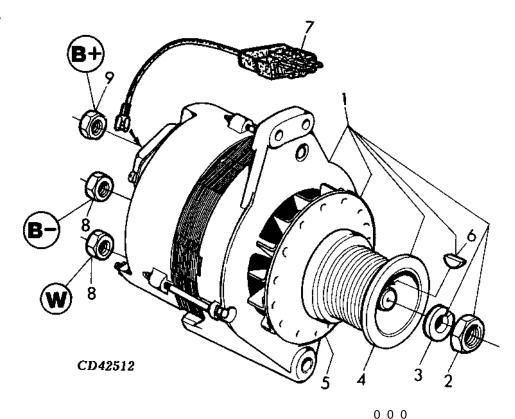
CDA40304 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY S	ENGINE 5 5 5 ERIAL NO. D T H	1 5	
1	RE63497	REGULATOR	1	XXΣ	((A) STD, 12V	
2	RE58515	DIODE	1	XXX	((A) 12V	

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

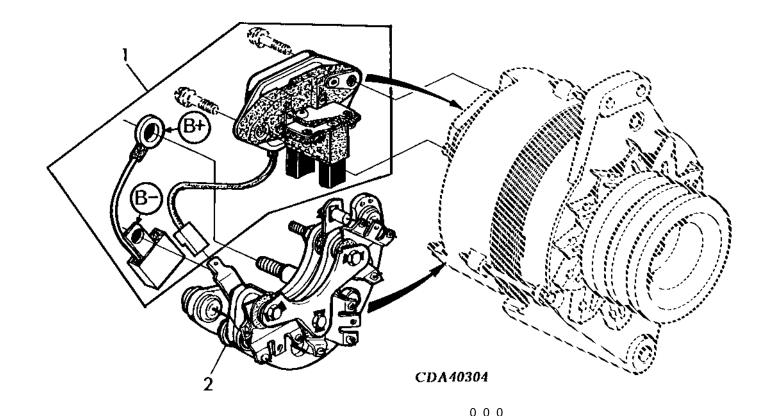
CD42512 -UN-18MAR98



				ENGINE	6 6 6 8 8 8	
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	DTH	REMARKS
1	RE501634	ALTERNATOR	1	-626484	XXX	(MAGNETON, 12V - 55A) (SUB RE506196)
						(ALSO ORDER RE506322)
	RE506196	ALTERNATOR	1	626485-	X X X	(MAGNETON, 12V - 55A) (SUB FOR
						RE501634) (ALSO ORDER RE506322)
2	14M7156	NUT	1		X X X	M14
3	12H317	LOCK WASHER	1		X X X	9/16"
4	R501192	SHEAVE	1		XXX	
5	T158584	FAN	1		X X X	
6		SHAFT KEY	1		X X X	
7	RE62627	CONNECTOR	1	-626484	XXX	(SUB RE506322) 47 OHMS
	RE506322	CONNECTOR	1	626485-	X X X	(USE WITH RE506196) 47 OHMS
8	14M7360	LOCK NUT	2		X X X	M5
9	14M7165	LOCK NUT	1		XXX	M6

3115 - CONTINUED 3115 - SUITE 3115 - FORTSETZUNG 3115 - SEGUITO 3115 - CONTINUACTION 3115 - FORTS

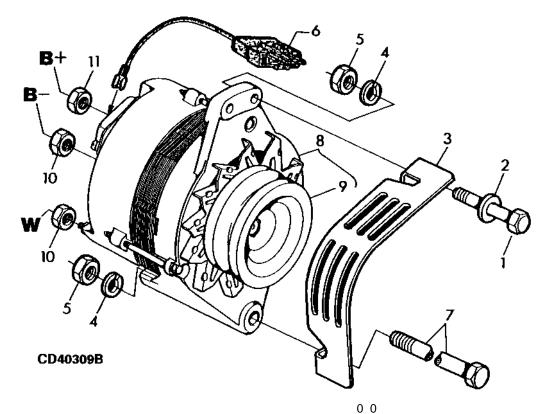
CDA40304 -UN-20JUL95



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	6 6 6 8 8 8 D T H REMARKS	
1	RE63497	REGULATOR	1	X X X (A) STD, 12V	
2	RE58515	DIODE	1	X X X (A) 12V	

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

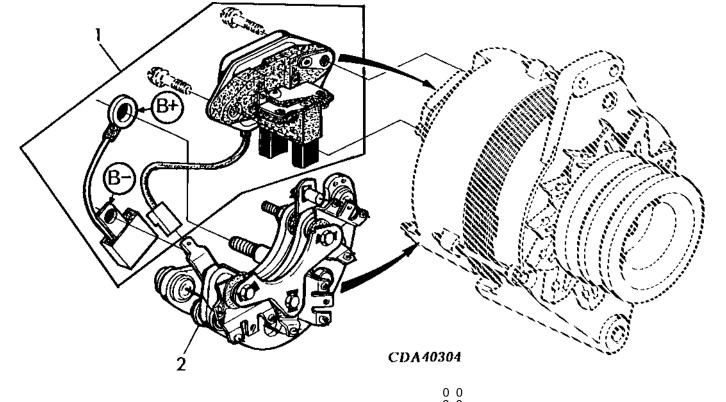
CD40309B -UN-28NOV95



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3119 - CONTINUED 3119 - SUITE 3119 - FORTSETZUNG 3119 - SEGUITO 3119 - CONTINUACTION 3119 - FORTS

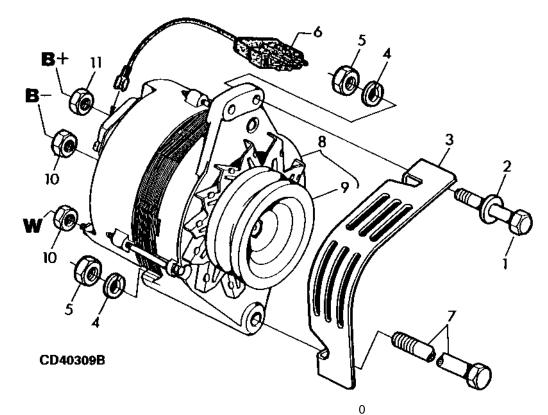
CDA40304 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS	
1 2	RE500068 RE500066	REGULATOR DIODE	1 1		X X (A	A) (24V) A) (24V)	

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

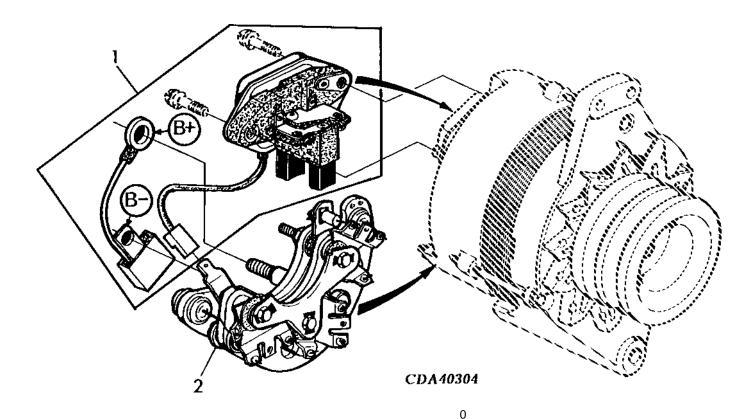
CD40309B -UN-28NOV95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS	
1	19H1906	CAP SCREW	1		Χ	5/16" X 1-1/2"	
2	24H1292	WASHER	1		Χ	11/32" X 3/4" X 0.120"	
3	R121008	SHIELD	1		Χ		
4	12M7056	LOCK WASHER	2		Χ	8 MM	
5	14H785	NUT	2		Χ	5/16"	
6	RE71583	CONNECTOR	1		Χ	82 OHMS	
7	19H1897	CAP SCREW	1		Χ	5/16" X 3-3/4"	
8	RE70779	ALTERNATOR	1		Χ	(MAGNETON 443113516760, 24V - 40A)	
9	R134417	SHEAVE	1		Χ	11/16" X OD 88MM	
10	14M7265	LOCK NUT	2		Χ	M5	
11	14M7165	LOCK NUT	1		Χ	M6	

3121 - CONTINUED 3121 - SUITE 3121 - FORTSETZUNG 3121 - SEGUITO 3121 - CONTINUACION 3121 - FORTS

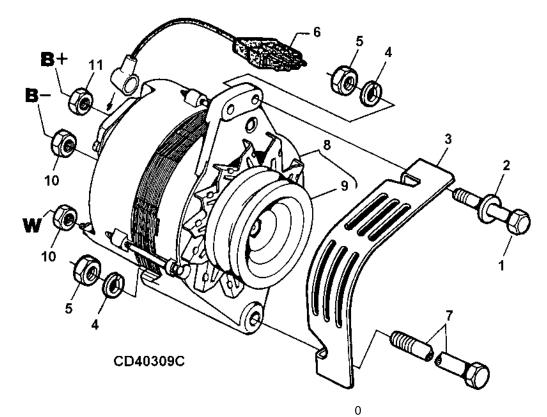
CDA40304 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE 9 SERIAL NO. D	REMARKS
1	RE500068	REGULATOR	1	X	(A) STD, 24V
2	RE500066	DIODE	1	X	(A) 24V

- (A) SEE YOUR AUTHORIZED ALTERNATOR REPAIR STATION FOR PARTS NOT LISTED (A) CONSULTER VOTRE REPARATEUR AGREE D'ALTERNATEUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON DREHSTROMGENERATOR VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE ALTERNATORE
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE ALTERNADOR
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

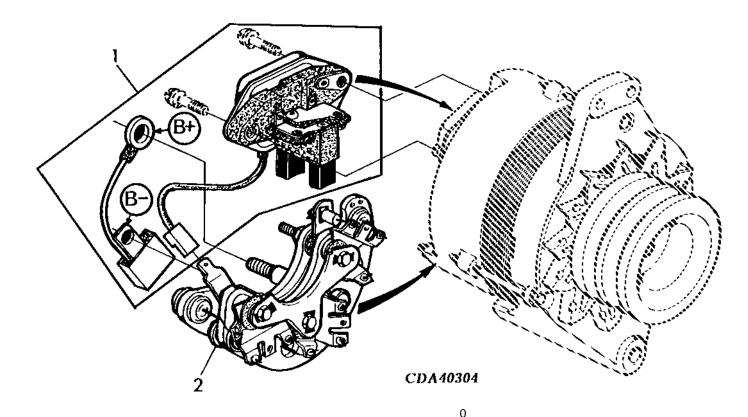
CD40309C -UN-05JUL01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS	
1	19H2661	CAP SCREW	1		X	5/16" X 1-3/8"	
2	24H1292	WASHER	2		X	11/32" X 3/4" X 0.120"	
3		SHIELD	NA		Χ		
4	12M7056	LOCK WASHER	2		Х	8 MM	
5	14H785	NUT	2		Χ	5/16"	
6	RE506322	CONNECTOR	1		Χ	47 OHMS	
7	19H1897	CAP SCREW	1		Χ	5/16" X 3-3/4"	
8	RE506197	ALTERNATOR	1		Χ	(MAGNETON , 12V - 55A)	
9	R134417	SHEAVE	1		Χ	11/16" X OD 88MM	
10	14M7265	LOCK NUT	2		Χ	M5	
11	14M7165	LOCK NUT	1		Χ	M6	

3123 - CONTINUED 3123 - SUITE 3123 - FORTSETZUNG 3123 - SEGUITO 3123 - CONTINUACTION 3123 - FORTS

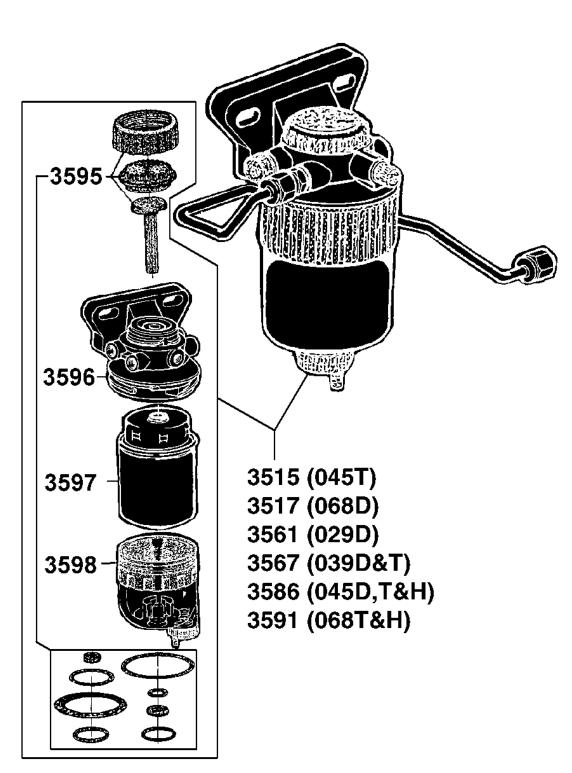
CDA40304 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS		
1	RE63497	REGULATOR	1		Х	(A) STD, 12V		
2	RE58515	DIODE	1		Χ	(A) 12V		

- (A) SEE YOUR AUTHORIZED STARTER REPAIR STATION FOR PARTS NOT LISTED
- (A) CONSULTER VOTRE REPARATEUR AGREE DE DEMARREUR POUR LES PIECES NON CATALOGUEES
- (A) NICHT GEZEIGTE TEILE VON STARTER VETRETER BEZIEHEN
- (A) PER LE PARTI NON ELENCATE, RIVOLGETEVI AL CENTRO AUTORIZZATO DI REPARAZIONE MOTORINO D'AVVIAM.
- (A) CONSULTE CON SU ESTACION AUTORIDAZA DE REPARACIONES DE MOTOR DE ARRANQUE
- (A) RAADGOER MED EN AUTORISERAD SERVICEVERKSTAD BETRAEFFANDE EJ UPPTAGNA

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INDICE DE SECCION
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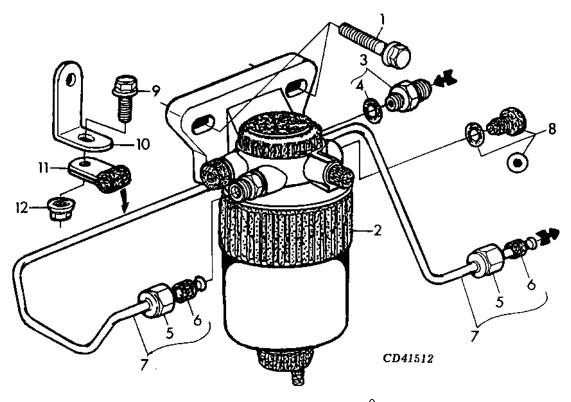
3515 -2D3 3517 -2D4 3561 -2D5 3567 -2D6 3586 -2D7 2D8 2D9 3596 -2D10 3597 -2D11 3598 -2D12

FUEL FILTER

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3515

CD41512 -UN-15JAN98

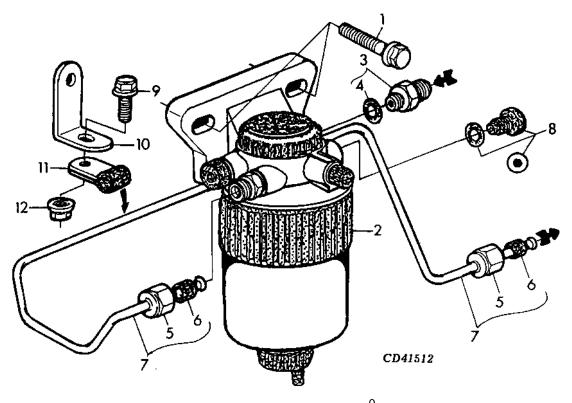


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS	
1	19M7785	SCREW	2		Х	M10 X 25, (10.9)	
2 .		FUEL FILTER	1		Χ	ASSY, ORD RE70358	
3	RE60029	FITTING	2		Χ	M12X1.5 X 9/16"-24UNEF	
4	51M7040	O-RING	1		Χ	9.300 X 2.200 MM	
5	R123594	NUT	2		X	9/16"-24UNEF	
6	R74012	SEALING WASHER	2		Χ		
7	RE60006	FUEL LINE	1		Х		
8	RE500565	PIPE PLUG	2		Χ	M12 X 1.5	
9	19M7865	SCREW	1		Χ	M8 X 16, (10.9)	
10	R116116	BRACKET	1		Х	· · · ·	
11	T14050	CLAMP	1		Χ		
12	14M7298	FLANGE NUT	1		Χ	M8, (10)	

FUEL FILTER

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CD41512 -UN-15JAN98

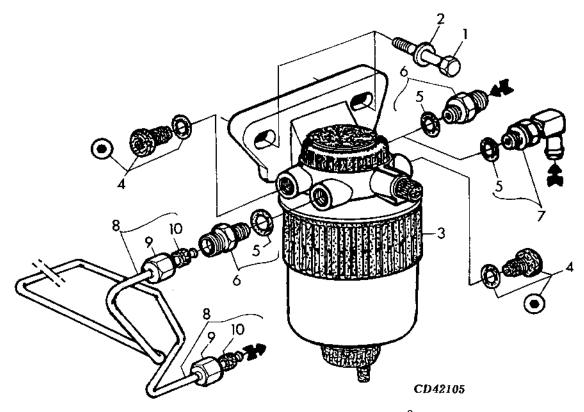


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 D	REMARKS	
1	19M7785	SCREW	2		Х	M10 X 25, (10.9)	
2 .		FUEL FILTER	1		Χ	ASSY, ORD RE70358	
3	RE60029	FITTING	2		Χ	M12X1.5 X 9/16"-24UNEF	
4	51M7040	O-RING	1		Χ	9.300 X 2.200 MM	
5	R123594	NUT	2		X	9/16"-24UNEF	
6	R74012	SEALING WASHER	2		Χ		
7	RE60006	FUEL LINE	1		Х		
8	RE500565	PIPE PLUG	2		Χ	M12 X 1.5	
9	19M7865	SCREW	1		Χ	M8 X 16, (10.9)	
10	R116116	BRACKET	1		Х	·	
11	T14050	CLAMP	1		Χ		
12	14M7298	FLANGE NUT	1		Χ	M8, (10)	

FUEL FILTER

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CD42105 -UN-27JUL98

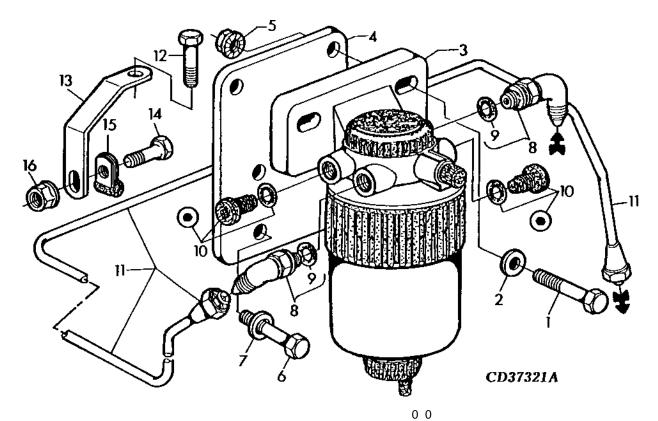


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS	
1	19H2676	CAP SCREW	2		Х	3/8" X 1", (SAE 8)	
2	24M7106	WASHER	2		Χ	10 X 18 X 2.500 MM	
3		FUEL FILTER	1		Χ	ASSY, ORD RE70538	
4	RE500565	PIPE PLUG	2		Χ	M12 X 1.5	
5	51M7040	O-RING	1		Χ	9.300 X 2.200 MM	
6	RE60029	FITTING	2		Χ	M12 X 1.5 X 9/16"-24UNEF	
7		HOSE FITTING	NA		Χ		
8	RE71144	FUEL LINE	1		Χ		
9	R123594	NUT	2		Χ		
10	R74012	SEALING WASHER	2		Χ		

FUEL FILTER

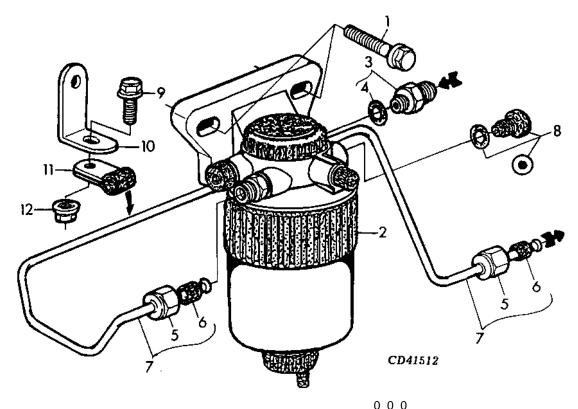
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CD37321A -UN-20JUL95



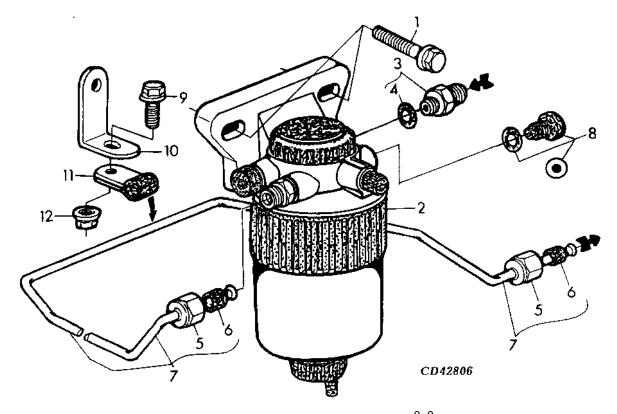
				ENGINE	3 3 9 9		
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DΤ	REMARKS	
1	19H1732	CAP SCREW	2		X X	3/8" X 1-1/4"	
2	24M7106	WASHER	2			10 X 18 X 2.500 MM	
3	2	FUEL FILTER	1			ASSY, ORD RE500160	
4	R119988	BRACKET	1		XX		
5	N10215	LOCK NUT	2		ХХ	3/8"	
6	19H2284	CAP SCREW	2		ХХ	3/8" X 7/8"	
7	12H304	LOCK WASHER	2		ХХ	3/8"	
8	RE56322	TEE FITTING	2		ХХ	1/2"-20UNF X 1/2"-20UNF	
9	R26286	O-RING	2		ХХ		
10	RE62158	PIPE PLUG	2		XX	1/2"-20UNF	
11	RE56667	FUEL LINE	1		ХХ		
12	19H2021	CAP SCREW	1		ХХ	3/8" X 5/8"	
13	R120966	BRACKET	1		XX		
14	19H2664	CAP SCREW	1		ХХ	5/16" X 3/4", (SAE 8)	
15	T13914	CLAMP	1		ХХ	,	
16	A22698	NUT	1		ХХ	5/16"	

CD41512 -UN-15JAN98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	19M7785	SCREW	2		XXX	M10 X 25, (10.9)	
2		FUEL FILTER	1		X X X	ASSY, ORD RE70538	
3	RE60029	FITTING	2		X X X	M12X1.5 X 9/16"-24UNEF	
4	51M7040	O-RING	1		X X X	9.300 X 2.200 MM	
5	R123594	NUT	2		X X X	9/16"-24UNEF	
6	R74012	SEALING WASHER	2		X X X		
7	RE60025	FUEL LINE	1		X X X		
8	RE500565	PIPE PLUG	2		X X X	M12 X 1.5	
9	19M7865	SCREW	1		X X X	M8 X 16, (10.9)	
10	R116116	BRACKET	1		X X X		
11	T14050	CLAMP	1		X X X		
12	14M7298	FLANGE NUT	1		X X X	M8, (10)	

-UN-21DEC98 CD42806

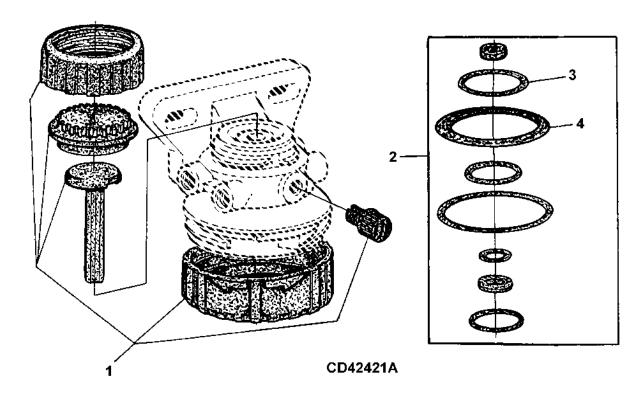


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 6 6 8 8 T H	REMARKS	
1	19M7785	SCREW	2		ХХ	M10 X 25, (10.9)	
2 .		FUEL FILTER	1		ХХ	ASSY, ORD RE705380	
3	RE60029	FITTING	2		ХХ	M12 X 1.5 X 9/16"-24UNEF	
4	51M7040	O-RING	1		XX	9.300 X 2.200 MM	
5	R123594	NUT	2		ХХ	9/16"-24UNEF	
6	R74012	SEALING WASHER	2		ХХ		
7	RE60026	FUEL LINE	1		XX		
8	RE500565	PIPE PLUG	2		ХХ	M12 X 1.5	
9	19M7865	SCREW	1		ХХ	M8 X 16, (10.9)	
10	R116116	BRACKET	1		XX	•	
11	T14050	CLAMP	1		ХХ		
12	14M7298	FLANGE NUT	1		XX	M8, (10)	

FUEL FILTER

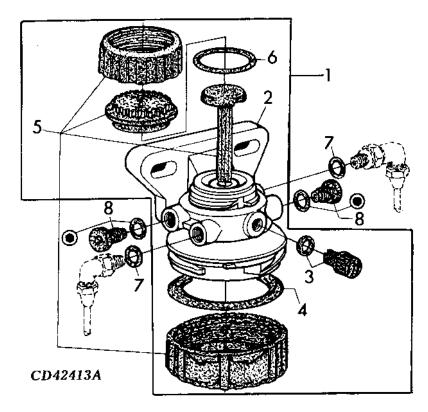
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CD42421A -UN-26JAN01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	A L L	REMARKS	
1	RE51649	SEAL KIT	AR		Х	INCL. INSTRUCTIONS, ANLEITUNG, ISTRUZIONI,	-
						INSTRUCCIONES, ANVISNINGAR	
2	RE50752	SEAL KIT	AR		Χ		
3	R113742	O-RING	1		Х		_
4	R113565	O-RING	1		X		

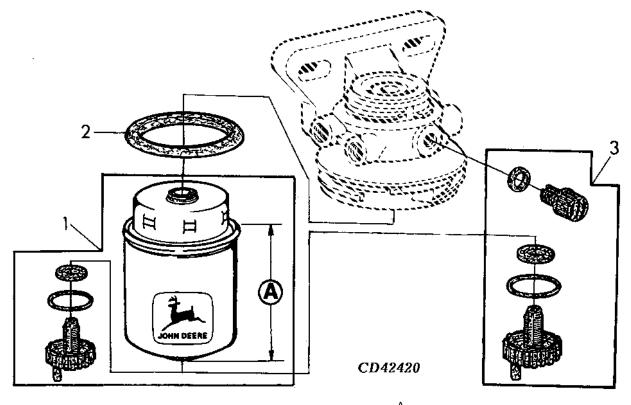
CD42413A -UN-18NOV98



KEY	PART NO.	PART NAME	QTY S	A ENGINE L ERIAL NO. L	REMARKS
			Q 0		
1	RE70538	KIT	1	X	(ALSO ORDER (2) 51M7040 AND (2) RE500565)
					(3567)
	RE500160	KIT	1	X	(ALSO ORDER (2) RE26286 AND (2) RE500565)
					(3567)
2		FILTER HEAD	1	X	1/2"-20UNF PORTS, NSEP, ORDER RE500160
					(3567)
		FILTER HEAD	1	X	M12 X 1.5 PORTS, NSEP, ORDER RE70538
					(3515,3517,3561,3586&3591)
3		DRAIN PLUG	1	X	NSEP, ORDER RE60854
4	R1135656	O-RING	1	X	
5		RETAINER	1	X	NSEP, ORDER RE516496
6	R113742	O-RING	1	X	
7	51M7040	O-RING	2	X	(3567)
	RE26286	O-RING	2	X	(3515,3517,3561,3586&3591)
8	RE62158	PIPE PLUG	2	X	1/2"-20UNF, (3567)
	RE500565	PIPE PLUG	2	X	M12 X 1.5 (3515.3517.3561.3586&3591)

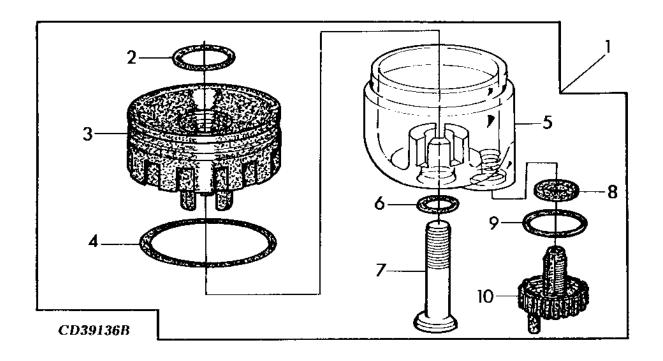
3597
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-UN-03MAR98 CD42420



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	L L	REMARKS
1	RE60021	FILTER ELEMENT	1		Х	A = 71MM, (ALSO ORDER R113565)
	RE62418	FUEL FILTER	1		Χ	A = 91MM, (ALSO ORDER R113565)
	RE62419	FUEL FILTER	1		Χ	A = 109MM, (ALSO ORDER R113565) PREFERRED
						IN HEAVY DUTY APPLICATIONS
2	R113565	O-RING	1		Χ	
3	RF60854	KIT	1		Y	

CD39136B -UN-15FEB96

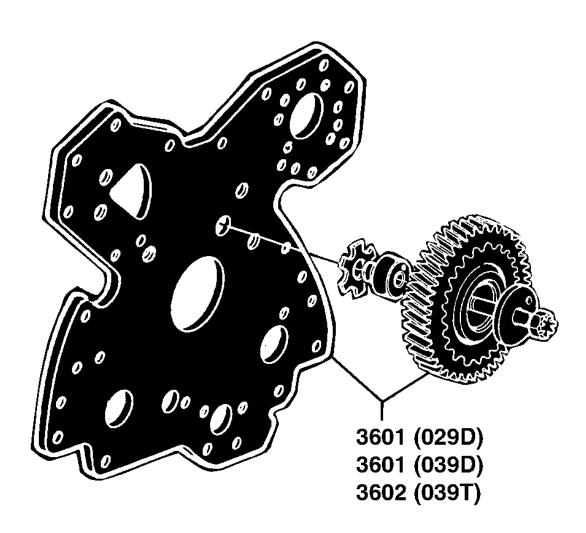


KEY	PART NO.	PART NAME	QTY	ENGINE L SERIAL NO. L	REMARKS
1	RE51650	SEDIMENT BOWL	AR	X	(A) KIT, INCL. INSTRUCTIONS, ANLEITUNG,
					ISTRUZIONI, INSTRUCCIONES, ANVISNINGAR
2		O-RING	1	X	ORD KIT RE50752
3		WING NUT	1	X	ORD KIT RE51650
4		O-RING	1	X	ORD KIT RE50752
5		SEDIMENT BOWL	1	X	ORD KIT RE51650
6		O-RING	1	X	ORD KIT RE50752
7		SCREW	1	X	ORD KIT RE51650
8		GASKET	1	X	ORD KIT RE60854
9		O-RING	1	X	ORD KIT RE60854
10		DRAIN PLUG	1	X	ORD KIT RE60854

- (A) ACCESSORY
- (Á) ACCESSOIRE
- (À) ZUBEHOER
- (A) ACCESSORI
- (A) ACCESSORIO
- (A) TILLBEHOER

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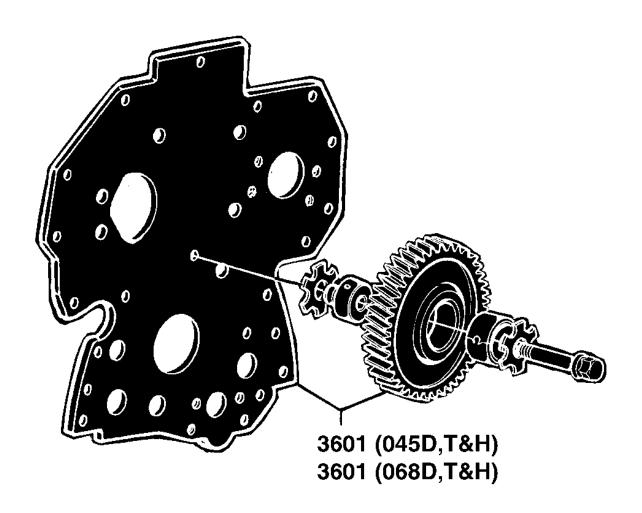
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CDP45086

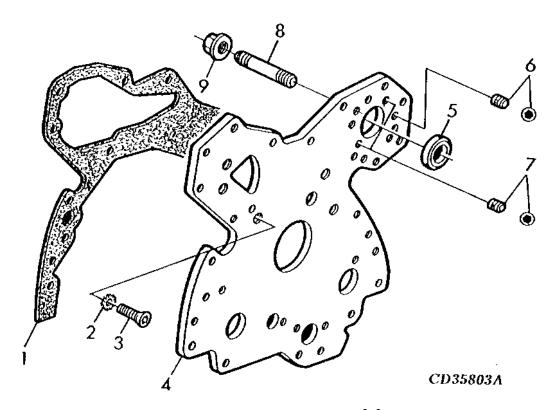
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3601 -	2D21
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3602 -	2D23



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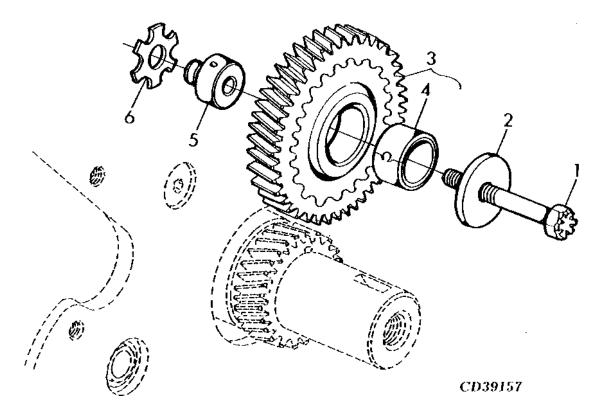
CD35803A -UN-01JAN94



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 2 3 9 9 D D	REMARKS
1	R131794	GASKET	1		ХХ	
2	12H324	WASHER	5		ХХ	3/8"
3	T20166	SCREW	5		ХХ	
4	R79863	PLATE	1		XX	(ALSO ORDER (8) AT21191 AND (2) AT22919)
5	R79854	WASHER	AR		ХХ	OD X ID 50MM X 46MM
6	AT21191	SET SCREW	8		ХХ	5/16" X 0.380"
7	AT22919	SET SCREW	2		XX	3/8" X 0.380"
8	T23442	STUD	3		ХХ	LGTH 36.6MM X 5/16"-24NS X 5/16"-18UNC
9	A22698	NUT	3		ХХ	5/16"-18UNC

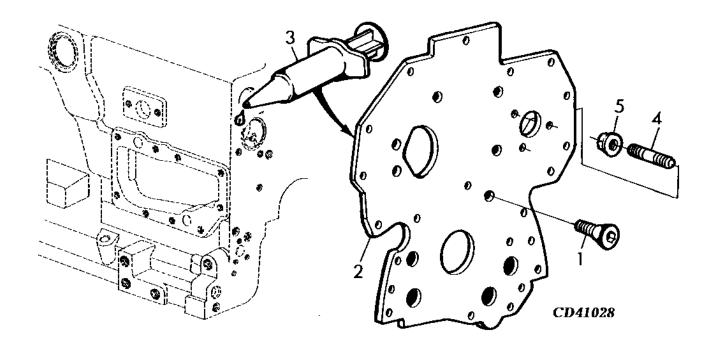
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CD39157 -UN-01JAN94



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	0 0 2 3 9 9 D D	REMARKS	
1	T26327	SCREW	1	ХХ		
2	R101227	THRUST WASHER	1	ХХ	14.7 X 57.9 X 4MM, FRONT	
3	AR91660	HELICAL GEAR	1	XX	(MARKED R70182) Z = 55	
4	T20034	BUSHING	1	XX		
5	R109863	PIN FASTENER	1	XX	OD 44.5MM	
6	R101225	THRUST WASHER	1	XX	22 X 60 X 3MM, REAR	

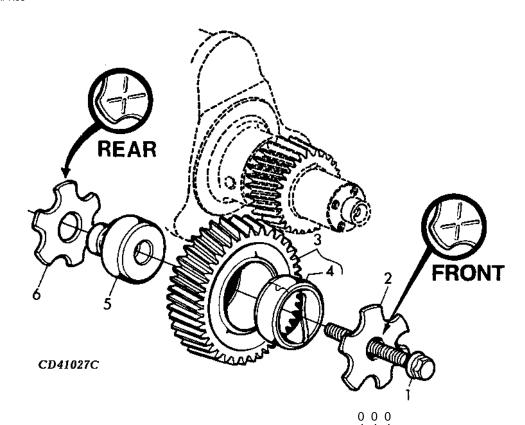
CD41028 -UN-11MAR96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	R136475	SCREW	4		XXX	
2	R134527	PLATE	1		$X \times X$	
3	DD15664	LIQUID GASKET	1		X X X	
4	R116386	STUD	3		XXX	
5	14M7298	FLANGE NUT	3		X X X	M8, (10)

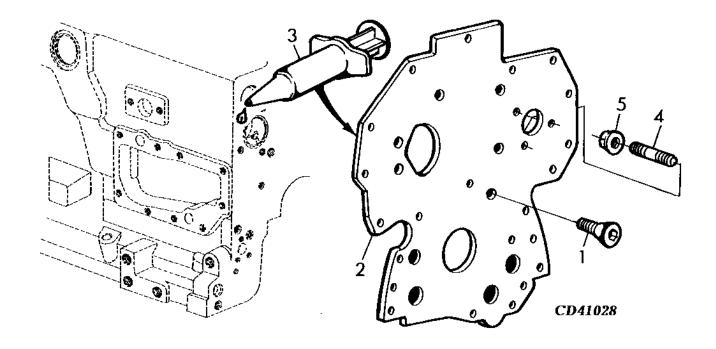
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CD41027C -UN-10APR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	19M8292	SCREW	1		XXX	M10 X 50, (10.9)	
2	R131283	THRUST WASHER	1		X X X	11 X 60 X 3MM	
3	RE56369	HELICAL GEAR	1		X X X	Z = 43, (MARKED R120636)	
4	R114193	BUSHING	1		XXX	OD 47.7MM	
5	R114194	SHAFT	1		X X X	OD 44.5MM	
6	R101225	THRUST WASHER	1		X X X	22 X 60 X 3MM	

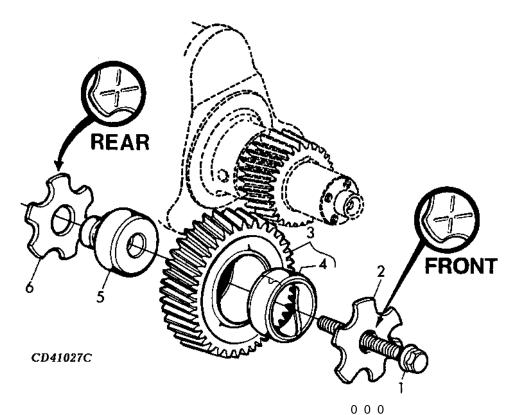
CD41028 -UN-11MAR96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS	
1	R136475	SCREW	4		XXX		
2	R134527	PLATE	1		X X X		
3	DD15664	LIQUID GASKET	1		X X X		
4	R116386	STUD	3		XXX		
5	14M7298	FLANGE NUT	3		X X X M8	3, (10)	

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CD41027C -UN-10APR98

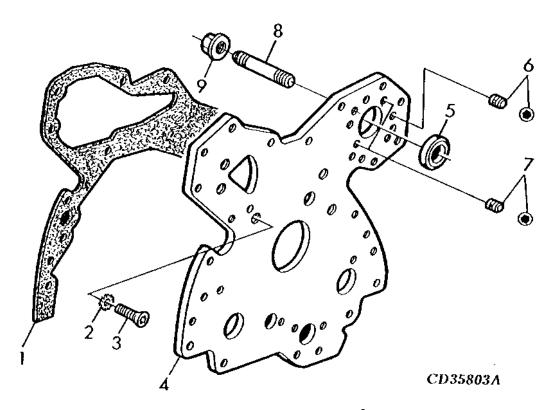


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS	
1	19M8292	SCREW	1		XXX	M10 X 50, (10.9)	
2	R131283	THRUST WASHER	1		X X X	11 X 60 X 3MM	
3	RE56369	HELICAL GEAR	1		X X X	Z = 43, (MARKED R120636)	
4	R114193	BUSHING	1		XXX	OD 47.7MM	
5	R114194	SHAFT	1		X X X	OD 44.5MM	
6	R101225	THRUST WASHER	1		X X X	22 X 60 X 3MM	

FRONT PLATE

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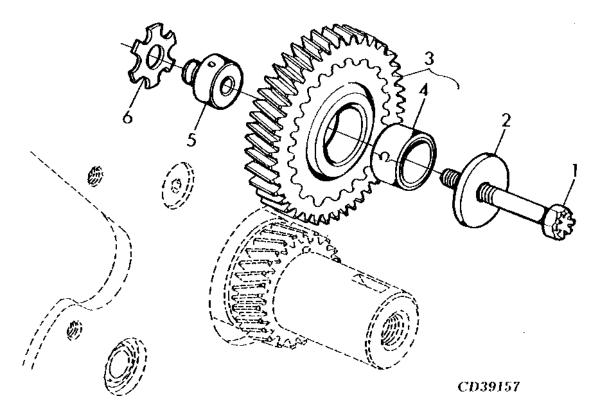
CD35803A -UN-01JAN94



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 T	REMARKS
1	R131794	GASKET	1		Х	
2	12H324	WASHER	5		Χ	3/8"
3	T20166	SCREW	5		Χ	
4	R79863	PLATE	1		Х	(ALSO ORDER (8) AT21191 AND (2) AT22919)
5	R79854	WASHER	AR		Χ	OD X ID 50MM X 46MM
6	AT21191	SET SCREW	8		Χ	5/16" X 0.380"
7	AT22919	SET SCREW	2		Х	3/8" X 0.380"
8	T23442	STUD	3		Χ	LGTH 36.6MM X 5/16"-24NS X 5/16"-18UNC
9	A22698	NUT	3		Χ	5/16"-18UNC

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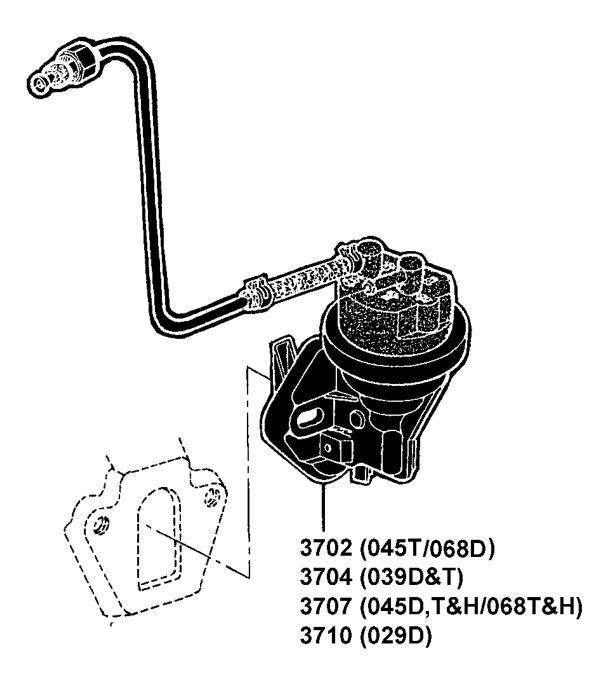


KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO	0 3 9 0. T	REMARKS	
1	T26327	SCREW	1	Х		
2	R101227	THRUST WASHER	1	X	14.7 X 57.9 X 4MM, FRONT	
3	AR91660	HELICAL GEAR	1	X	(MARKED R70182) $Z = 55$	
4	T20034	BUSHING	1	Х		
5	R109863	PIN FASTENER	1	X	OD 44.5MM	
6	R101225	THRUST WASHER	1	Χ	22 X 60 X 3MM, REAR	

FRONT PLATE

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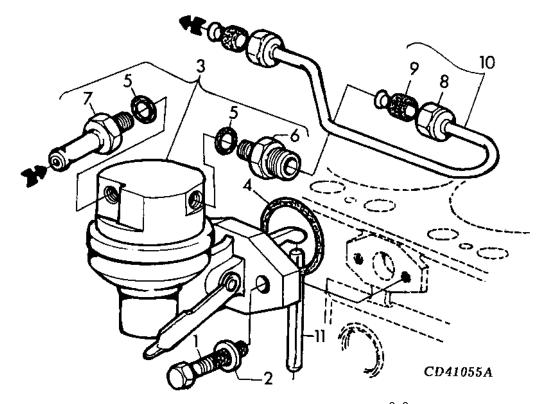
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FUEL PUMP

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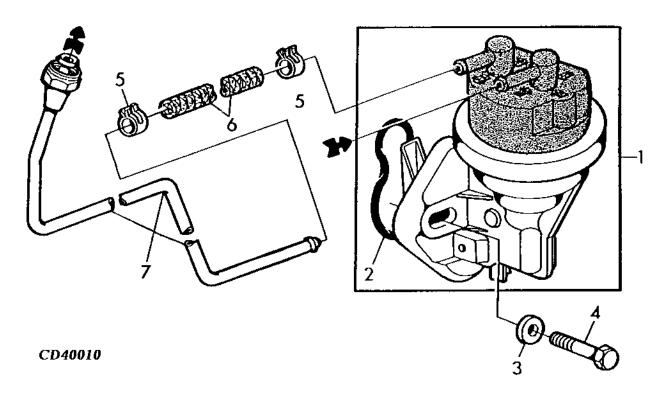


KEY	PART NO.	PART NAME	QTY	ENGINE	0 (4 (5 (T)	6 8	REMARKS
1	RE66298	CAP SCREW	2		X X	X	WITH SEALANT
2	24M7055	WASHER	2		X	Χ	8.400 X 16 X 1.600 MM
3	RE68345	FUEL PUMP	1		X	Χ	ASSY, INCL KEYS 4-7
4	R123273	O-RING	1		X X	Χ	
5	R500271	O-RING	2		X X	Χ	
6	R500270	UNION FITTING	1		X X	Χ	M10 X 9/16"
7	R500269	FITTING	1		X X	Χ	M10 X OD 8.5MM, (ALSO ORDER R500271)
8	R123594	NUT	2		X	Χ	9/16"-24UNEF
9	R74012	SEALING WASHER	2		X	Χ	
10	RE60037	FUEL LINE	1		X X	Χ	
11	R133405	PUSH ROD	1		X X	Χ	

FUEL PUMP

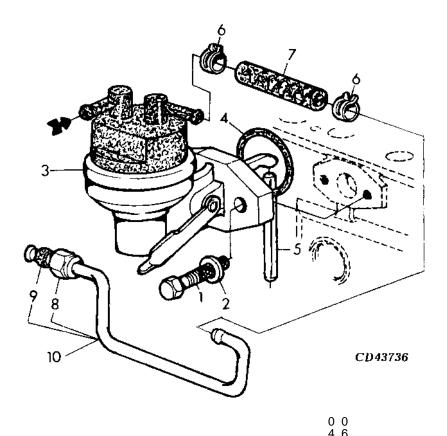
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CD40010 -UN-07SEP95



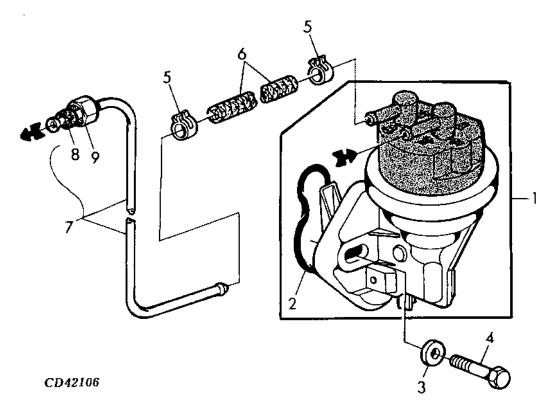
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS	
1	RE38009	FUEL PUMP	1		ХХ	80 L/H-15 KPA (0.15 BAR) 2500 MIN-1 (21	
						GPH-2.1 PSI/2500 MIN-1)	
2	T16318	O-RING	1		ХХ	•	
3	24H1136	WASHER	2		ХХ	11/32" X 11/16" X 0.065"	
4	19H2127	CAP SCREW	2		ХХ	5/16" X 7/8"	
5	R56101	CLIP	2		ХХ		
6	UN4660	HOSE	1		ХХ	LGTH 50MM	
7	RE58915	FUEL LINE	1		ΧХ		

CD43736 -UN-19FEB01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 5 8 4 T T 5 & & D H H	REMARKS	
1	RE66298	CAP SCREW	2		XXX	WITH SEALING COMPOUND	
2	24M7055	WASHER	2		X X X		
3	RE502513	FUEL PUMP	1		X X X	ASSY, INCL. KEY 4	
4	R123273	O-RING	1		XXX		
5	R133405	FOLLOWER	1		X X X		
6	R56101	CLIP	2		X X X		
7	UN4660	HOSE	1		XXX	BULK, CUT TO LENGTH	
8	R123594	NUT	1		X X X		
9	R74012	SEALING WASHER	1		X X X		
10	RE60025	FUEL LINE	1		XXX		

CD42106 -UN-30JUL98



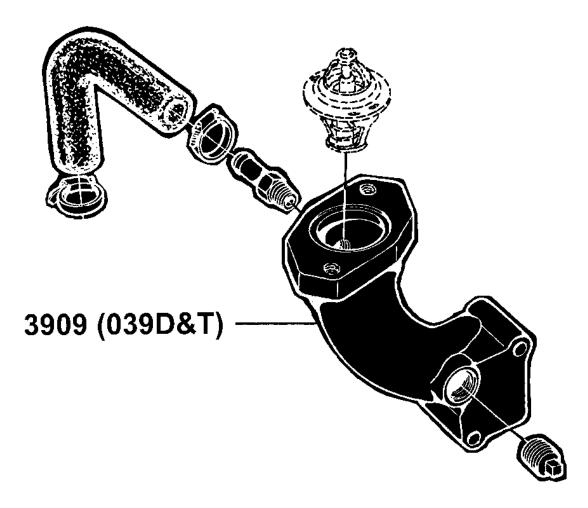
KEY	PART NO.	PART NAME	QTY	ENGINE 9 SERIAL NO. [PREMARKS
1	RE38009	FUEL PUMP	1	>	(80 L/H-15 KPA (0.15 BAR) 2500 MIN-1 (21 GPH-2.1 PSI/2500 MIN-1)
2	T16318	O-RING	1	>	·
3	24H1136	WASHER	2	>	(11/32" X 11/16" X 0.065"
4	19H2127	CAP SCREW	2	>	(5/16" X 7/8"
5	R56101	CLIP	2	>	(
6	UN4660	HOSE	1	>	C LGTH 1M, CUT TO LENGTH, COUPER A LONGUEUR, ABLAENGEN, TAGLIARE SU MISURE, CORTAR A LONGITUD, AVSKARE EFTER MATT
7	RE501214	FUEL LINE	1	>	
8	R74012	SEALING WASHER	1	>	
9	R123594	NUT	1	>	(9/16" - 24UNF

FUEL PUMP

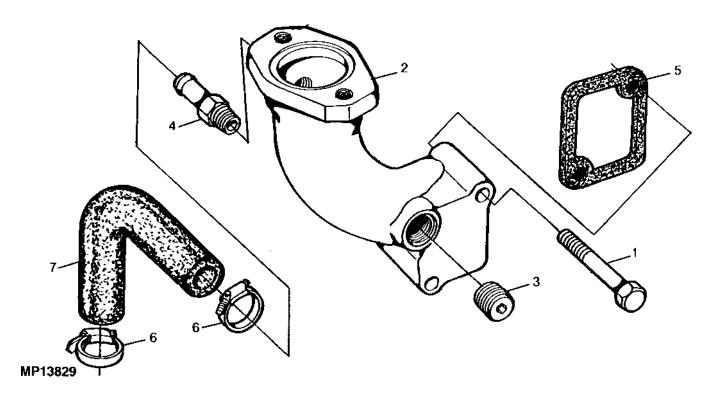
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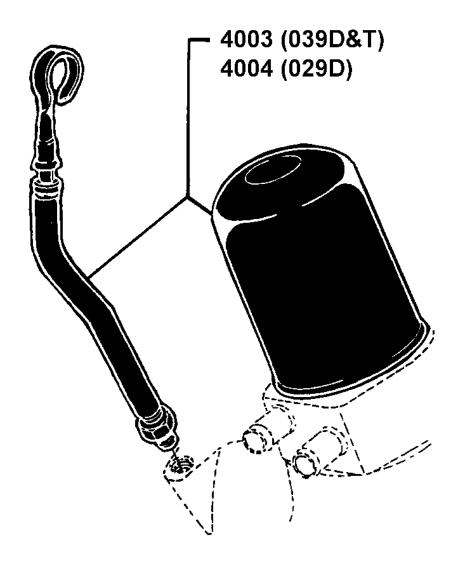
KEY	PART NO.	PART NAME		0 0 3 3 ENGINE 9 9 ERIAL NO. D T	REMARKS	
1	19H3031	CAP SCREW	2	XX	3/8" X 2-1/2", (SAE 8)	
2	R105806	HOUSING	1	XX		
3	15H584	PIPE PLUG	1	XX	1/2"	
4	T19651	HOSE FITTING	1	XX		
5	R54641	GASKET	1	XX		
6	AR21837	CLAMP	2	XX		
7	T20277	HOSE	1	ХХ		

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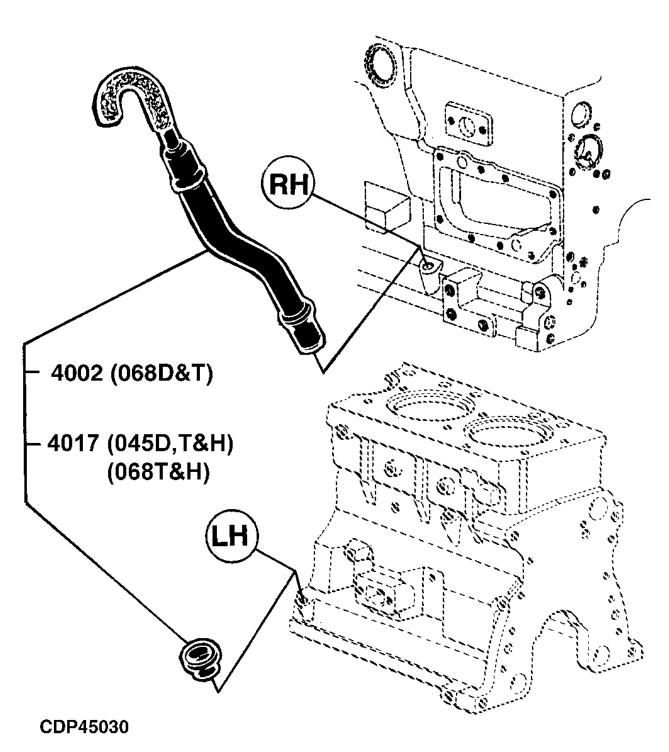
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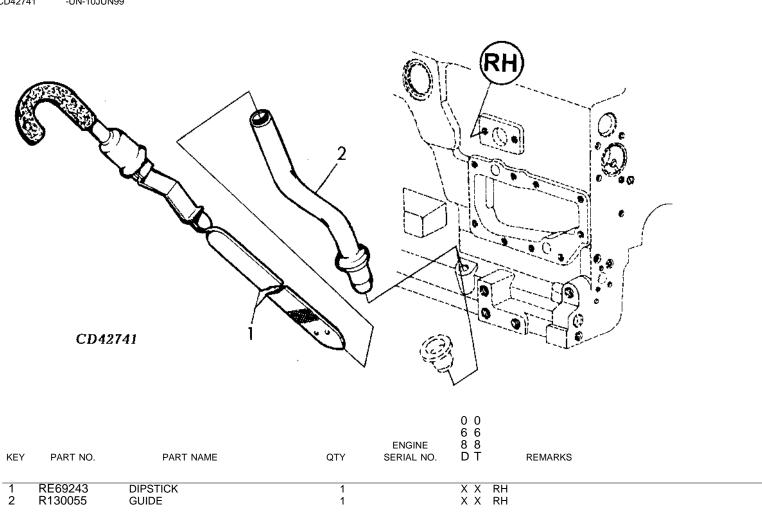
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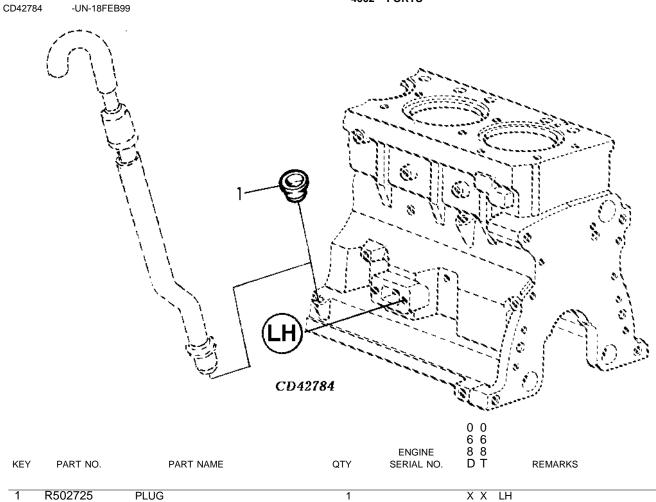
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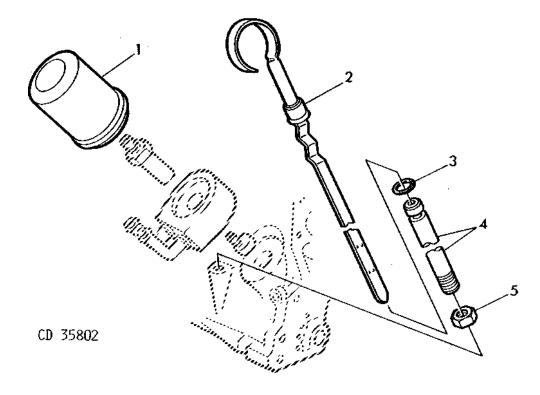
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OIL DIPSTICK

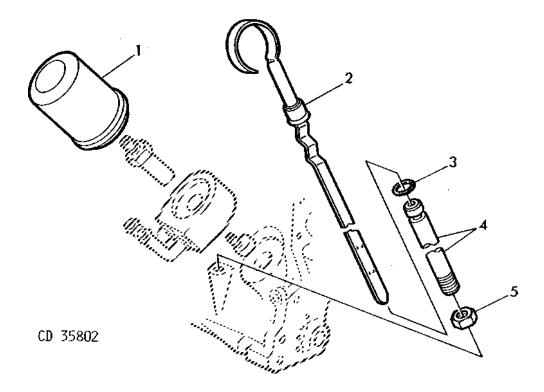
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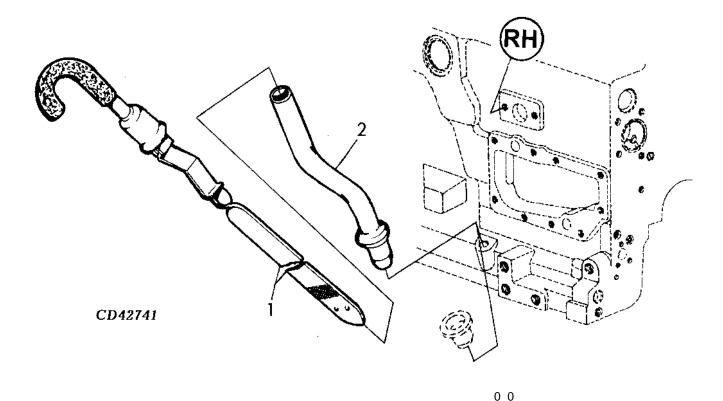
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS	
1	T19044	OIL FILTER	1		ХХ		
2	AT21535	DIPSTICK	1		XXL	GTH 270MM	
3	R10093	O-RING	1		ХХ		
4	R114102	GUIDE	1		XXL	GTH 155MM	
5	14H826	NLIT	1		X X 1	/2"	

CD35802 -UN-01JAN94

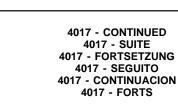


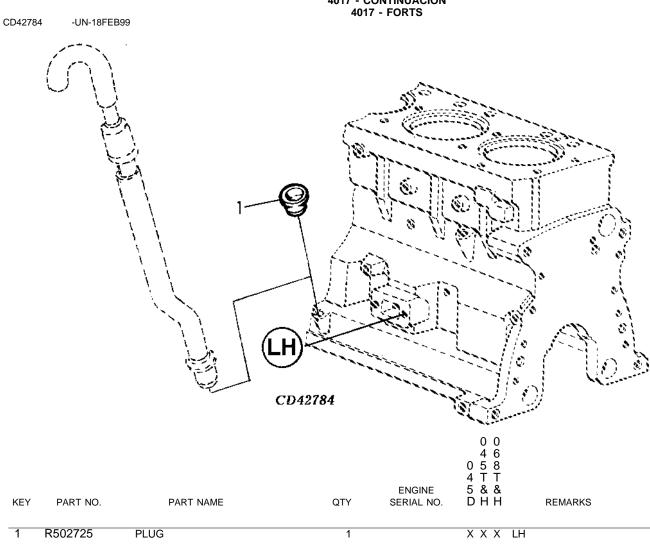
KEY	PART NO.	PART NAME	QTY	ENGINE 9 SERIAL NO. D) REMARKS	
1	T19044	OIL FILTER	1	Х		
2	AT21535	DIPSTICK	1	X	LGTH 270MM	
3	R10093	O-RING	1	X	•	
4	R55301	GUIDE	1	Х	LGTH 127MM	
5	144826	NILIT	1	_	1/0"	

CD42741 -UN-10JUN99

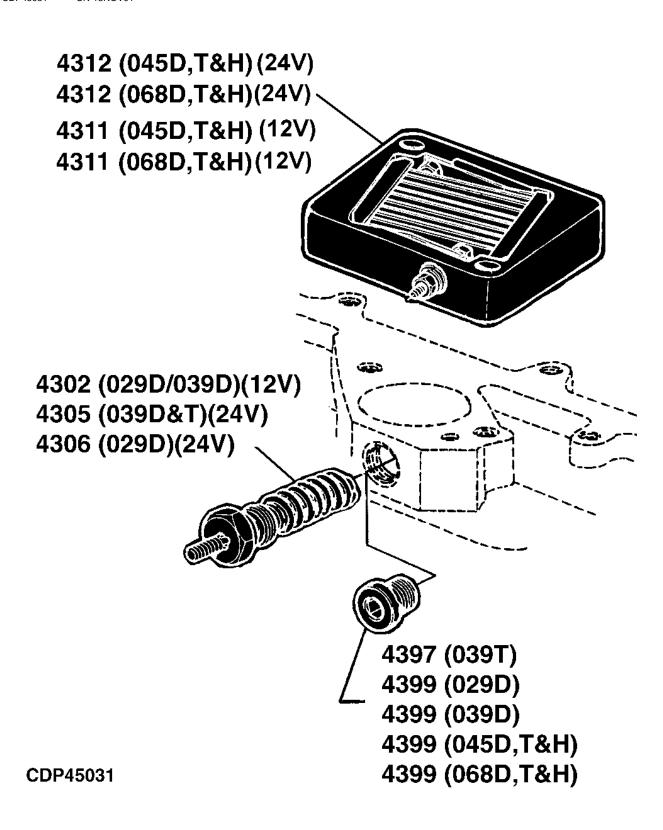


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 6 0 5 8 4 T T 5 & & D H H	REMARKS	
1	RE500168	DIPSTICK	1		X X X RH		
2	R501252	GUIDE	1		XXXRH		



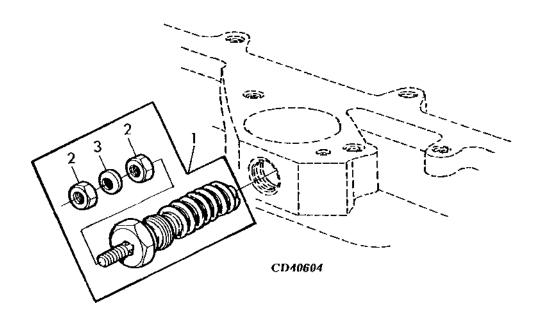


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CDP45031 -UN-13NOV01



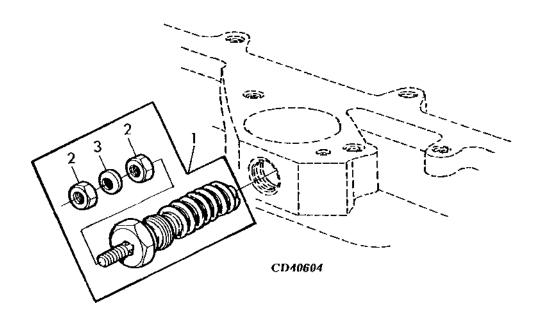
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CD40604 -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE 9 SERIAL NO. T	REMARKS
1	RE502079	GLOW PLUG	1	X	7/8"-14UNF (12V - 700W)
2	14M7297	NUT	2	X	M5
3	12M7077	WASHER	1	X	5 MM

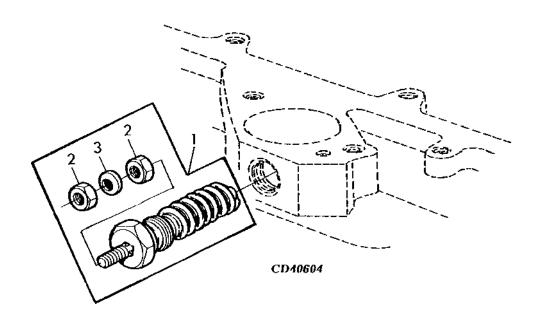
CD40604 -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 2 3 9 9 D D	REMARKS	
1	RE502079	GLOW PLUG	1		ХХ	7/8"-14UNF (12V - 700W)	
2	14M7297	NUT	2		ХХ	M5	
3	12M7064	LOCK WASHER	1		ХХ	5 MM	

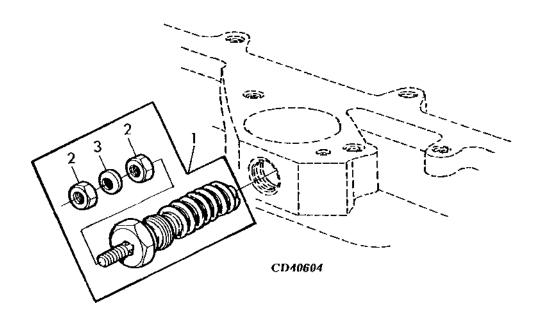
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CD40604 -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS	
1	RE68856	GLOW PLUG	1		ХХ	7/8"-14UNF (24V - 480W)	
2	14M7297	NUT	2		ХХ	M5	
3	12M7077	WASHER	1		ХХ	5 MM	

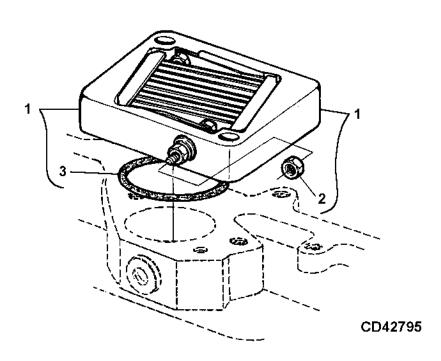
CD40604 -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE 9 SERIAL NO. D	REMARKS
1	RE68856	GLOW PLUG	1	Х	7/8"-14UNF (24V - 480W)
2	14M7297	NUT	2	X	M5
3	12M7077	WASHER	1	X	5 MM

CD42795 -UN-05JUL01

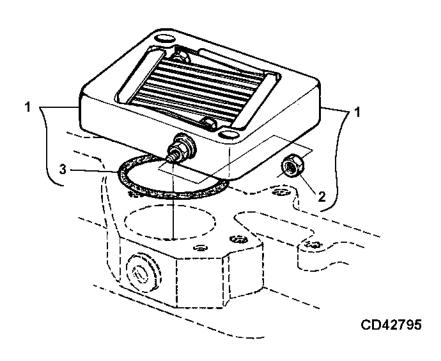




KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS	
1	RE502668 14M7165	HEATER LOCK NUT	1		X X X 12 X X X M6		
3	R501459	O-RING	1		XXX	U	

CD42795 -UN-05JUL01

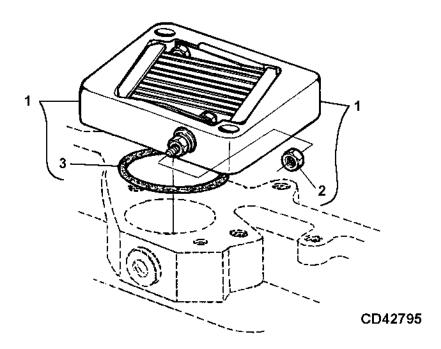




KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H REMARKS	
1	RE502668	HEATER	1	X X X 12V - 1.2KW	_
2	14M7165	LOCK NUT	1	X X X M6	
3	R501459	O-RING	1	XXX	

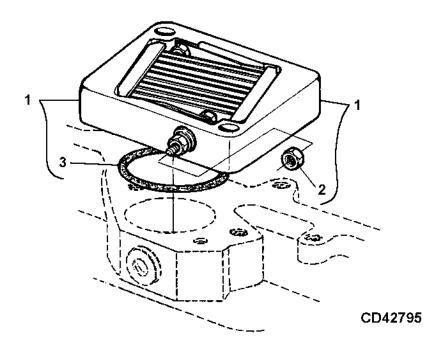
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CD42795 -UN-05JUL01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H REMARKS	
1	RE502657	HEATER	1		X X X 24V - 850W	_
2	14M7165	LOCK NUT	1		X X X M6	
3	R501459	O-RING	1		XXX	

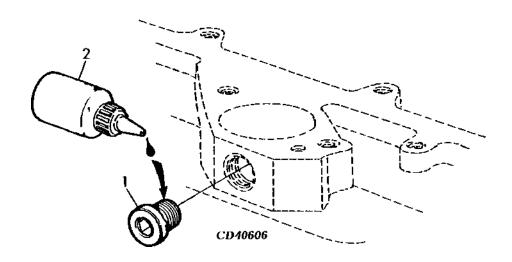
CD42795 -UN-05JUL01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H REMARKS	
1	RE502657	HEATER	1		X X X 24V - 850W	
2	14M7165	LOCK NUT	1		X X X M6	
3	R501459	O-RING	1		XXX	

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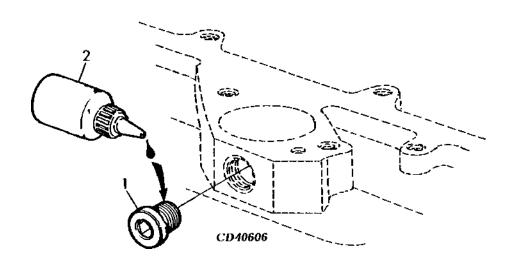
CD40606 -UN-17AUG95



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	0 3 9 T	REMARKS	
1	T58477	FITTING	1	Х	7/8"-14UNF, (ALSO ORDER TY9374 OR TY9375)	_
					APPL	
2	TY9374	SEALANT	AR	Χ	LOCTITE 592, 6ML (0.2 OZ)	
	TY9375	SEALANT	AR	Х	LOCTITE 592, 50ML (1.7 OZ)	_

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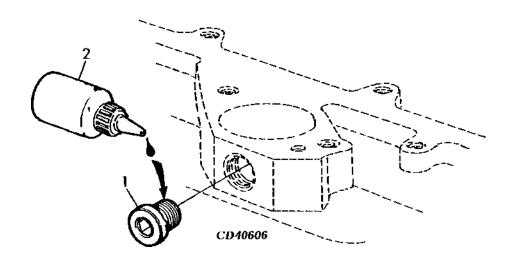
CD40606 -UN-17AUG95



KEY	PART NO.	PART NAME		0 0 2 3 GINE 9 9 AL NO. D D	REMARKS
1	T58477	FITTING	1	ХХ	7/8"-14UNF, (ALSO ORDER TY9371 OR T43513)
					APPL
2	TY9371	SEALANT	AR	XX	LOCTITE 271, 6ML (0.2 OZ)
	T43513	SEALANT	AR	ХХ	LOCTITE 271, 50ML (1.7 OZ)

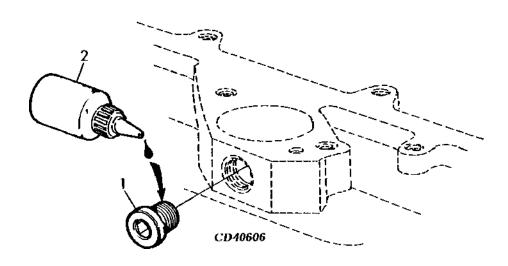
4399

CD40606 -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	T58477	FITTING	1		Χ	7/8"-14UNF, (ALSO ORDER TY9371 OR
						T43513) APPL
	T58477	FITTING	1		XX	7/8"-14UNF, (ALSO ORDER TY9374 OR
						TY9375) APPL
2	TY9371	SEALANT	AR		X	LOCTITE 271, 6ML (0.2 OZ)
	T43513	SEALANT	AR		X	LOCTITE 271, 50ML (1.7 OZ)
	TY9374	SEALANT	AR		ХХ	LOCTITE 592, 6ML (0.2 OZ)
	TY9375	SEALANT	AR		ΧХ	LOCTITE 592, 50ML (1.7 OZ)

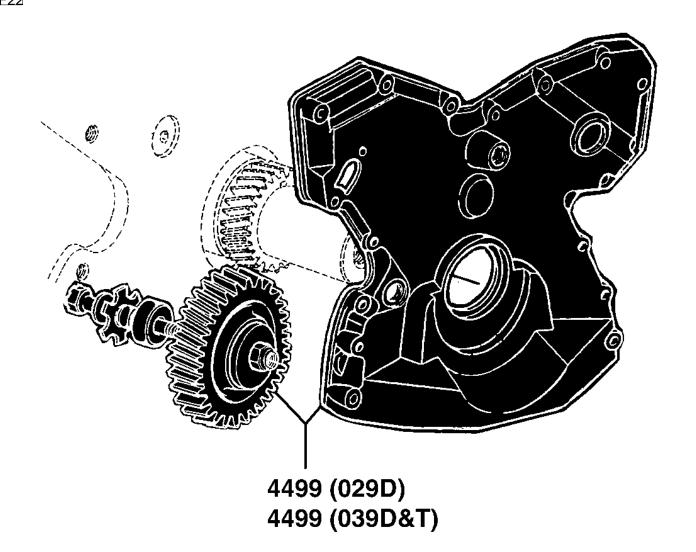
CD40606 -UN-17AUG95



KEY	PART NO.	PART NAME	ENGIN QTY SERIAL I		REMARKS	
1	T58477	FITTING	1	Х	7/8"-14UNF, (ALSO ORDER TY9371 OR	_
					T43513) APPL	
	T58477	FITTING	1	XX	7/8"-14UNF, (ALSO ORDER TY9374 OR	
					TY9375) APPL	
2	TY9371	SEALANT	AR	X	LOCTITE 271, 6ML (0.2 OZ)	
	T43513	SEALANT	AR	Χ	LOCTITE 271, 50ML (1.7 OZ)	
	TY9374	SEALANT	AR	ХХ	LOCTITE 592, 6ML (0.2 OZ)	
	TY9375	SEALANT	AR	XX	LOCTITE 592, 50ML (1.7 OZ)	

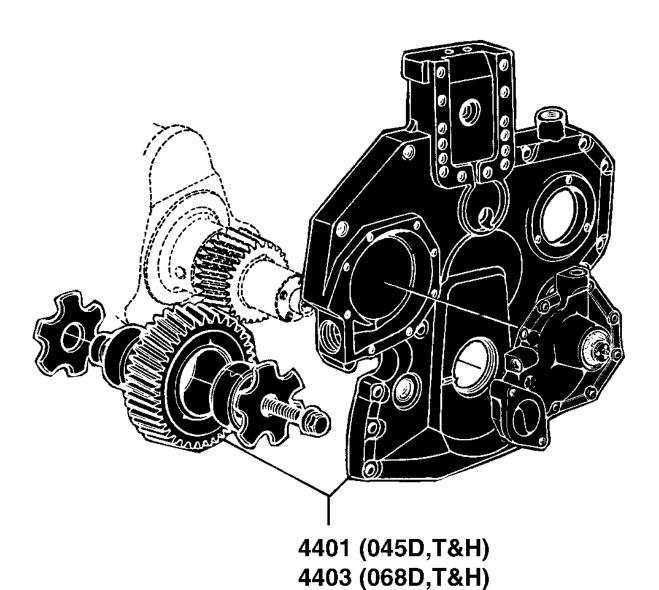
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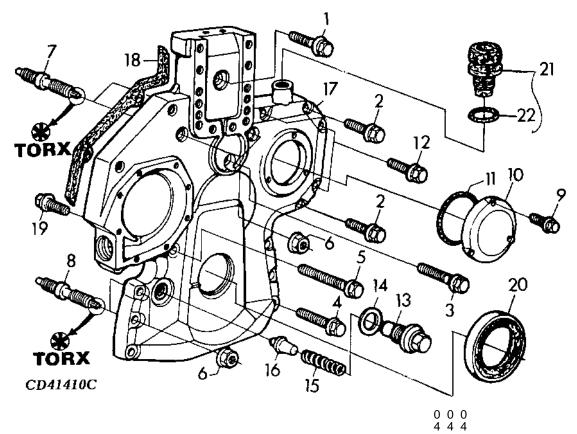


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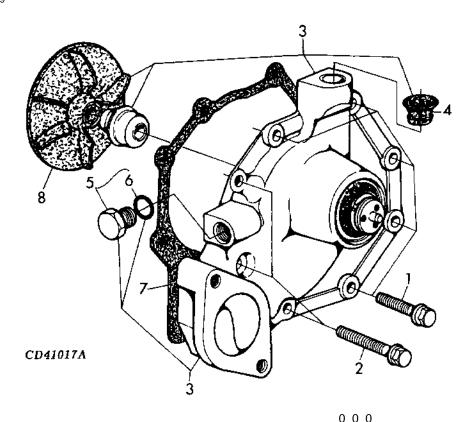
CD41410C -UN-19FEB99



				ENGINE	5 5 5	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DTH	REMARKS
1	19M8291	SCREW	1		XXX	M8 X 35, (10.9)
2	19M8317	SCREW	4		X X X	M8 X 40, (10.9)
3	RE67239	SCREW	1		X X X	WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITE, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR,
						MED TAETNINGSMEDEL
4	19M7979	SCREW	2		X X X	M8 X 55, (10.9)
5	19M7801	SCREW	1			M8 X 60, (10.9)
6	14M7296	FLANGE NUT	6		X X X	M10, (10)
7	R134518	STUD	2			LGTH 68MM
8	R123584	STUD	4		X X X	LGTH 79MM
9	19M7775	SCREW	3		X X X	M6 X 16, (10.9)
10	R121411	COVER	1		X X X	
11	R121424	O-RING	1		X X X	
<u>12</u>	19M7800	SCREW	2			M8 X 50, (10.9)
13	R91692	PLUG	1		X X X	
14	A4827R	WASHER	1		X X X	
15	T27658	SPRING	1		X X X	LGTH 119MM
16	R83169	VALVE	1		X X X	
17	R134531	COVER	1		X X X	
18	R136516	GASKET	1		X X X	
19	19M7867	SCREW	1		X X X	
20		SEAL	1		X X X	NSEP, ORD KIT RE59810
21	RE501938	PLUG	11		X X X	
22	51M7044	O-RING	1		X X X	17.300 X 2.200 MM

4401 - CONTINUED 4401 - SUITE 4401 - FORTSETZUNG 4401 - SEGUITO 4401 - CONTINUACION 4401 - FORTS

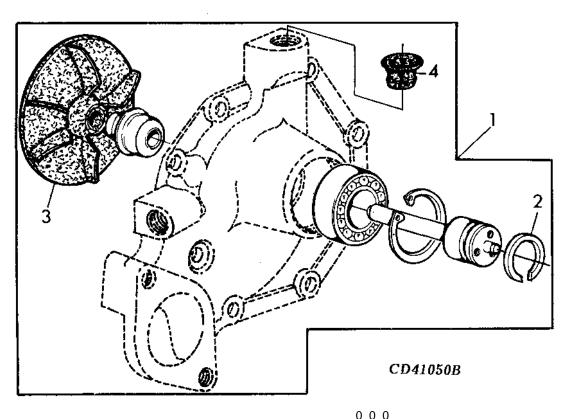
CD41017A -UN-19FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS
1	19M7863	SCREW	5		XXX	M6 X 25, (10.9)
2	19M7796	SCREW	3		X X X	M6 X 30, (10.9)
3	RE500737	WATER PUMP	1		X X X	ASSY, INCL. KEYS 4-6,8, (ALSO ORDER
						R123417 AND R123226)
4	R123226	GASKET	1		X X X	,
5	RE46685	PLUG	1		X X X	M18 X 1.5
6	51M7043	O-RING	1		XXX	15.300 X 2.200 MM
7	R123417	GASKET	1		X X X	
8		IMPELLER	1		X X X	MARKED R121036, ORD KIT RE71240

4401 - CONTINUED 4401 - SUITE 4401 - FORTSETZUNG 4401 - SEGUITO 4401 - CONTINUACION 4401 - FORTS

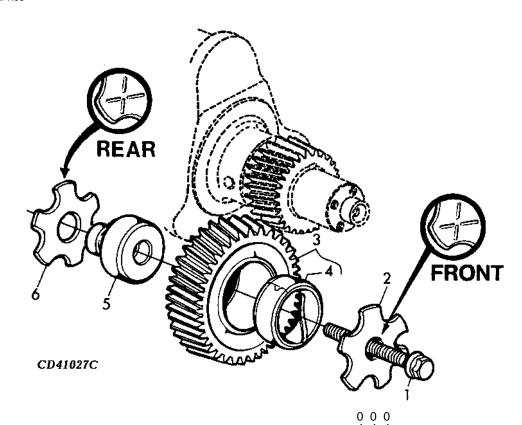
CD41050B -UN-19FEB98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS
1	RE71240	KIT	AR		XXX	(ALSO ORDER R123417 AND R123226)
2	A364R	SNAP RING	1		X X X	
3		IMPELLER	1		X X X	MARKED R121036, ORD RE71240
4	R123226	GASKET	1		X X X	

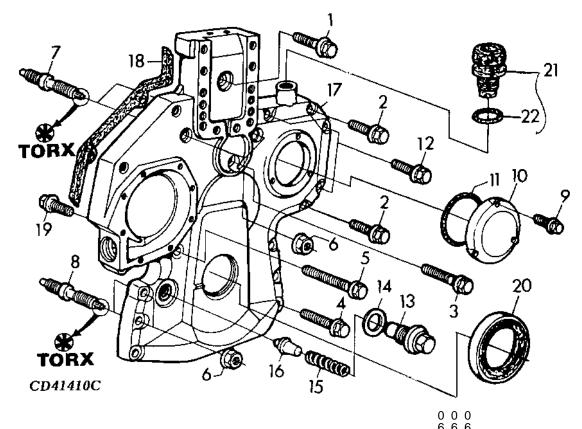
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CD41027C -UN-10APR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	19M8292	SCREW	1		XXX	M10 X 50, (10.9)	
2	R131283	THRUST WASHER	1		X X X 1	1 X 60 X 3MM	
3	RE56369	HELICAL GEAR	1		X X X Z	Z = 43, (MARKED R120636)	
4	R114193	BUSHING	1		XXXX	DD 47.7MM	
5	R114194	SHAFT	1		XXXX	DD 44.5MM	
6	R101225	THRUST WASHER	1		X X X 2	22 X 60 X 3MM	

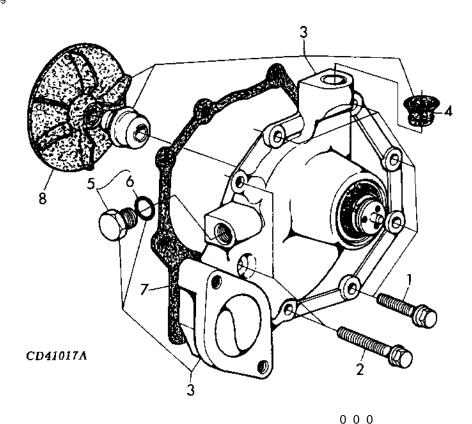
CD41410C -UN-19FEB99



				ENGINE	6 6 6 8 8 8	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DTH	REMARKS
1	19M8291	SCREW	1		XXX	M8 X 35, (10.9)
2	19M8317	SCREW	4			M8 X 40, (10.9)
3	RE67239	SCREW	1			1/8"-27NPTF, WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITE, MIT DICHTMITTEL, CON MATERIALE DI TENUTA, CON SELLADOR, MED TAETNINGSMEDEL
4	19M7979	SCREW	2		X X X	M8 X 55, (10.9)
5	19M7801	SCREW	1			M8 X 60, (10.9)
6	14M7296	FLANGE NUT	6		X X X	M10, (10)
7	R134518	STUD	2			LGTH 68MM
8	R123584	STUD	4			LGTH 79MM
_9	19M7775	SCREW	3		XXX	M6 X 16, (10.9)
10	R121411	COVER	1		XXX	
11	R121424	O-RING	1		X X X	
12	19M7800	SCREW	2			M8 X 50, (10.9)
13	R91692	PLUG	1		X X X	
14	A4827R	WASHER	1		X X X	
15	T27658	SPRING	1		X X X	LGTH 119MM
16	R83169	VALVE	1		X X X	
17	R134531	COVER	1		X X X	
18	R136516	GASKET	1		X X X	
19	19M7867	SCREW	1		X X X	M8 X 25, (10.9)
		SEAL	1		X X X	NSEP, ORD KIT RE59810
21	RE501938	PLUG	1		X X X	
22	51M7044	O-RING	1		XXX	17.300 X 2.200 MM

4403 - CONTINUED 4403 - SUITE 4403 - FORTSETZUNG 4403 - SEGUITO 4403 - CONTINUACION 4403 - FORTS

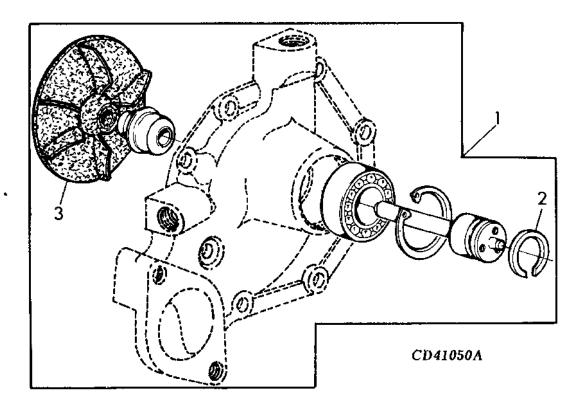
CD41017A -UN-19FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H REMARKS	
1	19M7863	SCREW	5		X X X M6 X 25, (10.9)	
2	19M7796	SCREW	3		X X X M6 X 30, (10.9)	
3	RE500734	WATER PUMP	1		X X X ASSY, INCL KEYS 4-6,8, (ALSO ORDER	
					R123417 AND R123226)	
4	R123226	GASKET	1		XXX	
5	RE46685	PLUG	1		X X X M18 X 1.5	
6	51M7043	O-RING	1		X X X 15.300 X 2.200 MM	
7	R123417	GASKET	1		XXX	
8		IMPELLER	1		X X X MARKED R123395, ORD KIT RE70962	

4403 - CONTINUED 4403 - SUITE 4403 - FORTSETZUNG 4403 - SEGUITO 4403 - CONTINUACION 4403 - FORTS

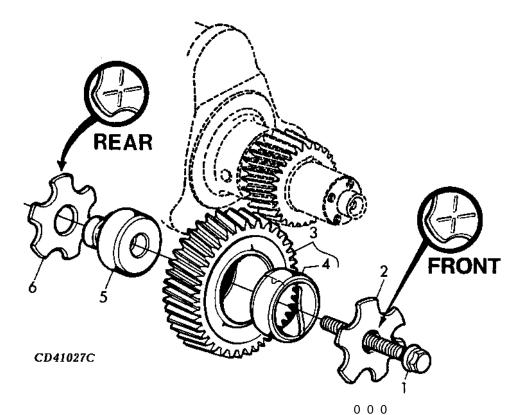
CD41050A -UN-13AUG96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS	
1	RE70962	KIT	AR		XXX	(ALSO ORDER R123417 AND (2) R123226)	_
2	A364R	SNAP RING	1		X X X		
3		IMPELLER	1		X X X	MARKED R123395 . ORD RE70962	

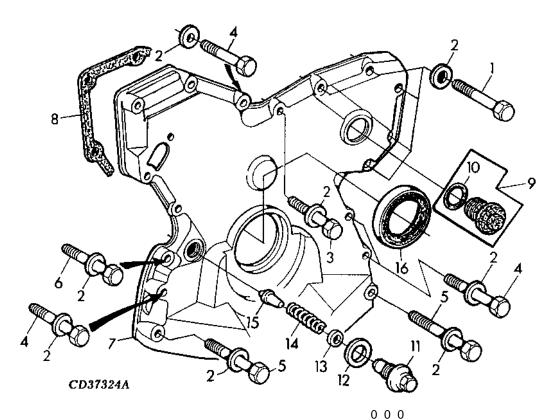
4403 - CONTINUED 4403 - SUITE 4403 - FORTSETZUNG 4403 - SEGUITO 4403 - CONTINUACION 4403 - FORTS

CD41027C -UN-10APR98



KEY	PART NO.	PART NAME		6 6 6 ENGINE 8 8 8 RIAL NO. D T H	REMARKS
1	19M8292	SCREW	1	XXX	M10 X 50, (10.9)
2	R131283	THRUST WASHER	1	X X X	11 X 60 X 3MM
3	RE56369	HELICAL GEAR	1	X X X	Z = 43, (MARKED R120636)
4	R114193	BUSHING	1	XXX	OD 47.7MM
5	R114194	SHAFT	1	X X X	OD 44.5MM
6	R101225	THRUST WASHER	1	XXX	22 X 60 X 3MM

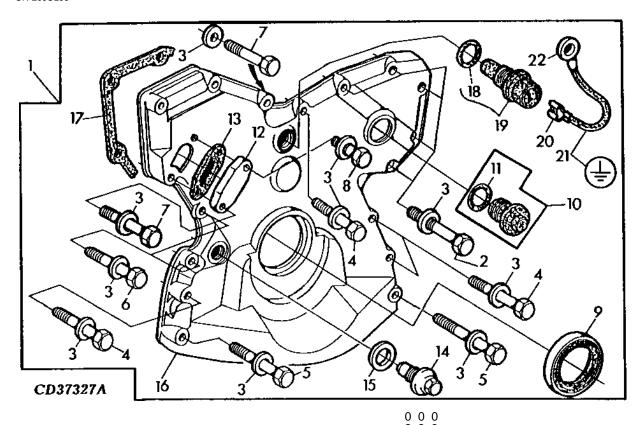
CD37324A -UN-19MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 3 3 9 9 9 D D T	REMARKS	
	19H3065	CAP SCREW	5		V V V	3/8" X 2", (SAE 8)	
ı	24M7106		_		XXX	, ,	
2		WASHER	13			10 X 18 X 2.500 MM	
3	19H1726	CAP SCREW	1		XXX	3/8" X 2-1/4"	
4	19H2733	CAP SCREW	4		XXX	3/8" X 2-3/8", (SAE 8)	
5	19H3031	CAP SCREW	2		X X X		
_6	19H2549	CAP SCREW	1		XXX	0,0 11 1,0	
7		COVER	1		X X X	ALUMINIUM, ALLUMINIO, ALUMINIO,	
						ALUMINIUM, MARKED R122417, ORD	
						RE51527	
8	R97454	GASKET	1		X X X		
9	RE52977	DRAIN PLUG	1		X X X	M42 X 2	
10	51M7049	O-RING	1		$X \times X$	38.600 X 2.900 MM	
11	R91692	PLUG	1		XXX	1"-16UNC	
12	A4827R	WASHER	1		$X \times X$		
13	24H1290	WASHER	AR		X X X	21/64" X 3/4" X 0.035"	
14	T27658	SPRING	1		XXX	LGTH 119MM	
15	R83169	VALVE	1		$X \times X$		
16	AR67942	SEAL	1		X X X		

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CD37327A -UN-20JUL95

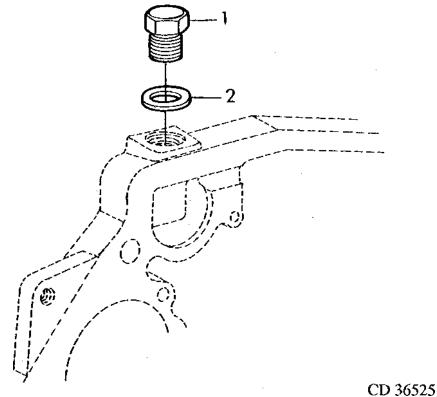


				ENGINE	2 3 3 9 9 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DDT	REMARKS
1	RE51527	KIT	AR		XXX	INCL. INSTRUCTIONS, ANLEITUNG,
						ISTRUZIONI, INSTRUCCIONES, ANVISNINGAR
2	19H3065	CAP SCREW	5		XXX	3/8" X 2", (SAE 8)
3	24M7106	WASHER	16		X X X	10 X 18 X 2.500 MM
<u>4</u> 5	19H2733	CAP SCREW	4		X X X	3/8" X 2-3/8", (SAE 8)
5	19H3031	CAP SCREW	2		X X X	3/8" X 2-1/2", (SAE 8)
6	19H2549	CAP SCREW	2		X X X	3/8" X 1-7/8"
_7	19H1726	CAP SCREW	2		X X X	3/8" X 2-1/4"
8	19H2284	CAP SCREW	1		X X X	3/8" X 7/8"
9	AR67942	SEAL	1		X X X	
10	RE52977	DRAIN PLUG	1			M42 X 2
11	51M7049	O-RING	1			38.600 X 2.900 MM
12	T23260	COVER	1		X X X	
13	R97352	GASKET	1		XXX	
14	R91692	PLUG	1		X X X	
15	A4827R	WASHER	1		X X X	
16		COVER	1		XXX	ALUMINIUM, ALLUMINIO, ALUMINIO,
						ALUMINIUM, MARKED R114217, ORD RE51527
17	R97454	GASKET	1		X X X	
18	51M7044	O-RING	2		X X X	17.300 X 2.200 MM
19	RE38028	SENSOR	1		X X X	
20	R65607	TERMINAL	1		X X X	
21	TY16086	GROUND CABLE	1		X X X	LGTH 30.5M, CUT TO LENGTH
22	R77491	TERMINAL	1		X X X	

4499 - CONTINUED 4499 - SUITE 4499 - FORTSETZUNG 4499 - SEGUITO 4499 - CONTINUACION 4499 - FORTS

CD36525

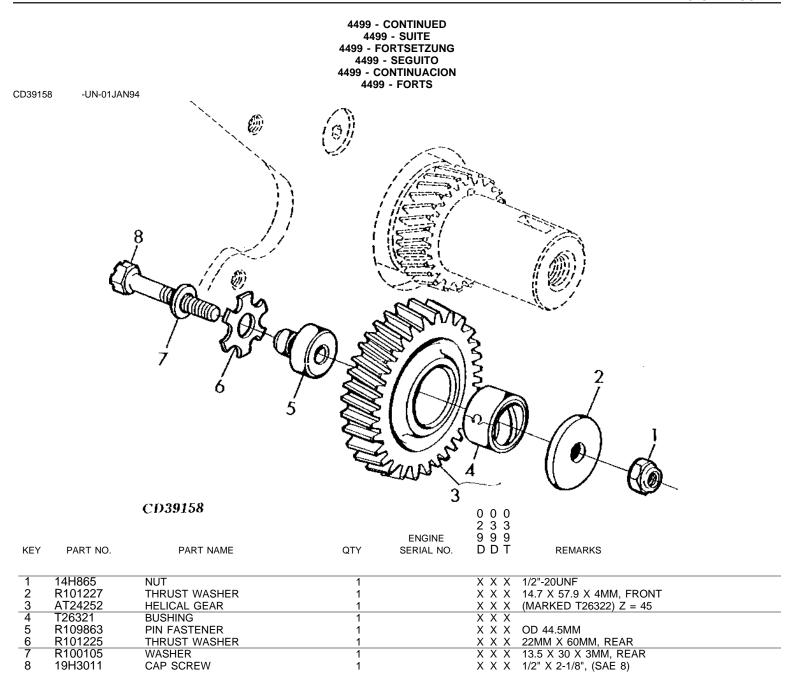
-UN-01JAN94



0 0 0 2 3 3 ENGINE 9 9 9 KEY PART NO. PART NAME QTY SERIAL NO. D D T

1 M1746T DRAIN PLUG 1 X X X 7/8"-14UNF 2 H1058R WASHER 1 X X X 29/32" X 1-1/8" X 0.032"

REMARKS



T26321

R109863

R101225

R100105

19H3011

BUSHING

WASHER

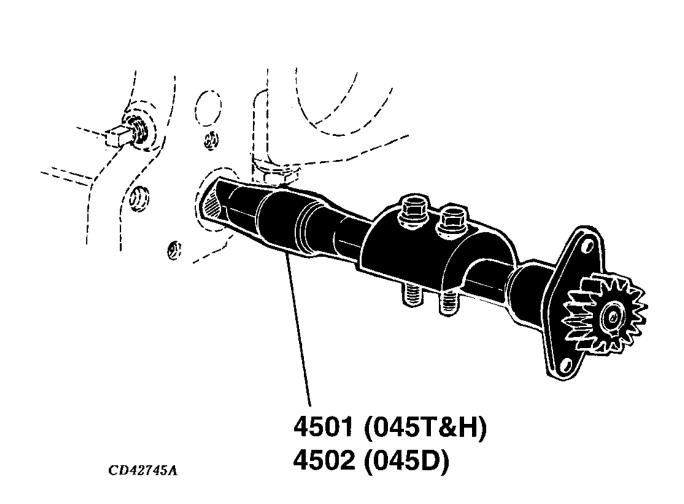
CAP SCREW

PIN FASTENER

THRUST WASHER

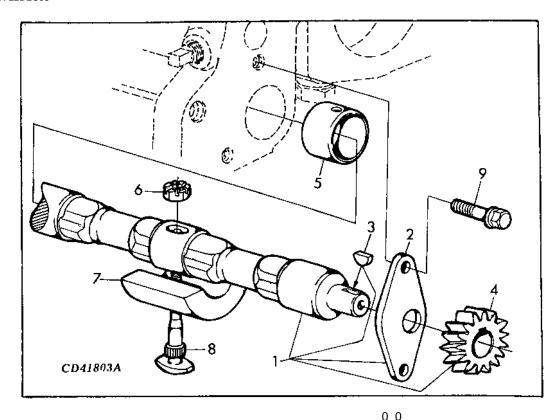
SECTIONAL INDEX
INDEX DE SECTION
GRUPPENINDEX
INDICE DELLA SEZIONE
INDICE DE SECCION
GRUPPSFORTECKNING
CD42745A -UN-24NOV00

4501 - 2G3 4501 - 2G4 4502 - 2G5



4501 - EARLY DESIGN 4501 - ANCIENNE CONCEPTION 4501 - VORHERGEHENDES DESIGN 4501 - PRECEDENTE DISEGNO 4501 - ANTERIOR DISENO 4501 - ALDRE UTFORANDE

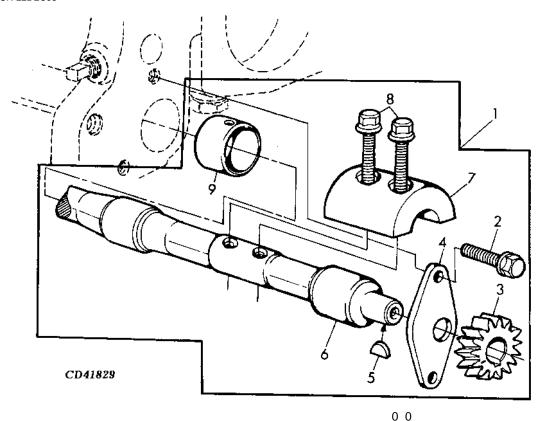
CD41803A -UN-22DEC98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 5 5 T H	REMARKS
1		BALANCER SHAFT	1	-552261	XX	,
						RE502447, RH
		BALANCER SHAFT	1	-552261	ΧХ	MARKED R134357, ORD RE502446 AND
						RE502447, LH
2	R116078	PLATE	1	-552261	ХХ	
3	26M4224	SHAFT KEY	1	-552261	ХХ	4 X 16 MM
4	R120637	HELICAL GEAR	1	-552261	XX	Z = 15, RH
	R120639	HELICAL GEAR	1	-552261	ХХ	Z = 15, LH
5	R115299	BUSHING	6	-552261	ХХ	
6	T15634	NUT	4	-552261	XX	
7	R134358	WEIGHT	4	-552261	ΧХ	
8	T28745	BOLT	4	-552261	ΧХ	
9	19M7864	SCREW	4	-552261	ХХ	M8 X 12, (10.9)

4501 - LATE DESIGN 4501 - RECENTE CONCEPTION 4501 - NEUES DESIGN 4501 - RECENTE DISEGNO 4501 - RECIENTE DISENO 4501 - NYARE UTFORANDE

CD41829 -UN-22DEC98

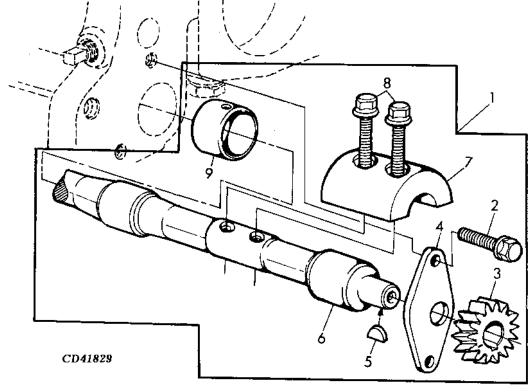


KE'	Y PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 5 5 T H	REMARKS
1	RE502447	BALANCER SHAFT	1	552262-	ХХ	WITH INSTALLATION INSTRUCTIONS, RH
	RE502446	BALANCER SHAFT	1	552262-	ΧХ	WITH INSTALLATION INSTRUCTIONS, LH
2	19M7864	SCREW	2	552262-	ΧХ	M8 X 12, (10.9)
3	R120637	HELICAL GEAR	1	552262-	ХХ	Z = 15, RH
	R120639	HELICAL GEAR	1	552262-	ΧХ	Z = 15, LH
4	R116078	PLATE	1	552262-	ΧХ	
5	26M4224	SHAFT KEY	1	552262-	ХХ	4 X 16 MM
6		BALANCER SHAFT	1	552262-	ΧХ	MARKED R500668, RH, ORD RE502447
		BALANCER SHAFT	1	552262-	ΧХ	MARKED R500266, LH, ORD RE502446
7	R500650	WEIGHT	2	552262-	ХХ	
8	19M7798	SCREW	4	552262-	ΧХ	M8 X 40, (10.9)
9	R115299	BUSHING	3	552262-	ХХ	

BALANCER SHAFTS

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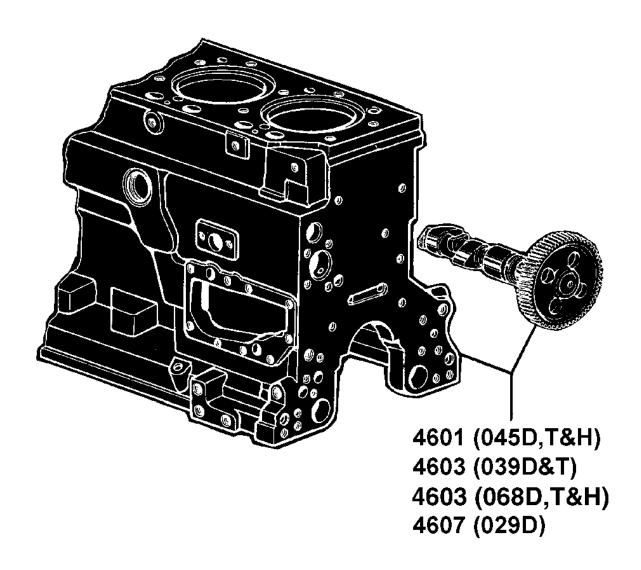
KEY	PART NO.	PART NAME	ENGIN QTY SERIAL	_	REMARKS
1	RE502448	KIT	1	Х	WITH INSTALLATION INSTRUCTIONS, RH
	RE502449	KIT	1	X	WITH INSTALLATION INSTRUCTIONS, LH
2	19M7864	SCREW	2	X	M8 X 12, (10.9)
3	R120637	HELICAL GEAR	1	X	Z = 15, RH
	R120639	HELICAL GEAR	1	X	Z = 15, LH
4	R116078	PLATE	1	X	
5	26M4224	SHAFT KEY	1	X	4 X 16 MM
6		BALANCER SHAFT	1	X	MARKED R500668, NSEP, ORDER RE502448, RH
		BALANCER SHAFT	1	X	MARKED R500266, NSEP, ORDER RE502449, LH
7	R500265	WEIGHT	2	X	
8	19M7798	SCREW	4	X	M8 X 40, (10.9)
9	R115299	BUSHING	3	Х	

BALANCER SHAFTS

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SECTIONAL INDEX INDEX DE SECTION GRUPPENINDEX INDICE DELLA SEZIONE INDICE DE SECCION GRUPPSFORTECKNING CDP45033 -UN-13NOV01 4601 - 2G8

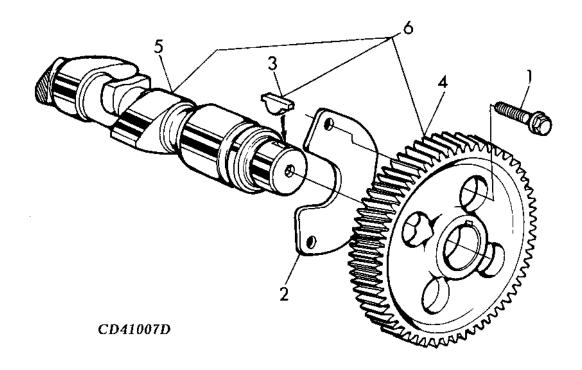
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4601 -	2G9
4603 -	2G11
4603 -	2G13
4603 -	2G14
4603 -	2G15
4607 -	2G17
4607 -	2G19



CDP45033

CD41007D

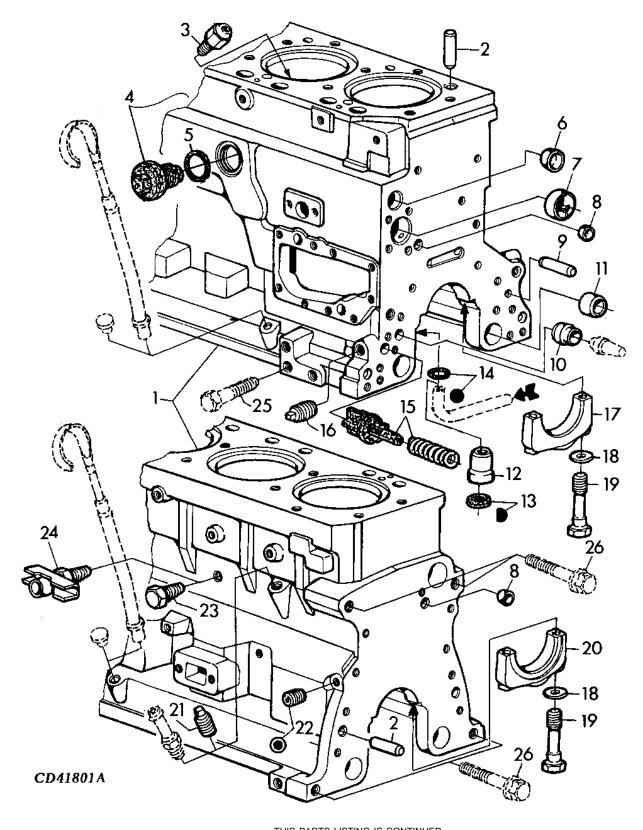
-UN-13MAR98



KEY	PART NO.	PART NAME	ENGIN QTY SERIAL	<u> </u>	
1	19M7867	SCREW	2	X X X M8 X 25, (10.9)	
2	R132518	PLATE	1	XXX	
3		SHAFT KEY	1	X X X NSEP, ORD RE56375	
4		HELICAL GEAR	1	X X X Z= 60 , MARKED R133812, NSEP, ORD	
				RE56375	
5		CAMSHAFT	1	X X X NSEP, ORD RE56375	
6	RE56375	CAMSHAFT	1	XXX	

4601

-UN-08DEC98 CD41801A



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1		CYLINDER BLOCK	1		XXX	MARKED R115081, ORD RE65957 + RE501455 + RE504914 + DD15664
2	A120R	DOWEL PIN	4		X X X	111200101111 2210001
3	R131182	ORIFICE	4		XXX	
4	RE502422	DRAIN PLUG	2		X X X	1-5/8"-12UN
5	R501377	O-RING	2		X X X	
6	R116466	PLUG	1		XXX	
7	R119874	BUSHING	1		X X X	(ALSO ORDER TY6333)
8	T18891	CAP	2		X X X	OD 16MM
9	B153R	DOWEL PIN	2		XXX	9.525 X 25.400MM
10	R26493	BUSHING	1		X X X	
11	R115299	BUSHING	6		X X X	
12	R115390	BUSHING	AR		X X X	FOR R75892
13	R75892	O-RING	AR		X X X	FOR R115390
14	R97185	O-RING	1		X X X	
15	RE63674	VALVE	1		X X X	KIT
16	15H623	PIPE PLUG	1		X X X	3/8"-18NPT
17	R114241	BEARING CAP	4		X X X	
18	T20168	WASHER	10		X X X	
19	T23474	CAP SCREW	10		X X X	
20	R132186	BEARING CAP	1		X X X	
21	15H584	PIPE PLUG	AR			1/2"-14NPT
22	R104592	PIPE PLUG	5		X X X	1/8"-27NPT
23	RE507807	PIPE PLUG	1		X X X	1/4"-18NPT, WITH SEALANT
24	AT13740	DRAIN VALVE	AR		X X X	
25		CAP SCREW	AR		X X X	*****
26		CAP SCREW	AR		X X X	M12

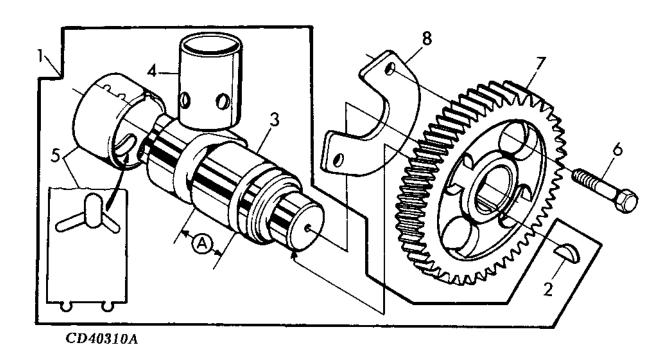
4603 4603 4603 4603 4603 4603 CD37255A -UN-16JAN97 21 16 30 26mm (1.02°) CD37255A -16

19

					0 0 3 3	
				ENGINE	9 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DΤ	REMARKS
1	RE51870	KIT	1		ХХ	W/ INSTRUCTIONS
2	19H2676	CAP SCREW	2		ХХ	3/8" X 1", (SAE 8)
_3	T20072	PLATE	1		XX	
4	26H72	SHAFT KEY	1			1/8" X 5/8"
5		CAMSHAFT	1			MARKED R115335, ORD KIT RE55901
6	T20073	TAPPET	8		XX	
7	R54802	ORIFICE	4		XX	
8	A120R	DOWEL PIN	4		XX	
9	B153R	DOWEL PIN	2			LOW
10	19H1726	CAP SCREW	2			3/8" X 2-1/4"
11	R130883	STUD	1			LGTH 47MM, 3/8"-16NC X 3/8"-16UNC
12	T18891	CAP	1		XX	
13 14	R26493	BUSHING	1		XX	
		SPRING VALVE	1			LGTH 51MM, NSEP, ORDER KIT RE63674
15 16	T23474	CAP SCREW	10		X X	LGTH 41MM, NSEP, ORDER KIT RE63674
17	R32214	WASHER	10		XX	
18	R65215	BEARING CAP	4		XX	
19	R79089	CAP	4			REAR
20	R97185	O-RING	1		XX	
04		CYLINDER BLOCK	1			MARKED R116194, NSEP, ORDER KIT RE51870
22	15H623	PIPE PLUG	<u></u>			3/8"-18NPT
23	15H690	PIPE PLUG	1			3/4"-14NPTF USE WITH 15H690
24	15H616	PIPE BUSHING	1			1"-11.5NPTF X 3/4"-14NPTF USE WITH 15H665
25	R104592	PIPE PLUG	5			1/8"-27NPT, WITH SEALANT
26	RE502422	DRAIN PLUG	1		XX	
27	R507807	O-RING	i		XX	
28	R55233	PIPE PLUG	1			1/4"-18NPT, WITH SEALANT
29	R119874	BUSHING	i			(ALSO ORDER TY6333)
30	15H584	PIPE PLUG	2			1/2"-14NPT
31	T23435	THREADED NIPPLE			XX	
32	15H562	PIPE PLUG	1			1"-11.5NPTF
33	R119210	BUSHING	6			OD STD
	R91708	BUSHING	AR			OS +2MM
34	19H2351	CAP SCREW	1		ΧХ	1/2" X 1/2"
35	T24608	WASHER	1		ХХ	
36	R121194	ADAPTER	1		ХХ	1/2"-13UNC X 1/2"-14NPTF
37	14H1076	NUT	1		ХХ	3/8"-16UNC, HS SAE 8
38	R75892	O-RING	1			(USE WITH R75893)
39	R75893	FITTING	1		ХХ	(USE WITH R75892)
40	RE63674	KIT	1		ХХ	
41	AT13740	DRAIN VALVE	AR		ХХ	

4603 - CONTINUED 4603 - SUITE 4603 - FORTSETZUNG 4603 - SEGUITO 4603 - CONTINUACTION 4603 - FORTS

CD40310A -UN-22JAN97

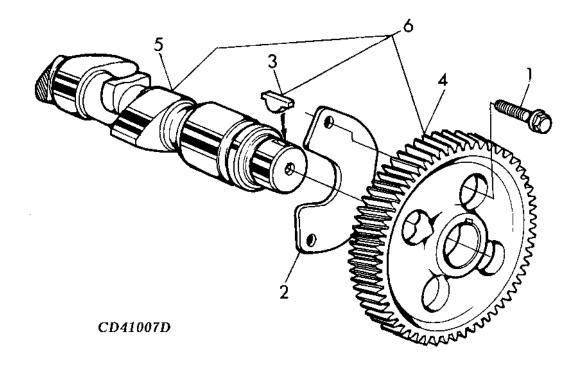


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS
1	RE55901	KIT	1		ХХ	(ALSO ORDER TY6333) INCL INSTRUCTIONS
2	26H72	SHAFT KEY	1		ХХ	1/8" X 5/8"
3		CAMSHAFT	1		ХХ	A = 40MM, MARKED R115335, ORD RE55901
4	T20073	TAPPET	8		XX	
5	R119874	BUSHING	AR		ХХ	
6	19H2676	CAP SCREW	2		ХХ	3/8" X 1", (SAE 8)
7	T20070	HELICAL GEAR	1		XX	Z = 48
8	T20072	PLATE	1		ΧХ	

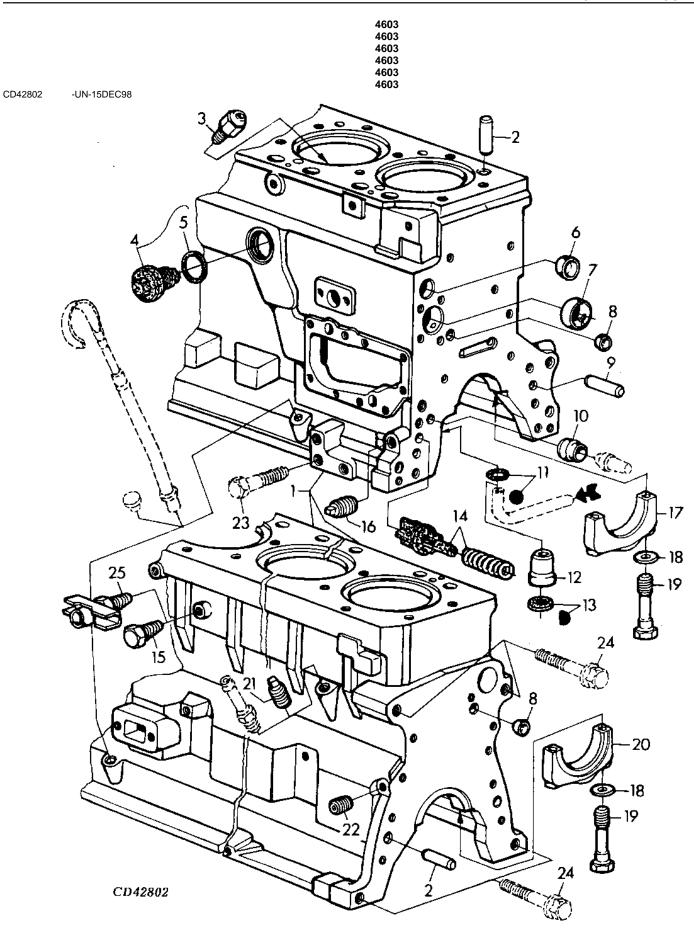
4603

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-UN-13MAR98

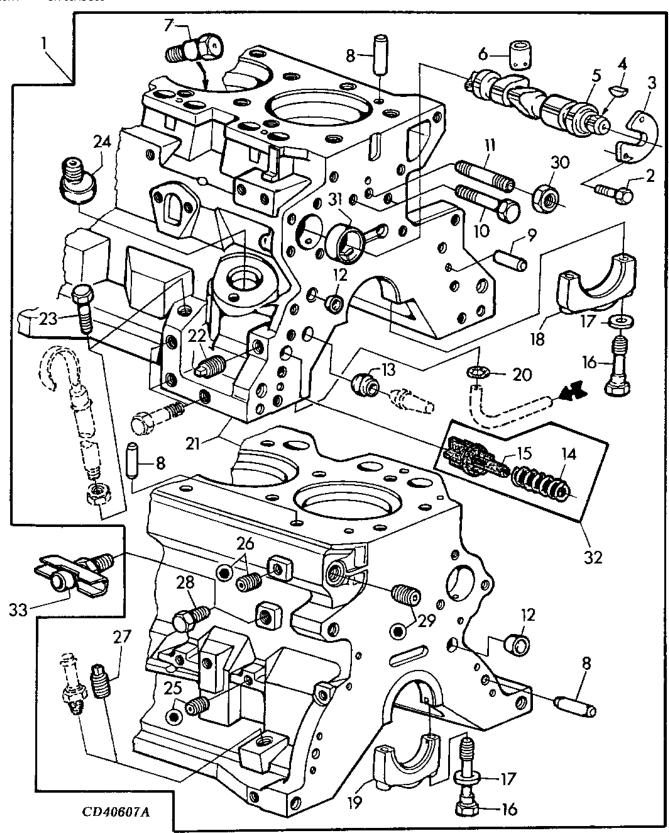


KEY	PART NO.	PART NAME		0 0 6 6 GINE 8 8 AL NO. T H	REMARKS
1	19M7867	SCREW	2	XX	M8 X 25, (10.9)
2	R132518	PLATE	1	ХХ	,
3		SHAFT KEY	1	XX	
4		HELICAL GEAR	1	XX	Z = 60, MARKED R133812, NSEP, ORD RE56578
5		CAMSHAFT	1	XX	NSEP, ORD RE56578
6	RE56578	CAMSHAFT	1	XX	



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 6 6 8 8 T H	REMARKS
1		CYLINDER BLOCK	1		ХХ	MARKED R119565 , ORD RE65959 + RE501456 + RE504914 + DD15664
3	A120R	DOWEL PIN	4		ХХ	
3	R131182	ORIFICE	6		ХХ	
4	RE502422	DRAIN PLUG	2			1-5/8"-12UN
_5	R501377	O-RING	2		ХХ	
6	R116466	PLUG	1		ХХ	
7	R119874	BUSHING	1		ХХ	(ALSO ORDER TY6333)
8	T18891	CAP	2		ХХ	OD 16MM
9	B153R	DOWEL PIN	2		ХХ	
10	R26493	BUSHING	1		ΧХ	
<u>11</u>	R97185	O-RING	1		ХХ	
12	R115390	BUSHING	1		ΧХ	
13	RE507807	PIPE PLUG	1			FOR R115390
14	RE63674	VALVE	1		ХХ	KIT
15	R55233	PIPE PLUG	1			1/4"-18NPT, WITH SEALANT
16	15H623	PIPE PLUG	1			3/8"-18NPT
17	R114241	BEARING CAP	6		ХХ	
18	T20168	WASHER	14		ΧХ	
19	T23474	CAP SCREW	14		ХХ	
20	R132186	BEARING CAP	1		ХХ	
21	15H584	PIPE PLUG	AR		ΧХ	1/2"-14NPT
22	R104592	PIPE PLUG	6		ΧХ	1/8"-27NPT
23		CAP SCREW	AR		ХХ	
24		CAP SCREW	AR		ХХ	M12
25	AT13740	DRAIN VALVE	AR		ХХ	

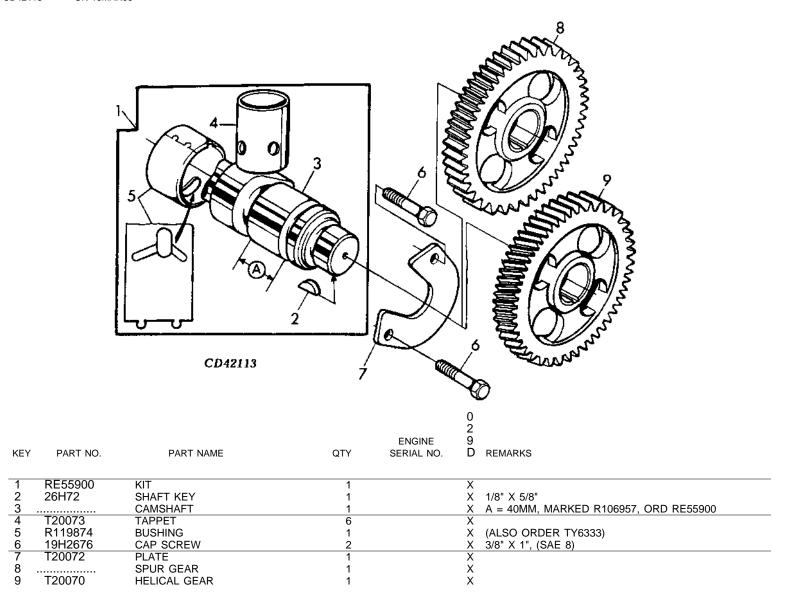
CD40607A -UN-05AUG96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS
1	RE65358	CYLINDER BLOCK	1		Х	
2	19H2676	CAP SCREW	2			3/8" X 1", (SAE 8)
3	T20072 26H72	PLATE	1		X	4/0!! V F/0!!
4 5 6		SHAFT KEY	1			1/8" X 5/8" MARKED R106957, NSEP, ORD KIT RE55900
6	T20073	CAMSHAFT TAPPET	6		X	MARKED R100957, NSEP, ORD KIT RESS900
7	R54802	ORIFICE	3		$\frac{\hat{x}}{x}$	
8	R48685	DOWEL PIN	4			OD 12.7MM, UP, REAR
9	R26650	DOWEL PIN	2			OD 9.5MM, FRONT
10	19H1726	CAP SCREW	2			3/8" X 2-1/4"
11	R130883	STUD	1			LGTH 47MM, 3/8"
12	T18891	CAP	AR			OD 16MM
13	R26493	BUSHING	1		Х	
		SPRING	1		Χ	LGTH 51MM, ORD RE63674
		VALVE	1		Χ	LGTH 40.5MM, ORD RE63674
16	T23474	CAP SCREW	8		Χ	
17	R32214	WASHER	8		Χ	
18	R65215	BEARING CAP	3		X	
19	R79089	CAP	1			REAR
20	R97185	O-RING	1		Х	
		CYLINDER BLOCK	1			MARKED R129432, ORD RE65358
22	15H695	PIPE PLUG	1			3/8"-18NPT
23	19H2351	CAP SCREW	1			1/2" X 1/2"
24 25	T23435	THREADED NIPPLE	11		X	A JOH OZNICH NAJITH OF ALANIT AND DOODHIT
25	R104592	PIPE PLUG	4		Х	1/8"-27NPT, WITH SEALANT, AVEC PRODUIT D'ETANCHEITE, MIT DICHTMITTEL, CON MATERIALE DI TENUTA, CON SELLADOR, MED
26	1511605	DIDE DI LIC	4		V	TAETNINGSMEDEL
26	15H685 15H584	PIPE PLUG	1			1/4"-18NPT
27 28	RE507807	PIPE PLUG	1 1			1/2"-14NPT
20 29	15H562	PIPE PLUG PIPE PLUG	1			1/4"-18NPT, WITH SEALANT 1"-11.5NPT
30	14H1076	NUT	1			3/8"-16UNC
31	R119874	BUSHING	<u>1</u>			(ALSO ORDER TY6333)
32	RE63674	VALVE	AR		x	KIT
33	AT13740	DRAIN VALVE	AR		X	MI
00	7.1107-10	DIAMIN VALVE	AIX		^	

4607 - CONTINUED 4607 - SUITE 4607 - FORTSETZUNG 4607 - SEGUITO 4607 - CONTINUACTION 4607 - FORTS

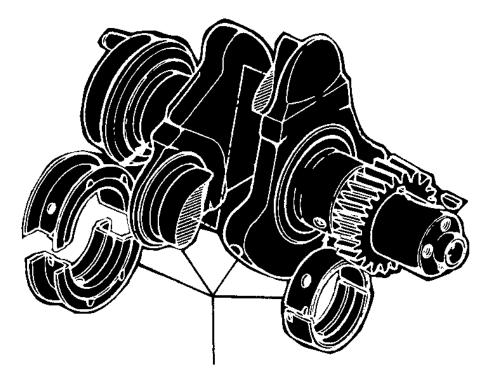
CD42113 -UN-13MAR98



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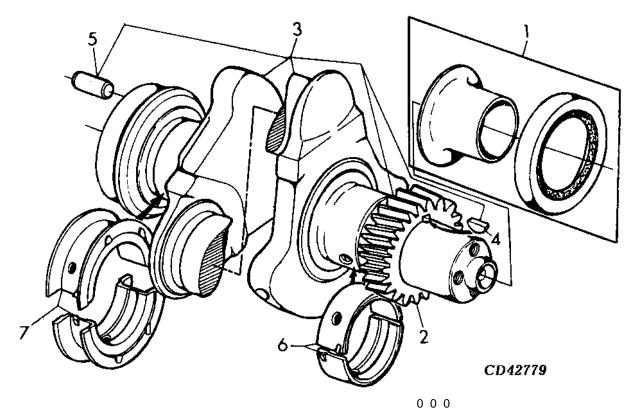
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CDP45034	-UN-16NOV
4701 -	2G22
4702 -	2G23
4703 -	2G24
4708 -	2G2\$
4708 -	2H1
4708 -	2H2
4710 -	2H3
4710 -	2H4
4710 -	2H5



4701 (045D,T&H) 4702 (068D&T) 4703 (068T&H) 4708 (039D&T) 4710 (029D)

CDP45034

CD42779 -UN-24FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS
1	RE59810	KIT	1		XXX	FRONT
2	R120631	HELICAL GEAR	1		X X X	Z = 30
3	RE50618	CRANKSHAFT	1		X X X	ASSY, INCL KEYS 2,4,5, (MARKED R113596)
						(ALSO ORDER RE59810 AND RE44574)
4	26M4224	SHAFT KEY	1		X X X	4 X 16 MM
5	A120R	DOWEL PIN	1		X X X	12.725 X 28.448 MM
6	RE65165	BEARING KIT	4		X X X	(KIT R123561 AND R123562) STD
	RE65911	BEARING	AR		X X X	(A) (KIT R130576 AND R130577) ID -0.254
						MM
7	RE65168	THRUST BEARING	1		X X X	(KIT R123563 AND R123564) STD
	RE65912	THRUST BEARING	AR		X X X	(A) (KIT R130574 AND R130575) ID -0.254
						MM

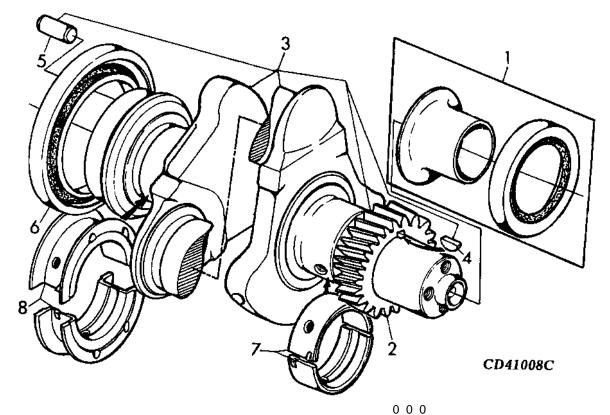
(A) GRINDING GUIDELINES: SEE CTM104

(A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106

(A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116

(A) INTRUC.REFERER.RECTIF. : VER CTM107
(A) ANVISNINGAR BETRAFF.OMSLIPNING : SE CTM108

CD41008C -UN-19FEB98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	RE59810	SEAL KIT	1		XXX	FRONT
ż	R120631	HELICAL GEAR	1		XXX	
3	RE52850	CRANKSHAFT	1		X X X	(A) (MARKED R116076) ASSY, INCL.KEYS
						2,4,5
4	26M4224	SHAFT KEY	1		X X X	4 X 16 MM
5	R48685	DOWEL PIN	1		X X X	
6	RE44574	SEAL	1		X X X	REAR
7	RE65165	BEARING KIT	6		X X X	(KIT R123561 AND R123562) STD
	RE65911	BEARING	AR		X X X	(A) (KIT R130576 AND R130577) US -0.254
						MM
8	RE65168	BEARING KIT	1		X X X	(KIT R123563 AND R123564) STD
	RE65912	THRUST BEARING	AR		X X X	(A) (KIT R130574 AND R130575) US -0.254
						MM

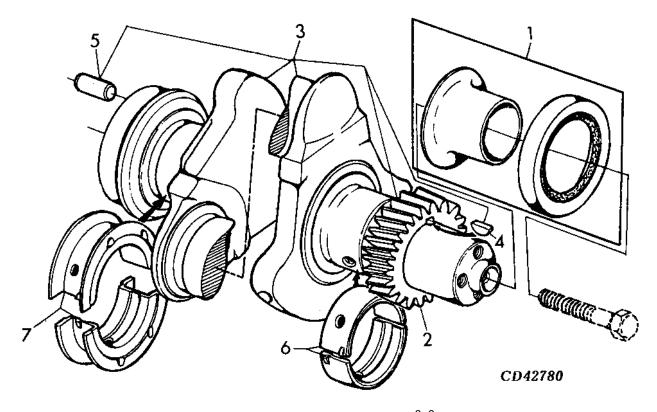
(A) GRINDING GUIDELINES: SEE CTM104

(A) DIRECTIVES DE RECTIFICATION : VOIR CTM105

(A) HINWEISE ZUM SCHLEIFEN: SIEHE CTM106
(A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
(A) INSTRUCCIONES REFERENTE AL RECTIFICADO: VER CTM107

(A) ANVISNINGAR BETRAFF. OMSLIPNING: SE CTM108

CD42780 -UN-24FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE 8	0 0 6 6 8 8 T H	REMARKS
1	RE59810	SEAL KIT	1		ХХ	FRONT
2	R120631	HELICAL GEAR	1		ΧХ	Z = 30
3	RE500016	CRANKSHAFT	1)	ΧХ	(A) ASSY, INCL KEYS 2,4,5, (MARKED
						R116076) (ALSO ORDER RE59810 AND RE44574)
4	26M4224	SHAFT KEY	1)	ΧХ	4 X 16 MM
5	A120R	DOWEL PIN	1)	ΧХ	
6	RE65165	BEARING KIT	6)	ΧХ	(KIT R123561 AND R123562) STD
	RE65911	BEARING	AR)	ΧХ	(A) (KIT R130576 AND R130577) US -0.254
						MM
7	RE65168	BEARING KIT	1)	ΧХ	(KIT R123563 AND R123564) STD
	RE65912	THRUST BEARING	AR)	ΧХ	(A) (KIT R130574 AND R130575) US -0.254
						MM

(A) GRINDING GUIDELINES: SEE CTM104

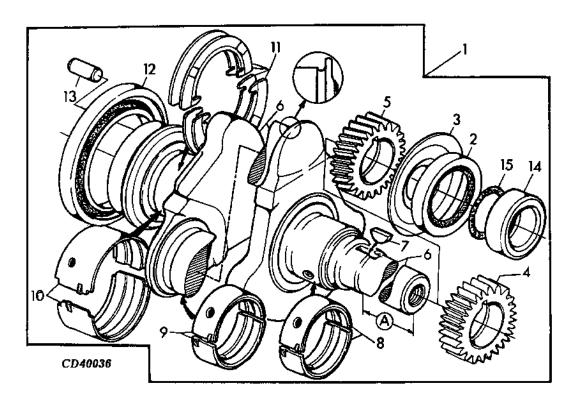
(A) DIRECTIVES DE RECTIFICATION : VOIR CTM105

(A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106

(A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
(A) INTRUC.REFERER.RECTIF.: VER CTM107

(A) ANVISNINGAR BETRAFF.OMSLIPNING : SE CTM108

CD40036 -UN-26MAR96



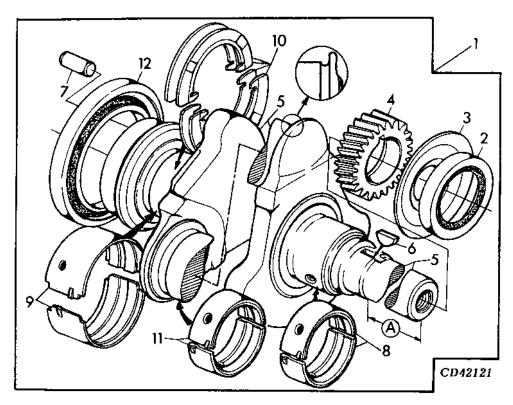
				ENOWE.	3	
14514	DART NO	DART MAME	OTV	ENGINE	9	DEMARKO
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	D	REMARKS
1	RE65224	CRANKSHAFT	1		Х	KIT
2	AR67942	SEAL	1		Χ	FRONT
3	T20046	OIL SLINGER	1		X	
4		SPUR GEAR	NA		X	Z = 24
5	T20094	HELICAL GEAR	1		X	Z = 24
6		CRANKSHAFT	1		X	(A) A = 60MM, MARKED R121018, ORD RE65224
7	26H72	SHAFT KEY	1		X	1/8" X 5/8"
8	RE27352	BEARING	4		X	ID STD, (KIT (2) T23214)
9	RE27348	BEARING	4		X	ID STD, (KIT (2) R83379)
10	RE60350	BEARING	1		X	ID STD, (KIT (2) R121413)
11	RE13571	THRUST WASHER	1		X	TK STD, (KIT (4) R78598)
12	RE44574	SEAL	1		X	REAR
13	A120R	DOWEL PIN	1		Х	
14	R81989	SLEEVE	1		X	
15	H35244	O-RING	1		Χ	

- (A) GRINDING GUIDELINES : SEE CTM8 OR CTM3274
 (A) DIRECTIVES DE RECTIFICATION : VOIR CTM71 OU CTM3275
 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM3273
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM3277
 (A) INTRUC.REFERER.RECTIF.: VER CTM70 O CTM3276
 (A) ANVISNINGAR BETRAFF.OMSLIPNING: SE CTM3279

4708 - CONTINUED 4708 - SUITE 4708 - FORTSETZUNG 4708 - SEGUITO 4708 - CONTINUACION 4708 - FORTS

CD42121

-UN-13MAR98

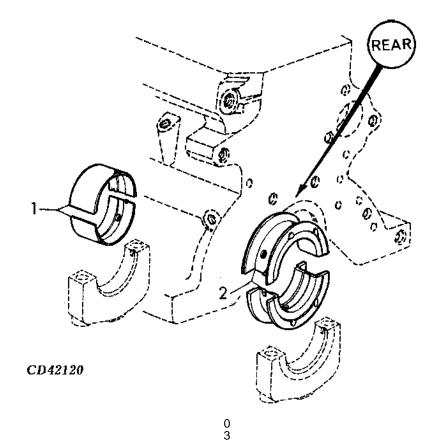


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3
9
D

KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	& T	REMARKS
1	DD15070	CRANKSHAFT	AR		Х	KIT , W/O KEY 3, (ALSO ORDER R100850)
2	AR67942	SEAL	1		Χ	FRONT
3	T20046	OIL SLINGER	AR		Χ	
4		HELICAL GEAR	NA		Χ	Z = 24
5		CRANKSHAFT	1		Χ	A = 60MM, MARKED "R", ORD DD15070
6	26H72	SHAFT KEY	1		Χ	1/8" X 5/8"
7	R48685	DOWEL PIN	1		Χ	
8	RE27353	BEARING	4		Χ	US -0.254MM, (KIT (2) R87750)
9	RE27351	BEARING	1		Χ	US -0.254MM, (KIT (2) R87749)
10	RE13571	THRUST WASHER	1		Χ	TK = STANDARD, (KIT (4) R78598)
11	RE27349	BEARING	4		Х	ID -0.254MM, (KIT (2) R87748) CONNECTING ROD
12	RE44574	SEAL	1		X	REAR

4708 - CONTINUED 4708 - SUITE 4708 - FORTSETZUNG 4708 - SEGUITO 4708 - CONTINUACION 4708 - FORTS

CD42120 -UN-30JUL98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	9 D & T	REMARKS
1	AT21140	BEARING	4		Х	(KIT (2) T23214) STD
		BEARING	AR		Χ	(A) US -0.254MM, MARKED T23554, ORD RE27353
2	AT21139	BEARING	1		Χ	(KIT (2) T23215) STD, REAR
		BEARING	AR		Χ	(A) US -0.254MM, REAR,MARKED T23576, ORD RE27351 AND RE13571

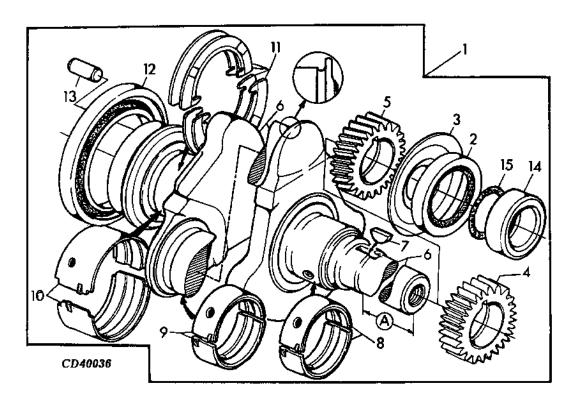
- (A) GRINDING GUIDELINES: SEE CTM3274
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM3275 (A) HINWEISE ZUM SCHLEIFEN : SIEHE CTM3273
- (A) ISTRUZIONI RIGUARDO RETTFICA : VEDERE CTM3277 (A) INSTRUC.REFERENTE AL RECTIFIC. : VER CTM3276
- (A) FOR ANVISNINGAR BETRAFF. OMSLIPNING: SE CTM3279

CRANKSHAFT

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CRANKSHAFT

CD40036 -UN-26MAR96



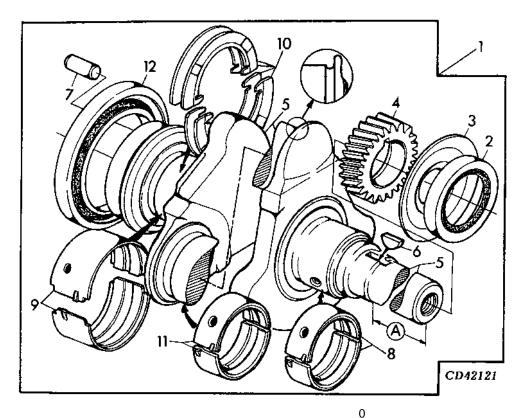
					0 2		
				ENGINE	9		
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	D	REMARKS	
1	RE50979	CRANKSHAFT	1		Х	(A) KIT	
2	AR67942	SEAL	1		X	FRONT	
3	T20046	OIL SLINGER	1		Χ		
4		SPUR GEAR	NA		Х		
5	T20094	HELICAL GEAR	1		Χ	Z = 24	
6		CRANKSHAFT	1		Χ	MARKED R101223	
7	26H72	SHAFT KEY	1		Х	1/8" X 5/8"	
8	RE27352	BEARING KIT	3		Χ	(KIT (2) T23214) ID STD	
9	RE27348	KIT	3		Χ	(KIT (2) R83379) ID STD	
10	RE60350	KIT	1		Х	(KIT (2) R121413) ID STD	
11	RE13571	KIT	1		X	(KIT (4) R78598) TK STD	
12	RE44574	SEAL	1		Χ	REAR	
13	R48685	DOWEL PIN	1		Х		
14	R81989	SLEEVE	AR		Χ		
15	H35244	RING	AR		Χ		

- (A) GRINDING GUIDELINES : SEE CTM8 OR CTM3274
 (A) DIRECTIVES DE RECTIFICATION : VOIR CTM71 OU CTM3275
 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM3273
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM3277
 (A) INTRUC.REFERER.RECTIF.: VER CTM70 O CTM3276
 (A) ANVISNINGAR BETRAFF.OMSLIPNING: SE CTM3279

4710 - CONTINUED 4710 - SUITE 4710 - FORTSETZUNG 4710 - SEGUITO 4710 - CONTINUACION 4710 - FORTS

CD42121

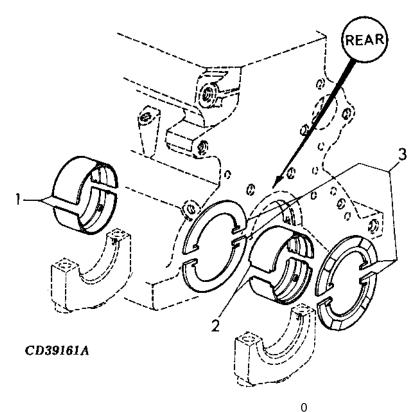
-UN-13MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS
1	DD15078	KIT	AR		Х	
2	AR67942	SEAL	1		Χ	FRONT
3	T20046	OIL SLINGER	AR		Χ	
4	T20094	HELICAL GEAR	1		Χ	Z = 24
5		CRANKSHAFT	1		Х	A = 60MM, MARKED "R", CAST IRON, FONTE, GUSS, FUSO, HIERRO COLADO, GJUTJARN, ORD
						DD15078
6	26H72	SHAFT KEY	1		X	1/8" X 5/8"
7	R48685	DOWEL PIN	1		X	
8	AT21110	BEARING	3		Х	US -0.254MM, (KIT (2) T23554)
9	AR81788	BEARING	1		Х	US -0.254MM, (KIT (2) R64848)
10	RE13571	KIT	1		X	(KIT (4) R78598) TK STD
11	AT21124	BEARING	3		Х	US -0.254MM, (KIT (2) T23568) CONNECTING ROD, BIELLE, PLEUELSTANGE, BIELLA, BIELA, VEVSTAKE
12	RE44574	SEAL	1		Х	REAR

4710 - CONTINUED 4710 - SUITE 4710 - FORTSETZUNG 4710 - SEGUITO 4710 - CONTINUACION 4710 - FORTS

CD39161A -UN-19MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS	
1	RE27352	BEARING KIT	3		Х	(KIT (2) T23214) ID STD	_
	RE27353	BEARING KIT	AR		Χ	(A) (KIT (2) R87750) US -0.254MM	
2	RE60350	KIT	1		Χ	(KIT (2) R121413) ID STD	
	RE27351	KIT	AR		Х	(A) (KIT (2) R87749) US -0.254MM	_
3	RE13571	KIT	1		Χ	(KIT (4) R78598) TK STD	
	AR95932	KIT	AR		Χ	(KIT (3) R64851) OS +0.17MM	

(A) GRINDING GUIDELINES: SEE CTM3274

(A) DIRECTIVES DE RECTIFICATION : VOIR CTM3275

(A) HINWEISE ZUM SCHLEIFEN : SIEHE CTM3273 (A) ISTRUZIONI RIGUARDO RETTFICA : VEDERE CTM3277

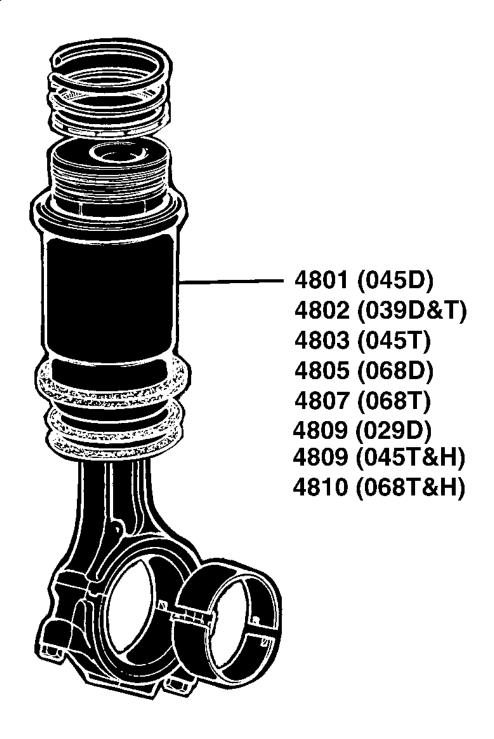
(A) INSTRUC.REFERENTE AL RECTIFIC. : VER CTM3276

(A) FOR ANVISNINGAR BETRAFF. OMSLIPNING: SE CTM3279

CRANKSHAFT

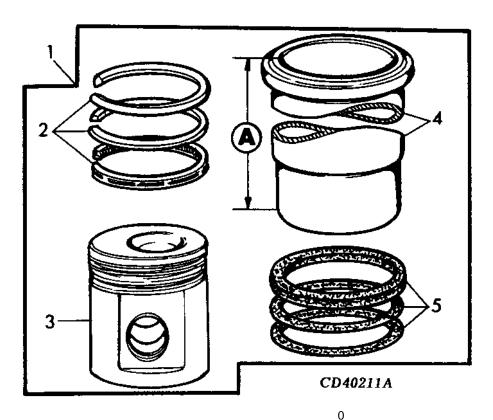
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CDP45035	-UN-13NOV01
4801 -	2H8
4801 -	2H9
4802 -	2H10
4802 -	2H11
4803 -	2H12
4803 -	2H13
4805 -	2H14
4805 -	2H15
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4809 -	2H22
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4810 -	2H25
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CDP45035

CD40211A -UN-09NOV99

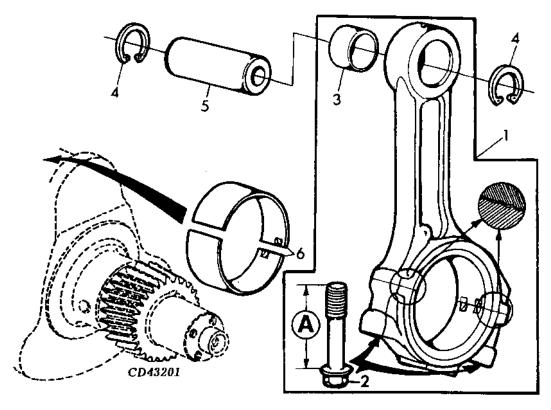


KEY	' PART NO.	PART NAME	QTY	ENGINE 5 SERIAL NO. D	REMARKS
1	RE505110	PISTON-LINER KIT	4	Х	
2	RE66271	PISTON RING KIT	1	X	PACKG (3)
3		PISTON	1	X	MARKED RE505101, NSEP, ORDER RE505110
4		CYLINDER LINER	1	Х	A= 218MM , NSEP, ORDER RE505110
5	AR65507	O-RING KIT	1	X	PACKG (3)

4801 - CONTINUED 4801 - SUITE 4801 - FORTSETZUNG 4801 - SEGUITO **4801 - CONTINUACTION** 4801 - FORTS

CD43201

-UN-03MAY99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS	
1	RE500002	CONNECTING ROD	4		Х	(MARKED R500000)	
2	R501124	SCREW	2		Χ	A = 61MM	
3	R123960	BUSHING	1		Χ		
4	M41029	SNAP RING	8		Х		
5	R123178	PISTON PIN	4		Χ	OD 35MM	
6	RE65908	BEARING	4		Χ	(KIT (2) R113698) STD	
	RE65909	BEARING	AR			(A) (KIT (2) R130578) US -0.254MM	

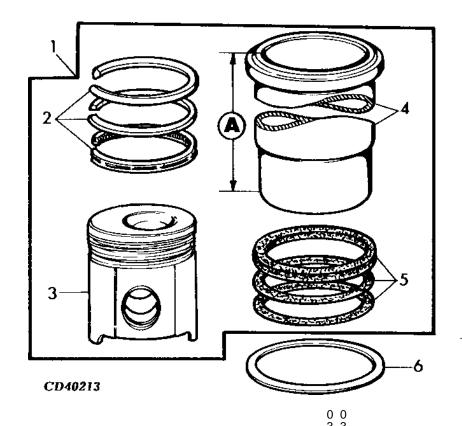
- (A) GRINDING GUIDELINES: SEE CTM104
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
- (A) INTRUC.REFERER.RECTIF. : VER CTM107
 (A) ANVISNINGAR BETRAFF.OMSLIPNING : SE CTM108

CONNECTING ROD & PISTONS

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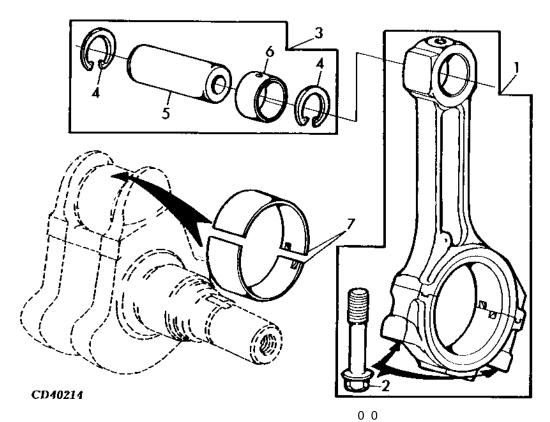
-UN-23MAY95 CD40213



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 3 9 9 D T	REMARKS	
1	RE24458	PISTON-LINER KIT	4		X		
	RE22678	PISTON-LINER KIT	4		X		
2	RE66820	PISTON RING KIT	1		ХХ	PACKG (3)	
3		PISTON	1		X	MARKED RE19282, ORD RE24458	
		PISTON	1		X	MARKED RE48368, ORD RE22678	
4	R131575	CYLINDER LINER	1		ХХ	A = 196MM	
5	AR65507	O-RING KIT	1		ХХ	PACKG (3)	
6	CD15466	SHIM	AR		ХХ	TK 0.05MM	
	R65833	SHIM	AR		ХХ	TK 0.10MM	

4802 - CONTINUED 4802 - SUITE 4802 - FORTSETZUNG 4802 - SEGUITO 4802 - CONTINUACTION 4802 - FORTS

CD40214 -UN-23MAY95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 3 9 9 D T	REMARKS
1121	TAICT NO.	174CL IVANIE	Q11	OLIVIAL IVO.	٠.	KEWAKO
1	RE21076	CONNECTING ROD	4		Х	(MARKED R80034)
	RE42733	CONNECTING ROD	4		X	(MARKED R80034)
2	R80033	CAP SCREW	2		ХХ	
3	RE63914	PISTON PIN	4		Х	KIT
	RE63913	PISTON PIN	4		X	KIT
4	M41029	SNAP RING	2		Χ	PACKG (6)
	R54114	SNAP RING	2		Χ	PACKG (6)
5		PISTON PIN	1		Χ	OD 35MM, ORD RE63914
		PISTON PIN	1		Χ	OD 41MM, ORD RE63913
6		BUSHING	1		Χ	ORD RE63914
		BUSHING	1		X	ORD RE63913
_7		BEARING	4		Χ	MARKED T20011, STD,ORDER RE27348
	RE27348	BEARING	4		Х	(KIT (2) R83379) STD
	RE27349	BEARING	AR		ХХ	(A) (KIT (2) R87748) US -0.254MM

- (A) GRINDING GUIDELINES: SEE CTM8 OR CTM3274
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM71 OU CTM3275
- (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM3273
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM3277
- (A) INTRUC.REFERER.RECTIF.: VER CTM70 O CTM3276 (A) ANVISNINGAR BETRAFF.OMSLIPNING: SE CTM3279

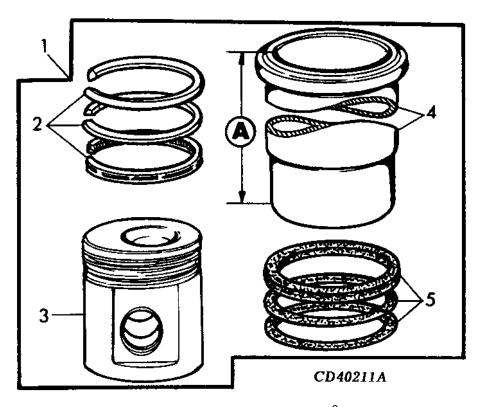
Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

CONNECTING ROD & PISTONS

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4803

CD40211A -UN-09NOV99

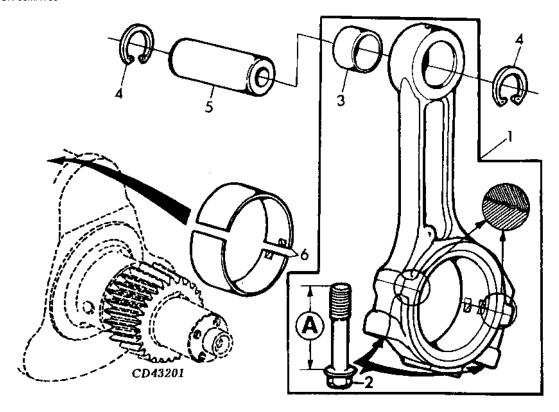


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS	
1	RE505111	PISTON-LINER KIT	1		Х		
2	RE66271	PISTON RING KIT	1		X	PACKG (3)	
3		PISTON	1		Χ	MARKED RE505100, NSEP, ORDER RE505111	
4		CYLINDER LINER	1		Х	A = 218MM, NSEP, ORDER RE505111	
5	AR65507	O-RING KIT	1		X	PACKG (3)	

4803 - CONTINUED 4803 - SUITE 4803 - FORTSETZUNG 4803 - SEGUITO **4803 - CONTINUACTION** 4803 - FORTS

CD43201

-UN-03MAY99

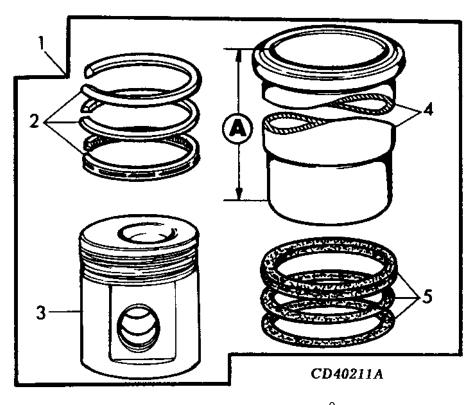


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS	
1	RE500002	CONNECTING ROD	4	,	X	(MARKED R500000)	
2	R501124	SCREW	2		Χ	A = 61MM	
3	R123960	BUSHING	1		Χ		
4	M41029	SNAP RING	8		Χ		
5	R123178	PISTON PIN	4		Χ	OD 35MM	
6	RE65908	BEARING	4		Χ	(KIT (2) R113698) STD	
	RE65909	BEARING	AR)		(A) (KIT (2) R130578) US -0.254MM	

- (A) GRINDING GUIDELINES: SEE CTM104
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
- (A) INTRUC.REFERER.RECTIF. : VER CTM107
 (A) ANVISNINGAR BETRAFF.OMSLIPNING : SE CTM108

4805

CD40211A -UN-09NOV99

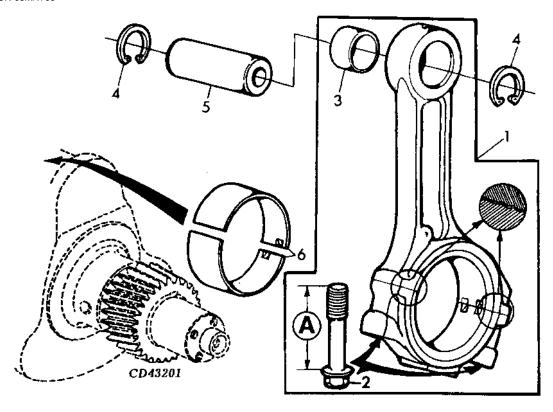


KEY	PART NO.	PART NAME	QTY	ENGINE 8 SERIAL NO. D) REMARKS
1	RE505110	PISTON-LINER KIT	6	Х	
2	RE66271	PISTON RING KIT	1	Х	PACKG (3)
3		PISTON	1	X	MARKED RE505101, NSEP, ORDER RE505110
4		CYLINDER LINER	1	Х	A= 218MM , NSEP, ORDER RE505110
5	AR65507	O-RING KIT	1	X	PACKG (3)

4805 - CONTINUED 4805 - SUITE 4805 - FORTSETZUNG 4805 - SEGUITO 4805 - CONTINUACTION 4805 - FORTS

CD43201

-UN-03MAY99

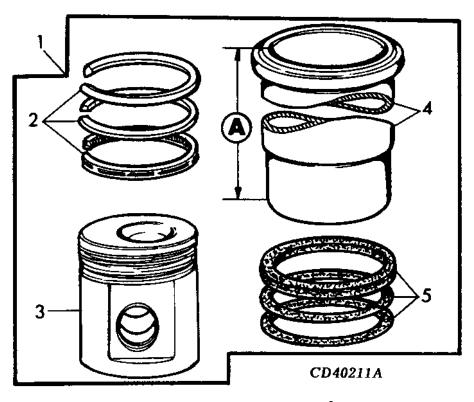


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 D	REMARKS	
1	RE500002	CONNECTING ROD	6		Χ	(MARKED R500000)	
2	R501124	SCREW	2		Χ	A = 61MM	
3	R123960	BUSHING	1		Χ		
4	M41029	SNAP RING	12		Χ		
5	R123178	PISTON PIN	6		Χ	OD 35MM	
6	RE65908	BEARING	6		Χ	(KIT (2) R113698) STD	
	RE65909	BEARING	AR			(A) (KIT (2) R130578) US -0.254MM	

- (A) GRINDING GUIDELINES: SEE CTM104
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
- (A) INTRUC.REFERER.RECTIF. : VER CTM107
 (A) ANVISNINGAR BETRAFF.OMSLIPNING : SE CTM108

4807

CD40211A -UN-09NOV99

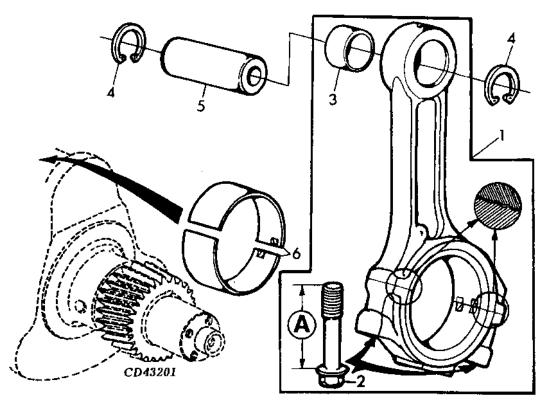


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 T	REMARKS	
1	RE505111	PISTON-LINER KIT	1		Х		
2	RE66271	PISTON RING KIT	1		Χ	PACKG (3)	
3		PISTON	1		Χ	MARKED RE505100, NSEP, ORDER RE505111	
4		CYLINDER LINER	1		Х	A = 218MM, NSEP, ORDER RE505111	
5	AR65507	O-RING KIT	1		X	PACKG (3)	

4807 - CONTINUED 4807 - SUITE 4807 - FORTSETZUNG 4807 - SEGUITO 4807 - CONTINUACTION 4807 - FORTS

CD43201

-UN-03MAY99

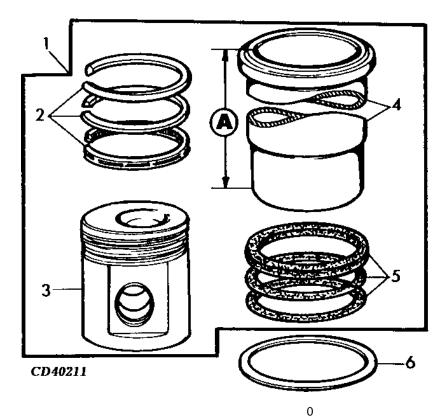


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 T	REMARKS	
1	RE500002	CONNECTING ROD	6		Х	(MARKED R500000)	
2	R501124	SCREW	2		Χ	A = 61MM	
3	R123960	BUSHING	1		Χ		
4	M41029	SNAP RING	12		Х		
5	R123178	PISTON PIN	6		Χ	OD 35MM	
6	RE65908	BEARING	6		Χ	(KIT (2) R113698) STD	
	RE65909	BEARING	AR		X	(A) (KIT (2) R130578) US -0.254MM	

- (A) GRINDING GUIDELINES: SEE CTM104
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
- (A) INTRUC.REFERER.RECTIF. : VER CTM107
 (A) ANVISNINGAR BETRAFF.OMSLIPNING : SE CTM108

CD40211 -UN-23MAY95

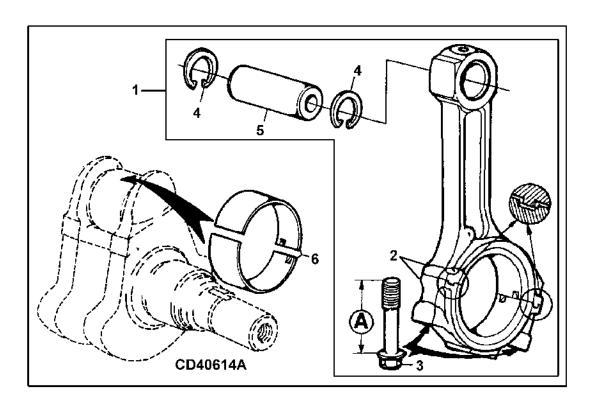




KEY	PART NO.	PART NAME		GINE 9 AL NO. D	REMARKS	
1	RE66968	PISTON-LINER KIT	AR	Х	(ORDER RE500672)	
2	RE66271	PISTON RING KIT	1	X	PACKG (3)	
3		PISTON	1	X	MARKED RE61467, ORD RE66968	
4	R131575	CYLINDER LINER	1	X	A = 196MM	
5	AR65507	O-RING KIT	1	X	PKG (3)	
6	CD15466	SHIM	AR	X	TK 0.05MM	
	R65833	SHIM	AR	Х	TK 0.1MM	

4809 - CONTINUED 4809 - SUITE 4809 - FORTSETZUNG 4809 - SEGUITO 4809 - CONTINUACTION 4809 - FORTS

CD40614A -UN-27SEP00

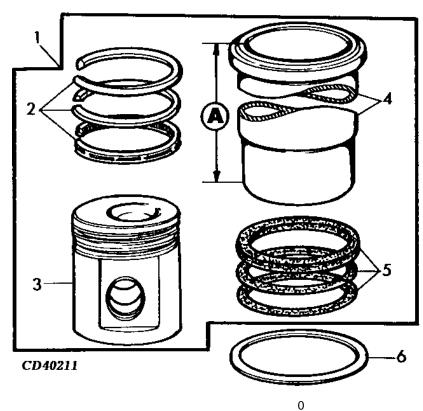


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS	
1	RE505454	KIT	3	-584318	Х	(ORDER RE501674) ASSY, INCL.KEYS 2-5	
2		CONNECTING ROD	1	-584318	X	MARKED R501072, NSEP, ORD RE505454	
3	R501124	SCREW	2	-584318	X	A = 61MM	
4	40M1856	SNAP RING	2	-584318	Х		
5		PISTON PIN	1	-584318	X	OD 32MM, NSEP, ORD RE505454	
6	RE27348	BEARING	3	-584318	X	ID STD, (KIT (2) R83379)	
	RE27349	BEARING	AR	-584318	X	(A) ID - 0.254MM , (KIT (2) R87748)	

- (A) GRINDING GUIDELINES: SEE CTM125
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM127 (A) HINWEISE ZUM SCHLEIFEN : SIEHE CTM129
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM129
- (A) INSTRUCCIONES REFERENTE AL RECTIFICADO : VER CTM126
 (A) ANVISNINGAR BETRAFF. OMSLIPNING : SE CTM125

-UN-23MAY95 CD40211

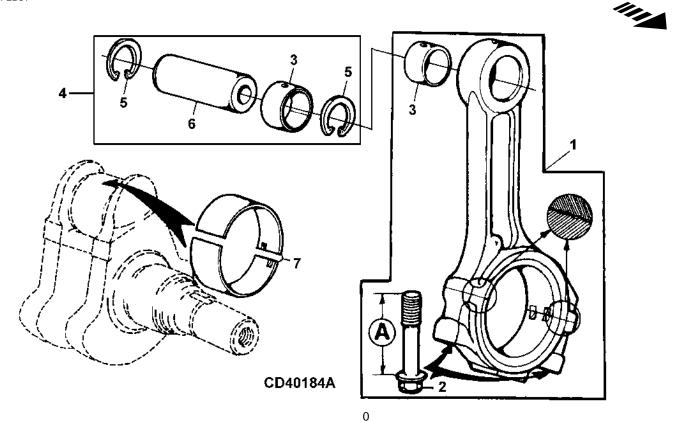




KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO	2 9 . D	REMARKS	
1	RE500672	PISTON-LINER KIT	3	Х		
2	RE66271	PISTON RING KIT	1	X	PACKG (3)	
3		PISTON	1	X	MARKED RE500210, NSEP, ORD RE500672	
4	R131575	CYLINDER LINER	1	Х	A= 196MM	
5	AR65507	O-RING KIT	1	X	PACKG (3)	
6	CD15466	SHIM	AR	X	TK 0.05MM	
	R65833	SHIM	AR	Х	TK 0.10MM	
4 5 6	AR65507 CD15466	O-RING KIT SHIM		X X X	PACKG (3) TK 0.05MM	

4809 - CONTINUED 4809 - SUITE 4809 - FORTSETZUNG **BIELLA / CUSCINETTO** 4809 - CONTINUACTION 4809 - FORTS

CD40184A -UN-28FEB01

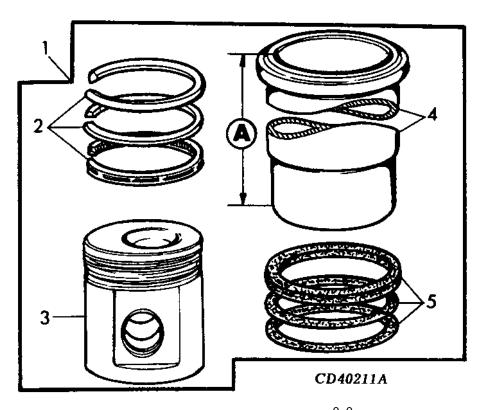


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS	
1	RE501674	CONNECTING ROD	3	584319-	Х	(MARKED R501072) INCL. INSTRUCTIONS	
2	R501124	SCREW	2	584319-	X	A= 61MM	
3		BUSHING	1	584319-	X	ORD RE508859	
4	RE508859	KIT	3	584319-	X	INCL. INSTRUCTIONS	
5	40M1856	SNAP RING	2	584319-	X		
6		PISTON PIN	1	584319-	X	OD 32MM, ORD RE508859	
7	RE27348	BEARING	3	584319-	X	ID STD, (KIT (2) R83379)	
	RE27349	BEARING	AR	584319-	Χ	(A) ID - 0.254MM , (KIT (2) R87748)	

- (A) GRINDING GUIDELINES: SEE CTM125
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM127
- (A) HINWEISE ZUM SCHLEIFEN: SIEHE CTM128
- (A) ISTRUZIONI RIGUARDO RETTIFICA : VEDERE CTM129
 (A) INSTRUCCIONES REFERENTE AL RECTIFICADO : VER CTM126
- (A) ANVISNINGAR BETRAFF. OMSLIPNING: SE CTM125

4809

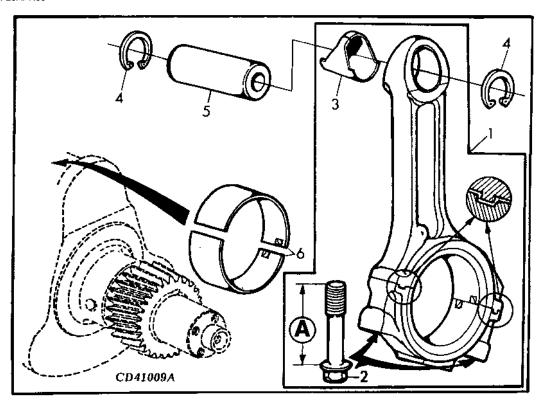
CD40211A -UN-09NOV99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS
1	RE65969	PISTON-LINER KIT	4	-529835	ХХ	(ORDER RE505112)
	RE505112	PISTON-LINER KIT	4	529836-	ХХ	
2	RE66820	PISTON RING KIT	1		ХХ	PACKG (3)
3		PISTON	1	-529835	ХХ	MARKED RE55512, NSEP, ORD RE65969
		PISTON	1	529836-	ХХ	MARKED RE505102, NSEP, ORD RE505112
4		CYLINDER LINER	1		ХХ	A = 218MM, NSEP, ORD RE505112
-5	AR65507	O-RING KIT	1		XX	PACKG (3)

4809 - CONTINUED 4809 - SUITE 4809 - FORTSETZUNG 4809 - SEGUITO 4809 - CONTINUACTION 4809 - FORTS

CD41009A -UN-20APR99

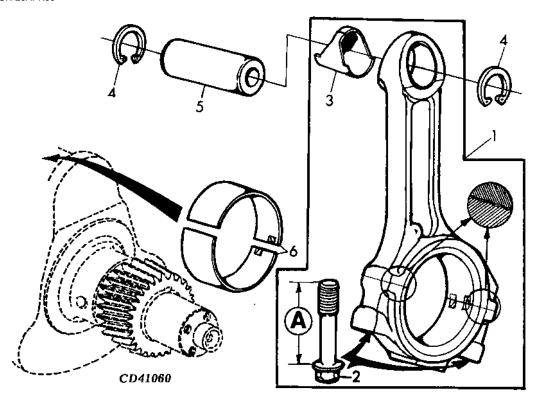


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS	
1	RE50770	CONNECTING ROD	4	-553936	ХХ	(MARKED R114081) (ORDER RE500608)	
2	R114083	SCREW	2	-553936	ХХ	A=64 MM	
3	R114082	BUSHING	1	-553936	ХХ		
4	R54114	SNAP RING	8	-553936	XX		
5	R123177	PISTON PIN	4	-553936	ХХ	OD 41MM, LGTH 72MM	
6	RE65908	BEARING	4	-553936	ХХ	(KIT (2) R113698) STD	
	RE65909	BEARING	AR	-553936	XX	(A) (KIT (2) R130578) ID -0.254MM	

- (A) GRINDING GUIDELINES: SEE CTM104
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
- (A) INTRUC.REFERER.RECTIF. : VER CTM107
- (A) ANVISNINGAR BETRAFF.OMSLIPNING: SE CTM108

4809 - CONTINUED 4809 - SUITE 4809 - FORTSETZUNG 4809 - SEGUITO 4809 - CONTINUACTION 4809 - FORTS

CD41060 -UN-20APR99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS	
1	RE500608	CONNECTING ROD	4	553937-	ХХ	(MARKED R500335)	
2	R501124	SCREW	2	553937-	ΧХ	A=61 MM	
3	R114082	BUSHING	1	553937-	ΧХ		
4	R54114	SNAP RING	8	553937-	ХХ		
5	R123177	PISTON PIN	4	553937-	ХХ	OD 41MM, LGTH 72MM	
6	RE65908	BEARING	4	553937-	ХХ	(KIT (2) R113698) STD	
	RE65909	BEARING	AR	553937-	ХХ	(A) (KIT (2) R130578) ID -0.254MM	

- (A) GRINDING GUIDELINES: SEE CTM104
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
- (A) INTRUC.REFERER.RECTIF. : VER CTM107
 (A) ANVISNINGAR BETRAFF.OMSLIPNING : SE CTM108

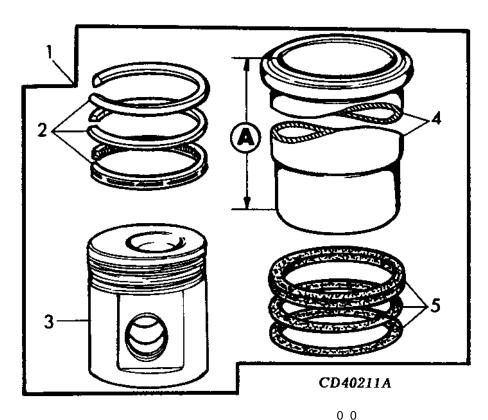
Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

CONNECTING ROD & PISTONS

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4810

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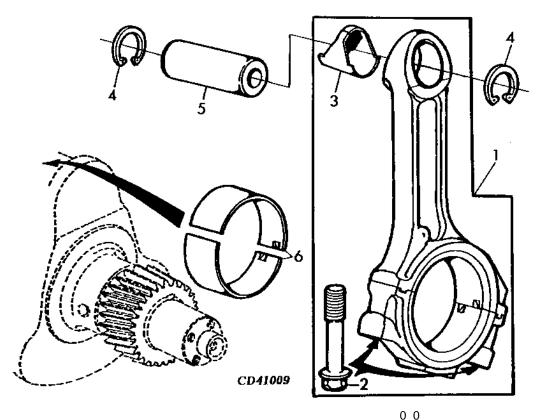


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 8 8 T H	REMARKS
1	RE65969	PISTON-LINER KIT	6	-529835	ХХ	(ORDER RE505112)
	RE505112	PISTON-LINER KIT	6	529836-	ХХ	
2	RE66820	PISTON RING KIT	1		ХХ	PACKG (3)
3		PISTON	1	-529835	ХХ	MARKED RE55512, NSEP, ORD RE65969
		PISTON	1	529836-	ХХ	MARKED RE505102, NSEP, ORD RE505112
4		CYLINDER LINER	1		ХХ	A = 218MM, NSEP , ORD RE505112
5	AR65507	O-RING KIT	1		ХХ	PACKG (3)

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-UN-26FEB96



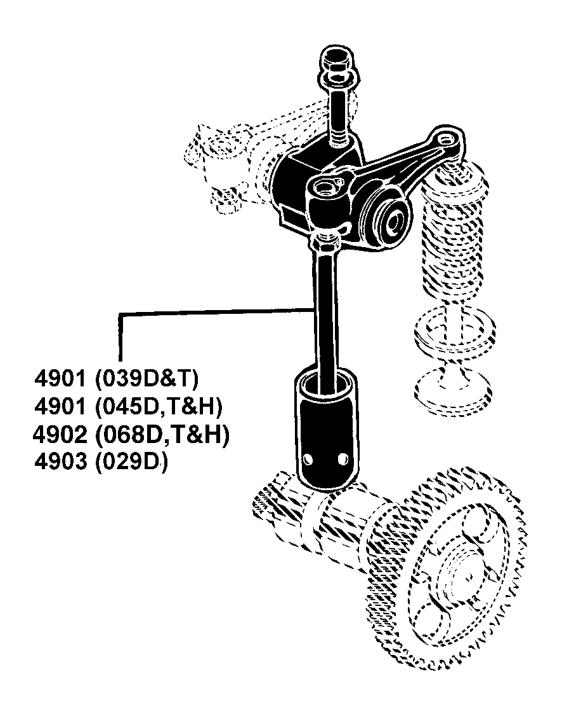
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 8 8 T H	REMARKS	
1	RE50770	CONNECTING ROD	6		ХХ	(ORDER RE500608)	
2	R114083	SCREW	2		ХХ	,	
3	R114082	BUSHING	1		ХХ		
4	R54114	SNAP RING	12		ХХ		
5	R123177	PISTON PIN	6		ХХ	OD 41MM, LGTH 72MM	
6	RE65908	BEARING	6		ХХ	(KIT (2) R113698) STD	
	RE65909	BEARING	AR		ХХ	(A) (KIT (2) R130578) ID -0.254MM	

- (A) GRINDING GUIDELINES: SEE CTM104
- (A) DIRECTIVES DE RECTIFICATION : VOIR CTM105 (A) HINWEISE ZUM SCHLEIFEN : SEIHE CTM106
- (A) ISTRUZIONI RIGUARDO RETTIFICA: VEDERE CTM116
- (A) INTRUC.REFERER.RECTIF. : VER CTM107
- (A) ANVISNINGAR BETRAFF.OMSLIPNING: SE CTM108

CONNECTING ROD & PISTONS

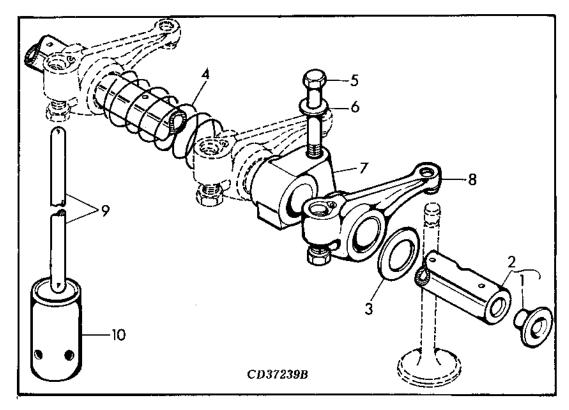
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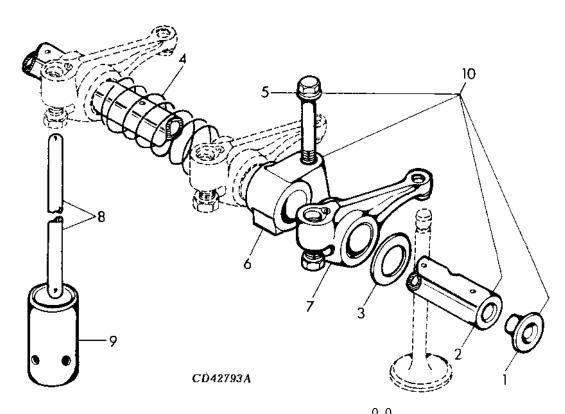
CD37239B -UN-08JUN99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS	
1	R54565	PLUG	2	-388770	ХХ		
2	DD12120	ROCKER ARM SHAFT	1	-388770	ХХ	(ORDER RE502874)	
3	T20316	WASHER	2	-388770	ХХ	,	
4	T20314	SPRING	3	-388770	XX		
5	19H3031	CAP SCREW	4	-388770	ХХ	3/8" X 2-1/2", (SAE 8)	
6	R42729	WASHER	4	-388770	ХХ		
7	T20315	SUPPORT	4	-388770	ХХ	(ORDER RE502861)	
8	RE31973	ROCKER ARM	8	-388770	ХХ	,	
9	T20310	PUSH ROD	8	-388770	ХХ	LGTH 234MM	
10	T20073	TAPPET	8	-388770	XX		

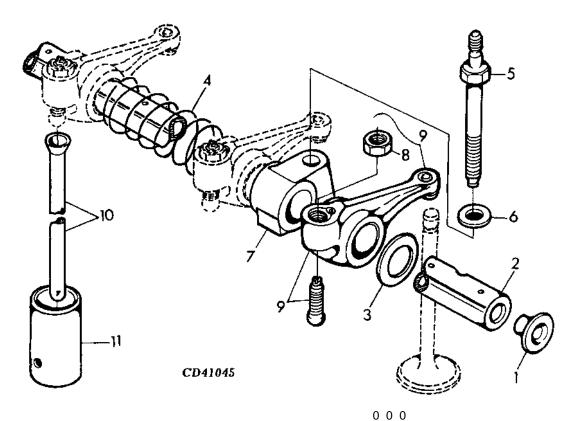
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CD42793A -UN-01SEP99



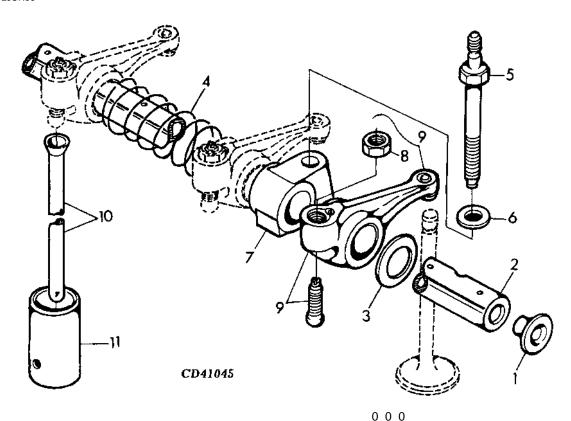
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 3 9 9 D T	REMARKS	
1	R54565	PLUG	2	388771-	ХХ		
2		ROCKER ARM SHAFT	1	388771-	ХХ	(ORDER RE502874)	
3	T20316	WASHER	2	388771-	ХХ		
4	T20314	SPRING	3	388771-	ХХ		
5	R504813	SELF-LOCKING SCREW	4	388771-	ХХ		
6		SUPPORT	4	388771-	ХХ	(ORDER RE502861)	
7	RE31973	ROCKER ARM	8	388771-	ХХ		
8	T20310	PUSH ROD	8	388771-	ХХ	LGTH 234MM	
9	T20073	TAPPET	8	388771-	ХХ		
10	RE502874	KIT	AR	388771-	ХХ		

CD41045 -UN-12JUN96



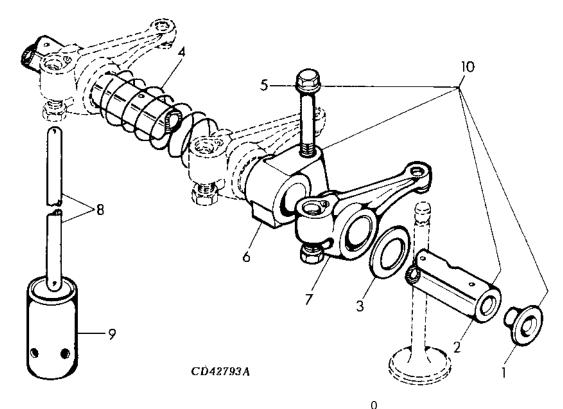
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	R54565	PLUG	2		XXX		
2	R123513	ROCKER ARM SHAFT	1		X X X		
3	T20316	WASHER	2		X X X		
4	T20314	SPRING	3		XXX		
5	R123271	STUD	4		X X X		
6	R42729	WASHER	4		X X X		
7	R123161	SUPPORT	4		XXX		
8	14M7148	NUT	1		XXX M10	0	
9	RE68695	ROCKER ARM	8		X X X		
10	R107731	PUSH ROD	8		XXX		
11	R123565	CAM FOLLOWER	8		X X X		

CD41045 -UN-12JUN96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS	
1	R54565	PLUG	2		XXX		
2	R123514	ROCKER ARM SHAFT	1		X X X		
3	T20316	WASHER	2		X X X		
4	T20314	SPRING	5		XXX		
5	R123271	STUD	6		X X X		
6	R42729	WASHER	6		X X X		
7	R123161	SUPPORT	6		XXX		
8	14M7148	NUT	1		XXX M1	0	
9	RE68695	ROCKER ARM	12		X X X		
10	R107731	PUSH ROD	12		XXX		
11	R123565	CAM FOLLOWER	12		X X X		

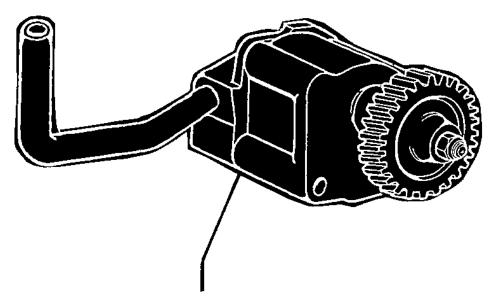
CD42793A -UN-01SEP99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D REMARKS
1	R54565	PLUG	2		X
2	R501532	ROCKER ARM SHAFT	1		X
3	T20316	WASHER	2		X
4	T20314	SPRING	2		X
5	R501529	SELF-LOCKING SCREW	3		X
6	R123161	SUPPORT	3		X
7	RE31973	ROCKER ARM	6		X
8	T20310	PUSH ROD	6		X LGTH 234MM
9	T20073	TAPPET	6		X
10	RE502875	KIT	AR		X ASSY, INCL. KEYS 1,2,5,6

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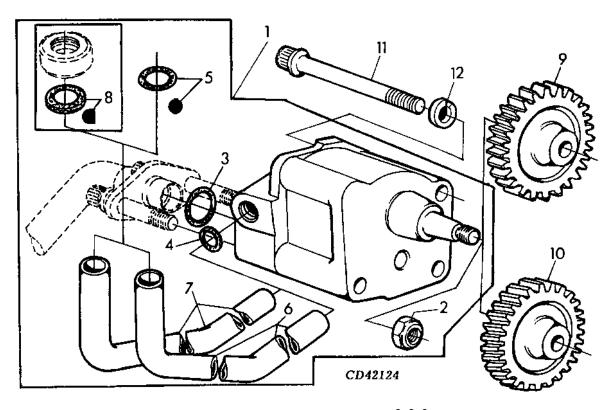
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5001 (029D/039D&T) 5001 (045D,T&H/068D,T&H) 5002 (045D)

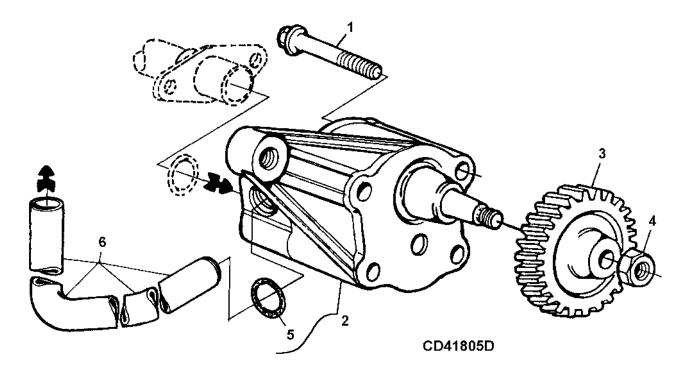
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CD42124 -UN-17MAR98



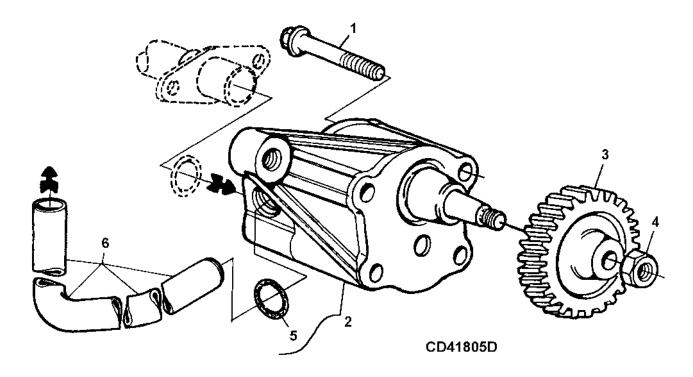
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 2 3 3 9 9 9 D D T	REMARKS	
1	RE52020	KIT	1		XXX		
2	14H826	NUT	1		X X X	1/2"-13UNC	
3	R61871	O-RING	1		X X X		
4	R74354	O-RING	1		XXX		
5	R97185	O-RING	AR		X X X		
6	R113752	OIL TUBE	NA		X X X	W/ COLOR MARK	
7	R115280	OIL TUBE	1		XXX	APPL	
8	R75892	O-RING	AR		X X X		
9		SPUR GEAR	NA		X X X	Z = 33	
10	T20298	HELICAL GEAR	1		XXX	Z = 33	
11	R57059	CAP SCREW	1		X X X	LGTH 70MM	
12	12H304	LOCK WASHER	1		X X X	3/8"	

CD41805D -UN-11MAY01



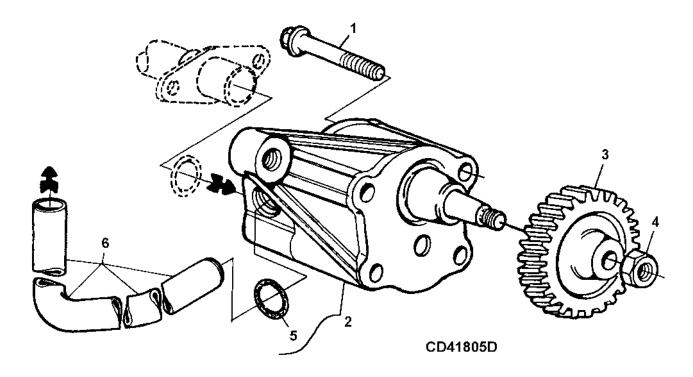
KEY	PART NO.	PART NAME	QTY S	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H REMARKS
1	19M7802	SCREW	2		X X X M8 X 65, (10.9)
2	RE504914	OIL PUMP	1		X X X ASSY, INCL KÉY 5
3	R120638	HELICAL GEAR	1		X X X Z = 30
4	14M7066	NUT	1		X X M12
5	R97185	O-RING	1		X X
6	R121376	TUBF	1		X X

CD41805D -UN-11MAY01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H REMARKS	
1	19M7802	SCREW	2		X X X M8 X 65, (10.9)	
2	RE502269	OIL PUMP	1		X X X ASSY, INCL KÉY 5	
3	R120638	HELICAL GEAR	1		X X X Z = 30	
4	14M7066	NUT	1		X X X M12	
5	R97185	O-RING	1		XXX	
6	R121376	TUBE	1		XXX	

CD41805D -UN-11MAY01

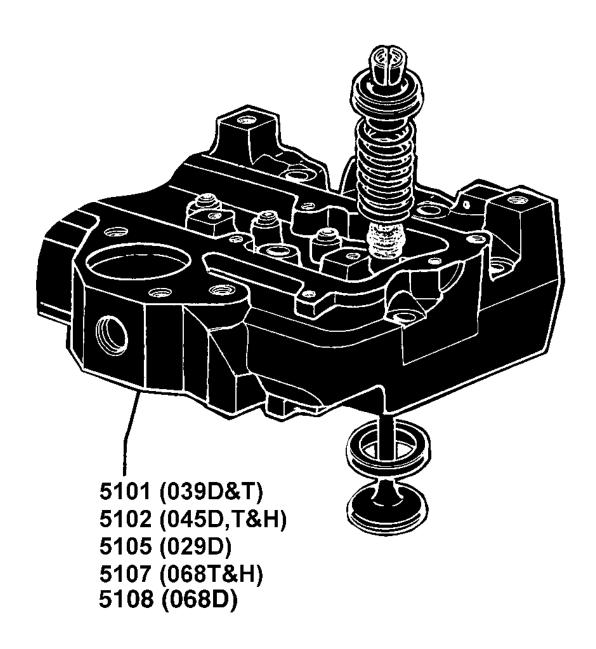


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS	
1	19M8987	SCREW	2		Х	M8 X 65, (10.9)	
2	RE504914	OIL PUMP	1		Χ	ASSY, INCL KÉY 5	
3	R120638	HELICAL GEAR	1		Χ	Z = 30	
4	14M7066	NUT	1		Х	M12	
5	R97185	O-RING	1		Χ		
6	R121376	TUBE	1		Х		

OIL PUMP

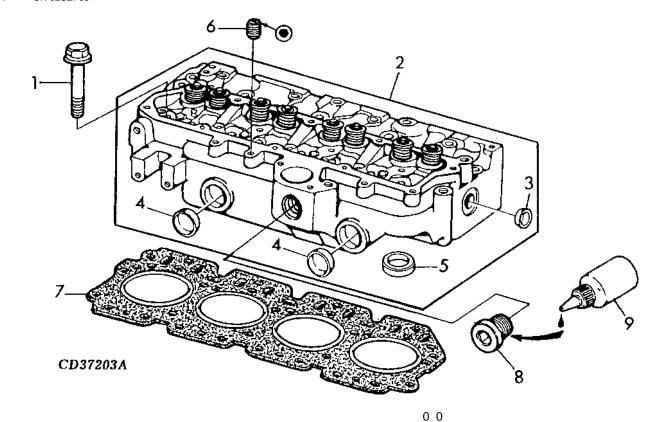
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5105 -	2122
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5107 -	2124
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5108 - 5108 -	2J1



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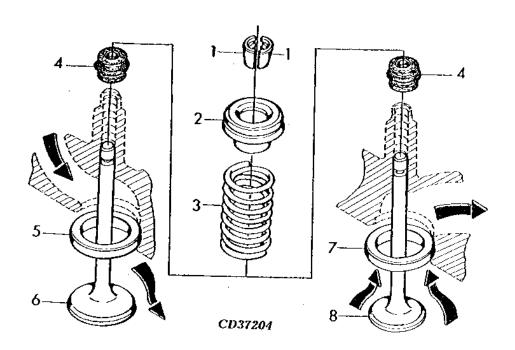
CD37203A -UN-02SEP98



				ENGINE	3 3 9 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	ĎΤ	REMARKS
	Dococo	OAD OODEW	40		V V	40 7MM V 440MM
1	R85363	CAP SCREW	18			12.7MM X 112MM
2		CYLINDER HEAD	1		X	MARKED R116569, ORD RE48615,T58477, TY9371 OR T43513, APPL
	RE48615	CYLINDER HEAD	1		ХХ	(MARKED R111949) W/ VALVES, SOUPAPES,
	TTE 10010	OTENIBER HEAD	•		Λ Λ	VENTIL, VALVOLA, VALVULA, VENTIL, ALSO
						ORDER T58477,TY9374 OR TY9375, APPL
3	CD16284	CAP	AR		ХХ	OD 32.6MM
	A3910R	CAP	AR		ΧХ	OD 25.4MM (1")
4	R43409	CAP	AR		ХХ	OD 43.3MM `
5		VALVE SEAT INSERT	AR		ХХ	ORD R106831 + R106829
6	R104592	PIPE PLUG	AR		ХХ	1/8"-27NPT ,
7	R92425	ENGINE CYLINDER HEAD GASKET	1		ХХ	
8	T58477	PIPE PLUG	AR		Х	7/8"-14UNF, (ALSO ORDER TY9371 OR T43513)
						APPL
	T58477	PIPE PLUG	AR		Χ	7/8"-14UNF, (ALSO ORDER TY9374 OR TY9375)
						APPL
9	TY9371	SEALANT	AR		Χ	LOCTITE 271, 6ML (0.2 OZ)
	T43513	SEALANT	AR		Χ	LOCTITE 271, 50ML (1.7 OZ)
	TY9374	SEALANT	AR		Х	LOCTITE 572/592, 6ML (0.2 OZ)
	TY9375	SEALANT	AR		Χ	LOCTITE 572/592, 50ML (1.7 OZ)

5101 - CONTINUED 5101 - SUITE 5101 - FORTSETZUNG 5101 - SEGUITO 5101 - CONTINUACION 5101 - FORTS

-UN-01JAN94 CD37204

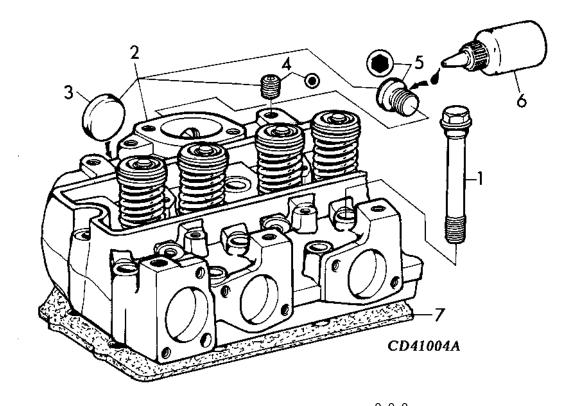


				0 0	
			ENGINE		
PART NO.	PART NAME	QTY	SERIAL NO.	DΤ	REMARKS
R91889	RETAINER	16		ХХ	OD 11.7MM
RE60005	ROTATOR	8		ХХ	
R26125	SPRING	8		ХХ	
RE31617	SEAL	8		ХХ	ID STD
R106831	VALVE SEAT INSERT	4		ХХ	OD 47.22MM, INTAKE, ADMISSION, EINLASS,
					ASPIRAZIONE, ADMISION, INSUG
R98062	INTAKE VALVE	4		ΧХ	OD STD
R97490	INTAKE VALVE	AR		ΧХ	OD +0.381MM
	INTAKE VALVE	AR		ХХ	OD +0.762MM
R106829	VALVE SEAT INSERT	4		ΧХ	OD 43.1MM, EXHAUST, ECHAPPEMENT, AUSLASS,
					SCARICO, ESCAPE, AVGAS
R90692	EXHAUST VALVE	4		ΧХ	OD STD
R97492	EXHAUST VALVE	AR		ХХ	OD +0.381MM
R97493	EXHAUST VALVE	AR		ХХ	OD +0.762MM
	R91889 RE60005 R26125 RE31617 R106831 R98062 R97490 R97491 R106829 R90692 R97492	R91889 RETAINER RE60005 ROTATOR R26125 SPRING RE31617 SEAL R106831 VALVE SEAT INSERT R98062 INTAKE VALVE R97490 INTAKE VALVE R97491 INTAKE VALVE R106829 VALVE SEAT INSERT R90692 EXHAUST VALVE R97492 EXHAUST VALVE	R91889 RETAINER 16 RE60005 ROTATOR 8 R26125 SPRING 8 RE31617 SEAL 8 R106831 VALVE SEAT INSERT 4 R98062 INTAKE VALVE 4 R97490 INTAKE VALVE AR R97491 INTAKE VALVE AR R106829 VALVE SEAT INSERT 4 R90692 EXHAUST VALVE 4 R97492 EXHAUST VALVE AR	PART NO. PART NAME QTY SERIAL NO. R91889 RETAINER 16 RE60005 ROTATOR 8 R26125 SPRING 8 RE31617 SEAL 8 R106831 VALVE SEAT INSERT 4 R98062 INTAKE VALVE AR R97490 INTAKE VALVE AR R97491 INTAKE VALVE AR R106829 VALVE SEAT INSERT 4 R90692 EXHAUST VALVE 4 R97492 EXHAUST VALVE AR	PART NO. PART NAME QTY ENGINE 9 9 9 9 9 9 5 5 5 5 7 5 5 5 7 5 7 5 7 5

CYLINDER HEAD & VALVES

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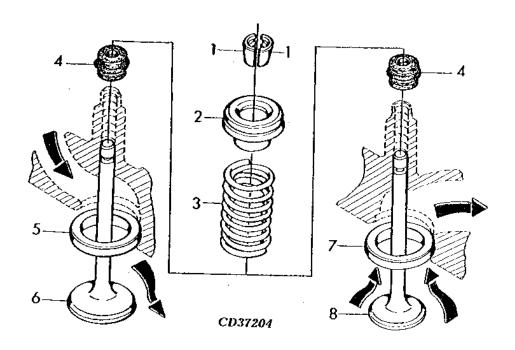
CD41004A -UN-10JUN98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	R85363	CAP SCREW	18		XXX	12.7MM X 112MM
2	RE57234	CYLINDER HEAD	1		X X X	(MARKED R121402) ASSY, INCL KEYS 3,4,5.
						HIGH SWIRL, HAUTE TURBULENCE, HOHE
						WIRBELSTROEMUNG, ALTA TURBOLENZA,
						ALTA TURBULENCIA, HOEG
						VIRVELSTROEMNING
3	CD16284	CAP	1		X X X	OD 32.6MM, REAR
	CD16607	CAP	AR		X X X	OD 34.3MM, REAR
	R43409	CAP	3		X X X	OD 43.3MM
4	R104592	PIPE PLUG	AR		XXX	1/8"-27NPT
5	T58477	FITTING	1		X X X	7/8"-14UNF, (ALSO ORDER TY9374 OR
						TY9375) APPL
6	TY9374	SEALANT	AR		XXX	LOCTITE 592, 6ML (0.2 OZ)
	TY9375	SEALANT	AR		X X X	LOCTITE 592, 50ML (1.7 OZ)
7	R116515	ENGINE CYLINDER HEAD GASKET	1		X X X	

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CD37204 -UN-01JAN94



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	R91889	RETAINER	16		XXX	OD 11.7MM
2	RE60005	ROTATOR	8		X X X	
3	R26125	SPRING	8		X X X	
4	RE31617	SEAL	8		X X X	ID STD
5	R106831	VALVE SEAT INSERT	4		X X X	OD 47.22MM, INTAKE, ADMISSION, EINLASS,
						ASPIRAZIONE, ADMISION, INSUG
6	R98062	INTAKE VALVE	4		X X X	OD STD
	R97490	INTAKE VALVE	AR		X X X	OD +0.381MM
	R97491	INTAKE VALVE	AR		X X X	OD +0.762MM
7	R106829	VALVE SEAT INSERT	4		XXX	OD 43.1MM, EXHAUST, ECHAPPEMENT,
						AUSLASS, SCARICO, ESCAPE, AVGAS
8	R90692	EXHAUST VALVE	4		X X X	OD STD
	R97492	EXHAUST VALVE	AR		XXX	OD +0.381MM
	R97493	EXHAUST VALVE	AR		X X X	OD +0.762MM

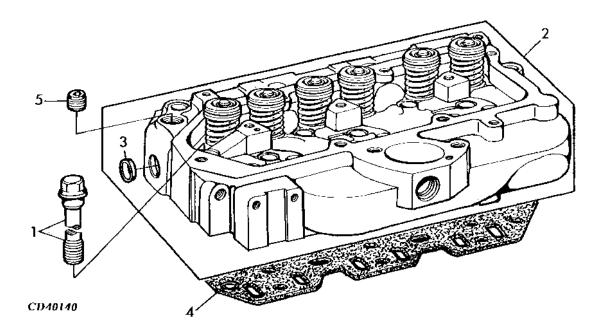
Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

CYLINDER HEAD & VALVES

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CYLINDER HEAD & VALVES

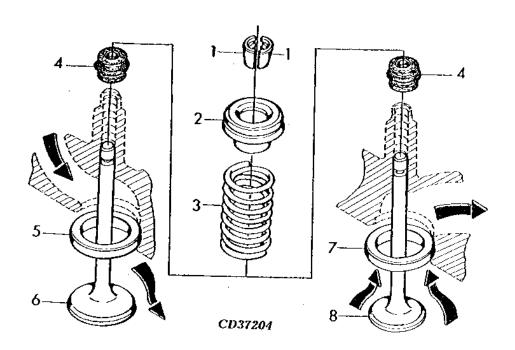
CD40140 -UN-01DEC94



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS
1	R85363	CAP SCREW	14		Х	12.7MM X 112MM
2	RE65214	CYLINDER HEAD	1		Χ	MARKED R129305
3	CD16284	CAP	2		Χ	OD 32.6MM
4	R97356	ENGINE CYLINDER HEAD GASKET	1		Х	
5	15H584	PIPE PLUG	AR		Χ	1/2"-14NPTF

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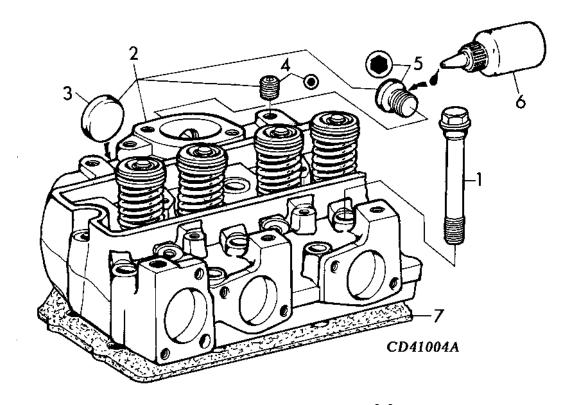
CD37204 -UN-01JAN94



				ENGINE	0 2	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	D	REMARKS
1	R91889	RETAINER	12		Х	OD 11.7MM
2	RE60005	ROTATOR	6		Χ	
3	R26125	SPRING	6		Χ	
4	RE31617	SEAL	6		Χ	
5	R106831	VALVE SEAT INSERT	6		Х	OD 47.2MM, INTAKE, ADMISSION, EINLASS, ASPIRAZIONE, ADMISION, INSUG
6	R98062	INTAKE VALVE	3		Х	OD STD
	R97490	INTAKE VALVE	AR		Χ	OS +0.381MM
	R97491	INTAKE VALVE	AR		Χ	OS +0.762MM
7	R106829	VALVE SEAT INSERT	3		Х	OD 43.1MM, EXHAUST, ECHAPPEMENT, AUSLASS, SCARICO, ESCAPE, AVGAS
8	R90692	EXHAUST VALVE	3		Χ	OD STD
	R97492	EXHAUST VALVE	AR		Х	OS +0.381MM
	R97493	EXHAUST VALVE	AR		Χ	OS +0.762MM

CYLINDER HEAD & VALVES

CD41004A -UN-10JUN98

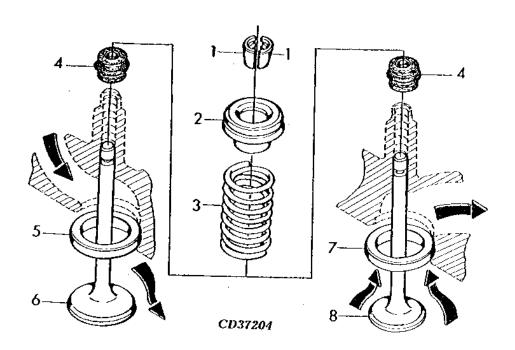


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 6 6 8 8 T H	REMARKS
1	R85363	CAP SCREW	26		ХХ	12.7MM X 112MM
2	RE57489	CYLINDER HEAD	1		ХХ	(MARKED R121608) ASSY, INCL KEYS 3,4,5 . MEDIUM SWIRL
3	CD16284	CAP	1		ХХ	OD 32.6MM, REAR
	CD16607	CAP	AR		ХХ	OD 34.3MM, REAR
	R43409	CAP	3		ХХ	OD 43.3MM
4	R104592	PIPE PLUG	AR		XX	1/8"-27NPT
5	T58477	FITTING	1		ХХ	7/8"-14UNF, (ALSO ORDER TY9374 OR TY9375) APPL
6	TY9374	SEALANT	AR		XX	LOCTITE 592, 6ML (0.2 OZ)
	TY9375	SEALANT	AR		ХХ	LOCTITE 592, 50ML (1.7 OZ)
7	R116516	ENGINE CYLINDER HEAD GASKET	1		ΧХ	, ,

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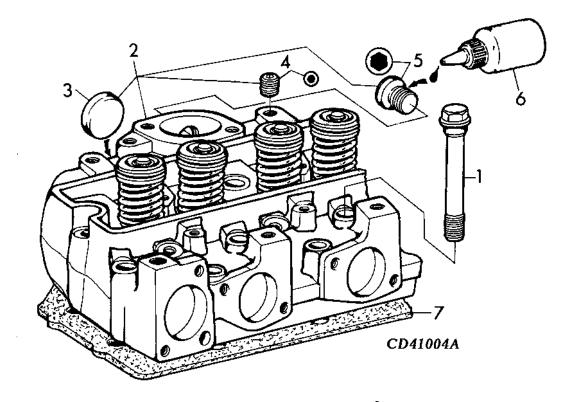


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 6 6 8 8 T H	REMARKS
1	R91889	RETAINER	24		ХХ	
2	RE60005	ROTATOR	12		ХХ	
3	R26125	SPRING	12		ХХ	
4	RE31617	SEAL	12		ХХ	STD
5	R106831	VALVE SEAT INSERT	6		ХХ	
6	R98062	INTAKE VALVE	6		ХХ	STD
	R97490	INTAKE VALVE	AR		ХХ	OD +0.381MM
	R97491	INTAKE VALVE	AR		ХХ	OD +0.762MM
7	R106829	VALVE SEAT INSERT	6		ХХ	
8	R90692	EXHAUST VALVE	6		XX	STD
	R97492	EXHAUST VALVE	AR		ХХ	OD +0.381MM
	R97493	EXHAUST VALVE	AR		ХХ	OD +0.762MM

CYLINDER HEAD & VALVES

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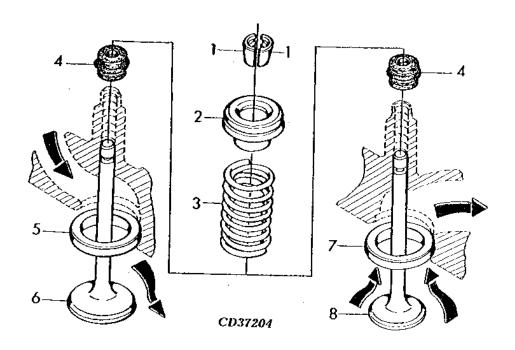
CD41004A -UN-10JUN98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 D	REMARKS
1	R85363	CAP SCREW	26		Х	12.7MM X 112MM
2	RE57237	CYLINDER HEAD	1		Х	(MARKED R121403) ASSY, INCL KEYS 3,4,5 . MEDIUM SWIRL
3	CD16284	CAP	1		Х	OD 32.6MM, REAR
	CD16607	CAP	AR		Χ	OD 34.3MM, REAR
	R43409	CAP	3		Χ	OD 43.3MM
4	R104592	PIPE PLUG	AR		Х	1/8"-27NPT
5	T58477	FITTING	1		Х	7/8"-14UNF, (ALSO ORDER TY9374 OR TY9375) APPL
6	TY9374	SEALANT	AR		Х	LOCTITE 592, 6ML (0.2 OZ)
	TY9375	SEALANT	AR		Χ	LOCTITE 592, 50ML (1.7 OZ)
7	R116516	ENGINE CYLINDER HEAD GASKET	1		X	• • •

5108 - CONTINUED 5108 - SUITE 5108 - FORTSETZUNG 5108 - SEGUITO 5108 - CONTINUACION 5108 - FORTS

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KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 D	REMARKS
1	R91889	RETAINER	24		Х	
2	RE60005	ROTATOR	12		Χ	
3	R26125	SPRING	12		Χ	
4	RE31617	SEAL	12		Х	STD
5	R106831	VALVE SEAT INSERT	6		Χ	
6	R98062	INTAKE VALVE	6		Χ	STD
	R97490	INTAKE VALVE	AR		Χ	OD +0.381MM
	R97491	INTAKE VALVE	AR		Χ	OD +0.762MM
_7	R106829	VALVE SEAT INSERT	6		Χ	
8	R90692	EXHAUST VALVE	6		Χ	STD
	R97492	EXHAUST VALVE	AR		Χ	OD +0.381MM
	R97493	EXHAUST VALVE	AR		Χ	OD +0.762MM

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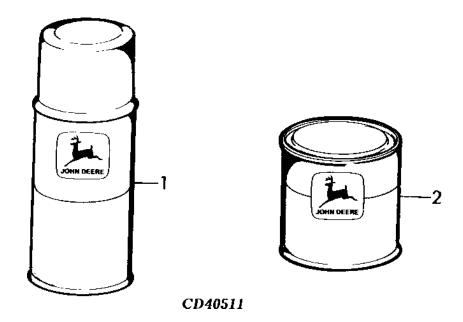


5601 (all models) 5602 (all models) 5603 (all models) 5607 (all models)



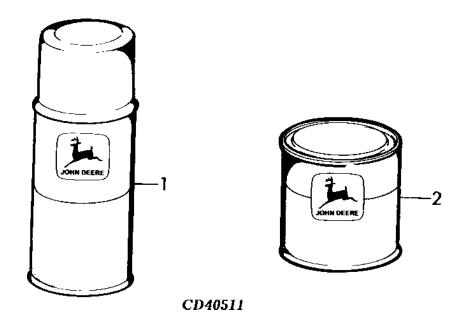
CDP45039

CD40511 -UN-17FEB95



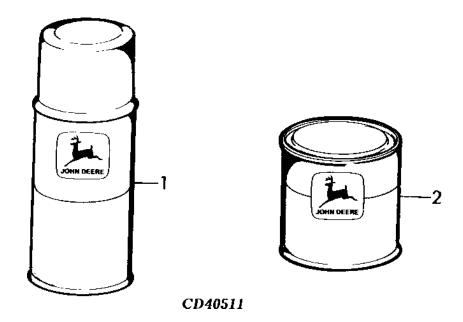
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	A L L REMARKS
1	TY6519	BROWN SPRAY PAINT	AR		X "INDUSTRIAL TAN"
2	TY6520	PAINT	AR		X "INDUSTRIAL TAN" 0.94L (1QT)

CD40511 -UN-17FEB95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	A L L	REMARKS	
1		PAINT	NA		Х		
2	VFLK07V7467	PAINT	AR		Χ	GREEN, VERT, GRUEN, VERDE, GROEN, 0.7L (0.73QT)	

CD40511 -UN-17FEB95

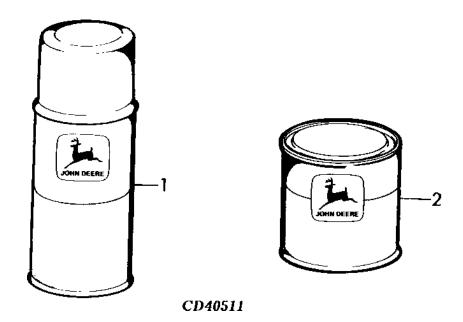


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	A L L	REMARKS
1		PAINT	NA		Χ	
2	VFLK7970	PAINT	AR		Χ	INDUSTRIAL YELLOW, JAUNE INDUSTRIEL,
						BAUMASCHINEN GELB, GIALLO INDUSTRIALE,
						AMARILLO INDUSTRIAL, INDUSTRIMASKIN GUL, 0.7L (0.73QT)

PAINT

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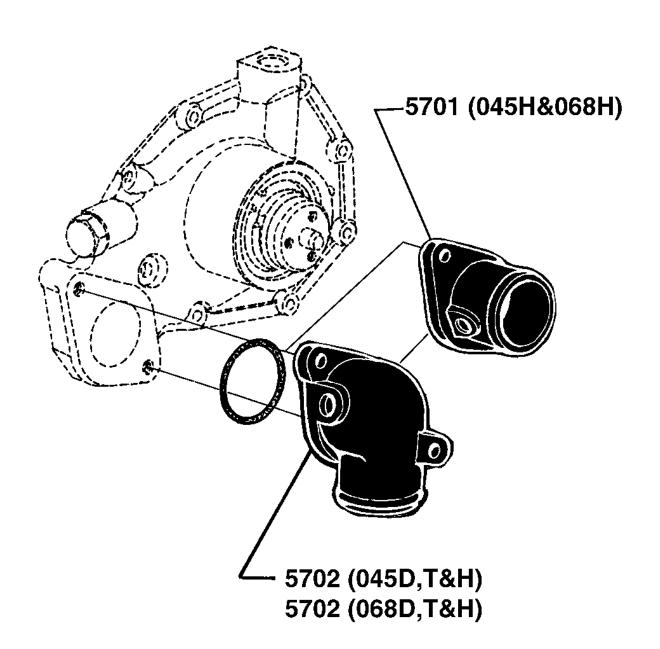
CD40511 -UN-17FEB95



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	A L L REMARKS
1 .		PAINT	NA	X
2	VFLK7685	PAINT	AR	X MATT BLACK, NOIR MAT, SCHWARZ MATT, NERO
				OPACO, NEGRO MATE, MATT SVART, 0.7L
				(0.73QT)

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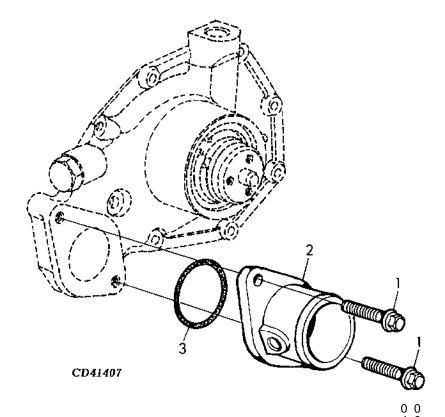
5701 - 2J10 5702 - 2J11 5702 - 2J12



CDP45040

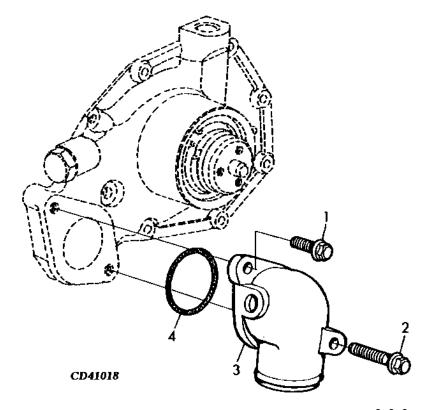
WATER PUMP INLET

CD41407 -UN-17FEB97



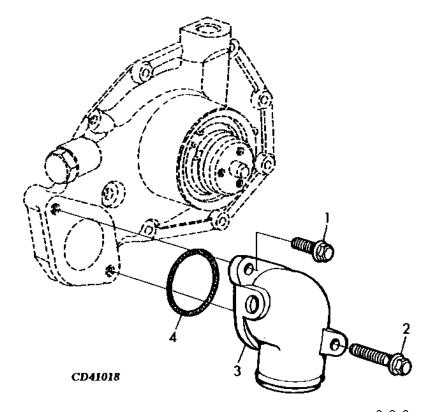
KEY	PART NO.	PART NAME	QTY	4 6 ENGINE 5 8 SERIAL NO. H H	REMARKS	
1	19M7867	SCREW	2	XX	M8 X 25, (10.9)	
2	R121634	ADAPTER	1	XX		
3	R89944	O-RING	1	XX		

CD41018 -UN-31JAN96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS		
1	19M7867	SCREW	1		XXX	l8 X 25, (10.9)		
2	19M7802	SCREW	1		X X X M	18 X 65, (10.9)		
3	R121635	ADAPTER	1		X X X	, ,		
4	R89944	O-RING	1		XXX			

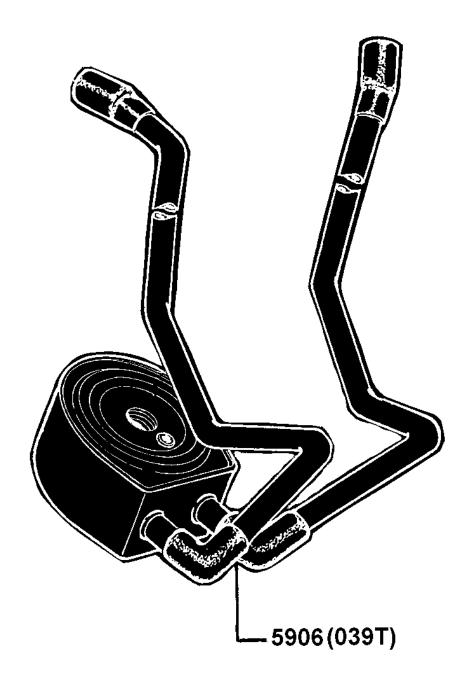
CD41018 -UN-31JAN96



KEY	PART NO.	PART NAME		0 0 0 6 6 6 IGINE 8 8 8 IAL NO. D T H	REMARKS	
1	19M7867	SCREW	1	XXX	И8 X 25, (10.9)	
2	19M7802	SCREW	1		18 X 65, (10.9)	
3	R121635	ADAPTER	1	XXX	, ,	
4	R89944	O-RING	1	XXX		

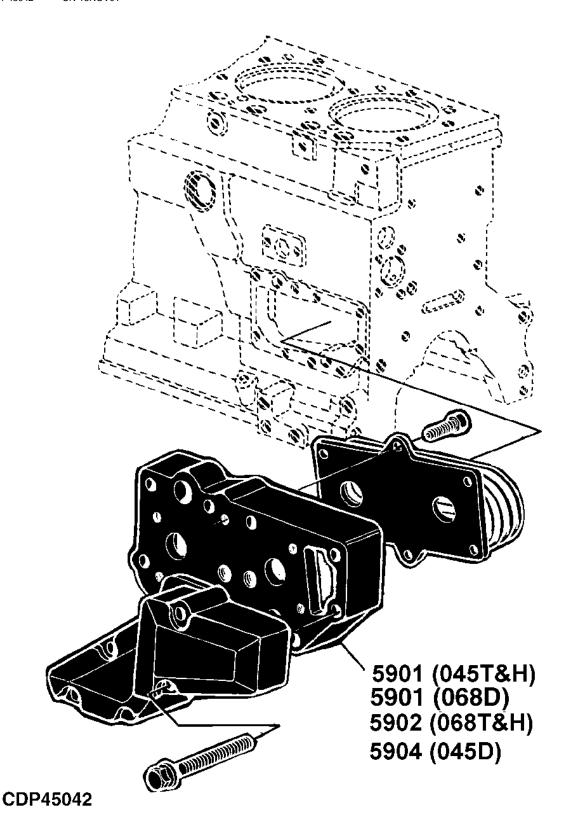
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CDP45041

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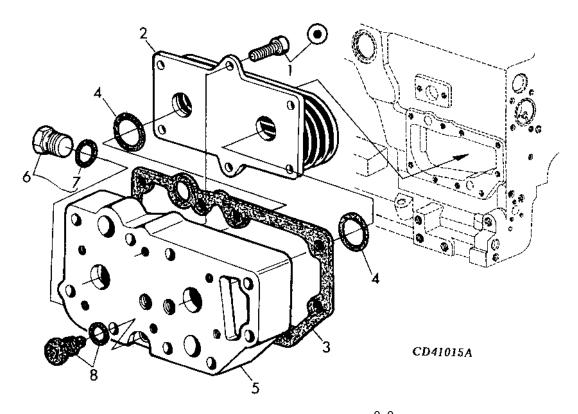


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OIL COOLER

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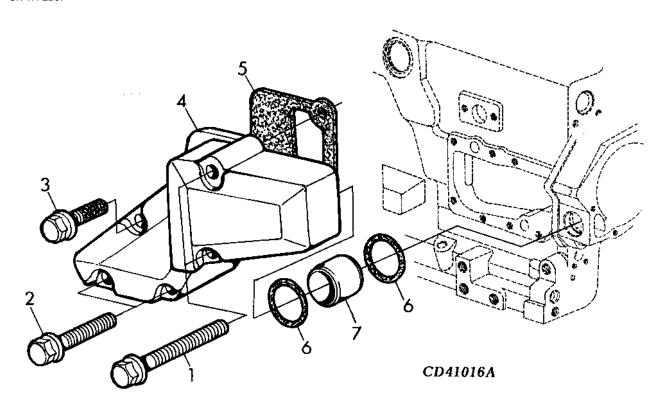
CD41015A -UN-10JUN98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS
1	RE67231	SCREW	6		ХХ	WITH SEALANT, AVEC PRODUIT D'ETANCHEITE,
						MIT DICHTMITTEL, CON MATERIALE DI TENUTA, CON SELLADOR, MED
						TAETNINGSMEDEL
2	RE59296	OIL COOLER	1		ХХ	5 PLATES
3	R123501	GASKET	1		ХХ	
4	T122075	O-RING	2		ХХ	29.820 X 2.616 MM
5	R123471	HOUSING	1		ХХ	
6	RE46685	PLUG	1		ХХ	M18 X 1.5
7	51M7043	O-RING	1		ХХ	15.300 X 2.200 MM
8	RE46686	PLUG	1			M12 X 1.5
9	51M7040	O-RING	1		ХХ	9.300 X 2.200 MM

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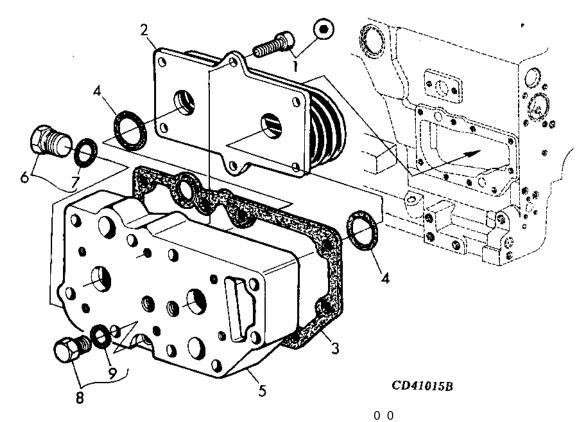
CD41016A -UN-17FEB97



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS
1	19M7970	SCREW	2		ХХ	M8 X 100, (10.9)
2	19M7802	SCREW	2			M8 X 65, (10.9)
3	RE67238	SCREW	1		ХХ	WITH SEALANT, AVEC PRODUIT D'ETANCHEITE,
						MIT DICHTMITTEL, CON MATERIALE DI
						TENUTA, CON SELLADOR, MED
						TAETNINGSMEDEL
4	R135177	ADAPTER	1	-624597	XX	(ORDER RE508599)
5	R501428	GASKET	1		ХХ	· ·
6	R61105	O-RING	2		ХХ	
7	R115252	TURF	1	-624597	XX	(ORDER RE508599)

5901
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CD41015B -UN-27JUL99

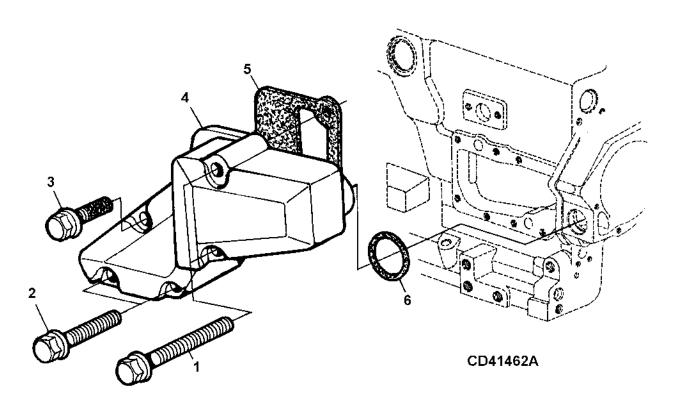


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	5 5 T H	REMARKS
1	RE67231	SCREW	6		ХХ	WITH SEALANT, AVEC PRODUIT D'ETANCHEITE, MIT DICHTMITTEL, CON MATERIALE DI
						TENUTA, CON SELLADOR, MED
						TAETNINGSMEDEL
2	RE59296	OIL COOLER	1		ХХ	5 PLATES
3	R123501	GASKET	1		ХХ	
4	T122075	O-RING	2		XX	29.820 X 2.616 MM
5	R123471	HOUSING	1		ХХ	
6	RE46685	PLUG	1		ХХ	M18 X 1.5
7	51M7043	O-RING	1		XX	15.300 X 2.200 MM
8	RE46686	PLUG	1		ХХ	M12 X 1.5
9	51M7040	O-RING	1		XX	9.3X2.2MM

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CD41462A -UN-14MAR01

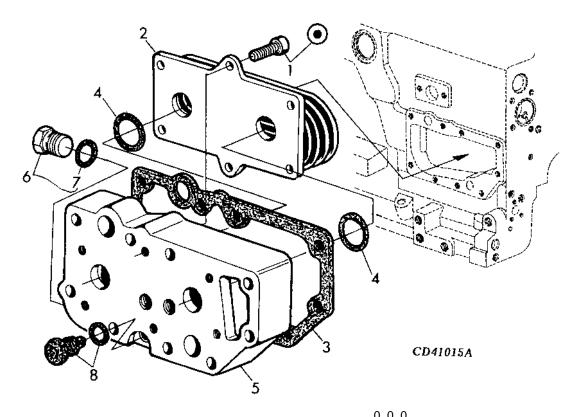


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS
1	19M7970	SCREW	2		ХХ	M8 X 100, (10.9)
2	19M7802	SCREW	2			M8 X 65, (10.9)
3	RE67238	SCREW	1		ΧХ	WITH SEALANT, AVEC PRODUIT D'ETANCHEITE,
						MIT DICHTMITTEL, CON MATERIALE DI
						TENUTA, CON SELLADOR, MED
						TAETNINGSMEDEL
4	RE508599	ADAPTER	1		ХХ	ASSY, INCL. KEYS 3,5&6
5	R501428	GASKET	1		ХХ	
6	R61105	O-RING	1		ХХ	37.694 X 3.531 MM

OIL COOLER

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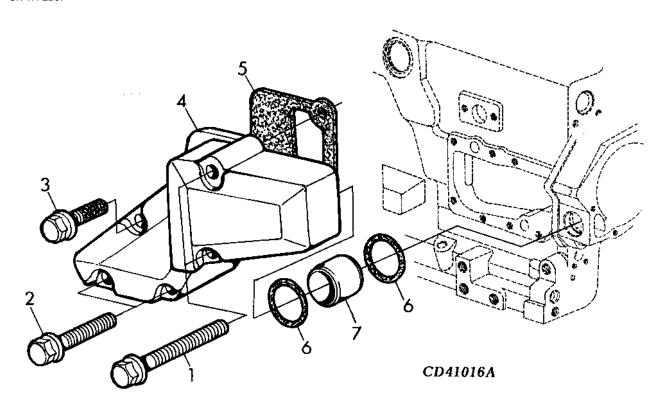
CD41015A -UN-10JUN98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	RE67231	SCREW	6		XXX	WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITE, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR,
						MED TAETNINGSMEDEL
2	RE56690	OIL COOLER	1		X X X	7 PLATES
3	R123501	GASKET	1		X X X	
4	T122075	O-RING	2		XXX	29.820 X 2.616 MM
5	R123471	HOUSING	1		X X X	
6	RE46685	PLUG	1		$X \times X$	M18 X 1.5
7	51M7043	O-RING	1		XXX	15.300 X 2.200 MM
8	RF500565	PIPE PLUG	1		X X X	M12 X 1.5

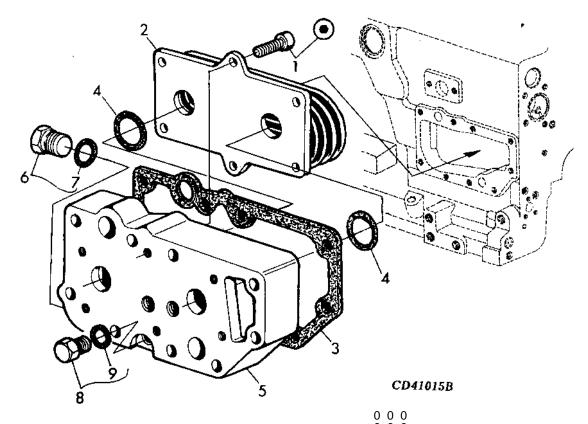
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-UN-17FEB97 CD41016A



KEY	PART NO.	PART NAME	QTY S	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	19M7970	SCREW	2		XXX	M8 X 100, (10.9)
2	19M7802	SCREW	2		X X X	M8 X 65, (10.9)
3	RE67238	SCREW	1		X X X	WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITE, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR,
						MED TAETNINGSMEDEL
4	R135177	ADAPTER	1	-624597	XXX	(ORDER RE508599)
5	R501428	GASKET	1		X X X	
6	R61105	O-RING	2		X X X	37.694 X 3.531 MM
7	R115252	TUBE	1	-624597	XXX	(ORDER RE508599)

CD41015B -UN-27JUL99

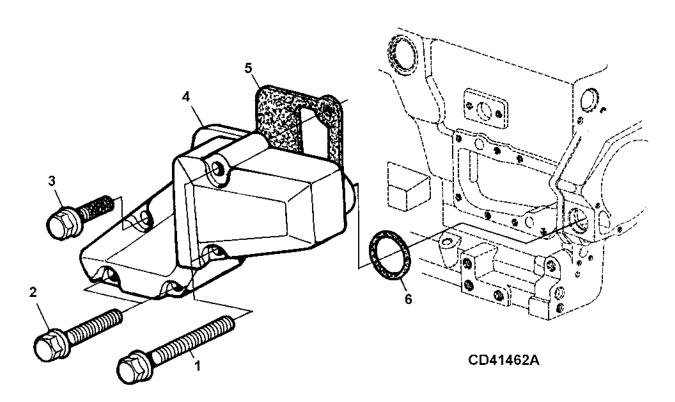


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	RE67231	SCREW	6		XXX	WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITE, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR,
						MED TAETNINGSMEDEL
2	RE56690	OIL COOLER	1		X X X	7 PLATES
3	R123501	GASKET	1		X X X	
4	T122075	O-RING	2		XXX	29.820 X 2.616 MM
5	R123471	HOUSING	1		X X X	
6	RE46685	PLUG	1		X X X	M18 X 1.5
7	51M7043	O-RING	1		XXX	15.300 X 2.200 MM
8	RE46686	PLUG	1		X X X	M12 X 1.5
9	51M7040	O-RING	1		X X X	9.3X2.2MM

2J23

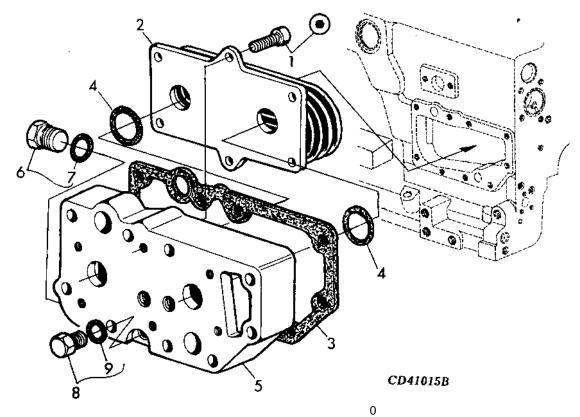
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KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	19M7970	SCREW	2		XXX	M8 X 100, (10.9)
2	19M7802	SCREW	2		X X X	M8 X 65, (10.9)
3	RE67238	SCREW	1		X X X	WITH SEALANT, AVEC PRODUIT
						D'ETANCHEITE, MIT DICHTMITTEL, CON
						MATERIALE DI TENUTA, CON SELLADOR,
						MED TAETNINGSMEDEL
4	RE508599	ADAPTER	1		XXX	ASSY, INCL. KEYS 3,5&6
5	R501428	GASKET	1		X X X	
6	R61105	O-RING	1		X X X	37.694 X 3.531 MM

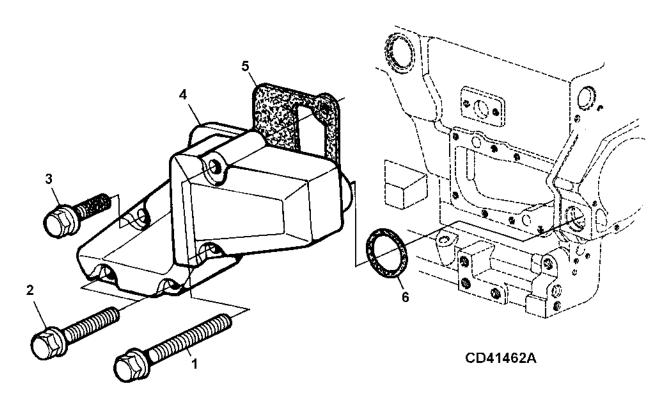
CD41015B -UN-27JUL99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 D	REMARKS
1	RE67231	SCREW	6		Χ	WITH SEALANT, AVEC PRODUIT D'ETANCHEITE,
						MIT DICHTMITTEL, CON MATERIALE DI TENUTA, CON SELLADOR, MED TAETNINGSMEDEL
2	RE59812	OIL COOLER	1		Χ	3 PLATES
3	R123501	GASKET	1		Χ	
4	T122075	O-RING	2		Χ	29.820 X 2.616 MM
5	R123471	HOUSING	1		Χ	
6	RE46685	PLUG	1		Χ	M18 X 1.5
7	51M7043	O-RING	1		Χ	15.300 X 2.200 MM
8	RE46686	PLUG	1		Χ	M12 X 1.5
9	51M7040	O-RING	1		Χ	9.3X2.2MM

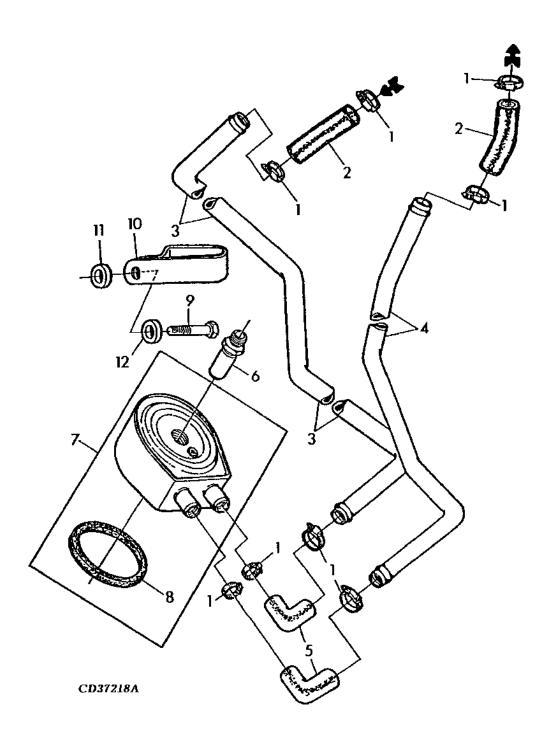
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KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 D	REMARKS
1	19M7970	SCREW	2		Х	M8 X 100, (10.9)
2	19M7802	SCREW	2		Χ	M8 X 65, (10.9)
3	RE67238	SCREW	1		Χ	WITH SEALANT, AVEC PRODUIT D'ETANCHEITE,
						MIT DICHTMITTEL, CON MATERIALE DI TENUTA,
						CON SELLADOR, MED TAETNINGSMEDEL
_4	RE508599	ADAPTER	1		Χ	ASSY, INCL. KEYS 3,5&6
5	R501428	GASKET	1		Χ	
6	R61105	O-RING	1		X	37 694 X 3 531 MM

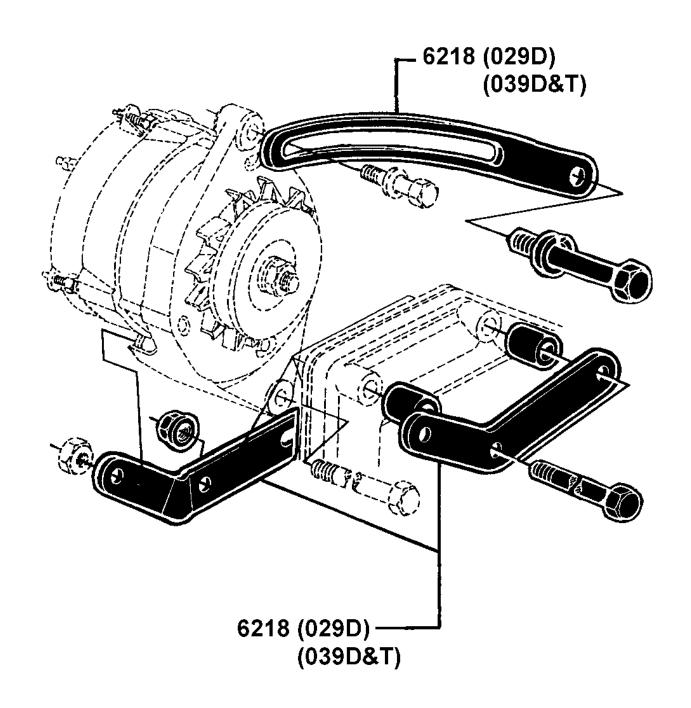
CD37218A -UN-17AUG95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 T	REMARKS	
1	AR21837	CLAMP	8		Х		
2	R83063	HOSE	2		Χ	LGTH 2370MM, CUT TO LENGTH	
3	R99259	LINE	1		Χ	OD 16MM	
4	R99258	LINE	1		Х	OD 16MM	
5	R99254	HOSE	2		Χ		
6	R125507	THREADED NIPPLE	1		Χ	13/16"-16UN X LGTH 54MM	
7	RE61767	OIL COOLER	1		Х		
8	R125508	PACKING	1		Χ	67MM X 74.4MM X 3.6MM	
9	19H2733	CAP SCREW	1		Χ	3/8" X 2-3/8", (SAE 8)	
10	R53524	CLAMP	1		Х		
11	R99257	WASHER	1		Χ	10 X 20 X 5 MM	
12	24M7106	WASHER	1		X	10 X 18 X 2.500 MM	

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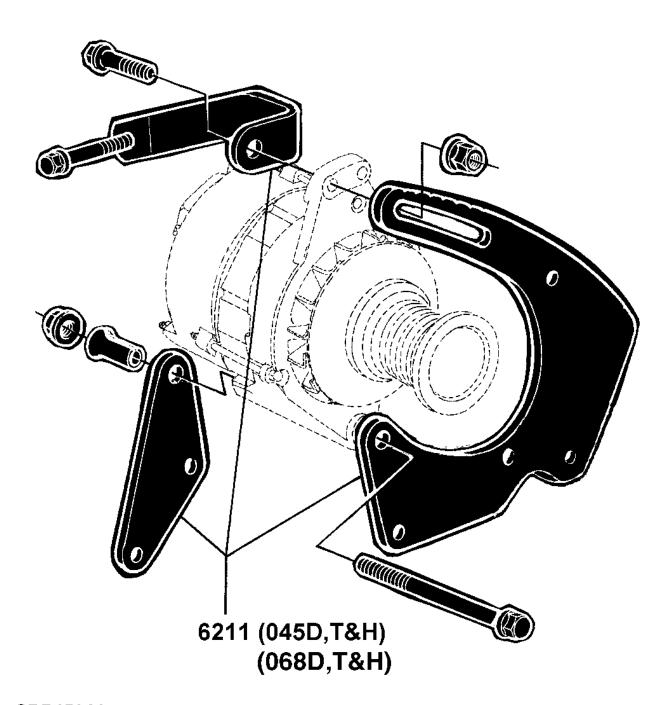
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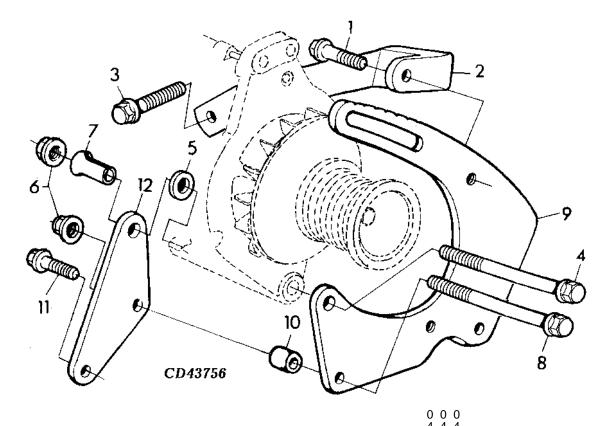
Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

ALTERNATOR BRACKETS

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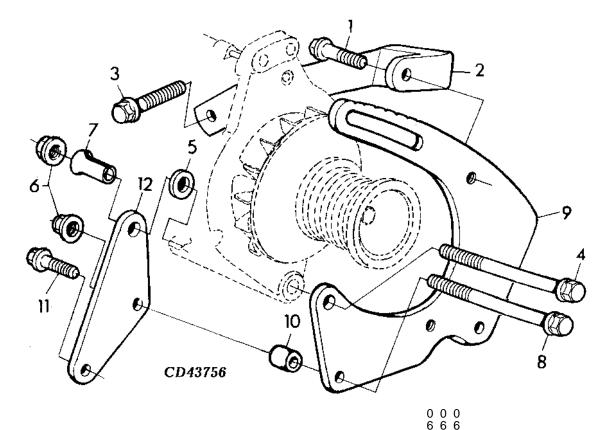
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-UN-22FEB01 CD43756



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	19M7783	SCREW	1		XXX		 —
2	R500333	BRACKET	1		X X X		
3	19M7785	SCREW	1		X X X		
4	19M8039	SCREW	1		X X X		
5	R501065	WASHER	1		X X X		
6	14M7298	FLANGE NUT	2		X X X		
7	R501018	BUSHING	1		X X X		
8	19M9028	SCREW	1		X X X		
9	R504526	BRACKET	1		X X X		
10	R500078	SPACER	2		X X X		
11	19M7868	SCREW	1		X X X		
12	R500080	BRACKET	1		X X X		

CD43756 -UN-22FEB01

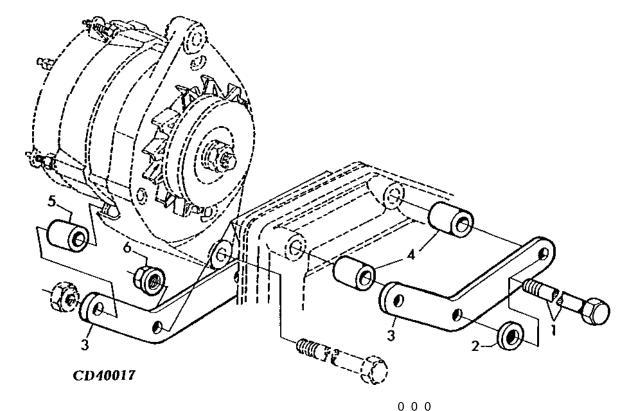


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	8 8 8 D T H	REMARKS	
1	19M7783	SCREW	1		XXX		
2	R500333	BRACKET	1		X X X		
3	19M7785	SCREW	1		X X X		
4	19M8039	SCREW	1		XXX		
5	R501065	WASHER	1		X X X		
6	14M7298	FLANGE NUT	2		X X X		
7	R501018	BUSHING	1		XXX		
8	19M9028	SCREW	1		X X X		
9	R504526	BRACKET	1		X X X		
10	R500078	SPACER	2		XXX		_
11	19M7868	SCREW	1		X X X		
12	R500080	BRACKET	1		X X X		

ALTERNATOR BRACKETS

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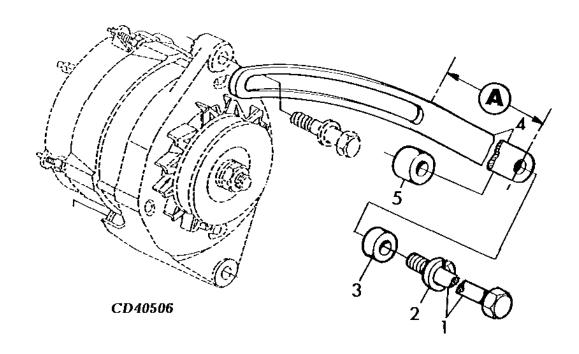
CD40017 -UN-20JUL95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 3 3 9 9 9 D D T	REMARKS	
1	19H1912	CAP SCREW	2		XXX	3/8" X 3-1/2"	
2		WASHER	NA		X X X		
3	R126389	BRACKET	2		X X X		
4	R64449	BUSHING	2		XXX	TK 25.4MM	
5	T20280	WASHER	1		X X X	TK 9MM	
6	N10215	LOCK NUT	2		X X X	3/8"	

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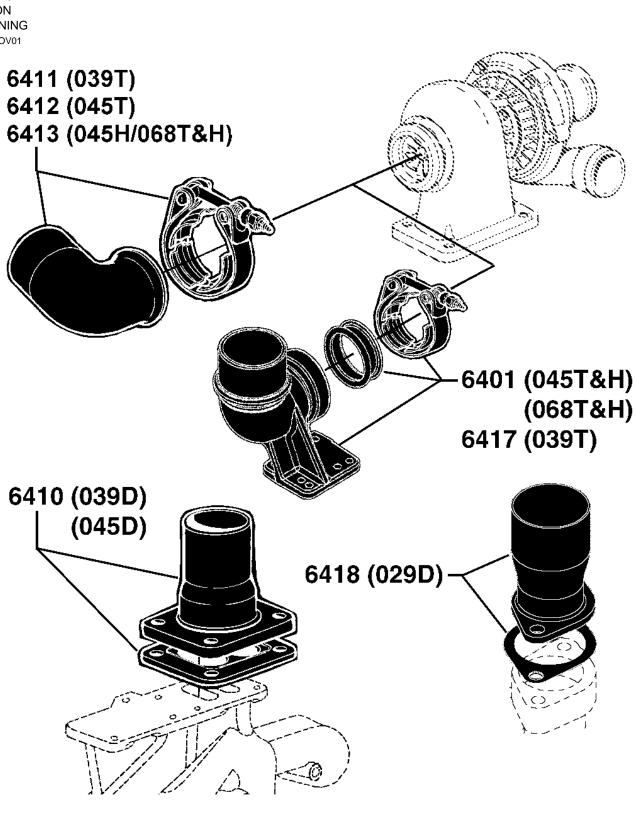
CD40506 -UN-17FEB95



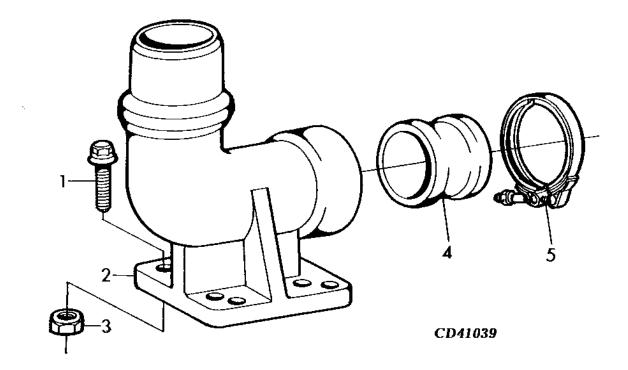
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 2 3 3 9 9 9 D D T	REMARKS	
1	19H3065	CAP SCREW	1		XXX	3/8" X 2", (SAE 8)	
2	12H304	LOCK WASHER	1		X X X	3/8"	
3		WASHER	NA		X X X		
4	T32853	STRAP	1		XXX	A = 104MM	
5	28H1517	WASHER	1		X X X	0.493" X 0.675" X 1/4"	

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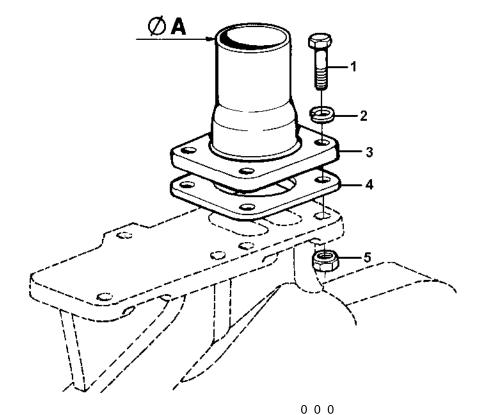


CD41039 -UN-01MAR96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 6 5 8 T T & & H H	REMARKS	
1	19M8162	CAP SCREW	4		X X M1	0 X 40, (10.9)	
2	R123246	EXHAUST PIPE	1		XX	,	
3	14M7296	FLANGE NUT	4		X X M1	0, (10)	
4	R87732	ADAPTER	1		XX		
5	RE40048	CLAMP	1		ХХ		

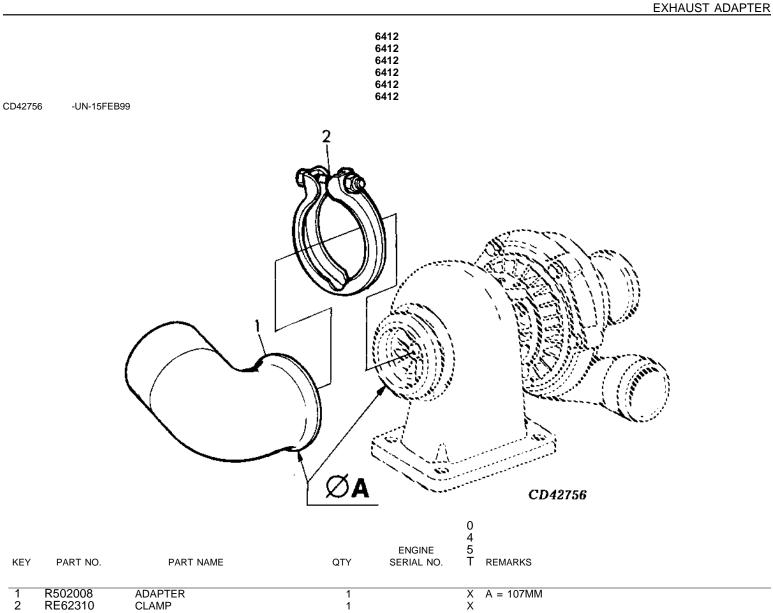
CD42754A -UN-20SEP01



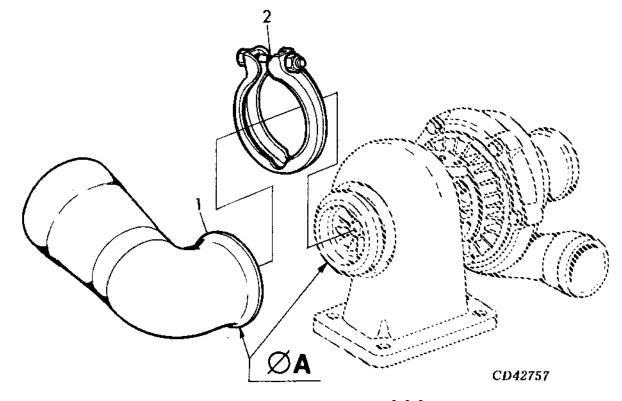
CD	427	54A	

KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	3 4 6 9 5 8 D D D	REMARKS	
1	19H2633	CAP SCREW	4		X X :	3/8" X 1-1/2"	
2	12H304	LOCK WASHER	4		X X :	3/8"	
3	RE503300	ADAPTER	1		XX	A = 60MM	
4	R502662	GASKET	1		XX		
5	14H812	NUT	4		X X :	3/8"	

			EXHAUS	T ADAPTER
CD4275	5 -UN-15FEB:	99	6411 6411 6411 6411 6411 6411	
			Z CD42755	
KEY	PART NO.	PART NAME	0 3 ENGINE 9 QTY SERIAL NO. T REMARKS	
1 2	R502007 RE503927	ADAPTER CLAMP	1 X A = 88MM 1 X	

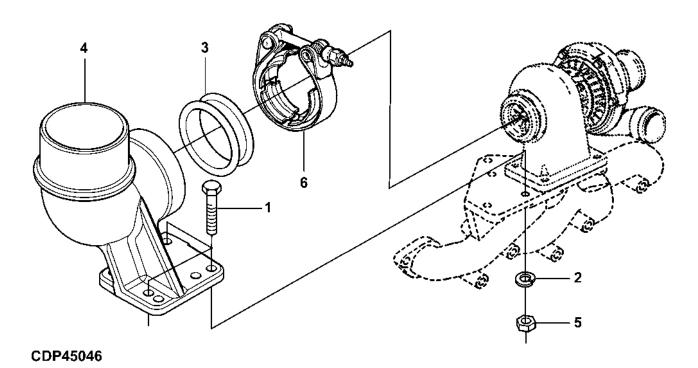


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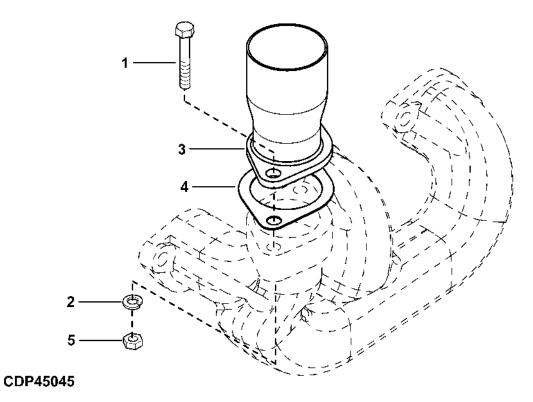
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 6 6 5 8 8 H T H	REMARKS	
1	R502009	ADAPTER	1		XXXA	= 107MM	
2	RE62310	CLAMP	1		X X X		

-UN-15NOV01 CDP45046



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 3 9 T	REMARKS	
1	19H2633	CAP SCREW	4		Х	3/8" X 1-1/2"	
2	12H304	LOCK WASHER	4		Χ	3/8"	
3	R503407	ADAPTER	1		Χ	A = 60MM	
4	R57270	ELBOW FITTING	1		Х		
5	14H255	NUT	4		Χ	3/8"	
6	RF503927	CLAMP	1		Y		

CDP45045 -UN-15NOV01



KEY	PART NO.	PART NAME		0 2 NGINE 9 RIAL NO. D	REMARKS	
1	19H2633	CAP SCREW	2	X	3/8" X 1-1/2"	
2	12H304	LOCK WASHER	2	X	3/8"	
3	RE507061	ADAPTER	1	X	A = 60MM	
4	R109985	GASKET	1	Х		
5	14H812	NUT	2	X	3/8"	

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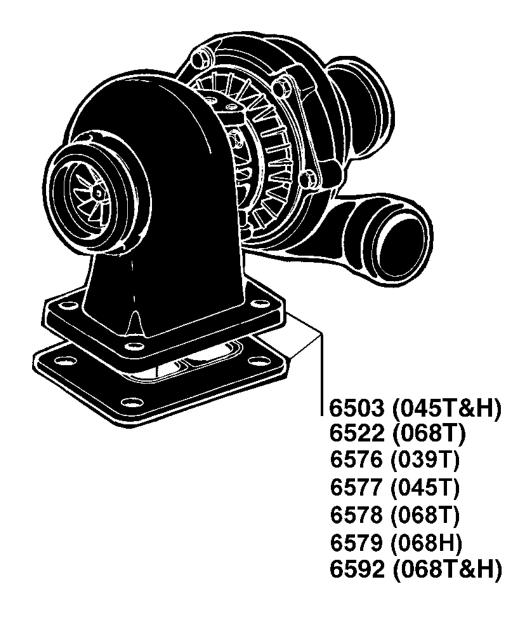
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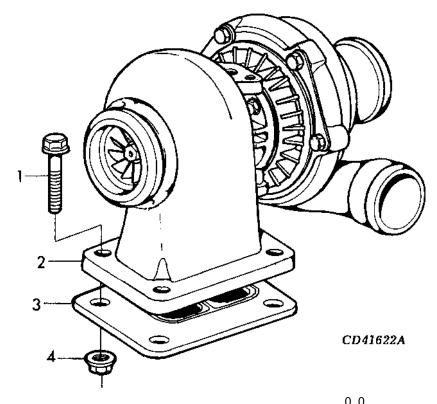
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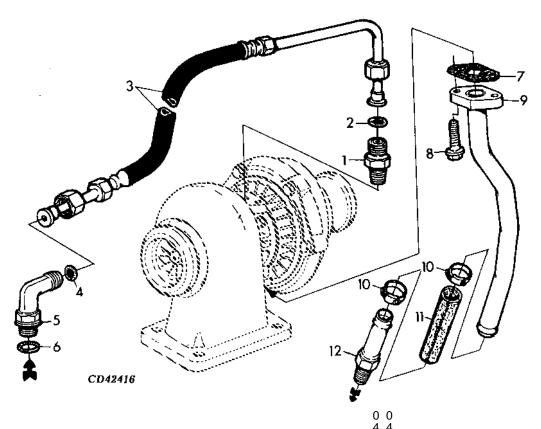
CD41622A -UN-25NOV97



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL N	<u> </u>	
1	19M7785	SCREW	4	X X M10 X 25, (10.9)	
2	RE60046	TURBOCHARGER	1	XX	
3	R123572	GASKET	1	XX	
4		FLANGE NUT	NA	X X	

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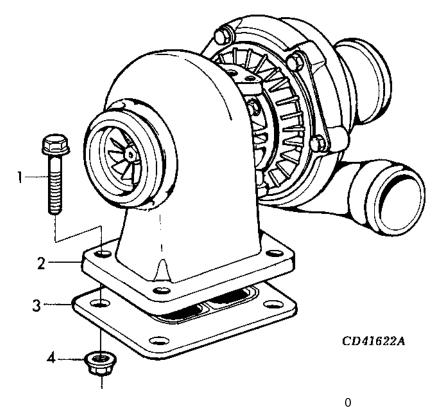


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 5 5 T H	REMARKS
1	M87733	ADAPTER	1		ХХ	1/4"-18NPT X 11/16"-16UN, (ALSO ORDER R63548)
2	R63548	O-RING	1		хх	9.246 X 1.778 MM
3	RE59922	HYDRAULIC HOSE	1		ХХ	
4	T77613	O-RING	1		ХХ	9.246 X 1.778 MM
5	38H5035	ELBOW FITTING	1		ХХ	90°, M16 X 1.5 X11/16"-16UN
6	51M7042	O-RING	1		ХХ	13.300 X 2.200 MM
7	R123570	GASKET	1		ХХ	
8	19M7866	SCREW	2		ХХ	M8 X 20, (10.9)
9	RE59547	OIL LINE	1		XX	
10	RE65978	CLAMP	2		ХХ	
11	R104536	HOSE	1		ХХ	ID X LGTH 19 X 2000MM, CUT TO LENGTH,
						COUPER A LONGUEUR, ABLAENGEN, TAGLIARE SU MISURE, CORTAR A LONGITUD, AVSKARE EFTER MATT
12	RE54885	HOSE FITTING	1		ΧХ	1/2"-14NPTF X LGTH 48MM

TURBOCHARGER

6522 6522

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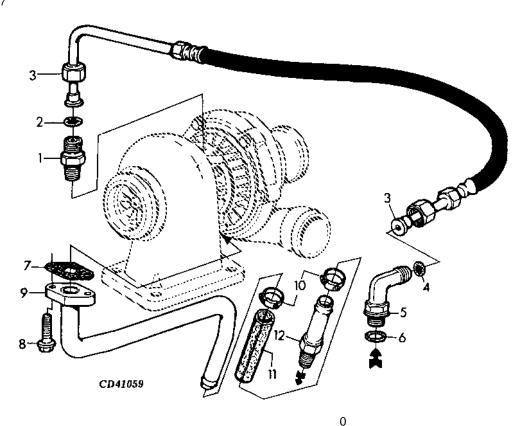


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS	
1	19M8162	CAP SCREW	4		Х	M10 X 40, (10.9)	
2	RE60074	TURBOCHARGER	1		Χ	,	
3	R123572	GASKET	1		Χ		
4	14M7296	FLANGE NUT	1		Y	M10	

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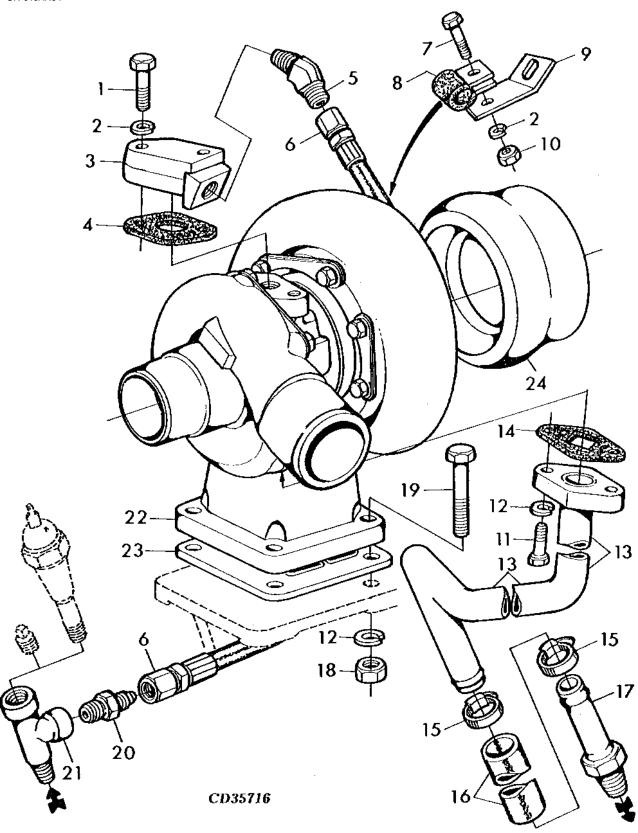
-UN-25NOV97



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	M87733	ADAPTER	1		Х	1/4"-18NPT X 11/16"-16UN, (ALSO ORDER
2	R63548	O-RING	1		X	R63548) 9.246 X 1.778 MM
3	RE501260	OIL LINE	1		X	0.210 X 1.770 MM
4	T77613	O-RING	1		Χ	9.246 X 1.778 MM
5	38H5037	ADAPTER	1		Χ	45°, M16 X 1.5 X 11/16"-16UN
6	51M7042	O-RING	1		Х	13.300 X 2.200 MM
7	R123570	GASKET	1		Χ	
8	19M7866	SCREW	2		Χ	M8 X 20, (10.9)
9	RE59438	OIL LINE	1		Х	. , ,
10	RE65978	CLAMP	2		X	
11	R120013	BULK HOSE	1		X	ID X LGTH 19 X 2000MM, CUT TO LENGTH,
						COUPER A LONGUEUR, ABLAENGEN, TAGLIARE SU MISURE, CORTAR A LONGITUD, AVSKARE EFTER MATT
12	RE54885	HOSE FITTING	1		X	

CD35716

-UN-01JAN94



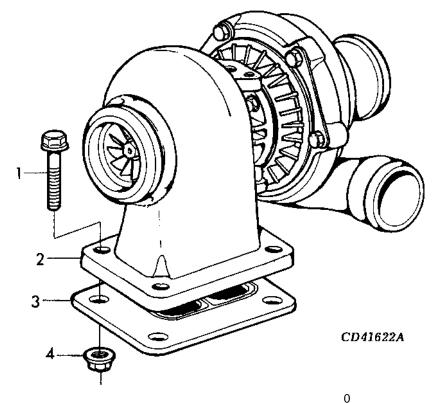
					0	
					0 3	
				ENGINE	9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	9	REMARKS
NE I	PART NO.	PART NAME	QIT	SERIAL NO.	'	KEWAKKS
1	19H1901	CAP SCREW	2		Х	5/16" X 2"
2	12M7056	LOCK WASHER	1		Х	8 MM
3	T30199	ADAPTER	1		X	
4	R97348	GASKET	1		Х	
5	M43551	ELBOW FITTING	1		X	1/8"-27NPTF X 1/2"-20UNF
6	RE23181	HYDRAULIC HOSE	1		X	
7	19H1813	CAP SCREW	1		X	5/16" X 5/8"
8	R46414	CLAMP	1		X	
9	R92179	STRAP	1		X	
10	14H785	NUT	1		X	5/16"
11	19H1648	CAP SCREW	2		X	3/8" X 3/4", (SAE 8)
12	12H304	LOCK WASHER	6		X	3/8"
13	RE25335	OIL LINE	1		X	
14	R105346	GASKET	1		X	
15	AT18904	CLAMP	2		X	
16	R104536	HOSE	1		X	ID X LGTH 19MM X 2000MM, CUT TO LENGTH
17	RE54885	HOSE FITTING	1		X	1/2"-14NPTF X LGTH 48MM
18	14H1076	NUT	4		X	3/8"
19	19H3267	CAP SCREW	4		Х	3/8" X 1-5/8", (SAE 8)
20	R27346	FITTING	1		X	1/8"-27NPTF X 1/2"-20UNF
21	T19158	TEE FITTING	1		Χ	1/8"-27NPTF
22	RE503722	TURBOCHARGER	1		Х	(ALSO ORDER R123752)
23	R123572	GASKET	1		Χ	,
24		ADAPTER	NA		Χ	

TURBOCHARGER

6577 6577

CD41622A

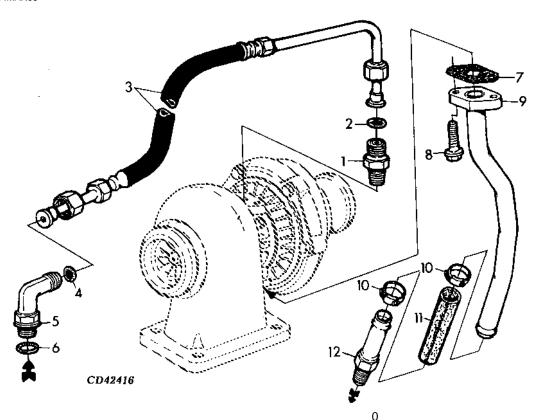
-UN-25NOV97



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS	
1	19M7785	SCREW	4		Х	M10 X 25, (10.9)	
2	RE503097	TURBOCHARGER	1		Χ	, ,	
3	R123572	GASKET	1		Χ		
4		FLANGE NUT	NΙΔ				

6577 - CONTINUED 6577 - SUITE 6577 - FORTSETZUNG 6577 - SEGUITO 6577 - CONTINUACION 6577 - FORTS

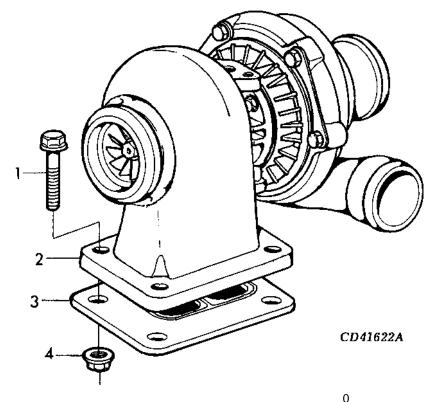
CD42416 -UN-04MAR98



KEY	PART NO.	PART NAME	QTY S	ENGINE SERIAL NO.	5 T	REMARKS
1	M87733	ADAPTER	1		Х	1/4"-18NPT X 11/16"-16UN, (ALSO ORDER
2	R63548	O DINO	4		V	R63548)
3	RE59922	O-RING	<u> </u>		~	9.246 X 1.778 MM
		HYDRAULIC HOSE	1		^	0.040 \/ 4.770 MM
4	T77613	O-RING	1		X	9.246 X 1.778 MM
_5	38H5035	ELBOW FITTING	1		Х	90°, M16 X 1.5 X 11/16"-16UN
6	51M7042	O-RING	1		Χ	13.300 X 2.200 MM
7	R123570	GASKET	1		Χ	
8	19M7866	SCREW	2		Χ	M8 X 20, (10.9)
9	RE59547	OIL LINE	1		Х	
10	RE65978	CLAMP	2		Χ	
11	R104536	HOSE	1		Χ	ID X LGTH 19 X 2000MM, CUT TO LENGTH,
						COUPER A LONGUEUR, ABLAENGEN, TAGLIARE SU
						MISURE, CORTAR A LONGITUD, AVSKARE EFTER
						MATT
12	RE54885	HOSE FITTING	1		Х	1/2"-14NPTF X LGTH 48MM

TURBOCHARGER

CD41622A -UN-25NOV97

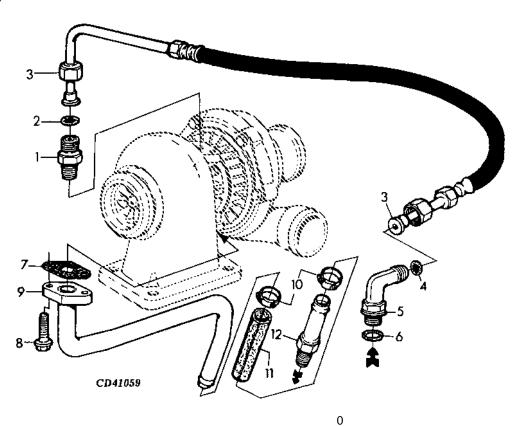


KEY	PART NO.	PART NAME	QTY :	6 ENGINE 8 SERIAL NO. T	REMARKS	
1	19M8162	CAP SCREW	4	X	M10 X 40, (10.9)	
2	RE503056	TURBOCHARGER	1	X	,	
3	R123572	GASKET	1	X		
4	14M7296	FLANGE NUT	Λ	Y	M10	

6578 - CONTINUED 6578 - SUITE 6578 - FORTSETZUNG 6578 - SEGUITO 6578 - CONTINUACION 6578 - FORTS

CD41059

-UN-25NOV97

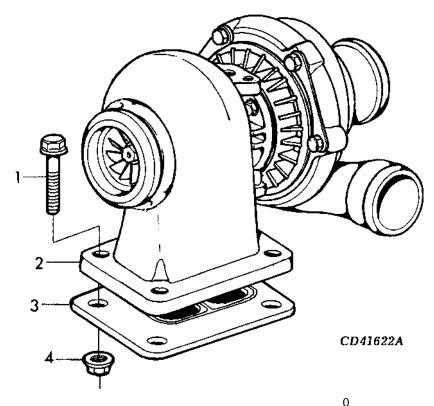


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 T	REMARKS
1	M87733	ADAPTER	1		Х	1/4"-18NPT X 11/16"-16UN, (ALSO ORDER R63548)
2	R63548	O-RING	1		Χ	
3	RE503208	OIL LINE	1		Х	
4	T77613	O-RING	1		Χ	9.246 X 1.778 MM
5	38H5154	ELBOW FITTING	1		Χ	45°, M16 X 1.5 X 11/16"-16UN
6	51M7042	O-RING	1		Х	13.300 X 2.200 MM
7	R123570	GASKET	1		Χ	
8	19M7866	SCREW	2		X	M8 X 20, (10.9)
9	RE59438	OIL LINE	1		Х	
10	RE65978	CLAMP	2		X	
11	R104536	HOSE	1		X	ID X LGTH 19 X 2000MM, CUT TO LENGTH,
						COUPER A LONGUEUR, ABLAENGEN, TAGLIARE SU MISURE, CORTAR A LONGITUD, AVSKARE EFTER MATT
12	RE54885	HOSE FITTING	1		X	

TURBOCHARGER

6579

CD41622A -UN-25NOV97

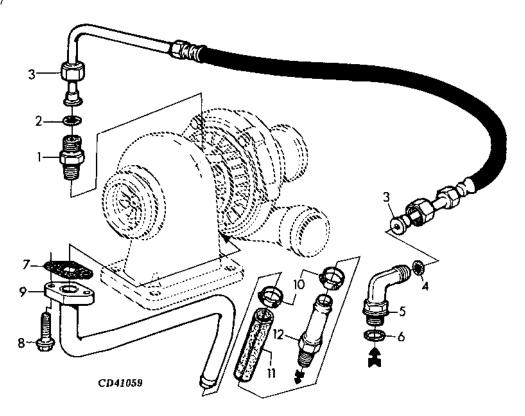


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 8 H	REMARKS	
1	19M8162	CAP SCREW	4		Х	M10 X 40, (10.9)	
2	RE502948	TURBOCHARGER	1		Χ	,	
3	R123572	GASKET	1		Χ		
4	14M7296	FLANGE NUT	4		X	M10	

6579 - CONTINUED 6579 - SUITE 6579 - FORTSETZUNG 6579 - SEGUITO 6579 - CONTINUACION 6579 - FORTS

CD41059

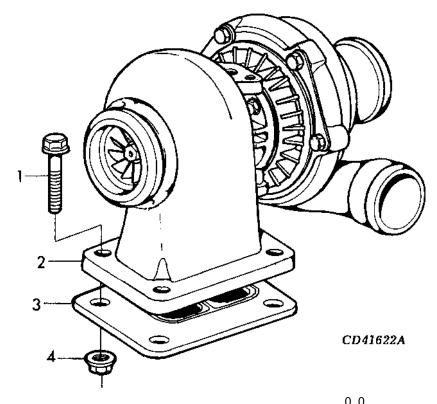
-UN-25NOV97



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 6 8 H	REMARKS
1	M87733	ADAPTER	1		Х	1/4"-18NPT X 11/16"-16UN, (ALSO ORDER
						R63548)
2	R63548	O-RING	1		X	9.246 X 1.778 MM
3	RE59922	HYDRAULIC HOSE	1		X	
4	T77613	O-RING	1		X	9.246 X 1.778 MM
5	38H5154	ELBOW FITTING	1		X	45°, M16 X 1.5 X 11/16"-16UN
6	51M7042	O-RING	1		X	13.300 X 2.200 MM
7	R123570	GASKET	1		X	
8	19M7866	SCREW	2		X	M8 X 20, (10.9)
9	RE59438	OIL LINE	1		X	
10	RE65978	CLAMP	2		X	
11	R104536	HOSE	1		X	ID X LGTH 19 X 2000MM, CUT TO LENGTH,
						COUPER A LONGUEUR, ABLAENGEN, TAGLIARE SU MISURE, CORTAR A LONGITUD, AVSKARE EFTER MATT
12	RF54885	HOSE FITTING	1		X	

TURBOCHARGER

CD41622A -UN-25NOV97

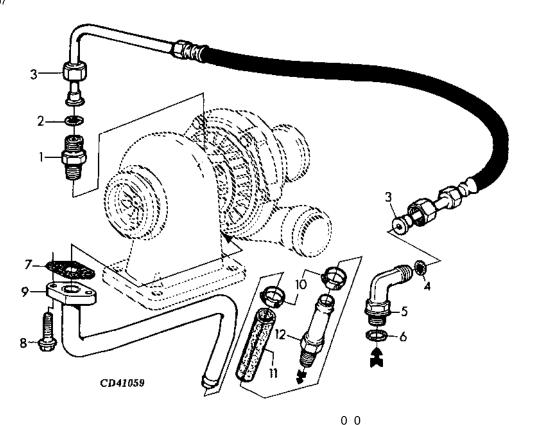


KEY	PART NO.	PART NAME		NGINE 88 RIAL NO. TH	REMARKS	
1	19M8162	CAP SCREW	4	ХХ	M10 X 40, (10.9)	
2	RE505057	TURBOCHARGER	1	ХХ	,	
3	R123572	GASKET	1	ΧX		
4	14M7296	FLANGE NUT	4	XX	M10	

6592 - CONTINUED 6592 - SUITE 6592 - FORTSETZUNG 6592 - SEGUITO 6592 - CONTINUACION 6592 - FORTS

CD41059

-UN-25NOV97



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 8 8 T H	REMARKS
1	M87733	ADAPTER	1		ХХ	1/4"-18NPT X 11/16"-16UN, (ALSO ORDER R63548)
2	R63548	O-RING	1		хх	9.246 X 1.778 MM
3	RE503208	OIL LINE			XX	0.2.10 // 111110 111111
4	T77613	O-RING	1		ХХ	9.246 X 1.778 MM
5	38H5154	ELBOW FITTING	1		ХХ	45°, M16 X 1.5 X 11/16"-16UN
6	51M7042	O-RING	1		ХХ	13.300 X 2.200 MM
7	R123570	GASKET	1		ХХ	
8	19M7866	SCREW	2		ХХ	M8 X 20, (10.9)
9	RE59438	OIL LINE	1		ХХ	
10	RE65978	CLAMP	2		ХХ	
11	R104536	HOSE	1		ХХ	ID X LGTH 19 X 2000MM, CUT TO LENGTH,
						COUPER A LONGUEUR, ABLAENGEN, TAGLIARE SU MISURE, CORTAR A LONGITUD, AVSKARE EFTER MATT
12	RE54885	HOSE FITTING	1		ХХ	

TURBOCHARGER

6608 -

6609 -

6610 -

6612 -6612 -

6613 -

6699 -

3B13

3B14

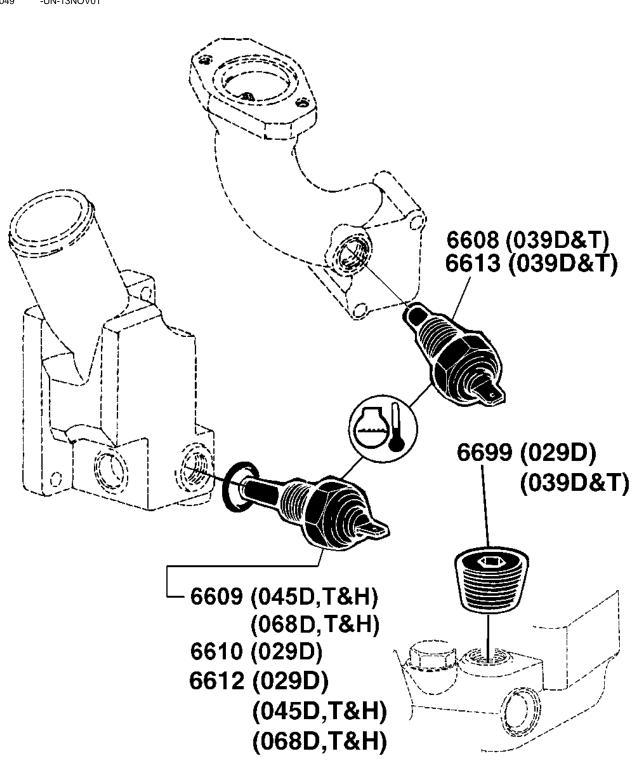
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3B17

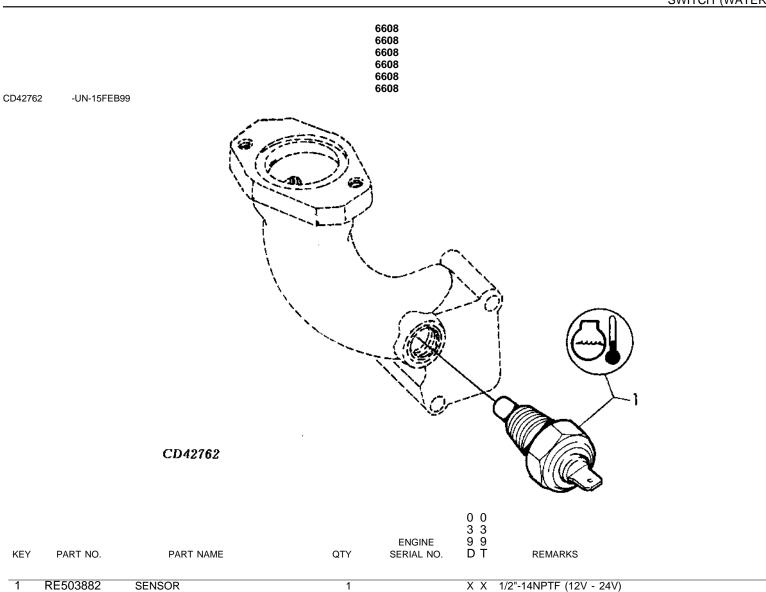
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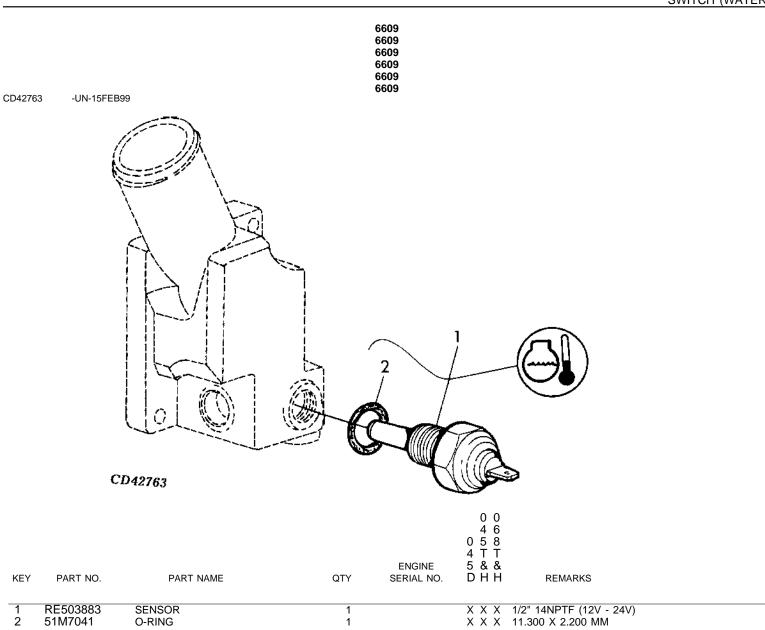
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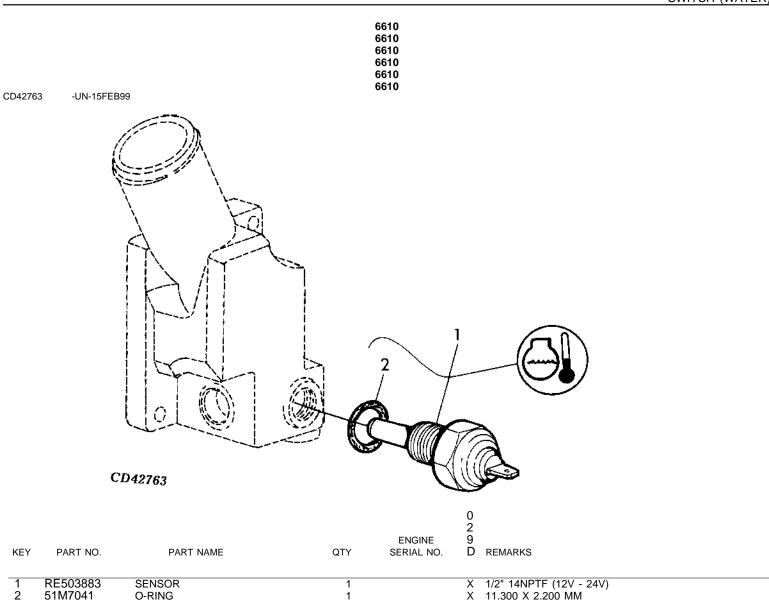
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CDP45049 -UN-13NOV01



CDP45049

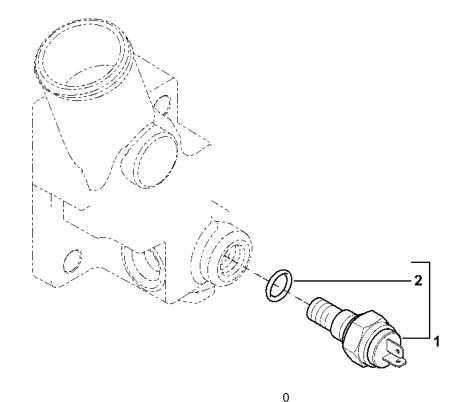






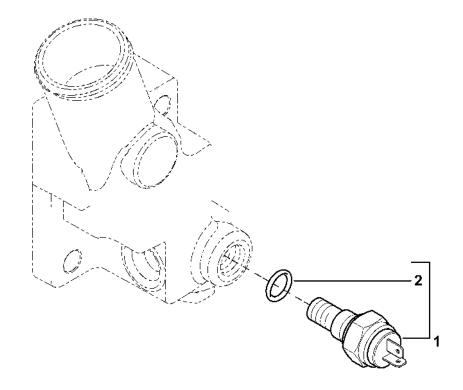
SWITCH (WATER)

CDP45002 -UN-12OCT01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 9 D	REMARKS	
1	RE504208	SENSOR	1		Х	M14 14NPTF (12V - 24V)	
2	51M7041	O-RING	1		Χ	11.300 X 2.200 MM	

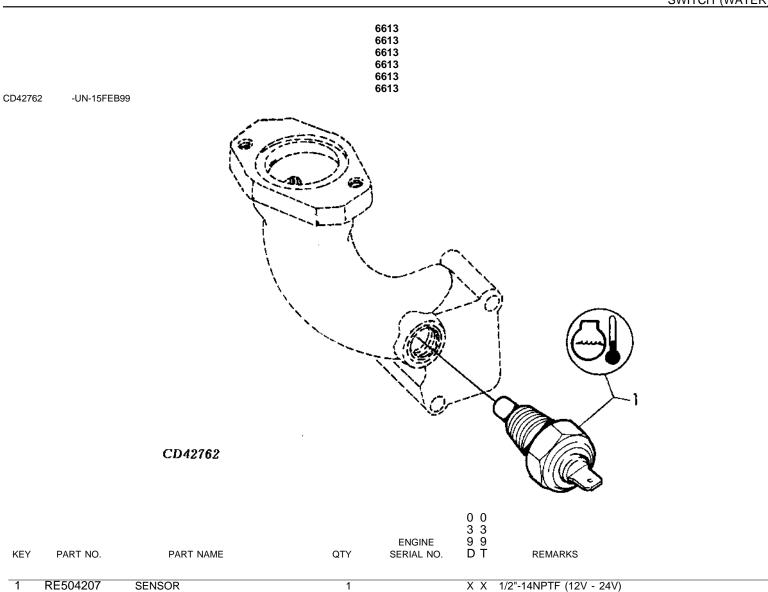
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CDP45002	-UN-12OCT01	



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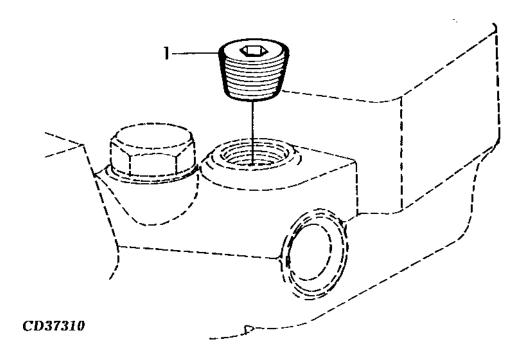
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 6 5 0 8 D 6 T & 8 & T D H	REMARKS	
1	RE504208	SENSOR	1		X X X M	14 14NPTF (12V - 24V)	
2	51M7041	O-RING	1		X X X 11	1.300 X 2.200 MM	

SWITCH (WATER)



SWITCH (WATER)

CD37310 -UN-29SEP94

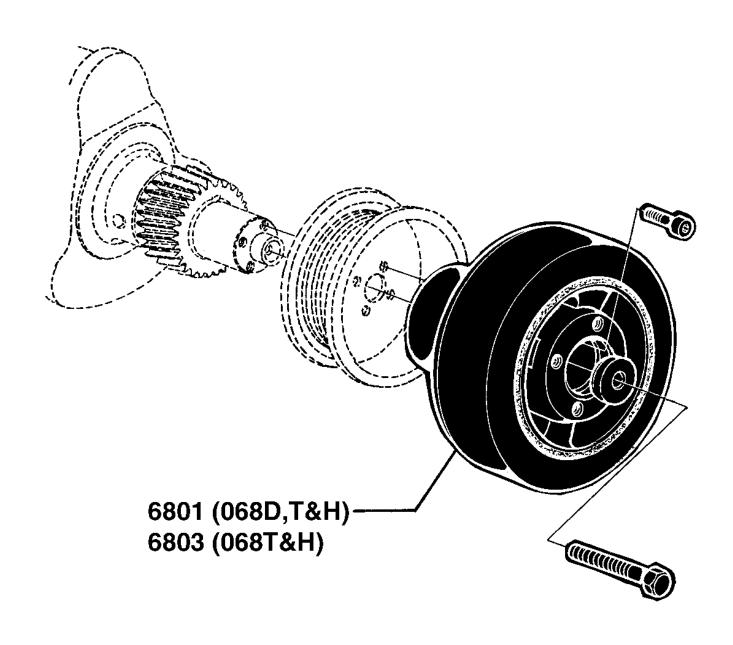


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 2 3 3 9 9 9 D D T	REMARKS	
1	15H584	PIPE PLUG	1		X X X	1/2"-14NPTF	

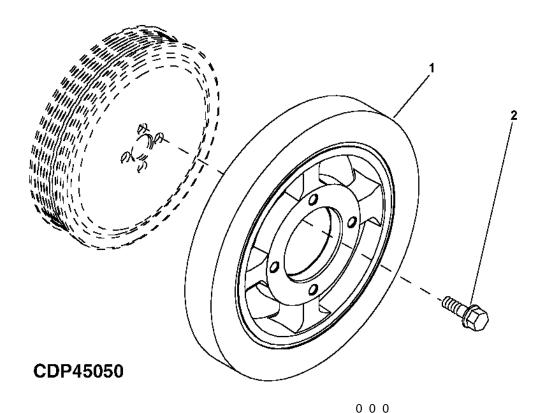
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CDP45051 -UN-13NOV01

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6803 - 3B23



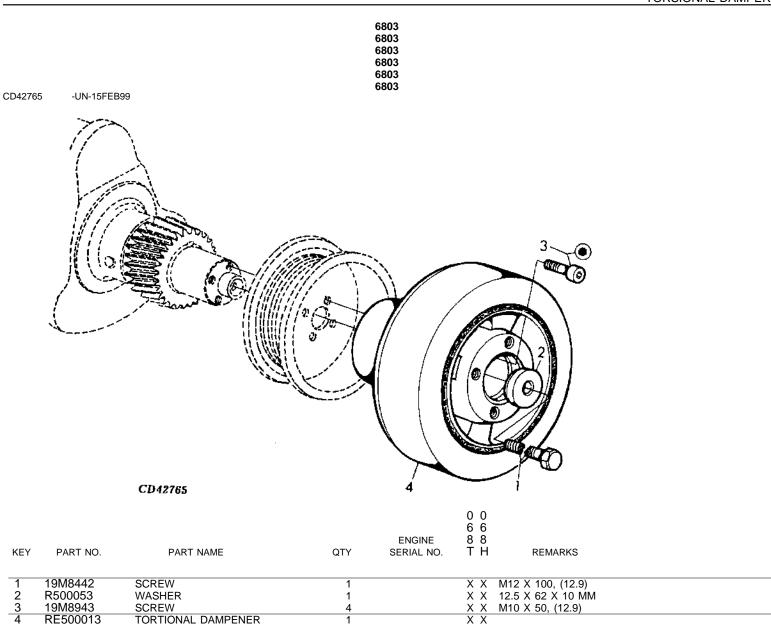
CDP45050 -UN-13NOV01



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS	
1	RE59355	TORTIONAL DAMPENER	1		XXX		
2	R121897	BOLT	4		X X X	M10 X 50, (ALSO ORDER (4) R121897)	

TORSIONAL DAMPER

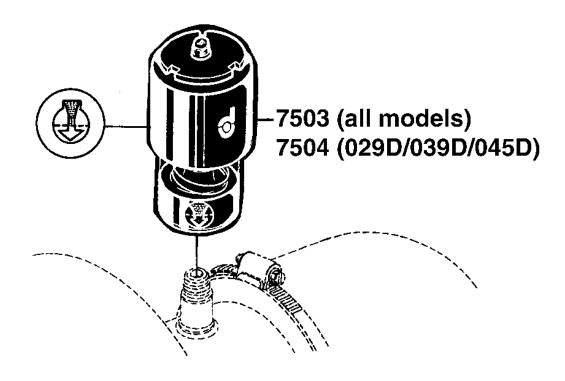
TORSIONAL DAMPER



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CDP45052 -UN-13NOV01

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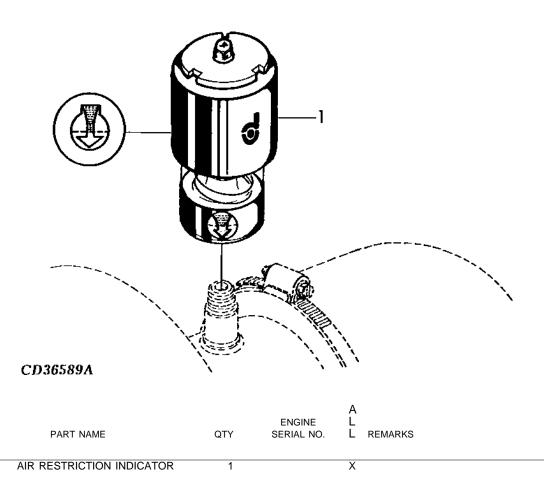
AIR RESTRICTION INDICATOR

CD36589A -UN-20JUL95

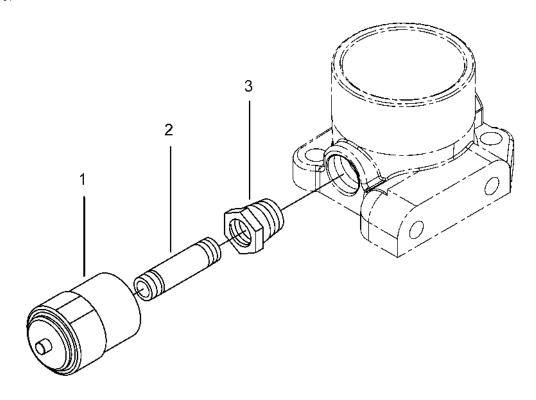
KEY

PART NO.

AT25983



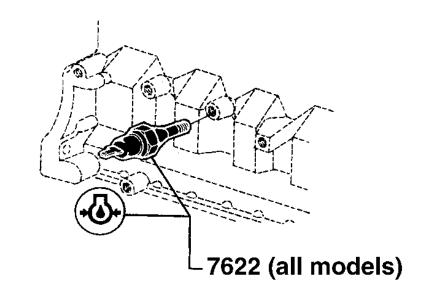
CDP45090 -UN-15NOV01

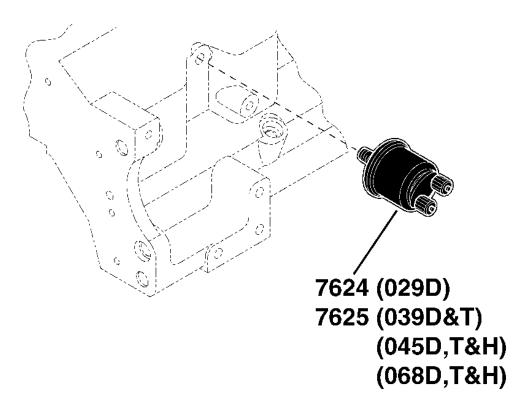


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 2 3 4 9 9 5 D D D	REMARKS
1	AT25983	AIR RESTRICTION INDICATOR	1		XXX	
2	29H13	THREADED NIPPLE	1		X X X 1/8"	
3	15H511	PIPE BUSHING	1		X X X 1/8"	

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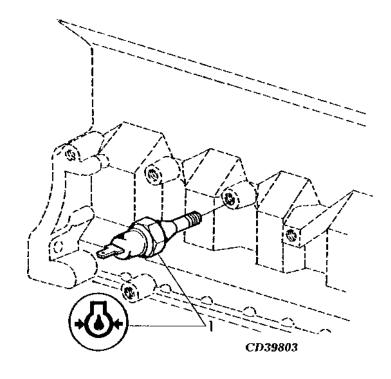
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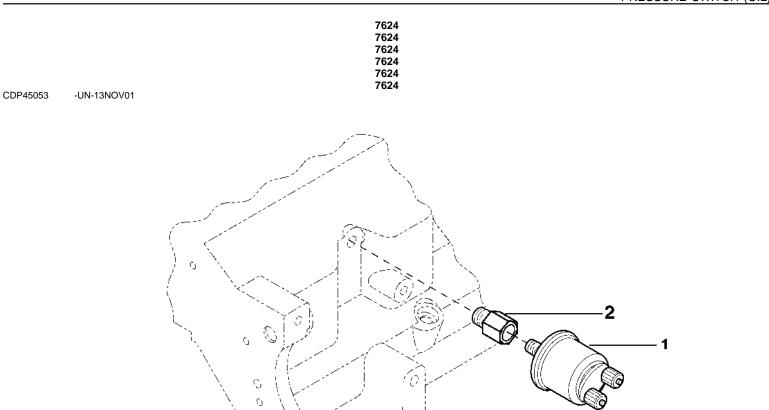
PRESSURE SWITCH (OIL)

CD39803 -UN-01JAN94



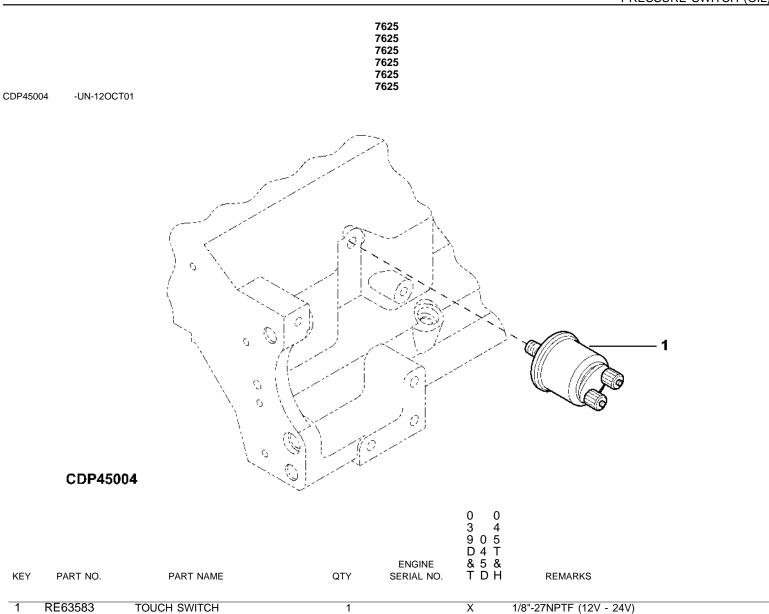
KEY	PART NO.	PART NAME	_	A :NGINE L RIAL NO. L REMARKS
1	RE503867	TOUCH SWITCH	1	X 1/8"-27NPTF (12V - 24V)

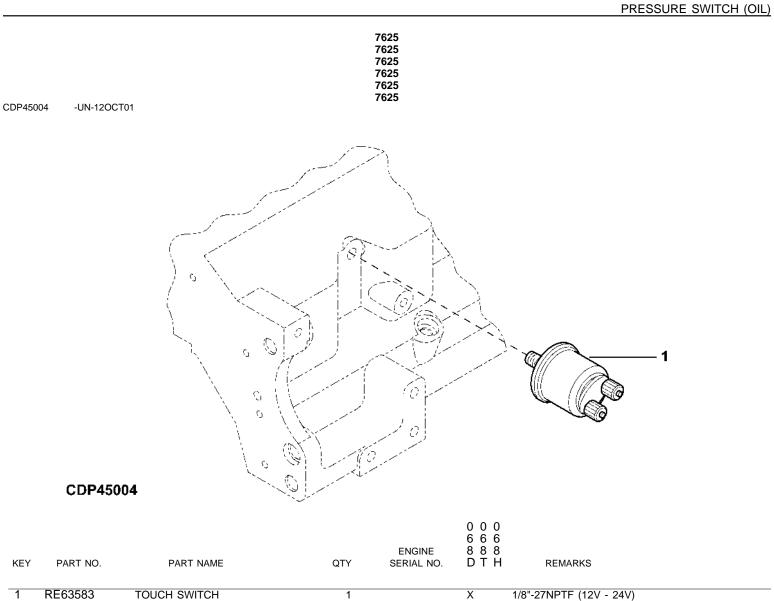
PRESSURE SWITCH (OIL)



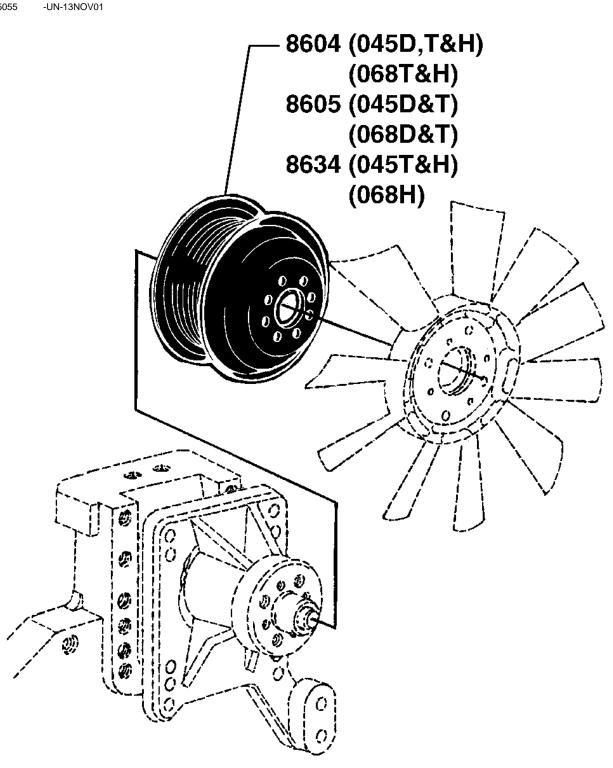
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS	
1	RE63583	TOUCH SWITCH	1		Х	1/8"-27NPTF (12V - 24V)	
2	RE507593	ADAPTER	1		Χ	,	

PRESSURE SWITCH (OIL)

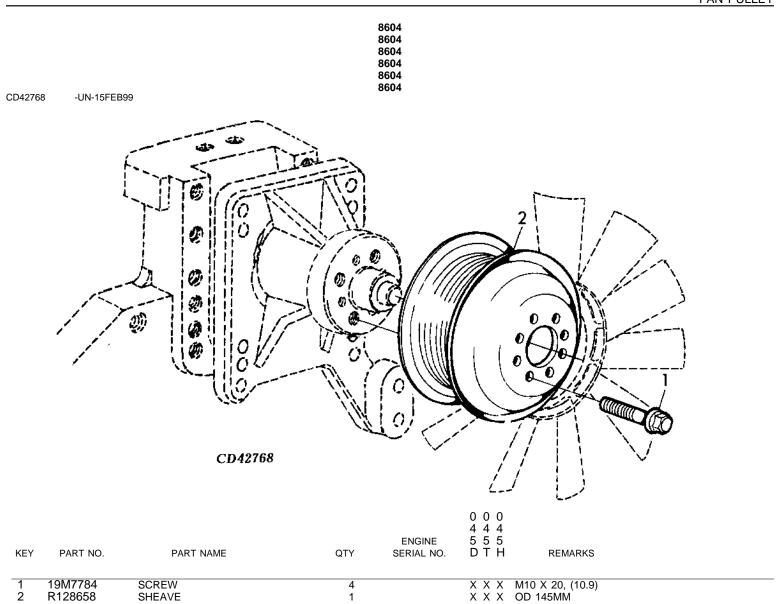


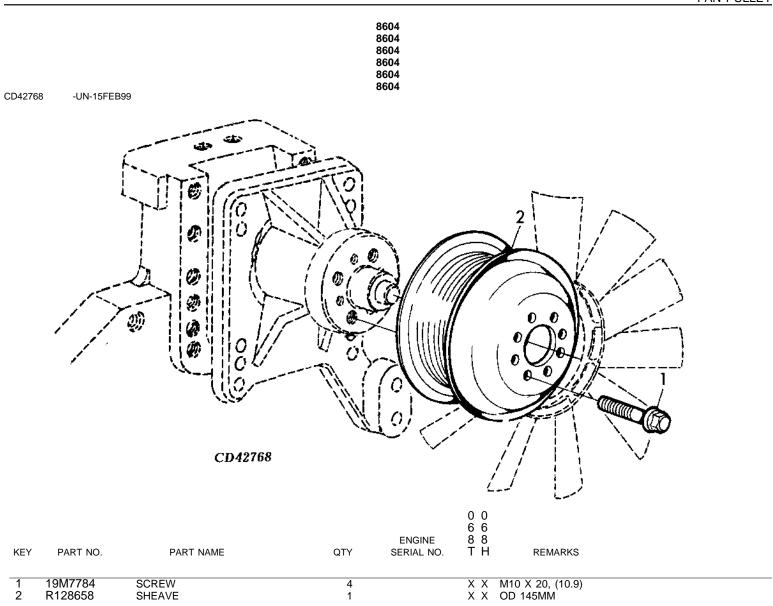


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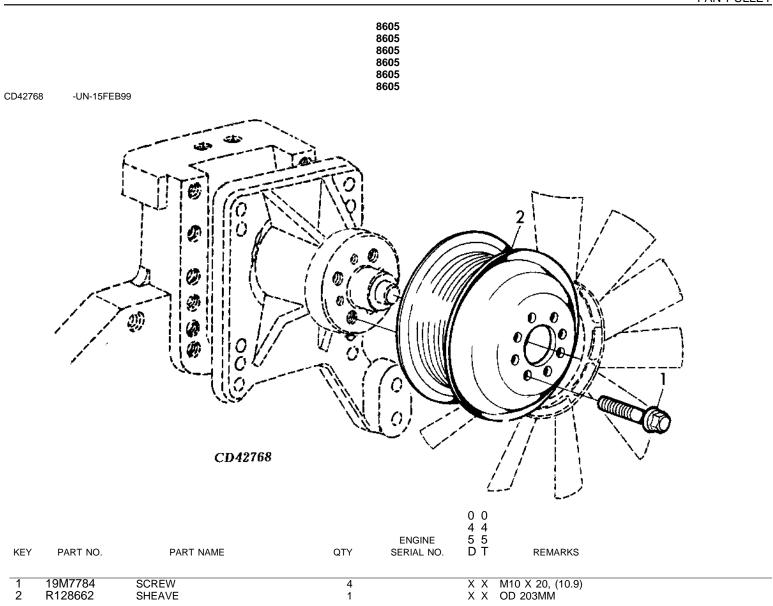


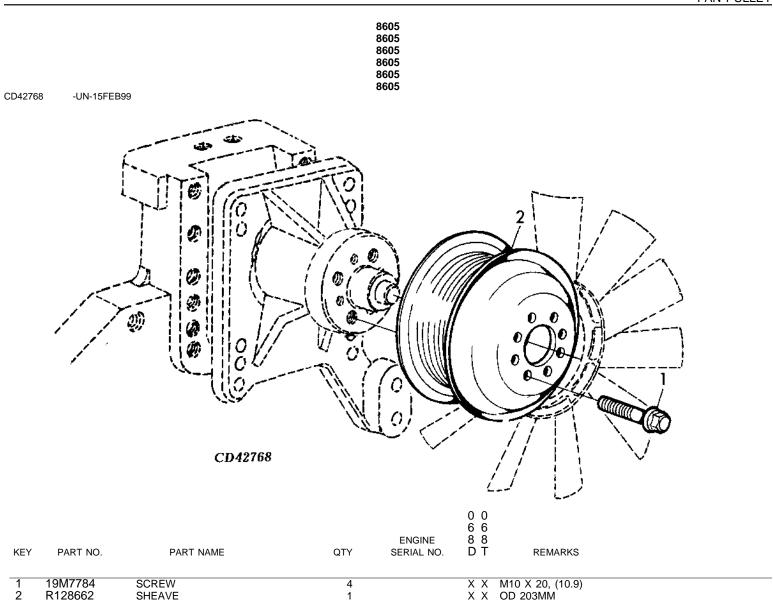
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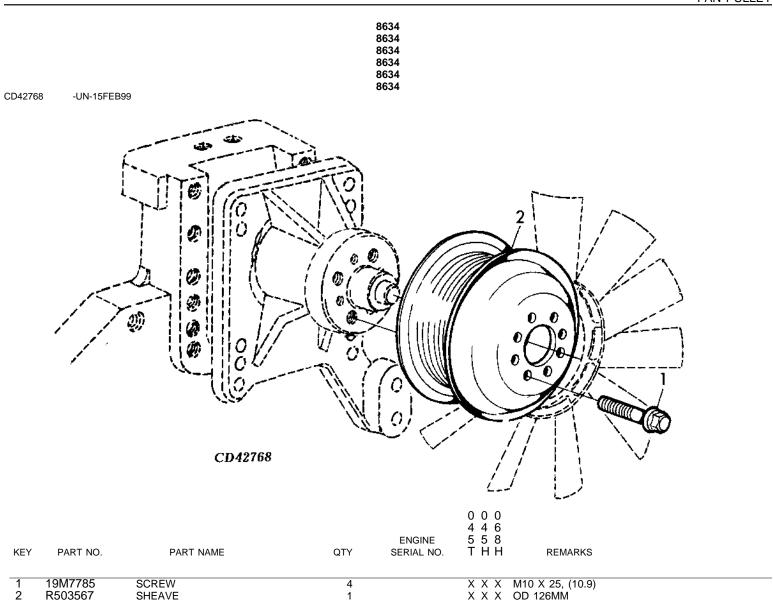


FAN PULLEY



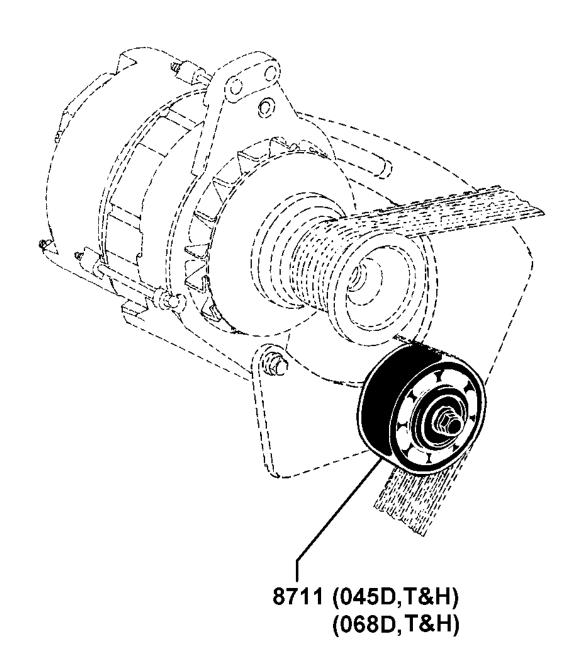


FAN PULLEY



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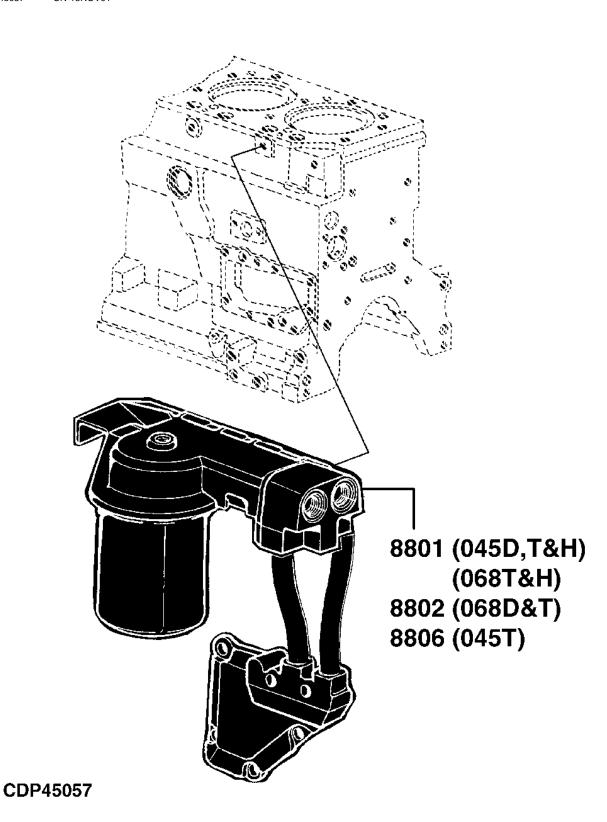


BELT TENSIONER

							DEET TENOIONEN
CD4376	:7 -UN-19FEB	301	8 8 8	3711 3711 3711 3711 3711 3711			
				`) [
					3		
		CD43767	4		Q	2	
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS	
1 2 3 4	19M7807 R502079 RE505264 R500320	SCREW SLEEVE PULLEY SPACER	1 1 1 1		X X X M1 X X X X X X	10 X 60	

							DEET TENOIONER
CD4376	7 -UN-19FEE	301		8711 8711 8711 8711 8711 8711			
		CD43767			3 Q	2	
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS	
1 2 3 4	19M7807 R502079 RE505264 R500320	SCREW SLEEVE PULLEY SPACER	1 1 1 1		X X X M X X X X X X	10 X 60	

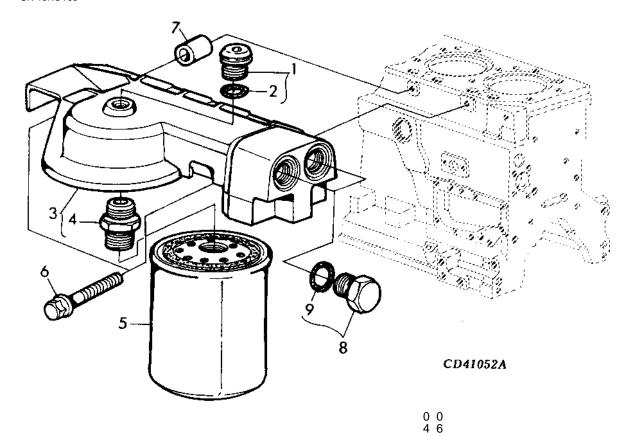
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CDP45057 -UN-13NOV01



Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

OIL FILTER/ADAPTER

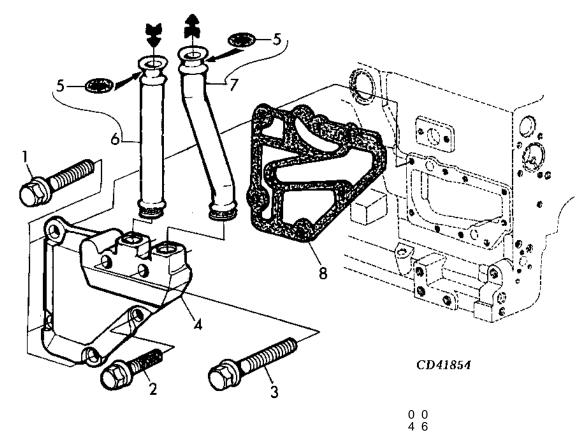
CD41052A -UN-15NOV99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 5 8 4 T T 5 & & D H H	REMARKS
1	RE52242	PLUG	1		XXX	M16 X 1.5, USED WITHOUT TURBOCHARGER
						OIL PRESSURE LINE, (045D)
2	51M7042	O-RING	1		X X X	USED WITHOUT TURBOCHARGER OIL PRESSURE
						LINE, (045D)
3	RE503727	FILTER HEAD	1		X X X	(MARKED R501439)
4	R123591	THREADED NIPPLE	1		X X X	,
5	RE59754	OIL FILTER	1		XXX	
6	19M7784	SCREW	2		X X X	M10 X 20, (10.9)
7	R114358	SPACER	1		X X X	
8	RE46687	FITTING	2		XXX	M22 X 1.5
9	51M7045	O-RING	1		X X X	

8801 - CONTINUED 8801 - SUITE 8801 - FOTRSETZUNG 8801 - SEGUITO 8801 - CONTINUACTION 8801 - FORTS

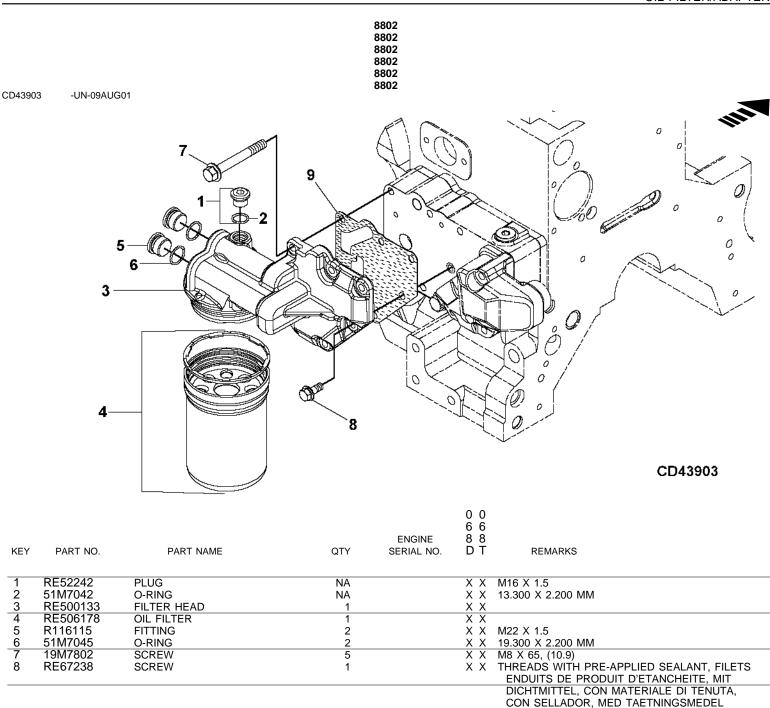
-UN-25FEB00 CD41854



KEY	PART NO.	PART NAME	ENGI QTY SERIAL		REMARKS	
1	19M7802	SCREW	3	XXX	M8 X 65, (10.9)	
2	RE67238	SCREW	1	X X X	WITH SEALANT,	
3	19M7913	SCREW	2	X X X	M8 X 90, (10.9)	
4	R501436	ADAPTER	1	XXX	•	
5	R56462	O-RING	2	X X X		
6	RE506816	TUBE	1	X X X	LGTH 199MM	
7	RE506817	TUBE	1	XXX	LGTH 199MM	
8	R123504	GASKET	1	X X X		

OIL FILTER/ADAPTER

MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA



9

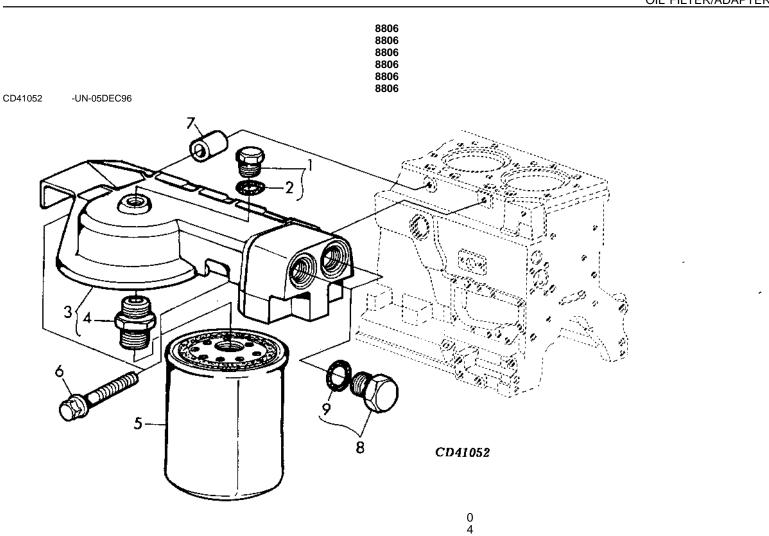
R500374

GASKET

X

OIL FILTER/ADAPTER

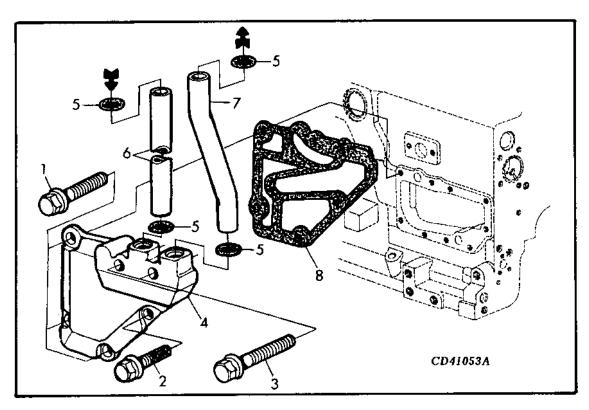
MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA MEMORANDA



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 5 T	REMARKS
1		FITTING	NA		Χ	M16 X 1.5
2		O-RING	NA		Χ	
3	RE503727	FILTER HEAD	1		Χ	(SUB FOR RE59906)
4	R123591	THREADED NIPPLE	1		Χ	·
5	RE59754	OIL FILTER	1		Χ	
6	19M7835	SCREW	2		Χ	M10 X 35, (10.9)
7	R114358	SPACER	1		Χ	12 X 25.400 X 12.700 MM
8	RE46687	FITTING	2		Χ	M22 X 1.5
9	51M7045	O-RING	1		Χ	19.300 X 2.200 MM

8806 - CONTINUED 8806 - SUITE 8806 - FOTRSETZUNG 8801 - SEGUITO 8806 - CONTINUACTION 8806 - FORTS

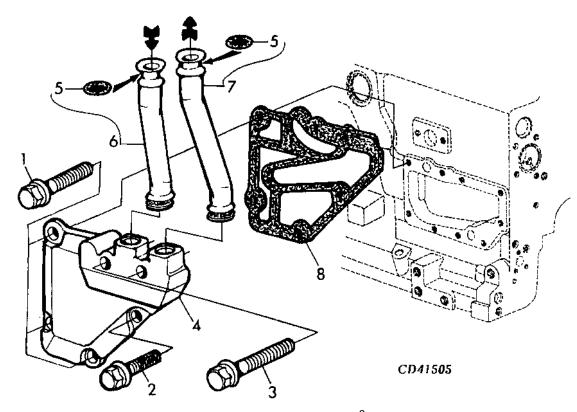
CD41053A -UN-03FEB00



KEY	PART NO.	PART NAME	QTY S	0 4 ENGINE 5 SERIAL NO. T	REMARKS	
1	19M7802	SCREW	3	X	M8 X 65, (10.9)	
2	RE67238	SCREW	1	X	WITH SEALANT,	
3	19M7913	SCREW	2	X	M8 X 90, (10.9)	
4	R135916	ADAPTER	1	X		
5	R72328	O-RING	4	X		
6	R135270	TUBE	1	X		
7	R135271	TUBE	1	X		
8	R123504	GASKET	1	X		

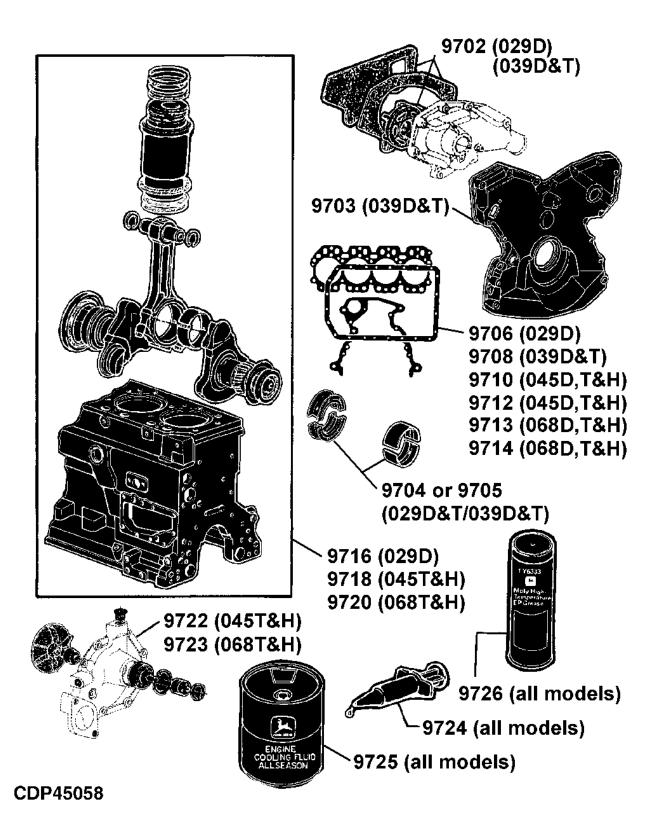
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-UN-03FEB00 CD41505



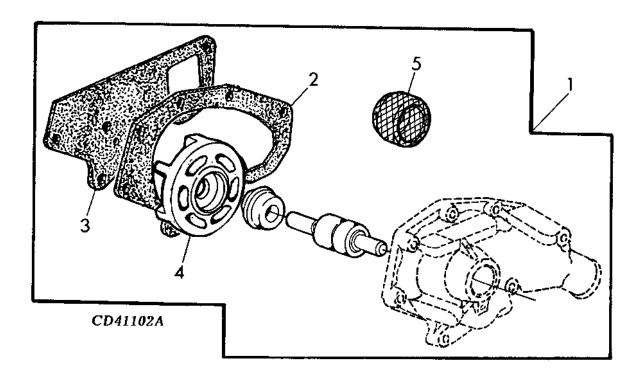
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 4 5 T	REMARKS	
1	19M7802	SCREW	3		Х	M8 X 65, (10.9)	_
2	RE67238	SCREW	1		X	WITH SEALANT,	
3	19M7913	SCREW	2		X	M8 X 90, (10.9)	
4	R135916	ADAPTER	1		Х		
5	R72328	O-RING	4		X		
6	RE502660	TUBE	1	-618894	X	LGTH 195.5MM	
	RE506818	TUBE	1	618895-	Х	LGTH 199.5MM	
7	RE502661	TUBE	1	-618894	X	LGTH 195.5MM	
	RE506819	TUBE	1	618895-	Χ	LGTH 199.5MM	
8	R123504	GASKET	1		Х		

SECTIONAL INDEX
INDEX DE SECTION
GRUPPENINDEX
INDICE DELLA SEZIONE
INDICE DE SECCION
GRUPPSFORTECKNING
CDP45058 -UN-13NOV01



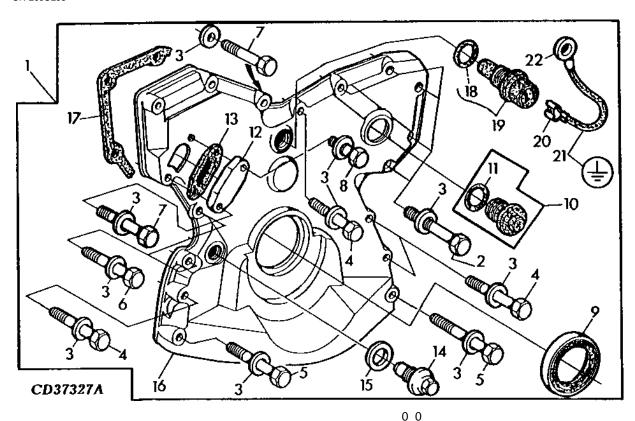
9702 -3D11 9703 -3D12 9704 -3D13 9705 -3D14 9706 -3D15 9712 -3D21 3D23 9716 -3E1 9718 -9720 -3E5 9722 -3E7 9724 -9725 -3E10 9726 -3E11

CD41102A -UN-16SEP98



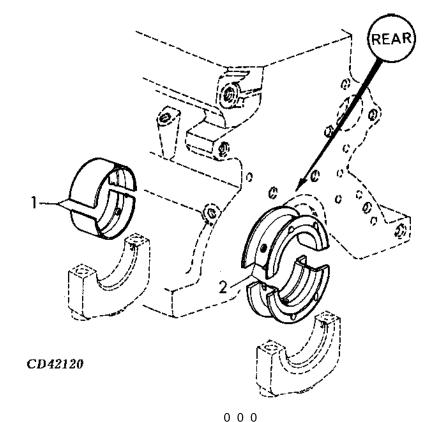
KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 3 3 2 9 9 9 D T	REMARKS
1	RE62658	KIT	AR		XXX	WITH INSTALLATION INSTRUCTIONS
2	R97455	GASKET	1		X X X	
3	T20243	GASKET	1		X X X	
4		IMPELLER	1		XXX	CAST IRON, MARKED T30897, ORD RE62658
5	R134742	TOOL	1		X X X	NI A

CD37327A -UN-20JUL95



				ENGINE	3 3 9 9	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DΤ	REMARKS
1	RE51527	KIT	AR		ХХ	INCL. INSTRUCTIONS, ANLEITUNG, ISTRUZIONI, INSTRUCCIONES, ANVISNINGAR
2	19H3065	CAP SCREW	5		ХХ	3/8" X 2", (SAE 8)
3	24M7106	WASHER	16		XX	10 X 18 X 2.500 MM
4	19H2733	CAP SCREW	4		ХХ	3/8" X 2-3/8", (SAE 8)
5	19H3031	CAP SCREW	2		ХХ	3/8" X 2-1/2", (SAE 8)
6	19H2549	CAP SCREW	2		XX	3/8" X 1-7/8"
7	19H1726	CAP SCREW	2		ХХ	3/8" X 2-1/4"
8	19H2284	CAP SCREW	1		ХХ	3/8" X 7/8"
9	AR67942	SEAL	1		XX	
10	RE52977	DRAIN PLUG	1		ХХ	M42 X 2
11	51M7049	O-RING	1		ХХ	38.600 X 2.900 MM
12	T23260	COVER	1		ХХ	
13	R97352	GASKET	1		ХХ	
14	R91692	PLUG	1		ХХ	
15	A4827R	WASHER	1		XX	
16		COVER	1		ХХ	ALUMINIUM, ALLUMINIO, ALUMINIO, ALUMINIUM, MARKED R114217, ORD RE51527
17	R97454	GASKET	1		XX	
18	51M7044	O-RING	2		ΧХ	17.300 X 2.200 MM
19	RE38028	SENSOR	1		ΧХ	
20	R65607	TERMINAL	1		ХХ	
21		GROUND CABLE	1		ΧХ	LGTH 150MM, MF R77499
22	R77491	TERMINAL	1		ΧХ	·
	R77499	WIRE	AR		ХХ	LGTH 30.5M

CD42120 -UN-30JUL98

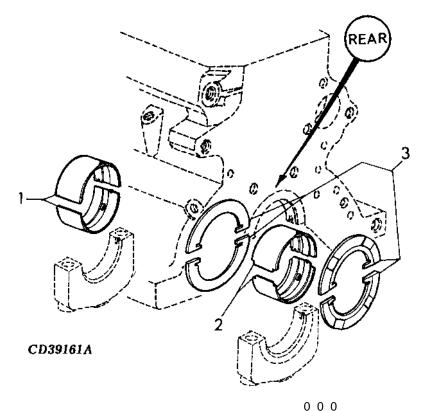


KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 3 3 9 9 9 D D T	REMARKS
1	RE27352	BEARING KIT	3		X X X	(KIT (2) T23314) STD
	RE27353	BEARING KIT	AR		X X X	(A) (KIT (2) R87750) US -0.254MM
2	AT21139	BEARING	1		X X X	(KIT (2) T23215) ID STD, REAR, ORD
						RE60350 AND RE13571
	AT21132	BEARING	AR		XXX	(A) (KIT (2) T23576) US -0.254MM, REAR, ORD RE27351 AND RE13571

- (A) GRINDING GUIDELINES CTM8 OR CTM3274
 (A) DIRECTIVES DE RECTIFICATION : CTM71 OU CTM3275
- (A) HINWEISE ZUM SCHLEIFEN : CTM3273 (A) ISTRUZIONI RIGUARDO RETTIFICA : CTM3277
- (A) INTRUC.REFERER.RECTIF. : CTM70 O CTM3276
- (A) ANVISNINGAR BETRAFF.OMSLIPNING: CTM3279

9705

CD39161A -UN-19MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	2 3 3 9 9 9 D D T	REMARKS	
1	RE27352	BEARING KIT	3		XXX	(KIT (2) T23214) ID STD	
	RE27353	BEARING KIT	AR		X X X	(A) (KIT (2) R87750) US -0.254MM	
2	RE60350	KIT	1		X X X	(KÍT (2) Ř121413) IĎ STD	
	RE27351	KIT	AR		XXX	(A) (KIT (2) R87749) US -0.254MM	
3	RE13571	KIT	1		X X X	(KIT (4) R78598) TK STD	
	AR95932	KIT	AR		X X X	(KIT (3) R64851) OS +0.17MM	

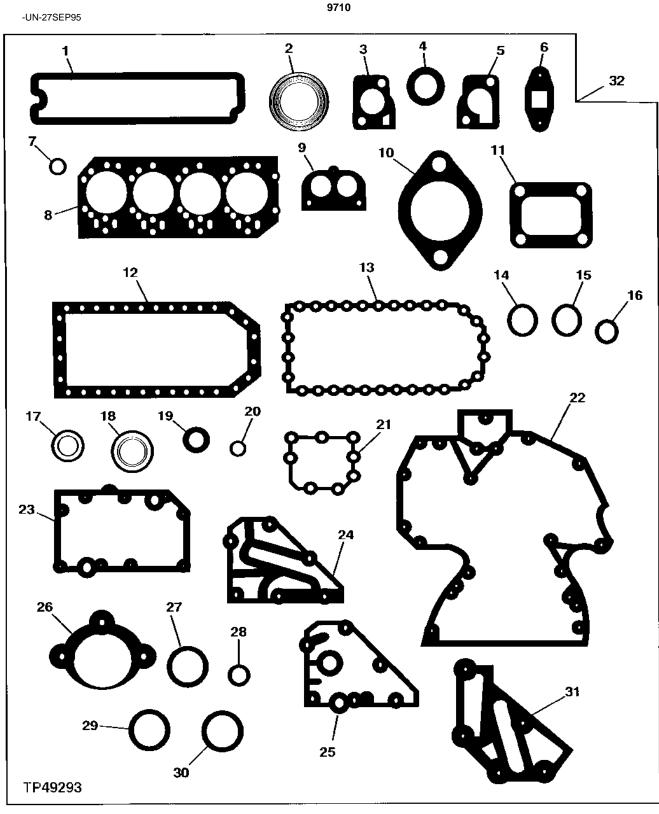
- (A) GRINDING GUIDELINES CTM8 OR CTM3274
 (A) DIRECTIVES DE RECTIFICATION : CTM71 OU CTM3275
- (A) HINWEISE ZUM SCHLEIFEN : CTM3273 (A) ISTRUZIONI RIGUARDO RETTIFICA : CTM3277
- (A) INTRUC.REFERER.RECTIF. : CTM70 O CTM3276
- (A) ANVISNINGAR BETRAFF.OMSLIPNING: CTM3279

KEY	PART NO.	PART NAME		0 2 NGINE 9 RIAL NO. D	REMARKS
1	RE64293	GASKET KIT	1	X	(A)
2	AR65507	O-RING KIT	3	X	PACKG (3)
3	RE64294	GASKET KIT	1	X	(B)
(A) (A) (A) (A) (A) (A) (A) (A)	TUNE-UP RODAGE SOUP/ VENTILEINSCHL RODAGGIO DEL RODAGE DE LA: MOTORTRIMNIN	EIFEN LE VALVOLE S VALVULAS	(B) (B) (B) (B)	MOTORUEBER RIPARAZIONE	MOTORE CION DEL MOTOR

CD 10410

KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 3 3 9 9 D T	REMARKS
1	RE64290	GASKET KIT	1		ХХ	(A)
2	AR65507	O-RING KIT	4		ΧХ	PACKG (3)
3	RE64291	GASKET KIT	1		XX	(B) INCL KEY 2
(A) I (A) I (A) I (A) I	TUNE-UP RODAGE SOUP, VENTILEINSCHL RODAGGIO DEL RODAGE DE LA MOTORTRIMNIN	.EIFEN .LE VALVOLE S VALVULAS		(B) MOTORU (B) RIPARAZ	TION CO JEBERHO JONE MO TRUCCI	OTORE ON DEL MOTOR

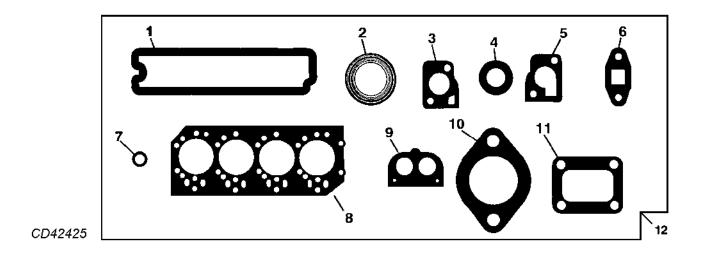
9710 9710 9710 9710 9710 9710 TP49293 -UN-27SEP95



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	R123542	GASKET	1		XXX	
2	R109985	GASKET	4		X X X	
_3	R502814	GASKET	1		XXX	
4	R123226	GASKET	2		XXX	
5	R123345	GASKET	1		X X X	
_6	R123570	GASKET	1		XXX	
7	R123575	GASKET	4		XXX	
8	R116515	GASKET	1		X X X	
_9	R54638	GASKET	1		XXX	
10	R81275	GASKET	1		XXX	
11	R92097	GASKET	1		X X X	
12	R123353	GASKET	1		XXX	
13	R123352	GASKET	1		X X X AF	PPL
14	R75892	O-RING	1		X X X	
15	R97185	O-RING	1		XXX	
16	R61871	O-RING	1		XXX	
17	A4827R	WASHER	1		X X X	
18	RE44574	SEAL	1		XXX	
19	RE59810	SEAL KIT	1		XXX	
20	R123273	O-RING	1		X X X	
21	R123417	GASKET	1		XXX	
22	R136516	GASKET	1		X X X AF	PPL
	R136515	GASKET	1		X X X	
23	R123501	GASKET	1		XXX	
24	R123504	GASKET	1		X X X AF	PL .
0.5	R500374	GASKET	1		XXX	
25	R123525	GASKET	1		XXX	
26	R53108	GASKET	1		XXX	
27	R72328	O-RING	4		XXX	
28	R89944	O-RING	1		XXX	
29	R61105	O-RING	2		XXX	
30	T122075	O-RING	2		X X X	
31	R123502	GASKET	1		XXX	
32	RE501455	GASKET KIT	1			LSO ORDER R133893, R501459, (4) AR65507, R105346, R123583 AND

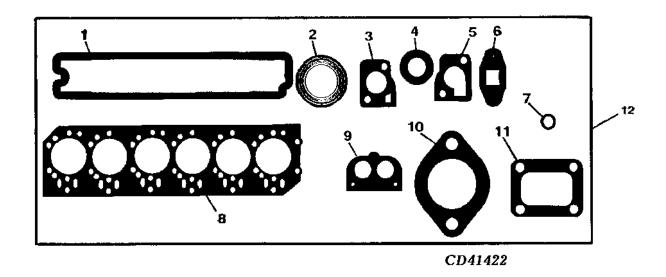
DD15664) APPL

CD42425 -UN-11MAR98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 4 4 4 5 5 5 D T H	REMARKS
1	R123542	GASKET	1		XXX	
2	R109985	GASKET	4		X X X	
3	R135896	GASKET	1		X X X	
4	R123226	GASKET	2		XXX	
5	R123345	GASKET	1		X X X	
6	R123570	GASKET	1		X X X	
7	R123575	O-RING	4		X X X	
8	R116515	ENGINE CYLINDER HEAD GASKET	1		X X X	
9	R54638	GASKET	1		X X X	
10	R81275	GASKET	1		X X X	
11	R92097	GASKET	1		X X X	
12	RE66082	GASKET KIT	1		X X X	(ALSO ORDER R133893, R501459, R105346,
						R123583 AND DD15664) APPL

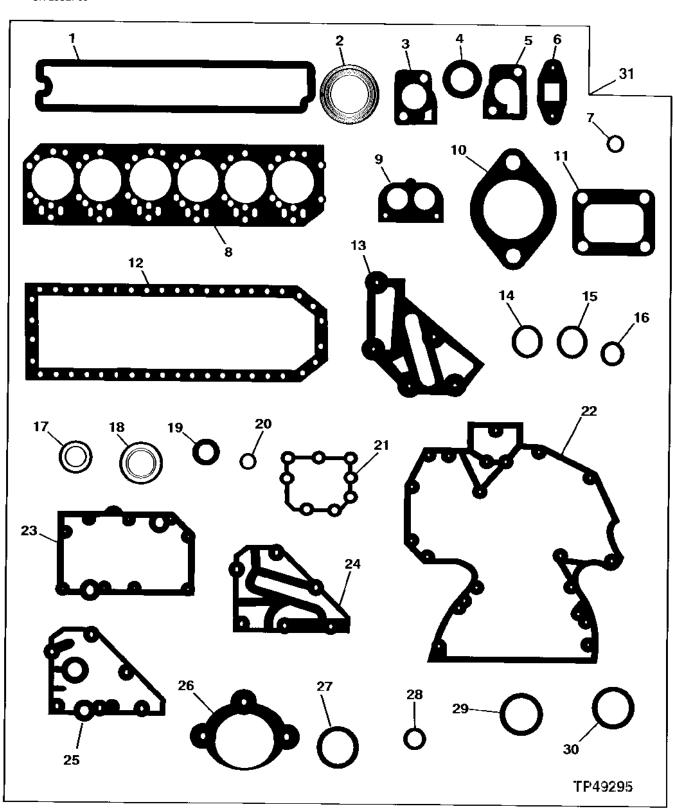
-UN-27JUL98 CD41422



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 0 6 6 6 8 8 8 D T H	REMARKS
1	R123543	GASKET	1		XXX	
2	R109985	GASKET	6		X X X	
3	R135896	GASKET	1		X X X	
4	R123226	GASKET	2		XXX	
5	R123345	GASKET	1		X X X	
6	R105346	GASKET	1		X X X	
7	R123575	O-RING	6		XXX	
8	R116516	ENGINE CYLINDER HEAD GASKET	1		X X X	
9	R54638	GASKET	1		X X X	
10	R81275	GASKET	1		XXX	
11	R123572	GASKET	1		X X X	
12	RE66083	GASKET KIT	1		X X X	(ALSO ORDER DD15664)

TP49295

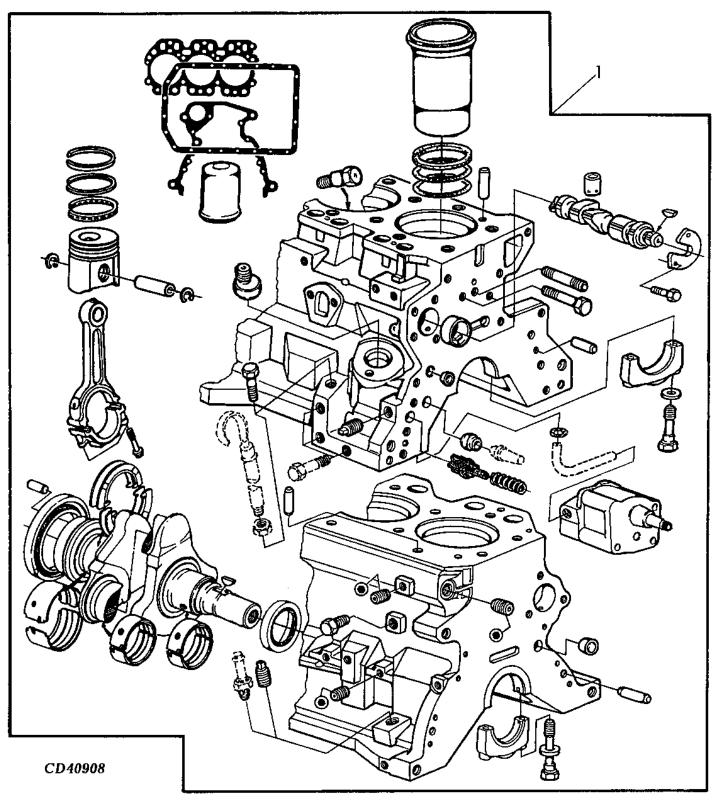
-UN-28SEP95



1/5)/	DADT NO	2.27.111.5	O.T./	ENGINE	0 0 0 6 6 6 8 8 8	
KEY	PART NO.	PART NAME	QTY	SERIAL NO.	DTH	REMARKS
1	R123543	GASKET	1		XXX	
2	R109985	GASKET	6		XXX	
3	R135896	GASKET	1		XXX	
4	R123226	GASKET	2		XXX	
5	R123345	GASKET	1		XXX	
6	R105346	GASKET	1		XXX	
7	R123575	GASKET	6		XXX	
8	R116516	GASKET	1		XXX	
9	R54638	GASKET	i		XXX	
10	R81275	GASKET	<u> </u>		XXX	
11	R123572	GASKET	i		XXX	
12	R97344	GASKET	i		XXX	
13	R123502	GASKET	<u>.</u> 1		XXX	
14	R75892	O-RING	1		XXX	
15	R97185	O-RING	1		XXX	
16	R61871	O-RING	1		XXX	
17	A4827R	WASHER	1		X X X	
18	RE44574	SEAL	1		X X X	
19	RE59810	SEAL KIT	1		XXX	
20	R123273	O-RING	1		X X X	
21	R123417	GASKET	1		X X X	
22	R136515	GASKET	1		XXX	
	R136516	GASKET	1		X X X	
23	R123501	GASKET	1		X X X	
24	R123504	GASKET	1		XXX	
25	R123525	GASKET	1		X X X	
26	R53108	GASKET	1		X X X	
27	R72328	O-RING	4		XXX	
28	R89944	O-RING	1		X X X	
29	R61105	O-RING	2		X X X	
30	T122075	O-RING	2		XXX	
31	RE501456	GASKET KIT	1		X X X	

CD40908

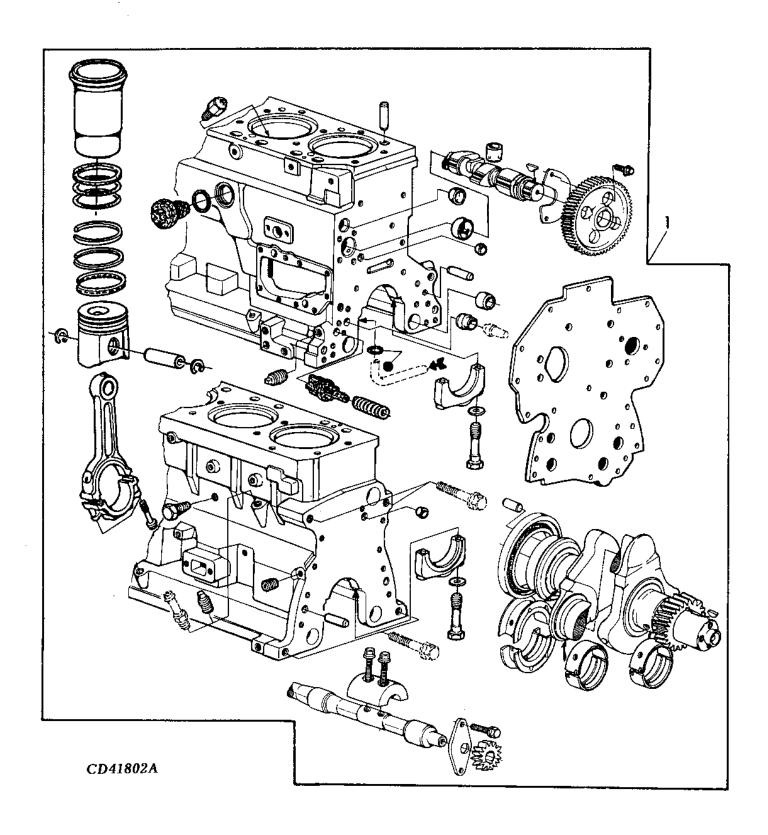
-UN-18NOV96



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 2 9 D	REMARKS	
1	RE70898	SHORT BLOCK ASSEMBLY	1		Х	MARKED R129432	

CD41802A

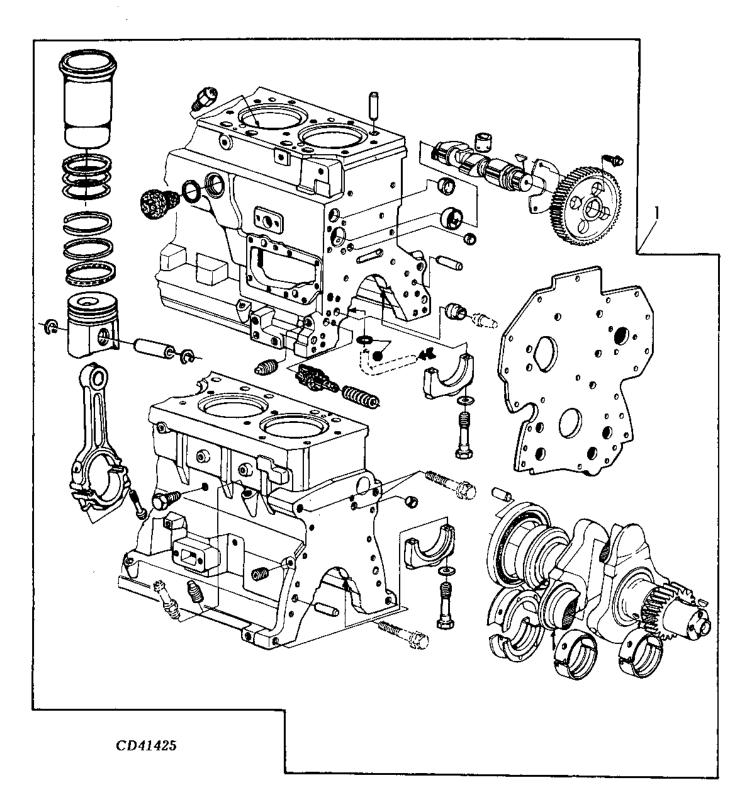
-UN-23FEB99



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	0 0 4 4 5 5 T H	REMARKS	
1	RE65957	SHORT BLOCK ASSEMBLY	1		X X ((ALSO ORDER RE501455, RE504914 AND	

CD41425

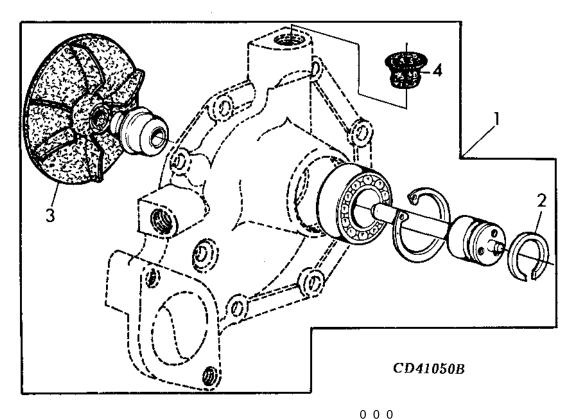
-UN-24FEB99



KEY PART N	O. PART NAME		0 0 6 6 IGINE 8 8 IAL NO. T H	REMARKS	
1	. SHORT BLOCK ASSEMBLY	1	XX	NOT YET AVAILABLE	

9722

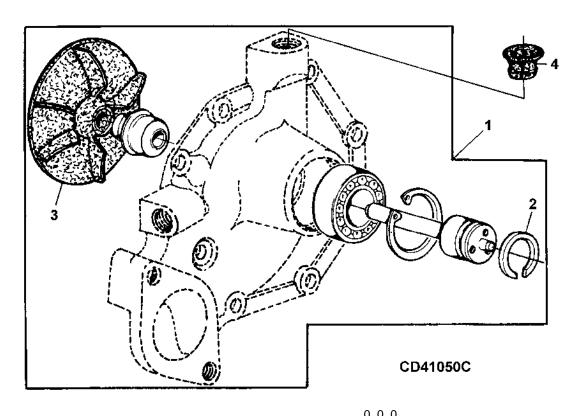
CD41050B -UN-19FEB98



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	4 4 4 5 5 5 D T H	REMARKS	
1	RE71240	KIT	AR		XXXX (A	LSO ORDER R123417 AND R123226)	
2	A364R	SNAP RING	1		X X X	,	
3		IMPELLER	1		XXX M	ARKED R121036, ORD RE71240	
4	R123226	GASKET	1		XXX		

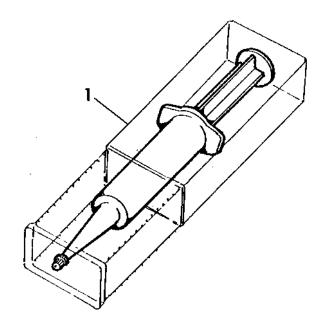
9723

CD41050C -UN-14DEC00



KEY	PART NO.	PART NAME	QTY	ENGINE SERIAL NO.	6 6 6 8 8 8 D T H	REMARKS
1	RE70962	KIT	AR		XXX	(ALSO ORDER R123417 AND (2) R123226)
2	A364R	SNAP RING	1		X X X	
3		IMPELLER	1		X X X I	MARKED R123395 , ORD RE70962
4	R123226	GASKET	AR		XXX	

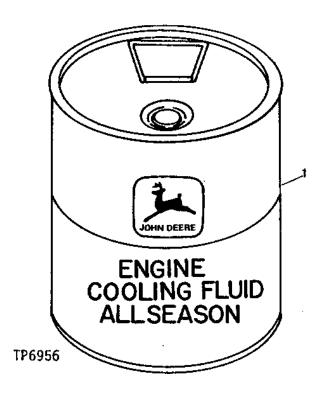
CD35696 -UN-01JAN94



CD35696

KEY	PART NO.	PART NAME		A NGINE L IAL NO. L	- DEMARKO
1	DD15664	LIQUID GASKET	AR	Х	(

TP6956 -UN-01JAN94



KEY	PART NO.	PART NAME	ENGINE QTY SERIAL NO.	A L L	REMARKS	
1	EPH76215-005	COOL-GARD	AR	Х	5L	_
	EPH76215-025	COOL-GARD	AR	Χ	25L	
	EPH76215-050		AR	Χ	50L	
	EPH76215-200	COOL-GARD	AR	Х	200L	

9726 9726 9726 9726 9726 9726 -UN-01JAN94 CD39055 TY6333 Moly High-Temperature EPGrease CD39055 **ENGINE** REMARKS KEY PART NO. PART NAME QTY SERIAL NO.

397 GRS, USE WITH R119874

TY6333

GREASE

POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED

NUMERICAL INDEX

PART NO.	GRID	KEY	PAGE	PART NO.	GRID	KEY	PAGE	PART NO.	GRID	KEY	PAGE
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AR21837	2E9	6	3900 - 3909	AT22919	2D16	4	3600 - 3601	DD15664	1C13	6	1400 - 1433
AR21837	2K2	1	5900 - 5906A	AT22919	2D16	7	3600 - 3601	DD15664	1C14	6	1400 - 1433A
AR21842	1G9	1	1800 - 1805B	AT22919	2D22	4	3600 - 3602	DD15664	2D18	3	3600 - 3601B
AR21842	1G15	1	1800 - 1812A	AT22919	2D22	7	3600 - 3602	DD15664	2D20	3	3600 - 3601D
AR21842	1G17	1	1800 - 1813B	AT24252	2F22	3	4400 - 4499C	DD15664	3D20	32	9700 - 9711
AR21842	1H4	1	1800 - 1832A	AT24834	1J6	2	2500 - 2508	DD15664	3D21	12	9700 - 9712
AR21842	1H6	1	1800 - 1833B	AT24834	1J9	2	2500 - 2531	DD15664	3D22	12	9700 - 9713
AR48871	1J13	2	2500 - 2546	AT25242	1G5	1	1800 - 1802A	DD15664	3E4	1	9700 - 9719
AR50411	1J16	2	2600 - 2601	AT25242	1G7	1	1800 - 1804A	DD15664	3E9	1	9700 - 9724
AR50411	1J17	2	2600 - 2602	AT25242	1G9	5	1800 - 1805B	EPH76215-00	53E10	1	9700 - 9725
AR65294	1F16	7	1700 - 1706	AT25242	1G13	1	1800 - 1811B	EPH76215-02	53E10	1	9700 - 9725
AR65294	1F20	5	1700 - 1735	AT25242	1G15	5	1800 - 1812A	EPH76215-05	03E10	1	9700 - 9725
AR65294	1F21	7	1700 - 1740	AT25242	1G17	5	1800 - 1813B	EPH76215-20	0.3F10	1	9700 - 9725
AR65294	1F22	7	1700 - 1748	AT25242	1G24	1	1800 - 1818A	E1343FN	1117	4	2300 - 2312
AR65294	1J21	28	2700 - 2704A	AT25242	1H2	1	1800 - 1822A	E1343FN	1118	4	2300 - 2312A
AR65294	1J23	21	2700 - 2710A	AT25242	1H4	5	1800 - 1832A	H1058R	2F21	2	4400 - 4499B
AR65294	1J25	17	2700 - 2711B	AT25242	1H6	5	1800 - 1833B	H23125	1B13	1	1100 - 1101
AR65294	1K2	28	2700 - 2712A	AT25983	3C3	1	7500 - 7503	H23125	1B14	1	1100 - 1102
AR65294	1K4	19	2700 - 2713B	AT25983	3C4	1	7500 - 7504	H35244	1C8	5	1300 - 1317
AR65294	1K6	18	2700 - 2714A	AT31819	1J4	4	2500 - 2501	H35244	2G25	15	4700 - 4708
AR65294	1K8	14	2700 - 2715B	AT31819	1J5	2	2500 - 2507	H35244	2H3	15	4700 - 4710
AR65507	2H8	5	4800 - 4801	AT31819	1J10	2	2500 - 2533	L30291	1H24	10	2000 - 2034
AR65507	2H10	5	4800 - 4802	AT31819	1J11	2	2500 - 2534	L39334	2B13	2	3000 - 3008
AR65507	2H12	5	4800 - 4803	AT32333	1E10	7	1600 - 1603	L39334	2B15	3	3000 - 3009
AR65507	2H14	5	4800 - 4805	AT32333	1E14	7	1600 - 1620	L39334	2B17	3	3000 - 3016
AR65507	2H16	5	4800 - 4807	AT32333	1E15	7	1600 - 1635	L39334	2B19	3	3000 - 3025
AR65507	2H18		4800 - 4809	AT32333	1E16	7	1600 - 1641	L39334	2B13	3	3000 - 3026
		5									
AR65507	2H20	5	4800 - 4809B	AT32333	1E16	10	1600 - 1641	M1746T	2F21	1	4400 - 4499B
AR65507	2H22	5	4800 - 4809D	AT32333	1E18	7	1600 - 1645	M41029	2H9	4	4800 - 4801A
AR65507	2H25	5	4800 - 4810A	A120R	2G10	2	4600 - 4601B	M41029	2H11	4	4800 - 4802A
AR65507	3D16	2	9700 - 9707	A120R	2G12	8	4600 - 4603A	M41029	2H13	4	4800 - 4803A
AR65507	3D18	2	9700 - 9709	A120R	2G16	2	4600 - 4603E	M41029	2H15	4	4800 - 4805A
AR65507	3D20	32	9700 - 9711	A120R	2G22	5	4700 - 4701	M41029	2H17	4	4800 - 4807A
AR67942	2F19	16	4400 - 4499	A120R	2G24	5	4700 - 4701	M43551	2L2	5	
											6500 - 6576A
AR67942	2F20	9	4400 - 4499A	A120R	2G25	13	4700 - 4708	M87733	2K22	1	6500 - 6503A
AR67942	2G25	2	4700 - 4708	A22698	2D6	16	3500 - 3567	M87733	2K24	1	6500 - 6522A
AR67942	2H1	2	4700 - 4708A	A22698	2D16	9	3600 - 3601	M87733	2L4	1	6500 - 6577A
AR67942	2H3	2	4700 - 4710	A22698	2D22	9	3600 - 3602	M87733	2L6	1	6500 - 6578A
AR67942	2H4	2	4700 - 4710A	A364R	2F13	2	4400 - 4401B	M87733	2L8	1	6500 - 6579A
AR67942	3D12	9	9700 - 9703	A364R	2F17	2	4400 - 4403B	M87733	2L10	1	6500 - 6592A
AR81788	2H4	9	4700 - 4710A	A364R	3E7	2	9700 - 9722	N10010	1J21	21	2700 - 2704A
AR89839		_	1600 - 1699			2				21	
	1E25	4		A364R	3E8		9700 - 9723	N10010	1K2		2700 - 2712A
AR89852	1F1	5	1600 - 1699A	A3910R	2117	3	5100 - 5101	N10010	1K4	13	2700 - 2713B
AR91660	2D17	3	3600 - 3601A	A4827R	2F11	14	4400 - 4401	N10010	1K6	11	2700 - 2714A
AR91660	2D23	3	3600 - 3602A	A4827R	2F15	14	4400 - 4403	N10215	1K17	4	2800 - 2825
AR95932	2H5	3	4700 - 4710B	A4827R	2F19	12	4400 - 4499	N10215	1K18	4	2800 - 2826
AR95932	3D14	3	9700 - 9705	A4827R	2F20	15	4400 - 4499A	N10215	2D6	5	3500 - 3567
AR98090	1J7	2	2500 - 2510	A4827R	3D12	15	9700 - 9703	N10215	2K8	6	6200 - 6218
AR98090	1J12				3D12	17	9700 - 9711	PE71011292	1G5	7	
		2	2500 - 2545	A4827R							1800 - 1802A
AT13740	2G10	24	4600 - 4601B	A4827R	3D24	17	9700 - 9715	PE71011292	1G7	7	1800 - 1804A
AT13740	2G12	41	4600 - 4603A	B153R	2G10	9	4600 - 4601B	RE13571	2G25	11	4700 - 4708
AT13740	2G16	25	4600 - 4603E	B153R	2G12	9	4600 - 4603A	RE13571	2H1	10	4700 - 4708A
AT13740	2G18	33	4600 - 4607B	B153R	2G16	9	4600 - 4603E	RE13571	2H3	11	4700 - 4710
AT18904	1K21	3	2900 - 2902	CD15466	2H10	6	4800 - 4802	RE13571	2H4	10	4700 - 4710A
AT18904	2L2	15	6500 - 6576A	CD15466	2H18	6	4800 - 4809	RE13571	2H5	3	4700 - 4710B
AT21110	2H4	8	4700 - 4710A	CD15466	2H20	6	4800 - 4809B	RE13571	3D14	3	9700 - 9705
AT21124	2H4	11	4700 - 4710A	CD16284	2 17	3	5100 - 5101	RE19282	2H10	3	4800 - 4802
AT21132	3D13	2	9700 - 9704	CD16284	2119	3	5100 - 5102	RE19797	1E25	6	1600 - 1699
AT21139	2H2	2	4700 - 4708B	CD16284	2 21	3	5100 - 5105	RE19797	1F1	8	1600 - 1699A
AT21139	3D13	2	9700 - 9704	CD16284	2123	3	5100 - 5107	RE19797	1F2	8	1600 - 1699B
AT21140	2H2	1	4700 - 4708B	CD16284	2125	3	5100 - 5108	RE19797	1F3	5	1600 - 1699C
AT21191	2D16	4	3600 - 3601	CD16607	2119	3	5100 - 5102	RE19797	1F4	5	1600 - 1699D
AT21191	2D16	6	3600 - 3601	CD16607	2113	3	5100 - 5102	RE19797	1F5	7	1600 - 1699E
AT21191	2D22	4	3600 - 3602	CD16607	2125	3	5100 - 5108	RE19797	1F6	7	1600 - 1699F
AT21191	2D22	6	3600 - 3602	DD12120	214	2	4900 - 4901	RE19799	1F1	9	1600 - 1699A
AT21535	2E15	2	4000 - 4003	DD15070	2H1	1	4700 - 4708A	RE19799	1F2	7	1600 - 1699B

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POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED

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PAPT NO. GRID PAPT NO. CRID PAPT NO. PAPT												
RE19799 1F4 7 1000-16990 RE30028 2F20 19 4400-4499A RE48786 1F8 1 1600-16991 RE19799 1F6 9 1000-16991 RE40078 2K12 5 6400-6401 RE500002 2H19 1 4800-4801A RE19800 RE19	PART NO.	GRID	KEY	PAGE	PART NO.	GRID	KEY	PAGE	PART NO.	GRID	KEY	PAGE
RE19799 1F5 9 1600-1699E RE39028 3D12 19 9700-9703 RE48786 1F9 1 1600-1699L RE19790 1F6 10 1600-1699E RE40172 1619 5 1600-1619E RE500002 2H13 1 4800-4801A RE19800 1F5 10 1600-1699E RE40172 1619 5 1600-1619E RE500002 2H13 1 4800-4802A RE201808 1E25 1 1600-1699E RE40172 1619 5 1600-1619E RE500002 2H13 1 4800-4802A RE201808 1E25 1 1600-1699E RE40172 1619 5 1600-1619E RE500002 2H13 1 4800-4802A RE201808 1E25 1 1600-1699E RE40172 1619 5 1600-1619E RE500002 2H13 1 4800-4802A RE201808 1E25 1 1600-1699E RE40181 1 1 1 1 1 1 1 1 1	RE19799	1F3	7	1600 - 1699C	RE38009	2E6	1	3700 - 3710	RE48615	2117	2	5100 - 5101
RE19990 166 9 1600 1699F RE40048 2K12 5 6400 64011 RE500002 2H13 1 4800 4801A RE19900 166 10 1600 1699F RE40172 1G22 5 1800 1815B RE500002 2H13 1 4800 4805A RE20898 1625 2 1600 1699F RE40172 1G22 5 1800 1815B RE500002 2H15 1 4800 4805A RE20898 1625 2 1600 1699F RE40173 1H12 9 1900 1810A RE500002 2H15 1 4800 4805A RE20898 1625 2 1600 1699F RE40173 1H12 9 1900 1810A RE500002 2H15 1 4800 4805A RE20898 RE40172 1G22 5 1800 1699F RE40173 1H12 9 1900 1810A RE500002 2H15 1 4800 4805A RE500003 1H13 1H12	RE19799	1F4	7	1600 - 1699D	RE38028	2F20	19	4400 - 4499A	RE48786	1F8	1	1600 - 1699H
RE19800 1F5 10 1600-1699E RE40172 1G19 5 1800-1817B RE500002 2H13 1 4800-4809A RE20898 1E25 1 1600-16998 RE40173 1H12 9 1900-1917B RE500002 2H13 1 4800-4809A RE20898 1E25 1 1600-16998 RE40131 1G3 5 1800-1810A RE500002 2H13 1 4800-4809A RE20899 1E25 3 1600-16998 RE40313 1G3 5 1800-1810A RE500005 1B13 RE500001 1E25 5 1600-1699 RE40313 1G3 5 1800-1810A RE500005 1B13 RE50001 1E25 5 1600-1699 RE41313 1G13 5 1800-1811A RE500013 3B23 4 1800-4802 RE41313 1G13 5 1800-1812A RE500068 2C11 2 3100-3114A RE23318 2L2 6 6500-6576A RE41331 1G13 5 1800-1822A RE500066 2C13 2 3100-3114A RE23383 FIF 5 1800-18289 RE42333 1H2 5 1800-1822A RE500066 2C13 2 3100-3114A RE23383 FIF 5 1800-18284 RE4333 1H2 5 1800-1822A RE500066 2C13 2 3100-3114A RE23383 FIF 5 1800-1822A RE4333 1H2 5 1800-1822A RE500066 2C13 2 3100-3114A RE23383 FIF 5 1800-1822A RE4334 1H1 7 1 1800-1802A RE500066 2C13 2 3100-3114A RE23383 FIF 5 1800-1822A RE500068 2C11 1 3100-3119A RE23348 2C13 3 1800-3180A RE43244 FIF 1 1600-16998 RE500068 2C21 1 3100-3119A RE23348 2C13 3 1800-3180A RE43244 FIF 1 1600-16998 RE500068 2C21 1 3100-3119A RE23348 2C13 3 1800-3180A RE23384 RE50008 2C11 1 3100-3190A RE23348 2C13 3 1800-3180A RE23348 RE23348 RE3348 RE3348 RE3348 RE3348 RE3348	RE19799	1F5	9	1600 - 1699E	RE38028	3D12	19	9700 - 9703	RE48786	1F9	1	1600 - 1699J
RE19800 166 10 1600-1699F RE40172 1G22 5 1800-18178 RE500002 2H15 1 4800-4805A RE20899 1E25 1 1600-1699 RE401931 1G5 5 1800-1800-1800-1800-1800-1800-1800-1800	RE19799	1F6	9	1600 - 1699F	RE40048	2K12	5	6400 - 6401	RE500002	2H9	1	4800 - 4801A
RE19600 166 10 1600-1699F RE40172 1622 5 1600-1690 RE500002 2H15 1 4800-4806A RE20809 1625 2 1600-1699 RE401931 165 5 1800-1802A RE500002 HB13 6 1100-1101 RE208001 1625 3 1800-1699 RE41931 167 5 1800-1802A RE500005 1813 6 1100-1101 RE208001 1625 3 1800-1802A RE500005 1813 6 1100-1101 RE208001 RE20801 RE401931 167 5 1800-1802A RE500005 1813 6 1100-1101 RE208001 RE40193	RE19800	1F5	10	1600 - 1699E	RE40172	1G19	5	1800 - 1815B	RE500002	2H13	1	4800 - 4803A
RE20999 1E25	RE19800	1F6	10	1600 - 1699F	RE40172	1G22		1800 - 1817B	RE500002	2H15	1	4800 - 4805A
RE20999 1E25	RE20898	1E25	1	1600 - 1699	RE40473	1H12	9	1900 - 1910A	RE500002	2H17	1	4800 - 4807A
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	RE36935	1F7	1	1600 - 1699G	RE48154	1E10	1	1600 - 1603	RE502079	2E22	1	4300 - 4303
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POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED

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RE502422	2G12	26	4600 - 4603A	RE503729	1E8	1	1600 - 16RB	RE505112	2H22	1	4800 - 4809D
RE502422	2G16	4	4600 - 4603E	RE503735	1D15	1	1600 - 16LZ	RE505112	2H25	1	4800 - 4810A
RE502446	2G4	1	4500 - 4501A	RE503736	1E2	1	1600 - 16MV	RE505264	3C20	3	8700 - 8711
RE502447	2G4	1	4500 - 4501A	RE503737	1D17	1	1600 - 16MB	RE505264	3C21	3	8700 - 8711A
RE502448	2G5	1	4500 - 4502	RE503740	1E4	1	1600 - 16MX	RE505454	2H19	1	4800 - 4809A
RE502449	2G5	1	4500 - 4502	RE503742	1D19	1	1600 - 16MG	RE505521	1G9	17	1800 - 1805B
RE502513	2E5	3	3700 - 3707	RE503744	1D21	1	1600 - 16MJ	RE505521	1G15	17	1800 - 1812A
RE502657	2F2	1	4300 - 4312	RE503746	1D23	1	1600 - 16ML	RE505521	1G17	17	1800 - 1813B
RE502657	2F3	1	4300 - 4312A	RE503770	1J25	4	2700 - 2711B	RE505521	1H4	17	1800 - 1832A
RE502660	3D8	6	8800 - 8806B	RE503770	1K8	4	2700 - 2715B	RE505521	1H6	17	1800 - 1833B
RE502661	3D8	7	8800 - 8806B	RE503771	1J25	3	2700 - 2711B	RE505615	1K6	3	2700 - 2714A
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RE502711	1D6	1	1600 - 16GB	RE503773	1G25	4	1800 - 1820	RE505618	1K4	4	2700 - 2713B
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RE502861	215	6	4900 - 4901A	RE503834	1D13	1	1600 - 16LX	RE505650	1G3	7	1800 - 1801
RE502874	214	2	4900 - 4901	RE503836	1D14	1	1600 - 16LY	RE505650	1G19	12	1800 - 1815B
RE502874	215	2	4900 - 4901A	RE503852	1G3	2	1800 - 1801	RE505650	1G22	12	1800 - 1817B
RE502874	215	10	4900 - 4901A	RE503867	3C7	1	7600 - 7622	RE505651	1G3	6	1800 - 1801
RE502875	218	10	4900 - 4903	RE503875	1G3	3	1800 - 1801	RE505651	1G10	4	1800 - 1810
RE502903	1F15	6	1700 - 1705	RE503882	3B13	1	6600 - 6608	RE505651	1G11	2	1800 - 1811
RE502903	1F16	6	1700 - 1706	RE503883	3B14	1	6600 - 6609	RE505651	1G19	11	1800 - 1815B
RE502903	1F21	6	1700 - 1740	RE503883	3B15	1	6600 - 6610	RE505651	1G20	1	1800 - 1816
RE502903	1F22	6	1700 1740	RE503927	2K14	2	6400 - 6411	RE505651	1G22	11	1800 - 1817B
RE502903	1F23	6	1700 - 1760	RE503927	2K17	6	6400 - 6417	RE505651	1G25	2	1800 - 1820
RE502903	1F24	6	1700 - 1762	RE504009	2B23	4	3000 - 3052	RE505665	1J21	29	2700 - 2704A
RE502948	2L7	2	6500 - 6579	RE504009	2B25	4	3000 - 3052B	RE505665	1K2	29	2700 - 2712A
RE503049	1D9	1	1600 - 16GS	RE504073	1G20	2	1800 - 1816	RE505666	1J21	30	2700 - 2704A
RE503051	1D10	i	1600 - 16GT	RE504207	3B18	1	6600 - 6613	RE505666	1K2	30	2700 - 2704A
RE503056	2L5	2	6500 - 6578	RE504208	3B16	1	6600 - 6612	RE505798	1G10	2	1800 - 1810
RE503073	2B16	1	3000 - 3009A	RE504208	3B17	1	6600 - 6612A	RE505798	1G10	1	1800 - 1811
RE503073	2B24	1	3000 - 3003A	RE504533	1J21	5	2700 - 2704A	RE505798	1G25	i	1800 - 1811
RE503073	2C1	1	3000 - 3052A 3000 - 3052C	RE504533	1K2	5	2700 - 2704A 2700 - 2712A	RE505799	1G23	1	1800 - 1820
RE503073	2C3	1	3000 - 30520 3000 - 3054A	RE504533	1K4	15	2700 - 2712A 2700 - 2713B	RE505848	1G20	3	1800 - 1816
RE503073	2C5	1	3000 - 3054C	RE504533	1K4	5	2700 - 2713B 2700 - 2714A	RE505926	1620 1E24	1	1600 - 1610
RE503093	2B15	4	3000 - 30040	RE504648	1J21	4	2700 - 2714A 2700 - 2704A	RE505927	1E11	1	1600 - 1606
RE503097	2L3	2	6500 - 6577	RE504648	1K2	4	2700 - 2704A 2700 - 2712A	RE505929	1E12	1	1600 - 1613
RE503101	1H9	9	1900 - 1908	RE504649	1J21	3	2700 - 2712A 2700 - 2704A	RE505960	1E22	i	1600 - 1678
RE503101	1H11	8	1900 - 1900	RE504649	1K2	3	2700 - 2704A 2700 - 2712A	RE506072	1F4	8	1600 - 1678 1600 - 1699D
RE503101	1H13	8	1900 - 1910 1900 - 1949A	RE504693	1E9	1	1600 - 16RC	RE506072	1F6	11	1600 - 1699E
RE503101	1H15	8	1900 - 19 4 9A	RE504849	1G19	3	1800 - 1815B	RE506130	1E20	1	1600 - 1673
RE503101	2B19	4	3000 - 3025	RE504849	1G19	3	1800 - 1813B	RE506131	1E21	1	1600 - 1673
RE503119	2B19	4	3000 - 3025	RE504850	1G22	6	1800 - 1817B	RE506178	3D5	4	8800 - 8802
RE503119	2C2	4	3000 - 3020	RE504850	1G22	6	1800 - 1817B	RE50618	2G22	3	4700 - 4701
RE503119	2C2 2C4	4	3000 - 3054B	RE504882	1J23	15	2700 - 2710A	RE506196	2G22 2C14	1	3100 - 3115
RE503119 RE503208	2L6	3	6500 - 6578A	RE504883	1J25	11	2700 - 2710A 2700 - 2711B	RE506196	2C14	7	3100 - 3115
RE503208	2L10	3	6500 - 6592A	RE504914	2112	2	5000 - 5001A	RE506196	2C14	1	3100 - 3115B
RE503224	1H17	1	1900 - 1950C	RE504914	2112	2	5000 - 5001	RE506196	2C16	7	3100 - 3115B
RE503243	1F11	2	1600 - 1699L	RE504914	3E4	1	9700 - 9719	RE506197	2C10	6	3100 - 3113B
RE503264	1H22	1	2000 - 2026	RE504931	1D16	1	1600 - 16MA	RE506197	2C8	8	3100 - 3106
RE503204 RE503272	1H23	1	2000 - 2020	RE504932	1D18	1	1600 - 16MC	RE506197	2C22	8	3100 - 3100
RE503300	2K13	3	6400 - 6410	RE504967	1D10 1D20	1	1600 - 16MH	RE506257	1K4	5	2700 - 2713B
RE503543	2C10	1	3100 - 3114	RE504968	1D20 1D22	1	1600 - 16MK	RE506300	1110	1	2200 - 2201
RE503543	2C10	1	3100 - 3114B	RE505049	1D22 1D24	1	1600 - 16MM	RE506300	1111	1	2200 - 2201A
RE503664	1117	2	2300 - 2312	RE505051	1E3	1	1600 - 16MW	RE506322	2C8	6	3100 - 3106
RE503664	1117	2	2300 - 2312A	RE505051	1E5	1	1600 - 16MY	RE506322	2C8	8	3100 - 3106
RE503694	1G10	1	1800 - 1810	RE505057	2L9	2	6500 - 6592	RE506322	2C14	1	3100 - 3100
RE503694	1G10	3	1800 - 1811	RE505100	2H12	3	4800 - 4803	RE506322	2C14	7	3100 - 3115
RE503694	1G11	3	1800 - 1811	RE505100	2H16	3	4800 - 4803 4800 - 4807	RE506322	2C14	1	3100 - 3115 3100 - 3115B
RE503699	1J23	13	2700 - 2710A	RE505100	2H8		4800 - 4801	RE506322	2C16	7	3100 - 3115B
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RE503099 RE503700	1J23	4	2700 - 2713B 2700 - 2710A	RE505102	2H25	3	4800 - 4810A	RE506545	1D7 1D11	1	1600 - 16GQ 1600 - 16LV
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RE503727	3D3	3	8800 - 8801	RE505110	2H12	1	4800 - 4803 4800 - 4803	RE506656	1H16	9	1900 - 1950B 1900 - 1908
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POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED PC2451 (19-NOV-01)

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RE60043	1F4	2	1600 - 1699D	RE62670	2B16	3	3000 - 3009A	RE65908	211	6	4800 - 4810B
RE60044	1F4	3	1600 - 1699D	RE62670	2B18	3	3000 - 3016A	RE65909	2H9	6	4800 - 4801A
RE60045	1F4	4	1600 - 1699D	RE62670	2B24	3	3000 - 3052A	RE65909	2H13	6	4800 - 4803A
RE60046	2K21	2	6500 - 6503	RE62670	2C1	3	3000 - 3052C	RE65909	2H15	6	4800 - 4805A
RE60049	1F6	1	1600 - 1699F	RE62670	2C3	3	3000 - 3054A	RE65909	2H17	6	4800 - 4807A
RE60050	1F6	2	1600 - 1699F	RE62670	2C5	3	3000 - 3054C	RE65909	2H23	6	4800 - 4809E
RE60051	1F6	3	1600 - 1699F	RE62672	2B16	4	3000 - 3009A	RE65909	2H24	6	4800 - 4809F
RE60052	1F6	4	1600 - 1699F	RE62672	2B18	4	3000 - 3016A	RE65909	2112-	6	4800 - 4810B
RE60053	1F6	5	1600 - 1699F	RE62672	2B22	4	3000 - 3016A	RE65911	2G22	6	4700 - 4701
RE60054	1F6	6	1600 - 1699F	RE62672	2B24	4	3000 - 3020A	RE65911	2G22 2G23	7	4700 - 4701
RE60055	1F5	1	1600 - 1699E	RE62672	2C1	4	3000 - 3052C	RE65911	2G24	6	4700 - 4703
RE60056	1F5	2	1600 - 1699E	RE62672	2C3	4	3000 - 3054A	RE65912	2G22	7	4700 - 4701
RE60057	1F5	3	1600 - 1699E	RE62672	2C5	4	3000 - 3054C	RE65912	2G23	8	4700 - 4702
RE60058	1F5	4	1600 - 1699E	RE62673	2B16	5	3000 - 3009A	RE65912	2G24	7	4700 - 4703
RE60059	1F5	5	1600 - 1699E	RE62673	2B18	5	3000 - 3016A	RE65957	3E4	1	9700 - 9719
RE60060	1F5	6	1600 - 1699E	RE62673	2B20	5	3000 - 3025A	RE65969	2H22	1	4800 - 4809D
RE60062	1F8	1	1600 - 1699H	RE62673	2B22	5	3000 - 3026A	RE65969	2H25	1	4800 - 4810A
RE60062	1F9	1	1600 - 1699J	RE62673	2B24	5	3000 - 3052A	RE65978	2K22	10	6500 - 6503A
RE60074	2K23	2	6500 - 6522	RE62673	2C1	5	3000 - 3052C	RE65978	2K24	10	6500 - 6522A
RE60350	2G25	10	4700 - 4708	RE62673	2C3	5	3000 - 3054A	RE65978	2L4	10	6500 - 6577A
RE60350	2H3	10	4700 - 4710	RE62673	2C5	5	3000 - 3054C	RE65978	2L6	10	6500 - 6578A
RE60350	2H5	2	4700 - 4710B	RE63497	2C9	1	3100 - 3106A	RE65978	2L8	10	6500 - 6579A
RE60350	3D14	2	9700 - 9705	RE63497	2C15	1	3100 - 3115A	RE65978	2L10	10	6500 - 6592A
RE60854	2D11	3	3500 - 3597	RE63497	2C17	1	3100 - 3115C	RE66082	3D21	12	9700 - 9712
RE61094	1G9	3	1800 - 1805B	RE63497	2C23	1	3100 - 3123A	RE66083	3D22	12	9700 - 9713
RE61094	1G15	3	1800 - 1812A	RE63583	3C8	1	7600 - 7624	RE66271	2H8	2	4800 - 4801
RE61094	1G13	3	1800 - 1812A	RE63583	3C9	1	7600 - 7625	RE66271	2H12	2	4800 - 4803
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RE61094	1H6	3	1800 - 1833B	RE63674	2G10	15	4600 - 4601B	RE66271	2H16	2	4800 - 4807
RE61467	2H18	3	4800 - 4809	RE63674	2G12	40	4600 - 4603A	RE66271	2H18	2	4800 - 4809
RE61767	2K2	7	5900 - 5906A	RE63674	2G16	14	4600 - 4603E	RE66271	2H20	2	4800 - 4809B
RE62158	2D6	10	3500 - 3567	RE63674	2G18	32	4600 - 4607B	RE66298	2E3	1	3700 - 3702
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RE62220	1 G 9	7	1800 - 1805B	RE63914	2H11	3	4800 - 4802A	RE66559	1F11	4	1600 - 1699L
RE62220	1G15	7	1800 - 1812A	RE64211	1H9	12	1900 - 1908	RE66820	2H10	2	4800 - 4802
RE62220	1G17	7	1800 - 1813B	RE64211	1H10	9	1900 - 1908A	RE66820	2H22	2	4800 - 4809D
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RE62221	1J25	2	2700 - 2711B	RE64290	3D18	1	9700 - 9709	RE67231	2J18	1	5900 - 5901B
RE62221	1K2	2	2700 - 2712A	RE64291	3D18	3	9700 - 9709	RE67231	2J20	1	5900 - 5902
RE62221	1K4	2	2700 - 2713B	RE64292	1F7	14	1600 - 1699G	RE67231	2J22	1	5900 - 5902B
RE62221	1K6	2	2700 - 2714A	RE64292	1F8	14	1600 - 1699H	RE67231	2J24	1	5900 - 5904
RE62221	1K8	2	2700 - 2715B	RE64292	1F9	14	1600 - 1699J	RE67238	1B20	1	1200 - 1299A
RE62310	2K15	2	6400 - 6412	RE64293	3D16	1	9700 - 9707	RE67238	1B21	1	1200 - 1299B
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RE62418	2D11	1	3500 - 3597	RE64354	1112	1	2200 - 2204	RE67238	1B23	1	1200 - 1299D
RE62419	2D11	1	3500 - 3597	RE64354	1113	1	2200 - 2204A	RE67238	2J17	3	5900 - 5901A
RE62627	2C8	6	3100 - 3106	RE65165	2G22	6	4700 - 4701	RE67238	2J19	3	5900 - 5901C
RE62627	2C14	7	3100 - 3115	RE65165	2G23	7	4700 - 4702	RE67238	2J21	3	5900 - 59016 5900 - 5902A
RE62627	2C16	7	3100 - 3115B	RE65165	2G24	6	4700 - 4702	RE67238	2J23	3	5900 - 5902A
RE62658	3D11		9700 - 9702	RE65168	2G24 2G22		4700 - 4703 4700 - 4701				
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RE62665	2B18	1	3000 - 3016A	RE65168	2G23	8	4700 - 4702	RE67238	3D4	2	8800 - 8801A
RE62666	2B14	2	3000 - 3008A	RE65168	2G24	7	4700 - 4703	RE67238	3D5	8	8800 - 8802
RE62666	2B16	2	3000 - 3009A	RE65201	1F7	14	1600 - 1699G	RE67238	3D7	2	8800 - 8806A
RE62666	2B18	2	3000 - 3016A	RE65201	1F8	14	1600 - 1699H	RE67238	3D8	2	8800 - 8806B
RE62666	2B20	2	3000 - 3025A	RE65201	1F9	14	1600 - 1699J	RE67239	2F11	3	4400 - 4401
RE62666	2B22	2	3000 - 3026A	RE65214	2 21	2	5100 - 5105	RE67239	2F15	3	4400 - 4403
RE62666	2B24	2	3000 - 3052A	RE65224	2G25	1	4700 - 4708	RE68345	2E3	3	3700 - 3702
RE62666	2C1	2	3000 - 3052C	RE65358	2G18	1	4600 - 4607B	RE68464	1C17	2	1500 - 1501
RE62666	2C3	2	3000 - 3054A	RE65908	2H9	6	4800 - 4801A	RE68695	216	9	4900 - 4901B
RE62666	2C5	2	3000 - 3054C	RE65908	2H13	6	4800 - 4803A	RE68695	217	9	4900 - 4902
RE62667	2B14	3	3000 - 3008A	RE65908	2H15	6	4800 - 4805A	RE68722	1125	4	2400 - 2408A
RE62668	2B14	4	3000 - 3008A	RE65908	2H17	6	4800 - 4807A	RE68856	2E23	1	4300 - 4305
RE62668	2B20	4	3000 - 3025A	RE65908	2H23	6	4800 - 4809E	RE68856	2E24	1	4300 - 4306
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RE69243	2E13	1	4000 - 4002	R104592	1C11	2	1400 - 1418	R113742	2D9	3	3500 - 3595
RE69789	1E13	1	1600 - 1614	R104592	1C12	2	1400 - 1421	R113742	2D10	6	3500 - 3596
RE69790	1E23	1	1600 - 1680	R104592	2G10	22	4600 - 4601B	R113752	2 11	6	5000 - 5001
RE70177	1117	2	2300 - 2312	R104592	2G12	25	4600 - 4603A	R114081	2H23	1	4800 - 4809E
RE70177	1117	3	2300 - 2312	R104592	2G16	22	4600 - 4603E	R114082	2H23	3	4800 - 4809E
RE70177	1117	5	2300 - 2312	R104592	2G18	25	4600 - 4607B	R114082	2H24	3	4800 - 4809F
RE70177	1118	2	2300 - 2312A	R104592	2117	-6	5100 - 5101	R114082	211	3	4800 - 4810B
RE70177	1118	3	2300 - 2312A	R104592	2119	4	5100 - 5102	R114083	2H23	2	4800 - 4809E
RE70177	1118	5	2300 - 2312A	R104592	2123	4	5100 - 5102	R114083	21123	2	4800 - 4810B
RE70400	1B14	4	1100 - 1102	R104592	2125	4	5100 - 5107	R114102	2E15	4	4000 - 4003
RE70400	1B14	4	1100 - 1102	R104997	1E10	12	1600 - 1603	R114193	2D19	4	3600 - 3601C
			3500 - 3596					1			3600 - 3601C
RE70538	2D10	1		R104907	1E14	12	1600 - 1620	R114193	2D21	4	
RE70779	2C18	8	3100 - 3119	R104907	1E15	12	1600 - 1635	R114193	2F14	4	4400 - 4401C
RE70779	2C20	8	3100 - 3121	R104907	1E16	12	1600 - 1641	R114193	2F18	4	4400 - 4403C
RE70848	1F3	8	1600 - 1699C	R105346	2L2	14	6500 - 6576A	R114194	2D19	5	3600 - 3601C
RE70848	1F5	11	1600 - 1699E	R105346	3D20	32	9700 - 9711	R114194	2D21	5	3600 - 3601E
RE70898	3E2	1	9700 - 9717	R105346	3D21	12	9700 - 9712	R114194	2F14	5	4400 - 4401C
RE70962	2F17	1	4400 - 4403B	R105346	3D22	6	9700 - 9713	R114194	2F18	5	4400 - 4403C
RE70962	3E8	1	9700 - 9723	R105346	3D24	6	9700 - 9715	R114241	2G10	17	4600 - 4601B
RE71143	1H15	11	1900 - 1950A	R105806	2E9	2	3900 - 3909	R114241	2G16	17	4600 - 4603E
RE71143	1H16	8	1900 - 1950B	R106796	1B15	2	1100 - 1103	R114282	1C17	3	1500 - 1501
RE71144	2D5	8	3500 - 3561	R106796	1B16	2	1100 - 1104	R114358	3D3	7	8800 - 8801
RE71240	2F13	1	4400 - 4401B	R106829	2118	7	5100 - 5101A	R114358	3D6	7	8800 - 8806
RE71240	3E7	1	9700 - 9722	R106829	2120	7	5100 - 5102A	R115081	2G10	1	4600 - 4601B
RE71583	2C10	7	3100 - 3114	R106829	2122	7	5100 - 5105A	R115250	1H20	2	2000 - 2001
RE71583	2C12	7	3100 - 3114B	R106829	2124	7	5100 - 5107A	R115252	2J17	7	5900 - 5901A
RE71583	2C18	6	3100 - 3119	R106829	2J1	7	5100 - 5108A	R115252	2J21	7	5900 - 5902A
RE71583	2C20	6	3100 - 3121	R106831	2118	5	5100 - 5101A	R115280	2111	7	5000 - 5001
RT77000402		5	3000 - 3008	R106831	2120	5	5100 - 5102A	R115299	2G3	5	4500 - 4501
RT77000402		4	3000 - 3009	R106831	2122	5	5100 - 5105A	R115299	2G4	9	4500 - 4501A
RT77000402		9	3000 - 3009	R106831	2124	5	5100 - 5103A 5100 - 5107A	R115299	2G5	9	4500 - 4502
RT77000402		9	3000 - 3009	R106831	2J1	5	5100 - 5107A 5100 - 5108A	R115299	2G10	11	4600 - 4601B
RT77000402		9	3000 - 3010	R106861	1K11	3	2800 - 2803	1	2G10 2G13	3	4600 - 4603B
		9		R106861		3	2800 - 2806 2800 - 2806	R115335	2G13 2G10		
RT77000402			3000 - 3026	1	1K13			R115390		12	4600 - 4601B
RT77000402		4	3000 - 3052	R106861	1K14	3	2800 - 2806A	R115390	2G16	12	4600 - 4603E
RT77000402		5	3000 - 3052	R106957	2G18	5	4600 - 4607B	R116076	2G23	3	4700 - 4702
RT77000402		4	3000 - 3052B	R107731	216	10	4900 - 4901B	R116076	2G24	3	4700 - 4703
RT77000402		5	3000 - 3052B	R107731	217	10	4900 - 4902	R116078	2G3	2	4500 - 4501
RT77000402		4	3000 - 3054	R107749	1125	3	2400 - 2408A	R116078	2G4	4	4500 - 4501A
RT77000402		5	3000 - 3054	R109086	1C7	2	1300 - 1312	R116078	2G5	4	4500 - 4502
RT77000402		4	3000 - 3054B	R109086	1C8	2	1300 - 1317	R116115	3D5	5	8800 - 8802
RT77000402		5	3000 - 3054B	R109863	2D17	5	3600 - 3601A	R116116	2D3	10	3500 - 3515
R100105	2F22	7	4400 - 4499C	R109863	2D23	5	3600 - 3602A	R116116	2D4	10	3500 - 3517
R100850	2H1	1	4700 - 4708A	R109863	2F22	5	4400 - 4499C	R116116	2D7	10	3500 - 3586
R10093	2E15	3	4000 - 4003	R109985	1K11	9	2800 - 2803	R116116	2D8	10	3500 - 3591
R10093	2E16	3	4000 - 4004	R109985	1K12	3	2800 - 2803A	R116194	2G12	21	4600 - 4603A
R101201	1F7	6	1600 - 1699G	R109985	1K13	6	2800 - 2806	R116296	1B20	2	1200 - 1299A
R101223	2H3	6	4700 - 4710	R109985	1K14	6	2800 - 2806A	R116296	1B21	2	1200 - 1299B
R101225	2D17	6	3600 - 3601A	R109985	2K18	4	6400 - 6418	R116296	1B22	2	1200 - 1299C
R101225	2D19	6	3600 - 3601C	R109985	3D20	2	9700 - 9711	R116296	1B23	2	1200 - 1299D
R101225	2D21	6	3600 - 3601E	R109985	3D21	2	9700 - 9712	R116324	1B13	8	1100 - 1101
R101225	2D23	6	3600 - 3602A	R109985	3D22	2	9700 - 9713	R116366	1F8	6	1600 - 1699H
R101225	2F14	6	4400 - 4401C	R109985	3D24	2	9700 - 9715	R116366	1F9	6	1600 - 1699J
R101225	2F18	6	4400 - 4403C	R110081	1116	4	2300 - 2308	R116386	2D18	4	3600 - 3601B
R101225	2F22	6	4400 - 4499C	R111949	2117	2	5100 - 5101	R116386	2D20	4	3600 - 3601D
R101227	2D17	2	3600 - 3601A	R113565	2D9	4	3500 - 3595	R116466	2G10	6	4600 - 4601B
R101227	2D23	2	3600 - 3602A	R113565	2D11	1	3500 - 3597	R116466	2G16	6	4600 - 4603E
R101227	2F22	2	4400 - 4499C	R113565	2D11	2	3500 - 3597	R116515	2119	7	5100 - 5102
R102901	1H22	8	2000 - 2026	R1135656	2D11	4	3500 - 3596	R116515	3D20	8	9700 - 9711
R102901	1H23	8	2000 - 2020	R113596	2G22	3	4700 - 4701	R116515	3D20	8	9700 - 9711
R102901 R102901	1H23	8	2000 - 2027 2000 - 2034	R113698	2G22 2H9	3 6	4800 - 4801A	R116516	2l23	o 7	5100 - 5107
	2K22	0 11		R113698	2H13			1	2123 2125	7	
R104536			6500 - 6503A			6	4800 - 4803A	R116516			5100 - 5108
R104536	2L2	16	6500 - 6576A	R113698	2H15	6	4800 - 4805A	R116516	3D22	8	9700 - 9713
R104536	2L4	11	6500 - 6577A	R113698	2H17	6	4800 - 4807A	R116516	3D24	8	9700 - 9715
R104536	2L6	11	6500 - 6578A	R113698	2H23	6	4800 - 4809E	R116569	2117	2	5100 - 5101
R104536	2L8	11	6500 - 6579A	R113698	2H24	6	4800 - 4809F	R116617	2B13	8	3000 - 3008
R104536	2L10	11	6500 - 6592A	R113698	2 1	6	4800 - 4810B	R116617	2B15	4	3000 - 3009

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R116617	2B17	8	3000 - 3016	R121038	1H21	2	2000 - 2002	R123323	114	9	2100 - 2109A
R116617	2B19	8	3000 - 3025	R121194	2G12	36	4600 - 4603A	R123323	114	11	2100 - 2109A
R116617	2B21	8	3000 - 3026	R121376	2112	6	5000 - 5001A	R123323	115	9	2100 - 2109B
R116617	2B23	4	3000 - 3052	R121376	2113	6	5000 - 5001B	R123323	115	11	2100 - 2109B
R116617	2B23	8	3000 - 3052	R121376	2114	6	5000 - 5002	R123326	114	3	2100 - 2109A
R116617	2B25	4	3000 - 3052B	R121402	2119	2	5100 - 5102	R123326	114	4	2100 - 2109A
R116617	2B25	8	3000 - 3052B	R121403	2125	2	5100 - 5108	R123326	115	4	2100 - 2109B
R116617	2C2	4	3000 - 3054	R121411	2F11	10	4400 - 4401	R123345	3D20	5	9700 - 9711
R116617	2C2	8	3000 - 3054	R121411	2F15	10	4400 - 4403	R123345	3D21	5	9700 - 9712
R116617	2C4	4	3000 - 3054B	R121413	2G25	10	4700 - 4708	R123345	3D22	5	9700 - 9713
R116617	2C4	8	3000 - 3054B	R121413	2H3	10	4700 - 4710	R123345	3D24	5	9700 - 9715
R119210	2G12	33	4600 - 4603A	R121413	2H5	2	4700 - 4710B	R123352	1H9	5	1900 - 1908
R119220	1C8	3	1300 - 1317	R121413	3D14	2	9700 - 9705	R123352	1H10	5	1900 - 1908A
R119359	1H11	5	1900 - 1910	R121424	2F11	11	4400 - 4401	R123352	1H13	4	1900 - 1949A
R119359	1H12	5	1900 - 1910A	R121424	2F15	11	4400 - 4403	R123352	1H14	4	1900 - 1949B
R119395	1K15	3	2800 - 2809	R121608	2123	2	5100 - 5107	R123352	3D20	13	9700 - 9711
R119395	1K17	6	2800 - 2825	R121634	2J10	2	5700 - 5701	R123353	3D20	12	9700 - 9711
R119395	1K18	6	2800 - 2826	R121635	2J11	3	5700 - 5702	R123395	2F16	8	4400 - 4403A
R119565	2G16	1	4600 - 4603E	R121635	2J12	3	5700 - 5702A	R123395	2F17	3	4400 - 4403B
R119874	2G10	7	4600 - 4601B	R121674	1B14	8	1100 - 1102	R123395	3E8	3	9700 - 9723
R119874	2G12	29	4600 - 4603A	R121897	1C3	1	1300 - 1301	R123417	2F12	3	4400 - 4401A
R119874	2G13	5	4600 - 4603B	R121897	1C4	1	1300 - 1302	R123417	2F12	7	4400 - 4401A
R119874	2G16	7	4600 - 4603E	R121897	3B22	2	6800 - 6801	R123417	2F13	1	4400 - 4401B
								R123417			
R119874	2G18	31	4600 - 4607B	R122401	1K21	4	2900 - 2902	-	2F16	3	4400 - 4403A
R119874	2G19	5	4600 - 4607C	R122401	1K22	3	2900 - 2904	R123417	2F16	7	4400 - 4403A
R119988	2D6	4	3500 - 3567	R122401	1K23	3	2900 - 2904A	R123417	2F17	1	4400 - 4403B
R120013	2K24	11	6500 - 6522A	R122417	2F19	7	4400 - 4499	R123417	3D20	21	9700 - 9711
R120247	1H9	6	1900 - 1908	R122843	1G5	2	1800 - 1802A	R123417	3D24	21	9700 - 9715
R120247	1H9	9	1900 - 1908	R122843	1G13	2	1800 - 1811B	R123417	3E7	1	9700 - 9722
R120247	1H10	6	1900 - 1908A	R122843	1H2	2	1800 - 1822A	R123417	3E8	1	9700 - 9723
R120247	1H11	6	1900 - 1910	R123161	216	7	4900 - 4901B	R123441	1125	1	2400 - 2408A
R120247	1H12	6	1900 - 1910A	R123161	217	7	4900 - 4902	R123454	1J1	1	2400 - 2457
R120247	1H13	5	1900 - 1949A	R123161	218	6	4900 - 4903	R123471	2J16	5	5900 - 5901
R120247	1H13	8	1900 - 1949A	R123177	2H23	5	4800 - 4809E	R123471	2J18	5	5900 - 5901B
R120247	1H14	5	1900 - 1949B	R123177	2H24	5	4800 - 4809F	R123471	2J20	5	5900 - 5902
R120247	1J21	32	2700 - 2704A	R123177	211	5	4800 - 4810B	R123471	2J22	5	5900 - 5902B
R120247		23	2700 - 2710A		2H9	5	4800 - 4801A		2J24	5	5900 - 5904
	1J23			R123178				R123471			
R120247	1J25	19	2700 - 2711B	R123178	2H13	5	4800 - 4803A	R123501	2J16	3	5900 - 5901
R120247	1K2	32	2700 - 2712A	R123178	2H15	5	4800 - 4805A	R123501	2J18	3	5900 - 5901B
R120247	1K4	22	2700 - 2713B	R123178	2H17	5	4800 - 4807A	R123501	2J20	3	5900 - 5902
R120247	1K6	19	2700 - 2714A	R123226	115	3	2100 - 2109B	R123501	2J22	3	5900 - 5902B
			2700 - 271 4 A 2700 - 2715B					R123501			
R120247	1K8	18		R123226	117	3	2100 - 2129		2J24	3	5900 - 5904
R120467	1K22	2	2900 - 2904	R123226	117	5	2100 - 2129	R123501	3D20	23	9700 - 9711
R120467	1K23	2	2900 - 2904A	R123226	117	6	2100 - 2129	R123501	3D24	23	9700 - 9715
R120586	1C12	1	1400 - 1421	R123226	2F12	3	4400 - 4401A	R123502	3D20	31	9700 - 9711
	2G22			R123226		4	4400 - 4401A		3D24	13	
R120631		2	4700 - 4701		2F12			R123502			9700 - 9715
R120631	2G23	2	4700 - 4702	R123226	2F13	1	4400 - 4401B	R123504	3D4	8	8800 - 8801A
R120631	2G24	2	4700 - 4703	R123226	2F13	4	4400 - 4401B	R123504	3D7	8	8800 - 8806A
R120636	2D19	3	3600 - 3601C	R123226	2F16	3	4400 - 4403A	R123504	3D8	8	8800 - 8806B
R120636	2D21	3	3600 - 3601E	R123226	2F16	4	4400 - 4403A	R123504	3D20	24	9700 - 9711
R120636	2F14	3	4400 - 4401C	R123226	2F17	1	4400 - 4403B	R123504	3D24	24	9700 - 9715
R120636	2F18	3	4400 - 4403C	R123226	3D20	4	9700 - 9711	R123513	216	2	4900 - 4901B
R120637	2G3	4	4500 - 4501	R123226	3D21	4	9700 - 9712	R123514	217	2	4900 - 4902
R120637	2G4	3	4500 - 4501A	R123226	3D22	4	9700 - 9713	R123525	3D20	25	9700 - 9711
R120637	2G5			R123226	3D24			R123525	3D24		
		3	4500 - 4502			4	9700 - 9715			25	9700 - 9715
R120638	2112	3	5000 - 5001A	R123226	3E7	1	9700 - 9722	R123542	1B13	5	1100 - 1101
R120638	2113	3	5000 - 5001B	R123226	3E7	4	9700 - 9722	R123542	3D20	1	9700 - 9711
R120638	2114	3	5000 - 5002	R123226	3E8	1	9700 - 9723	R123542	3D21	1	9700 - 9712
R120639	2G3	4	4500 - 4501	R123226	3E8	4	9700 - 9723	R123543	1B14	5	1100 - 1102
R120639	2G4	3	4500 - 4501A	R123246	2K12	2	6400 - 6401	R123543	3D22	1	9700 - 9713
R120639	2G5	3	4500 - 4502	R123271	216	5	4900 - 4901B	R123543	3D24	1	9700 - 9715
R120966	2D6	13	3500 - 3567	R123271	217	5	4900 - 4902	R123561	2G22	6	4700 - 4701
R121008	2C20	3	3100 - 3121	R123273	2E3	4	3700 - 3702	R123561	2G23	7	4700 - 4702
R121018	2G25	6	4700 - 4708	R123273	2E5	4	3700 - 3707	R123561	2G24	6	4700 - 4703
R121036	2F12	8	4400 - 4401A	R123273	3D20	20	9700 - 9711	R123562	2G22	6	4700 - 4701
R121036	2F13	3	4400 - 4401B	R123273	3D24	20	9700 - 9715	R123562	2G23	7	4700 - 4702

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R123562	2G24	6	4700 - 4703	R124883	1G17	2	1800 - 1813B	R132186	2G10	20	4600 - 4601B
R123563	2G22	7	4700 - 4701	R125407	117	6	2100 - 2129	R132186	2G16	20	4600 - 4603E
R123563	2G23	8	4700 - 4702	R125507	2K2	6	5900 - 5906A	R132203	1K17	1	2800 - 2825
R123563	2G24	7	4700 - 4703	R125508	2K2	8	5900 - 5906A	R132260	1K18	1	2800 - 2826
R123564	2G22	7	4700 - 4701	R126389	2K8	3	6200 - 6218	R132262	1K15	2	2800 - 2809
R123564	2G23	8	4700 - 4702	R128355	1F17	3	1700 - 1710	R132267	1D5	12	1600 - 16EN
R123564	2G24	7	4700 - 4703	R128355	1F19	3	1700 - 1723	R132267	1D6	12	1600 - 16GB
R123565	216	11	4900 - 4901B	R128415	117	7	2100 - 2129	R132267	1D7	12	1600 - 16GQ
R123565	217	11	4900 - 4902	R128443	1J9	3	2500 - 2531	R132267	1D8	12	1600 - 16GR
R123570	2K22	7	6500 - 6503A	R128443	1J10	3	2500 - 2533	R132267	1D9	12	1600 - 16GS
R123570	2K24	7	6500 - 6522A	R128602	1F18	3	1700 - 1712	R132267	1D10	12	1600 - 16GT
R123570	2L4	7	6500 - 6577A	R128602	1F24	2	1700 - 1712	R132267	1D10	12	1600 - 16LV
R123570	2L4 2L6	7	6500 - 6578A	R128658	3C13	2	8600 - 8604	R132267	1D11	12	1600 - 16LW
R123570	2L8	7	6500 - 6579A	R128658	3C14	2	8600 - 8604A	R132267	1D13	12	1600 - 16LX
R123570	2L10	7	6500 - 6592A	R128662	3C15	2	8600 - 8605	R132267	1D14	12	1600 - 16LY
R123570	3D20	6	9700 - 9711	R128662	3C16	2	8600 - 8605A	R132267	1D15	12	1600 - 16LZ
R123570	3D21	6	9700 - 9712	R128799	1E11	6	1600 - 1606	R132267	1D16	12	1600 - 16MA
R123572	1K17	5	2800 - 2825	R128799	1E12	6	1600 - 1613	R132267	1D17	12	1600 - 16MB
R123572	1K18	5	2800 - 2826	R128799	1E22	6	1600 - 1678	R132267	1D18	12	1600 - 16MC
R123572	2K21	3	6500 - 6503	R128799	1E24	6	1600 - 1683	R132267	1D19	12	1600 - 16MG
R123572	2K23	3	6500 - 6522	R129130	1H6	2	1800 - 1833B	R132267	1D20	12	1600 - 16MH
R123572	2L2	23	6500 - 6576A	R129131	1G22	2	1800 - 1817B	R132267	1D21	12	1600 - 16MJ
R123572	2L3	3	6500 - 6577	R129432	2G18	21	4600 - 4607B	R132267	1D21	12	1600 - 16MK
R123572	2L5		6500 - 6578	R129432	3E2	1	9700 - 9717	R132267	1D22	12	1600 - 16ML
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R123572	2L9	3	6500 - 6592	R130574	2G22	7	4700 - 4701	R132267	1D25	12	1600 - 16MT
R123572	3D22	11	9700 - 9713	R130574	2G23	8	4700 - 4702	R132267	1E1	12	1600 - 16MU
R123572	3D24	11	9700 - 9715	R130574	2G24	7	4700 - 4703	R132267	1E2	12	1600 - 16MV
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R123575	1B13	3	1100 - 1101	R130575	2G24	7	4700 - 4703	R132267	1E5	12	1600 - 16MY
R123575	1B14	3	1100 - 1102	R130576	2G22	6	4700 - 4701	R132267	1E6	12	1600 - 16QZ
R123575	3D20	7	9700 - 9711	R130576	2G23	7	4700 - 4702	R132267	1E7	12	1600 - 16RA
R123575	3D21	7	9700 - 9712	R130576	2G24	6	4700 - 4703	R132267	1E8	12	1600 - 16RB
R123575	3D22	7	9700 - 9713	R130577	2G22	6	4700 - 4701	R132267	1E9	12	1600 - 16RC
	3D22	7	9700 - 9715	R130577	2G22		4700 - 4701	R132267	1E11		1600 - 1606
R123575						7				7	
R123583	3D20	32	9700 - 9711	R130577	2G24	6	4700 - 4703	R132267	1E12	7	1600 - 1613
R123583	3D21	12	9700 - 9712	R130578	2H9	6	4800 - 4801A	R132267	1E13	12	1600 - 1614
R123584	2F11	8	4400 - 4401	R130578	2H13	6	4800 - 4803A	R132267	1E20	12	1600 - 1673
R123584	2F15	8	4400 - 4403	R130578	2H15	6	4800 - 4805A	R132267	1E21	12	1600 - 1674
R123591	3D3	4	8800 - 8801	R130578	2H17	6	4800 - 4807A	R132267	1E22	7	1600 - 1678
R123591	3D6	4	8800 - 8806	R130578	2H23	6	4800 - 4809E	R132267	1E23	12	1600 - 1680
R123593	1F3	10	1600 - 1699C	R130578	2H24	6	4800 - 4809F	R132267	1E24	7	1600 - 1683
R123593	1F4	10	1600 - 1699D	R130578	211	6	4800 - 4810B	R132373	1K12	2	2800 - 2803A
R123593	1F5	13	1600 - 1699E	R130586	1H22	2	2000 - 2026	R132518	2G8	2	4600 - 4601
R123593	1F6	13	1600 - 1699F	R130586	1H23	2	2000 - 2027	R132518	2G14	2	4600 - 4603C
R123593	1F7	8	1600 - 1699G	R130883	2G12	11	4600 - 4603A	R132750	1G5	6	1800 - 1802A
R123593	1F8	8	1600 - 1699H	R130883	2G18	11	4600 - 4607B	R132750	1G7	6	1800 - 1804A
R123593	1F9		1600 - 1699J	R131016	114	3	2100 - 2109A	R132750	1G13		1800 - 1804A 1800 - 1811B
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R123594	2D4	5	3500 - 3517	R131129	1G7	2	1800 - 1804A	R132750	1H2	6	1800 - 1822A
R123594	2D5	9	3500 - 3561	R131129	1G24	2	1800 - 1818A	R132751	1G9	6	1800 - 1805B
R123594	2D7	5	3500 - 3586	R131182	2G10	3	4600 - 4601B	R132751	1G15	6	1800 - 1812A
R123594	2D8	5	3500 - 3591	R131182	2G16	3	4600 - 4603E	R132751	1G17	6	1800 - 1813B
R123594	2E3	8	3700 - 3702	R131283	2D19	2	3600 - 3601C	R132751	1H4	6	1800 - 1832A
R123594	2E5	8	3700 - 3707	R131283	2D21	2	3600 - 3601E	R132751	1H6	6	1800 - 1833B
R123594	2E6	9	3700 - 3710	R131283	2F14	2	4400 - 4401C	R132874	1D5	4	1600 - 16EN
R123752	2L2	22	6500 - 6576A	R131283	2F18	2	4400 - 4403C	R132874	1D6	4	1600 - 16GB
R123960	2H9	3	4800 - 4801A	R131575	2H10	4	4800 - 4802	R132874	1D7	4	1600 - 16GQ
R123960	2H13	3	4800 - 4803A	R131575	2H18	4	4800 - 4809	R132874	1D7 1D8	4	1600 - 16GR
R123960 R123960	2H15			R131575				R132874	1D8 1D9		1600 - 16GR 1600 - 16GS
		3	4800 - 4805A		2H20	4	4800 - 4809B			4	
R123960	2H17	3	4800 - 4807A	R131765	1C11	6	1400 - 1418	R132874	1D10	4	1600 - 16GT
R124128	1H9	7	1900 - 1908	R131768	1C12	6	1400 - 1421	R132874	1D11	4	1600 - 16LV
R124128	1H11	7	1900 - 1910	R131768	1C13	4	1400 - 1433	R132874	1D12	4	1600 - 16LW
R124128	1H13	6	1900 - 1949A	R131768	1C14	4	1400 - 1433A	R132874	1D13	4	1600 - 16LX
R124883	1 G 9	2	1800 - 1805B	R131794	2D16	1	3600 - 3601	R132874	1D14	4	1600 - 16LY
R124883	1G15	2	1800 - 1812A	R131794	2D22	1	3600 - 3602	R132874	1D15	4	1600 - 16LZ

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R132874	1D17	4	1600 - 16MB	R135177	2J21	4	5900 - 5902A	R48685	2G18	8	4600 - 4607B
R132874	1D18	4	1600 - 16MC	R135179	114	8	2100 - 2109A	R48685	2G23	5	4700 - 4702
R132874	1D19	4	1600 - 16MG	R135179	115	8	2100 - 2109B	R48685	2H1	7	4700 - 4708A
R132874	1D20	4	1600 - 16MH	R135270	3D7	6	8800 - 8806A	R48685	2H3	13	4700 - 4710
R132874	1D21	4	1600 - 16MJ	R135271	3D7	7	8800 - 8806A	R48685	2H4	7	4700 - 4710A
R132874	1D22	4	1600 - 16MK	R135896	3D21	3	9700 - 9712	R48993	1H23	11	2000 - 2027
R132874	1D23	4	1600 - 16ML	R135896	3D22	3	9700 - 9713	R500000	2H9	1	4800 - 4801A
R132874	1D24	4	1600 - 16MM	R135896	3D24	3	9700 - 9715	R500000	2H13	1	4800 - 4803A
R132874	1D25	4	1600 - 16MT	R135916	3D7	4	8800 - 8806A	R500000	2H15	1	4800 - 4805A
R132874	1E1	4	1600 - 16MU	R135916	3D8	4	8800 - 8806B	R500000	2H17	1	4800 - 4807A
R132874	1E2	4	1600 - 16MV	R135918	1C13	3	1400 - 1433	R500001	1B13	7	1100 - 1101
R132874	1E3	4	1600 - 16MW	R135918	1C14	3	1400 - 1433A	R500001	1B14	7	1100 - 1102
R132874	1E4	4	1600 - 16MX	R136180	1J5	3	2500 - 2507	R500053	3B23	2	6800 - 6803
R132874	1E5	4	1600 - 16MY	R136475	2D18	1	3600 - 3601B	R500078	2K6	10	6200 - 6211
R132874	1E6	4	1600 - 16QZ	R136475	2D20	1	3600 - 3601D	R500078	2K7	10	6200 - 6211A
R132874	1E7	4	1600 - 16RA	R136495	1B20	3	1200 - 1299A	R500080	2K6	12	6200 - 6211
R132874	1E8	4	1600 - 16RB	R136495	1B21	3	1200 - 1299B	R500080	2K7	12	6200 - 6211A
R132874	1E9	4	1600 - 16RC	R136495	1B22	3	1200 - 1299C	R500265	2G5	7	4500 - 4502
R132874	1E10	4	1600 - 1603	R136495	1B23	3	1200 - 1299D	R500266	2G4	6	4500 - 4501A
R132874	1E11	3	1600 - 1606	R136515	3D20	22	9700 - 9711	R500266	2G5	6	4500 - 4502
R132874	1E12	3	1600 - 1613	R136515	3D24	22	9700 - 9715	R500269	2E3	7	3700 - 3702
R132874	1E13	4	1600 - 1614	R136516	2F11	18	4400 - 4401	R500270	2E3	6	3700 - 3702
R132874	1E14	4	1600 - 1620	R136516	2F15	18	4400 - 4403	R500271	2E3	5	3700 - 3702
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R132874	1E16	4	1600 - 1641	R136516	3D24	22	9700 - 9715	R500320	1125	5	2400 - 2408A
R132874	1E17	4	1600 - 1644	R26125	2118	3	5100 - 5101A	R500320	3C20	4	8700 - 8711
R132874	1E18	4	1600 - 1645	R26125	2120	3	5100 - 5102A	R500320	3C21	4	8700 - 8711A
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R132874	1E22	3	1600 - 1678	R26286	1E10	8	1600 - 1603	R500349	1H15	4	1900 - 1950A
R132874	1E23	4	1600 - 1680	R26286	1E14	8	1600 - 1620	R500349	1H16	4	1900 - 1950B
R132874	1E24	3	1600 - 1683	R26286	1E15	8	1600 - 1635	R500349	1H17	4	1900 - 1950C
R133148	1K16	1	2800 - 2822	R26286	1E16	8	1600 - 1641	R500374	3D5	9	8800 - 8802
R133295	1C4	3	1300 - 1302	R26286	1E17	8	1600 - 1644	R500374	3D20	24	9700 - 9711
R133295	1C6	1	1300 - 1306	R26286	1E18	8	1600 - 1645	R500649	1C3	2	1300 - 1301
R133296	1C3	3	1300 - 1301	R26286	1E19	8	1600 - 1648	R500649	1C4	2	1300 - 1302
R133296	1C5	1	1300 - 1305	R26286	2D6	9	3500 - 3567	R500650	2G4	7	4500 - 4501A
R133405	2E3	11	3700 - 3702	R26493	2G10	10	4600 - 4601B	R500668	2G4	6	4500 - 4501A
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R133414	1J12	3	2500 - 2545	R26493	2G16	10	4600 - 4603E	R500731	1F7	13	1600 - 1699G
R133812	2G8	4	4600 - 4601	R26493	2G18	13	4600 - 4607B	R500731	1F8	13	1600 - 1699H
R133812	2G14	4	4600 - 4603C	R26650	2G18	9	4600 - 4607B	R500731	1F9	13	1600 - 1699J
R133893	1F15	3	1700 - 1705	R27346	2L2	20	6500 - 6576A	R501018	2K6	7	6200 - 6211
R133893	1F16	3	1700 - 1706	R28811	1C18	3	1500 - 1503	R501018	2K7	7	6200 - 6211A
R133893	1F21	3	1700 - 1740	R28811	1C19	3	1500 - 1503A	R501065	2K6	5	6200 - 6211
R133893	1F22	3	1700 - 1748	R28811	1C20	3	1500 - 1505	R501065	2K7	5	6200 - 6211A
R133893	1F23	5	1700 - 1760	R28811	1C21	3	1500 - 1551	R501072	2H19	2	4800 - 4809A
R133893	1F24	5	1700 - 1762	R32214	2G12	17	4600 - 4603A	R501072	2H21	1	4800 - 4809C
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R133893	3D21	12	9700 - 9712	R35352	1E10	9	1600 - 1603	R501124	2H9	2	4800 - 4801A
R134357	2G3	1	4500 - 4501	R35352	1E14	9	1600 - 1620	R501124	2H13	2	4800 - 4803A
R134358	2G3	7	4500 - 4501	R35352	1E15	9	1600 - 1635	R501124	2H15	2	4800 - 4805A
R134417	2C8	9	3100 - 3106	R35352	1E16	9	1600 - 1641	R501124	2H17	2	4800 - 4807A
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R134417	2C22	9	3100 - 3123	R35352	1E19		1600 - 1648	R501124	2H24	2	4800 - 4809F
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R134518	2F15	7	4400 - 4403	R39112	1C14	7	1400 - 1433A	R501130	115	3	2100 - 2109B
R134527	2D18	2	3600 - 3601B	R42729	214	6	4900 - 4901	R501192	2C10	4	3100 - 3114
R134527	2D20	2	3600 - 3601D	R42729	216	6	4900 - 4901B	R501192	2C12	4	3100 - 3114B
R134531	2F11	17	4400 - 4401	R42729	217	6	4900 - 4902	R501192	2C14	4	3100 - 3115
R134531	2F15	17	4400 - 4403	R43409	2117	4	5100 - 5101	R501192	2C16	4	3100 - 3115B
R134742	3D11	5	9700 - 9702	R43409	2119	3	5100 - 5102	R501222	1C7	3	1300 - 1312
R134775	1117	2	2300 - 2312	R43409	2113	3	5100 - 5102	R501252	2E17	2	4000 - 4017
					2123 2125	3				3	2600 - 2601
R134775	1118	2	2300 - 2312A	R43409	2120	3	5100 - 5108	R501377	1J16	3	2000 - 200 I

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R501377	2G10	5	4600 - 4601B	R502079	3C21	2	8700 - 8711A	R503372	1G19	9	1800 - 1815B
R501377	2G16	5	4600 - 4603E	R502096	1J23	19	2700 - 2710A	R503372	1G22	9	1800 - 1817B
R501428	2J17	5	5900 - 5901A	R502132	1J25	15	2700 - 2711B	R503407	2K17	3	6400 - 6417
R501428							2700 - 2711B				
	2J19	5	5900 - 5901C	R502134	1J25	16		R503512	1F15	2	1700 - 1705
R501428	2J21	5	5900 - 5902A	R502137	1G11	5	1800 - 1811	R503567	3C17	2	8600 - 8634
R501428	2J23	5	5900 - 5902C	R502137	1G25	5	1800 - 1820	R503975	1K4	14	2700 - 2713B
R501428	2J25	5	5900 - 5904A	R502166	1G9	9	1800 - 1805B	R503975	1K6	14	2700 - 2714A
R501436	3D4	4	8800 - 8801A	R502166	1G15	9	1800 - 1812A	R504045	1J21	12	2700 - 2704A
R501439	3D3	3	8800 - 8801	R502166	1G17	9	1800 - 1813B	R504045	1K2	12	2700 - 2712A
R501459	2E25	3	4300 - 4311	R502166	1H4	9	1800 - 1832A	R504056	1K4	11	2700 - 2713B
R501459	2F1	3	4300 - 4311A	R502166		9	1800 - 1833B	R504056		10	2700 - 2714A
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R501459	2F2	3	4300 - 4312	R502176	1G3	4	1800 - 1801	R504073	1K8	12	2700 - 2715B
R501459	2F3	3	4300 - 4312A	R502182	117	3	2100 - 2129	R504074	1K8	13	2700 - 2715B
R501459	3D20	32	9700 - 9711	R502198	1J21	17	2700 - 2704A	R504075	1K8	9	2700 - 2715B
R501459	3D21	12	9700 - 9712	R502198	1K2	17	2700 - 2712A	R504084		15	2700 - 2715B
									1K8		
R501472	1F15	4	1700 - 1705	R502199	1J21	18	2700 - 2704A	R504160	1H4	2	1800 - 1832A
R501472	1F16	4	1700 - 1706	R502199	1K2	18	2700 - 2712A	R504272	1C13	1	1400 - 1433
R501472	1F21	4	1700 - 1740	R502200	1J21	16	2700 - 2704A	R504272	1C14	1	1400 - 1433A
R501472	1F21	8	1700 - 1740	R502200	1K2	16	2700 - 2712A	R504526	2K6	9	6200 - 6211
R501472	1F22	4	1700 - 1748	R502201	1J21	15	2700 - 2704A	R504526	2K7	9	6200 - 6211A
R501472	1F23	4	1700 - 1760	R502207	1J21	9	2700 - 2704A	R504813	215	5	4900 - 4901A
R501472	1F24	4	1700 - 1762	R502207	1K2	9	2700 - 2712A	R504902	1F16	8	1700 - 1706
R501529	218	5	4900 - 4903	R502272	1C13	1	1400 - 1433	R504902	1F20	6	1700 - 1735
R501532	218	2	4900 - 4903	R502272	1C14	1	1400 - 1433A	R504902	1F22	8	1700 - 1748
R501642	1J6	3	2500 - 2508	R502282	1G20	4	1800 - 1816	R507807	2G12	27	4600 - 4603A
R501642	1J7	3	2500 - 2510	R502283	1K2	15	2700 - 2712A	R51936	1F3	9	1600 - 1699C
R501642	1J11	3	2500 - 2534	R502357	1K4	17	2700 - 2713B	R51936	1F4	9	1600 - 1699D
R501642	1J13	3	2500 - 2546	R502386	1G5	10	1800 - 1802A	R51936	1F5	12	1600 - 1699E
R501657	1H15	6	1900 - 1950A	R502386	1G7	10	1800 - 1804A	R51936	1F6	12	1600 - 1699F
R502007	2K14	1	6400 - 6411	R502386	1G9	10	1800 - 1805B	R51936	1F7	9	1600 - 1699G
R502008	2K15	1	6400 - 6412	R502386	1G13	10	1800 - 1811B	R51936	1F8	9	1600 - 1699H
R502009	2K16	1	6400 - 6413	R502386	1G15	10	1800 - 1812A	R51936	1F9	9	1600 - 1699J
R502076	1D7	5	1600 - 16GQ	R502386	1G17	10	1800 - 1813B	R52819	1K11	8	2800 - 2803
R502076	1D8	5	1600 - 16GR	R502386	1G24	10	1800 - 1818A	R53108	3D20	26	9700 - 9711
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R502076	1D10	5	1600 - 16GT	R502386	1H4	10	1800 - 1832A	R53524	2K2	10	5900 - 5906A
R502076	1D11	5	1600 - 16LV	R502386	1H6	10	1800 - 1833B	R54114	2H11	4	4800 - 4802A
R502076	1D12	5	1600 - 16LW	R502393	1K6	16	2700 - 2714A	R54114	2H23	4	4800 - 4809E
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R502076	1D13	5	1600 - 16LX	R502394	1K4	18	2700 - 2713B	R54114	2H24	4	4800 - 4809F
R502076	1D14	5	1600 - 16LY	R502394	1K6	17	2700 - 2714A	R54114	2 1	4	4800 - 4810B
R502076	1D15	5	1600 - 16LZ	R502662	2K13	4	6400 - 6410	R54565	214	1	4900 - 4901
R502076	1D16	5	1600 - 16MA	R502666	1G19	2	1800 - 1815B	R54565	215	1	4900 - 4901A
R502076	1D17			R502667	1G19	7	1800 - 1815B	R54565		-	
		5	1600 - 16MB						216	1	4900 - 4901B
R502076	1D18	5	1600 - 16MC	R502667	1G22	7	1800 - 1817B	R54565	217	1	4900 - 4902
R502076	1D19	5	1600 - 16MG	R502679	1J23	20	2700 - 2710A	R54565	218	1	4900 - 4903
R502076	1D20	5	1600 - 16MH	R502680	1J23	16	2700 - 2710A	R54638	3D20	9	9700 - 9711
R502076	1D21	5	1600 - 16MJ	R502680	1J25	12	2700 - 2711B	R54638	3D21	9	9700 - 9712
R502076	1D22	5	1600 - 16MK	R502698	1J21	20	2700 - 2704A	R54638	3D22	9	9700 - 9713
R502076	1D23	5	1600 - 16ML	R502698	1K2	20	2700 - 2712A	R54638	3D24	9	9700 - 9715
R502076	1D24	5	1600 - 16MM	R502699	1J21	19	2700 - 2704A	R54641	2E9	5	3900 - 3909
R502076	1D25	5	1600 - 16MT	R502699	1K2	19	2700 - 2712A	R54802	2G12	7	4600 - 4603A
R502076	1E1	5	1600 - 16MU	R502700	1J21	23	2700 - 2704A	R54802	2G18	7	4600 - 4607B
R502076	1E2	5	1600 - 16MV	R502700	1K2	23	2700 - 2712A	R55233	2G12	28	4600 - 4603A
R502076	1E3	5	1600 - 16MW	R502701	1J21	22	2700 - 2704A	R55233	2G16	15	4600 - 4603E
R502076	1E4	5	1600 - 16MX	R502701	1K2	22	2700 - 2712A	R55301	2E16	4	4000 - 4004
R502076	1E5	5	1600 - 16MY	R502725	2E14	1	4000 - 4002A	R56101	2E4	5	3700 - 3704
R502076	1E6	5	1600 - 16QZ	R502725	2E18	1	4000 - 4017A	R56101	2E5	6	3700 - 3707
R502076	1E7	5	1600 - 16RA	R502814	114	5	2100 - 2109A	R56101	2E6	5	3700 - 3710
R502076	1E8	5	1600 - 16RB	R502814	115	5	2100 - 2109B	R56131	1D5	2	1600 - 16EN
R502076	1E9	5	1600 - 16RD	R502814	117	3	2100 - 2109	R56131	1D6	2	1600 - 16GB
R502076	1E10	5	1600 - 1603	R502814	117	4	2100 - 2129	R56131	1D7	2	1600 - 16GQ
R502076	1E14	5	1600 - 1620	R502814	3D20	3	9700 - 9711	R56131	1D8	2	1600 - 16GR
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R502076	1E20	5	1600 - 1673	R502882	1G10	3	1800 - 1810	R56131	1D11	2	1600 - 16LV
R502076	1E21	5	1600 - 1674	R502902	1B13	7	1100 - 1101	R56131	1D12	2	1600 - 16LW
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NUMERICAL INDEX - CONTINUED

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RS65131 D1014 2 1600-16LX R83548 2L4 2 6500-6577A R722282 3D7 3 1 2000-16LY 83348 2L6 1 6500-6577A R722282 3D7 3 1 2000-16LZ 83348 2L6 2 6500-6577A R722282 3D7 3 8 8800-88068 8800-88068 8 8 6 8800-88068 8 8 6 8 9 6 8 8 2 6 6 8 8 8 8 2 6 6 6 8 8 8 2 6 6 6 7 8 3 200-60-6592A 8 3 200-00-6592A 8	PART NO	GRID	KFY	PAGE	PART NO	GRID	KFY	PAGE	PART NO	GRID	KFY	PAGE
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POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED PC2451 (19-NOV-01)

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T17949	1F10	3	1600 - 1699K	T23214	2H2	1	4700 - 4708B	T58477	2F6	1	4300 - 4399A
T17950	1F10	2	1600 - 1699K	T23214	2H3	8	4700 - 4710	T58477	2F7	1	4300 - 4399B
T18891	2G10	8	4600 - 4601B	T23214	2H5	1	4700 - 4710B	T58477	2117	8	5100 - 5101
T18891	2G12	12	4600 - 4603A	T23214	3D14	1	9700 - 9705	T58477	2119	5	5100 - 5102
T18891	2G16	8	4600 - 4603E	T23215	2H2	2	4700 - 4708B	T58477	2123	5	5100 - 5107
T18891	2G18	12	4600 - 4607B	T23215	3D13	2	9700 - 9704	T58477	2125	5	5100 - 5107
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T19158	2L2	21	6500 - 6576A	T23260	3D12	12	9700 - 9703	T77613	2K24	4	6500 - 6522A
T19651	1H22	10	2000 - 2026	T23314	3D13	1	9700 - 9704	T77613	2L4	4	6500 - 6577A
T19651	1H23	10	2000 - 2027	T23435	2G12	31	4600 - 4603A	T77613	2L6	4	6500 - 6578A
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T19858	1F10	4	1600 - 1699K	T23442	2D16	8	3600 - 3601	T77613	2L10	4	6500 - 6592A
T19860	1F10	5	1600 - 1699K	T23442	2D22	8	3600 - 3602	UN4660	2E4	6	3700 - 3704
T19861	1F10	7	1600 - 1699K	T23474	2G10	19	4600 - 4601B	UN4660	2E5	7	3700 - 3707
T20011	2H11	7	4800 - 4802A	T23474	2G12	16	4600 - 4603A	UN4660	2E6	6	3700 - 3710
T20034	2D17	4	3600 - 3601A	T23474	2G16	19	4600 - 4603E	VFLK07V7467		2	5600 - 5602
T20034	2D23	4	3600 - 3602A	T23474	2G18	16	4600 - 4607B	VFLK7685	2J7	2	5600 - 5607
T20034	2G25	3	4700 - 4708	T23554	2H2	1	4700 - 4708B	VFLK7970	2J6	2	5600 - 5603
T20046	2023 2H1	3	4700 - 4708A	T23554	2H4	8	4700 - 4700B	36106060	1I4	8	2100 - 2109A
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T20070	2G13	7	4600 - 4603B	T23576	3D13	2	9700 - 9704				
T20070	2G19	9	4600 - 4607C	T23628	1H24	2	2000 - 2034				
T20072	2G12	3	4600 - 4603A	T24473	1123	1 25	2400 - 2402 4600 - 4603 A				

POWER UNITS FOR GENSET APPLICATIONS AND FOR VARIABLE SPEED PC2451 (19-NOV-01)

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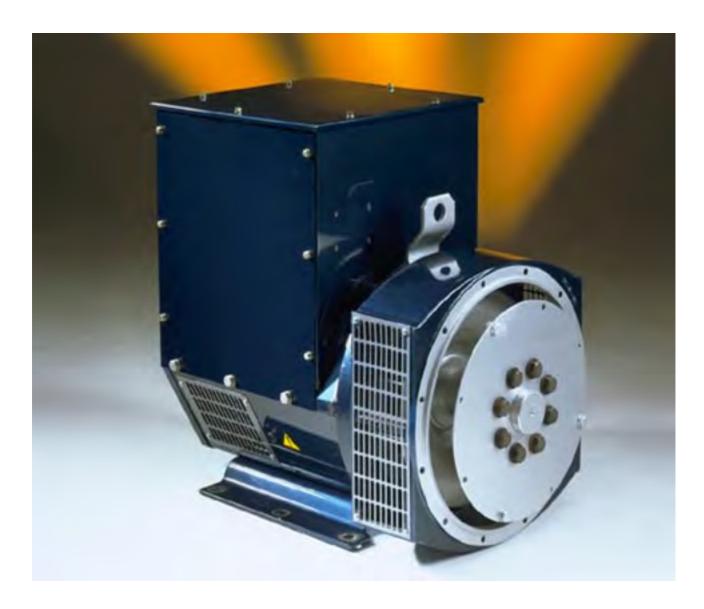
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Section 4 - Stamford Alternator

Publication No: UCH-027 27th Edition 2/001





Installation, Service & Maintenance Manual

for AC generators with the following prefixes: UCI; UCM; UCD 224 & 274.

SAFETY PRECAUTIONS

Before operating the generating set, read the generating set operation manual and this generator manual and become familiar with it and the equipment.

SAFE AND EFFICIENT OPERATION CAN ONLY BE ACHIEVED IF THE EQUIPMENT IS CORRECTLY OPERATED AND MAINTAINED.

Many accidents occur because of failure to follow fundamental rules and precautions.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

- Ensure installation meets all applicable safety and local electrical codes. Have all installations performed by a qualified electrician.
- Do not operate the generator with protective covers, access covers or terminal box covers removed.
- Disable engine starting circuits before carrying out maintenance.
- Disable closing circuits and/or place warning notices on any circuit breakers normally used for connection to the mains or other generators, to avoid accidental closure.

Observe all **IMPORTANT, CAUTION, WARNING,** and **DANGER** notices, defined as:

Important!

Important refers to hazard or unsafe method or practice which can result in product damage or related equipment damage.

Caution!

Caution refers to hazard or unsafe method or practice which can result in product damage or personal injury.



Warning refers to a hazard or unsafe method or practice which CAN result in severe personal injury or possible death.



Danger refers to immediate hazards which WILL result in severe personal injury or death.

Due to our policy of continuous improvement, details in this manual which were correct at time of printing, may now be due for amendment. Information included must therefore not be regarded as binding.

FOREWORD

The function of this book is to provide the user of the Stamford generator with an understanding of the principles of operation, the criteria for which the generator has been designed, and the installation and maintenance procedures. Specific areas where the lack of care or use of incorrect procedures could lead to equipment damage and/or personal injury are highlighted, with WARNING and/or CAUTION notes, and it is IMPORTANT that the contents of this book are read and understood before proceeding to fit or use the generator.

The Service, Sales and technical staff of Newage International are always ready to assist and reference to the company for advice is welcomed.



Incorrect installation, operation, servicing or replacement of parts can result in severe personal injury or death, and/or equipment damage.

Service personnel must be qualified to perform electrical and mechanical service.

EC DECLARATION OF INCORPORATION

All Stamford generators are supplied with a declaration of incorporation for the relevant EC legislation, typically in the form of a label as below.

EC DECLARATION OF INCORPORATION

IN ACCORDANCE WITH THE SUPPLY OF MACHINERY (SAFETY) REGULATIONS 1992 AND THE SUPPLY OF MACHINERY (SAFETY) (AMENDMENT) REGULATIONS 1994 IMPLEMENTING THE EC MACHINERY DIRECTIVE 89/392/EEC AS AMENDED BY 91/368/EEC.

THIS STAMFORD A.C. GENERATOR WAS MANUFACTURED BY OR ON BEHALF OF NEWAGE INTERNATIONAL LTD
BARNACK ROAD STAMFORD LINCOLNSHIRE ENGLAND.

THIS COMPONENT MACHINERY MUST NOT BE PUT INTO SERVICE UNTIL THE MACHINERY INTO WHICH IT IS TO BE INCORPORATED HAS BEEN DECLARED IN CONFORMITY WITH THE PROVISIONS OF THE SUPPLY OF MACHINERY (SAFETY) REGULATIONS 1995/MACHINERY DIRECTIVE

FOR AND ON BEHALF OF NEWAGE INTERNATIONAL LIMITED

LAWRENCE HAYDOCK NAME: POSITION: TECHNICAL DIRECTOR

SIGNATURE:

THIS COMPONENT MACHINERY CARRIES THE CE MARK FOR COMPLIANCE WITH THE STATUTORY REQUIREMENTS FOR THE IMPLEMENTATION OF THE FOLLOWING DIRECTIVES

The EMC Directive 89/336/EEC

This Component Machinery shall not be used in the Residential, Commercial and WARNING! Light Industrial environment unless it also conforms to the relevant standard (EN 50081 - 1) REFER TO FACTORY FOR DETAILS

ii) The Low Voltage Directive 73/23/EEC as amended by 93/68/EEC

Under the EC Machinery Directive section 1.7.4. It is the responsibility of the generator set builder to ensure the generator identity is clearly displayed on the front cover of this book.



Additional Information

European Union Council Directive 89/336/EEC

For installations within the European Union, electrical products must meet the requirements of the above directive, and Newage ac generators are supplied on the basis that:

- They are to be used for power-generation or related function.
- They are to be applied in one of the following environments:

Portable (open construction - temporary site supply)

Portable (enclosed - temporary site supply)

Containerised (temporary or permanent site supply)

Ship-borne below decks (marine auxiliary power)

Commercial vehicle (road transport / refrigeration etc)

Rail transport (auxiliary power)

Industrial vehicle (earthmoving, cranes etc)

Fixed installation (industrial - factory / process plant)

Fixed installation (residential, commercial and light industrial home / office / health)

Energy management (Combined heat and power and/or peak lopping)

Alternative energy schemes

- The standard generators are designed to meet the 'industrial' emissions and immunity standards. Where the generator is required to meet the residential, commercial and light industrial emissions and immunity standards reference should be made to Newage document reference N4/X/011, as additional equipment may be required.
- The installation earthing scheme involves connection of the generator frame to the site protective earth conductor using a minimum practical lead length.
- Maintenance and servicing with anything other than factory supplied or authorised parts will invalidate any Newage liability for EMC compliance.
- Installation, maintenance and servicing is carried out by adequately trained personnel fully aware of the requirements of the relevant EC directives.



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INTRODUCTION

1.1 INTRODUCTION

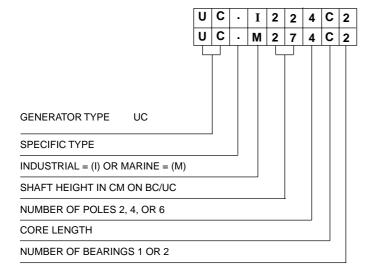
The UC22/27 range of generators is of brushless rotating field design, available up to 660V/50Hz (1500 rpm) or 60Hz (1800 rpm), and built to meet BS5000 Part 3 and international standards.

All the UC22/27 range are self-excited with excitation power derived from the main output windings, using either the SX460/SX440/SX421 AVR. The UC22 is also available with specific windings and a transformer controlled excitation system.

A permanent magnet generator (PMG) powered excitation system is available as an option using either the MX341 or MX321 AVR.

Detailed specification sheets are available on request.

1.2 DESIGNATION



1.3 SERIAL NUMBER LOCATION AND IDENTITY NUMBER LOCATION

Each generator is metal stamped with it's own unique serial number, the location of this number is described below.

UCI and UCM generators have their serial number stamped into the upper section of the drive end frame to end bracket adaptor ring, shown as item 31 in the parts lists at the back of this book.

UCD generators have their serial number stamped into the top of the drive end adaptor /fan shroud casting. If for any reason this casting is removed, it is imperative that care is taken to refit it to the correct generator to ensure correct identification is retained.

Inside the terminal box two adhesive rectangular labels have been fixed, each carrying the generators unique identity number. One label has been fixed to the inside of the terminal box sheet metal work, and the second label fixed to the main frame of the generator.

1.4 RATING PLATE

The generator has been supplied with a self adhesive rating plate label to enable fitting after final assembly and painting.

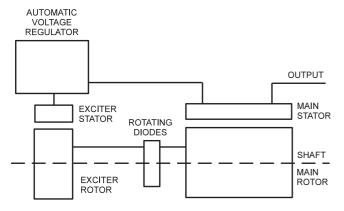
It is intended that this label will be stuck to the outside of the terminal box on the left hand side when viewed from the N.D.E. To assist with squarely positioning the label, location protrusions have been made in the sheet metalwork.

A CE Mark label is also supplied loose for fitment after final assembly and painting. This should be attached to an external surface of the Generator at a suitable location where it will not be obscured by the customer's wiring or other fittings.

The surface in the area where a label is to be stuck must be flat, clean, and any paint finish be fully dry before attempting to attach label. Recommended method for attaching label is peel and fold back sufficient of the backing paper to expose some 20 mm of label adhesive along the edge which is to be located against the sheet metal protrusions. Once this first section of label has been carefully located and stuck into position the backing paper can be progressively removed, as the label is pressed down into position. The adhesive will achieve a permanent bond in 24 hours.

PRINCIPLE OF OPERATION

2.1 SELF-EXCITED AVR CONTROLLED GENERATORS

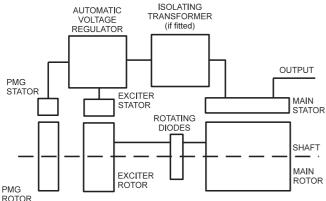


The main stator provides power for excitation of the exciter field via the SX460 (SX440 or SX421) AVR which is the controlling device governing the level of excitation provided to the exciter field. The AVR responds to a voltage sensing signal derived from the main stator winding. By controlling the low power of the exciter field, control of the high power requirement of the main field is achieved through the rectified output of the exciter armature.

The SX460 or SX440 AVR senses average voltage on two phases ensuring close regulation. In addition it detects engine speed and provides voltage fall off with speed, below a pre-selected speed (Hz) setting, preventing over-excitation at low engine speeds and softening the effect of load switching to relieve the burden on the engine.

The SX421 AVR in addition to the SX440 features has three phase rms sensing and also provides for over voltage protection when used in conjunction with an external circuit breaker (switchboard mounted).

2.2 PERMANENT MAGNET GENERATOR (PMG) EXCITED - AVR CONTROLLED GENERATORS



The permanent magnet generator (PMG) provides power for excitation of the exciter field via the AVR (MX341 or MX321) which is the controlling device governing the level of excitation provided to the exciter field. The AVR responds to a voltage sensing signal derived, via an isolating transformer in the case of MX321 AVR, from the main stator winding. By controlling the low power of the exciter field, control of the high power requirement of the main field is achieved through the rectified output of the exciter armature.

The PMG system provides a constant source of excitation power irrespective of main stator loading and provides high motor starting capability as well as immunity to waveform distortion on the main stator output created by non linear loads, e.g. thyristor controlled dc motor.

The MX341 AVR senses average voltage on two phases ensuring close regulation. In addition it detects engine speed and provides an adjustable voltage fall off with speed, below a pre-selected speed (Hz) setting, preventing over-excitation at low engine speeds and softening the effect of load switching to relieve the burden on the engine. It also provides over-excitation protection which acts following a time delay, to de-excite the generator in the event of excessive exciter field voltage.

The MX321 provides the protection and engine relief features of the MX341 and additionally incorporates 3 phase rms sensing and over-voltage protection.

The detailed function of all the AVR circuits is covered in the load testing (subsection 4.7).

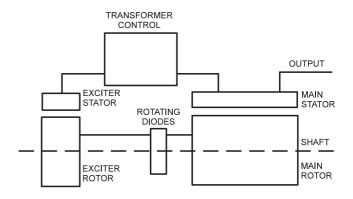
2.3 AVR ACCESSORIES

The SX440, SX421, MX341 and MX321 AVRs incorporate circuits which, when used in conjunction with accessories, can provide for parallel operation either with 'droop' or 'astatic' control, VAR/ PF control and in the case of the MX321 AVR, short circuit current limiting.

Function and adjustment of the accessories which can be fitted inside the generator terminal box are covered in the accessories section of this book.

Separate instructions are provided with other accessories available for control panel mounting.

2.4 TRANSFORMER CONTROLLED GENERATORS



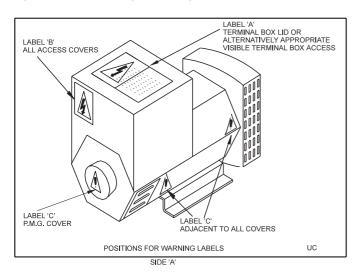
The main stator provides power for excitation of the exciter field via a transformer rectifier unit. The transformer combines voltage and current elements derived from the main stator output to form the basis of an open-loop control system, which is self regulating in nature. The system inherently compensates for load current magnitude and power factor and provides short circuit maintenance in addition to a good motor starting performance.

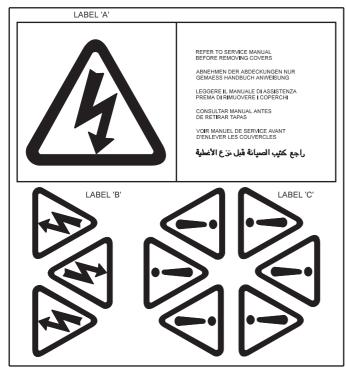
Three phase generators normally have a three phase transformer control for improved performance with unbalanced loads but a single phase transformer option is available.

No accessories can be provided with this control system.

APPLICATION OF THE GENERATOR

The generator is supplied as a component part for installation in a generating set. It is not, therefore, practicable to fit all the necessary warning/hazard labels during generator manufacture. The additional labels required are packaged with this Manual, together with a drawing identifying their locations. (See below).





It is the responsibility of the generating set manufacturer to ensure that the correct labels are fitted, and are clearly visible.

The generators have been designed for use in a maximum ambient temperature of 40°C and altitude less than 1000m above sea level in accordance with BS5000.

Ambients in excess of 40°C and altitudes above 1000m can be tolerated with reduced ratings - refer to the generator nameplate for rating and ambient. In the event that the generator is required to operate in an ambient in excess of the nameplate value or at altitudes in excess of 1000 metres above sea level, refer to the factory.

The generators are of air-ventilated screen protected drip-proof design and are not suitable for mounting outdoors unless adequately protected by the use of canopies. Anti-condensation heaters are recommended during storage and for standby duty to ensure winding insulation is maintained in good condition.

When installed in a closed canopy it must be ensured that the ambient temperature of the cooling air to the generator does not exceed that for which the generator has been rated.

The canopy should be designed such that the engine air intake to the canopy is separated from the generator intake, particularly where the radiator cooling fan is required to draw air into the canopy. In addition the generator air intake to the canopy should be designed such that the ingress of moisture is prohibited, preferably by use of a 2 stage filter.

The air intake/outlet must be suitable for the air flow given in the following table with additional pressure drops less than or equal to those given below:

Frame	Air Flow		Additional (intake/outlet)
	50Hz	60Hz	Pressure Drop
UC22	0.216m³/sec	0.281m³/sec	6mm water gauge
	458cfm	595cfm	0.25"
UCD22	0.25m³/sec	0.31m³/sec	6mm water gauge
	530cfm	657cfm	0.25"
UC27	0.514m³/sec	0.617m³/sec	6mm water gauge
	1090cfm	1308cfm	0.25"
UCD27	0.58m³/sec	0.69m³/sec	6mm water gauge
	1230cfm	1463cfm	0.25"

Important! Reduction in cooling air flow or inadequate protection to the generator can result in damage and/or failure of windings.

Dynamic balancing of the generator rotor assembly has been carried out during manufacture in accordance with BS 6861 Part 1 Grade 2.5 to ensure vibration limits of the generator are in accordance with BS 4999 Part 142.

The main vibration frequencies produced by the generator are as follows:-

4 pole 1500 rpm 25 Hz 4 pole 1800 rpm 30 Hz

However, vibrations induced by the engine are complex and contain frequencies of 1.5, 3, 5 or more times the fundamental frequency of vibration. These induced vibrations can result in generator vibration levels higher than those derived from the generator itself. It is the responsibility of the generating set designer to ensure that the alignment and stiffness of the bedplate and mountings are such that the vibration limits of BS5000 Part 3 are not exceeded.

In standby applications where the running time is limited and reduced life expectancy is accepted, higher levels than specified in BS5000 can be tolerated, up to a maximum of 18mm/sec.

Two bearing generators open coupled require a substantial bedplate with engine/generator mounting pads to ensure a good base for accurate alignment. Close coupling of engine to generator can increase the overall rigidity of the set. For the purposes of establishing set design the bending moment at the engine flywheel housing to generator adaptor interface should not exceed 1000ft.lb. (140 kgm). A flexible coupling, designed to suit the specific engine/generator combination, is recommended to minimise torsional effects.

Belt driven applications of two bearing generators require the pulley diameter and design to be such that the side load or force applied to the shaft is central to the extension and does not exceed the values given in the table below:-

Frame	Side Load		Shaft extension mm
	kgf	N	
UC22	408	4000	110
UC27	510	5000	140

In instances where shaft extensions greater than specified in the table have been supplied reference must be made to the factory for appropriate loadings.

Alignment of single bearing generators is critical and vibration can occur due to the flexing of the flanges between the engine and generator. As far as the generator is concerned the maximum bending moment at this point must not exceed 1000ft.lb. (140 kgm). A substanial bedplate with engine/generator mounting pads is required.

It is expected that the generator will be incorporated into a generating set operating in an environment, where the maximum shock load experienced by the generator will not exceed 3g. in any plane. If shock loads in excess of 3g are to be encountered, anti-vibration mountings must be incorporated into the generating set to ensure they absorb the excess.

The maximum bending moment of the engine flange must be checked with the engine manufacturer.

Generators can be supplied without a foot, providing the option for customers own arrangement. See SECTION 4.2.1 for assembly procedure.

Torsional vibrations occur in all engine-driven shaft systems and may be of a magnitude to cause damage at certain critical speeds. It is therefore necessary to consider the torsional vibration effect on the generator shaft and couplings.

It is the responsibility of the generator set manufacturer to ensure compatibility, and for this purpose drawings showing the shaft dimensions and rotor inertias are available for customers to forward to the engine supplier. In the case of single bearing generators coupling details are included.

Important!

Torsional incompatibility and/or excessive vibration levels can cause damage or failure of generator and/or engine components.

The terminal box is constructed with removable panels for easy adaptation to suit specific glanding requirements. Within the terminal box there are insulated terminals for line and neutral connections and provision for earthing. Additional earthing points are provided on the generator feet.

The neutral is NOT connected to the frame.

The main stator winding has leads brought out to the terminals in the terminal box.



No earth connections are made on the generator and reference to site regulations for earthing must be made. Incorrect earthing or protection arrangements can result in personal injury or death.

Fault current curves (decrement curves), together with generator reactance data, are available on request to assist the system designer to select circuit breakers, calculate fault currents and ensure discrimination within the load network.



Incorrect installation, service or replacement of parts can result in severe personal injury or death, and/or equipment damage. Service personnel must be qualified to perform electrical and mechanical service.

7

INSTALLATION - PART 1

4.1 LIFTING



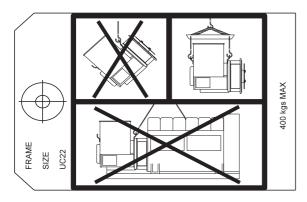
Incorrect lifting or inadequate lifting capacity can result in severe personal injury or equipment damage. MINIMUM LIFTING CAPACITY REQUIRED IS 750Kg. Generator lifting lugs should NOT be used for lifting the complete generator set.

Two lifting lugs are provided for use with a shackle and pin type lifting aid. Chains of suitable length and lifting capacity must be used. Lifting points are designed to be as close to the centre of gravity of the generator as possible, but due to design restrictions it is not possible to guarantee that the generator frame will remain horizontal while lifting. Care is therefore needed to avoid personal injury or equipment damage. The correct lifting arrangement is shown on the label attached to the lifting lug. (See sample below).

IMPORTANT

REFER TO SERVICE MANUAL BEFORE REMOVING COVERS. IT IS THE GENERATOR SET MANUFACTURER'S RESPONSIBILITY TO FIT THE SELF ADHESIVE WARNING LABELS SUPPLIED WITH THE GENERATOR. THE LABEL SHEET CAN BE FOUND WITH THE INSTRUCTION BOOK.





Single bearing generators are supplied fitted with a rotor retaining bar at the non-drive end of the shaft.

To remove retaining bar:

- 1. Remove the four screws holding the sheet metal cover at the non drive end and remove cover
- 2. Remove central bolt holding the retaining bar to the shaft
- Refit sheet metal cover.

Once the bar is removed, to couple the rotor to engine, the rotor is free to move in the frame, and care is needed during coupling and alignment to ensure the frame is kept in the horizontal plane.

Generators fitted with a PMG excitation system are not fitted with retaining bar. Refer to frame designation to verify generator type (subsection 1.2)

4.2 ASSEMBLY

During the assembly of the generator to the engine it will be necessary firstly to carefully align, then rotate, the combined generator rotor - engine crankshaft assembly, as part of the construction process, to allow location, insertion and tightening of the coupling bolts. This requirement to rotate the combined assemblies exists for both single and two bearing units.

During the assembly of single bearing units it is necessary to align the generator's coupling holes with the engine flywheel holes; it is suggested that two diametrically opposite location dowel pins are fitted to the engine flywheel, over which the generator coupling can slide into final location into the engine flywheel spigot recess. The dowels must be removed and replaced by coupling bolts before the final bolt tightening sequence.

While fitting and tightening the coupling bolts it will be necessary to rotate the engine crankshaft - generator rotor assembly. Care should be taken to ensure that rotation is carried out in an approved manner that ensures safe working practice when reaching inside the machine to insert or tighten coupling bolts, and that no component of the assembly is damaged by non-approved methods of assembly rotation.

Engine manufacturers have available a proprietary tool or facility designed to enable manual rotation of the crankshaft assembly. This must always be used, having been engineered as an approved method of assembly rotation, engaging the manually driven pinion with the engine flywheel starter ring-gear.

Caution!

Before working inside the generator, during the aligning and fitting of coupling bolts, care should be taken to lock the assembly to ensure there is no possibility of rotational movement.

4.2.1 NO FOOT OPTION

Generators can be supplied without a foot providing the option for customers own arrangement.

For details of mounting this arrangement, see the general arrangement drawing supplied with the generator. Alternatively refer to Newage International for a copy of the latest general arrangement drawing showing the 'NO FOOT OPTION' appropriate to your generator.

4.2.2 TWO BEARING GENERATORS

A flexible coupling should be fitted and aligned in accordance with the coupling manufacturer's instruction.

If a close coupling adaptor is used the alignment of machined faces must be checked by offering the generator up to the engine. Shim the generator feet if necessary. Ensure adaptor guards are fitted after generator/engine assembly is complete. Open coupled sets require a suitable guard, to be provided by the set builder.

In the case of belt driven generators, ensure alignment of drive and driven pulleys to avoid axial load on the bearings. Screw type tensioning devices are recommended to allow accurate adjustment of belt tension whilst maintaining pully alignment. Side loads should not exceed values given in SECTION 3.

Belt and pulley guards must be provided by the set builder.

Important! Incorrect belt tensioning will result in excessive bearing wear.

Caution! Incorrect guarding and/or generator alignment can result in personal injury and/or equipment damage.

4.2.3 SINGLE BEARING GENERATORS

Alignment of single bearing generators is critical. If necessary shim the generator feet to ensure alignment of the machined surfaces.

For transit and storage purposes the generator frame spigot and rotor coupling plates have been coated with a rust preventative. This MUST BE removed before assembly to engine.

A practical method for removal of this coating is to clean the mating surface areas with a de-greasing agent based on a petroleum solvent.

Care should be taken not to allow any cleaning agent to come into prolonged contact with skin.

The sequence of assembly to the engine should generally be as follows:

- On the engine check the distance from the coupling mating face on the flywheel to the flywheel housing mating face. This should be within +/-0.5mm of nominal dimension. This is necessary to ensure that a thrust is not applied to the a.c. generator bearing or engine bearing.
- 2. Check that the bolts securing the flexible plates to the coupling hub are tight and locked into position. Torque tightening is 24.9kgfm (244Nm; 180 lb ft).

2a. UCD224 Only

Torque tightening is 15.29 kgfm (150Nm; 110 lb ft).

- 3. Remove covers from the drive end of the generator to gain access to coupling and adaptor bolts.
- 4. Check that coupling discs are concentric with adaptor spigot. This can be adjusted by the use of tapered wooden wedges between the fan and adaptor. Alternatively the rotor can be suspended by means of a rope sling through the adaptor opening.
- Offer the a.c. generator to engine and engage both coupling discs and housing spigots at the same time, finally pulling home by using the housing and coupling bolts. Use heavy gauge washers between bolt head and discs on disc to flywheel bolts.
- 6. Tighten coupling disc to flywheel. Refer to engine manual for torque setting of disc to flywheel bolts.
- 7. Remove wooden wedges.

Caution! Incorrect guarding and/or generator alignment can result in personal injury and/or equipment damage.

4.3 EARTHING

The generator frame should be solidly bonded to the generating set bedplate. If antivibration mounts are fitted between the generator frame and its bedplate a suitably rated earth conductor (normally one half of the cross sectional area of the main line cables) should bridge across the antivibration mount.



f

Refer to local regulations to ensure that the correct earthing procedure has been followed.

4.4 PRE-RUNNING CHECKS 4.4.1 INSULATION CHECK

Before starting the generating set, both after completing assembly and after installation of the set, test the insulation resistance of windings.

The AVR should be disconnected during this test.

A 500V Megger or similar instrument should be used. Disconnect any earthing conductor connected between neutral and earth and megger an output lead terminal U, V or W to earth. The insulation resistance reading should be in excess of 5M Ω to earth. Should the insulation resistance be less than 5M Ω the winding must be dried out as detailed in the Service and Maintenance section of this Manual.

Important!

The windings have been H.V. tested during manufacture and further H.V. testing may degrade the insulation with consequent reduction in operating life. Should it be necessary to demonstrate H.V. testing, for customer acceptance, the tests must be carried out at reduced voltage levels i.e. Test Voltage= 0.8 (2 X Rated Voltage + 1000)

4.4.2 DIRECTION OF ROTATION

The generator is supplied to give a phase sequence of U V W with the generator running clockwise looking at the drive end (unless otherwise specified at the time of ordering). If the generator phase rotation has to be reversed after the generator has been despatched apply to factory for appropriate wiring diagrams.

UCI224, UCI274, UCM224, UCM274

Machines are fitted with bi-directional fans and are suitable for running in either direction of rotation.

UCD224, UCD274

Machines are fitted with uni-directional fans and are suitable for running in one direction only.

4.4.3 VOLTAGE AND FREQUENCY

Check that the voltage and frequency levels required for the generating set application are as indicated on the generator nameplate.

Three phase generators normally have a 12 ends out reconnectable winding. If it is necessary to reconnect the stator for the voltage required, refer to diagrams in the back of this manual.

4.4.4 AVR SETTINGS

To make AVR selections and adjustments remove the AVR cover and refer to 4.4.4.1, 4.4.4.2, 4.4.4.3, 4.4.4.4 or 4.4.4.5 depending upon type of AVR fitted. Reference to the generator nameplate will indicate AVR type (SX460, SX440, SX421, MX341 or MX321).

Most of the AVR adjustments are factory set in positions which will give satisfactory performance during initial running tests. Subsequent adjustment may be required to achieve optimum performance of the set under operating conditions. Refer to 'Load Testing' section for details.

4.4.4.1 TYPE SX460 AVR

The following 'jumper' connections on the AVR should be checked to ensure they are correctly set for the generating set application.

Refer to Fig. 1 for location of selection links.

1. Frequency selection

50Hz operation LINK C-50 60Hz operation LINK C-60

2. External hand trimmer selection

No external hand trimmer LINK 1-2

External hand trimmer required - REMOVE LINK 1-2 and connect trimmer across

terminals 1 and 2.

3. AVR Input Selection

High voltage (220/240V) Input NO LINK Low voltage (110/120V) Input LINK 3-4

Refer to diagram in the back of this manual to determine wiring.

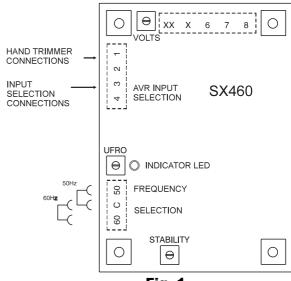


Fig. 1

4.4.4.2 TYPE SX440 AVR

The following 'jumper' connections on the AVR should be checked to ensure they are correctly set for the generating set application.

Refer to Fig. 2 for location of selection links.

1. Frequency selection terminals

50Hz operation LINK C-50 60Hz operation LINK C-60

2. Stability selection terminals

Frame UC22 LINK A-C Frame UC27 LINK B-C

3. Sensing selection terminals

LINK 2-3 LINK 4-5 LINK 6-7

4. Excitation Interruption Link

LINK K1-K2

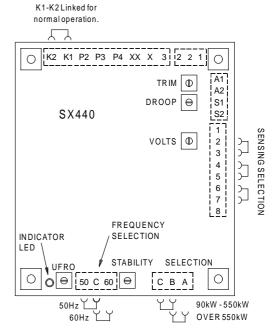


Fig. 2

4.4.4.3 TYPE SX421 AVR

The following 'jumper' connections on the AVR should be checked to ensure they are correctly set for the generating set application.

Refer to Fig. 3 for location of selection links.

1. Frequency selection terminals

50Hz operation LINK C-50 60Hz operation LINK C-60

2. Stability selection terminals

Depending upon kW output LINK B-D or LINK A-C or LINK B-C

3. Terminals K1 - K2

Excitation circuit breaker closed

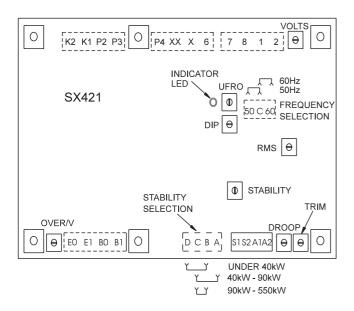


Fig. 3

4.4.4.4 TYPE MX341 AVR

The following 'jumper' connections on the AVR should be checked to ensure they are correctly set for the generating set application.

Refer to Fig. 4 for location of setting links.

1. Frequency selection terminals

50Hz operation LINK 2-3 60Hz operation LINK 1-3

2. Stability selection terminals

Frame UC22 LINK A-C Frame UC27 LINK B-C

3. Sensing selection terminals *

LINK 2-3 LINK 4-5 LINK 6-7

4. Excitation Interruption Link

LINK K1-K2

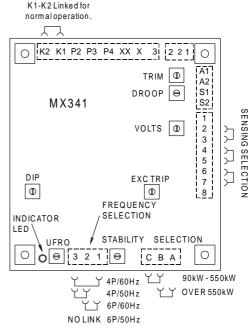


Fig. 4

4.4.4.5 TYPE MX321 AVR

The following 'jumper' connections on the AVR should be checked to ensure they are correctly set for the generating set application.

Refer to Fig. 5 for location of setting links.

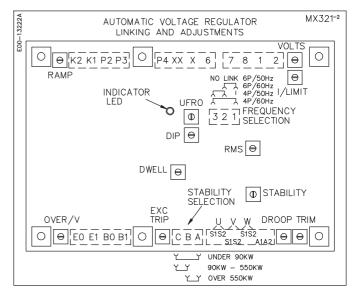


Fig. 5

1. Frequency selection terminals

50Hz operation LINK 2-3 60Hz operation LINK 1-3

2. Stability selection terminals

Frame UC22 LINK A-C Frame UC27 LINK B-C

3. Terminals K1 - K2

Excitation circuit breaker closed.

If this option not fitted, K1 - K2 linked at auxiliary terminal block.

4.4.5 TRANSFORMER CONTROLLED EXCITATION SYSTEM (Series 5)

This control system is identified with the digit 5 as the last digit of the frame size quoted on the nameplate.

The excitation control is factory set for the specific voltage shown on the nameplate and requires no adjustment.

4.5 GENERATOR SET TESTING



During testing it may be necessary to remove covers to adjust controls exposing 'live' terminals or components. Only personnel qualified to perform electrical service should carry out testing and/or adjustments.

4.5.1 TEST METERING/CABLING

Connect any instrument wiring and cabling required for initial test purposes with permanent or spring-clip type connectors.

Minimum instrumentation for testing should be line - line or line to neutral voltmeter, Hz meter, load current metering and kW meter. If reactive load is used a power factor meter is desirable.

Important!

When fitting power cables for load testing purposes, ensure cable voltage rating is at least equal to the genrator rated voltage. The load cable termination should be placed on top of the winding lead termination and clamped with the nut provided.

Caution!

Check that all wiring terminations for internal or external wiring are secure, and fit all terminal box covers and guards. Failure to secure wiring and/or covers may result in personal injury and/or equipment failure.

4.6 INITIAL START-UP



Warning!

During testing it may be necessary to remove covers to adjust controls exposing 'live' terminals or components. Only personnel qualified to perform electrical service should carry out testing and/or adjustments. Refit all access covers after adjustments are completed.

On completion of generating set assembly and before starting the generating set ensure that all engine manufacturer's prerunning procedures have been completed, and that adjustment of the engine governor is such that the generator will not be subjected to speeds in excess of 125% of the rated speed.

Important!

Overspeeding of the generator during initial setting of the speed governor can result in damage to the generator rotating components.

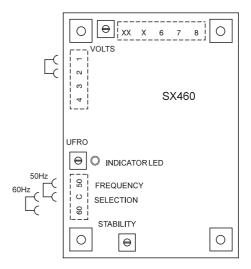
In addition remove the AVR access cover (on AVR controlled generators) and turn VOLTS control fully anti-clockwise. Start the generating set and run on no-load at nominal frequency. Slowly turn VOLTS control potentiometer clockwise until rated voltage is reached. Refer to Fig. 6a, 6b, 6c, 6d or 6e for control potentiometer location.

Important! Do not increase the voltage above the rated generator voltage shown on the generator nameplate.

The STABILITY control potentiometer will have been pre-set and should normally not require adjustment, but should this be required, usually identified by oscillation of the voltmeter, refer to Fig. 6a, 6b, 6c, 6d or 6e for control potentiometer location and proceed as follows:-

- Run the generating set on no-load and check that speed is correct and stable
- 2. Turn the STABILITY control potentiometer clockwise, then turn slowly anti-clockwise until the generator voltage starts to become unstable.

The correct setting is slightly clockwise from this position (i.e. where the machine volts are stable but close to the unstable region).



K1-K2 Linked for

normal operation

Fig. 6a

K1 P2 P3 P4 XX X 3 2 \bigcirc A1 TRIM \oplus A2 DROOP S1 SX440 S2 SENSING SELECTION VOLTS | 1 2 3 4 5 6 7 7 FREQUENCY SELECTION INDICATOR LED STABILITY SELECTION HERC Θ [50 C 60 | ⊖ СВ

Fig. 6b

90kW - 550kW OVER 550kW

60Hz L

12

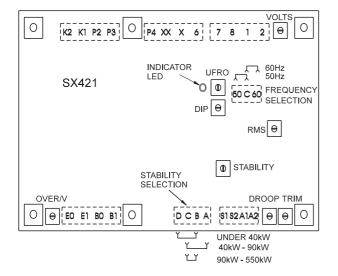


Fig. 6c

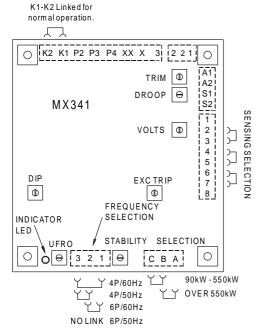


Fig. 6d

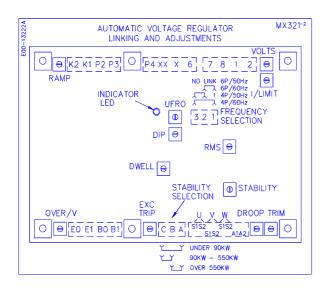


Fig. 6e

4.7 LOAD TESTING



During testing it may be necessary to remove covers to adjust controls exposing 'live' terminals or components. Only personnel qualified to perform electrical service should carry out testing and/or adjustments. Refit all access covers after adjustments are completed.

4.7.1 AVR CONTROLLED GENERATORS - AVR ADJUSTMENTS

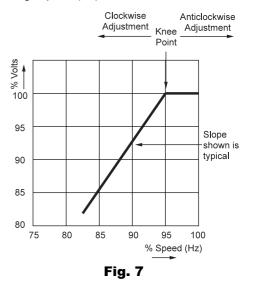
Refer to Fig. 6a, 6b, 6c, 6d or 6e for control potentiometer locations.

Having adjusted VOLTS and STABILITY during the initial startup procedure, other AVR control functions should not normally need adjustment.

If however, poor voltage regulation on-load or voltage collapse is experienced, refer to the following paragraphs on each function to a) check that the symptoms observed do indicate adjustment is necessary, and b) to make the adjustment correctly.

4.7.1.1 UFRO (Under Frequency Roll Off) (AVR Types SX460, SX440, SX421, MX341 and MX321)

The AVR incorporates an underspeed protection circuit which gives a voltage/speed (Hz) characteristic as shown:



The UFRO control potentiometer sets the "knee point".

Symptoms of incorrect setting are a) the light emitting diode (LED) indicator, just above the UFRO Control potentiometer, being permanently lit when the generator is on load, and b) poor voltage regulation on load, i.e. operation on the sloping part of the characteristic.

Clockwise adjustment lowers the frequency (speed) setting of the "knee point" and extinguishes the LED. For Optimum setting the LED should illuminate as the frequency falls just below nominal frequency, i.e. 47Hz on a 50Hz generator or 57Hz on a 60Hz generator.

Important!

With AVR Types MX341 and MX321. If the LED is illuminated and no output voltage is present, refer to EXC TRIP and/or OVER/V sections below.

4.7.1.2 EXC TRIP (Excitation Trip) AVR Types MX341 and MX321

An AVR supplied from a permanent magnet generator inherently delivers maximum excitation power on a line to line or line to neutral short circuit or large overload. In order to protect the generator windings the AVR incorporates an over excitation circuit which detects high excitation and removes it after a pre-determined time, i.e. 8-10 seconds.

Symptoms of incorrect setting are the generator output collapses on load or small overload, and the LED is permanently illuminated.

The correct setting is 70 volts +/-5% between terminals X and XX.

4.7.1.3 OVER/V (Over Voltage) AVR Type SX421, MX321

Over voltage protection circuitry is included in the AVR to remove generator excitation in the event of loss of AVR sensing input.

The MX321 has both internal electronic de-excitation and provision of a signal to operate an external circuit breaker.

The SX421 only provides a signal to operate an external breaker, which MUST be fitted if over voltage protection is required.

Incorrect setting would cause the generator output voltage to collapse at no-load or on removal of load, and the LED to be illuminated.

The correct setting is 300 volts +/-5% across terminals E1, E0. Clockwise adjustment of the OVER/V control potentiometer will increase the voltage at which the circuit operates.

4.7.1.4 TRANSIENT LOAD SWITCHING ADJUSTMENTS AVR Types SX421, MX341 and MX321

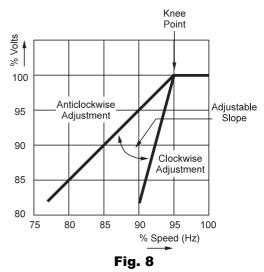
The additional function controls of DIP and DWELL are provided to enable the load acceptance capability of the generating set to be optimised. The overall generating set performance depends upon the engine capability and governor response, in conjunction with the generator characteristics.

It is not possible to adjust the level of voltage dip or recovery independently from the engine performance, and there will always be a 'trade off' between frequency dip and voltage dip.

DIP AVR Types SX421, MX341 and MX321

AVR Types SX421, MX341 and MX321

The dip function control potentiometer adjusts the slope of the voltage/speed (Hz) characteristic below the knee point as shown below:



DWELL AVR Type MX321

The dwell function introduces a time delay between the recovery of voltage and recovery of speed.

The purpose of the time delay is to reduce the generator kW below the available engine kW during the recovery period, thus allowing an improved speed recovery.

Again this control is only functional below the "knee point", i.e. if the speed stays above the knee point during load switching there is no effect from the DWELL function setting.

Clockwise adjustment gives increased recovery time.

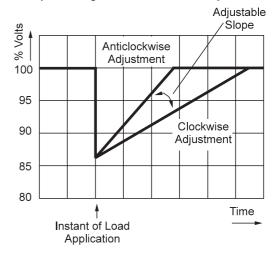


Fig. 9

The graphs shown above are representations only, since it is impossible to show the combined effects of voltage regulator and engine governor performance.

4.7.1.5 RAMP AVR Type MX321

The RAMP potentiometer enables adjustment of the time taken for the generator's initial build up to normal rated voltage during each start and run up to speed. The potentiometer is factory set to give a ramp time of three seconds, which is considered to be suitable for most applications. This time can be reduced to one second by turning the pot. fully counter clockwise, and increased to eight seconds by turning the pot. fully clockwise.

4.7.2 TRANSFORMER CONTROLLED GENERATORS - TRANSFORMER ADJUSTMENT

Normally no adjustment is required but should the no-load voltage and/or on-load voltage be unacceptable, adjustment of the transformer air gap can be made as follows.

Stop the generator. Remove transformer cover box. (Normally left hand side of the terminal box when viewed from the non drive end).

Slacken the three transformer mounting bolts along the top of the transformer.

Start the set with a voltmeter connected across the main output terminals.

Adjust the air gap between the transformer top lamination section and the transformer limbs to obtain required voltage on no-load. Slightly tighten the three mounting bolts. Switch load 'on' and 'off' two or three times. Application of load will normally raise the voltage setting slightly. With the load 'off' recheck the no-load voltage.

Readjust air gap and finally tighten mounting bolts.

Refit the access cover.



Failure to refit covers can result in operator personal injury or death.

4.8 ACCESSORIES

Refer to the "ACCESSORIES" - Section 6 of this Manual for setting up procedures related to generator mounted accessories.

If there are accessories for control panel mounting supplied with the generator refer to the specific accessory fitting procedures inserted inside the back cover of this book.

INSTALLATION - PART 2

5.1 GENERAL

The extent of site installation will depend upon the generating set build, e.g. if the generator is installed in a canopied set with integral switchboards and circuit breaker, on site installation will be limited to connecting up the site load to the generating set output terminals . In this case reference should be made to the generating set manufacturer's instruction book and any pertinent local regulations.

If the generator has been installed on a set without switchboard or circuit breaker the following points relating to connecting up the generator should be noted.

5.2 GLANDING

The terminal box is most conveniently glanded on either the right or left hand side. Both panels are removable for drilling/punching to suit glands/or glanding boxes. If single core cables are taken through the terminal box side panel an insulated or non-magnetic gland plate should be fitted.

Incoming cables should be supported from either below or above the box level and at a sufficient distance from the centre line of the generating set so as to avoid a tight radius at the point of entry into the terminal box panel, and allow movement of the generator set on its anti-vibration mountings without excessive stress on the cable.

Before making final connections, test the insulation resistance of the windings. The AVR should be disconnected during this test.

A 500V Megger or similar instrument should be used. Should the insulation resistance be less than $5 M\Omega$ the windings must be dried out as detailed in the Service and Maintenance section of this manual.

When making connections to the terminals the incoming cable termination should be placed on top of the winding lead termination(s) and clamped with the nut provided.

Important!

To avoid the possibility of swarf entering any electrical components in the terminal box, panels must be removed for drilling.

5.3 EARTHING

The neutral of the generator is not bonded to the generator frame as supplied from the factory. An earth terminal is provided inside the terminal box adjacent to the main terminals. Should it be required to operate with the neutral earthed a substantial earth conductor (normally equivalent to one half of the section of the line conductors) must be connected between the neutral and the earth terminal inside the terminal box. Additional earth terminals are provided on the generator feet. These should be already bonded to the generating set bedplate by the generating set builder, but will normally be required to be connected to the site earth system.

Caution!

Reference to local electricity regulations or safety rules should be made to ensure correct earthing procedures have been followed.

5.4 PROTECTION

It is the responsibility of the end user and his contractors/subcontractors to ensure that the overall system protection meets the needs of any inspectorate, local electricity authority or safety rules, pertaining to the site location.

To enable the system designer to achieve the necessary protection and/or discrimination, fault current curves are available on request from the factory, together with generator reactance values to enable fault current calculations to be made.



Incorrect installation and/or protective systems can result in personal injury and/or equipment damage.
Installers must be qualified to perform electrical installation work.

5.5 COMMISSIONING

Ensure that all external cabling is correct and that all the generating set manufacturer's pre-running checks have been carried out before starting the set.

The generator AVR controls will have been adjusted during the generating set manufacturer's tests and should normally not require further adjustment.

Should malfunction occur during commissioning refer to Service and Maintenance section 'Fault Finding' procedure (subsection 7.4).

ACCESSORIES

Generator control accessories may be fitted, as an option, in the generator terminal box. If fitted at the time of supply, the wiring diagram(s) in the back of this book shows the connections. When the options are supplied separately, fitting instructions are provided with the accessory.

The following matrix indicates availability of accessories with the differing AVRs.

Note the SX460 is not suitable for operation with accessories.

AVR Model	Parallel -ing Droop or Astatic	Manual Voltage Regulator	VAr/PF Control	Current Limit
SX440	~	×	~	×
SX421	~	×	~	×
MX341	~	~	~	×
MX321	~	~	~	~

6.1 REMOTE VOLTAGE ADJUST (ALL AVR TYPES)

A remote voltage adjust (hand trimmer) can be fitted.

SX460 Remove link 1-2 on the AVR and connect

adjuster to terminals 1 and 2.

SX440, SX421 Remove link 1-2 at the auxiliary terminals MX341 and MX321 and connect adjuster to terminals 1 and 2.

6.2 PARALLEL OPERATION

Understanding of the following notes on parallel operation is useful before attempting the fitting or setting of the droop kit accessory. When operating in parallel with other generators or the mains, it is essential that the phase sequence of the incoming generator matches that of the busbar and also that all of the following conditions are met before the circuit breaker of the incoming generator is closed on to the busbar (or operational generator).

- 1. Frequency must match within close limits.
- 2. Voltages must match within close limits.
- Phase angle of voltages must match within close limits.
 A variety of techniques, varying from simple synchronising lamps to fully automatic synchronisers, can be used to ensure these conditions are met.

Important! Failure to meet conditions 1, 2, and 3 when closing the cricuit breaker, will generate excessive mechanical and electrical stresses, resulting in equipment damage.

Once connected in parallel a minimum instrumentation level per generator of voltmeter, ammeter, wattmeter (measuring total power per generator), and frequency meter is required in order to adjust the engine and generator controls to share kW in relation to engine ratings and kVAr in relation to generator ratings.

It is important to recognise that:

 True kW are derived from the engine, and speed governor characteristics determine the kW sharing between sets

and

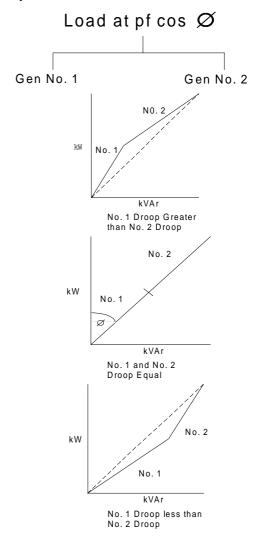
 kVAr are derived from the generator, and excitation control characteristics determine the kVAr sharing.
 Reference should be made to the generating set manufacturer's instructions for setting the governor controls.

6.2.1 DROOP

The most commonly used method of kVAr sharing is to create a generator voltage characteristic which falls with decreasing power factor (increasing kVAr). This is achieved with a current transformer (C.T.) which provides a signal dependent on current phase angle (i.e. power factor) to the AVR.

The current transformer has a burden resistor on the AVR board, and a percentage of the burden resistor voltage is summed into the AVR circuit. Increasing droop is obtained by turning the DROOP control potentiometer clockwise.

The diagrams below indicate the effect of droop in a simple two generator system:-



Generally 5% droop at full load current zero p.f. is sufficient to ensure kVAr sharing.

If the droop accessory has been supplied with the generator it will have been tested to ensure correct polarity and set to a nominal level of droop. The final level of droop will be set during generating set commissioning.

The following setting procedure will be found to be helpful.

6.2.1.1 SETTING PROCEDURE

Depending upon available load the following settings should be used - all are based on rated current level.

0.8 P.F. LOAD (at full load current) SET DROOP TO 3% Zero P.F. LOAD (at full load current) SET DROOP TO 5%

Setting the droop with low power factor load is the most accurate. Run each generator as a single unit at rated frequency or rated frequency + 4% depending upon type of governor and nominal voltage. Apply available load to rated current of the generator. Adjust 'DROOP' control potentiometer to give droop in line with above table. Clockwise rotation increases amount of droop. Refer to Fig 9a, 9b, 9c or 9d for potentiometer locations.

Note 1)

Reverse polarity of the C.T. will raise the generator voltage with load. The polarities S1-S2 shown on the wiring diagrams are correct for clockwise rotation of the generator looking at the drive end. Reversed rotation requires S1-S2 to be reversed.

Note 2)

The most important aspect is to set all generators equal. The precise level of droop is less critical.

Note 3)

A generator operated as a single unit with a droop circuit set at rated load 0.8 power factor is unable to maintain the usual +/-0.5% regulation. A shorting switch can be connected across S1-S2 to restore regulation for single running.

Important!

LOSS OF FUEL to an engine can cause its generator to motor with consequent damage to the generator windings.
Reverse power relays should be fitted to trip main circuit breaker. LOSS OF EXCITATION to the generator can result in large current oscillations with consequent damage to generator windings. Excitation loss detection equipment should be fitted on trip main circuit breaker.

6.2.2 ASTATIC CONTROL

The 'droop' current transformer can be used in a connection arrangement which enables the normal regulation of the generator to be maintained when operating in parallel.

This feature is only supplied from the factory as a fitted droop kit, however, if requested at the time of order, the diagrams inside the back cover of this book will give the necessary site connections. The end user is required to provide a shorting switch for the droop current transformer secondary.

Should the generator be required to be converted from standard droop to 'astatic' control, diagrams are available on request.

The setting procedure is exactly the same as for DROOP. (Subsection 6.2.1.1)

Important!

When using this connection arrangement a shorting switch is required across each C.T. burden (terminals S1 and S2.)The switch must be closed a) when a generating set is not running and b) when a generating set is selected for single running.

6.3 MANUAL VOLTAGE REGULATOR (MVR) - MX341 and MX321 AVR

This accessory is provided as an 'emergency' excitation system, in the event of an AVR failure.

Powered from the PMG output the unit is manually set, but automatically controls the excitation current, independent of generator voltage or frequency.

The unit is provided with 'MANUAL', 'OFF', 'AUTO' switching facility.

'MANUAL'

- position connects the exciter field to the MVR output. Generator output is then controlled by the operator adjusting the excitation current.

'OFF'

- disconnects the exciter field from both MVR and the normal $\ensuremath{\mathsf{AVR}}.$

'AUTO'

- connects the exciter field to the normal AVR and the generator output is controlled at the pre-set voltage under AVR control.

Switching mode of operation should be carried out with the generator set stationary to avoid voltage surges on the connected load, although neither the MVR nor AVR will be damaged should the switching be carried out with the set running.

6.4 OVERVOLTAGE DE-EXCITATION BREAKER SX421 and MX321 AVR

This accessory provides positive interuption of the excitation power in the event of overvoltage due to loss of sensing or internal AVR faults including the output power device.

With the MX321 AVR this accessory is supplied loose for fitting in the control panel.

In the case of the SX421 the cricuit breaker is always supplied and will normally be fitted in the generator.

Important!

When the circuit breaker is supplied loose, the AVR is fitted with a link on terminals K1-K2 to enable operation of the AVR. When connecting the circuit breaker this link must be removed.

6.4.1 RESETTING THE BREAKER

In the event of operation of the circuit breaker, indicated by loss of generator output voltage, manual resetting is required. When in the "tripped" state the circuit breaker switch lever shows "OFF". To reset move the switch lever to the position showing "ON".

When fitted in the generator, access to the breaker is gained by removal of the AVR access cover.



Terminals which are LIVE with the generating set running are exposed when the AVR access cover is removed. Resetting of the circuit breaker MUST be carried out with the generating set stationary, and engine starting circuits disabled.

The circuit breaker is mounted on the AVR mounting bracket either to the left or to the right of the AVR depending upon AVR poistion. After resetting the circuit breaker replace the AVR access cover before restarting the generating set. Should resetting of the circuit breaker not restore the generator to normal operation, refer to subsection 7.5.

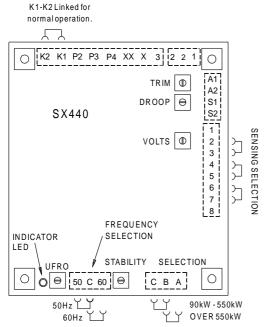


Fig. 9a

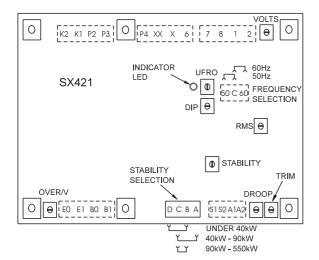


Fig. 9b

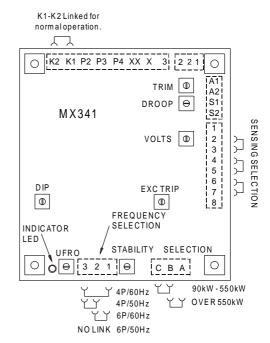


Fig. 9c

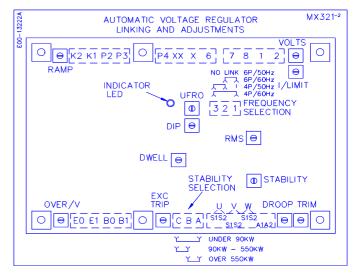


Fig. 9d

6.5 CURRENT LIMIT - MX321 AVR

These accessories work in conjunction with the AVR circuits to provide an adjustment to the level of current delivered into a fault. One current transformer (CT) per phase is fitted to provide current limiting on any line to line or line to neutral fault.

Note: The W phase CT can also provide "DROOP". Refer to 6.2.1.1 for setting droop independent of current limit.

Adjustment means is provided with the "I/LIMIT" control potentiometer on the AVR. Refer to Fig. 9d for location. If current limit transformers are supplied with the generator the limit will be set in accordance with the level specified at the time of order, and no further adjustment will be necessary. However, should the level need to be adjusted, refer to the setting procedure given in 6.5.1.

6.5.1 SETTING PROCEDURE

Run the generating set on no-load and check that engine governor is set to control nominal speed.

Stop the generating set. Remove the link between terminals K1-K2 at the auxiliary terminal block and connect a 5A switch across the terminals K1-K2.

Turn the "I/LIMIT" control potentiometer fully anticlockwise. Short circuit the stator winding with a bolted 3 phase short at the main terminals. An AC current clip-on ammeter is required to measure the winding lead current.

With the switch across K1-K2 open start the generating set.

Close the switch across K1-K2 and turn the "I/LIMIT" control potentiometer clockwise until required current level is observed on the clip-on ammeter. As soon as correct setting is achieved open the K1-K2 switch.

Should the current collapse during the setting procedure, the internal protective circuits of the AVR will have operated. In this event shut down the set and open the K1-K2 switch. Restart the set and run for 10 minutes with K1-K2 switch open, to cool the generator windings, before attempting to resume the setting procedure.

Important!

Failure to carry out the correct COOLING procedure, may cause overheating and consequent damage to the generator windings.

6.6 POWER FACTOR CONTROLLER (PFC3)

This accessory is primarily designed for those generator applications where operation in parallel with the mains supply is required.

Protection against loss of mains voltage or generator excitation is not included in the unit and the system designer must incorporate suitable protection.

The electronic control unit requires both droop and kVAr current transformers. When supplied with the generator, wiring diagrams inside the back cover of this manual show the conections and the additional instruction leaflet provided gives details of setting procedures for the power factor controller (PFC3).

The unit monitors the power factor of the generator current and adjusts excitation to maintain the power factor constant.

This mode can also be used to control the power factor of the mains if the point of current monitoring is moved to the mains cables. Refer to the factory for appropriate details.

It is also possible to operate the unit to control kVAr of the generator if required. Refer to the factory for appropriate details.

SERVICE AND MAINTENANCE

As part of routine maintenance procedures, periodic attention to winding condition (particularly when generators have been idle for a long period) and bearings is recommended. (Refer to subsections 7.1 and 7.2 respectively).

When generators are fitted with air filters regular inspection and filter maintenance is required. (Refer to subsection 7.3).

7.1 WINDING CONDITION



Service and fault finding procedures present hazards which can result in severe personal injury or death. Only personnel qualified to perform electrical and mechanical service should carry out these procedures.

Ensure engine starting circuits are disabled before commencing service or maintenance procedures. Isolate any anti-condensation heater supply.

Guidance of Typical Insulation Resistance [IR] Values

The following is offered as general information about IR values and is aimed at providing guidance about the typical IR values for generators from new through to the point of refurbishment.

New Machines

The generators Insulation Resistance, along with many other critical factors, will have been measured during the alternator manufacturing process. The generator will have been transported with an appropriate packaging suitable for the method of delivery to the Generating Set assemblers works. Where we expect it to be stored in a suitable location protected from adverse environmental conditions.

However, absolute assurance that the generator will arrive at the Gen-set production line with IR values still at the factory test levels of above 100 $\text{M}\Omega$ cannot be guaranteed.

At Generating Set Manufacturers Works

The generator should have been transported and stored such that it will be delivered to the assembly area in a clean dry condition. If held in appropriate storage conditions the generator IR value should typically be 25 M Ω .

If the unused/new generators IR values fall below 10 $M\Omega$ then a drying out procedure should be implemented by one of the processes outlined below before being despatched to the end customer's site. Some investigation should be undertaken into the storage conditions of the generator while on site.

Generators in Service

Whilst It is known that a generator will give reliable service with an IR value of just 1.0 M Ω . For a relatively new generator to be so low it must have been subjected to inappropriate operating or storage conditions.

Any temporarily reduction in IR values can be restored to expected values by following one of the drying out procedures.

7.1.1 WINDING CONDITION ASSESSMENT

Caution!

The AVR should be disconnected and the Resistance Temperature Detector (R.T.D.) leads grounded during this test.

The condition of the windings can be assessed by measurement of insulation resistance [IR] between phase to phase, and phase to earth.

Measurement of winding insulation should be carried out: -

- As part of a periodic maintenance plan.
- After prolonged periods of shutdown.
- When low insulation is suspected, e.g. damp or wet windings.

Care should be taken when dealing with windings that are suspected of being excessively damp or dirty. The initial measurement of the [IR] Insulation Resistance should be established using a low voltage (500V) megger type instrument. If manually powered the handle should initially be turned slowly so that the full test voltage will not be applied, and only applied for long enough to very quickly assess the situation if low values are suspected or immediately indicated.

Full megger tests or any other form of high voltage test should not be applied until the windings have been dried out and if necessary cleaned.

Procedure for Insulation Testing

Disconnect all electronic components, AVR, electronic protection equipment etc. Ground the [RTD's] Resistance Temperature Detection devices if fitted. Short out the diodes on the rotating diode assembly. Be aware of all components connected to the system under test that could cause false readings or be damaged by the test voltage.

Carry out the insulation test in accordance with the 'operating instructions for the test equipment.

The measured value of insulation resistance for all windings to earth and phase to phase should be compared with the guidance given above for the various 'life stages' of a generator. The minimum acceptable value must be greater than 1.0 $\text{M}\Omega.$

If low winding insulation is confirmed use one or more of the methods, given below, for drying the winding should be carried out.

7.1.2 METHODS OF DRYING OUT GENERATORS

Cold Run

Consider a good condition generator that has not been run for some time, and has been standing in damp, humid conditions. It is possible that simply running the gen set unexcited - AVR terminals K1 K2 open circuit - for a period of say 10 minutes will sufficiently dry the surface of the windings and raise the IR sufficiently, to greater than 1.0 $M\Omega$, and so allow the unit to be put into service.

Blown Air Drying

Remove the covers from all apertures to allow the escape of the water-laden air. During drying, air must be able to flow freely through the generator in order to carry off the moisture.

Direct hot air from two electrical fan heaters of around $1-3 \, kW$ into the generator air inlet apertures. Ensure the heat source is at least 300mm away from the windings to avoid over heating and damage to the insulation.

Apply the heat and plot the insulation value at half hourly intervals. The process is complete when the parameters covered in the section entitled, 'Typical Drying Out Curve', are met.

Remove the heaters, replace all covers and re-commission as appropriate.

If the set is not to be run immediately ensure that the anticondensation heaters are energised, and retest prior to running.

Short Circuit Method

NOTE: This process should only be performed by a competent engineer familiar with safe operating practices within and around generator sets of the type in question.

Ensure the generator is safe to work on, initiate all mechanical and electrical safety procedures pertaining to the genset and the site.

Bolt a short circuit of adequate current carrying capacity, across the main terminals of the generator. The shorting link should be capable of taking full load current.

Disconnect the cables from terminals "X" and "XX" of the AVR.

Connect a variable dc supply to the "X" (positive) and "XX" (negative) field cables. The dc supply must be able to provide a current up to $2.0\ \text{Amp}$ at 0 - $24\ \text{Volts}$.

Position a suitable ac ammeter to measure the shorting link current.

Set the dc supply voltage to zero and start the generating set. Slowly increase the dc voltage to pass current through the exciter field winding. As the excitation current increases, so the stator current in the shorting link will increase. This stator output current level must be monitored, and not allowed to exceed 80% of the generators rated output current.

After every 30 minutes of this exercise:

Stop the generator and switch off the separate excitation supply, and measure and record the stator winding IR values, and plot the results. The resulting graph should be compared with the classic shaped graph. This drying out procedure is complete when the parameters covered in the section entitled 'Typical Drying Out Curve' are met.

Once the Insulation Resistance is raised to an acceptable level - minimum value 1.0 $M\Omega-\,$ the dc supply may be removed and the exciter field leads "X" and "XX" re-connected to their terminals on the AVR.

Rebuild the genset, replace all covers and re-commission as appropriate.

If the set is not to be run immediately ensure that the anticondensation heaters are energised, and retest the generator prior to running.

TYPICAL DRYING OUT CURVE

Whichever method is used to dry out the generator the resistance should be measured every half-hour and a curve plotted as shown. (fig 6.)

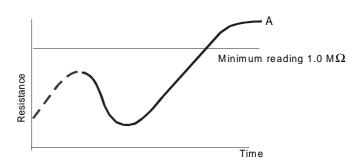


Fig. 9

The illustration shows a typical curve for a machine that has absorbed a considerable amount of moisture. The curve indicates a temporary increase in resistance, a fall and then a gradual rise to a steady state. Point 'A', the steady state, must be greater than 1.0 $M\Omega.$ (If the windings are only slightly damp the dotted portion of the curve may not appear).

For general guidance expect that the typical time to reach point 'A' will be:

- 1 hour for a BC16/18,
- 2 hours for a UC22/27
- 3 hours for an HC4.5.6&7

Drying should be continued after point "A" has been reached for at least one hour.

It should be noted that as winding temperature increases, values of insulation resistance may significantly reduce. Therefore, the reference values for insulation resistance can only be established with windings at a temperature of approximately 20°C.

If the IR value remains below 1.0 M Ω , even after the above drying methods have been properly conducted, then a Polarisation Index test [PI] should be carried out.

If the minimum value of 1.0 $M\Omega$ for all components cannot be achieved rewinding or refurbishment of the generator will be necessary.

The generator must not be put into service until the minimum values can be achieved.

Important! The short circuit must not be applied with the AVR connected in circuit. Current in

the AVR connected in circuit. Current in excess of the rated generator current will cause damage to the windings.

After drying out, the insulation resistances should be rechecked to verify minimum resistances quoted above are achieved. On re-testing it is recommended that the main stator insulation resistance is checked as follows:Separate the neutral leads

Ground	V and W	phase and megger	U phase to ground
Ground	U and W	phase and megger	V phase to ground
Ground	U and V	phase and megger	W phase to ground

If the minimum value of 1.0M Ω is not obtained, drying out must be continued and the test repeated.

7.2 BEARINGS

All bearings are supplied sealed for life and are, therefore, not regreasable.

Important!

The life of a bearing in service is subject to the working conditions and the environment.

Important!

Long stationary periods in an environment where there is vibration can cause false brinnelling which puts flats on the ball and grooves on the races.

Very humid atmospheres or wet conditions can emulsify the grease and cause corrosion.

Important!

High axial vibration from the engine or misalignment of the set will stress the bearing.

The bearing, in service, is affected by a variety of factors that together will determine the bearing life. We recommend that the health of the bearings be monitored, using 'spike energy' vibration monitoring equipment. This will allow the timely replacement of bearings, that exhibit a deteriorating trend, during a major engine overhaul.

If excessive heat, noise or vibration is detected, change the bearing as soon as practicable. Failure to do so could result in bearing failure.

In the event that 'spike energy' vibration monitoring equipment is not available, it is strongly recommend that consideration be given to changing the bearing during each 'major engine overhaul'.

Belt driven application will impose an additional load on bearings. The bearing life will therefore be significantly affected. It is important that the side load limits given in SECTION 3 are not exceeded and the health of the bearing is monitored more closely.

7.3 AIR FILTERS

The frequency of filter maintenance will depend upon the severity of the site conditions. Regular inspection of the elements will be required to establish when cleaning is necessary.

7.3.1 CLEANING PROCEDURE



Danger!

Removal of filter elements enables access to LIVE parts.

Only remove elements with the generator out of service.

Remove the filter elements from the filter frames. Immerse or flush the element with a suitable detergent until the element is clean. Dry elements thoroughly before refitting.

7.4 FAULT FINDING

Important! Before commencing any fault finding procedure examine all wiring for broken or loose conections.

Four types of excitation control system, involving four types of AVR, can be fitted to the range of generators covered by this manual. The systems can be identified by a combination of AVR type, where applicable, and the last digit of the generator frame size designation. Refer to the generator nameplate then proceed to the appropriate subsection as indicated below:-

DIGIT	EXCITATION CONTROL	SUBSECTION
6	SX460 AVR	7.4.1
4	SX440 AVR	7.4.2
4	SX421 AVR	7.4.3
5	Transformer control	7.4.4
3	MX341 AVR	7.4.5
3	MX321 AVR	7.4.6

7.4.1 SX460 AVR - FAULT FINDING

No voltage build-up when starting set	 Check speed Check residual voltage. Refer to subsection 7.4.7. Follow Separate Excitation Test Procedure to check generator and AVR.
Unstable voltage either on no-load or with load	 Check speed stability. Check stability setting. Refer to subsection 4.6.
High voltage either on no-load or with load	Check speed. Check that generator load is not capacitive (leading power factor).
Low voltage no-load	Check speed. Check link 1-2 or external hand trimmer leads for continuity.
Low voltage on-load	 Check speed. Check UFRO setting. Refer to subsection 4.7.1.1. Follow Separate Excitation Procedure to check generator and AVR. Refer to subsection 7.5.

7.4.2 SX440 AVR - FAULT FINDING

No voltage build-up when starting set.	 Check link K1-K2 on auxiliary terminals. Check speed. Check residual voltage. Refer to subsection 7.4.7. Follow Separate Excitation Test Procedure to check generator and AVR. Refer to subsection 7.5.
Unstable voltage either on no-load or with load.	 Check speed stability. Check stability setting. Refer to subsection 4.6.
High voltage either on no-load or with load	 Check speed. Check that generator load is not capacitive (leading power factor).
Low voltage no-load	Check speed. Check link 1-2 or external hand trimmer leads for continuity.
Low voltage on-load	 Check speed. Check UFRO setting. Refer to subsection 4.7.1.1. Follow Separate Excitation Procedure to check generator and AVR. Refer tosubsection 7.5.

7.4.3 SX421 AVR - FAULT FINDING

No voltage build-up when starting set	 Check circuit breaker 'ON'. Refer to subsection 6.4.1. Check speed. Check residual voltage. Refer to subsection 7.4.7. Follow Separate Excitation Procedure to check generator and AVR. Refer to subsection 7.5.
Unstable voltage either on no-load or with load	 Check speed stability. Check stability setting. Refer to subsection 4.6.
High voltage either on no-load or with load	 Check speed. Check link 1-2 or external hand trimmer leads for continuity. Check continuity of leads 7-8 and P3-P2 for continuity. Check that generator load is not capacitive (leading power factor).
Low voltage no-load	Check speed. Check link 1-2 or external hand trimmer leads for continuity.

Low voltage on-load	 Check speed. Check UFRO setting. Refer to subsection 4.7.1.1. Follow Separate Excitation to check generator and AVR. Refer to subsection 7.5.
Excessive voltage/speed dip on-load switching	Check governor response. Refer to generating set manual. Check 'DIP' setting. Refer to subsection 4.7.1.4.

7.4.4 TRANSFORMER CONTROL - FAULT FINDING

No voltage build-up when starting set	Check transformers rectifiers. Check transformer secondary winding for open circuit.
Low volatge	 Check speed. Check transformer air gap setting. Refer to subsection 4.7.2.
High voltage	 Check speed. Check transformer air gap setting. Refer to subsection 4.7.2. Check transformer secondary winding for short circuited turns.
Excessive voltage drop on-load	 Check speed drop on-load. Check transformer rectifiers. Check transformer air gap setting. Refer to subsection 4.7.2.

7.4.5 MX341 AVR - FAULT FINDING

•	
No voltage build-up when starting set	 Check link K1-K2 on auxiliary terminals. Follow Separate Excitation Test Procedure to check machine and AVR. Refer to subsection 7.5.
Loss of voltage when set running	First stop and re-start set. If no voltage or voltage collapses after short time, follow Separate Excitation Test Procedure. Refer to subsection 7.5.
Generator voltage high followed by collapse	 Check sensing leads to AVR. Refer to Separate Excitation Test Procedure. Refer to subsection 7.5.
Voltage unstable either on no-load or with load	 Check speed stability. Check "STAB" setting. Refer to Load Testing section for procedure. Refer to subsection 4.6.
Low voltage on-load	 Check speed. If correct check "UFRO" setting. Refer to subsection 4.7.1.1.
Excessive voltage/speed dip on load switching	Check governor response. Refer to generating set manual. Check "DIP" setting. Refer to subsection 4.7.1.4.
Sluggish recovery on load switching	Check governor response. Refer to generating set manual.

7.4.6 MX321 AVR - FAULT FINDING

No voltage build-up when starting set	Check link K1-K2 on auxiliary terminals. Follow Separate Excitation Test Procedure to check machine and AVR. Refer to subsection 7.5.
Voltage very slow to build up	Check setting of ramp potentiometer. Refer to 4.7.1.5.
Loss of voltage when set running	First stop and re-start set. If no voltage or voltage collapses after short time, follow Separate Excitation Test Procedure. Refer to subsection 7.5.
Generator voltage high followed by collapse	Check sensing leads to AVR. Refer to Separate Excitation Test Procedure. Refer to subsection 7.5.
Voltage unstable either on no-load or with load	 Check speed stability. Check "STAB" setting. Refer to Load Testing section for procedure. Refer to subsection 4.6.
Low voltage on-load	Check speed. If correct check "UFRO" setting. Refer to subsection 4.7.1.1.
Excessive voltage/speed dip on load switching	Check governor responses. Refer to generating set manual. Check "DIP" setting. Refer to subsection 4.7.1.4.
Sluggish recovery on load switching	Check governor response. Refer to generating set manual. Check "DWELL" setting. Refer to Load Testing section 4.7.1.4.

7.4.7 RESIDUAL VOLTAGE CHECK

This procedure is applicable to generators with either SX460 or SX440 or SX421 AVR.

With the generator set stationary remove AVR access cover and leads X and XX from the AVR.

Start the set and measure voltage across AVR terminals 7-8 on SX460 AVR or P2-P3 on SX440 or SX421 AVR.

Stop the set, and replace leads X and XX on the AVR terminals.If the measured voltage was above 5V the generator should operate normally.

If the measured voltage was under 5V follow the proceedure below.

Using a 12 volt d. c. battery as a supply clip leads from battery negative to AVR terminal XX, and from battery positive through a diode to AVR terminal X. See Fig. 10.

Important! A diode must be used as shown below to ensure the AVR is not damaged.

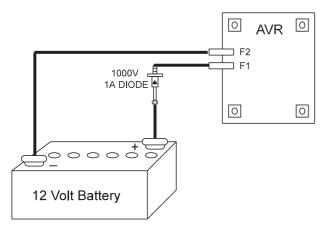


Fig. 11

Important! If the generating set battery is used for field flashing the generator main stator neutral must be disconnected from earth.

Restart the set and note output voltage from main stator, which should be approximately nominal voltage, or voltage at AVR terminals 7 and 8 on SX460, P2-P3 on SX440 or SX421 which should be between 170 and 250 volts.

Stop the set and unclip battery supply from terminals X and XX. Restart the set. The generator should now operate normally. If no voltage build-up is obtained it can be assumed a fault exists in either the generator or the AVR circuits. Follow the SEPARATE EXCITATION TEST PROCEDURE to check generator windings, rotating diodes and AVR. Refer to subsection 7.5.

7.5 SEPARATE EXCITATION TEST PROCEDURE

The generator windings, diode assembly and AVR can be checked using the appropriate following section.

7.5.1 GENERATOR WINDINGS, ROTATING DIODES and PERMANENT MAGNET GENERATOR (PMG)
7.5.2 EXCITATION CONTROL TEST.

7.5.1 GENERATOR WINDINGS, ROTATING DIODES and PERMANENT MAGNET GENERATOR (PMG)

Important! The res

The resistances quoted apply to a standard winding. For generators having windings or voltages other than those specified refer to factory for details. Ensure all disconnected leads are isolated and free from earth.

Important!

Incorrect speed setting will give proportional error in voltage output.

CHECKING PMG

Start the set and run at rated speed.

Measure the voltages at the AVR terminals P2, P3 and P4. These should be balanced and within the following ranges:-

50Hz generators - 170-180 volts 60Hz generators - 200-216 volts

Should the voltages be unbalanced stop the set, remove the PMG sheet metal cover from the non drive endbracket and disconnect the multipin plug in the PMG output leads. Check leads P2, P3, P4 for continuity. Check the PMG stator resistances between output leads. These should be balanced and within +/-10% of 2.3 ohms. If resistances are unbalanced and/or incorrect the PMG stator must be replaced. If the voltages are balanced but low and the PMG stator winding resistances are correct - the PMG rotor must be replaced.

CHECKING GENERATOR WINDINGS AND ROTATING DIODES

This procedure is carried out with leads X and XX disconnected at the AVR or transformer control rectifier bridge and using a 12 volt d.c. supply to leads X and XX.

Start the set and run at rated speed.

Measure the voltages at the main output terminals U, V and W. If voltages are balanced and within +/-10% of the generator nominal voltage, refer to 7.5.1.1.

Check voltages at AVR terminals 6, 7 and 8. These should be balanced and between 170-250 volts.

If voltages at main terminals are balanced but voltage at 6, 7 and 8 are unbalanced, check continuity of leads 6, 7 and 8. Where an isolating transformer is fitted (MX321 AVR) check transformer windings. If faulty the transformer unit must be replaced.

If voltages are unbalanced, refer to 7.5.1.2.

7.5.1.1 BALANCED MAIN TERMINAL VOLTAGES

If all voltages are balanced within 1% at the main terminals, it can be assumed that all exciter windings, main windings and main rotating diodes are in good order, and the fault is in the AVR or transformer control. Refer to subsection 7.5.2 for test procedure.

If voltages are balanced but low, there is a fault in the main excitation windings or rotating diode assembly. Proceed as follows to identify:-

2

Rectifier Diodes

The diodes on the main rectifier assembly can be checked with a multimeter. The flexible leads connected to each diode should be disconnected at the terminal end, and the forward and reverse resistance checked. A healthy diode will indicate a very high resistance (infinity) in the reverse direction, and a low resistance in the forward direction. A faulty diode will give a full deflection reading in both directions with the test meter on the 10,000 ohms scale, or an infinity reading in both directions.

On an electronic digital meter a healthy diode will give a low reading in one direction, and a high reading in the other.

Replacement of Faulty Diodes

The rectifier assembly is split into two plates, the positive and negative, and the main rotor is connected across these plates. Each plate carries 3 diodes, the negative plate carrying negative biased diodes and the positive plate carrying positive biased diodes. Care must be taken to ensure that the correct polarity diodes are fitted to each respective plate. When fitting the diodes to the plates they must be tight enough to ensure a good mechanical and electrical contact, but should not be overtightened. The recommended torque tightening is 4.06 - 4.74Nm (36-42lb in).

Surge Suppressor

The surge suppressor is a metal-oxide varistor connected across the two rectifier plates to prevent high transient reverse voltages in the field winding from damaging the diodes. This device is not polarised and will show a virtually infinite reading in both directions with an ordinary resistance meter. If defective this will be visible by inspection, since it will normally fail to short circuit and show signs of disintegration. Replace if faulty.

Main Excitation Windings

If after establishing and correcting any fault on the rectifier assembly the output is still low when separately excited, then the main rotor, exciter stator and exciter rotor winding resistances should be checked (see Resistance Charts), as the fault must be in one of these windings. The exciter stator resistance is measured across leads X and XX. The exciter rotor is connected to six studs which also carry the diode lead terminals. The main rotor winding is connected across the two rectifier plates. The respective leads must be disconnected before taking the readings.

Resistance values should be within +/-10% of the values given in the table below:-

Frame	Main	I	Exciter		
Size	Size Rotor		Type 2*	Type 3**	Rotor
UC22C	0.59	21	28	138	0.142
UC22D	0.64	21	28	138	0.142
UC22E	0.69	20	30	155	0.156
UC22F	0.83	20	30	155	0.156
UC22G	0.94	20	30	155	0.156
UC27C	1.12	20	-	-	0.156
UC27D	1.26	20	-	-	0.156
UC27E	1.34	20	-	-	0.182
UC27F	1.52	20	-	-	0.182
UC27G	1.69	20	-	-	0.182
UC27H	1.82	20	-	-	0.182
UCD27J	2.08	20	-	-	0.182
UCD27K	2.08	20	-	-	0.182

^{*} Used with 1 phase transformer controlled 3 phase or 1 phase generators.

7.5.1.2 UNBALANCED MAIN TERMINAL VOLTAGES

If voltages are unbalanced, this indicates a fault on the main stator winding or main cables to the circuit breaker. NOTE: Faults on the stator winding or cables may also cause noticeable load increase on the engine when excitation is applied. Disconnect the main cables and separate the winding leads U1-U2, U5-U6, V1-V2, V5-V6, W1-W2, W5-W6 to isolate each winding section. (U1-L1, U2-L4 on single phase generators).

Measure each section resistance - values should be balanced and within +/-10% of the value given below:-

AVR CONTROLLED GENERATORS				
Frame	SECTION RESISTANCES			
Size	Winding 311	Winding 17	Winding 05	Winding 06
UC22C	0.09	0.14	0.045	0.03
UC22D	0.065	0.1	0.033	0.025
UC22E	0.05	0.075	0.028	0.02
UC22F	0.033	0.051	0.018	0.012
UC22G	0.028	0.043	0.014	0.01
UC27C	0.03	0.044	0.016	0.011
UC27D	0.019	0.026	0.01	0.007
UC27E	0.016	0.025	0.009	0.008
UC27F	0.012	0.019	0.007	0.005
UC27G	0.01	0.013	0.006	0.004
UC27H	0.008	0.014	0.004	0.004
UCD27J	0.006	0.009	-	-
UCD27K	0.006	0.009	-	-

TRANSFORMER CONTROLLED GENERATORS					
	SECTION RESISTANCES, 3 PHASE WINDINGS				IDINGS
Frame Size	380V	400V	415V	416V	460V
	50Hz	50Hz	50Hz	60Hz	60Hz
UC22C	0.059	0.078	0.082	0.055	0.059
UC22D	0.054	0.056	0.057	0.049	0.054
UC22E	0.041	0.05	0.053	0.038	0.041
UC22F	0.031	0.032	0.033	0.025	0.031
UC22G	0.022	0.026	0.028	0.021	0.022

Measure insulation resistance between sections and each section to earth.

Unbalanced or incorrect winding resistances and/or low insulation resistances to earth indicate rewinding of the stator will be necessary. Refer to removal and replacement of component assemblies subsection 7.5.3.

7.5.2 EXCITATION CONTROL TEST 7.5.2.1 AVR FUNCTION TEST

All types of AVR's can be tested with this procedure:

- Remove exciter field leads X & XX (F1 & F2) from the AVR terminals X & XX (F1 & F2).
- Connect a 60W 240V household lamp to AVR terminals X & XX (F1 & F2).
- 3. Set the AVR VOLTS control potentiometer fully clockwise.
- Connect a 12V, 1.0A DC supply to the exciter field leads X & XX (F1 & F2) with X (F1) to the positive.

^{**} Used with 3 phase transformer controlled 3 phase generators. 27

- 5. Start the generating set and run at rated speed.
- Check that the generator output voltage is within +/-10% of rated voltage.

Voltages at AVR terminals 7-8 on SX460 AVR or P2-P3 on SX440 or SX421 AVR should be between 170 and 250 volts. If the generator output voltage is correct but the voltage on 7-8 (or P2-P3) is low, check auxiliary leads and connections to main terminals.

Voltages at P2, P3, P4 terminals on MX341 and MX321 should be as given in 7.5.1.

The lamp connected across X-XX should glow. In the case of the SX460, SX440 and SX421 AVRs the lamp should glow continuously. In the case of the MX341 and MX321 AVRs the lamp should glow for approximately 8 secs. and then turn off. Failure to turn off indicates faulty protection circuit and the AVR should be replaced. Turning the "VOLTS" control potentiometer fully anti-clockwise should turn off the lamp with all AVR types.

Should the lamp fail to light the AVR is faulty and should be replaced.

Important! After this test turn VOLTS control potentiometer fully anti-clockwise.

7.5.2.2 TRANSFORMER CONTROL

The transformer rectifier unit can only be checked by continuity, resistance checks and insulation resistance measurement.

Two phase transformer

Separate primary leads T1-T2-T3-T4 and secondary leads 10-11. Examine windings for damage. Measure resistances across T1-T3 and T2-T4. These will be a low value but should be balanced. Check that there is resistance in the order of 8 ohms between leads 10 and 11. Check insulation resistance of each winding section to earth and to other winding sections.

Low insulation resistance, unbalanced primary resistance, open or short circuited winding sections, indicates the transformer unit should be replaced.

Three phase transformer

Separate primary leads T1-T2-T3 and secondary leads 6-7-8 and 10-11-12.

Examine windings for damage. Measure resistances across T1-T2, T2-T3, T3-T1. These will be low but should be balanced. Check that resistances are balanced across 6-10, 7-11 and 8-12 and in the order of 18 ohms.

Check insulation resistance of each winding section to earth and to other winding sections.

Low insulation resistance, unbalanced primary or secondary winding resistances, open or short circuited winding sections indicates the transformer unit should be replaced.

Rectifier units - Three phase and single phase

With the leads 10-11-12-X and XX removed from the rectifier unit (lead 12 is not fitted on single phase transformer rectifier units), check forward and reverse resistances between terminals 10-X, 11-X, 12-X, 10-XX, 11-XX and 12-XX with a multimeter.

A low forward resistance and high reverse resistance should be read between each pair of terminals. If this is not the case the unit is faulty and should be replaced.

7.5.3 REMOVAL AND REPLACEMENT OF COMPONENT ASSEMBLIES

METRIC THREADS ARE USED THROUGHOUT

Caution!

When lifting single bearing generators, care is needed to ensure the generator frame is kept in the horizontal plane. The rotor is free to move in the frame and can slide out if not correctly lifted. Incorrect lifting can cause serious personal injury.

7.5.3.1 REMOVAL OF PERMANENT MAGNET GENERATOR (PMG)

- 1. Remove 4 screws holding the sheet metal cylindrical cover at the non-drive end and remove the cover.
- Disconnect the in line connector from the PMG stator (3 wires go to this connector). It may be necessary to cut off the nylon cable tie first.
- Remove the 4 threaded pillars and clamps holding the PMG stator onto the end bracket.
- 4. Tap the stator out of the 4 spigots and withdraw. The highly magnetic rotor will attract the stator. Take care to avoid contact which may damage the windings.
- 5. Remove the bolt in the centre from the rotor shaft and pull off the rotor. It may be necessary to gently tap the rotor away. Take care to tap gently and evenly - the rotor has ceramic magnets which are easily broken by shock.

Important! The rotor assembly must not be dismantled.

Replacement is a reversal of the above procedure.

7.5.3.2 REMOVAL OF BEARINGS

Important! Position the main rotor so that a full pole face of the main rotor core is at the bottom of the stator bore.

NOTE: Removal of the bearings may be effected either after the rotor assembly has been removed OR more simply by removal of endbracket(s). Refer to 7.5.3.3. and 7.5.3.4.

The bearings are pre-packed with grease and sealed for life.

The bearing(s) are a press fit and can be removed from the shaft with 3 leg or 2 leg manual or hydraulic bearing pullers.

SINGLE BEARING ONLY: Before trying to pull off the bearing remove the small circlip retaining it.

When fitting new bearings use a bearing heater to expand the bearing before fitting to the shaft. Tap the bearing into place ensuring that it contacts the shoulder on the shaft.

Refit the retaining circlip on single bearing generators.

7.5.3.3 REMOVAL OF ENDBRACKET AND EXCITER STATOR

- 1. Remove exciter leads X+, XX- at the AVR.
- 2. Slacken 4 bolts (2 each side) situated on horizontal centre line holding the terminal box.
- Remove 2 bolts holding lifting lug, at the non-drive end, and remove lug.

 Remove sheet metal cylindrical cover (4 screws) over PMG (if fitted)

or

Remove shallow sheet metal cover (4 screws) at the nondrive end.

- 5. Ease up the terminal box and support clear of the nondrive endbracket.
- Remove 6 bolts holding the non-drive endbracket to the stator bar assembly. The endbracket is now ready for removal.
- Replace the lifting lug onto the endbracket and sling the endbracket on a hoist to facilitate lifting.
- Tap the endbracket around its perimeter to release from the generator. The endbracket and exciter stator will come away as a single assembly.
- Remove the 4 screws holding the exciter stator to the endbracket and gently tap the exciter stator to release it. Replacement is a reversal of the above procedure.

7.5.3.4 REMOVAL OF THE ROTOR ASSEMBLY

Remove the permanent magnet generator. Refer to 7.5.3.1 or

Remove the four screws holding the sheet metal cover at the non drive end and remove cover.

Caution!

With the PMG rotor removed single bearing generator rotors are free to move in the frame. Ensure frame is kept in the horizontal plane when lifting.

TWO BEARING GENERATORS

- 1. Remove 2 screws holding the sheet metal cover around the adaptor at the drive end and remove the cover.
- Remove the bolts holding the adaptor to the endbracket at the drive end.
- Tap off the adaptor. It may be preferred to sling the adaptor first depending on its size and weight.
- Remove the screens and louvres (if fitted) at each side on the drive end.

Now ensure that the rotor is positioned with a full pole face at the bottom centre line. This is to avoid damage to the bearing exciter, or rotor winding, by limiting the possible rotor downward movement to the air gap length.

- Remove 6 bolts holding drive endbracket onto adaptor ring DE. The boltheads face towards the non-drive end. The top bolt passes through the centre of the lifting lug.
- Tap the drive endbracket away from the adaptor ring DE and withdraw the endbracket.
- 7. Ensure the rotor is supported at the drive end on a sling.
- 8. Tap the rotor from the non-drive end to push the bearing clear of the endbracket and its position within an 'O' ring.
- 9. Continue to push the rotor out of the stator bore, gradually working the sling along the rotor as it is withdrawn, to ensure that it is fully supported all the time.

SINGLE BEARING GENERATORS

 Remove the screws, screens and louvres (if fitted) at each side on drive end adaptor.

2. UCI224, UCI274, UCM224, UCM274, UCD274 Only

Remove 6 bolts holding the adaptor at the drive end. It may be preferred to sling the adaptor on a hoist. The bolt heads face towards the non-drive end. The top bolt passes through the centre of the lifting lug.

2a. UCD224 Only

Remove 6 bolts holding the adaptor at the drive end. It may be preferred to sling the adaptor on a hoist.

3. UCI224, UCI274, UCM224, UCM274, UCD274 Only

Tap the adaptor away from stator bar adaptor ring.

3a. UCD224 Only

Tap the adaptor away from stator bar assembly.

ALL SINGLE BEARING GENERATORS

- 4. Ensure the rotor is supported at drive end on a sling.
- 5. Tap the rotor from the non-drive end to push the bearing clear of the endbracket and its position within an 'O' ring.
- Continue to push the rotor out of the stator bore, gradually working the sling along the rotor as it is withdrawn, to ensure that it is fully supported at all times.

Replacement of rotor assemblies is a reversal of the procedures above.

Before commencing re-assembly, components should be checked for damage and bearing(s) examined for loss of grease.

Fitting of new bearing(s) is recommended during major overhaul.

Before replacement of a single bearing rotor assembly, check that the drive discs are not damaged, cracked or showing other signs of fatigue. Also check that the holes in the discs for drive fixing screws are not elongated.

Damaged or worn components must be replaced.

Caution!

When major components have been replaced, ensure that all covers and guards are securely fitted, before the generator is put into service.

7.6 RETURNING TO SERVICE

After rectification of any faults found, remove all test connections and reconnect all control system leads.

Restart the set and adjust VOLTS control potentiometer on AVR controlled generators by slowly turning clockwise until rated voltage is obtained.

Refit all terminal box covers/access covers and reconnect heater supply.

Caution!

Failure to refit all guards, access covers and terminal box covers can result in personal injury of death.

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SECTION 8 SPARES AND AFTER SALES SERVICE

8.1 RECOMMENDED SPARES

Service parts are conveniently packaged for easy identification. Genuine parts may be recognised by the Nupart name.

We recommend the following for Service and Maintenance. In critical applications a set of these service spares should be held with the generator.

AVR Controlled Generators

1.	Diode Set (6 diodes with surge suppressor)		RSK	2001
2.	AVR SX440		E000	24030
	AVR SX460		E000	24602
	AVR SX421		E000	24210
	AVR MX321		E000	23212
	AVR MX341		E000	23410
3.	Non drive end Bearing	UC22	051	01032
		UC27	051	01049
4.	Drive end Bearing	UC22	051	01044
		UC27	051	01050

Transformer Controlled Generators (UC22 Only)

1.	 Diode Set (6 diodes with surge suppressor) 		RSK	2001
2.	Diode Assembly		E000	22006
3.	Non drive end Bearing	UC22	051	01032
4.	Drive end Bearing	UC22	051	01044

When ordering parts the machine serial number or machine identity number and type should be quoted, together with the part description. For location of these numbers see paragraph 1.3.

Orders and enquiries for parts should be addressed to:

Newage International Limited Nupart Department PO Box 17, Barnack Road STAMFORD Lincolnshire PE9 2NB ENGLAND

Telephone: 44 (0) 1780 484000 Fax: 44 (0) 1780 766074

Or any of our subsidiary companies listed on the back cover.

8.2 AFTER SALES SERVICE

A full technical advice and on-site service facility is available from our Service Department at Stamford or through our Subsidiary Companies. A repair facility is also available at our Stamford Works.

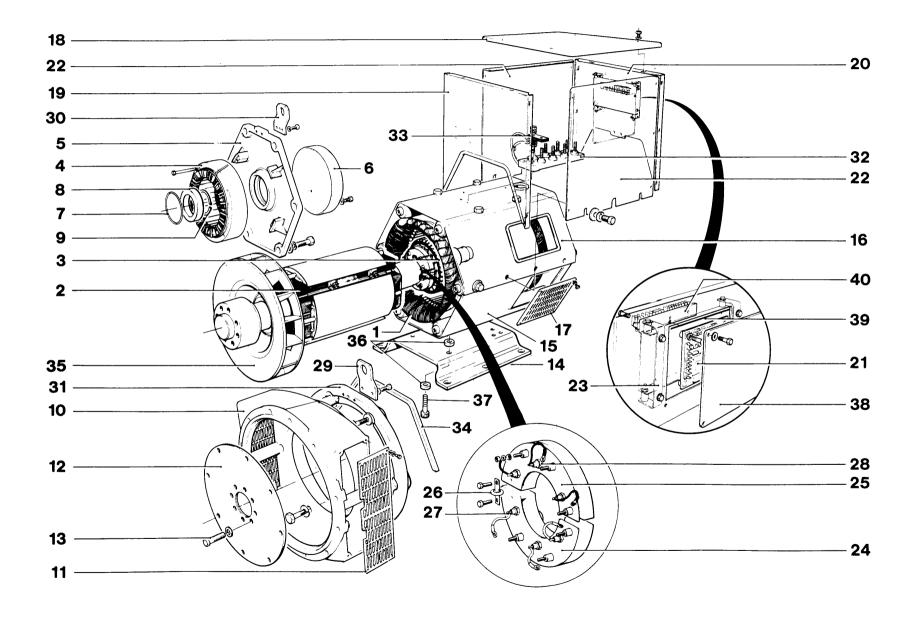
PARTS LIST TYPICAL SINGLE BEARING GENERATOR

Plate Ref.	Description	Plate Ref.	Description
Plate Ref. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	Stator Rotor Exciter Rotor Exciter Stator N.D.E. Bracket Cover N.D.E. Bearing 'O' Ring N.D.E. Bearing N.D.E. Bearing Circlip N.D.E. D.E. Bracket/Engine Adaptor D.E. Screen Coupling Disc Coupling Bolt Foot Frame Cover Bottom Frame Cover Top Air Inlet Cover Terminal Box Lid	25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	Main Rectifier Assembly - Reverse Varistor Diode - Forward Polarity Diode - Reverse Polarity Lifting Lug - D.E. Lifting Lug - N.D.E. Frame to Endbracket Adaptor Ring Main Terminal Panel Terminal Link Edging Strip Fan Foot Mounting Spacer Cap Screw AVR Access Cover AVR Anti-Vibration Mounting Assembly Auxiliary Terminal Assembly
19	Endpanel D.E. Endpanel N.D.E.		
21 22	AVR Side Panel		
23 24	AVR Mounting Bracket Main Rectifier Assembly - Forward		

N.D.E. Non Drive End D.E. Drive End

PMG Permanent Magnet Generator **AVR** Automatic Voltage Regulator

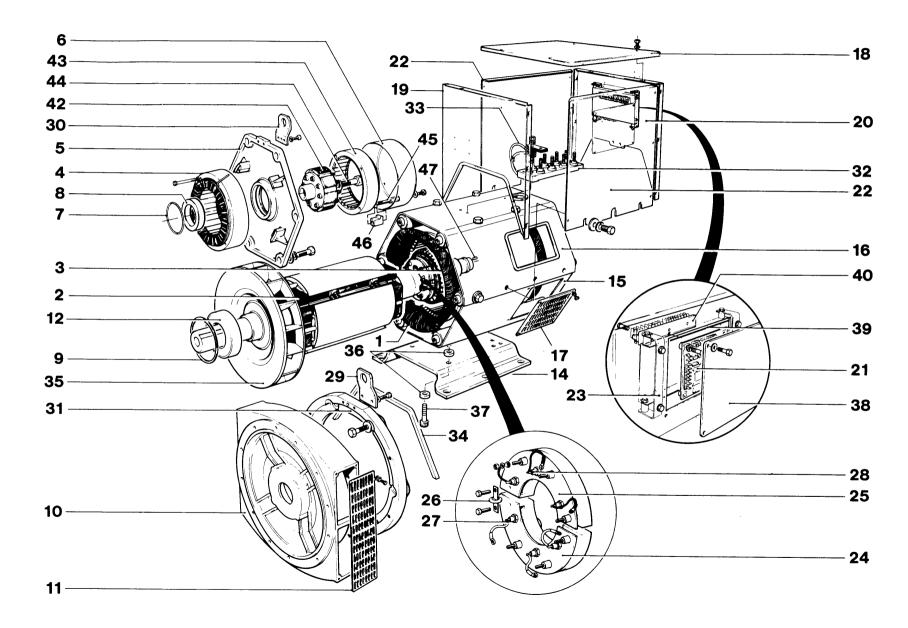




1 Stator 25 Main Rectifier Assembly - Reverse 2 Rotor 26 Varistor 3 Exciter Rotor 27 Diode - Forward Polarity 4 Exciter Stator 28 Diode - Reverse Polarity 5 N.D.E. Bracket 29 Lifting Lug - D.E. 6 Cover N.D.E. 30 Lifting Lug - N.D.E. 7 Bearing N.D.E. 31 Frame to Endbracket Adaptor Ring 8 Bearing N.D.E. 32 Main Terminal Panel 9 Bearing Wave Washer D.E. 33 Terminal Link 10 D.E. Bracket 34 Edging Strip 11 D.E. Screen 35 Fan 12 Bearing D.E. 36 Foot Mounting Spacer 14 Foot 37 Cap Screw 15 Frame Cover Bottom 38 AVR Access Cover 16 Frame Cover Top 39 AVR Anti-Vibration Mount 17 Air Inlet Cover 40 Auxiliary Terminal Assembly 18	Plate Ref.	Description	Plate Ref.	Description
23 AVR Mounting Bracket 47 PMG Dowel 24 Main Rectifier Assembly - Forward	1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 17 18 19 20 21 22 23	Stator Rotor Exciter Rotor Exciter Stator N.D.E. Bracket Cover N.D.E. Bearing 'O' Ring N.D.E. Bearing Wave Washer D.E. D.E. Bracket D.E. Screen Bearing D.E. Foot Frame Cover Bottom Frame Cover Top Air Inlet Cover Terminal Box Lid Endpanel D.E. Endpanel N.D.E. AVR Side Panel AVR Mounting Bracket	25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 42 43 44 45 46	Main Rectifier Assembly - Reverse Varistor Diode - Forward Polarity Diode - Reverse Polarity Lifting Lug - D.E. Lifting Lug - N.D.E. Frame to Endbracket Adaptor Ring Main Terminal Panel Terminal Link Edging Strip Fan Foot Mounting Spacer Cap Screw AVR Access Cover AVR Anti-Vibration Mount Auxiliary Terminal Assembly PMG Exciter Rotor PMG Bolt PMG Pillar PMG Clamp

N.D.E. Non Drive EndD.E. Drive EndPMG Permanent Magnet GeneratorAVR Automatic Voltage Regulator





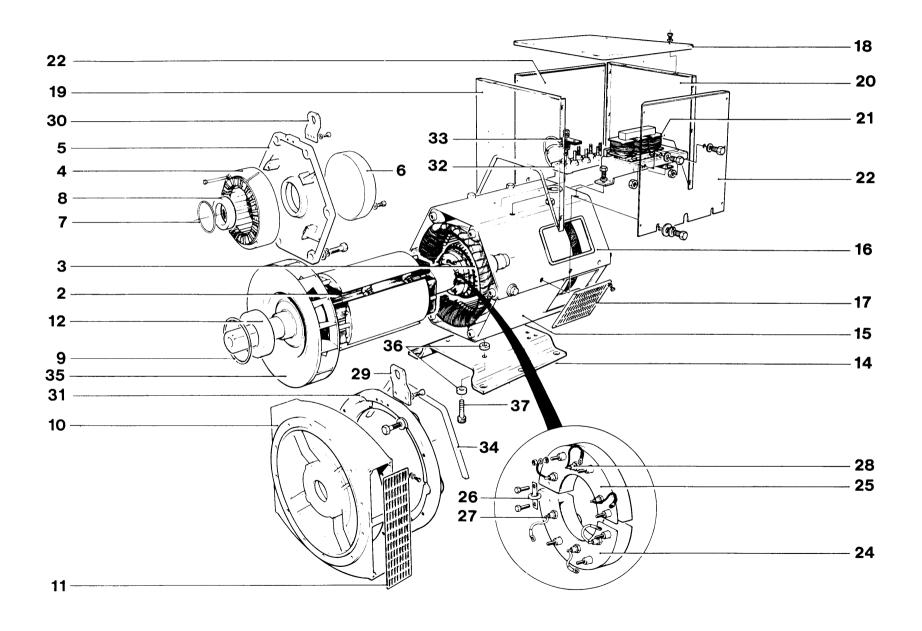
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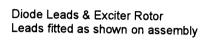
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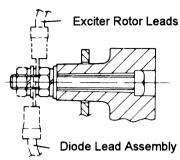
	Description	Plate Ref.	Description
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	Stator Rotor Exciter Rotor Exciter Stator N.D.E. Bracket Cover N.D.E. Bearing 'O' Ring N.D.E. Bearing Wave Washer D.E. D.E. Bracket D.E. Screen Bearing D.E. Foot Frame Cover Bottom Frame Cover Top Air Inlet Cover Terminal Box Lid Endpanel D.E. Endpanel N.D.E. Series 5 Control Gear Side Panel Main Rectifier Assembly - Forward	25 26 27 28 29 30 31 32 33 34 35 36 37	Main Rectifier Assembly - Reverse Varistor Diode - Forward Polarity Diode - Reverse Polarity Lifting Lug - D.E. Lifting Lug - N.D.E. Frame to Endbracket Adaptor Ring Main Terminal Panel Terminal Link Edging Strip Fan Foot Mounting Spacer Cap Screw

N.D.E. Non Drive End D.E. Drive End

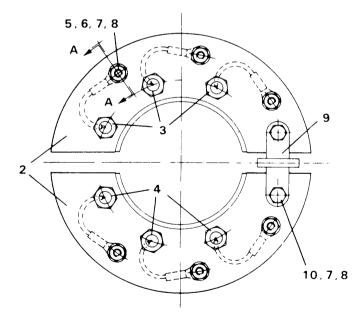








Scrap Section A-A



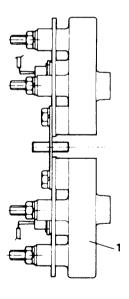


Plate Ref.	Description	Qty
1	Hub	1
2	Fin	2
3	Diode (fwd)	3
4	Diode (rev)	3
5	Hx. Screw	6
6	Hx. Nut	6
7	Pl. Washer	8
8	SC. L/Washer	8
9	Varistor	1
10	Hx. Screw	2

NOTES:

Fitting of Diodes.

- 1. Underside of diodes to be smeared with Midland Silicone 'Heat Sink' compound type MS2623. This compound must not be applied to the diode threads.
- 2. Diodes to be tightened to a torque of 2.03 2.37 Nm.
- 3. For Nupart rectifier service kit see page 28.

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This manual is available in the following languages on request: English, French, German, Italian and Spanish.
Denne manual er til rådighed på følgende sprog: engelsk, fransk, tysk, italiensk og spansk.
Denne håndboken er tilgjengelig på de følgende språkene: engelsk, fransk, tysk, italiensk og spansk.
Sur simple demande, ce manuel vous sera fourni dans l'une des langues suivantes: anglais, français, allemand, italien, espagnol.
Dieses Handbuch ist auf Anfrage in den folgenden Sprachen erhältlich: Englisch, Französisch, Deutsch, Italienisch, Spanisch.
Deze handleiding is op verzoek leverbaar in de volgende talen: Engels, Frans, Duits, Italiaans, Spaans.
Este manual pode também ser obtido nas seguintes línguas: inglês, francês, alemão, italiano e espanhol.
Tämä käsikirja on saatavissa pyynnöstä seuraavilla kielillä: Englanti, ranska, saksa, italia, espanja.
Il presente manuale è disponibile, su richiesta, nelle seguenti lingue: inglese, francese, tedesco, italiano e spagnolo.
Este manual también puede solicitarse en los siguientes idiomas: inglés, francés, alemán, italiano e español.
Αυτό το εγχειρίδιο οδηγιών χρήσεως διατίθεται στις ακόλουθες γλώσσες κατόπιν αιτήσενς: Αγγλικά, Γαλλικά Γερμανικά, Ιταλικά, Ισπανικά.

A.C. GENERATOR WARRANTY

WARRANTY PERIOD

A.C. Generators

In respect of a.c. generators the Warranty Period is eighteen months from the date when the goods have been notified as ready for despatch by N.I. or twelve months from the date of first commissioning (whichever is the shorter period).

DEFECTS AFTER DELIVERY

We will make good by repair or, at our option, by the supply of a replacement, any fault which under proper use appears in the goods within the period specified on Clause 12, and is found on examination by us to be solely due to defective material and workmanship; provided that the defective part is promptly returned, carriage paid, with all identification numbers and marks intact, or our works or, if appropriate to the Dealer who supplied the goods.

Any part repaired or replaced, under warranty, will be returned by N.I. free of charge (via sea freight if outside the UK).

We shall not be liable for any expenses which may be incurred in removing or replacing any part sent to us for inspection or in fitting any replacement supplied by us. We shall be under no liability for defects in any goods which have not been properly installed in accordance with N.I. recommended installation practices as detailed in the publications 'N.I. Installation, Service and Maintenance Manual' and 'N.I. Application Guidelines', or which have been improperly stored or which have been repaired, adjusted or altered by any person except ourselves or our authorised agents, or in any second-hand goods, proprietary articles or goods not of our own manufacture although supplied by us, such articles and goods being covered by the warranty (if any) given by the separate manufacturers.

Any claim under this clause must contain fully particulars of the alleged defect, the description of the goods, the date of purchase, and the name and address of the Vendor, the Serial Number (as shown on the manufacturers identification plate) or for Spares the order reference under which the goods were supplied.

Our judgement in all cases of claims shall be final and conclusive and the claimant shall accept our decision on all questions as to defects and the exchange of a part or parts.

Our liability shall be fully discharged by either repair or replacement as above, and in any event shall not exceed the current list price of the defective goods.

Our liability under this clause shall be in lieu of any warranty or condition implied by law as to the quality or fitness for any particular purpose of the goods, and save as expressly provided in this clause we shall not be under any liability, whether in contract, tort or otherwise, in respect of defects in goods delivered or for any injury, damages or loss resulting from such defects or from any work undone in connection therewith.

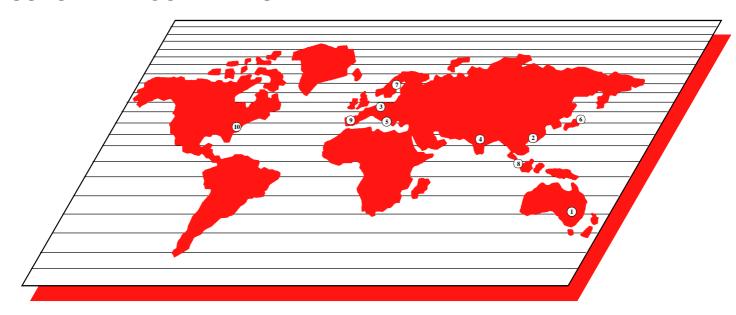
MACHINE SERIAL NUMBER	

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Section 5 - GE Fanuc PLC



GE Fanuc Automation

Series 90™-30 PLCs

The Series 90™-30 PLCs are a family of controllers, I/O systems and specialty modules designed to meet the demand for versatile industrial solutions. With its single overall control architecture, the Series 90-30 has been the PLC of record in over 200,000 applications, such as high-speed packaging, material handling, complex motion control, water treatment, continuous emissions monitoring, mining, food processing, elevator control, injection molding and many more.



Thanks to its modular design, the Series 90-30 offers unmatched versatility. Configure just the system you need, saving critical space and reducing cost.

With over 100 I/O modules, the Series 90-30 PLC can be adapted to a wide range of applications.

- Digital interfaces for push buttons, switches, proximity sensors, relays, contactors and many other devices
- Analog modules with varying degrees of resolution for flow, temperature or pressure applications
- · Direct connect wiring or remote termination
- Local or remote I/O systems

Series 90-30 Ethernet communications provide a real-time link between the plant floor and the boardroom. You can begin with an Ethernet-enabled CPU, or at a later date, choose from our selection of rack-mounted Ethernet modules. The Series 90-30 Ethernet module supports both SRTP and Modbus TCP/IP application protocols.

The scaleable processing power in the Series 90-30 CPU creates a clear upgrade path. Create the system that's ideal today, while leaving open the option of creating a more powerful system tomorrow — without having to change your application software.

Motion control integrated into the Series 90-30 fosters high performance point-to-point applications.

A variety of Series 90-30 field bus interfaces enables distributed control and/or I/O. Choose from Ethernet EGD, Profibus-DP™, Genius®, DeviceNet™ and Interbus-S™ modules. Field Bus interface modules are easy to install and quick to configure. Plug them into an existing system or design a new system around them.

Ease of programming is a strong suit of the Series 90-30. Choose the programming options that meet your needs: Windows®-based IEC programming, advanced C or State Logic®. Floating point math, PID, indirect addressing, array moves and sequencing are just a few of the over 200 instructions available.

The Series 90-30 stands out among small controls for offering redundancy options. The Series 90-30 is the low-cost solution for high availability applications, with redundant CPUs and power supplies.

Easy trouble shooting and machine setup using a handheld PDA. CIMPLICITY® Machine Edition Logic Developer PDA software allows you to interface a Palm® handheld device to your Series 90-30 controller. With Logic Developer PDA, you can monitor/change data, view diagnostics, force ON/OFF, and configure machine setup — saving you time and increasing productivity.

Ordering Information

Orderin Description	Catalog Number		Catalog Number	
Discrete Input	IC693MDL230	120 VAC Isolated Input (8 Points)	IC693MDL646	24 VDC Input, Neg/Pos Logic, 1 msec Filter (16 Points)
•		240 VAC Isolated Input (8 Points)	IC693MDL648	
Modules	IC693MDL231			48 VDC Input, Neg/Pos Logic, 1 msec filter, Neg/Pos Logic (16 Points)
	IC693MDL240	120 VAC Input (16 Points)	IC693MDL653	24 VDC Input, Neg/Pos Logic, 2msec Filter (32 Points)
	IC693MDL241	24 VAC/VDC Input (16 Points)	IC693MDL654	5/12 VDC (TTL) Input, Neg/Pos Logic, (32 Points)
	IC693MDL632	125 VDC Input (8 Points)	IC693MDL655	24 VDC Input, Neg/Pos Logic, 1 ms, (32 Points)
	IC693MDL634	24 VDC Input, Neg/Pos Logic (8 Points)	IC693ACC300	Input Simulator Module (8 Points)
	IC693MDL645	24 VDC Input, Neg/Pos Logic (16 Points)		
Discrete Output	IC693MDL310	120 VAC Output, 0.5 Amp (12 Points)	IC693MDL740	12/24 VDC Output, 0.5 Amp, Positive Logic (16 Points)
Modules	IC693MDL330	120/240 VAC Output, 2 Amp (8 Points)	IC693MDL741	12/24 VDC Output, 0.5 Amp, Negative Logic (16 Points)
	IC693MDL340	120 VAC Output, 0.5 Amp (16 Points)	IC693MDL742	12/24 VDC Output, 1 Amp, Positive Logic (16 Points), Fused
	IC693MDL390	120/240 VAC Isolated Output, 2 Amp (5 Points)	IC693MDL748	48 VDC Output, 0.5 Amps, Positive Logic (8 Points)
	IC693MDL730	12/24 VDC Output, 2 Amp, Positive Logic (8 Points)	IC693MDL750	12/24 VDC Output, Negative Logic (32 Points)
	IC693MDL731	12/24 VDC Output, 2 Amp, Negative Logic (8 Points)	IC693MDL751	12/24 VDC Output, Positive Logic (32 Points)
	IC693MDL732	12/24 VDC Output, 0.5 Amp, Positive Logic (8 Points)	IC693MDL752	5/12/24 VDC (TTL) Output, Negative Logic, (32 Points)
	IC693MDL733	12/24 VDC Output, 0.5 Amp, Negative Logic (8 Points)	IC693MDL753	12/24 VDC Output, Positive Logic (32 Points)
	IC693MDL734	125 VDC Output, (6 Points)	TGGGGIVIDE735	1224 VDG Output, 1 ostave Logic (32.1 otrics)
Dalass Osstasst			ICCOOMEDIAN	Dalan Ontant 2 Arra (16 Dainte)
Relay Output	IC693MDL930	Relay Output, Isolated, 4 Amp (8 Points)	IC693MDL940	Relay Output, 2 Amp (16 Points)
Module	IC693MDL931	Relay Output, 8 Amp Form B/C contacts, Isolated in 2 Groups of 4 (8 Points)		
Mixed Discrete Module	IC693MDR390	Mixed I/O, 24 VDC Input (8 points), Relay Output (8 points)	IC693MAR590	Mixed I/O, 120 VAC Input (8 Points), Relay Output (8 Points)
Analog Input	IC693ALG220	Analog Input, Voltage/Current, 4 Channels	IC693ALG222	Analog Input, Voltage 16 Single/8 Differential Channels
Modules	IC693ALG221	Analog Input, Current, 4 Channels	IC693ALG223	Analog Input, Current, 16 Single Channels
Analog Output	IC693ALG390	Analog Output, Voltage, 2 Channels	IC693ALG392	High Density Analog Output (8 Channels)
			10033AL0332	riigii Density Analog Output (o Granners)
Modules	IC693ALG391	Analog Output, Current, 2 Channels		
Mixed Analog	IC693ALG442	Analog Combo Module 4IN/20UT		
Modules				
Motion Modules	IC693APU300	High Speed Counter (HSC)	IC693APU305	High Speed Counter with Gray Code Encoder or an A QUAD B Encoder Input
	IC693APU301	Axis Positioning Module (APM), 1 Axis	IC693DSM302	Digital Servo Motion Controller, 2 Axis
	IC693APU302	Axis Positioning Module (APM), 2 Axis	IC693DSM314	Digital Servo Motion Controller, 1-2 Axis of Digital Servo or 1-4 Axis Analog Servo
Specialty	IC693MDL760	Solenoid Valve Output (11 Points)/24 VDC Output, 0.5 Amp, Positive Logic (5 Points)	IC693PTM101	Power Transducer Module, CT and PT Interface 120/240 VAC (1m cable)
Modules	IC693PCM301	Programmable Coprocessor Module, 192 KB (47 KB Basic or C Program), 2 Serial Ports	IC693TCM302	Temperature Control Module, (8) TC In and (8) 24 VDC Solid State Outputs
	IC693PCM311 IC693PTM100	Programmable Coprocessor Module, 640 KB (640 KB Basic or C Program), 2 Serial Ports Power Transducer Module, CT and PT Interface 120/240 VAC (0.5m Cable)	IC693TCM303	Temperature Control Module Extended Temperature Range, (8) TC In and (8) 24 VDC Solid State Outputs
C			ICCOORDA ADOO	
Communications	IC693BEM331	Genius Bus Controller (Supports I/O and Datagrams)	IC693PBM200	Profibus DP Master Module
Modules	IC693CMM302	Communication Module, Genius (1 Kbyte) GCM+ (No Datagram Support)	IC693PBM201	Profibus DP Slave Module
	IC693CMM311	Communications Module, CCM, RTU, SNP, and SNPx Protocols	IC693DNM200	DeviceNet Master Module
	IC693CMM321	Ethernet Interface TCP/IP Module, 10Mbs (Supports SRTP and Modbus TCP/IP, No EGD)	IC693DNS201	DeviceNet Slave Module
Controllers	IC693CPU311	5-Slot Base with CPU in Base (6KBytes User Program), Not Expandable	IC693CPU360	CPU 360 Module (240KBytes Configurable User Memory, 4K I/O, 8 Racks), No Built-In Serial Ports, Logic Execution is .22msec/K
	IC693CPU313	5-Slot Base with Turbo CPU in Base (Logic Execution is .6 msec), 1K Registers,	IC693CPU363	CPU 363 Module (240KBytes Configurable User Memory 4K I/O, 8 Racks),
		(12KBytes User Program), Not Expandable		2 Built-In Serial Ports, Logic Execution is .22msec/K
	IC693CPU323	10-Slot Base with Turbo CPU in Base (Logic Execution is .6 msec) 12Kbytes	IC693CPU364	CPU 364 Module (240KBytes Configurable User Memory 4K I/O, 8 Racks), No Built-In Serial Por
	1003301 0323	User Program, Not Expandable	1003301 0304	Built-In 10Mbs Ethernet, Supports SRTP, Channels and EGD, Logic Execution is .22msec
	IC693CPU350	CPU 350 Module (32KBytes User Memory, 4K I/O, 8 Racks), No Built-In Serial Ports,	IC693CPU374	CPU 374 Module (240KBytes Configurable User Memory), No Built-In Serial Ports,
	1000001 0000	Logic Execution is .22msec/K	1000001 0074	Built-In 10/100Mbs with Built-In Switch, Ethernet Supports SRTP, EGD and No Channel
		Logic Execution is .22msec/K		Support; Logic Execution is .22msec/K.
Daabalaaaa	100000110001	Base, CPU, 10 Slots, Use with CPU331/CSE331 and above	100000110007	Base, CPU, 5 Slots (use with CPU331/CSE331 and above)
Backplanes	IC693CHS391 IC693CHS392		IC693CHS397	
		Base, Expansion, 10 Slots	IC693CHS398	Base, Expansion, 5 Slots
	IC693CHS393	Base, Remote Expansion, 10 Slots (700 ft.)	IC693CHS399	Base, Remote Expansion, 5 Slots (700 ft.)
Power Supplies	IC693PWR321	Power Supply, 120/240 VAC, 125 VDC, Standard, 30 Watts	IC693PWR332	Power Supply, 12 VDC, High Capacity, 30 Watts
	IC693PWR322	Power Supply, 24/48 VDC, Standard, 30 Watts	IC693ACC340	Redundant Power Supply Base (RPSB) with 0.1 meter cable to connect to Power Supply Adapter Modul
	IC693PWR328	Power Supply, 48 VDC, Standard, 30 Watts	IC693ACC341	Redundant Power Supply Base with 0.5 meter cable to connect to Power Supply Adapter Module
	IC693PWR330	Power Supply, 120/240 VAC, 125 VDC, High Capacity, 30 Watts	IC693ACC350	Redundant Power Supply Adapter (RPSA) Module. The RPSA replaces the power supply
	IC693PWR331	Power Supply, 24 VDC, High Capacity, 30 Watts		on a CPU base or expansion base and connects to a Redundant Power Supply Base.
Accessories	IC693ACC301	Replacement Battery, CPU & PCM (Qty. 2)	IC693CBL301	Rack to Rack Expansion Cable, 2 Meters
	IC693ACC302	High Capacity Battery Pack	IC693CBL302	Rack to Rack Expansion Cable, 15 Meters
	IC200ACC003	EZ Program Store Flash Device (for CPU374 only)	IC693CBL312	Rack to Rack Expansion Cable, 0.15 Meters, Shielded
	IC693ACC310	Filler Module, Blank Slot	IC693CBL313	Rack to Rack Expansion Cable, 8 Meters
	IC693CBL300	Rack to Rack Expansion Cable, 1 Meter	IC693CBL314	Rack to Rack Expansion Cable, 15 Meters, Shielded
Programming and	IC646MPP001	Logic Developer - PLC Professional	IC646MPH101	Logic Developer PDA Software Tool with Cable Adapter
Trouble Shooting		Logic Developer - PLC Standard		J
Tools	22.2 0001			
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Additional Resources

For detailed technical specifications and product ordering information, please visit the GE Fanuc e-catalog at:

www.gefanuc.com

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GE Fanuc Automation

Programmable Control Products

Series 90[™]-30 PLC Installation and Hardware Manual

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GFL-002

Warnings, Cautions, and Notes as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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Alarm Master	Field Control	Modelmaster	Series 90
CIMPLICITY	GEnet	Motion Mate	Series One
CIMPLICITY Control	Genius	PowerMotion	Series Six
CIMPLICITY PowerTRAC	Genius PowerTRAC	ProLoop	Series Three
CIMPLICITY 90-ADS	Helpmate	PROMACRO	VuMaster
CIMSTAR	Logicmaster	Series Five	Workmaster

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RFI Standards

The Series 90-30 PLC and its associated modules have been tested and found to meet or exceed the requirements of FCC Rule, Part 15, Subpart J. The Federal Communications Commission (FCC) requires the following note to be published according to FCC guidelines.

NOTE

This equipment generates, uses, and can radiate radio frequency energy and if not installed in accordance with this instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules, which are designed to provide reasonable protection against harmful interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

The following note is required to be published by the Canadian Department of Communications.

NOTE

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the radio interference regulations of the Canadian Department of Communications.

The following statements are required to appear in the Series 90_-30 Installation Manual and the Series 90_-30 I/O Specifications Manual for Class I Div 2 Hazardous Locations.

- 1. EQUIPMENT LABELED WITH REFERENCE TO CLASS I, GROUPS A, B, C, and D, DIV. 2 HAZARDOUS LOCATIONS IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY.
- 2. WARNING EXPLOSION HAZARD SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2:
- WARNING EXPLOSION HAZARD DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
- 4. ALL UNUSED SLOTS IN ALL BASEPLATES MUST BE POPULATED WITH FILLER MODULES, IC693ACC310, OR EQUIVALENT.

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This manual describes the GE Fanuc Series 90-30 Programmable Logic Controller (PLC). It contains a description of hardware components and provides basic hardware installation procedures. The Series 90-30 PLC is a member of the Series 90_ family of Programmable Logic Controllers from GE Fanuc.

For a list of product standards, refer to data sheet GFK-0867B or later, GE Fanuc Approvals, Standards, General Specifications which lists all of the standards for GE Fanuc products. Installation instructions in this manual are provided for installations that do not require special procedures for noisy or hazardous environments. For installations that must conform to more stringent requirements (such as CE Mark), see GFK-1179, Installation Requirements for Conformance to Standards.

What's New in This Manual

- Added the model 374 CPU, which supports connection to an Ethernet network through two built-in 10BaseT/100BaseTx auto-negotiating full-duplex Ethernet ports. Models 364 (release 9.10 and later) and 374 are the only Series 90-30 CPUs that support Ethernet Global Data. Note that the CPU374 is supported only by the Windows®-based programmers.
- Other corrections and clarifications as necessary.

Related Publications

For more information on Series 90-30 products, refer to these publications. (For a publication to product catalog number cross-reference refer to Appendix G):

GFK-0255 - Series 90[™] PCM and Support Software User's Manual

GFK-0256 - MegaBasic™ Programming Reference Manual

GFK-0293 - Series 90™ -30 High Speed Counter User's Manual

GFK-0401 - Workmaster® II PLC Programming Unit Guide to Operation

GFK-0402 - Series 90TM -30 and 90-20 PLC Hand-Held Programmer User's Manual

GFK-0412 - Genius® Communications Module User's Manual

GFK-0466 - Logicmaster 90™ Series 90™ -30/20/Micro Programming Software User's Manual

GFK-0467 - Series 90™ -30/20/Micro Programmable Controllers Reference Manual

GFK-0487 - Series 90™ PCM Development Software (PCOP) User's Manual

GFK-0499 - CIMPLICITY® 90-ADS Alphanumeric Display System User's Manual

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Preface

- GFK-0582 Series 90™ PLC Serial Communications User's Manual
- GFK-0631 Series 90TM -30 I/O LINK Interface User's Manual
- GFK-0641 CIMPLICITY® 90-ADS Alphanumeric Display System Reference Manual
- GFK-0664 Series 90TM-30 PLC Axis Positioning Module Programmer's Manual
- GFK-0685 Series 90™ Programmable Controllers Flow Computer User's Manual
- GFK-0695 Series 90™-30 Enhanced Genius) Communications Module User's Manual
- GFK-0726 Series 90[™]-30 PLC State Logic Processor User's Guide
- GFK-0732 Series 90TM-30 PLC ECLiPS User's Manual
- GFK-0747 Series 90TM-30 PLC OnTOP User's Guide
- GFK-0750 OnTop for Series 90™-30 (State Logic) Program User's Manual
- GFK-0781 Motion Mate™ APM300 for Series 90™-30 PLC Follower Mode User's Manual
- GFK-0823 Series 90™ -30 I/O LINK Master Module User's Manual
- GFK-0828 Series 90™ -30 Diagnostic System User's Manual
- GFK-0840 Motion Mate™ APM300 for Series 90™ -30 PLC Standard Mode User's Manual
- GFK-0867 GE Fanuc Product Agency Approvals, Standards, General Specifications
- GFK-0898 Series 90™ -30 PLC I/O Module Specifications
- GFK-1028 Series 90™ -30 I/O Processor Module User's Manual
- GFK-1034 Series 90™ -30 Genius® Bus Controller User's Manual
- GFK-1037 Series 90™ -30 FIP Remote I/O Scanner User's Manual
- GFK-1056 Series 90™ -30 State Logic Control System User's Manual
- GFK-1186 TCP/IP Ethernet Communications for the Series 90 -30 PLC Station Manager Manual
- GFK-1179 Series 90™ PLC Installation Requirements for Conformance to Standards
- GFK-1464 Motion Mate DSM302 for Series 90TM-30 PLCs User's Manual
- GFK-1466 Temperature Control Module for the Series 90™-30 PLC User's Manual
- GFK-1541 TCP/IP Ethernet Communications for the Series 90™ PLC User's Manual

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	CPU352	Catalog Number IC693CPU352	
	CPU360	Catalog Number IC693CPU360	
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Chapter **1**

Overview of the Series 90-30 PLC

The Series 90[™]-30 Programmable Logic Controller (PLC) is a member of the GE Fanuc Series 90 PLC family.

The Basic Parts of a Series 90-30 PLC

The Series 90-30 PLC is very versatile because (1) it is programmable, and (2) it is assembled from a wide variety of modular, plug-together components. Therefore, by choosing the correct components and developing an appropriate program, the PLC can be used for an almost unlimited variety of applications. Although there are many choices of individual hardware components to use in a system, there are just a few basic categories. Each of these component categories is covered in detail in a separate chapter in this manual. They are introduced in this chapter so you can see how they fit together:

- Baseplates
- Power Supplies
- CPUs
- I/O Modules
- Option Modules
- Cables

Baseplates

The baseplates are the foundation of the PLC system because most other components mount on them. As a basic minimum, every system has at least one baseplate, which usually contains the CPU (in which case, it is referred to as "the CPU Baseplate"). Many systems require more modules than can be mounted on one baseplate, so there are also Expansion and Remote baseplates that connect together. The three categories of baseplates, CPU, Expansion, and Remote, are available in two sizes, 5-slot and 10-slot, named according to the number of modules they can hold.

Power Supply Modules

Every baseplate must have its own power supply. The power supply always mounts in a baseplate's left-most slot. There are several power supply models available to meet a variety of requirements.

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CPUs

The CPU is the manager of the PLC. Every PLC system must have one. A CPU uses the instructions in its firmware and application program to direct the PLC's operation and to monitor the system to make sure there are no basic faults. Some Series 90-30 CPUs are built into baseplates, but most are contained in plug-in modules. In some cases, the CPU resides in a Personal Computer using a Personal Computer Interface Card that interfaces to Series 90-30 Input, Output, and Option modules.

Input and Output (I/O) Modules

These modules enable the PLC to interface with input and output field devices such as switches, sensors, relays, and solenoids. They are available in both discrete and analog types.

Option Modules

These modules extend the capability of the PLC beyond the basic functions. These provide such things as communications and networking options, motion control, high speed counting, temperature control, interfacing to operator interface stations, etc.

Cables

These connect the PLC components together or to other systems. Many standard prefabricated cables are available from GE Fanuc. They are primarily used to:

- Interconnect baseplates
- Connect a programmer to the CPU or to an option module
- Connect option modules to field devices or other systems.

Assembling a Basic Series 90-30 PLC System

Let's assemble, on paper, a basic system using the following components:

- Baseplate
- Power Supply module
- CPU module
- Some I/O modules

We'll start with the **baseplate**. To keep it simple, we'll use a 5-slot size. Note that a 5-slot baseplate actually has six slots, but the power supply slot is not numbered. Note also, that this baseplate has a CPU slot, which is slot number 1, and it has an expansion connector on the right end, which is used for connecting to another baseplate if the system has more than one baseplate.

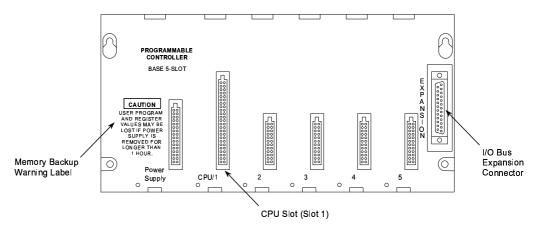


Figure 1-1. Five-Slot CPU Baseplate

Next, we'll add a **power supply** module. It mounts in the unnumbered slot on the left end of the baseplate. This slot has a unique connector that will only fit a power supply module.

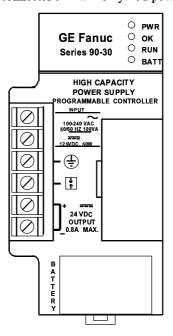


Figure 1-2. Power Supply Module

Then add a **CPU module**. A CPU module can only mount in baseplate slot 1, next to the power supply. Slot 1 has a unique connector that will only fit CPU or special Option modules.

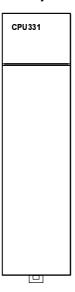


Figure 1-3. CPU Module

To finish, we will add some I/O modules to baseplate slots 2 through 5.

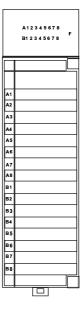


Figure 1-4. I/O Module

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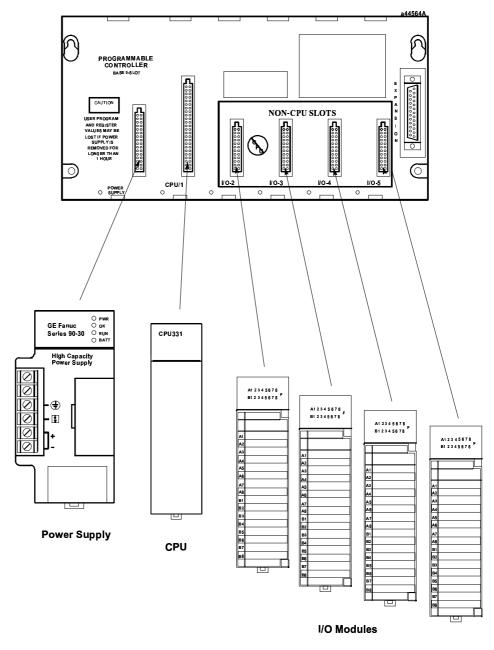


Figure 1-5. Assembling the System

When assembled, the system will look like this:

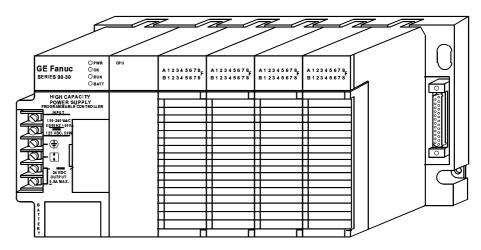


Figure 1-6. A Basic System

An assembly of baseplate and modules such as this one is called a "Rack."

What else would be needed to make this basic system functional?

To make this basic system functional, you would need:

- Mounting. Safe, secure mounting for the PLC in a protective enclosure.
- Wiring. This includes properly installed incoming power to the power supply, as well as wiring from the I/O modules to field devices such as switches, sensors, solenoids, relays, etc.
- **Program**. An application program for the PLC to run. This is developed with GE Fanuc PLC programming software.

What if the application requires more than five modules?

You could use a 10-slot baseplate, shown in the next picture:

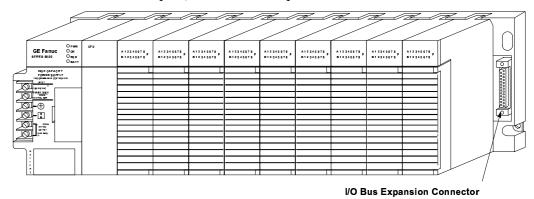


Figure 1-7. Ten-Slot Rack

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What if the application requires more than ten modules?

You can add one or more Expansion or Remote racks to this system. Some CPUs can support up to seven additional racks. If you added seven additional 10-slot racks, you could have 70 more modules.

Racks are interconnected in a "daisy-chain" cabling arrangement. This interconnection system is called the "I/O Expansion Bus." The connections are made from one baseplate's I/O Bus Expansion Connector (shown in the figure above) to the next one's. The I/O Bus Expansion Cables, shown below, have a double connector on one end to facilitate these connections.

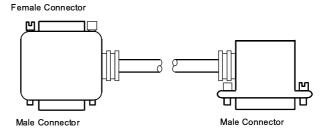


Figure 1-8. I/O Bus Expansion Cable

The next figure shows a system that has a CPU baseplate, one Expansion rack and three Remote racks. Notice that the last rack, the one at the end of the I/O Expansion Bus, must be terminated. A convenient way of terminating the bus is with an IC693ACC307 I/O Bus Terminator Plug, as shown.

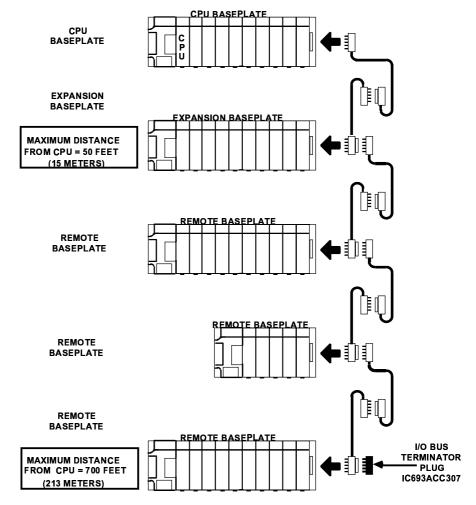


Figure 1-9. Connecting Expansion and Remote Baseplates

What is the Difference Between Expansion and Remote baseplates?

The main factor to consider is distance. How far will the baseplate be from the CPU baseplate? If the cabling distance from the CPU baseplate is 50 feet (15 meters) or less, use an Expansion baseplate. The Expansion baseplate is preferable because of its higher communication speed with the CPU baseplate. However, if a baseplate must be located where it requires a cabling distance from the CPU rack in excess of 50 feet, an Expansion baseplate will not work - a Remote baseplate must be used. The limit for a Remote baseplate is a cabling distance of 700 feet (213 meters) from the CPU baseplate to the farthest Remote baseplate.

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What if I need to cover more than 700 feet (213 meters)?

You can cover much greater distances by using Series 90-30 communications option modules. For example, Genius Bus Controller Modules (GBC) can communicate at distances up to 7,500 feet (2,286 meters) over a shielded twisted-pair cable, as shown in Example 1 below. Or, serial communications with Communications Coprocessor Modules (CMM) using the RS-485 standard can cover up to 4,000 feet (1,219 meters), as shown in Example 2 below. And virtually unlimited communication distances can be attained with modems and telephone lines or radio transmitters. Also, there are numerous networking options available such as Ethernet or WorldFIP.

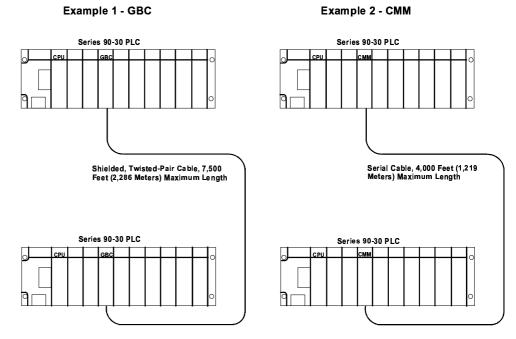


Figure 1-10. Connecting PLCs Using GBC or CMM Modules

Chapter

2

Installation

This chapter discusses installation details only. Other information about the products such as hardware descriptions and specifications, is covered in the applicable chapters.

Important Note

Series 90-30 PLCs must be mounted in a protective enclosure.

The installation instructions described in this chapter apply to PLC installations that do not require special procedures for noisy or hazardous environments. For installations that must conform to more stringent requirements (such as CE Mark), see GFK-1179, Installation Requirements for Conformance to Standards. Also see GFK-0867, GE Fanuc Product Agency Approvals, Standards, General Specifications.

Receiving your Products - Visual Inspection

When you receive your Series 90-30 PLC system, carefully inspect all shipping containers for damage that may have occurred during shipping. If any part of the system is damaged, notify the carrier immediately. The damaged shipping container should be saved as evidence for inspection by the carrier.

As the consignee, it is your responsibility to register a claim with the carrier for damage incurred during shipment. However, GE Fanuc will fully cooperate with you if such action is necessary.

Pre-installation Check

After unpacking Series 90-30 PLC racks, cables, modules, etc., **record all serial numbers**. Serial numbers are printed on the module packaging. Serial numbers are required to make a claim during the warranty period of the equipment. All software product registration cards should be completed and returned to GE Fanuc. See "Module Features" in this chapter for location of module serial numbers. See "Common Baseplate Features" in chapter 3 for location of baseplate serial numbers.

You should verify that all components of the system have been received and that they agree with your order. If the parts received do not agree with your order, call Programmable Control Customer Service at 1-800-432-7521. A Customer Service representative will provide further instructions.

If you require assistance with your installation, GE Fanuc's Technical Support department offers expert help. Call the support number for your area from the list in Chapter 13, "Maintenance and Troubleshooting." The GE Fanuc web site support address is www.gefanuc.com/support/plc.

Warranty Claims

Record the serial number of the defective item and contact your distributor for instructions.

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Working with Series 90-30 Modules

Module Features

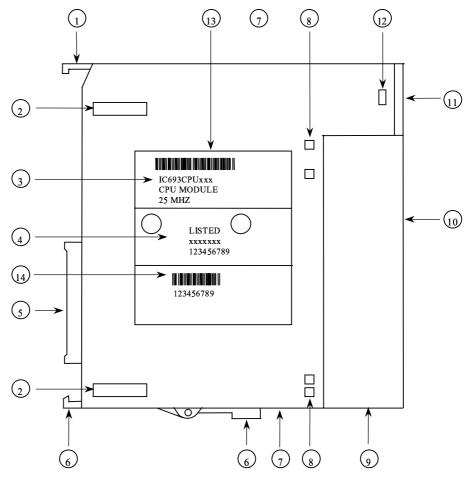


Figure 2-1. Features of Series 90-30 Module

- 1. Pivot hook
- 2. Circuit board holding tabs (two on each side of module)
- 3. Catalog number and description section of label (Includes MAC address for CPU374.)
- 4. Certification (UL, CE, etc.) section of label
- 5. Module connector plugs into baseplate backplane connector
- 6. Release lever spring loaded
- 7. Ventilation openings in module case (top and bottom)
- 8. Front cover holding tabs (two on each side of module)
- 9. Front cover (shown) or terminal board (for I/O modules).
- 10. Front cover faceplate or hinged cover for terminal board.
- 11. Lens cap (some modules do not have).
- 12. Lens cap holding tabs (one on each side of module)
- 13. Module label
- 14. Serial Number used to determine module warranty status. (On some modules, the Serial Number may be on a small tag on the back of the module.)

Installing a Module

Warning

Do not insert or remove modules with power applied. This could cause the PLC to stop or malfunction. Injury to personnel and damage to the module or baseplate may result. Also, attempts to force a module into an improper slot type will result in damage to the module and/or the baseplate. Modules will mount in the correct slot type easily, with a minimum of force.

Use the following instructions as a guide when inserting a module into a baseplate slot.

- Check that module catalog number matches slot configuration. Each slot is, or will be, assigned a particular module type during configuration. A Power Supply module must be installed in the left end unnumbered slot only, and a CPU module and some special Option modules can only be installed in Slot 1 of a CPU baseplate. I/O Modules and most Option modules install in slots numbered 2 and higher.
- Grasp the module firmly with terminal board toward you and with rear pivot hook facing away from you.
- Align the module with the desired baseplate slot and connector. Tilt the module upwards so that top rear pivot hook of the module engages the baseplate's top module retainer.
- Swing the module downward until the module's connector engages the baseplate's backplane connector, and the release lever on the bottom of the module snaps into place in the baseplate's bottom module retainer.
- Visually inspect the module to be sure that it properly seated.

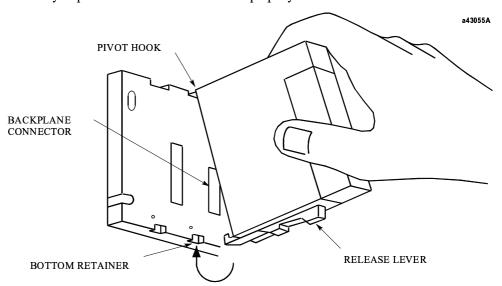


Figure 2-2. Installing a Module

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Removing a Module

Warning

Do not insert or remove modules with power applied. This could cause the PLC to stop or malfunction. Injury to personnel and damage to the module or baseplate may result. Also potentially dangerous voltages from user devices may be present on a module's screw terminals even though power to the rack is turned off. Care must be taken any time that you are handling the module's removable terminal board or any wires connected to it.

- If the module has wiring, remove the module's terminal board (NOTE: You do not have to unwire the terminal board) or cables. The procedure for removing a terminal board is described later in this section.
- Locate the release lever at the bottom of the module and firmly press it up, towards the module.
- While holding the module firmly at its top and fully depressing release lever, swing (pivot) the module upward (release lever must be free of its retaining slot).
- Disengage pivot hook at the top rear of the module by moving the module up and away from the baseplate.

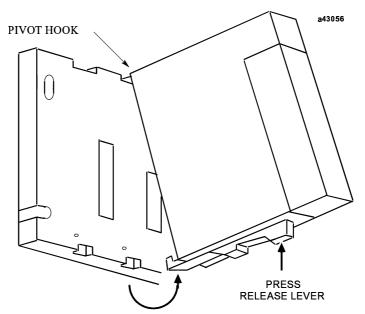


Figure 2-3. Removing a Module

Note

Modules in expansion or remote baseplates can be added, removed, or replaced while the PLC is in RUN mode if power is first removed from the expansion or remote baseplate. I/O data to/from this baseplate will not be updated while power is removed.

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Installing a Module's Terminal Board

Note: Modules IC693MDL730F (and later) and IC693MDL731F (and later) have special terminal boards that are equipped with holding screws. For Installation and Removal instructions, please see the section "Installing and Removing Terminal Boards with Holding Screws" later in this chapter.

To install a terminal board (circled numbers refer to drawing below):

- Hook the pivot hook ①, located on the bottom of the terminal board, to the lower slot on the module.
- Push the terminal board toward the module ② until it snaps into place.
- Open the terminal board cover ③ and ensure that the latch on the module is securely holding the terminal board in place.

Caution

Compare the module catalog number on the label on the back of the hinged door (see Figure 2-6) and the label on the side of the module (see below) to ensure that they match. If a wired terminal board is installed on the wrong module type, damage to the module may occur when the system is powered up.

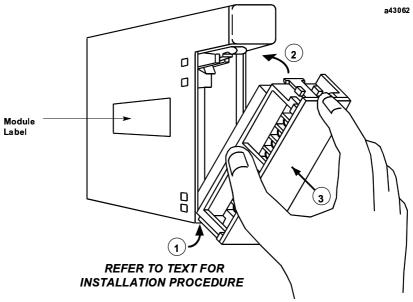


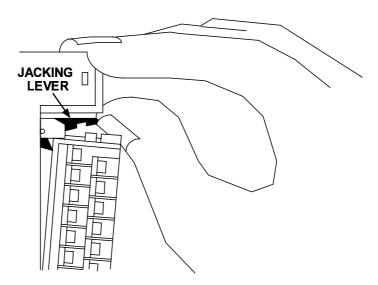
Figure 2-4. Installing an I/O Module's Terminal Board

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Removing a Module's Terminal Board

To remove a terminal board:

- Open the plastic terminal board cover.
- Push up on the jacking lever to release the terminal block.



Grasp pull-tab and pull it towards you until contacts have separated from module housing and bottom pivot hook has disengaged.

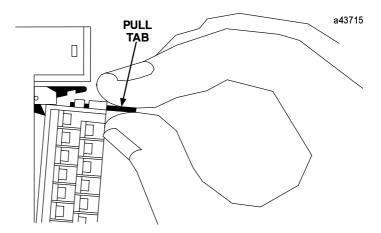


Figure 2-5. Removing a Module's Terminal Board

I/O Module Terminal Board Posts

The terminal board has three posts on the left side. The top and bottom posts hold the terminal board cover in place. The middle post keeps the terminal board wiring in place. If you do not require it to hold the wiring in place, the middle post can be easily snapped off. (Be careful that you do not inadvertently snap it off if you need it to keep your wiring in place.)

Installing and Removing Terminal Boards with Holding Screws

Discrete output modules IC693MDL730F (and later) and IC693MDL731F (and later) have a special terminal board that is equipped with holding screws, shown in the figure below. These screws prevent the terminal board-to-module connections from deteriorating in applications where the PLC is subjected to severe vibration .

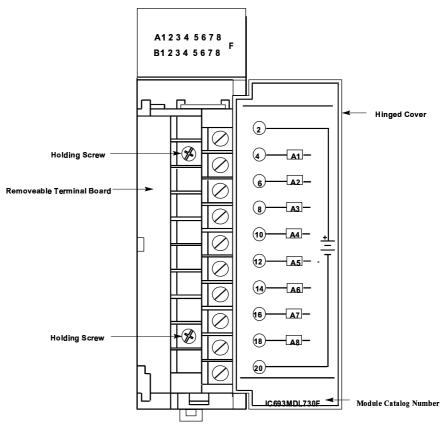


Figure 2-6. Terminal Board with Holding Screws

- Removing: To Remove these terminal boards, first loosen the two holding screws on the front of the terminal board, then follow the standard removal instructions in the section "Removing an I/O Module's Terminal Board." The holding screws are held captive in the terminal board and do not have to be completely removed.
- Installing: To install these terminal boards, follow the standard installation instructions in the section "Installing an I/O Module's Terminal Board," then tighten the two holding screws to 8 to 10 inch-pounds (1 Newton-meter) of torque.

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Baseplate Mounting

Warning

Be sure to follow baseplate grounding instructions in this chapter. Failure to properly ground the PLC can result in improper operation, damage to equipment, and injury to personnel.

Mounting a Baseplate to a Panel

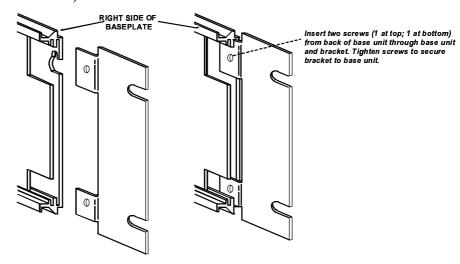
- Use four good-quality 8-32 x 1/2 (4 x 12mm) machine screws, lock washers and flat washers. Install the screws in four tapped holes. The "Baseplates" chapter has the applicable dimensions and mounting clearances. Alternately, 10-slot baseplates can be mounted in standard 19-inch racks by using the appropriate adapter. This is also discussed in the "Baseplates" chapter.
- A vertical mounting orientation is preferred for maximum heat dissipation. Other mounting orientations will require derating the Power Supply current capabilities. See Chapter 12, "System Design," for details.
- All baseplates must be grounded. The "Baseplate Safety Grounding" section of this chapter has details.
- The Rack Number Selection switch must be set on each Expansion or Remote baseplate. A CPU baseplate does not require this switch. Rack numbers should be assigned by the system designer. Failure to set the Rack Number Selection switches properly will result in system malfunction. See the "Baseplates" chapter for details on setting these switches.

Mounting a Baseplate to a 19" Rack

Two optional Baseplate Adapter Brackets allow a 10-slot baseplate to be mounted in a 19 inch rack. Each baseplate installation requires only one of the adapter brackets.

■ IC693ACC308 Front Mount Adapter Bracket. Used to mount a baseplate to the front face of a 19" rack. Install the adapter bracket by inserting the tabs at the top and bottom of the adapter bracket into the corresponding slots at the top and bottom of the plastic baseplate cover. NOTE: Although Figure 2-7 shows the plastic baseplate cover removed, this is for illustration purposes only. It is not necessary to remove the cover to install the bracket. With the bracket in place, insert and tighten the two screws (included with the bracket) through the back of the baseplate holes into the threaded holes in the bracket.

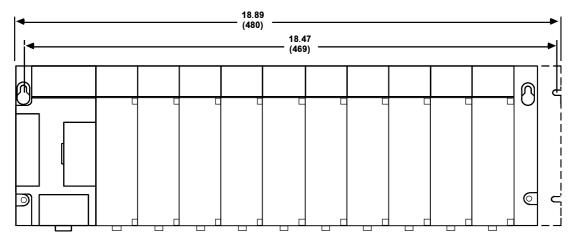
■ IC693ACC313 Recessed Mount Adapter Bracket. Used to recess mount a baseplate inside a 19" rack. A baseplate mounts on the rear panel of this adapter bracket using four 8-32 (4mm) screws, nuts, lock washers, and flat washers. The Adapter Bracket bolts through its four slotted holes to the face of the 19" rack using applicable hardware (lock washers recommended).



Note: Baseplate is shown with cover removed for illustration purposes. It is not necessary to remove the baseplate cover to install the bracket.

Figure 2-7. IC693ACC308 Front Mount Adapter Bracket Installation

Dimensions for rack mounting a 10-slot baseplate with the IC693ACC308 Front Mount Adapter Bracket are shown in the following figure.



DIMENSIONS IN INCHES (MILLIMETERS IN PARENTHESES)

Figure 2-8. Dimensions for 19-inch Rack Mounting Using IC693ACC308 Adapter Bracket

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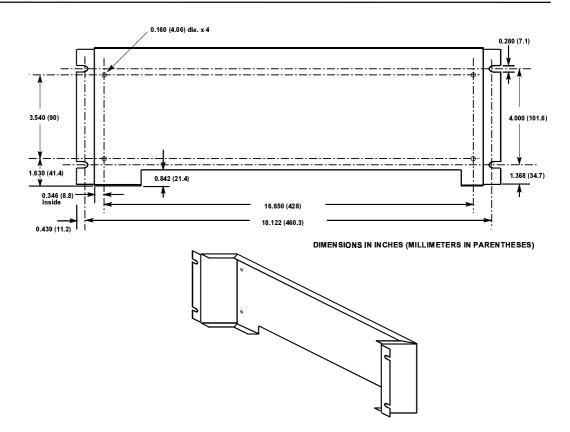


Figure 2-9. IC693ACC313 Recessed Mount Adapter Bracket

Grounding Procedures

System Grounding Procedures

Warning

In addition to the following grounding information, we strongly urge that you follow all applicable codes that apply to your area. For example, in the United States, most areas have adopted the National Electrical Code standard and specify that all wiring conform to its requirements. In other countries, different codes will apply. For maximum safety to personnel and property you must follow these codes. Failure to do so can mean injury or death to personnel, damage to property, or both.

All components of a programmable logic control system and the devices it is controlling must be properly grounded. This is particularly important for the following reasons.

- A low resistance path from all parts of a system to earth minimizes exposure to shock in the event of short circuits or equipment malfunction.
- The Series 90-30 PLC system requires proper grounding for correct operation.

Ground Conductors

- Ground conductors should be connected in a tree fashion with branches routed to a central earth ground point, shown in the figure below. This ensures that no ground conductor carries current from any other branch. This method is shown in the following figure.
- Ground conductors should be as short and as large in size as possible. Braided straps or ground cables (typically green insulation with a yellow tracer AWG #12 (3.3 mm²) or larger) can be used to minimize resistance. Conductors must always be large enough to carry the maximum short circuit current of the path being considered.

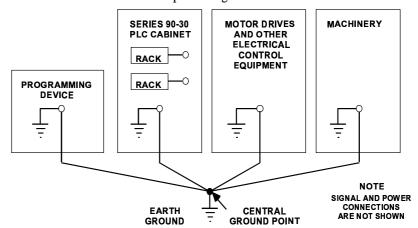


Figure 2-10. Recommended System Grounding

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Series 90-30 PLC Equipment Grounding

Equipment grounding recommendations and procedures are listed below. These grounding procedures must be properly followed for safe, proper operation of your Series 90-30 PLC system.

Baseplate Safety Grounding

The following recommendations are offered, but applicable safety codes for your area or equipment type should also be consulted. The baseplate's metal back must be grounded using a separate conductor; the baseplate mounting screws are not considered to an acceptable ground connection by themselves. Use a minimum AWG #12 (3.3 mm²) wire with a ring terminal and star lock washer under the head of one of the baseplate's two lower mounting holes. These two holes have openings to the side to allow connecting a wire and ring terminal under the head of a mounting screw. Connect the other end of this ground wire to a tapped hole in the panel that the baseplate is mounted to, using a machine screw, star lock washer, and flat washer. Alternately, if your panel has a ground stud, it is recommended you use a nut and star lock washer for each wire on the ground stud to ensure adequate grounding. Where connections are made to a painted panel, the paint should be removed so clean, bare metal is exposed at the connection point. Terminals and hardware used should be rated to work with the aluminum baseplate material.

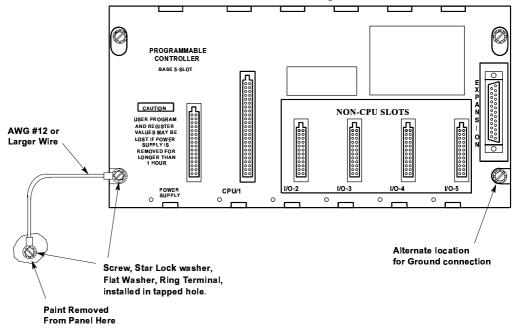


Figure 2-11. Baseplate Grounding

Warning

All baseplates must be grounded to minimize electrical shock hazard. Failure to do so can result in severe personal injury.

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All baseplates grouped together in a Series 90-30 PLC system must have a common ground connection. This is especially important for baseplates that are not mounted in the same control cabinet.

Grounding 19" Rack-Mounted Baseplates

There are two Adapter Brackets used for mounting a 10-slot Series 90-30 baseplate to a 19" Rack. Regardless of which of the two Adapter Brackets is used, the 19" Rack should be grounded as per the instructions in "System Grounding Procedures," including Figure 2-10. (For details on the Adapter Brackets, see the "Mounting a Baseplate to a 19" Rack" section earlier in this chapter.)

Nineteen-Inch Rack-mounted PLC baseplates should be grounded according to the guidelines in the "Baseplate Safety Grounding" section, using a separate ground wire from the PLC baseplate as shown in the previous figure (Fig. 2-11).

- If using the Recessed Mount Adapter Bracket (IC693ACC313), the ground wire can be installed as shown in Figure 2-11 with the ground attached to the Recessed Mount Adapter Bracket. An additional ground wire connecting the Adapter Bracket to a solid chassis ground on the 19" Rack should be installed. Use the same or equivalent hardware and paint removal scheme as shown in Figure 2-11.
- If using the Surface Mount Adapter Bracket (IC693ACC308), the ground wire should be run from the baseplate as shown in Figure 2-11, to a solid chassis ground on the 19" Rack. Use the same or equivalent hardware and paint removal scheme as shown in Figure 2-11.

Programmer Grounding

For proper operation, the computer (programmer) running the PLC software must have a ground connection in common with the CPU baseplate. Normally, this common ground connection is provided by ensuring that the programmer's power cord is connected to the same power source (with the same ground reference point) as the baseplate. If it is not possible to ensure this common ground scheme, use a port isolator (IC690ACC903) between the programmer and PLC serial connection. If the programmer ground is at a different potential than the PLC ground, a shock hazard could exist. Also, damage to the ports or converter (if used) could occur when the programmer serial cable is connected between the two.

Warning

Failure to follow programmer grounding recommendations could result in personal injury, equipment damage, or both.

Module Shield Grounding

In general, the aluminum PLC baseplate is used for module shield grounding. On some Series 90-30 modules, shield connections to the user terminal connector on the module are routed to the baseplate through the module's backplane connector. Other modules, such as CPUs 351, 352, 363, 364, and 374 require a separate shield ground. These are discussed in the next several sections.

Shield Grounding Information for CPUs with External Port Connections

CPUs with external port connections, the 351, 352, 363, 364, and 374 must have a separate shield ground connection to provide shielding for these ports. Because the design of the ground connection for the CPU351 and 352 is different from that of the CPU363, 364, and 374, each grounding method is discussed in a separate section.

CPU351 and 352 Shield Grounding

The CPU 351 or 352 module must be connected to frame ground at the slot where it is installed. Two methods are provided for making this ground connection. Each CPU comes with an EMC Grounding Kit (44A737591-G01) that contains a ground wire, grounding bracket, and screws.

1. The connection from the CPU to frame ground can be made using the ground wire (part number 44A735970-001R01) that comes with the module in the EMC Grounding Kit. This wire has a stab-on connector on one end for connection to a mating terminal on the bottom of the CPU, and a ring terminal on the other end for connection to a grounded enclosure. Where the ring terminal contacts a painted enclosure panel, either a star lock washer can be installed between the terminal and the panel to cut through the paint, or the paint can be scraped away down to clean, bare metal to ensure a good contact. Note: The star lock washer method is suitable for a shield ground, but not suitable for a safety ground.

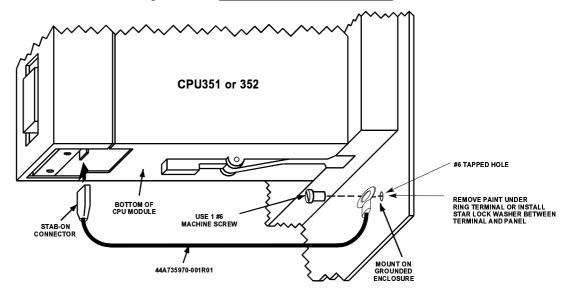


Figure 2-12. CPU 351 or 352 - Attaching Shield Ground Wire

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2. The second method, which can be used for systems in noisy environments consists of installing the green ground wire *and* the optional grounding bracket (part number 44C715646-001R01). This bracket attaches to the CPU using two #4 thread-rolling screws (part number N666P9004B6) and to the grounded enclosure using two #6 thread-rolling screws (part number N666P13006B6). Two holes must be drilled in the enclosure for mounting this bracket. Also, if the bracket will be attached to a painted surface, the paint should be removed down to bare metal under the bracket to ensure good contact between the bracket and the surface. See the next figure.

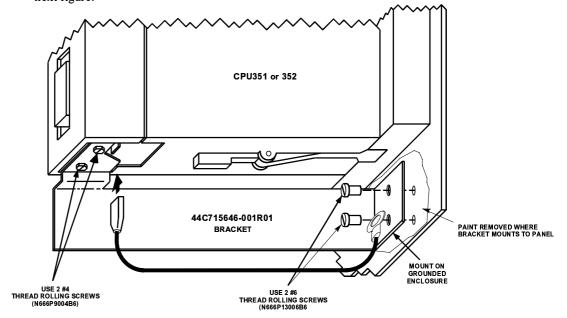


Figure 2-13. CPU 351 or 352 - Mounting the Shield Grounding Bracket and Wire

Note: When the grounding bracket is used, pin 1 of the cable connector that plugs into the Port 2 connector should not be connected. A metal connector shell must be used on the cable for this port, and the cable shield must be terminated at the metal shell instead of pin 1 of the connector.

CPU363, CPU364, and CPU374 Shield Grounding

The CPU363, CPU364, and CPU374 modules must be connected to frame ground at the slot where they are installed. Each module comes with a grounding wire for this purpose. These modules do not support or require the use of a grounding bracket. If the ring terminal on the grounding wire is to be mounted to a painted surface, remove the paint under the ring terminal to ensure good contact, or place a star lock washer between the ring terminal and the painted surface. See the next figure.

Note: The star lock washer method is suitable for a shield ground, but not suitable for a

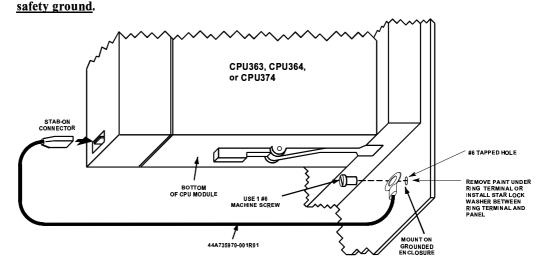


Figure 2-14. CPU 363, CPU364, or CPU374 - Attaching Ground Wire

Additional Modules with Shield Grounding Requirements

Some of the Series 90-30 Option modules, such as the FIP Remote I/O Scanner (IC693BEM330), and DSM modules (IC693DSM302 and IC693DSM314) also have shield grounding requirements. These modules come equipped with suitable grounding hardware. Please refer to each module's user's manual for grounding instructions. Appendix G contains a product to publication cross-reference to help you identify the correct manual.

General Wiring Guidelines

Warning

In addition to the following wiring suggestions, we strongly urge that you follow all wiring and safety codes that apply to your area or your type of equipment. For example, in the United States, most areas have adopted the National Electrical Code standard and specify that all wiring conform to its requirements. In other countries, different codes will apply. For maximum safety to personnel and property you must follow these codes. Failure to do so can lead to personal injury or death, property damage or destruction, or both.

Color Coding Wires

These color codes are commonly used in industrial equipment manufactured in the United States. They are cited here as a reference. Where they are in conflict with codes that apply to your area or your type of equipment, you should follow your applicable codes instead. Besides satisfying code requirements, wire color coding makes testing and troubleshooting safer, faster, and easier.

- Green or green with stripe- Ground
- Black Primary AC
- Red Secondary AC
- Blue DC
- White Common or neutral
- Yellow Secondary power source not controlled by the main disconnect. Alerts maintenance personnel that there may be power present (from an external source) even if the equipment is disconnected from its main power source.

Wire Routing

To reduce noise coupling among PLC wires, it is recommended you keep electrically noisy wiring, such as AC power wiring and Discrete Output Module wiring, physically separated from low-level signal wiring such as DC and Analog Input module wiring or communications cables. This can be accomplished by grouping separately, where practical, the following categories of wiring:

- AC power wiring. This includes the AC input to the PLC power supply, as well as other AC devices in the control cabinet.
- Analog Input or Output Module wiring. This should be shielded to further reduce noise coupling. See the Series 90-30 I/O Module Specifications Manual, GFK-0898 for details.
- **Discrete Output Module wiring.** These often switch inductive loads that produce noise spikes when switched off.
- **DC Input Module wiring.** Although suppressed internally, these low-level inputs should be further protected against noise coupling by observing these wiring practices.
- Communications Cables. Wiring such as Genius Bus or serial cables should be kept away from noise-producing wiring.

Where AC or Output wiring bundles must pass near noise-sensitive signal wiring bundles, avoid running them beside each other. Route them so that, if they have to cross, they do so at a right angle. This will minimize coupling between them.

Grouping Modules to Keep Wires Segregated

If practical, grouping similar modules together in the PLC racks can help keep wiring segregated. For example, one rack could contain only AC modules, and a different rack only DC modules, with further grouping in each rack by input and output types. For smaller systems, as an example, the left end of a rack could contain Analog modules, the middle could contain DC modules, and the right end could contain AC modules.

Discrete I/O Module Connection Methods

- For modules with 16 points or less, the standard method is to use the removable terminal board which comes with these modules. The removable terminal board makes it easy to prewire field wiring to the user supplied input and output devices, and to replace modules in the field without disturbing existing field wiring.
- Some discrete 16-point I/O modules can be used with an optional Terminal Block Quick Connect (TBQC) assembly. This assembly contains a module faceplate, with built-in connector, that replaces the removable terminal board. The assembly also contains a DIN-rail mounted terminal block and a cable to connect the module to the terminal block. The advantage of this method is that it saves about two hours of wiring time per module compared with hand wiring from a module's removable terminal board to a user-supplied, panel-mounted terminal block or strip.
- Older 32-point I/O modules have one 50-pin connector on the front of the module that is either connected by a cable with a connector on each end to a Weidmuller panel-mounted terminal block (Weidmuller catalog no. 912263), or is connected by a cable with stripped, tinned leads to a user-supplied terminal block or strip.
- Newer 32-point I/O modules have two 24-pin connectors on the front of the module. These module may be wired in one of three ways. (1) Use a pair of cables (IC693CBL327/328 see data sheet in "Cables" chapter) to connect the module to a user-supplied, panel-mounted terminal block or strip. These cables have a 24-pin connector on one end, and stripped, tinned leads with wire markers on the other end. (2) Use a pair of dual-connector cables to connect the module to a Terminal Block Quick Connect (TBQC) terminal block (IC693ACC377). See Appendix H for details. (3) Make your own custom cables. Instructions are found in the IC693CBL327/328 data sheet in Chapter 10.

Connections to I/O Module Terminal Boards

Series 90-30 PLC I/O terminal boards have either 10 or 20 screw terminals that will accept from two AWG #22 (0.36 mm²) to two AWG #16 (1.3 mm²), or one AWG #14 (2.1 mm²) copper 90°C (194°F) wire(s). Each terminal can accept solid or stranded wires, but the wires into any given terminal should be the same type (both solid or both stranded) to ensure a good connection. Wires are routed to and from the terminals out of the bottom of the terminal board cavity. The suggested torque for the I/O terminal board connection screws is from 9.6 in-lbs to 11.5 in-lbs (1.1–1.3 Newton-meters).

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For 24 volt DC input modules, an internal 24 volt power connection is provided on the terminal board to supply a limited number of input devices. Also, a 24 volt DC output is available on the power supply module's terminal board to supply a limited number of output devices.

Terminal Block Quick Connect Installation for 16-Point Discrete Modules

The Terminal Block Quick Connect (TBQC) Assembly is an option for certain Series 90-30 discrete I/O modules. See Appendix H for more information.

- Remove standard terminal board from module.
- Install TBQC faceplate (it has a 24-pin connector).
- Mount the TBQC terminal block. It has a 24-pin connector and a terminal strip, and mounts on a standard 35 mm DIN-rail.
- Connect a TBQC cable between the TBQC faceplate connector on the module and the connector on the TBQC terminal block.
- Wire I/O devices to the terminal block.

Installation of 32-Point Discrete, 50-Pin Connector Modules

These 50-Pin modules are an older design and are not generally used on new systems, unless to fulfill standardization requirements. They are mainly used as replacements for existing installations. For new installations, we recommend the dual 24-pin connector style because they have additional features not found on the older modules (LED indicators, TBQC), and it is much easier to fabricate custom-length cables for them. Installation information is provided here for the convenience of those still using these modules.

Using Weidmuller #912263 Terminal Block

Note: The TBQC is not available for these modules, but you may purchase a Weidmuller #912263 from your electronics distributor for this application.

- Mount the Weidmuller#912263 terminal block. It has a 50-pin connector and a terminal strip, and mounts on a standard 35 mm DIN-rail.
- Connect an IC693CBL306/307 cable between the module's faceplate connector and the connector on the Weidmuller terminal block. See Chapter 10 for cable data.
- Wire I/O devices to the terminal block. See the Series 90-30 PLC I/O Module Specifications Manual, GFK-0898, for pin-out information.

Using a Generic Terminal Block or Strip

- Mount terminal block/strip to the enclosure panel.
- Connect an IC693CBL308 or 309 cable, or a custom made cable, to the module's faceplate connector and wire the stripped ends of the cable to the terminal block/strip. See Chapter 10 for cable data.
- Wire I/O devices to the terminal block/strip.

Direct Method

■ Connect an IC693CBL308 or 309 cable, or a custom made cable, to the module's faceplate connector and wire the stripped ends of the cable directly to the field devices. See Chapter 10 for cable data. See the Series 90-30 PLC I/O Module Specifications Manual, GFK-0898, for pin-out information.

Installation of Discrete 32-Point, Dual 24-Pin Connector Modules

Using a TBQC

- Mount two TBQC terminal blocks. Each has a 24-pin connector and a terminal strip, and mounts on a standard 35 mm DIN-rail.
- Connect a pair of TBQC cables (IC693CBL329 334) between the module's faceplate connector and the connectors on the two TBQC terminal blocks. Note that both a right side and left side cable is required. See Appendix H for a list of cables.
- Wire I/O devices to the terminal blocks. See the Series 90-30 PLC I/O Module Specifications Manual, GFK-0898, for pin-out information.

The Terminal Block Quick Connect (TBQC) Assembly is an option for certain Series 90-30 discrete I/O modules. See Appendix H for more information.

With a Generic Terminal Block/Strip

- Mount terminal block/strip to the enclosure panel.
- Connect an IC693CBL327/328 cables, or a custom made cables, to the module's faceplate connectors, and wire the stripped ends of the cables to the terminal block/strip. Note that both a right side and left side cable is required. See Appendix H for a list of cables. See Chapter 10 for cable data sheets.
- Wire I/O devices to the terminal block/strip. See the Series 90-30 PLC I/O Module Specifications Manual, GFK-0898, for pin-out information.

Direct Method

■ Connect an IC693CBL327/328 cable, or a custom made cable, to the module's faceplate connectors, and wire the stripped ends of the cable directly to the field devices. See Chapter 10 for cable data. See the Series 90-30 PLC I/O Module Specifications Manual, GFK-0898, for pin-out information.

General Wiring Methods for Analog Modules

Twisted, shielded instrumentation cable is strongly recommended for analog module input or output signal connections. Proper grounding of the shield is also important. For maximum electrical noise suppression, the cable shield should only be grounded at one end of the cable. For Input modules, ground the end that is in the noisiest environment (which often is at the field device end). For Output modules, ground at the module end. See GFK-0898, Series 90-30 PLC I/O Module Specifications, for more shield grounding information.

Analog Input Module Wiring Methods

Correcting electrical noise problems can sometimes be a trial-and-error routine. However, in general, it is generally best to ground the cable shield as close to the source of the noise as possible, which is usually at the device end. In troubleshooting noise problems, sometimes it is beneficial to experiment with the shield grounding point location. Remember, the cable shield should be grounded at one end only. Also, it is best to keep the length of stripped cable leads as short as possible to minimize the length of unshielded conductors that will be exposed to the noisy environment. See the *Series 90-30 PLC I/O Module Specifications Manual*, GFK-0898 for additional details.

Using a Generic Terminal Block or Strip

- Mount a terminal strip inside the control enclosure and run a shielded cable from the terminal strip to each input circuit on the module's terminal board terminals.
- Connect each cable's shield to the metal panel next to the terminal strip. Do not connect the shields at the module end (cut shield off at module end of cable and insulate with shrink tubing).
- Wire the field device to the terminal strip with a shielded cable, grounding the shield at the device end only (cut shield off at terminal strip end of cable and insulate with shrink tubing). Also, keep the length of exposed (outside of shield) leads at the terminal strip and device ends as short as possible.

Direct Method

- Run a shielded cable from the field device (transducer, potentiometer, etc.) directly to the module.
- Connect the conductors to the applicable screws on the module's terminal board.

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■ Ground the shield at the field device end, exposing a minimum amount of conductor to the noisy environment. Do not connect the shield at the module end (cut shield off at module end of cable and insulate with shrink tubing).

TBQC not Recommended for Analog Modules

The Terminal Block Quick Connect (TBQC) Assembly is not recommended for use with analog modules due to cable shielding requirements.

Analog Output Module Wiring

General

Each output should be connected using a good quality shielded wire with the cable shield grounded at the module end. See GFK-0898, Series 90-30 PLC I/O Module Specifications, for more information.

Using a Generic Terminal Block or Strip

- Mount a terminal strip inside the control enclosure and run a shielded cable from the terminal strip to each output circuit on the module's terminal board terminals.
- Ground each cable's shield at the module end only. Do not connect the shields at the terminal strip end (cut shields off at terminal strip end of cables and insulate with shrink tubing).
- Wire the field device to the terminal strip with shielded cables, grounding the shields at the terminal strip end only (cut shields off at field device end of cables and insulate with shrink tubing). Also, keep the length of exposed (outside of shield) leads at the terminal strip and device ends as short as possible.

Direct Method

- Run a shielded cable from each field device (transducer, potentiometer, etc.) directly to the module.
- Connect the conductors to the applicable screws on the module's terminal board.
- Ground the shield at the module end only, exposing a minimum amount of conductor to the noisy environment. Do not connect the shield at the device end (cut shield off at device end of cable and insulate with shrink tubing).

TBQC not Recommended for Analog Modules

The Terminal Block Quick Connect (TBQC) Assembly is not recommended for use with analog modules due to cable shielding requirements.

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AC Power Source Connections

AC Input Wiring to AC/DC Power Supplies

Warning

If the same AC power source is used to provide AC power to other baseplates in a Series 90-30 PLC System, ensure that all AC input connections are identical at each rack. Do not cross Line 1 (L1) and Line 2 (L2). A resulting difference in potential can injure personnel or cause damage to equipment. Each baseplate must be connected to a common ground.

Ensure that the protective cover is installed over all terminal boards. During normal operation with an AC power source either 120 VAC or 240 VAC is present on the AC Power Supply. The cover protects against accidental shock hazard which could cause severe or fatal injury to the operator or maintenance personnel.

Both the Standard (IC693PWR321) and High Capacity (IC693PWR330) AC/DC power supplies currently have six terminals for user connections. Early versions of some Series 90-30 power supplies had five terminals (see next figure). The wiring methods for both five-terminal and sixterminal types is similar, except that step 3 below does not apply to the five-terminal type.

The power supply terminal boards will accept one AWG #14 (2.1 mm²) or two AWG #16 (1.3 mm²) copper 75_ C (167_ F) wires. Each terminal can accept solid or stranded wires, but the wires in any given terminal should be the same type. The suggested torque for the power supply terminal board is 12 in-lbs (1.36 Newton-meters). Open the door protecting the terminal board and make the following connections from the AC power source, and ground connections (system grounding requirements are described in detail later in this chapter).

- These are wide range supplies that can operate from an AC power source within the nominal range of 100 VAC to 240 VAC at 50/60 Hz. This may vary -15% to +10% for a total maximum range of 85 VAC to 264 VAC. These are auto-ranging supplies that do not require jumper or switch settings for selection of power source voltage.
- 2. Connect the hot and neutral wires or lines L1 and L2 to the upper two terminals on the terminal board. Connect the safety ground wire to the ground terminal, which is the third terminal from the top, and is marked with a ground symbol.
- 3. For power supplies with six terminals, the factory jumper between the 3rd and 4th terminals (see figure below), should be left in place for normal installations. However, this jumper must be removed and external surge suppressors installed in installations with a "Floating Neutral" input. Please see the section "Special Instructions for Floating Neutral (IT) Systems" later in this chapter for details.
- 4. After all connections to Power Supply terminal board have been completed, the protective cover plate should be carefully reinstalled.

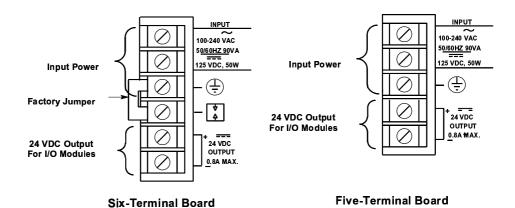


Figure 2-15. Power Supply Terminal Boards

Power Supply Overvoltage Protection Devices

The overvoltage protection devices for this power supply are connected internally to pin 4 on the user terminal board. This pin is normally connected to frame ground (pin 3) with the supplied jumper strap which is installed at the factory. If overvoltage protection is not required *or* is supplied upstream, this feature can be disabled by leaving pin 4 unconnected by removing the jumper strap. Also, this jumper must be removed and external surge suppressors installed in installations with a "Floating Neutral" input, please see the following section "Special Instructions for Floating Neutral (IT) Systems" later in this chapter.

If you want to Hi-pot test this supply, overvoltage protection *must be disabled* during the test by removing the terminal board strap. Re-enable overvoltage protection after testing by reinstalling the strap.

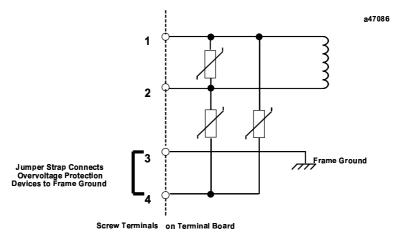


Figure 2-16. Overvoltage Protection Devices and Jumper Strap

Special Installation Instructions for Floating Neutral (IT) Systems

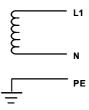
When the AC input power supplies listed below are installed in a system where the Neutral line is **not** referenced to Protective Earth Ground, these special installation instructions must be followed to prevent damage to the power supply.

IC693PWR321S (or later version) IC693PWR330A (or later version)

Definition of Floating Neutral Systems

A Floating Neutral System is a system of power distribution wiring where Neutral and Protective Earth Ground are **not** tied together by a negligible impedance. In Europe this is referred to as an IT system (see IEC950). In a Floating Neutral System, voltages measured from input terminals to protective earth ground may exceed the 264 Volts AC maximum input voltage specified in the power supply specifications in Chapter 24in this manual.

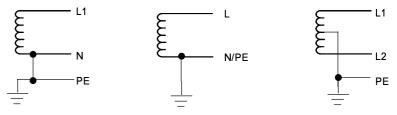
Example of Floating Neutral System



This system must be installed using the special installation instructions on the following page.

Systems in which one leg of the power distribution wiring is tied to Protective Earth or a tap between two legs of the power distribution wiring is tied to Protective Earth are **not** Floating Neutral Systems.

Examples of Non-Floating Neutral System



These non-floating neutral systems do not require these special installation instructions.

Use These Special Installation Instructions for Floating Neutral Systems

- 1. The input power terminals should be wired according to the instructions in the "AC Power Source Connections" section of this chapter.
- 2. The factory installed jumper between terminals 3 and 4 of the Power Supply module **must** be removed if using one of the Power Supplies that have this feature. See the "Overvoltage Protection Devices" section of the "Power Supplies" chapter for details.
- 3. Voltage surge protection devices, such as MOVs, <u>MUST</u> be installed between the following terminals:
 - From L1 to earth ground
 - From L2 (Neutral) to earth ground

The voltage surge devices must be rated such that the system is protected from power line transients that exceed $Line\ voltage + 100V + (N-PE)_{MAX}$.

The expression *N-PE* refers to the voltage potential between neutral and Protective Earth (PE) ground.

For example, in a 240 Volt AC system with neutral floating 50V above earth ground, the transient protection should be rated at:

240V + 100V + 50V = 390V

DC Power Source Connections

DC Input Wiring to AC/DC and DC-Only Power Supplies

DC Input power can range from 12 to 30 VDC for the 24 VDC supply, 18 to 56 VDC for the 24/48 VDC supply or 100 to 150 VDC for the 125 VDC supply. All Series 90-30 power supplies have DC input capabilities. The following connection information applies to all of them:

Connect the + and - wires from the power source to the top terminals on the terminal board (+ to the top terminal, - to the second terminal). Connect the third terminal from the top to system ground.

+24 VDC Output (All Supplies)

The bottom two terminals are connected to the isolated 24 volt DC output that can be used to supply power to input circuits (within power limitations of the supply).

Warning

If the same DC input power source is used to provide power to two or more power supplies in a Series 90-30 PLC System, ensure that connection polarity is identical at each rack (top terminal + and second terminal -). Do not cross the Positive (+) and Negative (-) lines. A resulting difference in potential can injure personnel or cause damage to equipment. Also, each baseplate must be connected to a common system ground, described earlier in this chapter.

Basic Installation Procedure

Note: Series 90-30 PLCs must be mounted in a protective enclosure. The enclosure should be capable of properly dissipating the heat produced by all of the devices mounted inside it. For details on calculating heat dissipation, refer to Appendix F.

The system design, which includes producing the layout and wiring drawings, should be completed before beginning the installation procedure. This section offers a basic step-by-step approach to installing a Series 90-30 PLC system. Some steps refer to earlier sections of this chapter for additional details. An attempt was made to place the steps in an order that will make the process as efficient as possible. However, due to the wide variance in system designs, this order may not be the most efficient for your system, so you may wish modify this procedure to fit your needs.

1. Gather the schematics, layouts, prints, and other information for the job.

Warning

To avoid the possibility of electrical shock to personnel or damage to your PLC, we recommend that you shut off all power to the system before mounting and wiring the PLC. Also, keep all electronic components away from the area while drilling and tapping to keep metal chips and filings out of these sensitive components.

- 2. From the layout drawing, determine where the baseplate(s) will be mounted. Lay out the hole locations, either using the dimensions given on your layout drawing or from the "Baseplates" chapter of this manual.
- 3. Mark the hole locations for the baseplate safety ground wire (see "Baseplate Safety Ground" in this chapter).
- 4. Mark the hole locations for module shield ground connections (if any). See "Module Shield Ground" (and accompanying sections) in this chapter for instructions.
- 5. Finish laying (marking hole locations) out the rest of the system. This includes any terminal blocks you will be using. DIN-rail mounted terminal blocks for some of the 32-point I/O modules are manufactured by Weidmuller. DIN-rail mounted GE Fanuc Terminal Block Quick Connect (TBQC) assemblies are optional for some of the 16-point and 32-point discrete I/O modules. If using these TBQCs, refer to Appendix H for data. Also, APM and DSM modules use DIN-rail mounted terminal blocks.

Note

We recommend drilling and tapping all holes before mounting any components. This will avoid getting chips and filings in the components.

- 6. Drill and tap the marked holes. For baseplate mounting, use 8-32 or 4mm size.
- 7. Mount the baseplates. Use good quality 8-32 x 1/2 inch or 4 x 12mm size screws. We recommend using star lock washers and flat washers under the screw heads (star lock washer should be located between screw head and flat washer) to ensure a tight baseplate ground connection, and to keep the screws from loosening. Connect each baseplate ground wire as shown in the "Baseplate Safety Ground" section of this chapter.
- 8. If you have Expansion or Remote racks, determine the correct rack number for each one, then set the rack numbers using the Rack Number Selection dual in-line package (DIP) switch on

2-28

- the baseplate. Please refer to the "Baseplates" chapter for details on setting these DIP switches. Rack numbers should be assigned by the system programmer because they correspond to system configuration settings and program memory addressing.
- 9. If you have more than one baseplate (rack), connect the I/O Bus Expansion Cables between the I/O Bus Expansion Connectors, which are located on the right end of the baseplates. The cables are connected in a "daisy-chain" arrangement from one baseplate to the other. This is made possible by the fact that the cables have a dual connector on one end. Therefore, when the cable is plugged into a baseplate connector, the second connector on that end of the cable provides a socket for connecting to the next cable. The data sheet for the I/O Bus Expansion cables (IC693CBL300 etc.) in the "Cables" chapter has sample wiring figures.
- 10. On the last I/O Bus Expansion Connector, plug in an I/O Bus Expansion Terminator, Catalog Number IC693ACC307 (unless using a cable with built-in terminator resistors, which would either be GE Fanuc cable IC693CBL302, or your own custom-built cable).
- 11. Install the modules in their correct slots using your system layout drawings. (The label on the side of each module identifies the module type and catalog number.) Refer to the section "Installing Modules" if you are not familiar with how to do this.
- 12. Connect cables to Option modules. Route cables away from noise-producing wires. See the "Wire Routing" section of this chapter.
- 13. Be sure to follow the information in the "Wiring Guidelines" section of this chapter to protect the system from electrical noise. Install the power wires to the Power Supply and I/O modules:
 - I/O modules with removable terminal boards. You can wire the terminal boards inplace on the modules or remove them from the modules before wiring. Although
 removing them may help make wiring easier (a previous section "Working with
 Removable Terminal Boards" shows how to remove a terminal board), care should be
 taken to avoid mixing them (each terminal board has the catalog number of the module
 printed on it, and the hinged cover has a wiring diagram for that module type). If you are
 using wire duct, routing each module's wires through the opening in the duct directly
 under the module will help to keep each terminal board in its correct position.
 - I/O Modules with terminal blocks. Some modules use terminal blocks that mount to the enclosure panel. This includes all 32-point modules and, can include other I/O modules if they are fitted with the optional Terminal Block Quick Connect Assembly. Connect the terminal blocks to the connectors on the modules with the provided cables.
- 14. Connect the signal (switches, sensors, solenoids, etc.) wires to the terminal boards, or terminal blocks/strips. If wiring to terminal boards, these can be removed for ease of wiring, if desired. See the section "Removing a Module's Terminal Board."
- 15. When finished wiring the I/O terminal boards (if used and if you removed them for ease of wiring), re-install them on the modules, being careful to match each one with the correct module.



GE Fanuc Automation

Programmable Control Products



GE Fanuc Automation

P.O. Box 8106 Charlottesville, VA 22906

GFZ-0085

Series 90TM–30 Programmable Controller

Troubleshooting Guide



GE Fanuc Automation

Programmable Control Products

Series 90TM–30 Programmable Controller

Troubleshooting Guide

GFZ-0085

August 1993

Notice Road Wynnum West SPS SP049 Backup Generato Safety Considerations ower)

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained in this document does not purport to cover all details or variations in hardware and software, nor to provide for every contingency in connection with installation, operation and maintenance. This document may describe features not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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PROMACRO	Series Six	CIMPLICITY
GEnet	Logicmaster	Series One
Series 90	CIMPLICITY 90-ADS	Genius
Modelmaster	Series Three	VuMaster
ProLoop	CIMPLICITY PowerTRAC	Series Five
Workmaster	Genius Power TRAC	

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General Warnings When Troubleshooting

Stand clear of controlled equipment when power is applied. If the problem is intermittent, sudden unexpected machine motion could occur, causing injury. Also reference NFPA 70E Part II for additional guidelines for safety practices.

Never reach into a machine to operate a switch since unexpected motion could occur, causing injury.

Remove all electrical power at the Main Power Disconnect to ensure total power removal.

Always remove power before inserting or removing modules, or before connecting I/O cabling.

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This guide describes a logical sequence for troubleshooting your Series 90–30 programmable controller. It includes the procedure for changing or adding a EPROM or EEPROM to your CPU. The Series 90–30 PLC is a member of the Series 90^{TM} family of programmable logic controllers from GE Fanuc Automation.

Revisions to this Troubleshooting Guide

This is the first release of this Troubleshooting Guide. Included are models CPU 311, 313, 321, 323, 331 and 341.

Related Publications

Series 90TM_30 Programmable Controller Installation Manual (GFK_0356).

Series 90TM_30 and 90–20 PLC Hand–Held Programmer User's Manual (GFK–0402)

LogicmasterTM 90 Series 90–30 and 90–20 Programming Software User's Manual (GFK–0466)

Series 90TM_30/90–20 Programmable Controllers Reference Manual (GFK–0467)

We Welcome Your Comments and Suggestions

At GE Fanuc Automation, we strive to produce quality technical documentation. After you have used this troubleshooting guide, please take a few moments to write us with your comments and suggestions. Our address is: Manager Technical Publications, GE Fanuc Automation. PO Box 8106, Charlottesville, VA 22906

Drake C. Fink
Sr. Staff Systems Engineer

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Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)

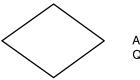


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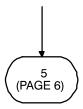


FOLLOW THE PATH WITH THE CORRECT ANSWER IN THE DIRECTION OF THE ARROW

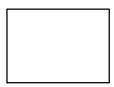
SYMBOLS USED THROUGHOUT THE GUIDE ARE GEOMETRICALLY CODED



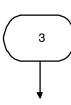
A DIAMOND ASKS A QUESTION



A NUMBERED BUBBLE WITH AN ARROW INTO THE BUBBLE INDICATES THAT THE PROCEDURE IS CONTINUED AT A CORRESPONDINGLY NUMBERED BUBBLE ON THE INDICATED PAGE NUMBER.



A RECTANGLE TELLS YOU TO DO SOMETHING



A NUMBERED BUBBLE WITH AN ARROW OUT OF THE BUBBLE INDICATES THE START OF A PROCEDURE ON THAT PAGE.I

Adding or Changing the EEPROM in the 90TM-30

Application programs are normally developed in the CPU's RAM memory and executed from RAM memory. If additional program integrity is desired, or operation of the PLC without a battery is desired, an optional EEPROM or EPROM can be installed in a spare socket (labeled PROGRAM PROM) on the Model 311/313 backplane or in a socket on the model 331/341 CPU module. EEPROMs can be written to and read from. EPROMs can be read when installed in the PLC; however, they must be written to using an external PROM programming device.

Following is the procedure for adding or changing the EEPROM or EPROM. For clarity, the term PROM is used to refer to either an EEPROM or an EPROM.

- 1. Remove power from the system.
- 2. If 311/313
- Remove all modules, including the power supply.
- Remove the plastic cover.
- 3. If 331/341:
 - Remove CPU from backplane.
- Remove front plate and bezel. Unsnap circuit board and remove from case.
- 4. If the socket is the type which has a screw near the top edge (some versions of 311/331), loosen screw at top of PROM socket (CCW twist;).
- 5. If present, remove old PROM from socket. Replace with or install new PROM. Orient the PROM so the end with a notch (the top of the prom) is toward the top edge of the backplane. Pin 1 of the prom is the first pin on the left as you move counter–clockwise from the notch. On the 311/331, correct installation orients the notch toward the screw.
- 6. When present, tighten screw at top of PROM socket (CW twist).
- 7. If 311/313:
 - Replace the plastic cover.
 - Replace all modules, including the power supply.

- 8. If 331 CPU: __
- Assure jumper JP1, located at the bottom of the PROM socket, is in the 1–2 position for EPROM and the 3–2 position for EEPROM. This informs the CPU firmware which type of device is present.
- 9. If 331/341 CPU:
 - Replace circuit board in case.
 - Reinstall front plate and bezel.
 - Replace CPU in backplane.

Changing the EEPROM (continued)

- 10. Apply power. The PLC follows the flowchart found in the "Power–Up Sequence" figure in the Power–Up and Power–Down Section of the *Series 90–30/90–20 Programmable Controllers Reference Manual* (GFK–0467) to determine if a program will be loaded from PROM to RAM.
- 11. For the EEPROM to be used by the CPU, the CPU configuration must be set to use EE-PROM as the "Program Source". You may use the LM90 Configuration software or the HHP to accomplish this.
- 12. To store the program in RAM, you may use either the Hand–Held Programmer or Logic-master 90–30, Rev 3.5 or higher. Refer to the instructions in the *HHP User's Manual* (GFK–0402) for HHP. To use Logicmaster 90–30, follow these instructions:
 - Start the LM90–30 Programmer Package
- Activate the Utilities Menu (F9)
- Select the EEPROM function (F10)
- Select the WRITE operation
- Verify the items you want to write to EEPROM are selected.
- Press ENTER to start the operation. Refer to the *Logicmaster 90 Series 90–30* and 90–20 Programming Software User's Manual (GFK–0466) for more information.

Notes and Precautions

- 1. WARNING: Do not discard the lithium—manganese dioxide battery in fire. Do not attempt to discharge the battery. The battery may burst or burn or release hazardous materials. Dispose of the battery as you would any hazardous material.
- **2. CAUTION**: After a power fault, the system will come back on in the mode (*STOP*, *RUN/ENABLED*) in which it was operating before power loss, unless the power up configuration specifies a particular mode.
- 3. Not having a battery installed will not prevent the PLC from running. It will generate a PLC fault on power cycle that prevents the PLC from entering *RUN* mode automatically. Clearing this fault will enable the PLC to be placed in *RUN* mode.
- 4. To short the 'super cap' on a 311/321 PLC:
- Remove power from the system.
- Remove all modules, including the power supply.
- Remove the plastic face plate.
- Find component C20 along the left edge of the module. This is the 'super cap'. Short the positive (+) and negative (-) leads of this device.
- Replace the plastic face plate.
- Replace all modules.
- Restore power to the system.

5. Supply (input) voltage tolerances for Series 90–30 power supplies:

IC693PWR321: 100 to 240 VAC

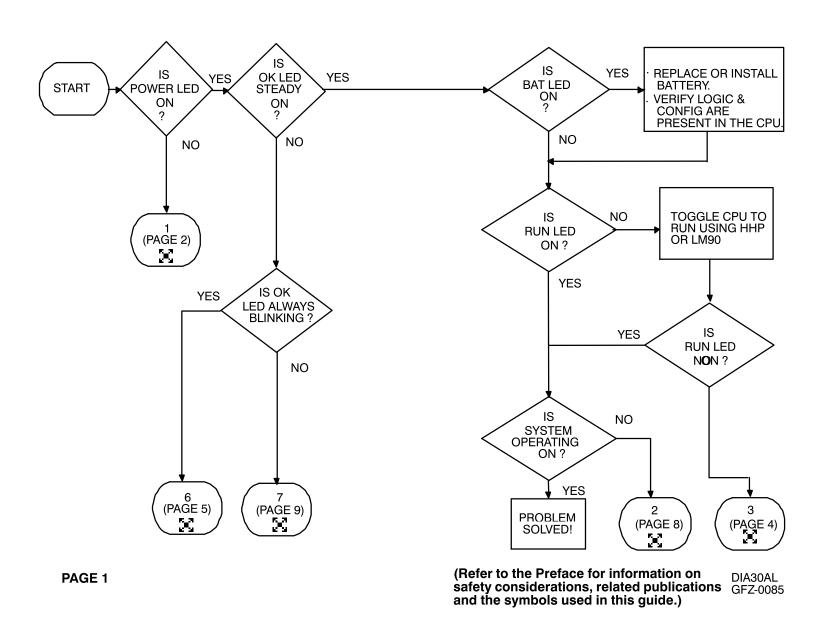
100 to 250 VDC (125 VDC nominal)

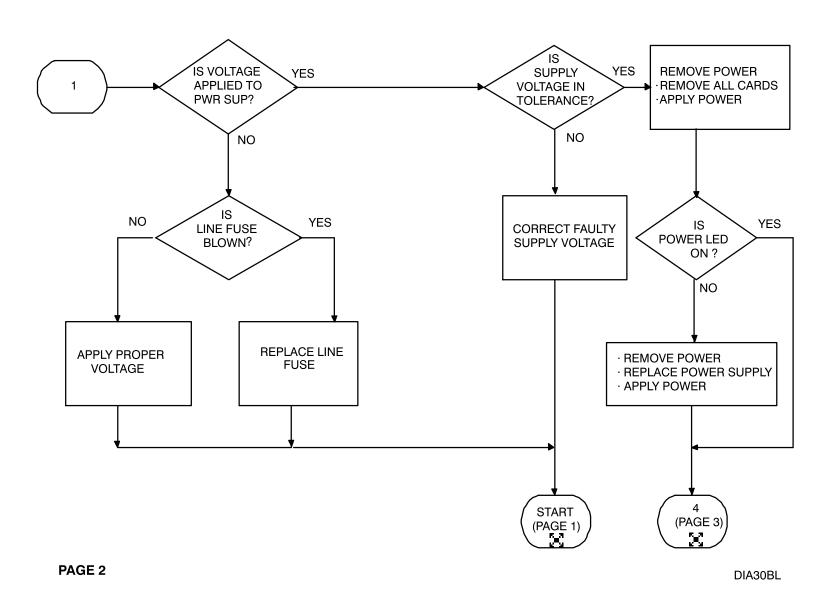
IC693PWR322: 18 to 56 VDC, 21 VDC

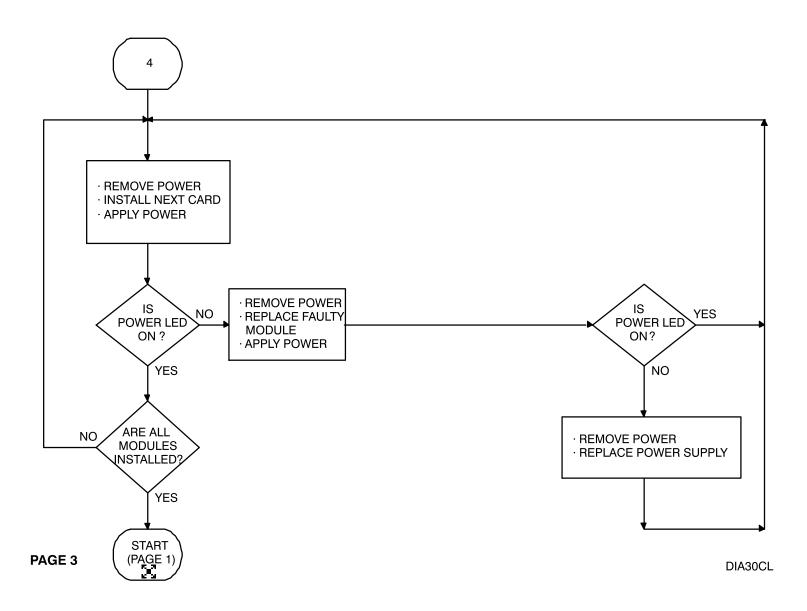
minimum to start

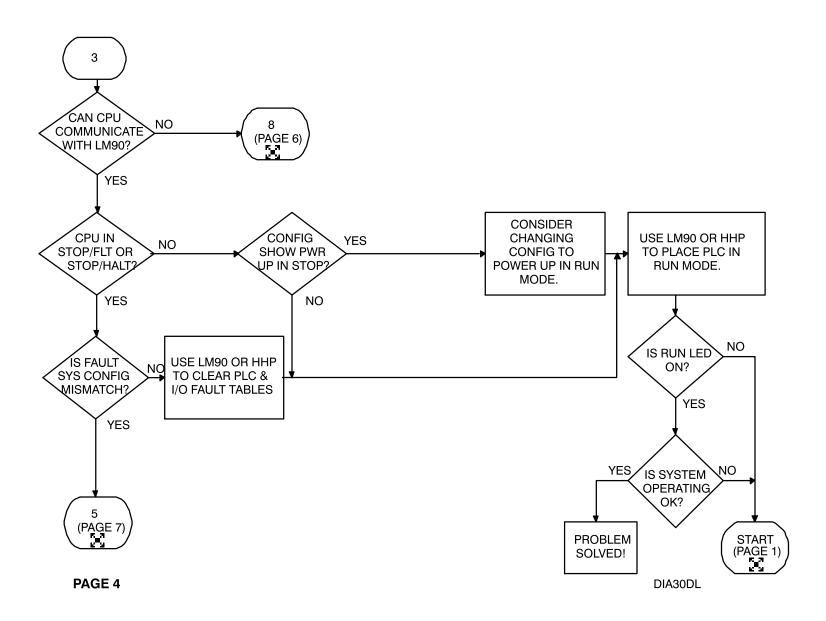
24 VDC OR 48 VDC nominal

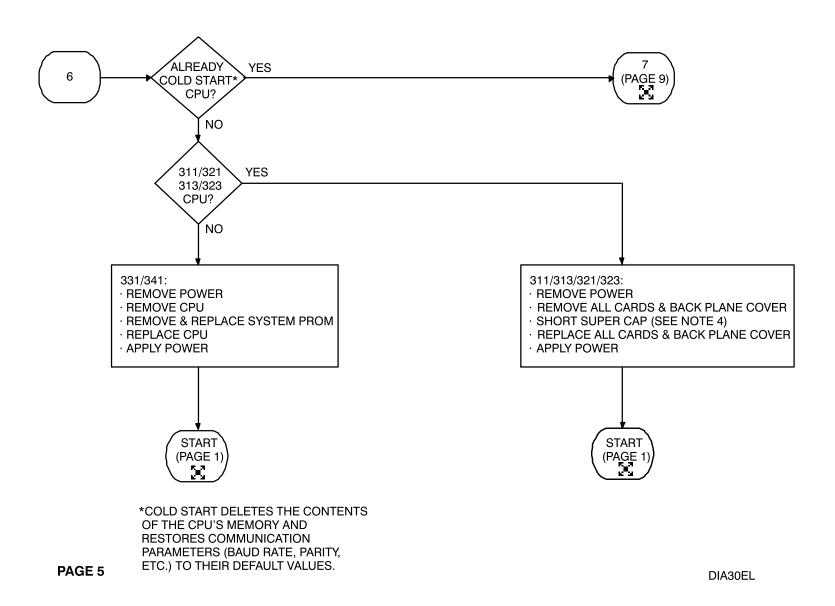
6. Total cable length must not exceed 50 feet between a CPU rack and an expansion rack. Length must not exceed 700 feet between a CPU rack and a remote rack. No termination plug is needed on a one–rack system.

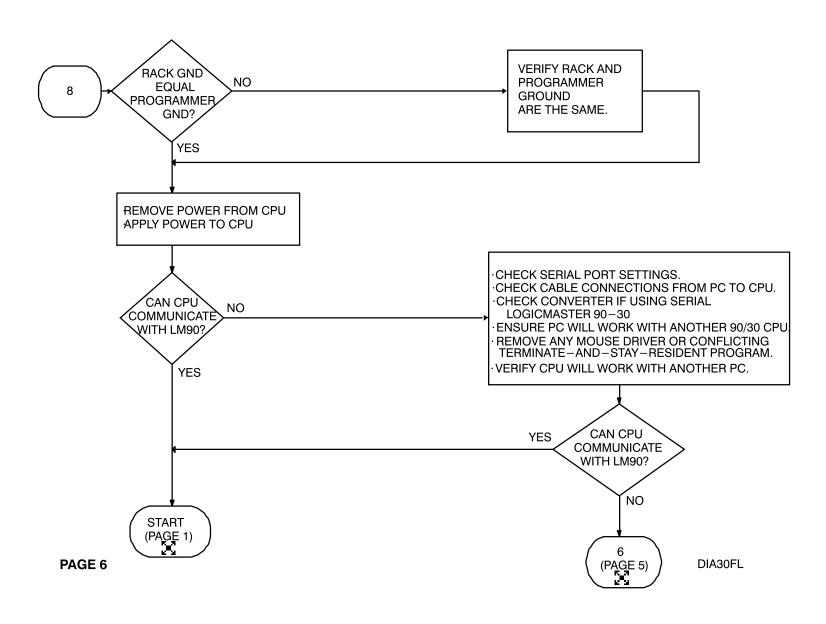


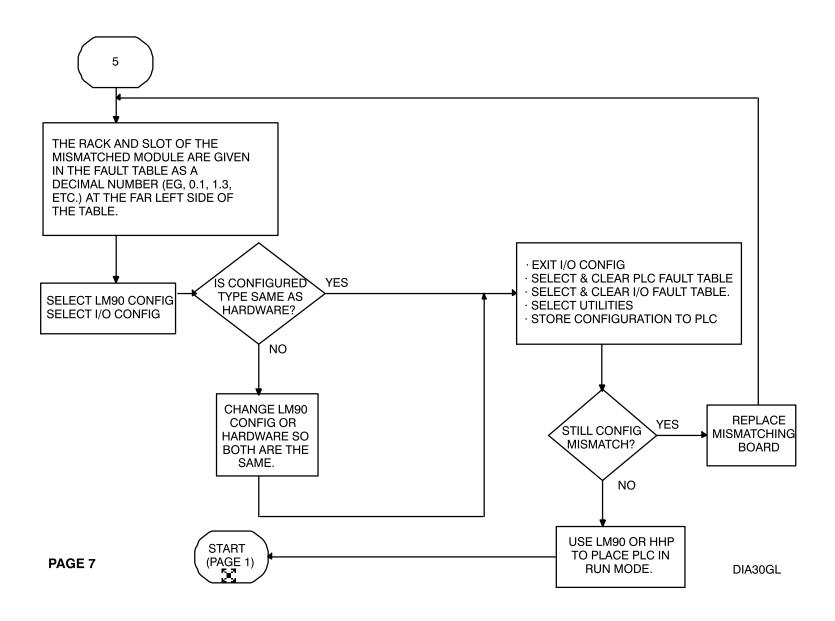


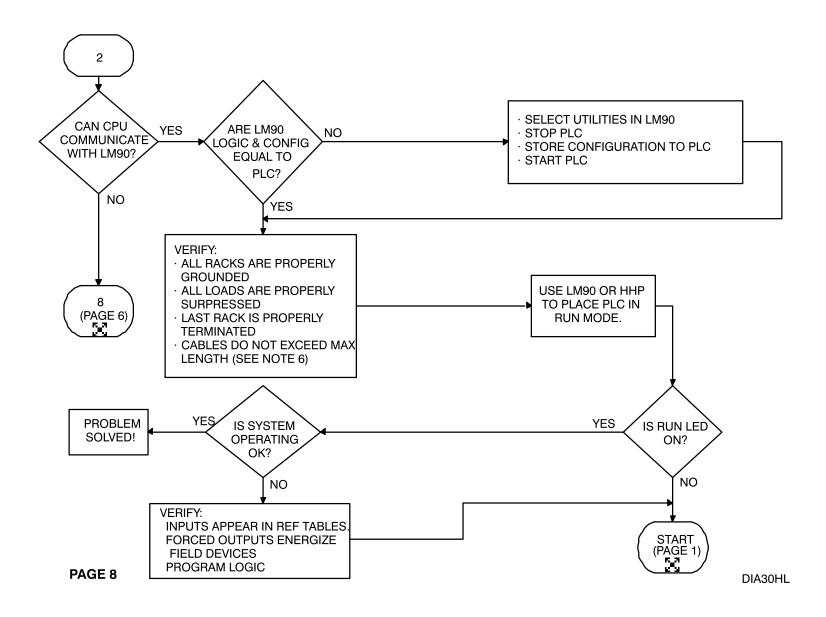


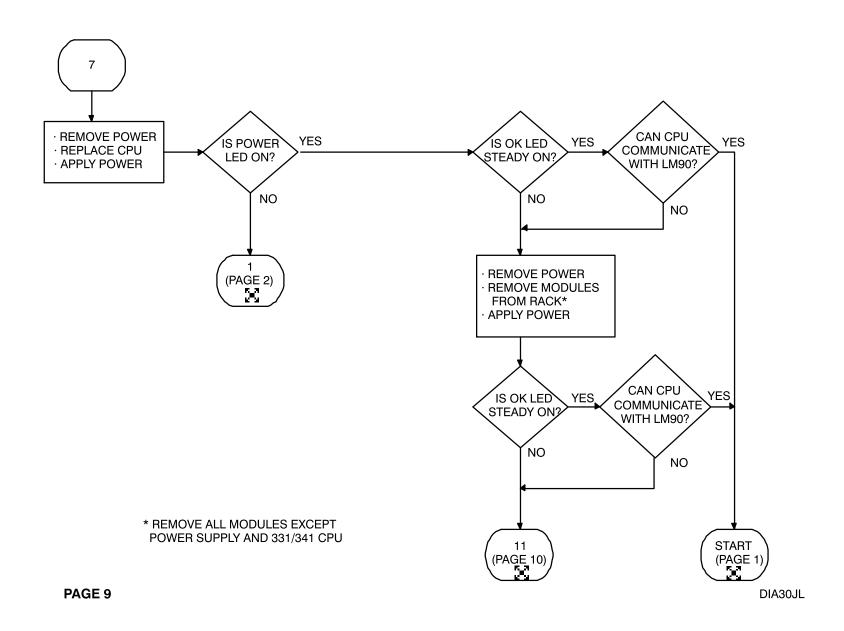


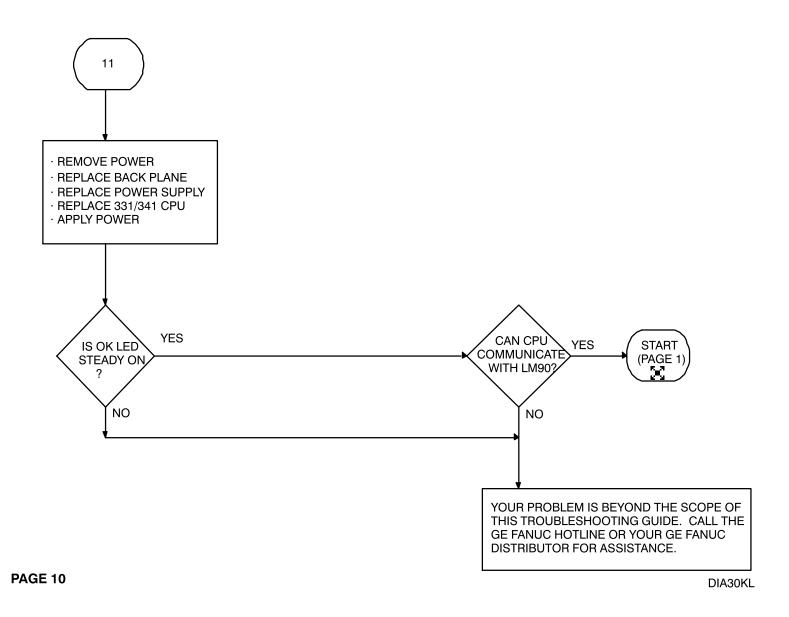












SP049

Section 6 - Functional Description



DIESEL STANDBY GENERATOR

LOCAL CONTROL PANEL

FUNCTIONAL DESCRIPTION

FOR

Brisbane City Council

19th May 2003

ABBREVIATIONS

G1 Generator 1 Diesel

1. **GENERAL**

- 1.1. The PLC for the above operation is a GE Fanuc IC693CPU350. This program has been designed for the use on G1. The operation below controls G1.
- 1.2. A mode selector switch selects how G1 shall operate :
 - 1.2.1. Off
 - 1.2.2. Manual Mode
 - 1.2.3. Test Mode.
 - 1.2.4. Automatic Mode.

2. MANUAL MODE

- 2.1. To operate G1 in MANUAL Mode.
- 2.2. Select this operation by turning the AUTO TEST MAN- OFF selector switch to the MANUAL position.
- 2.3. Press the MANUAL START push button to start the generator.
- 2.4. The generator will begin to crank.
 - 2.4.1. If it fails to start within the 10 seconds, the starter motor is stopped and a delay of 10 seconds before it will attempt to restart.
 - 2.4.2. The generator set is allowed 3 attempts to start.
 - 2.4.3. If it fails to start on the third attempt, the generator is locked out on FAIL TO START Alarm.
 - 2.4.4. When the generator starts, the starter motor is stopped by a stop cranking input which measures the speed of the generator.
 - 2.4.5. Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.
 - 2.4.6. If the oil pressure is not up to pressure after the 10 second time delay, the generator shall shut down on LOW OIL PRESS Alarm.
 - 2.4.7. Once the generator is running there is a 5 second warm up time before it is ready to accept load.

- 2.5. To Manual Transfer to Generator in the MANUAL Mode.
 - 2.5.1. Start the generator and wait for the generator to run up to speed and voltage and ready to accept load.
 - 2.5.2. Press the MANUAL TRANSFER TO GEN push button.
 - 2.5.3. The MAINS ATS shall Open.
 - 2.5.4. After a 30 second delay the GEN ATS shall Close.
 - 2.5.5. If the MAINS ATS fails to Open.
 - 2.5.5.1. After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.
 - 2.5.5.2. The system shall return back to MAINS ATS operation.
 - 2.5.6. If the GEN ATS fails to Close.
 - 2.5.6.1. After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.
 - 2.5.6.2. The system shall return back to MAINS ATS operation.
- 2.6. To Manual Transfer to Mains in the MANUAL Mode.
 - 2.6.1. The GENERATOR ATS is Closed.
 - 2.6.2. Press the MAN TRANSFER TO MAINS push button.
 - 2.6.3. The GEN ATS shall Open.
 - 2.6.4. After a 30 second delay the MAINS ATS shall Close.
 - 2.6.5. If the GEN ATS fails to Open.
 - 2.6.5.1. After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.
 - 2.6.5.2. The system shall return back to GEN ATS operation.
 - 2.6.6. If the MAINS ATS fails to Close.

- 2.6.6.1. After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.
- 2.6.6.2. The system shall return back to GEN ATS operation.
- 2.7. To stop the generator in the MANUAL Mode.
 - 2.7.1. When the generator is running, it may be stopped by pressing the MANUAL STOP push button.
 - 2.7.2. If the generator is still GEN ATS operation. The MANUAL TRANSFER TO MAINS is initiated.
 - 2.7.3. When the GEN ATS is Open, the generator will enter the cool down time of 1 second.
 - 2.7.4. After the cool down time, the generator will shut down.
 - 2.7.5. Once the generator has shut down there is a 15 second delay before it may be restarted. This is to ensure the engine has mechanically stopped.

3. NON-PERMANENT SITE, MANUAL MODE

- 3.1. To operate G1 in a Non-Permanent Site Location in MANUAL Mode.
- 3.2. Connect the generator cables to the site generator CB ensuring the site generator CB is OFF. See BCC procedures.
- 3.3. A plug with shorting links is required to be installed. It is required to be plugged into the 27 Pin Station Plug.
 - 3.3.1. Pins 11 and 12 are required to be connected. This is to indicate that the Mains ATS is Closed. If they are not connected a MAINS ATS Alarm shall be indicated.
- 3.4. Select from the AUTO TEST MAN- OFF selector switch to the MANUAL position.
- 3.5. Press the MANUAL START push button to start the generator.
- 3.6. The generator will begin to crank.
 - 3.6.1. If it fails to start within the 10 seconds, the starter motor is stopped and a delay of 10 seconds before it will attempt to restart.
 - 3.6.2. The generator set is allowed 3 attempts to start.
 - 3.6.3. If it fails to start on the third attempt, the generator is locked out on FAIL TO START Alarm.
 - 3.6.4. When the generator starts, the starter motor is stopped by a stop cranking input which measures the speed of the generator.
 - 3.6.5. Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.
 - 3.6.6. If the oil pressure is not up to pressure after the 10 second time delay, the generator shall shut down on LOW OIL PRESS Alarm.
 - 3.6.7. Once the generator is running there is a 5 second warm up time before it is ready to accept load.
- 3.7. To connect the generator to the site load.
 - 3.7.1. Manually switch over to the generator supply via the site CB's. See BCC procedures.
 - 3.7.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.

- 3.8. To disconnect the generator from the site load.
 - 3.8.1. Manually switch over to the mains supply via the site CB's. See BCC procedures.
 - 3.8.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.
- 3.9. To stop the generator in the MANUAL Mode.
 - 3.9.1. When the generator is running, it may be stopped by pressing the MANUAL STOP push button.
 - 3.9.2. The generator will enter the cool down time of 1 second.
 - 3.9.3. After the cool down time, the generator will shut down.
 - 3.9.4. Once the generator has shut down there is a 15 second delay before it may be restarted. This is to ensure the engine has mechanically stopped.

4. TEST OPERATION

- 4.1. To operate the generator in the TEST Mode.
- 4.2. Select this operation by turning the AUTO TEST MAN- OFF selector switch to the TEST position.
- 4.3. If the selector is changed to MAN while the generator is operating on TEST, the system shall change to MANUAL TRANSFER TO GEN.
- 4.4. The generator shall begin to crank.
 - 4.4.1. If it fails to start within the 10 seconds, the starter motor is stopped and a delay of 10 seconds before it will attempt to restart.
 - 4.4.2. The generator is allowed 3 attempts to start.
 - 4.4.3. If it fails to start on the third attempt, the generator is faulted on FAIL TO START Alarm.
- 4.5. When the generator starts, the starter motor is stopped by a stop cranking input which measures the speed of the generator.
- 4.6. The MAINS ATS shall Open.
- 4.7. Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.
- 4.8. If the oil pressure is not up to pressure after the 10 second time delay, the generator shall shut down on LOW OIL PRESS Alarm.
- 4.9. Once the generator is running there is a 5 second warm up time before it is ready to accept load.
- 4.10. After the warm up time has expired and the MAINS ATS has been open for 30 seconds the GEN ATS shall Close.
- 4.11. If the MAINS ATS fails to Open.
 - 4.11.1. After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.
 - 4.11.2. The system shall shut down and return back to MAINS ATS operation.
- 4.12. If the GEN ATS fails to Close.

- 4.12.1. After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.
- 4.12.2. The system shall shut down and return back to MAINS ATS operation.
- 4.13. To stop the generator in the TEST Mode.
 - 4.13.1. Select this operation by turning the AUTO TEST MAN- OFF selector switch to the AUTO or OFF position.
 - 4.13.2. The GEN ATS shall Open.
 - 4.13.3. After a 30 second delay the MAINS ATS shall Close.
 - 4.13.4. If the GEN ATS fails to Open.
 - 4.13.4.1. After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.
 - 4.13.4.2. The system shall return back to GEN ATS operation.
 - 4.13.5. If the MAINS ATS fails to Close.
 - 4.13.5.1. After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.
 - 4.13.5.2. The system shall return back to GEN ATS operation.
 - 4.13.6. When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.
 - 4.13.7. After the cool down time, the generator will shut down.
 - 4.13.8. If a Mains Failure occurs during the cool down period the generator shall transfer back to the GENERATOR ATS without shutting down.
 - 4.13.9. Once the generator has shut down there is a 15 second delay before it may be restarted. This is to ensure the engine has mechanically stopped.

5. **AUTOMATIC OPERATION**

- 5.1. To operate the generator in the AUTO Mode.
- 5.2. Select this operation by turning the AUTO TEST MAN- OFF selector switch to the AUTO position.
- 5.3. The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.
- 5.4. The Remote Start Command.
 - 5.4.1. The generator shall begin to crank.
 - 5.4.1.1. If it fails to start within the 10 seconds, the starter motor is stopped and a delay of 10 seconds before it will attempt to restart.
 - 5.4.1.2. The generator is allowed 3 attempts to start.
 - 5.4.1.3. If it fails to start on the third attempt, the generator is faulted on FAIL TO START Alarm.
 - 5.4.2. When the generator starts, the starter motor is stopped by a stop cranking input which measures the speed of the generator.
 - 5.4.3. The MAINS ATS shall Open.
 - 5.4.4. Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.
 - 5.4.5. If the oil pressure is not up to pressure after the 10 second time delay, the generator shall shut down on LOW OIL PRESS Alarm.
 - 5.4.6. Once the generator is running there is a 5 second warm up time before it is ready to accept load.
 - 5.4.7. After the warm up time has expired and the MAINS ATS has been open for 30 seconds the GEN ATS shall Close.
 - 5.4.8. If the MAINS ATS fails to Open.
 - 5.4.8.1. After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.

- 5.4.8.2. The system shall shut down and return back to MAINS ATS operation.
- 5.4.9. If the GEN ATS fails to Close.
 - 5.4.9.1. After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.
 - 5.4.9.2. The system shall shut down and return back to MAINS ATS operation.
- 5.5. To stop the generator in the AUTO Mode.
 - 5.5.1. The Phase Failure Relay from the clients switch board shall give a Stop Signal for the generators to run.
 - 5.5.2. The Remote Stop Command.
 - 5.5.3. There is a 2 minute proving time for the Phase Failure Relay.
 - 5.5.4. After the 2 minute proving time the GEN ATS shall Open.
 - 5.5.5. After a 30 second delay the MAINS ATS shall Close.
 - 5.5.6. If the GEN ATS fails to Open.
 - 5.5.6.1. After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.
 - 5.5.6.2. The system shall return back to GEN ATS operation.
 - 5.5.7. If the MAINS ATS fails to Close.
 - 5.5.7.1. After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.
 - 5.5.7.2. The system shall return back to GEN ATS operation.
 - 5.5.8. When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.
 - 5.5.9. After the cool down time, the generator will shut down.
 - 5.5.10. If a Mains Failure occurs during the cool down period the generator shall transfer back to the GENERATOR ATS without shutting down.

5.5.11. Once the generator has shut down there is a 15 second delay before it may be restarted. This is to ensure the engine has mechanically stopped.

6. **FAULT OPERATION**

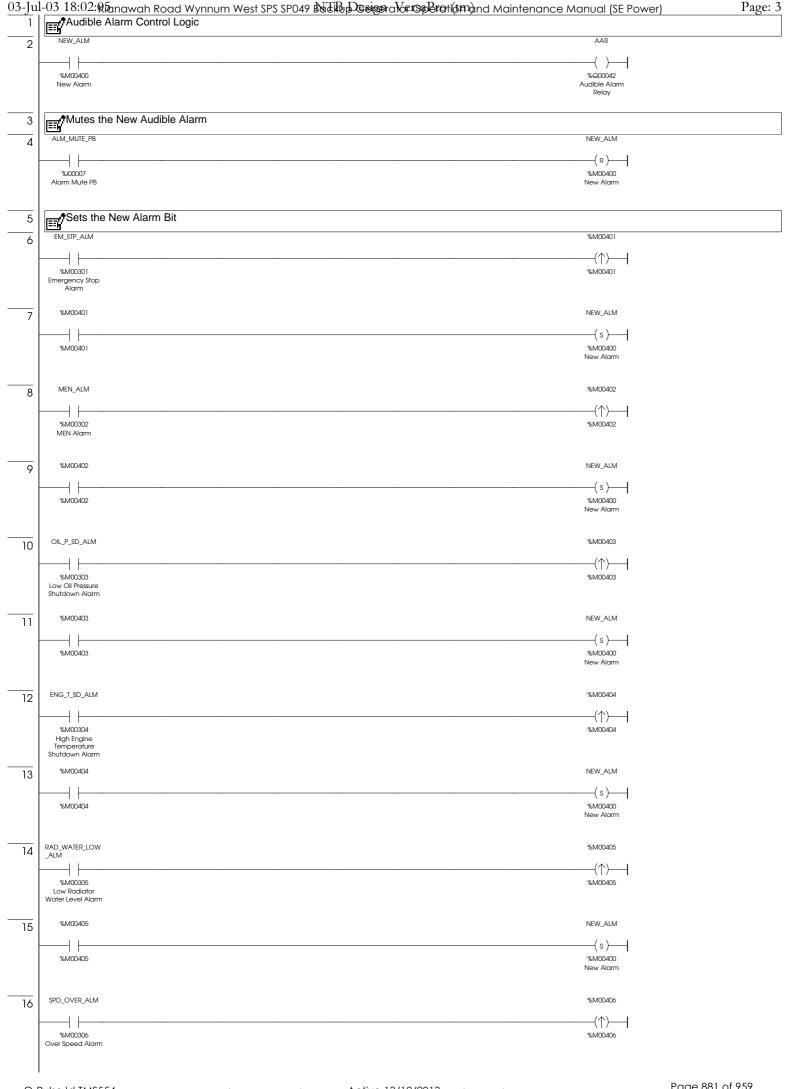
- 6.1. Emergency Stop Operation.
 - 6.1.1. Operation of the Emergency Stop push button immediately shuts down the generator and Opens the Generator CB. The Emergency Stop is latched, and requires manual resetting to release the Emergency Stop push button.
 - 6.1.2. After the Emergency Stop push button is released, a fault reset will need to be initiated to reset the PLC.
- 6.2. HIGH HIGH Alarm Operation.
 - 6.2.1. The Generator CB is Opened immediately.
 - 6.2.2. The generator is shut down immediately.
 - 6.2.3. The following alarms will initiate a HIGH HIGH Alarm condition :-
 - 6.2.3.1. Emergency Stop Fault
 - 6.2.3.2. MEN Fault
 - 6.2.3.3. Low Oil Pressure Shutdown Fault, 10 Seconds Startup Delay
 - 6.2.3.4. High Engine Temperature Shutdown Fault, 30 Second Startup Delay
 - 6.2.3.5. Low Radiator Level Fault, 5 Second Delay
 - 6.2.3.6. Over Speed Fault
- 6.3. HIGH Alarm Operation
 - 6.3.1. The Generator CB is Opened immediately.
 - 6.3.2. Once the generator circuit breaker is opened, the generator will run through its normal cool down time and shut down.
 - 6.3.3. The following alarms will initiate a HIGH Alarm condition:-
 - 6.3.3.1. Generator Under Speed Fault, 5 Second Delay
 - 6.3.3.2. Alternator Under Voltage Fault, 5 Second Delay
 - 6.3.3.3. Alternator Over Voltage Fault, 5 Second Delay

- 6.3.3.4. Generator CB Tripped Fault
- 6.3.3.5. Alternator High Temperature Fault, 30 Second Startup Delay
- 6.4. MEDIUM Alarm Operation.
 - 6.4.1. A Normal Shutdown shall be Initiated.
 - 6.4.2. If the GEN ATS does not Open then the Generator CB is Opened.
 - 6.4.3. The following alarms will initiate a MEDIUM Alarm condition :-
 - 6.4.3.1. Fuel Empty Level Fault, 5 Second Delay
 - 6.4.3.2. Fail To Start Fault, 3 Attempts
- 6.5. LOW Alarm Operation.
 - 6.5.1. A Warning has occurred on the generator. The generator will not shut down.
 - 6.5.2. The following alarms will initiate a LOW Alarm condition :-
 - 6.5.2.1. Low Oil Pressure Warning Alarm, 10 Seconds Startup Delay
 - 6.5.2.2. High Engine Temperature Warning Alarm, 30 Second Startup Delay
 - 6.5.2.3. Fuel Low Level Alarm, 5 Second Delay
 - 6.5.2.4. Battery Charger AC Supply Failed Alarm, 60 Second Delay
 - 6.5.2.5. Control Battery Low Volts Alarm, 30 Second Delay
 - 6.5.2.6. Start Battery Low Volts Alarm, 60 Second Delay

NTB Design

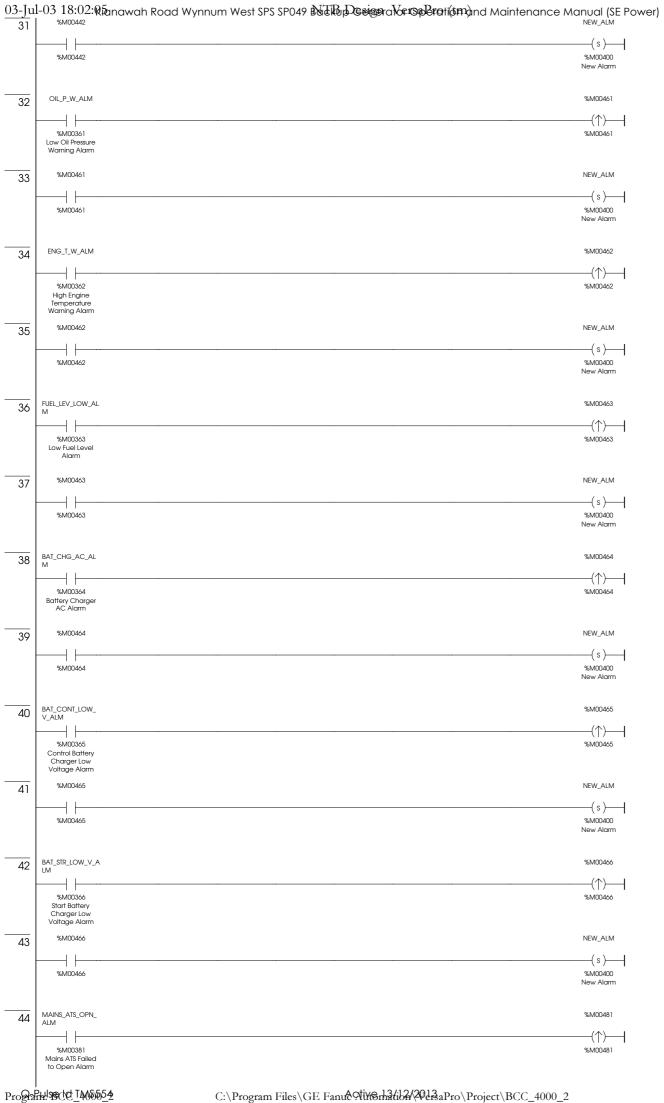
Folder Name	BCC 4000 2
Nickname	
Location	C:\Program Files\GE Fanuc Automation\VersaPro
	\Project\BCC_4000_2
Created	27-Jun-03, 16:36:03
Modified	
Description	BCC. Standby Generator, 4000

Block Name:	AUD ALM.bli
	Control Logic for the Audiable Alarm Logic
	Ladde

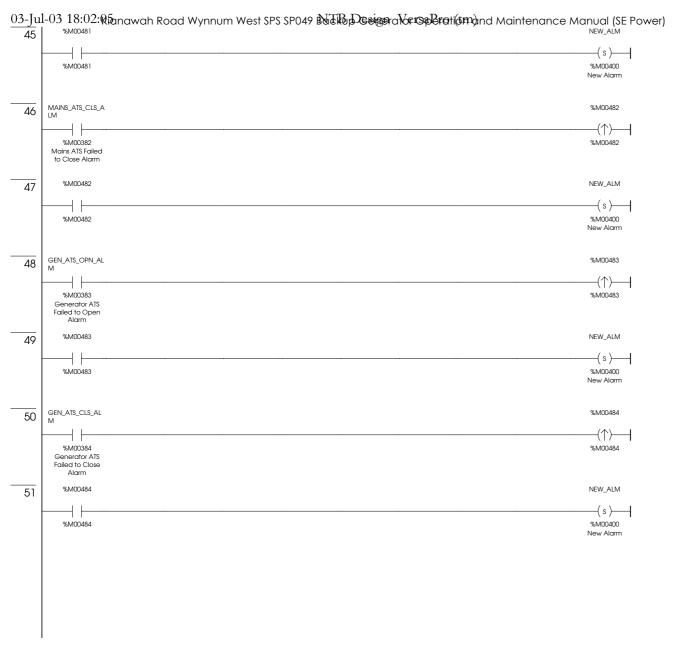




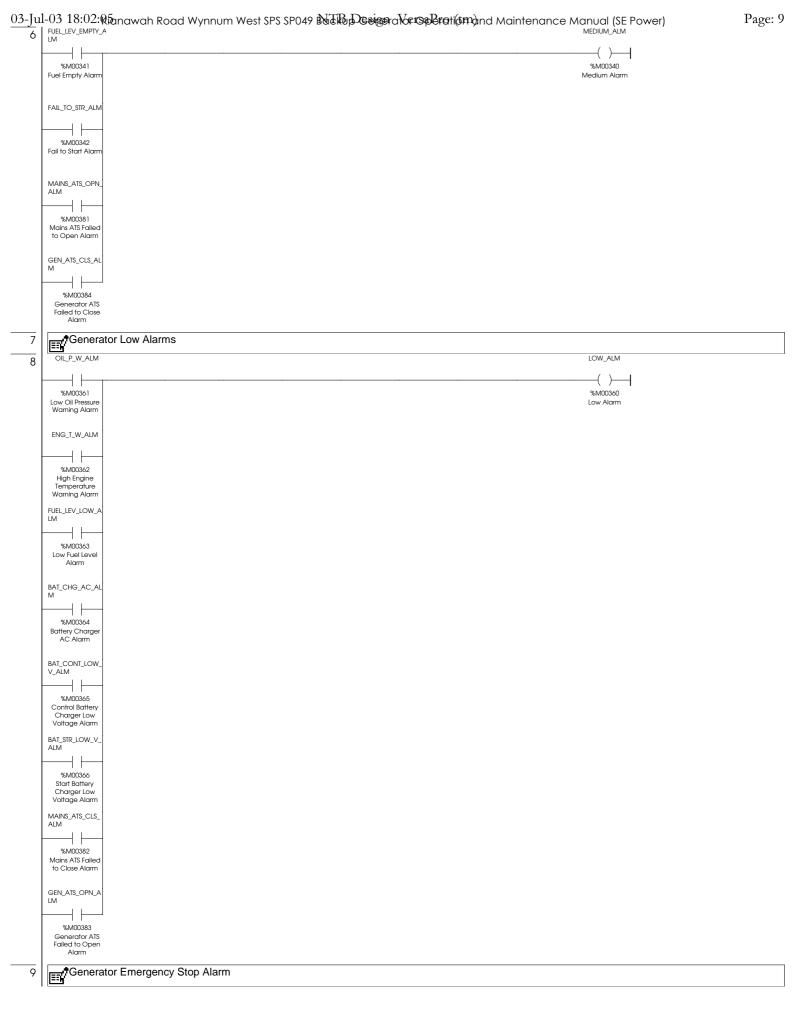
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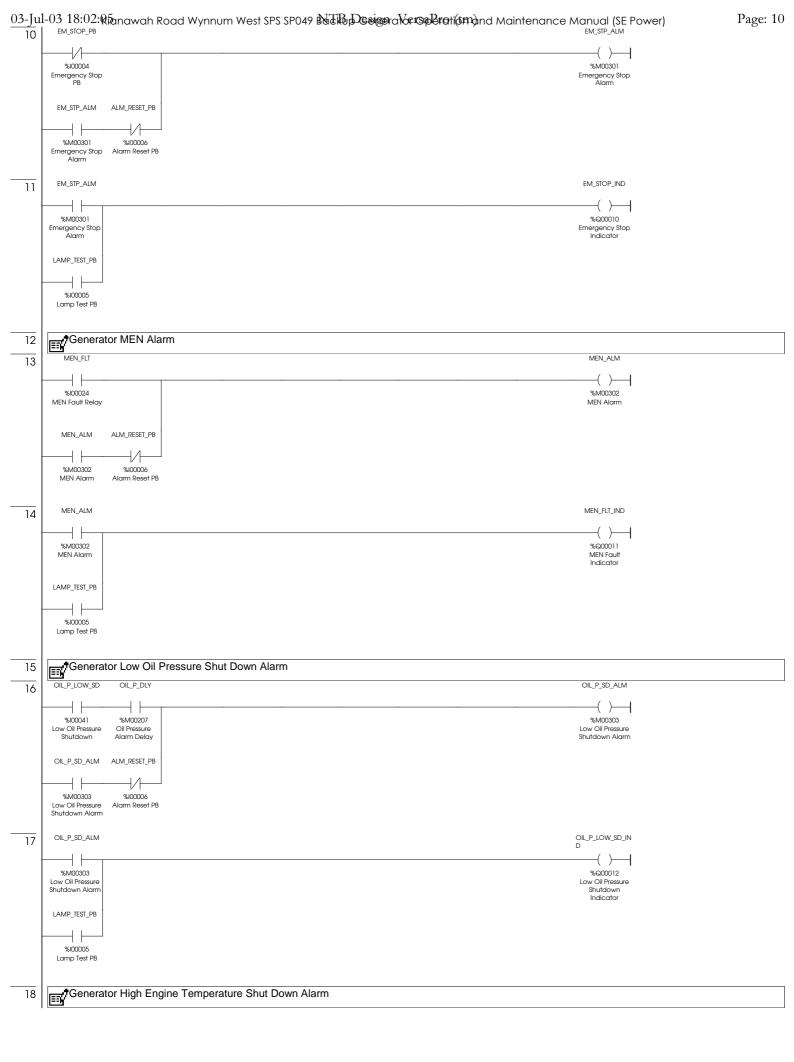


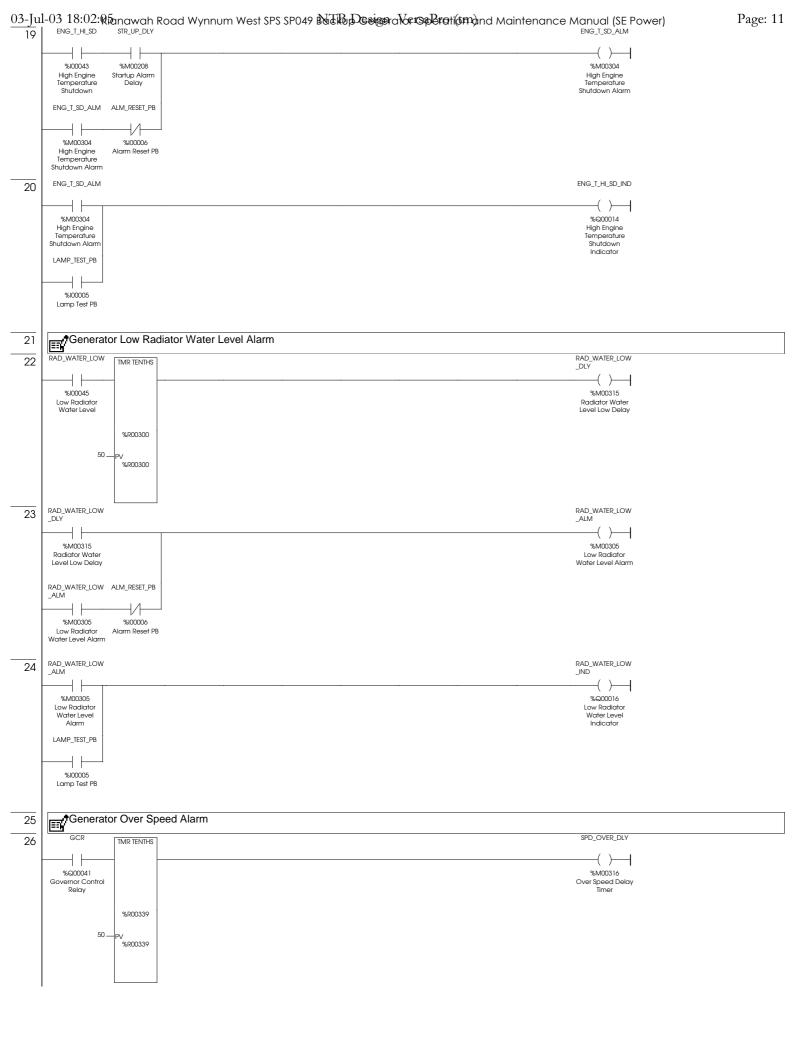
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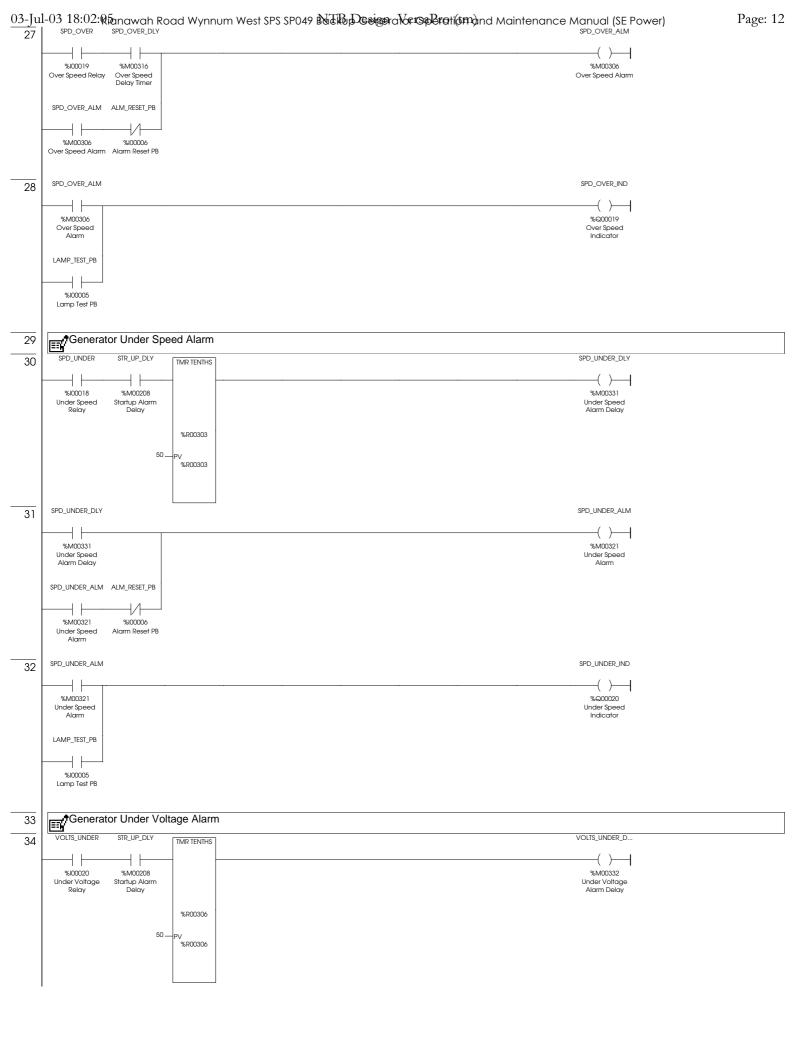


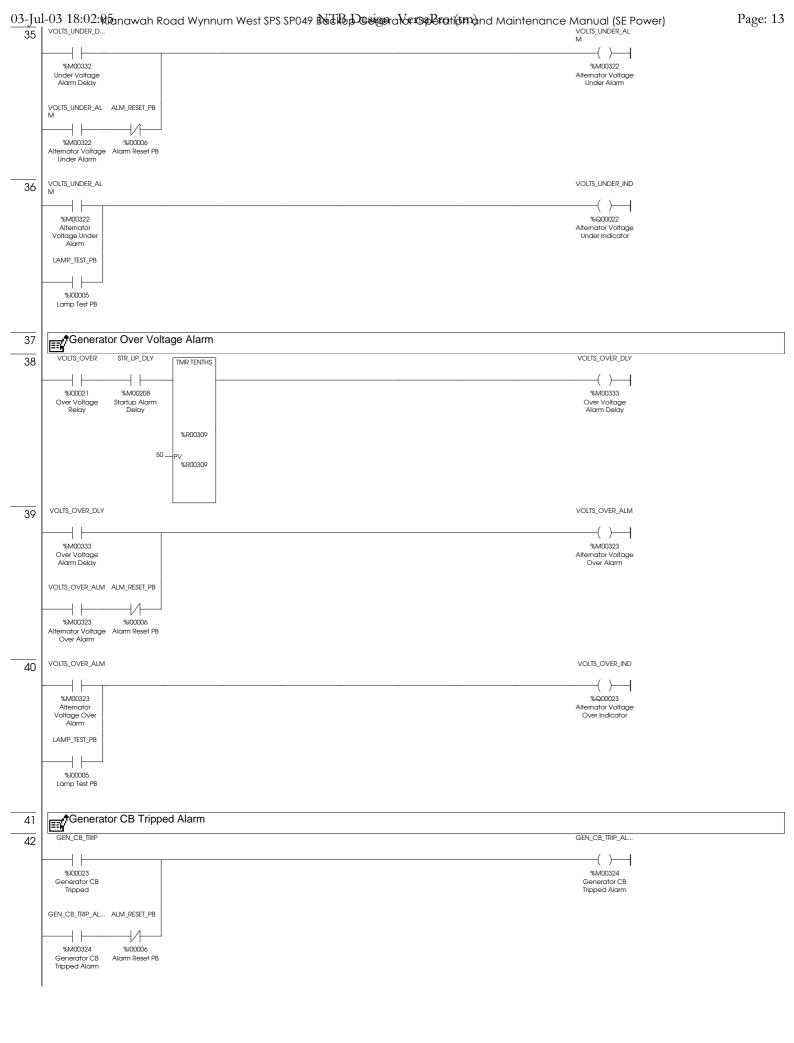
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	Control Logic for the Generator Alarms.
	Ladder

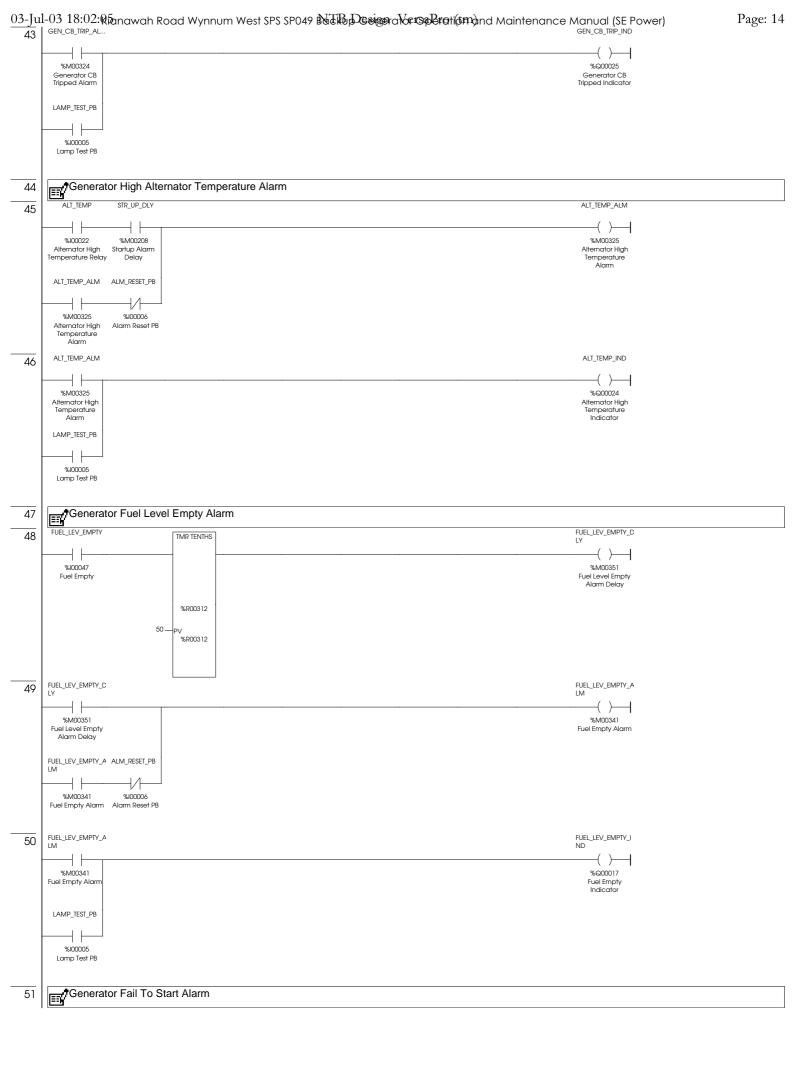


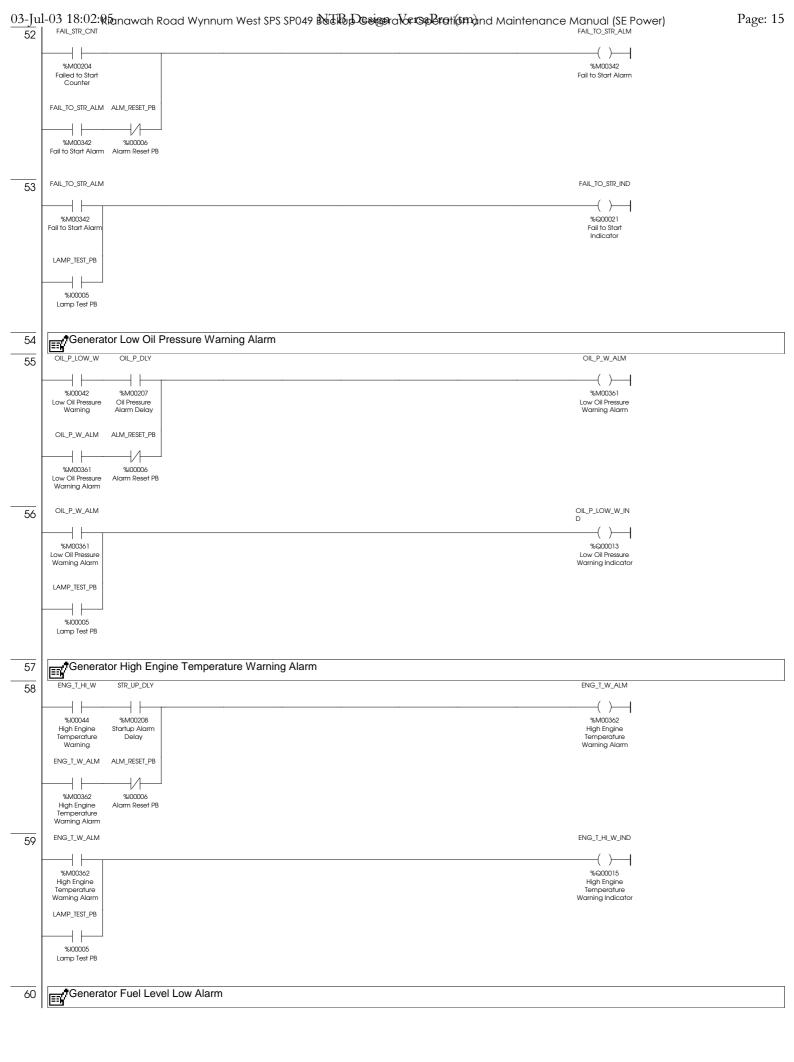


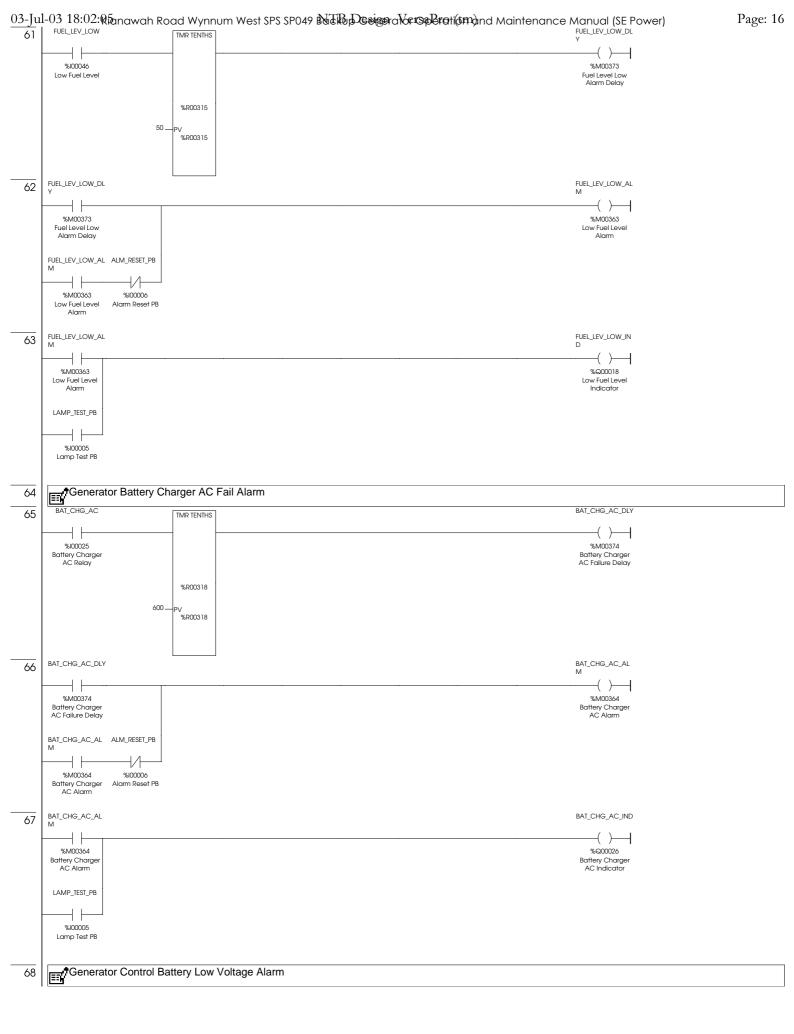


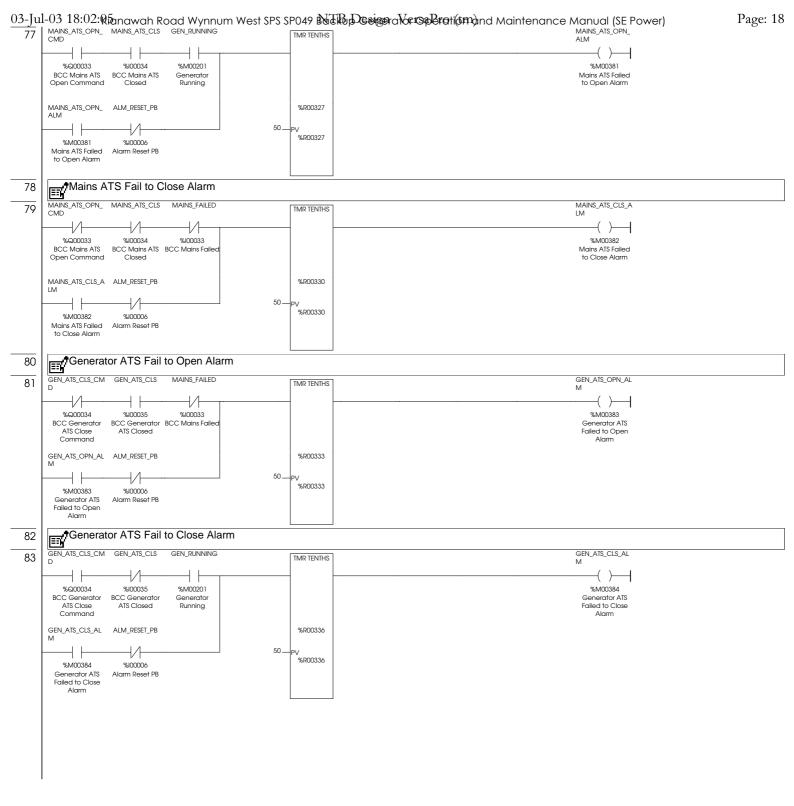




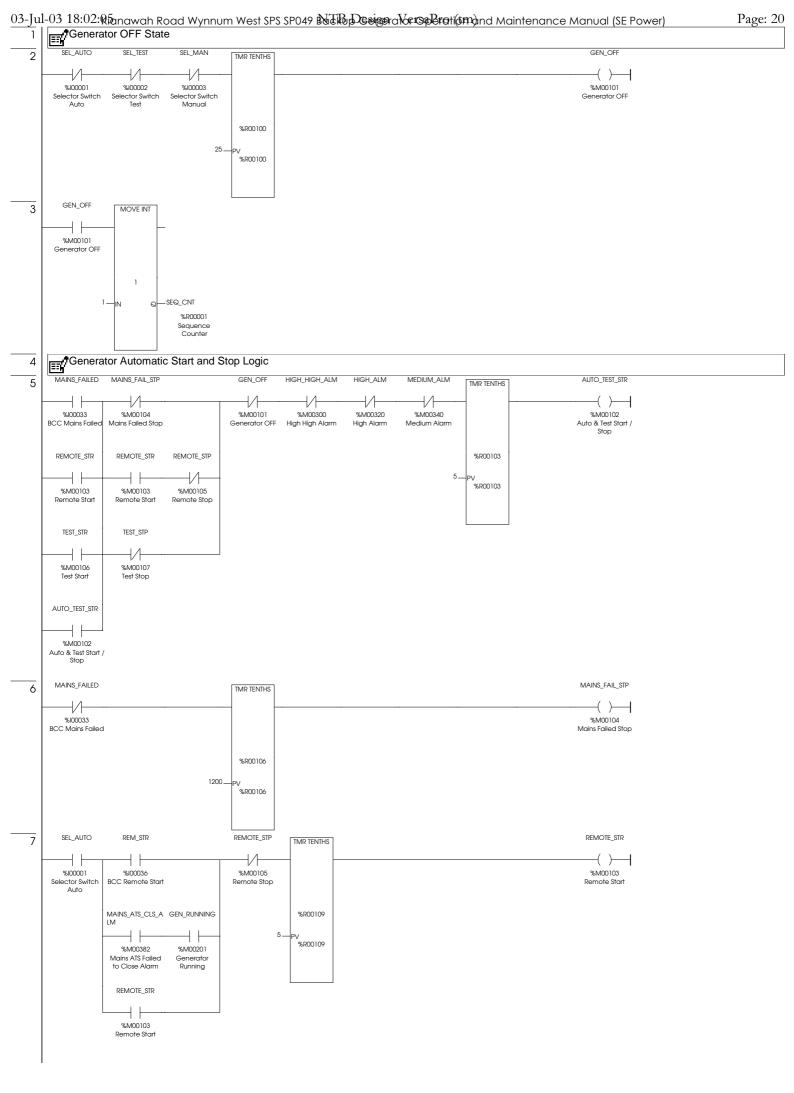


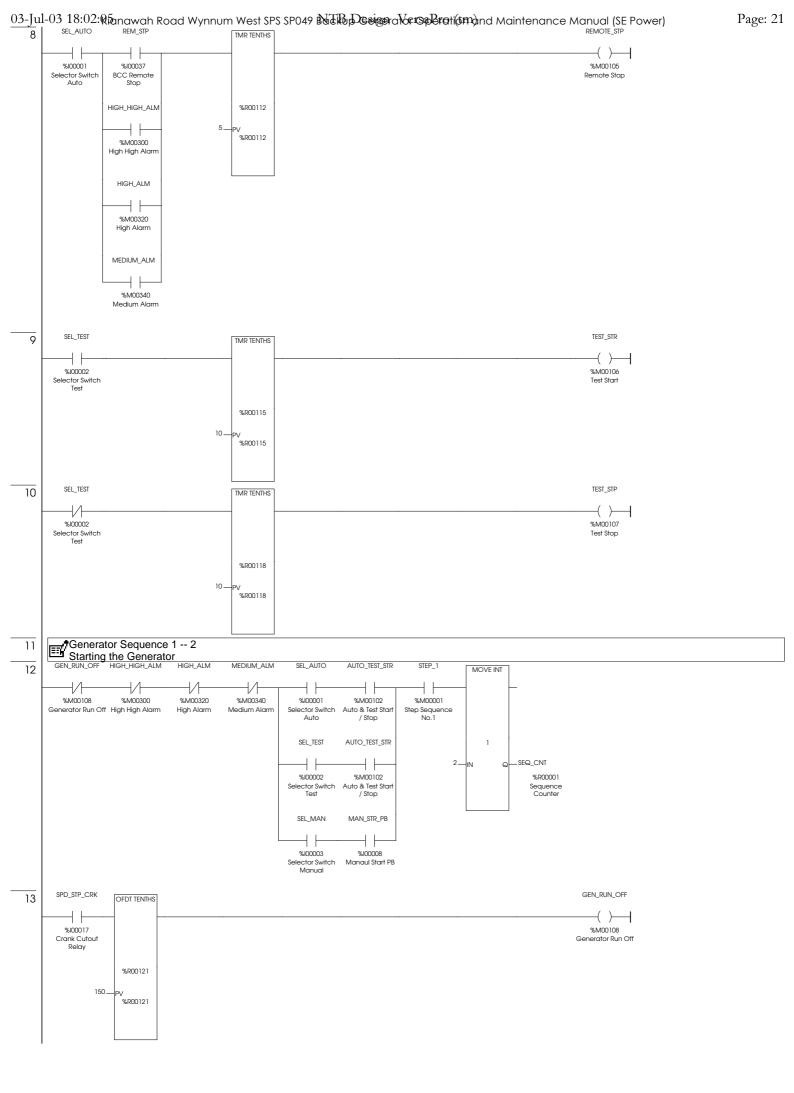


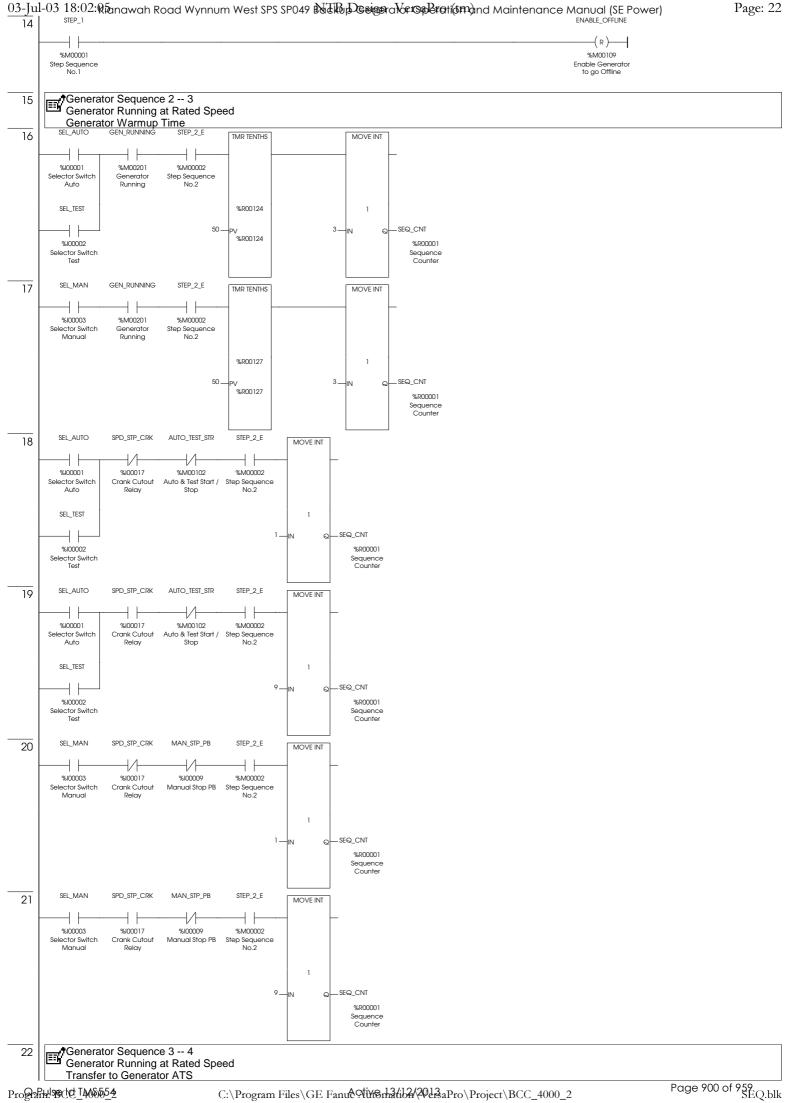


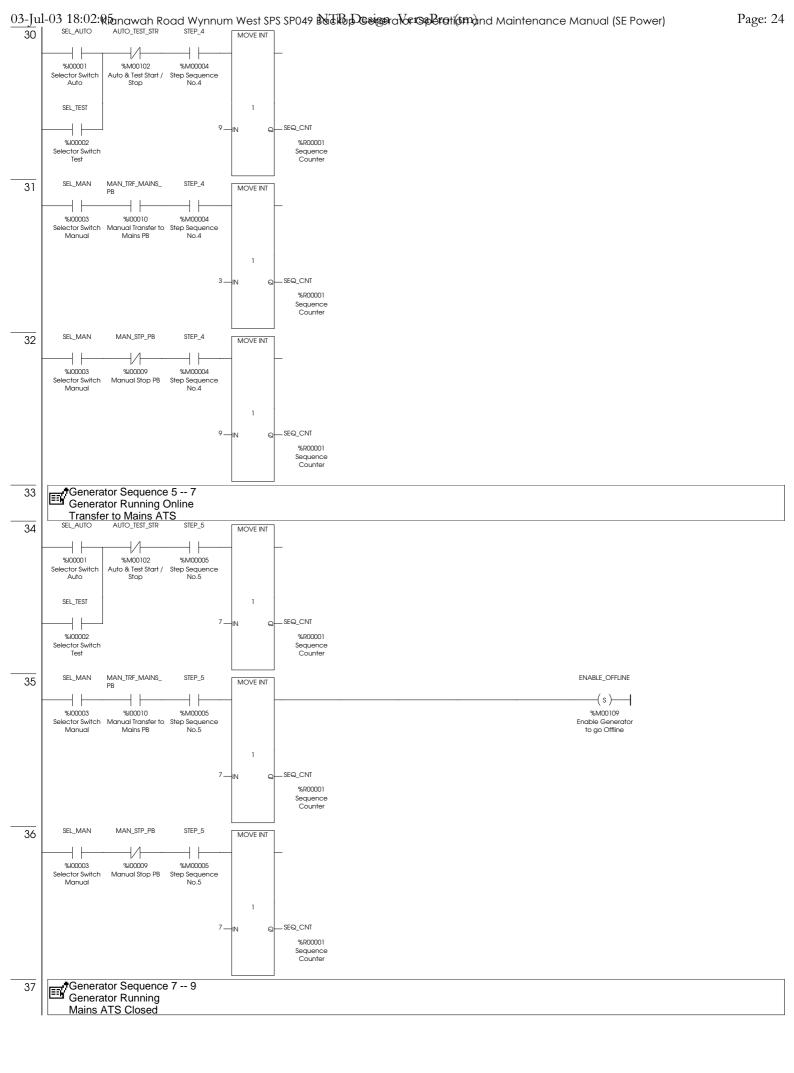


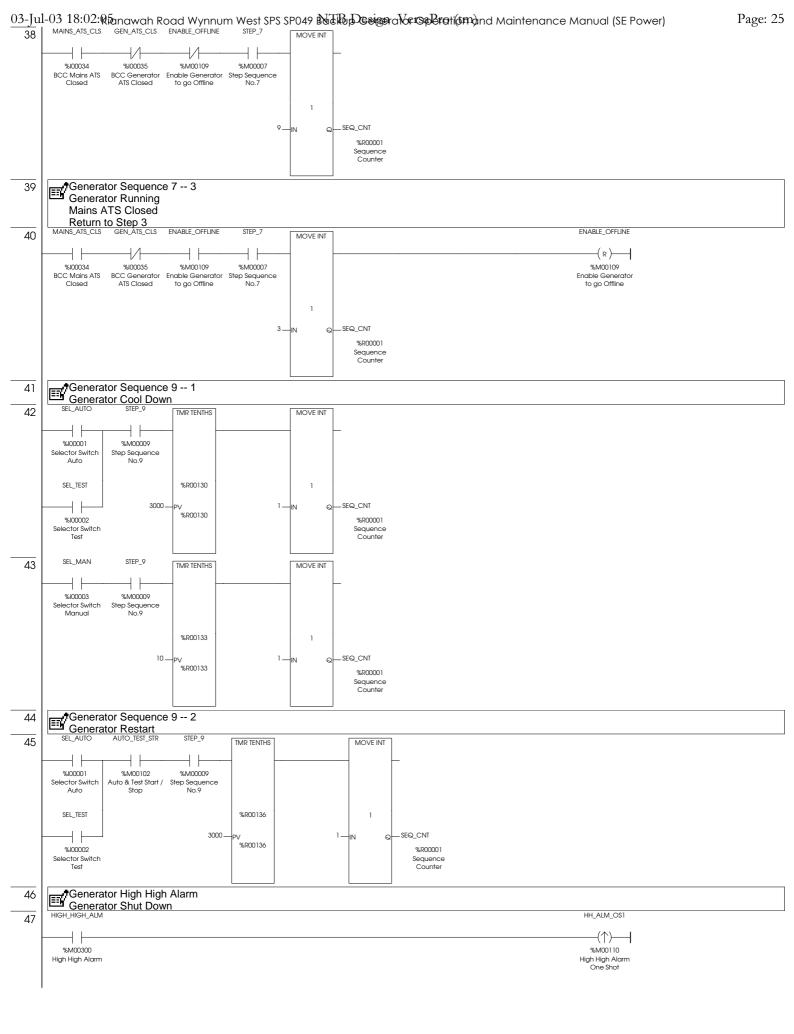
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Description:	Control Logic for the Generator Operation Sequences
	Ladde

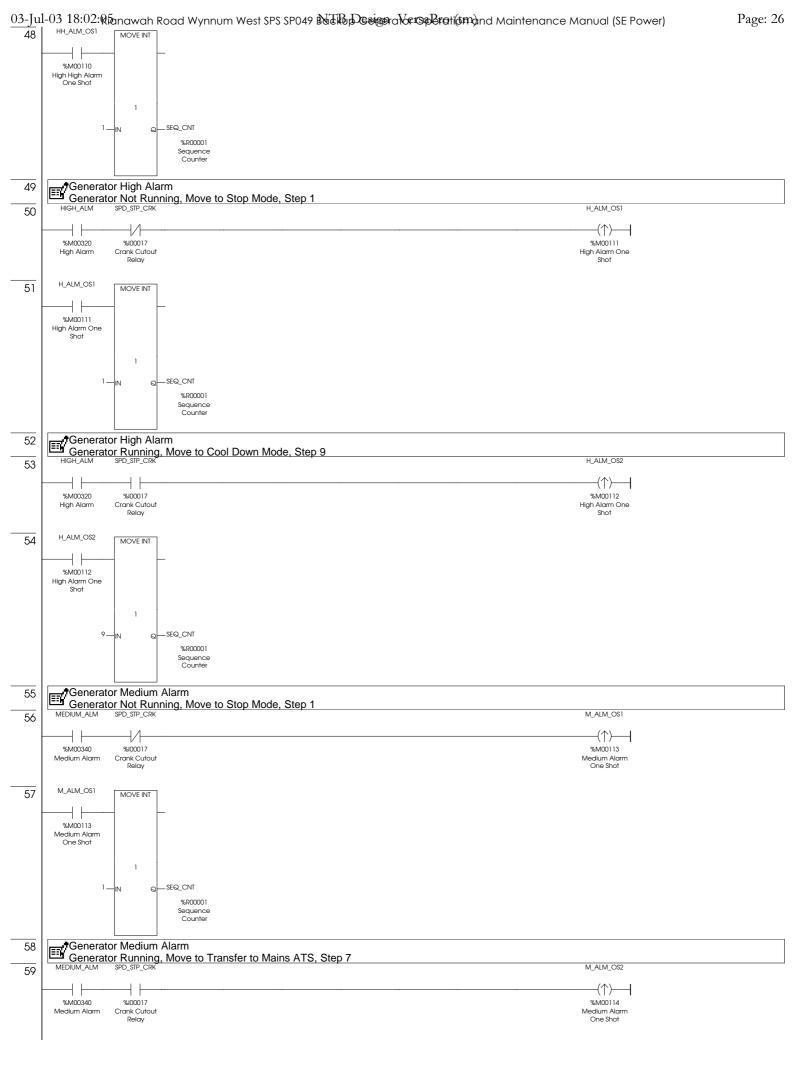


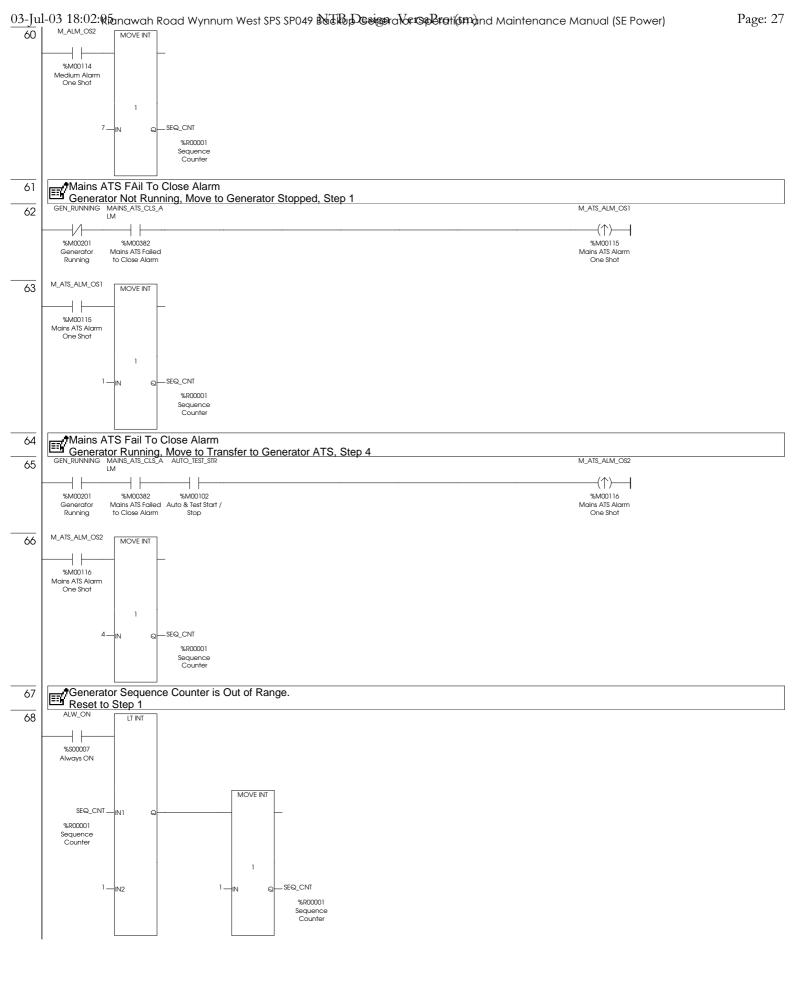


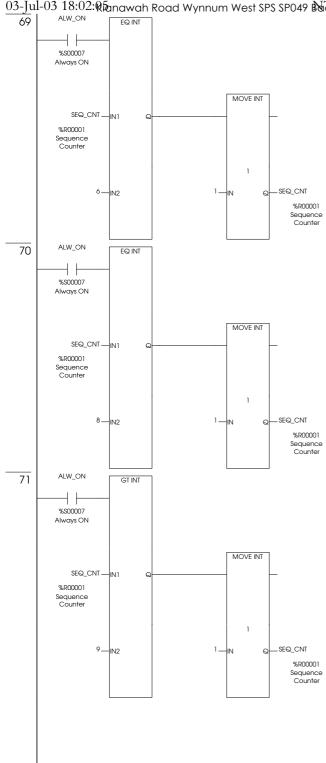




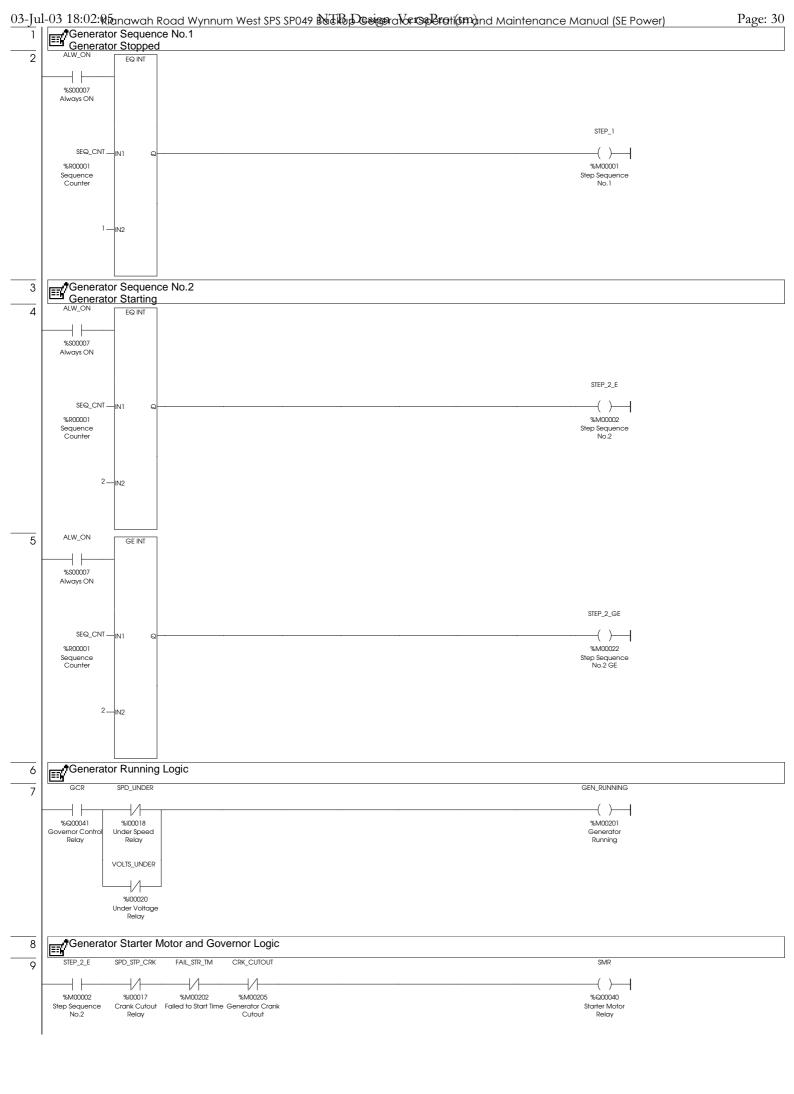


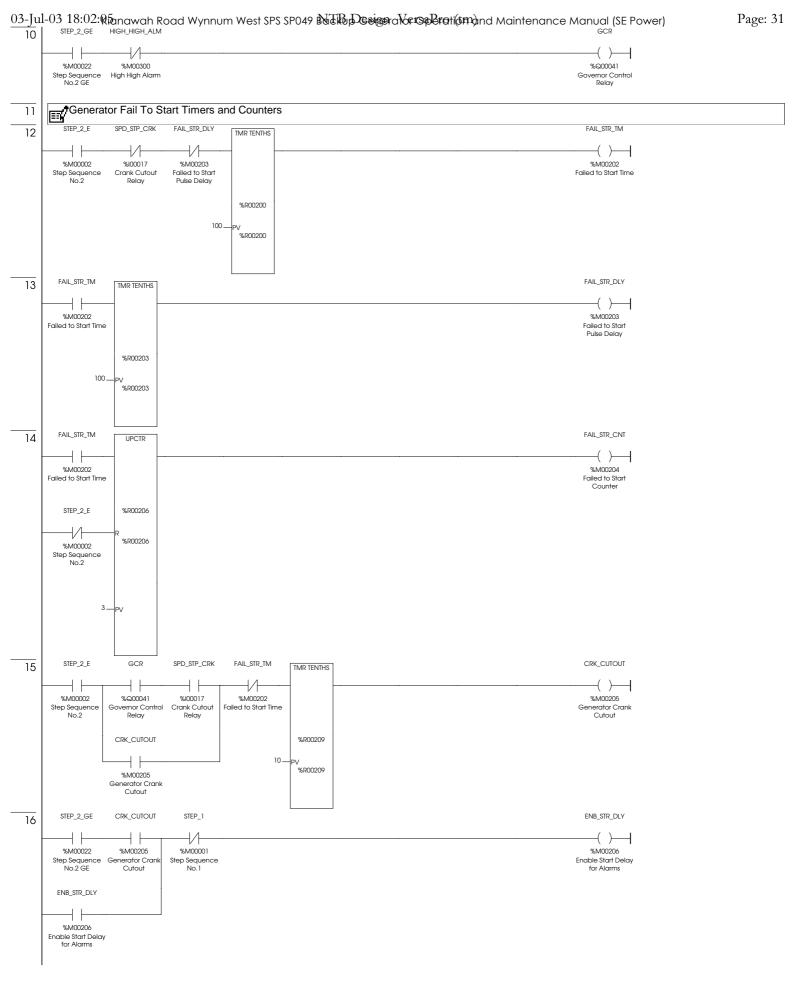


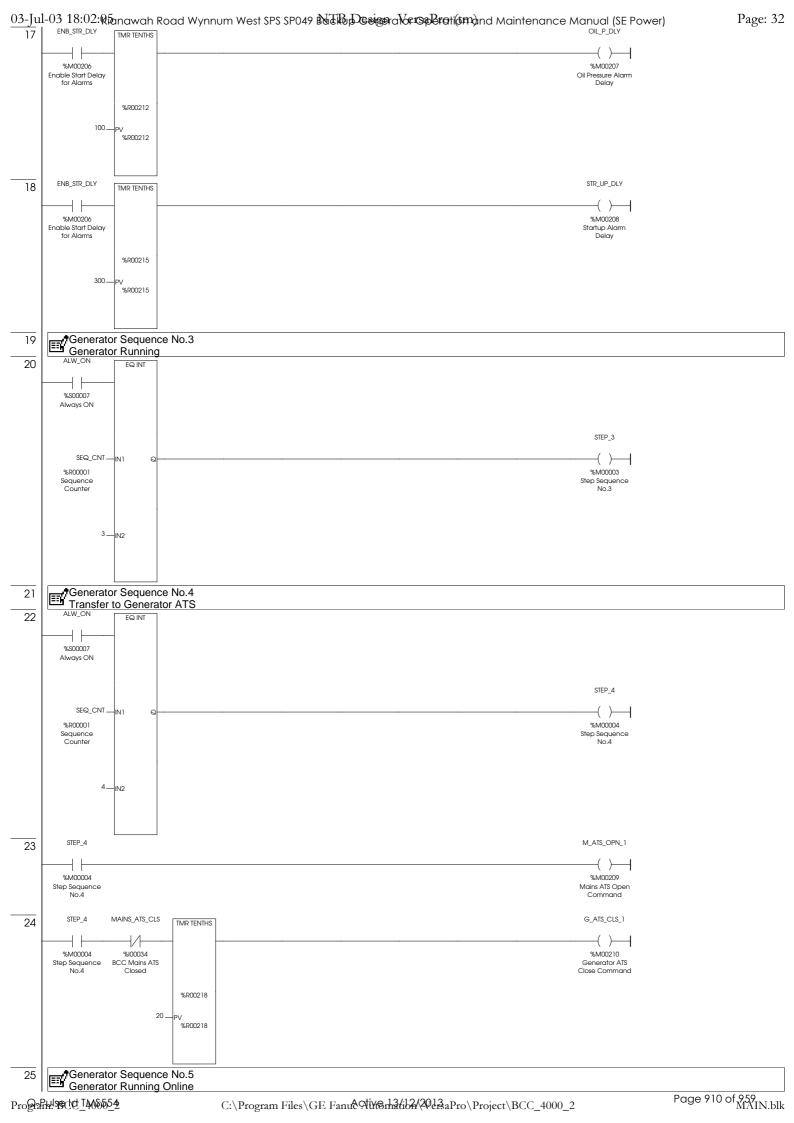


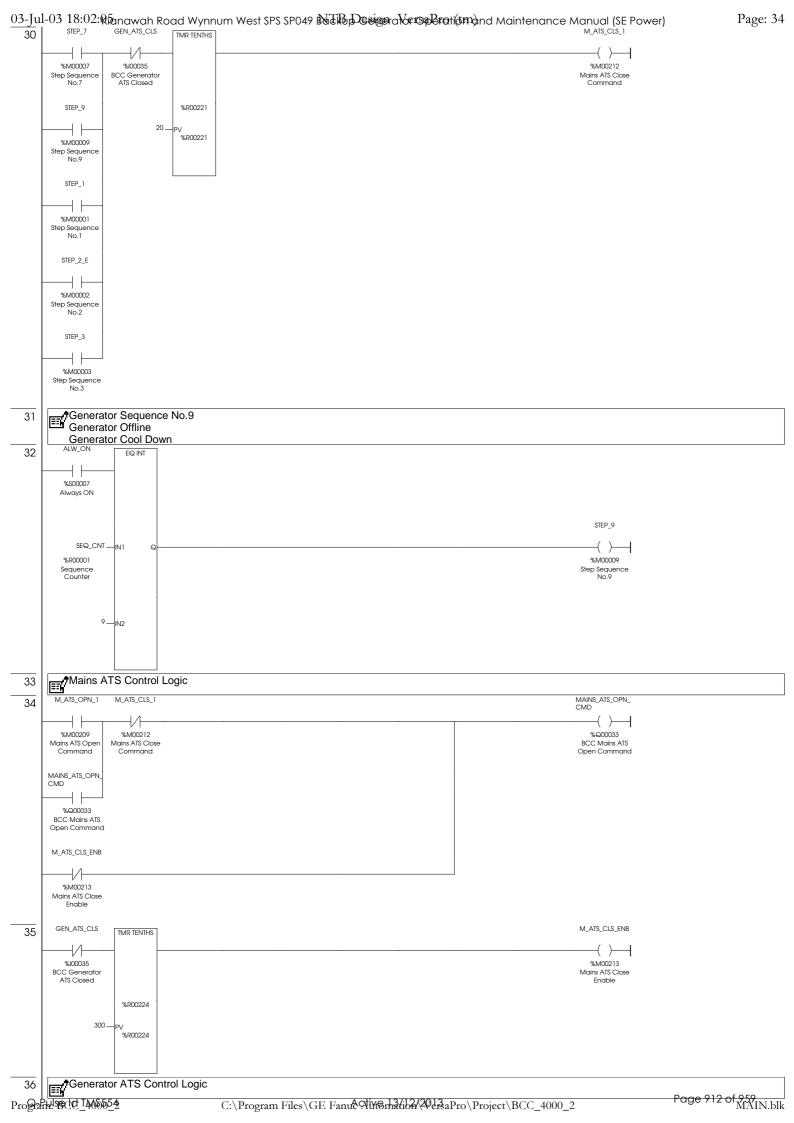


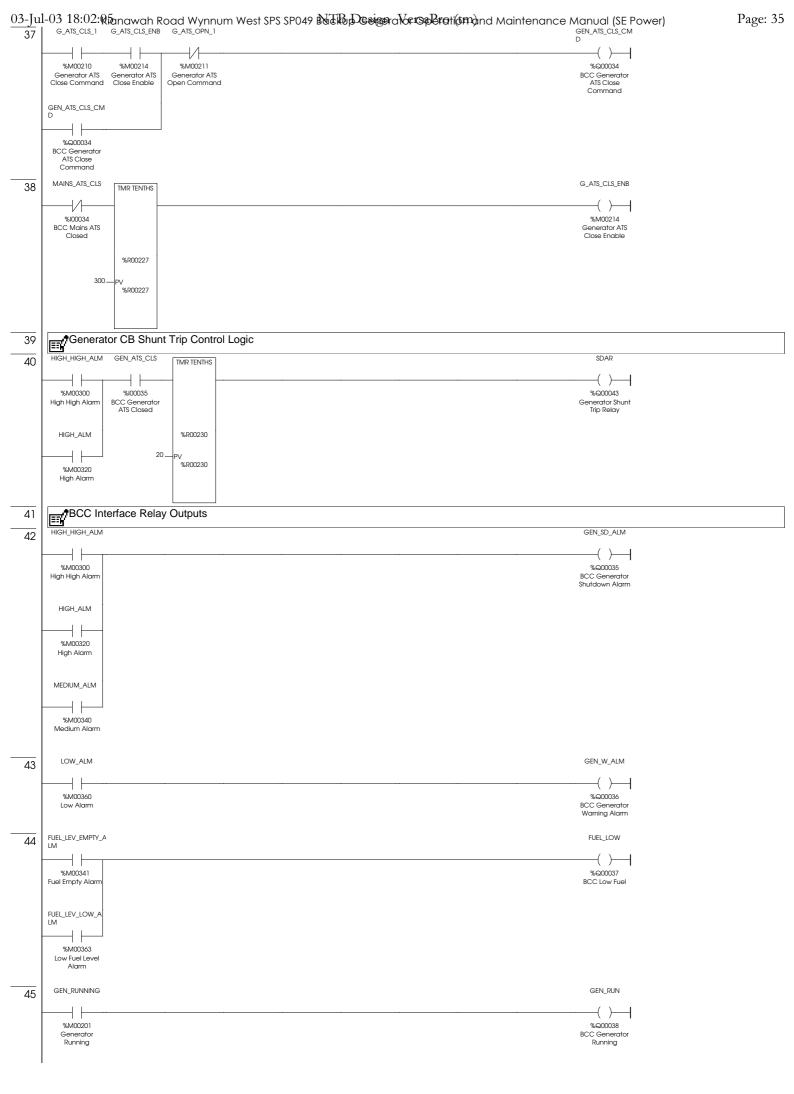
Block Name:	MAIN.blk
Description:	
	Ladder

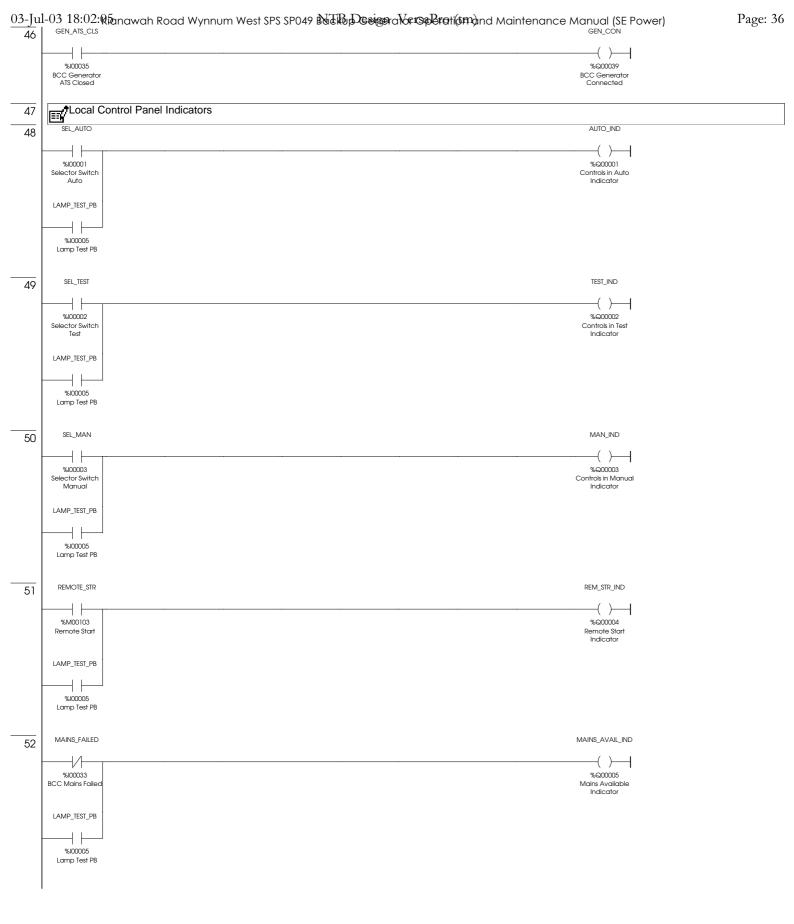


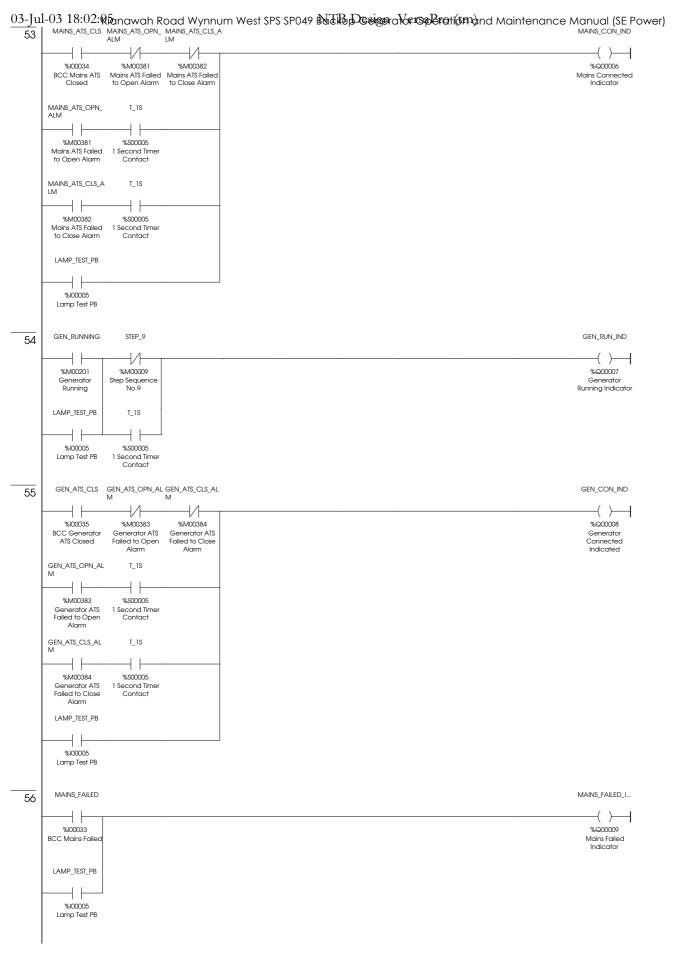












Block Name:	MAIN.blk
Description:	
	Ladder

Block Name:	PRESETS.bl/
Description:	Control Logic Generator Presets
	Ladde

Presets Routine

Move 1 to the Sequence Counter

ALW_ON

MOVE INT

%S00007

Always ON

1

1—IN Q—SEQ_CNT

%R00001

Sequence Counter

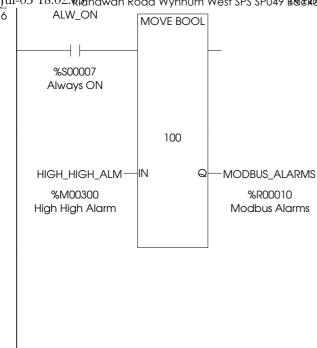
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Page: 43

Block Name:	MODBUS.blk
Description:	
	Ladder



			GLOI	BAL VARIABLES			
Name	Type	Len	Address	Description	Stored Val	Scope	Ret Ovr Ext
SEL_AUTO	BÍT	1	%100001	Selector Switch Auto		Global	R
SEL_TEST	BIT	1	%100002	Selector Switch Test		Global	R
SEL_MAN	BIT	1	%100003	Selector Switch Manual		Global	R
EM_STOP_PB	BIT	1	%100004	Emergency Stop PB		Global	R
LAMP_TEST_PB	BIT	1	%100005	Lamp Test PB		Global	R
ALM_RESET_PB	BIT	1	%100006	Alarm Reset PB		Global	R
ALM_MUTE_PB	BIT	1	%100007	Alarm Mute PB		Global	R
MAN_STR_PB	BIT	1	%100007	Manaul Start PB		Global	R
MAN_STP_PB	BIT	1	%100009	Manual Stop PB		Global	R
MAN_TRF_MAINS_PB	BIT	1	%I00010	Manual Transfer to Mains PB		Global	R
MAN_TRF_GEN_PB	BIT	i	%I00010 %I00011	Manual Transfer to Mains 1 B		Global	R
W/ (11 _ O E N_ 1 B	D11	•	70100011	PB		Ciobai	10
SPD_STP_CRK	BIT	1	%100017	Crank Cutout Relay		Global	R
SPD_UNDER	BIT	1	%I00017 %I00018	Under Speed Relay		Global	R
SPD OVER	BIT	1	%I00010 %I00019	Over Speed Relay		Global	R
VOLTS_UNDER	BIT	1	%I00019 %I00020	Under Voltage Relay		Global	R
VOLTS_OVER	BIT	1	%I00020 %I00021	Over Voltage Relay		Global	R
ALT_TEMP	BIT	1	%I00021 %I00022	Alternator High Temperature		Global	R
ALI_ILIVII	ы	'	/0100022	Relay		Giobai	IX
GEN_CB_TRIP	BIT	1	%100023	Generator CB Tripped		Global	R
MEN_FLT	BIT	1	%I00023 %I00024	MEN Fault Relay		Global	R
			%I00024 %I00025				
BAT_CHG_AC	BIT	1 1		Battery Charger AC Relay		Global	R
BAT_CONT_LOW_V	BIT	1	%100026	Control Battery Charger Low		Global	R
DAT CTD LOW V	DIT	4	0/100007	Voltage		Clahal	В
BAT_STR_LOW_V	BIT	1	%100027	Start Battery Charger Low		Global	R
MAINO FAILED	DIT	4	0/100000	Voltage		01-1-1	Б
MAINS_FAILED	BIT	1	%100033	BCC Mains Failed		Global	R
MAINS_ATS_CLS	BIT	1	%100034	BCC Mains ATS Closed		Global	R
GEN_ATS_CLS	BIT	1	%100035	BCC Generator ATS Closed		Global	R
REM_STR	BIT	1	%100036	BCC Remote Start		Global	R
REM_STP	BIT	1	%100037	BCC Remote Stop		Global	R
OIL_P_LOW_SD	BIT	1	%100041	Low Oil Pressure Shutdown		Global	R
OIL_P_LOW_W	BIT	1	%100042	Low Oil Pressure Warning		Global	R
ENG_T_HI_SD	BIT	1	%100043	High Engine Temperature		Global	R
				Shutdown		.	_
ENG_T_HI_W	BIT	1	%100044	High Engine Temperature		Global	R
		_		Warning			_
RAD_WATER_LOW	BIT	1	%I00045	Low Radiator Water Level		Global	R
FUEL_LEV_LOW	BIT	1	%100046	Low Fuel Level		Global	R
FUEL_LEV_EMPTY	BIT	1	%I00047	Fuel Empty		Global	R
CAN_DOORS_OPEN	BIT	1	%I00048	Canopy Doors Open		Global	R
STEP_1	BIT	1	%M00001	Step Sequence No.1		Global	
STEP_2_E	BIT	1	%M00002	Step Sequence No.2		Global	
STEP_3	BIT	1	%M00003	Step Sequence No.3		Global	
STEP_4	BIT	1	%M00004	Step Sequence No.4		Global	
STEP_5	BIT	1	%M00005	Step Sequence No.5		Global	
STEP_6	BIT	1	%M00006	Step Sequence No.6		Global	
STEP_7	BIT	1	%M00007	Step Sequence No.7		Global	
STEP_8	BIT	1	%M00008	Step Sequence No.8		Global	
STEP_9	BIT	1	%M00009	Step Sequence No.9		Global	
STEP_2_GE	BIT	1	%M00022	Step Sequence No.2 GE		Global	
GEN_OFF	BIT	1	%M00101	Generator OFF		Global	
AUTO_TEST_STR	BIT	1	%M00102	Auto _Test Start / Stop		Global	
REMOTE_STR	BIT	1	%M00103	Remote Start		Global	
MAINS_FAIL_STP	BIT	1	%M00104	Mains Failed Stop		Global	
REMOTE_STP	BIT	1	%M00105	Remote Stop		Global	
TEST_STR	BIT	1	%M00106	Test Start		Global	
TEST_STP	BIT	1	%M00107	Test Stop		Global	
GEN_RUN_OFF	BIT	1	%M00108	Generator Run Off		Global	
ENABLE_OFFLINE	BIT	1	%M00109	Enable Generator to go		Global	
				Offline			
HH_ALM_OS1	BIT	1	%M00110	High High Alarm One Shot		Global	
H_ALM_OS1	BIT	1	%M00111	High Alarm One Shot		Global	
H_ALM_OS2	BIT	1	%M00112	High Alarm One Shot		Global	
M_ALM_OS1	BIT	1	%M00113	Medium Alarm One Shot		Global	
M_ALM_OS2	BIT	1	%M00114	Medium Alarm One Shot		Global	
M_ATS_ALM_OS1	BIT	1	%M00115	Mains ATS Alarm One Shot		Global	
M_ATS_ALM_OS2	BIT	1	%M00116	Mains ATS Alarm One Shot		Global	
GEN_RUNNING	BIT	1	%M00201	Generator Running		Global	
FAIL_STR_TM	BIT	1	%M00202	Failed to Start Time		Global	
FAIL_STR_DLY	BIT	1	%M00203	Failed to Start Pulse Delay		Global	
FAIL_STR_CNT	BIT	1	%M00204	Failed to Start Counter		Global	
CRK_CUTOUT	BIT	1	%M00205	Generator Crank Cutout		Global	
ENB_STR_DLY	BIT	1	%M00206	Enable Start Delay for Alarms		Global	
OIL_P_DLY	BIT	1	%M00207	Oil Pressure Alarm Delay		Global	
STR_UP_DLY	BIT	1	%M00208	Startup Alarm Delay		Global	
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GLOBAL VARIABLES						
Name	Type	Len	Address		Stored Val Scope	Ret Ovr Ext
M_ATS_OPN_1	BIT	1	%M00209	Mains ATS Open Command	Global	
G_ATS_CLS_1	BIT	1	%M00210	Generator ATS Close	Global	
G_ATS_OPN_1	BIT	1	%M00211	Command Generator ATS Open	Global	
<u> </u>	5	•	7011100211	Command	0.050.	
M_ATS_CLS_1	BIT	1	%M00212	Mains ATS Close Command	Global	
M_ATS_CLS_ENB	BIT	1	%M00213	Mains ATS Close Enable	Global	
G_ATS_CLS_ENB	BIT	1	%M00214	Generator ATS Close Enable	Global	
HIGH_HIGH_ALM EM_STP_ALM	BIT BIT	1 1	%M00300 %M00301	High High Alarm Emergency Stop Alarm	Global Global	
MEN_ALM	BIT	1	%M00301	MEN Alarm	Global	
OIL_P_SD_ALM	BIT	1	%M00303	Low Oil Pressure Shutdown	Global	
				Alarm		
ENG_T_SD_ALM	BIT	1	%M00304	High Engine Temperature	Global	
RAD_WATER_LOW_ALM	BIT	1	%M00305	Shutdown Alarm Low Radiator Water Level	Global	
NAD_WATEN_EOW_ALM	DIT		701V100303	Alarm	Global	
SPD_OVER_ALM	BIT	1	%M00306	Over Speed Alarm	Global	
RAD_WATER_LOW_DLY	BIT	1	%M00315	Radiator Water Level Low	Global	
CDD OVED DLV	DIT	4	0/1400046	Delay	Clahal	R
SPD_OVER_DLY HIGH ALM	BIT BIT	1 1	%M00316 %M00320	Over Speed Delay Timer High Alarm	Global Global	ĸ
SPD_UNDER_ALM	BIT	1	%M00320	Under Speed Alarm	Global	
VOLTS_UNDER_ALM	BIT	1	%M00322	Alternator Voltage Under	Global	
				Alarm		
VOLTS_OVER_ALM	BIT	1	%M00323	Alternator Voltage Over	Global	
GEN_CB_TRIP_ALM	BIT	1	%M00324	Alarm Generator CB Tripped Alarm	Global	
ALT_TEMP_ALM	BIT	1	%M00325	Alternator High Temperature	Global	
, . <u> </u>		•	7000020	Alarm	0.000	
SPD_UNDER_DLY	BIT	1	%M00331	Under Speed Alarm Delay	Global	
VOLTS_UNDER_DLY	BIT	1	%M00332	Under Voltage Alarm Delay	Global	
VOLTS_OVER_DLY	BIT	1	%M00333	Over Voltage Alarm Delay	Global	
MEDIUM_ALM	BIT	1	%M00340	Medium Alarm	Global	
FUEL_LEV_EMPTY_ALM	BIT	1	%M00341	Fuel Empty Alarm	Global	
FAIL_TO_STR_ALM	BIT BIT	1 1	%M00342	Fail to Start Alarm	Global Global	
FUEL_LEV_EMPTY_DLY	DII	ı	%M00351	Fuel Level Empty Alarm Delay	Global	
LOW_ALM	BIT	1	%M00360	Low Alarm	Global	
OIL_P_W_ALM	BIT	1	%M00361	Low Oil Pressure Warning	Global	
				Alarm		
ENG_T_W_ALM	BIT	1	%M00362	High Engine Temperature	Global	
FUEL_LEV_LOW_ALM	BIT	1	%M00363	Warning Alarm Low Fuel Level Alarm	Global	
BAT_CHG_AC_ALM	BIT	1	%M00364	Battery Charger AC Alarm	Global	
BAT_CONT_LOW_V_ALM		1	%M00365	Control Battery Charger Low	Global	
			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Voltage Alarm		
BAT_STR_LOW_V_ALM	BIT	1	%M00366	Start Battery Charger Low	Global	
FUEL LEVILOW BLV	DIT	4	0/1400070	Voltage Alarm	Clahal	D
FUEL_LEV_LOW_DLY BAT_CHG_AC_DLY	BIT BIT	1 1	%M00373 %M00374	Fuel Level Low Alarm Delay Battery Charger AC Failure	Global Global	R R
BAT_CHG_AC_DET	ы	1	/6IVIOU374	Delay	Global	K
BAT_CONT_LOW_V_DLY	BIT	1	%M00375	Control Battery Low Voltage	Global	R
5.4T 0.TD 1.0W 1/ 51.V	D.T.	à	0/1400070	Delay	0.1.1	
BAT_STR_LOW_V_DLY	BIT	1	%M00376	Start Battery Low Voltage Delay	Global	R
MAINS_ATS_OPN_ALM	BIT	1	%M00381	Mains ATS Failed to Open	Global	
				Alarm		
MAINS_ATS_CLS_ALM	BIT	1	%M00382	Mains ATS Failed to Close	Global	
CEN ATS ODN ALM	BIT	1	0/ M00202	Alarm Generator ATS Failed to	Global	
GEN_ATS_OPN_ALM	DII	ı	%M00383	Open Alarm	Global	
GEN_ATS_CLS_ALM	BIT	1	%M00384	Generator ATS Failed to	Global	
				Close Alarm		
NEW_ALM	BIT	1	%M00400	New Alarm	Global	R
%M00401	BIT	1	%M00401	**No Description**	Global	R
%M00402 %M00403	BIT BIT	1	%M00402 %M00403	**No Description**	Global Global	R R
%M00403 %M00404	BIT	1	%M00403 %M00404	**No Description** **No Description**	Global	R R
%M00404 %M00405	BIT	1	%M00404 %M00405	**No Description**	Global	R
%M00406	BIT	1	%M00406	**No Description**	Global	R
%M00421	BIT	1	%M00421	**No Description**	Global	R
%M00422	BIT	1	%M00422	**No Description**	Global	R
%M00423	BIT	1	%M00423	**No Description**	Global	R
%M00424	BIT	1	%M00424	**No Description**	Global	R
%M00425	BIT	1	%M00425	**No Description**	Global	R
Program!sede_T40855_4		C:\Progr	am Files\GE Fanu	ASTIMETHATION Project BCC_40	000_2	Page 926 of 959

	GLOBAL VARIABLES						
Name	Type	Len	Address	Description	Stored Val	Scope	Ret Ovr Ext
%M00441	BÍŤ	1	%M00441	**No Description**		Global	R
%M00442	BIT	1	%M00442	**No Description**		Global	R
%M00461	BIT	1	%M00461	**No Description**		Global	R
%M00462	BIT	1	%M00462	**No Description**		Global	R
%M00463	BIT	1	%M00463	**No Description**		Global	R
%M00464	BIT	1	%M00464	**No Description**		Global	R
%M00465	BIT	1	%M00465	**No Description**		Global	R
%M00466	BIT	1	%M00466	**No Description**		Global	R
%M00481	BIT	1 1	%M00481	**No Description**		Global	R
%M00482 %M00483	BIT BIT	1	%M00482 %M00483	**No Description** **No Description**		Global Global	R R
%M00484	BIT	1	%M00484	**No Description**		Global	R
AUTO_IND	BIT	1	%Q00001	Controls in Auto Indicator		Global	IX
TEST_IND	BIT	1	%Q00001	Controls in Test Indicator		Global	
MAN_IND	BIT	i 1	%Q00003	Controls in Manual Indicator		Global	
REM_STR_IND	BIT	1	%Q00004	Remote Start Indicator		Global	
MAINS_AVAIL_IND	BIT	1	%Q00005	Mains Available Indicator		Global	
MAINS_CON_IND	BIT	1	%Q00006	Mains Connected Indicator		Global	
GEN_RUN_IND	BIT	1	%Q00007	Generator Running Indicator		Global	
GEN_CON_IND	BIT	1	%Q00008	Generator Connected		Global	
				Indicated			
MAINS_FAILED_IND	BIT	1	%Q00009	Mains Failed Indicator		Global	
EM_STOP_IND	BIT	1	%Q00010	Emergency Stop Indicator		Global	
MEN_FLT_IND	BIT	1	%Q00011	MEN Fault Indicator		Global	
OIL_P_LOW_SD_IND	BIT	1	%Q00012	Low Oil Pressure Shutdown		Global	
	DIT	4	0/ 000010	Indicator		01.1.1	
OIL_P_LOW_W_IND	BIT	1	%Q00013	Low Oil Pressure Warning		Global	
ENC T LIL CD IND	DIT	4	0/ 00004.4	Indicator		Clahal	
ENG_T_HI_SD_IND	BIT	1	%Q00014	High Engine Temperature		Global	
ENC T HI W IND	BIT	1	0/ 000015	Shutdown Indicator		Global	
ENG_T_HI_W_IND	ыі	ı	%Q00015	High Engine Temperature Warning Indicator		Global	
RAD_WATER_LOW_IND	BIT	1	%Q00016	Low Radiator Water Level		Global	
NAD_WATER_EOW_IIID	DIT	•	/0 Q 00010	Indicator		Global	
FUEL_LEV_EMPTY_IND	BIT	1	%Q00017	Fuel Empty Indicator		Global	
FUEL_LEV_LOW_IND	BIT	i	%Q00018	Low Fuel Level Indicator		Global	
SPD_OVER_IND	BIT	1	%Q00019	Over Speed Indicator		Global	
SPD_UNDER_IND	BIT	1	%Q00020	Under Speed Indicator		Global	
FAIL_TO_STR_IND	BIT	1	%Q00021	Fail to Start Indicator		Global	
VOLTS_UNDER_IND	BIT	1	%Q00022	Alternator Voltage Under		Global	
				Indicator			
VOLTS_OVER_IND	BIT	1	%Q00023	Alternator Voltage Over		Global	
			_	Indicator			
ALT_TEMP_IND	BIT	1	%Q00024	Alternator High Temperature		Global	
0511 05 7515 115	DIT		0/00005	Indicator		O	
GEN_CB_TRIP_IND	BIT	1	%Q00025	Generator CB Tripped		Global	
DAT CHO AC IND	DIT	4	0/ 000000	Indicator		Clahal	
BAT_CHG_AC_IND	BIT	1	%Q00026	Battery Charger AC Indicator		Global	
BAT_CONT_LOW_V_IND	BIT	1	%Q00027	Control Battery Charger Low		Global	
BAT_STR_LOW_V_IND	BIT	1	%Q00028	Voltage Indicator		Global	
BAT_STR_LOW_V_IND	ыі	ı	%Q00020	Start Battery Charger Low Voltage Indicator		Global	
CAN_DOORS_OPEN_IND	BIT	1	%Q00029	Canopy Doors Open Indicator		Global	
MAINS_ATS_OPN_CMD	BIT	1	%Q00023 %Q00033	BCC Mains ATS Open		Global	
W/ W/ 40_/ 11 0_01 14_0W/	DI.	•	70 Q 00000	Command		Ciobai	
GEN_ATS_CLS_CMD	BIT	1	%Q00034	BCC Generator ATS Close		Global	
				Command			
GEN_SD_ALM	BIT	1	%Q00035	BCC Generator Shutdown		Global	
				Alarm			
GEN_W_ALM	BIT	1	%Q00036	BCC Generator Warning		Global	
				Alarm			
FUEL_LOW	BIT	1	%Q00037	BCC Low Fuel		Global	
GEN_RUN	BIT	1	%Q00038	BCC Generator Running		Global	
GEN_CON	BIT	1	%Q00039	BCC Generator Connected		Global	
SMR	BIT	1	%Q00040	Starter Motor Relay		Global	
GCR	BIT	1	%Q00041	Governor Control Relay		Global	
AAR	BIT	1	%Q00042	Audible Alarm Relay		Global	
SDAR SEQ_CNT	BIT WORD	1	%Q00043 %R00001	Generator Shunt Trip Relay Sequence Counter		Global Global	R
MODBUS_INPUTS	WORD	1	%R00001 %R00002	Modbus Digital Inputs		Global	R R
MODBUS_INPUTS MODBUS_OUTPUTS	WORD	1	%R00002 %R00005	Modbus Digital Outputs		Global	R R
MODBUS_STATUS_1	WORD	1	%R00008	Modbus Status 1		Global	R
MODBUS_STATUS_2	WORD	1	%R00009	Modbus Status 2		Global	R
MODBUS_ALARMS	WORD	1	%R00010	Modbus Alarms		Global	R
%R00100	WORD	3	%R00100	**No Description**		Global	R
%R00103	WORD	3	%R00103	**No Description**		Global	R
Pro@727H!98ctct_T40655_4		C.\ D#0 ~==		tiven3tib2/20t3aPro\Project\BCC_4	000 2		Page 927 of 959
110g1am. 1900_4000_2		C. (1 rograf	THES (OE) PAILURY	rationiation (v cibai 10 (1 10)cct (DCC_4	000_2		

Name	Type	Len	Address	Description	Stored Val	Scope	Ret	Ovr	Ext
%R00106	WORD	3	%R00106	**No Description**		Global	R		
%R00109	WORD	3	%R00109	**No Description**		Global	R		
%R00112	WORD	3	%R00112	**No Description**		Global	R		
%R00115	WORD	3	%R00115	**No Description**		Global	R		
%R00118	WORD	3	%R00118	**No Description**		Global	R		
%R00121	WORD	3	%R00121	**No Description**		Global	R		
%R00124	WORD	3	%R00124	**No Description**		Global	R		
%R00127	WORD	3	%R00127	**No Description**		Global	R		
%R00130	WORD	3	%R00130	**No Description**		Global	R		
%R00200	WORD	3	%R00200	**No Description**		Global	R		
%R00203	WORD	3	%R00203	**No Description**		Global	R		
%R00206	WORD	3	%R00206	**No Description**		Global	R		
%R00209	WORD	3	%R00209	**No Description**		Global	R		
%R00212	WORD	3	%R00212	**No Description**		Global	R		
%R00215	WORD	3	%R00215	**No Description**		Global	R		
%R00218	WORD	3	%R00218	**No Description**		Global	R		
%R00221	WORD	3	%R00221	**No Description**		Global	R		
%R00224	WORD	3	%R00224	**No Description**		Global	R		
%R00227	WORD	3	%R00227	**No Description**		Global	R		
%R00230	WORD	3	%R00230	**No Description**		Global	R		
%R00300	WORD	3	%R00300	**No Description**		Global	R		
%R00303	WORD	3	%R00303	**No Description**		Global	R		
%R00306	WORD	3	%R00306	**No Description**		Global	R		
%R00309	WORD	3	%R00309	**No Description**		Global	R		
%R00312	WORD	3	%R00312	**No Description**		Global	R		
%R00315	WORD	3	%R00315	**No Description**		Global	R		
%R00318	WORD	3	%R00318	**No Description**		Global	R		
%R00321	WORD	3	%R00321	**No Description**		Global	R		
%R00324	WORD	3	%R00324	**No Description**		Global	R		
%R00327	WORD	3	%R00327	**No Description**		Global	R		
%R00330	WORD	3	%R00330	**No Description**		Global	R		
%R00333	WORD	3	%R00333	**No Description**		Global	R		
%R00336	WORD	3	%R00336	**No Description**		Global	R		
%R00339	WORD	3	%R00339	**No Description**		Global	R		
FST_SCN	BIT	1	%S00001	Set to 1 when the current		Global	R		
101_0011	DIT	'	70 0 00001	sweep is the first sweep		Global	11		
LST SCAN	BIT	1	%S00002	Reset from 1 to 0 when the		Global	R		
LOT_OOAN	DIT	'	/0000002	current sweep is the last		Global	11		
				sweep					
T_10MS	BIT	1	%S00003	0.01 Second Timer Contact		Global	R		
T_100MS	BIT	1	%S00003 %S00004	0.1 Second Timer Contact		Global	R		
T_1S	BIT	1	%S00004 %S00005	1 Second Timer Contact		Global	R		
T_1M	BIT	1	%S00003 %S00006	1 Minute Timer Contact		Global	R		
_	BIT	1	%S00007			Global	R		
ALW_ON ALW OFF	BIT	1	%S00007 %S00008	Always ON Always OFF		Global	R R		
_	BIT	1	%S00008 %S00014	Set to indicate a bad battery		Global	R		
PLC_BAT	DII	1	/0300014	in the CPU		Giobai	П		
% P00133	WORD	3	0/ D00122			Global	R		
%R00133	WORD	3 3	%R00133	**No Description**		Global	R		
%R00136	WUKD	S	%R00136	**No Description**		Giobai	Г		

GLOBAL SUMMARY OF HIGHEST USED REFERENCE ADDRESSES

MEMORY AREA	ADDRESS
Analog Input (%AI)	None Used
Analog Output (%AQ)	None Used
Input (%I)	%100048
Output (%Q)	%Q00048
Internal Memory (%M)	%M00484
Register (%R)	%R00341
Genius Global (%G)	None Used
Genius Global (%GA)	None Used
Genius Global (%GB)	None Used
Genius Global (%GC)	None Used
Genius Global (%GD)	None Used
Genius Global (%GE)	None Used
Temporary (%T)	None Used
System (%S)	%S00007
System (%SA)	None Used
System (%SB)	None Used
System (%SC)	None Used
Program (%P)	None Used

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PROJECTS – ENGINEERING

Sewerage System Performance Improvements Backup Diesel Generators for Pump Stations

FUNCTIONAL SITE TESTS FOR GENERATOR, AUTOMATIC TRANSFER SWITCH, AND RTU

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Telephone - 07 3403 3356 Facsimile - 07 3403 0205

Document ID : Genset Functional Tests

Date of Issue : June 2003

Revision : Rev 1

Actions are shown in **RED**

1 MANUAL MODE FUNCTIONAL TESTS

1.1 Manual Mode Start

Turn the AUTO – TEST – MAN- OFF selector switch to the MANUAL position. Press the MANUAL START push button to start the generator.

The generator set is allowed 3 attempts to start.

If it fails to start on the third attempt, the generator is locked out on FAIL TO START Alarm. Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise. Once the generator is running there is a 30 second warm up time before it is ready to accept load.

RESULTS: PASS/FAIL	NOTES

1.2 Stopping the generator in the Manual Mode.

Press the MANUAL STOP push button.

If the generator is still GEN ATS operation. The MANUAL TRANSFER TO MAINS is initiated.

When the GEN ATS is Open, the generator will enter the cool down time of 1 second. After the cool down time, the generator will shut down.

RESULTS: PASS/FAIL	NOTES

2 TEST MODE FUNCTIONAL TESTS

2.1 Test Mode Start – and test of Manual Mode interruption

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the TEST position.

The generator shall begin to crank.

Change the selector MAN while the generator is operating on TEST: to test that the system shall change to MANUAL TRANSFER TO GEN.

Press the MANUAL STOP push button.

RESULTS: PASS/FAIL	NOTES

2.2 Continue Test

Select TEST operation again by turning the AUTO – TEST – MAN- OFF selector switch to the TEST position.

The generator shall begin to crank.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise. Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close

RESULTS: PASS/FAIL	NOTES
RESCEID. I ASS/I AIL	TOTES

2.3 Stopping Generator In The Test Mode - To Test Mains Failure /Genset Restart During Shutdown

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO or OFF position.

The GEN ATS shall Open and the MAINS ATS shall Close

When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.

the GENERATOR ATS without shuttir	cool down period the generator shall transfer back to
2.4 Stopping generator in the Select this operation by turning the AU AUTO or OFF position. The GEN ATS shall Open and the MAI After the cool down time of 5 minutes, RESULTS: PASS/FAIL	TO – TEST – MAN- OFF selector switch to the INS ATS shall Close the generator will shut down.
Make GENSET unavailable Select this operation by turning the AU position.	genset unavailable (fault or GEN CB off). TO – TEST – MAN- OFF selector switch to the TEST preferred results (unit should not start?) _NOTES

3 AUTOMATIC MODE FUNCTIONAL TESTS

3.1 Automatic Start

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise. Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

RESULTS: PASS/FAIL NOTI	$\mathbf{E}\mathbf{S}$

3.2 Stopping the generator in the Auto Mode –and testing genset restart for mains failure during cool-down.

Turn on the Mains to the switchboard

The Phase Failure Relay from the clients switch board shall give a Stop Signal for the generator

There is a 2 minute proving time for the Phase Failure Relay.

After the 2 minute proving time the GEN ATS shall Open and the MAINS ATS shall Close When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.

т		41 .	4.	4	CC	41	TA /	r •		41	• •
	During	tnis	time	nırn	OTT	tne	IV	iains	to	tne	: SITE

When Mains Failure occurs duri	ng the cool down period the generato	r shall transfer back to
the GENERATOR ATS without	shutting down.	
RESULTS: PASS/FAIL	NOTES	

3.3 Stopping the generator in the Auto Mode - continued.

Turn on the Mains to the switchboard

The Phase Failure Relay from the clients switch board shall give a Stop Signal for the generator

There is a 2 minute proving time for the Phase Failure Relay.

After the 2 minute proving time the GEN ATS shall Open and the MAINS ATS shall Close When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes. After the cool down time, the generator will shut down.

RESULTS: PASS/FAIL	NOTES	

3.4 Automatic ATS Transfer To Genset- Mains ATS Failure

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

The MAINS ATS will fail to Open: After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.

The system shall then return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL	NOTES)

3.5 Automatic ATS Transfer - Gen ATS Failure

Re-enable the MAINS ATS CB

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

The GEN ATS will fail to Close: After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.

The system shall return back to MAINS ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL NOTES	
--------------------------	--

3.6 Automatic ATS Transfer To Mains - Gen ATS Failure

Disable GEN ATS CB

Restart the generator in Auto by turning off the Mains

The GEN ATS will fail to Open.

After a 5 second delay an Alarm shall be generated and the GENERATOR CONNECTED indicator shall flash to indicate the Alarm.

The system shall return back to GEN ATS operation.

Stop the generator using the Stop button

RESULTS: PASS/FAIL	NOTES	

3.7 Automatic ATS Transfer To Mains - Mains ATS Failure

Re-enable the GEN ATS CB

Disable MAINS ATS CB

Restart the generator in Auto by turning off the Mains

The MAINS ATS will fail to Close.

After a 5 second delay an Alarm shall be generated and the MAINS CONNECTED indicator shall flash to indicate the Alarm.

The system shall return back to GEN ATS operation.

RESULTS: PASS/FAIL NOTES	

3.8 Running in Auto and umbilical looses connection.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise. Once the generator is running there is a 30 second warm up time before it is ready to accept

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

Remove umbilical plug

Observe results – Genset discussion of p	preferred results (ATS returns to MAINS?)
RESULTS: PASS/FAIL	NOTES

3.9 Running in Auto and genset trips or faults.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise. Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

Cause Genset trip or fault

Observe results – Genset discussion of J	oreferred results (ATS returns to MAINS?)
RESULTS: PASS/FAIL	NOTES

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4 REMOTE START/STOP TESTS

4.1 Remote start command.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Initiate a Remote Start Command from the BW Control Room

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise. Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close.

RESULTS: PASS/FAIL NOT	ΓES
------------------------	-----

4.2 Remote stop command.

Initiate a Remote Start Command from the BW Control Room

The GEN ATS shall Open and the MAINS ATS shall Close

When the GEN ATS is Open, the generator will enter the cool down time of 5 minutes.

After the cool down time, the generator will shut down.

RESULTS: PASS/FAIL NOTES	
--------------------------	--

4.3 Remote Start with genset unavailable.

Make GENSET unavailable

Initiate a Remote Start Command from the BW Control Room

Observe results – Genset discussion of preferred results (unit should not transfer to MAINS?)
RESULTS: PASS/FAIL_____NOTES_____

4.4 Remote Stop with when running with MAINS not available unavailable.

Select this operation by turning the AUTO – TEST – MAN- OFF selector switch to the AUTO position.

Turn off the Mains to the switchboard.

The Phase Failure Relay from the clients switch board shall give a Start Signal for the generators to run.

Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise. Once the generator is running there is a 30 second warm up time before it is ready to accept load.

After the warm up time has expired, the MAINS ATS shall Open and the GEN ATS shall Close

Initiate a Remote Start Command from the BW Control Room

Observe results – Genset discussion of preferred results (unit should not transfer to MAINS?)
RESULTS: PASS/FAIL____NOTES____

5 SPECIFIC PROBLEM CHECKS (Variations to Functional Spec)

5.1 RTU IO and IDTS Alarms

The assumption is that all RTU IO and alarms have been proven by NCS.

5.2 From discussions on Indooroopilly Rd:

If the Genset ATS trips when genset is running - will ATS switch back to Mains? If the Genset ATS trips when genset is running (medium alarm) - will ATS switch back to Mains?

If the Genset on-board CB trips when genset is running - will ATS switch back to Mains?

If the Mains ATS trips when genset is not running - will the genset start? Eg Monitor the Mains ATS and allow the Gen ATS to take load when the Mains ATS is tripped. The problem is that genset start is initiated by PFR **above** the ATS.

If Mains trips amd no genset start is initiated (?) and then Remote Start signal is sent will unit start and then transfer to GENSET

Does a Remote start "reset" the tripped ATS CB or provide a "work-around"?

5.3 From M&E:

The remote start (from control room) was sent with the Generator C/B in the off / tripped position.

The generator started and the ATS Switched to generator supply.

The generator continued to run with out supplying the site (C/B was off) and failed to transfer back to the available Energex supply with out a remote stop signal.

5.4 From Contract:

Performance guarantee of not less than 0.8pu at alternator terminals during startup - measure volts drop on start-up of load.

6 FAULTS - TO BE TESTED WHERE REQUIRED

6.1 HIGH HIGH Alarm Operation.

The Generator CB is Opened immediately.

The generator is shut down immediately.

The following alarms will initiate a HIGH HIGH Alarm condition:-

Emergency Stop Fault

MEN Fault

Low Oil Pressure Shutdown Fault, 10 Seconds Startup Delay

High Engine Temperature Shutdown Fault, 30 second Startup Delay

Low Radiator Level Fault, 5 Second Delay

Over Speed Fault

6.2 HIGH Alarm Operation

The Generator CB is Opened immediately.

Once the generator circuit breaker is opened, the generator will run through its normal cool down time and shut down.

The following alarms will initiate a HIGH Alarm condition:-

Generator Under Speed Fault, 5 Second Delay

Alternator Under Voltage Fault, 5 Second Delay

Alternator Over Voltage Fault, 5 Second Delay

Generator CB Tripped Fault

Alternator High Temperature Fault, 30 Second Startup Delay

6.3 MEDIUM Alarm Operation.

A Normal Shutdown shall be Initiated.

If the GEN ATS does not Open then the Generator CB is Opened.

The following alarms will initiate a MEDIUM Alarm condition:-

Fuel Empty Level Fault, 5 Second Delay

Fail To Start Fault, 3 Attempts

6.4 LOW Alarm Operation.

A Warning has occurred on the generator. The generator will not shut down for this level of alarm.

The following alarms will initiate a LOW Alarm condition:-

Low Oil Pressure Warning Alarm, 10 Seconds Startup Delay

High Engine Temperature Warning Alarm, 30 Second Startup Delay

Fuel Low Level Alarm, 5 Second Delay

Battery Charger AC Supply Failed Alarm, 60 Second Delay

Control Battery Low Volts Alarm, 30 Second Delay

Start Battery Low Volts Alarm, 60 Second Delay

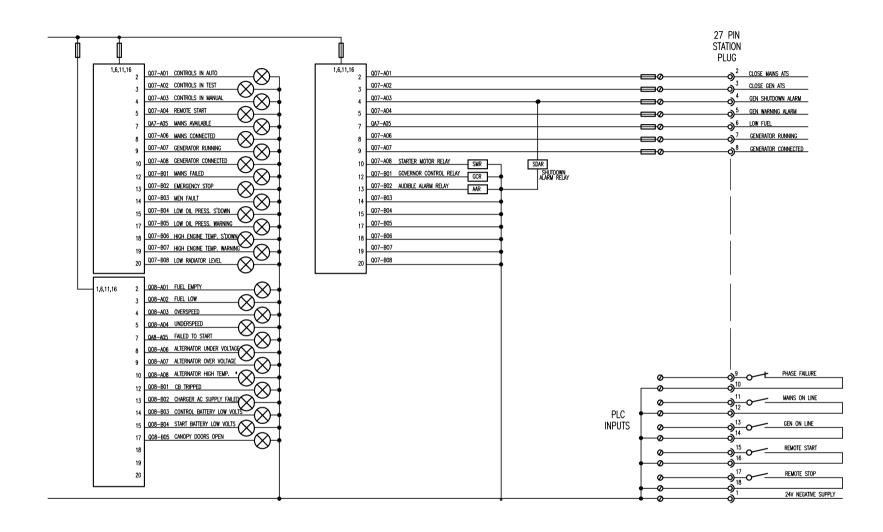
AT A LATER DATE??

3. NON-PERMANENT SITE, MANUAL MODE

- 3.1. To operate G1 in a Non-Permanent Site Location in MANUAL Mode.
- 3.2. Connect the generator cables to the site generator CB ensuring the site generator CB is OFF. See BCC procedures.
- 3.3. A plug with shorting links is required to be installed. It is required to be plugged into the 27 Pin Station Plug.
- 3.3.1. Pins 11 and 12 are required to be connected. This is to indicate that the Mains ATS is Closed. If they are not connected a MAINS ATS Alarm shall be indicated.
- 3.4. Select from the AUTO TEST MAN- OFF selector switch to the MANUAL position.
- 3.5. Press the MANUAL START push button to start the generator.
- 3.6. The generator will begin to crank.
- 3.6.1. If it fails to start within the 10 seconds, the starter motor is stopped and a delay of 10 seconds before it will attempt to restart.
- 3.6.2. The generator set is allowed 3 attempts to start.
- 3.6.3. If it fails to start on the third attempt, the generator is locked out on FAIL TO START Alarm.
- 3.6.4. When the generator starts, the starter motor is stopped by a stop cranking input which measures the speed of the generator.
- 3.6.5. Once the generator has started, there is a 10 second time delay for the oil pressure to stabilise.
- 3.6.6. If the oil pressure is not up to pressure after the 10 second time delay, the generator shall shut down on LOW OIL PRESS Alarm.
- 3.6.7. Once the generator is running there is a 5 second warm up time before it is ready to accept load.
- 3.7. To connect the generator to the site load.
- 3.7.1. Manually switch over to the generator supply via the site CB's. See BCC procedures.
- 3.7.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.
- 3.8. To disconnect the generator from the site load.
- 3.8.1. Manually switch over to the mains supply via the site CB's. See BCC procedures.
- 3.8.2. Do not use the MANUAL TRANSFER TO GEN or the MAN TRANSFER TO MAINS push buttons.
- 3.9. To stop the generator in the MANUAL Mode.
- 3.9.1. When the generator is running, it may be stopped by pressing the MANUAL STOP push button.
- 3.9.2. The generator will enter the cool down time of 1 second.
- 3.9.3. After the cool down time, the generator will shut down.
- 3.9.4. Once the generator has shut down there is a 15 second delay before it may be restarted. This is to ensure the engine has mechanically stopped.

SP049

Section 7 - Drawings



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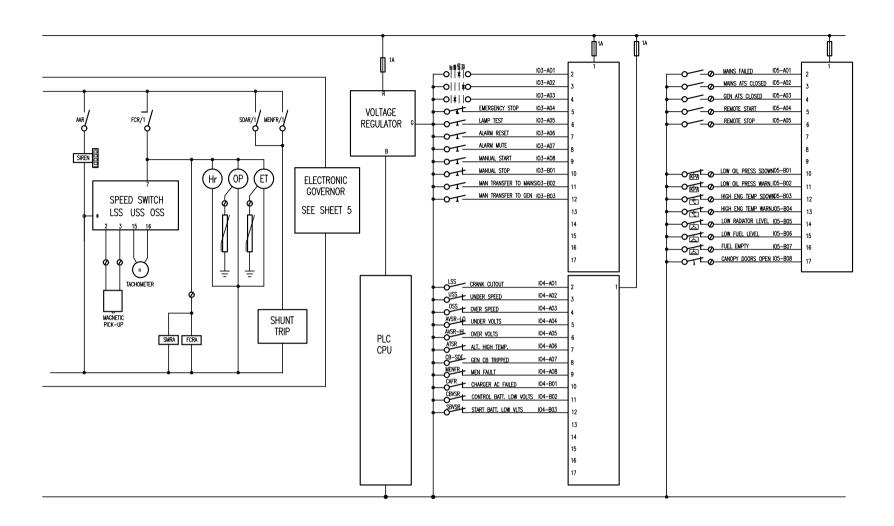
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	Division of Southside Engineering
	47 PROPRIETARY ST.
١	TINGALPA
"	BRISBANE, QLD. 4173
ί.	Phone: (07) 3890 1777

	Division of Southside Engineering	Client	RCC	BRISBANE WA	∆TFR
	47 PROPRIETARY ST.	L	Dec	DINIDUANE WA	1 L L I V
Λ		Project	PLIMP STA	TION DACKLIC	CENCET
-1)	TINGALPA		PUMP STA	TION BACKUP	GENSET
"	BRISBANE, QLD, 4173	Drafter	Draft Check	Reviewed	Approved Project Director
	Phone: (07) 3890 1744	HJR / RSL		Project Manager	Project Director
		Designed	Design Review	ID.	ID ID
	Facsimile: (07) 3388+163113/1	2 V 9/813)F	J
	7.011.0 1019	/			

Title		ELECT	RICAL	SCHEMATIC	
				S.E. Drawing No.	AMDT
Engineer's	Ref. No	Client Ref I	No.	14-22 546 8-35	9 0



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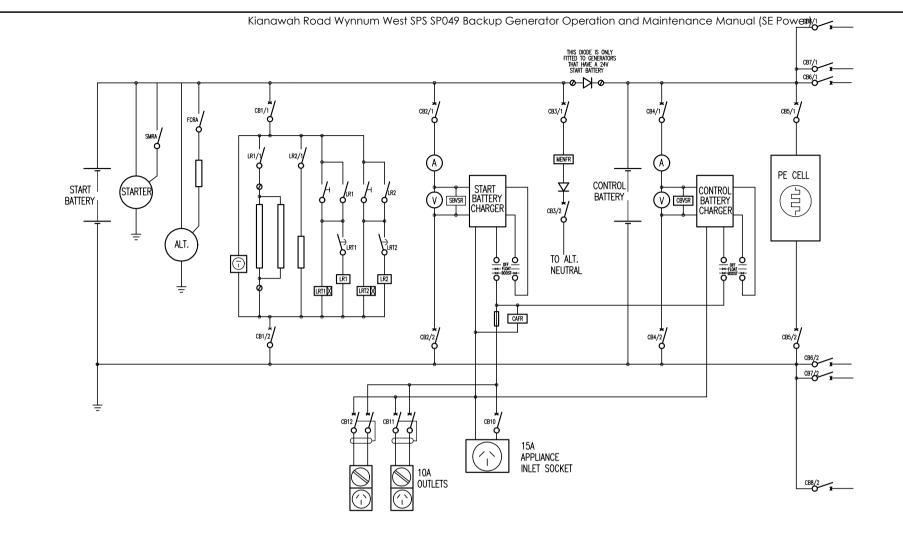
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#	BRISBANE, QLD. 4173	l
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1	Ctieni	BCC	BRISBANE WA	ATER
١	Project	PUMP STA	TION BACKUP	GENSET
١	Drafter HJR / RSL	Draft Check	Reviewed Project Manager	Approved Project Director
J	Designed	Design Review	JP	JP

Title		ELECT	RICAL	SCHEMATIC	
Scale 1:1	No in set 5	SE Ref No. 14291	SE Job No	S.E. Drawing No.	AMDT
Engineer'	Engineer's Ref. No		No.	142214682	9 0



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<u>Division of Southside Engineering</u> 47 PROPRIETARY ST.	Client	BCC E	BRISBANE WA	TER
TINGALPA	Project F	PUMP STA	TION BACKUP	GENSET
BRISBANE, QLD. 4173 Phone: (07) 3890 1744	Drafter HJR / RSL		Reviewed Project Manager	Approved Project Director
Facsimile: (07) 3398+1463113/1	Designed 2 V2 013	Design Review	JP	JP

Title		ELECT	RICAL	SCHEMATIC	
Scale 1:1	No in set	SE Ref No. 14291	SE Job No	S.E. Drawing No.	AMDT
Engineer's	Ref. No	Client Ref I	No.	14292 1-45 Of 15:	9 ⁰

0	1.00-1.67 71	Client Ref Wo. 30140-02/03	Engineer's Ref. No				
TOMA	S.E. Drawing No.	Jt291 SE Ref No. SE Job No	Scale No in set 1:20				
TNITIDNATIV							

VBBVNCEWENT Sb016' Sb076' Sb070

		Design Review	Designed RSL
bevonqq. notoenid toelon	Reviewed Project Manager		Drafter RSL
JP GENSETS	STATION BACK	GE PUMP	AW32 ^{togload}

BRISBANE WATER

1897 0688 (70)	Facsimile:
ללו 0688 (20)	:9по4Ч
סרם. לו73	BKISBANE ,
	AGJADNIT
LETARY ST.	
<u> Pouthside Engineering</u>	1o noisivi∏

tnambnamA	APP'D P.MGR	REV'D P.MGR	BEAIEM DESIGN	Date	Rev.
APPROVAL ISSUE				50.2.5	A
ISSUE FOR CONSTRUCTION				50.6.2	0

(NZING ILEW 5ª) (NZING ILEW 5ª)	KIRNAWAH KOAD CANZET KOAD	
(USING ITEM 2)	MACQUARIE STREET	
(USING ITEM 2)	MITTON ROAD	18092
(USING ITEM 2)	CENTENARY HIGHWAY	6109S

APPROVED FOR CONSTRUCTION

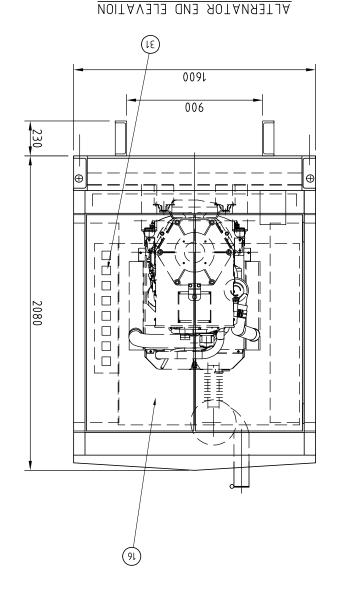
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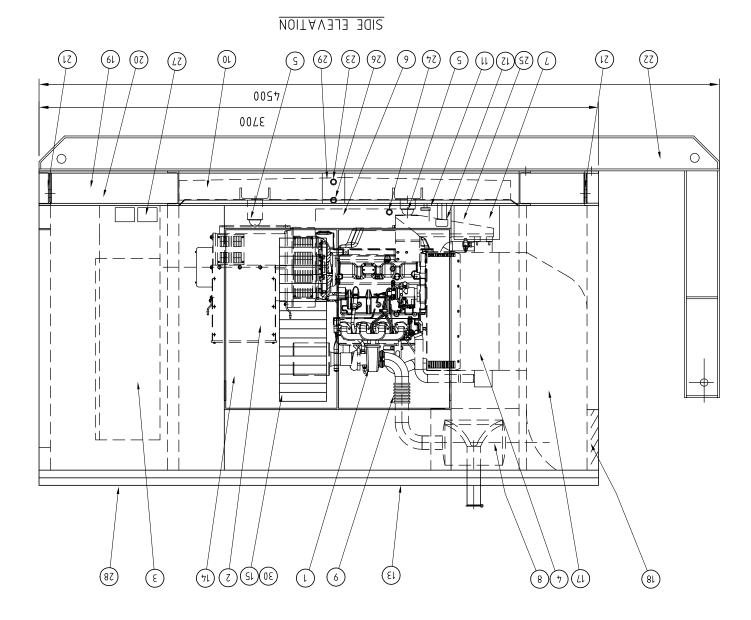
SKID BASE COLOUR: MIST GREEN

COLOUR: MIST GREEN

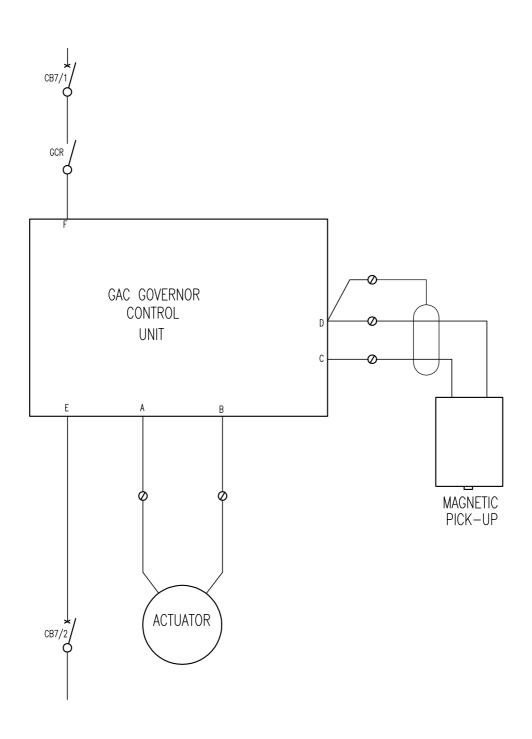
NOTE

OUTPUT & CONTROL SOCKETS T.B.A.	١٤
INSECT SCREEN	30
DRAIN POINT LOCKABLE COVER	67
BATTERY CHARGING SOLAR PANEL	82
CONTROL BATTERIES 2x12 VOLT	LZ
CATCHMENT TRAY DRAIN	97
ASOH NIARO ROTAIDAR	52
OIF DRAIN (LOCKABLE)	77
FUEL TANK DRAIN (LOCKABLE)	23
TRANSPORT SKID	77
LIFTING POINTS	12
ТИІОЧ ЯОНЭИА	02
CABLE ENTRY ZONE	6l
AIR OUTLET GRILL	81
PLENUM CHAMBER	Lι
SWITCHBOARD ACCESS DOOR	9ા
AIR INLET GRILL	Sl
SIDE ACCESS DOORS (2 OFF)	ול
ACOUSTIC ENCLOSURE (70dbA @ 7m)	٤١
FUEL FILL POINT (INSIDE ENCLOSURE)	Zl
FUEL GAUGE (MECHANICAL)	ll
FUEL TANK BASE FRAME 400 L	Ol
EXHAUST PIPE FLEXIBLE Ø75	6
EXHAUST SILENCER (COWL TS30PR)	8
STARTING BATTERY (382)	L
ENGINE DRIP TRAY	9
A/V MOUNTS (4 OFF)	S
AOTAIDAA	7
CONTROL SWITCHBOARD	٤
ALTERNATOR STAMFORD UC274E	72
ALTERNATOR STAMFORD UC274D	קמ
ENGINE 10HN DEEKE ¢0¢2H	l
DESCRIPTION	Mati
LEGEND	







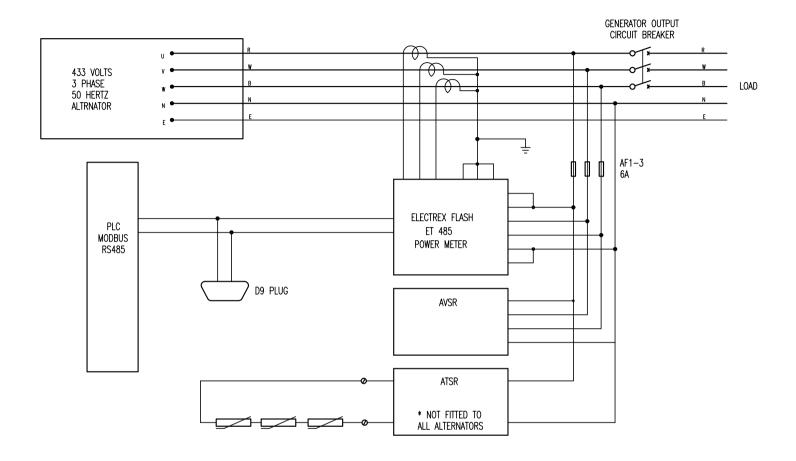


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EQUIPMENT DATA SHEET	REV No:	PROJECT No:	91-605	DATE: 1.08.03
BLAND GTATION BACKUP GENGE	-	REF:	PREPARED BY: HJR / RSL	CHECKED BY:
PUMP STATION BACKUP GENSE	1	APPROVED FOR ISSUE		SCALE:
GAC GOVERNOR CONTROLS		JP		1:1

Q-Pulse Id TM\$554 Active 13/12/2013 Page 945 of 959



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Division of Southside Engineering 47 PROPRIETARY ST.	Client	BCC	BRISBANE WA	ATER .
TINGALPA	Project	PUMP STA	TION BACKUP	GENSET
BRISBANE, QLD. 4173	Drafter HJR / RSL		Reviewed Project Manager	Approved Project Director
\$ Phone: (07) 3890 1744 Facsimile: (07) 3388†463113/1	Designed	Design Review	JP	JP

Title		ELECT	RICAL	SCHEMATIC	_
Scale 1:1	No in set 5	SE Ref No. 14291	SE Job No	S.E. Drawing No.	AMDT
Engineer'	s Ref. No	Client Ref	No.	14-29215-4884-95	9 0

SP049

Section 8 - Test Reports

Kianawah Road Wynnum West SPS SP049 Backup Generator Operation and Maintenance Manual (SE Power)



SE Power Equipment

47 Proprietary Street, Tingalpa, Qld 4173 Telephone: (07) 3890 1744 PO Box 3306 Tingalpa B.C. Qld 4173

DIESEL GENERATOR SET CONTROL FUNCTION TEST REPORT

SEP 009/B

CLIENT: BRISBANE WATER	5/049	_ D/	ATE: 21/7/03
SERIAL NO: 0307009	•		OB NO: (4291
ENGINE TYPE: 4945 H			NG. SERIAL NO: 726352
ALTERNATOR TYPE: 274 E		. <u>A</u> L	T. SERIAL NO: 20023531/1
DENOTE CONTROL TOWN		I	
GENSET CONTROL FUNCTIONS	FUNCTION	LAMP	REMARKS
Engine High Temp. Alarm	/		
Engine High Temp. Shutdown Low Water Level Alarm CB Tripped/Alt., Overload	V		
Low water Level Alarm		-	
CB Inpped/Ait., Overload			
Low Oil Pressure Alarm		1/	
Low Oil Pressure Shutdown		-	
Emergency Stop			
Start Fail Alarm	//	. //	
Genset Running			
MEN Fault			
Starter Motor Relay			
Fuel Low	//		
Fuel Empty	1		
Engine Gauges		//	
Status Lamps/Controls			
Underspeed Shutdown	/		
Overspeed Shutdown	4		
Remote Start/Stop	- //	-	
amp Test Alarm Shudown			
Alt Undervolts	- //		
Alt Overvolts			
Charger AC Failed	/		
Control Batt. Low Volts			
Start Batt. Low volts			
Canopy doors Open	-/-	-/-	
Audible Alarm/Mute	-/-	-/	
Remote ATS Controls	-/-	-/	
Alternator High Temperature	/		NOT ON THIS SET.
atomator riigir romperature			WOT OF THE SET.
			
	:		

CUSTOMER TESTING OFFICER:	TESTING OFFICER	R: PAUL HLAUKP M-
		JOHN ROTH



GENERATOR SET SOUND PRESSURE LEVEL TEST REPORT

SEP 0023/D

47 Proprietary Street Tingalpa Q 4173 BRISBANE AUSTRALIA

CLIENT:	B.W.	SP049	DATE:		
				91	
ENGINE TYP	E:	15 H	ENG. SERIAL NO: .	726352	
ALTERNATOR	R TYPE:	74E	ALT. SERIAL NO: _	20023531/1	,
SOUND LEVE	TI INSTRUMENT			.	

5 6 7 8 9

ALT 10

ENG

RAD

11

12

Position Layout

Remarks:

Distance: 7 m
Height: 1.5 m

POSITION	SOUND LEVEL	LOAD %						
	dB(A)	25	50	75	100	110		
1				69				
2				68				
3				68	,			
4				67				
5				64				
6				64				
7				64				
8				64				
9				64				
10				67				
11				68				
12				68				
Average	66.25							

QUALITY ASSURANCE OFFICER:	
CUSTOMER TESTING OFFICER:	
TESTING OFFICER:	D. Cooper
	0

WITNESS TESTING OFFICER:

SEP0084

47 Proprietary Street Tingalpa Qld 4173 PH: (07) 3890 1744

TRANSIENT LOAD RESPONSE TEST SHEET

Transient response for load changes: Load PF 0.8

25-0	22	7.5	0	/
20-0	25	7.5	0	<u>ن</u> ج
75-0	150	7.7	0	8
100-0	•			
0-100				
0-75	57	2.8	1	5.5
0-20	42	2.5	0	2.5
0-25	17	Ś	0	7
% Change Electrical kW	Change in Electrical kW	% Change HZ	% Change Volts	Recovery secs

CLIENT: BBS. WATER SPOYA

N: 0307009

ENGINE: 4045H

7 : 374E

JOVENDE: C.A.C



DIESEL GENERATOR SET LOAD TEST REPORT

SEP 0064/D

47 Proprietary Street Tingalpa Q 4173 BRISBANE AUSTRALIA

CLIENT: BUSBANE WATER SPOYA SERIAL NO: 0307009 ENGINE TYPE: 4045H ALTERNATOR TYPE: 774E GOVERNOR TYPE: G.A.C. OVERSPEED TYPE: PU SHUTDOWN SOLENOID: G.A.C. LOW OIL PRESSURE SHUTDOWN: Hebbs	JOB NO/CONTRACT NO: 14291 ENG. SERIAL NO: 726352 ALT. SERIAL NO: 20023531 1 STARTER MOTOR: 570					
A: 110 (+10%) KW: 79 (+10%)						
TECHNICAN:	INSPECTOR: PAUL HLANKA M					
TIME						
1540 1545 1605 1635	1705 1735 1750 1755					

TIME									
	1540	1545	1605	1635	1705	1735	1750	1755	
OIL PRESSURE	500	450	300	300	290	290	290	290	
OIL TEMPERATURE	_	-	_	_	-	_	-	70	
JACKET WATER TEMPERATURE	0	65	85	85	35	85	85	85	
17MP'S	0	85.7	124.5	124.3	124.1	124	64.3	0	
VOLTS 416.6	240 240 240	1	111		1	7//	77	//	
AMBIENT TEMPERATURE	22	22,	20	20	20	20	20	20	
HZ	50.1	50.1	50.1	56.1	50	50	502	50.2	
KW	0	6/	89.9	89.9	89.4	89.4	46	0	
LOAD%		2							
1ARKS	O	75%	110%	1109	110%	110%	50%	0	

Generator_Load_Test_Report.doc

47 Proprietary Street Tingalpa Q 4173 BRISBANE AUSTRALIA



SEP 0013

FINAL INSPECTION CHECKLIST

This form is to be completely filled out before any generating set leaves the factory.

It is to be signed by the person doing the inspection and by their immediate supervisor. In the case of a non-standard job it must also be signed by the Special Projects Manager or the Engineering Manager.

A copy of this form is to be sent out with the plant concerned.

Please	neatly	tick	in	the	boxes	provided	where	applicable	and	note	any	comments
in the	space	provid	ded	•		-		111			_	

	Til Clie	space provided.	
	MODEL:	SP049 SERIAL NO: 0307009 ENGINE NO: 726	352
	JOB NO	: 14291 DATE: 21/7/03 CUSTOMER: B.W	-
	BASE	=======================================	==
	(1) (2) (3) (4)	All welds continuous, neat and clean. All bolts tightened. Bearers completely secured. No sharp corners.	121
	RADIAT	OR OR	
	(1) (2) (3) (4) (5)	Radiator correctly mounted. All pipework included and secure. Drain plug in place. Water removed from radiator. Clamps on hoses tight.	
	ENGINE		
	(1) (2) (3)	Fan is correctly mounted. All guards in place and secure. Wiring loom is correct to drawing, securely fixed and marked and is terminated in an appropriate terminal box.	
	(4) - (5) (6) (7) (8)	Battery leads attached and secure and long enough for termination to batair cleaner is properly mounted. Magnetic pickup is fitted and set to correct depth. Exhaust pipe and silencer (where required) are fitted correctly. Dip stick in place.	ttery.
	(9) (10) (11) (12)	Oil removed from engine. All fuel and oil unions completely tightened. All ordered options are fitted and function correctly. All parts secure, no damage.	-
	(13) (14)	All earths less than 0.1 ohms. Cables and hoses secure for transport.	
	CONTROL	SYSTEM (where applicable)	
	(1) (2) (3)	Control functions as ordered. Control is mounted correctly. All leads, terminals, fuses, printed circuit boards and switchgear are	
	(4) (5) (6)	completely secure and marked correctly. Dust seals are fitted around doors. Doors hinged correctly. All earths less than 0.1 ohms.	
-Pulse Id TM		Red Danger labels in cubicle. Active 13/12/2013	Page 952 of 959

CONT	ROL SYSTEM (cont)	
(8) (9) (10)	Perspex shield secure, clean and no sharp corners. Cables correct, no damage. Locks and keys satisfactory.	
ALTE	RNATOR	
(1).	Alternator is correctly mounted. Alternator leads are correctly mounted inside terminal box and marked correctly.	
(3)	A.V.R. is mounted, connected properly and set to correct setting. Coupling and adaptor are properly fastened between engine and alternator with correct size and tensile grade bolts.	
(5) (6) (7)	All options ordered are fitted and function properly. Alternator is correctly wired for the appropriate voltage as per either Order or Bills of Material. Earth stud fitted.	
FINIS		
(1)	Plant is painted to correct colour. All blemishes in finish, especially paint runs, are completely removed.	
GENEI	RAL INSPECTION	
(1)	Genset is manufactured to correct engine/alternator/radiator/bases configuration as specified on Bill of Materials.	
(2)	All documents are in a sealed plastic bag and secured inside alternator terminal box.	
	a) Engine Handbook b) Alternator Handbook c) Warranty Card d) Packing List e) Test Sheet	
(3)	No Oil/No Water label is attached to positive battery lead. All labels are straight and in correct location.	
SIGNE	ED: D. COOPER PAULHLAUKA A INSPECTOR	-
	QUALITY ASSURANCE	
COMME	ENTS:	
-	· ·	
		,

Page 953 of 959

SP049

Section 9 - IDTS Test

BRISBANE WATER

Network Control Systems

IDTS POINT COMMISSIONING SHEET AND GENERATOR SUPPLY OPERATIONAL CHECKS

Pump Station Generator Connection Project (STTX- I910)

DATE: 13/5/04

Site Name:

NOTE: Some (or all) of the Generator associated IDTS points may be Scan Inhibited in the IDTS system. Remove the Scan Inhibit from these points before proceeding with these tests

IDTS Point: Generator Offsite

Action	Observation	Result
Connect the Control interface lead to the station	Confirm that GENERATOR OFFSITE alarm return to normal is received by IDTS	√ Yes
Disconnect the Control interface lead to the station	Confirm that GENERATOR OFFSITE alarm is received by IDTS	√ Yes
Reconnect the Control interface lead to the station		√ Yes

IDTS Point: Security Door_limit_switch

Action	Observation	Result
Open a canopy door on the Generator	Confirm that SECURITY DOOR_LIMIT_SWITCH alarm is received by IDTS	√ Yes
Close the canopy door	Confirm that SECURITY DOOR_LIMIT_SWITCH alarm return to normal is received by IDTS	√ Yes

IDTS Point : Generator Low_fuel

Action	Observation	Result
Make the Generator low fuel warning alarm active	Confirm that GENERATOR LOW_FUEL alarm is received by IDTS	√ Yes
Deactivate the Generator low fuel warning alarm	Confirm that GENERATOR LOW_FUEL alarm return to normal is received by IDTS	√ Yes

IDTS Point: Generator Warning

Action	Observation	Result
Make the Generator warning alarm active (except by low fuel)	Confirm that GENERATOR WARNING alarm is received by IDTS	√ Yes
Deactivate the Generator warning alarm	Confirm that GENERATOR WARNING alarm return to normal is received by IDTS	√ Yes

IDTS Point : Generator Common_fault

Action	Observation	Result
Make the Generator common fault alarm active	Confirm that GENERATOR COMMON_FAULT alarm is received by IDTS	√ Yes
Deactivate the Generator common fault alarm	Confirm that GENERATOR COMMON_FAULT alarm return to normal is received by IDTS	√ Yes

IDTS Point: Generator Automatic

Action	Observation	Result
Turn the generator to local mode	Confirm that GENERATOR AUTOMATIC alarm is received by IDTS	√ Yes
Return the generator to automatic mode	Confirm that GENERATOR AUTOMATIC alarm return to normal is received by IDTS	√ Yes

IDTS Point: Generator CB_tripped

Action	Observation	Result
Trip the Generator circuit breaker	Confirm that GENERATOR CB_TRIPPED alarm is received by IDTS	√ Yes
Reset the Generator circuit breaker	Confirm that GENERATOR CB_TRIPPED alarm return to normal is received by IDTS	√ Yes

IDTS Point: Generator Running

Action	Observation	Result
Start the Generator (off line only)	Confirm that GENERATOR RUNNING alarm is received by IDTS	√ Yes
Stop the Generator	Confirm that GENERATOR RUNNING alarm return to normal is received by IDTS	√ Yes

${\it IDTS~Control~Points: Generator~Remote_run_request}$

& Generator Remote_stop_request

Action	Observation	Result
Confirm the Generator is available to run, but not running		√ Yes
Set the IDTS control point GENERATOR REMOTE_RUN_REQUEST and send to	Confirm that the Generator starts and runs off-line	√ Yes
the site	Confirm that GENERATOR RUNNING alarm is received by IDTS	√ Yes
Set the IDTS control point GENERATOR REMOTE_STOP_REQUEST and send to	Confirm that the Generator stops	√ Yes
the site	Confirm that GENERATOR RUNNING alarm return to normal is received by IDTS	√ Yes

IDTS Point : Power_supply Energex_power

Action	Observation	Result
Turn the generator to local mode		√ Yes
Fail the Energex power	Confirm that POWER_SUPPLY ENERGEX POWER alarm is received by IDTS	√ Yes
Restore the Energex power	Confirm that POWER_SUPPLY ENERGEX POWER alarm return to normal is received by IDTS	√ Yes

IDTS Point: Generator Connected, and Generator supply operational checks

NOTE: The purpose of these operational checks is;

- to confirm Generator is capable of starting all available pumps on site "simultaneously" (each pump start separated only by the RTU/PLC minimum pump start separation time), and running all pumps continuously for at least one minute.
- to confirm the pumps are interlocked under Generator supply (where required)
- to confirm the code changes have not interfered with the operation of the Surcharge Imminent probe.

Action	Observation	Result
Ensure the Generator is in Automatic mode		√ Yes
Ensure the pumps are selected for local mode		√ Yes
Ensure there is enough sewage in the well for the pumps to run continuously for one minute		√ Yes
Fail the Energex power to the Generator	Confirm that the Generator starts and supplies power to the station	√ Yes
	Confirm that GENERATOR CONNECTED alarm is received by IDTS	√ Yes
Press all pumps local start buttons together	Confirm that all pumps (available under Generator supply) start	$\sqrt{\text{Yes}}$
Sites: Billan St, Musgrave Rd, Centenary Hwy / Kooringal Dr, Manet St, Sanananda St and Sinnamon Rd.	Confirm the RTU will run a maximum of one pump under generator supply.	√ Yes
Site: Creek Rd / Oldfield Rd	Confirm the RTU will run a maximum of two pumps under generator supply.	N/A
Restore Energex power and record the time taken for the Generator controller to	Time for station power to return to Energex supply	120 Secs
return the station power to Energex supply	Confirm that GENERATOR CONNECTED alarm return to normal is received by IDTS	√ Yes
Record time taken for the Generator to stop after station power to returns to Energex supply	Time for Generator to stop after station power to returns to Energex supply	300 Secs

Pump Automatic operation, and

Surcharge Imminent operation under Generator supply

Action	Observation	Result
Fail the Energex power to the Generator	Confirm that the Generator starts and supplies power to the station	√ Yes
Ensure the pumps are selected for remote mode	Fixed speed pump sites: Confirm that the duty pump lowers the well to the Duty A stop level and stops	√ Yes
	Variable speed pump sites: Confirm that the duty pump operates on variable speed control satisfactorily	√ Yes
Ensure the well level is below the Duty A start level using pump local control as required		√ Yes
Ensure the pumps are selected for remote mode and are stopped		√ Yes
Activate the surcharge imminent probe for at least 10 sec	Confirm that WET_WELL SURCHARGE_IMMINENT alarm is received by IDTS	√ Yes
	Confirm that all pumps (available under Generator supply) start	√ Yes
Ensure the well does not fall below the Duty A stop level by selecting local mode for the pumps as required		√ Yes
Return the surcharge imminent probe to normal	Confirm that WET_WELL SURCHARGE_IMMINENT alarm return to normal is received by IDTS	√ Yes
Restore Energex power indication to the Generator and allow the Generator controller to return the station power to Energex supply		√ Yes

Commissioning Notes:

IDTS Points and Generator Supply

Operational Checks commissioned by ...