



Ministry
of Defence



DE&S Secretariat (Land Equipment)

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Defence Equipment & Support
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9th October 2018 Our Reference: FOI2018/11759

Dear [Redacted],

Thank you for your email dated 7th September 2018 requesting the following information:

Could you please supply a copy of the AESP Octad and any other information regarding the operation and maintenance relating to the 2kw Lightweight Field Generator.

You helped to clarify this further on 10th September 2018 with the following:

The description I gave '2kw Lightweight Field Generator' is the title by which the MOD refers to this particular piece of equipment. I also included photographs to assist in identification because the naming does seem a bit vague.

The only other information I can find is that it is manufactured by Harrington and has a Hatz diesel engine.

In order to ensure that we could provide you with the correct information, you also provided us with the serial number on the 20th September 2018.

I am treating your correspondence as a request for information under the Freedom of Information Act (FOIA) 2000. Please find the information you requested in the other attachments.

Some of the information you have requested falls partially within the scope of the absolute exemption provided for at Section 40 (*Personal Information*) of the FOIA and has been withheld.

If you have any queries regarding the content of this letter, please contact this office in the first instance.

If you wish to complain about the handling of your request, or the content of this response, you can request an independent internal review by contacting the Information Rights Compliance team, Ground Floor, MOD Main Building, Whitehall, SW1A 2HB (e-mail CIO-FOI-IR@mod.gov.uk). Please note that any request for an internal review should be made within 40 working days of the date of this response. If you have any queries about this request do not hesitate to contact me.

If you remain dissatisfied following an internal review, you may raise your complaint directly to the Information Commissioner under the provisions of Section 50 of the Freedom of Information Act. Please note that the Information Commissioner will not normally investigate your case until the MOD internal review process has been completed. The Information Commissioner can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF. Further details of the role and powers of the Information Commissioner can be found on the Commissioner's website at <https://ico.org.uk/>.

Please remember to quote the reference number above in any future communications.

Yours sincerely,

DES Policy Secretariat (Land Equipment)



Ministry of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-201 TECHNICAL DESCRIPTION OPERATING INFORMATION MAINTENANCE INSTRUCTIONS

Issue No. 002

Amendment No. 003

June 2018

Sponsored for use in the
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Operational Infrastructure

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OPERATING INFORMATION

Chapter

- 1 General Description
- 2 Operating Procedures
- 3 Operator Maintenance
- 4 Destruction of Equipment



PREFACE

Sponsor: Operational Infrastructure (OI)

Project No.:

File Ref: DG Log (Land) ESS 13/8/18

Publication Authority: OI

INTRODUCTION

1 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

2 AESPs are issued under UK MoD authority and where AESPs specify action is to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores, subject to the provisions of Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DIN), Standard Operating Procedures (SOP) or by local regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication it is to be taken as the overriding authority.

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

4 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
7	1	Illustrated Parts Catalogue	711	*	*	*
	2	Commercial Parts List	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published



Associated publications

5 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201	Earthing and Earthing Protection
JSP 515	Hazardous Stores Information System
SEI 14411	Safety Precautions for Electrical Equipment

HAZARDOUS SUBSTANCES

6 Before using any hazardous substance or material, the user must be conversant with the safety precautions and first aid instructions:

- 6.1 On the label of the container it was supplied in.
- 6.2 On the material Safety Data Sheet
- 6.3 In local Safety Orders and Regulations

WARNINGS AND CAUTIONS

WARNINGS

7 The following WARNINGS are applicable to this category:

(1) EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

(2) EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.

(3) F54 DIESEL AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:

DO NOT RUN THE LFG

DO NOT SMOKE

AVOID ALL NAKED FLAMES

AVOID OVERFILLING THE FUEL TANK/JERRYCAN

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG

(4) GUARDS AND COVERS. DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.

-
- (5) **JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.**
- (6) **NOISE HAZARD. IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.**
- (7) **PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).**
- (8) **PERSONAL INJURY. THE LFG ALTERNATOR IS A PERMANENT MAGNET GENERATOR, CARE MUST BE TAKEN WHEN WORKING ON THE GENERATOR DUE TO THE HIGH STRENGTH OF THE MAGNETS WHICH COULD CAUSE PERSONAL INJURY.**
- (9) **SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.**
- (10) **SHOCK HAZARD. LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.**
- (11) **SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.**
- (12) **TOXIC FUMES. EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.**
- (13) **HEALTH HAZARD. PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLED, BE HAZARDOUS TO HEALTH. PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.**



CAUTIONS

8 The following CAUTIONS are applicable to this category:

- (1) **EQUIPMENT AIRFLOW.** The LFG should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.
- (2) **EQUIPMENT DAMAGE.** Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.
- (3) **EQUIPMENT DAMAGE.** During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.
- (4) **EQUIPMENT DAMAGE.** Operation of the AC Output Voltage Selector Switch (SW 1) when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.
- (5) **EQUIPMENT DAMAGE.** The engine must not be operated with the oil level below the specified minimum level.
- (6) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.
- (7) **EQUIPMENT DAMAGE.** The Low Oil Pressure Switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.
- (8) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.
- (9) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

9 The following abbreviations are used in this category:

A	Ampere
AC	Alternating Current
AESP	Army Equipment Support Publication
Amdt	Amendment

BFPO	British Forces Post Office
C	Celsius
CANbus	Control Area Network bus
Cat	Category
CB	Circuit Breaker
Chap	Chapter
dB(A)	decibel (A scale)
dc	direct current
Def-Stan	Defence Standard
DE&S	Defence Equipment and Support
DIN	Defence Instructions and Notices
EMER	Electrical and Mechanical Engineering Regulations
Eqpt	Equipment
Fig	Figure
FRACAS	Failure Reporting Analysis and Corrective Action System
hr	hour
Hz	Hertz
JAMES	Joint Asset Management and Engineering Solutions
JSP	Joint Service Publication
kg	kilogramme
kW	kiloWatt
lb ft	pounds feet
LE	Land Equipment
LED	Light Emitting Diode
LFG	Lightweight Field Generator
mA	milliAmpere
MCB	Miniature Circuit Breaker
mm	millimetre
MoD	Ministry of Defence
NATO	North Atlantic Treaty Organisation
Nm	Newton metre
No.	Number
OI	Operational Infrastructure
OSP	Operational Support Programme
Para	Paragraph
PMG	Permanent Magnet Generator
PT	Project Team
RAF	Royal Air Force
RCD	Residual Current Device
Ref	Reference
SEI	Service Engineering Instruction
SME	Subject Matter Expert
SOP	Standard Operating Procedures
TDOL	Technical Documents On-Line
Tel	Telephone
UK	United Kingdom
V	Volt
W	Watt

SYMBOLS

10 The following symbols are used in this category:

-	minus
-ve	negative
±	plus or minus
+	plus
+ve	positive



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CHAPTER 1

GENERAL DESCRIPTION

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- 24 Cooling
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INTRODUCTION

Role

1 The Lightweight Field Generator (LFG) provides a portable source of 230/110 V AC and 28 V DC power with a 2 kW continuous output. The LFG is powered by a small diesel engine and is capable of running on Dieso (F54) or AVTUR (F34).



FACILITIES AND GENERAL DATA

WARNING

EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN .

CAUTION

EQUIPMENT DAMAGE. Operation of the AC Output Voltage Selector Switch (SW 1) when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.

2 The LFG is either Dieso (F54) or AVTUR (F34) powered. The output is produced from a permanent magnet generator, with an inverter and regulator to give 230 V AC, 110 V AC and 28 V DC outputs. All outputs feature MCB over-current protection, and the ac outputs feature 30 mA earth leakage protection. The AC and DC Control panels, with associated outlet points, are mounted on opposite sides of the LFG frame.

3 Instrumentation is provided for AC Voltage, DC Voltage, Total Percentage Load and Hours Run.

4 A warning indication is provided for low oil pressure.

5 Starting is by either a recoil (rope) starter or by an integral electric starter motor powered from an external source.

WARNING

JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.

CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the design authority

6 Fuel is supplied to the engine externally from a jerrycan.

7 The LFG comes complete with a bag containing all necessary accessories such as earth spikes etc.

8 Leading particulars are detailed in Table 1 below.

TABLE 1 LIGHTWEIGHT FIELD GENERATOR - GENERAL DATA

Serial (1)	Item (2)	Data (3)
1	Overall Dimensions:	
	Length	600 mm
	Width	500 mm
	Height	540 mm
2	Weight	Up to 76 kg (Without fuel)
3	Operating Ambient Temperature Range	- 40 °C to + 55 °C
4	Outputs:	
	AC	1 x 230 V ± 5.75 V 2 x 110 V ± 2.75 V
	DC	1 x 28 V ± 0.5 V
5	Power	2.0 kW Continuous 2.2 kW Overload (for a maximum duration of 1 hour in every 10 hours operation)

Construction

9 The LFG is housed in a tubular steel frame, with a sound attenuating cover covering the engine, and a sheet aluminium box housing the inverters, rectifiers and control system.

10 The main items of the LFG are a single cylinder, four stroke, air cooled engine which drives a Permanent Magnet Generator (PMG). The output of the PMG is fed into an Inverter/DC Regulator whose outputs are fed to the AC and DC Output Control Panels. The Engine and Control Panels are mounted to the frame via anti-vibration mountings.

11 Fig 1 and Fig 2 show general views of the LFG from the AC Control Panel side with the Acoustic cover on and off accordingly. Fig 3 and Fig 4 show similar views but from the DC Control Panel side. On Figure 3 the Earth Spike is shown in the stowed position.



Fig 1 AC panel side (acoustic cover fitted)



Fig 2 Component locations - AC panel side (acoustic cover removed)

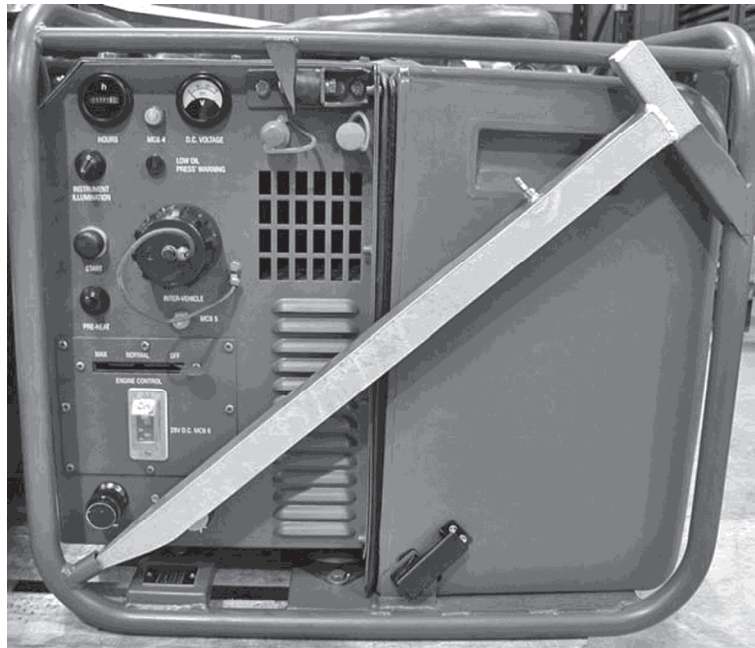


Fig 3 DC Panel side (acoustic cover fitted - earth spike stowed)

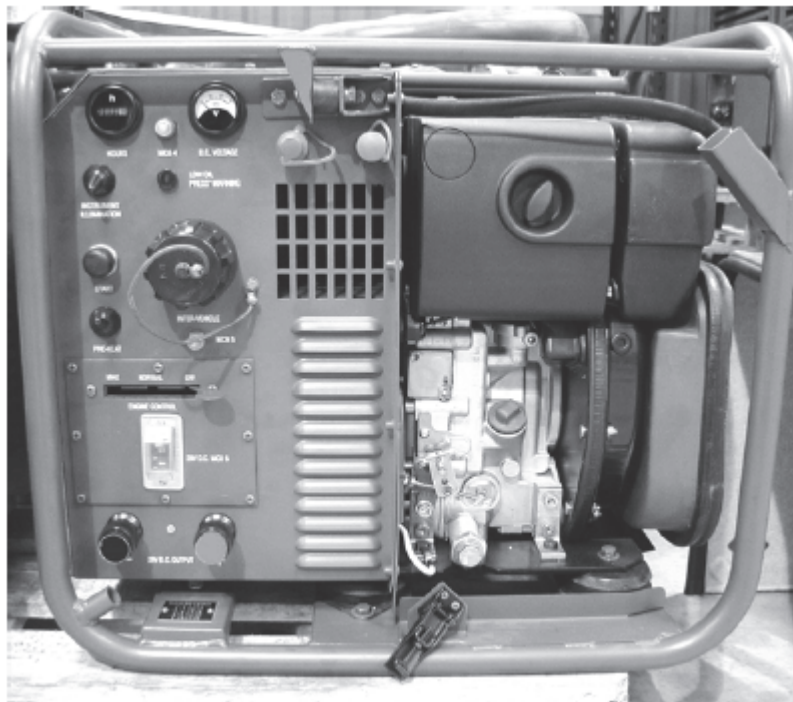


Fig 4 Component locations - DC panel side (acoustic cover and earth spike removed)

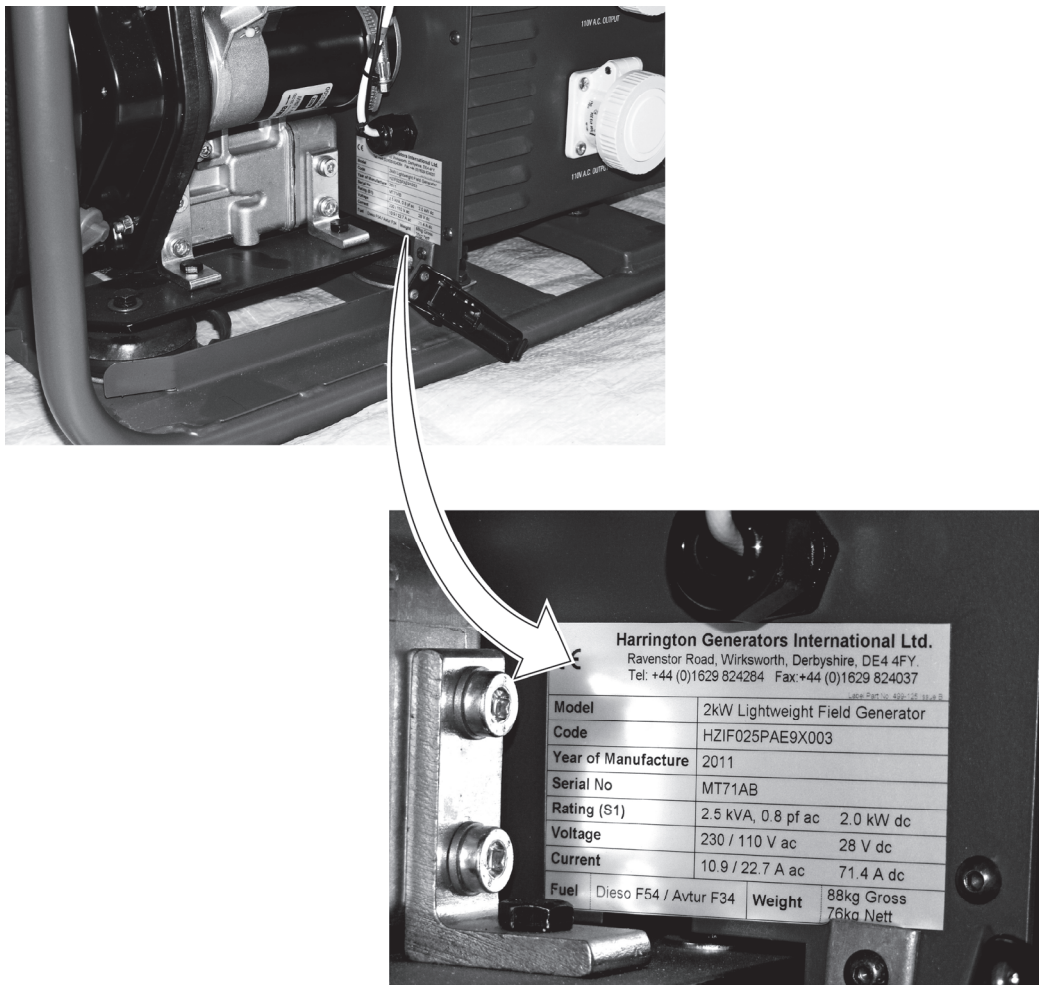


Fig 5 Equipment data plate

Equipment data plate

12 An equipment data plate is located beneath the electric starter motor, attached to the control panel casing. The plate details the manufacturer, model and code, year of manufacture, serial number, power, voltage and current ratings, usable fuel types and weight.

Brief functional description

13 A simplified block diagram of the LFG functional areas is shown in Fig 6.

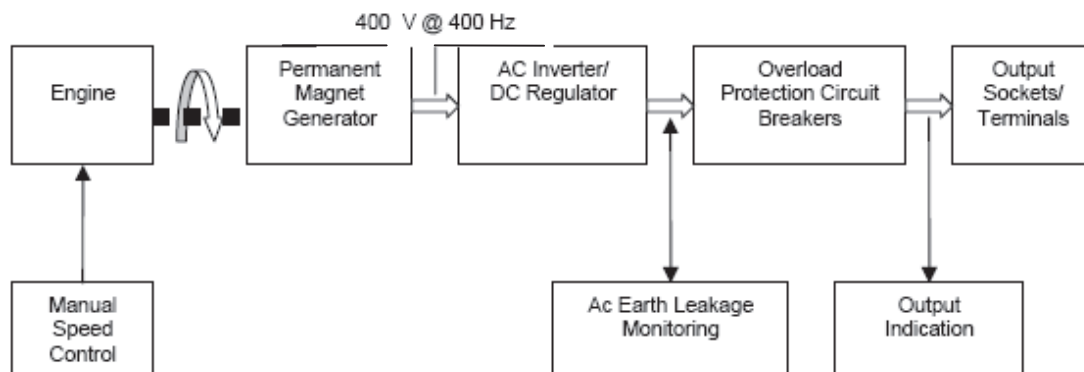


Fig 6 Simplified block diagram

14 The engine speed is controlled by an Engine Speed Control lever situated on the DC Control Panel. It has two speed settings; Normal and Max. Normal is used for the continuous 2 kW output and Max is used for the 2.2 kW Overload output condition.

15 The 400 V 400 Hz output of the Permanent Magnet Generator is conditioned by the AC Inverter/DC Regulator Assembly to provide the required AC and DC outputs via overload protection Circuit Breakers. An input socket for the external DC power required for the electric starter is provided.

16 Instrumentation is provided on both Control Panels for displaying output voltages, Percentage (%) Load and Hours run. Instrument panel lighting is selectable by an ON/OFF switch. Earth Leakage Monitoring/Testing and Low Oil Pressure Warnings are provided.

ENGINE

17 The LFG is driven by a Hatz-Diesel 1B20, single cylinder, four stroke air cooled engine which is capable of operating on either F54 Dieso or F34 AVTUR.

NOTE

There are two types of Hatz Diesel engines in service; Engine type 1B20-S-204C and Engine type 1B20-S-204D. The Engine type is identified by a data plate which is glued to the air filter housing. It is important to note the correct Engine type when undertaking any maintenance.

Air intake system

18 Air intake to the engine is via a dry type air cleaner assembly incorporating a disposable paper filter element and integrated pre-cleaner.

Exhaust system

19 Exhaust gas expelled from the engine is routed through a silencer unit and then vented to atmosphere via flexible exhaust extension piping.

Lubrication system

20 Lubrication of the engine moving parts is achieved by the pressurised circulation of oil. Oil filtering is achieved by a re-usable fine screen filter in the main oil flow. The oil filler plug/dipstick and drain plug are situated on the lower left side of the engine (as viewed from the recoil starter end).



FUEL SYSTEM

WARNINGS

(1) F54 DIESEL AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:

DO NOT RUN THE LFG

DO NOT SMOKE

AVOID ALL NAKED FLAMES

AVOID OVERFILLING THE FUEL TANK/JERRYCAN

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG

(2) JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.

CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority

21 Fuel for powering the engine is supplied externally from a jerrycan, via a jerrycan adaptor which is connected to quick-release couplings on the engine. The fuel from the jerrycan passes through a pulse pump, which is operated by crank case pressure via the crank case vent hose, and then into the integral fuel tank. From the integral fuel tank the fuel passes through the fuel tank filter and then directly to the engine.

22 To connect the jerrycan adapter pipes to the generator, simply push the pipes onto the corresponding couplings. The couplings are made so that only the correct pipe can be fitted to each. To release the jerrycan adapter pipes, pull back the locking ring, and the couplings pull apart. The jerrycan adapter fastens to the jerrycan using a standard jerrycan clamp.

NOTE

It is not necessary to empty the engine fuel tank of any residual fuel when fuel types are changed.

Starting system

23 The engine can be started by a conventional recoil (rope) type starter or by an electric starter motor. The electric starter motor is powered from an external 24 V DC power source via an interconnecting cable.

Cooling

24 For engine cooling, a cooling fan is incorporated in the flywheel and draws air in through the Recoil Starter and air vents in the Acoustic Cover. Cooling air for the Inverter/Regulator Assembly and the Permanent Magnet Generator is provided by a fan mounted on the engine output shaft which draws air in through the Louvre Panel vents.

Alternator

25 The alternator is a High Frequency Permanent Magnet Generator which powers an electronic Control Unit incorporating an AC Inverter and DC Regulator to give 230 V AC, 110 V AC and 28 V DC outputs respectively.

OUTPUT CONTROL PANELS

AC output

WARNING

EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

26 The AC Output Control Panel is on the right hand side of the LFG (as viewed from the recoil starter end), Fig 1. The Controls and Connector locations are shown in Fig 7 and their functions are described in Table 2.

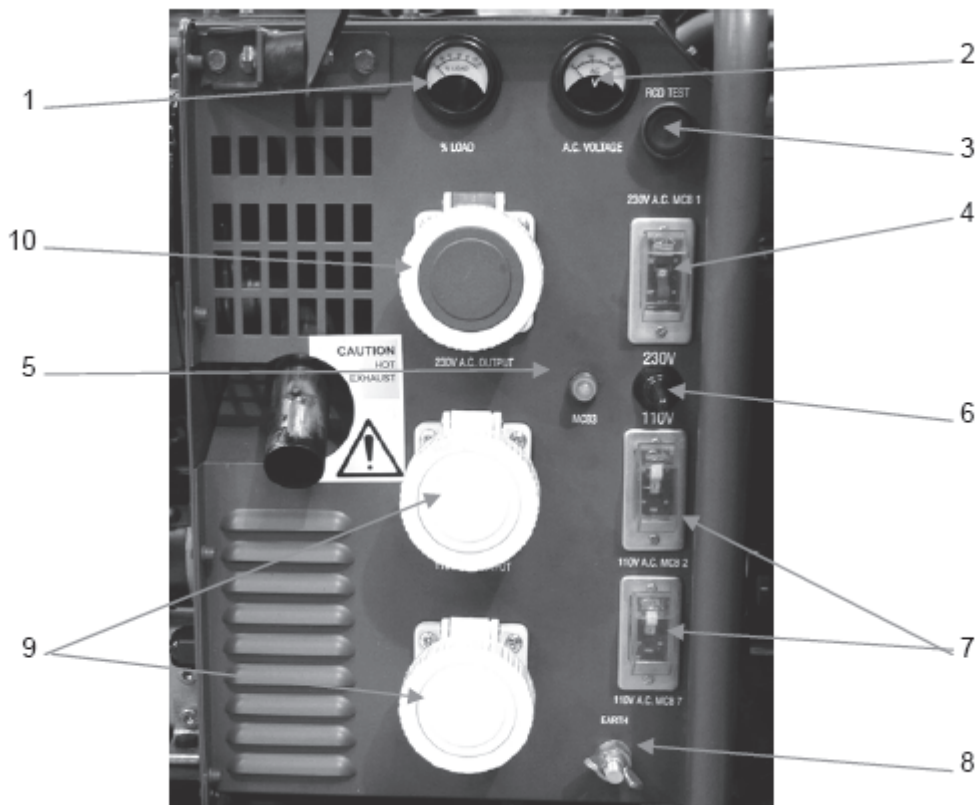


Fig 7 AC control panel - controls and connectors

TABLE 2 AC CONTROL PANEL - CONTROLS AND CONNECTOR FUNCTIONS

Serial (1)	Control/Connector (2)	Figure Item Ref (3)	Function (4)
1	PERCENTAGE(%)LOAD	1	Displays total percentage (%) load on the generator
2	AC VOLTAGE METER	2	Displays AC output voltage
3	RCD TEST	3	Pushbutton, used to test the operation of the Residual Current Detector
4	230 V AC MCB 1	4	Resettable 11 A circuit breaker providing 230 V output overload protection

(continued)

TABLE 2 AC CONTROL PANEL - CONTROLS AND CONNECTOR FUNCTIONS (continued)

Serial (1)	Control/Connector (2)	Figure Item Ref (3)	Function (4)
5	MCB 3	5	Resettable 2A circuit breaker providing overload protection for the AC control circuits
6	SW1 230 V / 110 V	6	AC Output Voltage Selector Switch
7	MCBs 2 & 7	7	Resettable 16 A circuit breakers providing individual output overload protection for the 110 V outputs
8	EARTH STUD	8	Stud for external Earth
9	110 V Output Sockets (Qty 2)	9	Individual 110 V output sockets
10	230 V Output Socket (Qty 1)	10	Single 230 V output socket

NOTE

If the AC Output Voltage Selector Switch (SW1) is inadvertently operated during running the inverter may trip off line. If this occurs, shut down and re-start the LFG to clear the trip condition.

DC output

27 The DC Output Control Panel is on the left hand side of the LFG (as viewed from the recoil starter end), Fig 2. The Controls and Connector locations are shown in Fig 8 and their functions are described in Table 3.

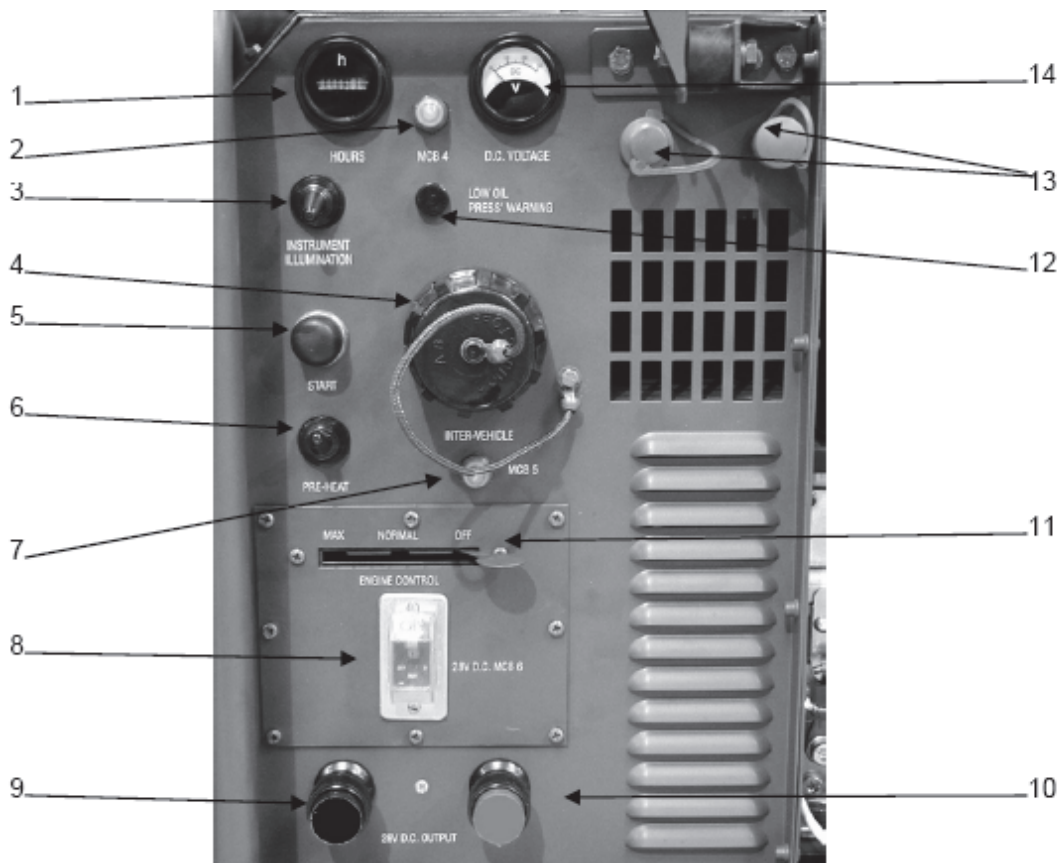


Fig 8 DC control panel - controls and connectors

TABLE 3 DC CONTROL PANEL - CONTROLS AND CONNECTOR FUNCTIONS

Serial (1)	Control/Connector (2)	Figure Item Ref (3)	Function (4)
1	HOURS RUN METER	1	Displays total hours run
2	MCB 4	2	Resettable 2 A circuit breaker providing overload protection for the DC control circuits
3	INSTRUMENT ILLUMINATION	3	Instrument panel lights ON/OFF switch
4	INTERVEHICLE CONNECTOR SOCKET	4	Connects external DC source of power for electric starting of the LFG
5	START	5	Engine electric start push button
6	PRE HEAT	6	Engine glow plug pre-heater push button
7	MCB 5	7	Resettable 15 A circuit breaker providing protection for the electric starter and pre-heater circuits
8	MCB 6	8	Resettable 80 A circuit breaker providing overload protection for the DC output circuits
9	28 V DC OUTPUT -ve (Black)	9	Negative DC output terminal
10	28 V DC OUTPUT +ve (Red)	10	Positive DC output terminal
11	ENGINE SPEED CONTROL LEVER	11	Controls the speed of the engine
12	LOW OIL PRESSURE WARNING	12	Low oil pressure warning LED
13	JERRYCAN QUICK RELEASE CONNECTIONS (blanking caps shown fitted)	13	Provide for the connection of the jerrycan adaptor pipes
14	DC VOLTAGE METER	14	Displays DC Output voltage



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CHAPTER 2
OPERATING PROCEDURES
CONTENTS

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- 4 Visual inspection (CAUTION)
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- 7 Exhaust extension (WARNINGS)
- 8 Lubricating oil level (CAUTION)
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- 11 Connecting the fuel supply (WARNING) (CAUTION)
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INTRODUCTION

1 This Chapter provides the information necessary to enable personnel to prepare the Lightweight Field Generator (LFG) for use and to operate it efficiently. The Operator must be fully conversant with the equipment and the contents of Chapter 1 before attempting to operate the LFG.

SITING

WARNINGS

(1) NOISE HAZARD. IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.

(2) PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).



CAUTIONS

(1) **EQUIPMENT AIRFLOW.** The generator should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.

(2) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

2 The ground site for LFG operation is to be as level and firm as possible. It is to be sited in open ground with free airflow around all sides and at least 1 metre from other equipment or buildings. If no level ground is available, the LFG may be operated at an angle up to 15 degrees from the horizontal plane, along any axis.

PRE START ACTIVITIES

3 Every time prior to using the LFG, the activities detailed in the following paragraphs must be carried out. Remove the Acoustic Cover before carrying out these activities and re-fit prior to starting the LFG.

Visual inspection

CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.

4 Inspect all cables, connectors, hoses, hose couplings, linkages, anti vibration mounts, switches, sockets, covers, exhaust extension, attaching parts and earth point etc for signs of damage, distortion or loose fitting. Visually inspect engine and hoses for leaks. Inspect the fuel drainage tube directly beneath the Fuel Tank for signs of water contamination and drain off any water that is present.

5 Inspect all cables, connectors, hoses and hose couplings to be connected during the LFG operation for signs of damage. Damaged items are not to be connected to the LFG.

Earthing

WARNINGS

(1) **EARTHING.** THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

(2) **EARTHING.** THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.

6 Whenever the LFG is used it must be earthed, using the earth cable and spike provided in the Accessories Bag, as follows:

6.1 In accordance with Def Stan 61-05, select an area of ground which is most easily penetrated by the earth spike and drive the spike into the ground.

NOTE

Wetting the ground will improve penetration by the earth spike and will also improve electrical contact

- 6.2 Securely connect the earth cable between the LFG and the Earth Spike (Figure 1).



Fig 1 Earth spike and LFG earth terminal

Exhaust extension**WARNINGS**

(1) TOXIC FUMES. EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.

(2) SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.

7 The exhaust extension is a bayonet fit. Connect it by pushing it firmly onto the exhaust pipe, ensuring the bayonet lugs engage, and turn to lock it in position. Ensure the exhaust extension is routed so as to discharge outside of any confined spaces.



Fig 2 Exhaust extension

Lubricating oil level

CAUTION

EQUIPMENT DAMAGE. The engine must not be operated with the oil level below the specified minimum level.

8 The oil dipstick is located on the DC Control Panel side of the engine (Figure 3). To check the oil level, remove the Acoustic Cover to gain access to the dipstick. Unscrew the dipstick to remove it, wipe off any excess oil, and re-insert it ensuring it is screwed down correctly. Remove it again and ensure the oil level is between the "Min" and "Max" levels marked on the dipstick. If the oil level is below the "Min" level then it should be replenished. The type of oil to be used is dependent on the temperature of the intended operating environment. Refer to Cat 601.

9 To replenish with either oil via the Oil Filler Cap on the Rocker Cover, fill until the "Max" mark on the dipstick is covered. Fill a little at a time, allowing sufficient time for the oil to settle between each fill before checking the level. Do not overfill.

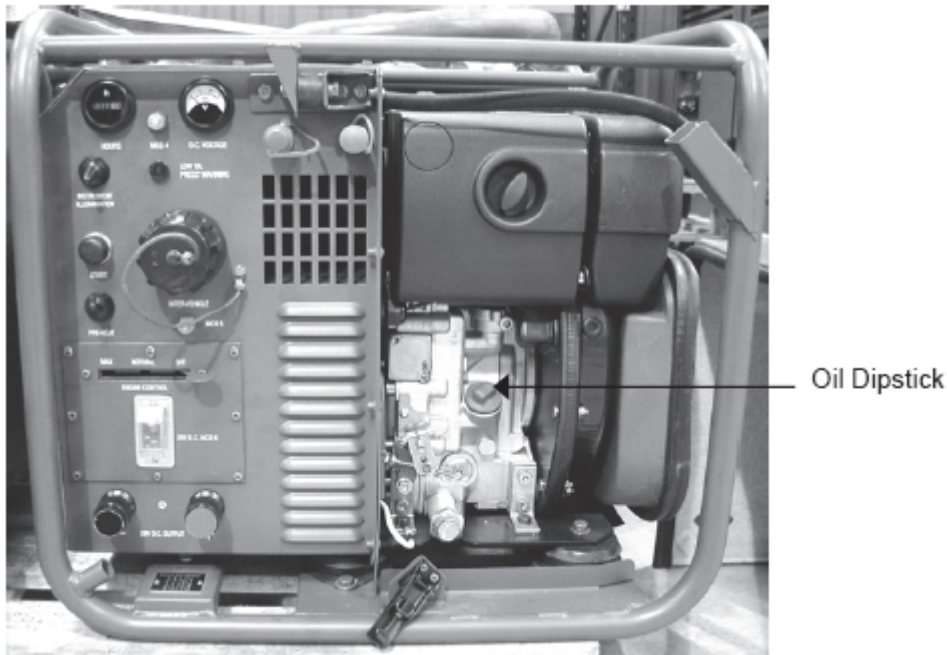


Fig 3 LFG DC side view

Recoil starter cord

10 To inspect the starter cord, gently pull the starter cord from the recoil starter to its full length (approx 1.6 metres) and inspect for signs of wear or damage. Inspect the exit hole on the recoil starter assembly for signs of damage (Fig 4).



Fig 4 Recoil starter cord

Connecting the fuel supply

WARNING

JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND THE PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.

CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.

11 Inspect the jerrycan hoses and fuel filter for signs of damage. Any damaged items must be replaced before the jerrycan is connected to the LFG and fit the jerrycan adaptor to the jerrycan. Fill the jerrycan with sufficient clean fuel for the task (either F54 Diesel or F34 AVTUR) and connect to the LFG fuel quick disconnect couplings. Ensure the integral fuel tank filler cap is securely closed and locked.

12 Check Fuel Tank Drain Pipe for fuel contamination (water presence), drain off water if present. Fit the Acoustic Cover.

NOTE

It is not necessary to empty the engine fuel tank of any residual fuel when fuel types are changed



Fig 5 Jerrycan connected to fuel quick disconnected couplings

Voltage selection

CAUTION

EQUIPMENT DAMAGE. Operation of the AC Output Voltage Selector Switch (SW 1) when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.

13 Ensure there are no output connectors or cables attached to the LFG, check that the main output Circuit Breakers (CBs) are open and select the AC Output Voltage Selector Switch (SW1) to the AC output voltage required (230 V AC or 110 V AC).

NOTE

If the AC Output Voltage Selector Switch (SW1) is inadvertently operated during running, the inverter may trip off line. If this occurs, shut down and re-start the LFG to clear the trip condition.

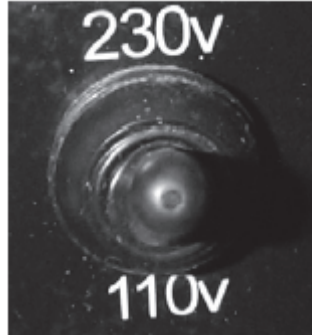


Fig 6 AC output selector switch (SW1)

STARTING PROCEDURE**WARNING**

JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND THE PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.

14 Before starting the LFG ensure that the Acoustic Cover is securely fitted and a jerrycan containing sufficient fuel for the task is connected. Ensure that the AC Output Voltage Selector Switch has been set to the voltage required, either 230 V AC or 110 V AC.

Manual start

15 To start the LFG using the Recoil Starter, proceed as follows:

15.1 Set the Engine Speed Control Lever, on the DC Control Panel, to the "Max" position.

15.2 Pull the starter handle gently until resistance is felt, release the cord back into the recoil starter, then pull smartly to start the LFG.

NOTE

If the engine fails to start after three attempts, carry out the Fault Finding procedures detailed in Chap 3.

15.3 Once the LFG has started and is running evenly, set the Engine Speed Control Lever to the "Normal" position and allow the engine to warm up for 1 minute.

Electric start

16 To start the LFG using the Electric Starter, proceed as follows:

16.1 Connect a 24 V DC supply to the LFG via the Inter-Vehicle Connector.

16.2 Set the LFG Engine Speed Control Lever to the "Max" position. In cold weather conditions hold the Pre-Heat switch to Pre-Heat for 20 seconds then release.

16.3 Press the Start button and hold until the engine fires, then release.

NOTE

If the engine turns over but fails to start, release the Start button and try again. If the engine fails to start after three attempts, carry out Fault Finding procedures detailed in Chap 3.

16.4 Once the LFG has started, set the Engine Speed Control Lever to the "Normal" position and allow the engine to warm up for 1 minute.

Earth leakage unit test

17 With the LFG running and no loads connected, close the AC CBs. Press the RCD push button and the AC CBs should open. If they do not, carry out Fault Finding procedures detailed in Chap 3.



Fig 7 Engine speed control lever

CONNECTING A LOAD

WARNING

SHOCK HAZARD. LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.

CAUTIONS

- (1) **EQUIPMENT DAMAGE.** Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.
- (2) **EQUIPMENT DAMAGE.** Operation of the AC Output Voltage Selector Switch (SW 1) when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.

18 The LFG has two speed settings; "Normal" and "Max". Normal is used for the continuous 2 kW output and Max is used for the 2.2 kW Overload output condition. Engine Speed Control Lever setting required before connecting any loads.

19 To connect AC loads to the LFG proceed as follows:

19.1 Connect the desired AC load to the correct output socket.

19.2 Close the relevant AC CB(s).

20 To connect a DC load to the LFG proceed as follows:

20.1 Connect the DC load to the DC output terminals ensuring correct polarity of connection.

20.2 Close the DC CB.

SHUT DOWN PROCEDURE

CAUTION

EQUIPMENT DAMAGE. Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.

21 To shut down the LFG, proceed as follows:

21.1 Switch off any connected equipment/load.

21.2 Trip the relevant load CBs.

21.3 Disconnect the load from the connector/terminals.

21.4 With the Engine Speed Control Lever set to the "Normal" position, allow the LFG to run off load for 2 minutes to cool down.

21.5 Move the Engine Speed Control Lever to the "Off" position to shut down the engine.

22 If the LFG is to be moved or not used again soon after shut down, disconnect the Fuel Hoses and Earth Lead and remove the Earth Spike from the ground.

23 In order to avoid fuel contamination and damage to the quick release couplings on the Fuel Adaptor, the male and female connectors should be joined together once they have been disconnected from the LFG.



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OPERATOR MAINTENANCE
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INTRODUCTION

1 This Chapter provides the Operator level information and step-by-step instructions relating to the procedures, tools and materials necessary to enable personnel to maintain the Lightweight Field Generator (LFG) in an operational condition.

2 All maintenance tasks and fault remedies which are outside of the scope of these procedures must be carried out by suitably qualified personnel in accordance with the relevant maintenance schedule / repair procedure.

Operator level routine maintenance schedule

3 Routine Operator maintenance tasks are restricted to those listed in Table 1 and these must be carried out at the intervals specified or at any time a fault is suspected.

4 As part of the pre-start and routine maintenance activities, users are required to ensure that all labels and warning notices are clean and legible and that air vents and air flow paths are clear.

5 When completing these tasks and when undertaking general cleaning of the LFG, avoid the use of caustic and solvent cleaners and do not point high pressure water jets into air vents.

6 If, for any reason, it is necessary to alter any part of the maintenance schedule, then the revision and authorisation must be carried out by appropriately qualified personnel.

TABLE 1 ROUTINE MAINTENANCE SCHEDULE

Serial (1)	Maintenance Task (2)	Periodicity (3)
	<u>PHYSICAL INSPECTION</u>	
1	Acoustic, Louvre and Top Cover condition and attachment)
2	Tubular Frame condition)
3	Serviceability of Cables, Connectors and Hoses)
4	RCD Press to Test button for functionality) Prior to use
5	Starter Pull Cord for signs of wear)
6	Engine Fuel Tank Cap undamaged and securely fitted)
7	Ensure all Labels and Warning Notices are clean and legible)
	<u>FUEL SYSTEM</u>	
8	Fuel Tank Drain Pipe for fuel contamination (water presence), drain off water if present)
9	Fuel Filter - Replace	Every 500 Hrs or 12 Months
	<u>ENGINE LUBRICATING OIL SYSTEM</u>	
10	Oil Level - check and top-up	Prior to use and every 12 Hrs
11	Oil filter strainer - Clean/Replace only if damaged	Every 1000 Hrs or 24 Months
12	Engine Oil - Replace	Every 250 Hrs or 6 Months
	<u>AIR INLET AND OUTLET VENTS, ENGINE AIR FILTER</u>	
13	Check Air Inlet and Outlet vents are not blocked	Prior to use and every 12 Hrs
14	Check engine Air Filter for damage and contamination. Replace Air Filter if necessary	Every 12 Hrs in harsh, dusty or dirty environments. The periodicity should be adjusted in response to the results of the initial series of checks

Operator level unscheduled maintenance

7 Unscheduled maintenance tasks are restricted to those listed in Table 2 and these must be carried out whenever a fault is identified or suspected or if an item is physically damaged or lost.

8 If, for any reason, it is necessary to revise this task list, then the revision and authorisation must be carried out by appropriately qualified personnel.

TABLE 2 UNSCHEDULED MAINTENANCE TASKS

Serial (1)	Maintenance Task (2)	Periodicity (3)
1	Check engine oil level)
2	Check fuel level)
3	Replace Air Filter)
4	Replace jerrycan Adaptor and Hoses)

(continued)

**TABLE 2 UNSCHEDULED MAINTENANCE TASKS (continued)**

Serial (1)	Maintenance Task (2)	Periodicity (3)
5	Replace Earth Spike) As required
6	Replace Earth Lead 2m)
7	Replace Exhaust Extension)
8	Replace Acoustic Cover)
9	Replace Accessories Bag)

Level 2 maintenance

9 In addition to the maintenance tasks identified in Tables 1 and 2, the Operator must be aware that there are a series of Level 2 maintenance tasks to be completed every 250 running hours.

10 Details of the tasks and the responsibility for their completion are provided within the AESP Cat 601.

Transportation - preparation and recovery

11 The tasks required to prepare the LFG for transportation and to recover it to operating condition post transportation are detailed in Table 3.

TABLE 3 TRANSPORTATION - PREPARATION AND RECOVERY

Serial (1)	Maintenance Task (2)	Periodicity (3)
	<u>PREPARATION</u>	
	<u>Normal Operating Conditions</u>	
1	Disconnect jerrycan and drain Engine Fuel Tank	Whenever the LFG is to be transported from one location to another
2	Fit and secure fuel tank filler cap and fuel line blanking caps	
3	Secure all covers	
4	Wrap and seal in plastic sheet (optional, depending on weather conditions and method of transport)	
	<u>Battlefield Conditions</u>	
5	Disconnect jerrycan	Whenever the LFG is to be moved on the Battlefield
6	Fit and secure fuel tank filler cap and fuel line blanking caps	
	<u>Air Transport</u>	
7	Prepare for Air Transport in accordance with JSP 335, Part II, Section 9, Leaflet 6	Prior to transportation by air
	<u>RECOVERY POST TRANSPORTATION</u>	
	<u>Normal Operating Conditions</u>	
8	Remove plastic sheeting (if used)	Following transportation from one location to another
9	Remove fuel line blanking caps and connect jerrycan. Fill the onboard fuel tank to approximately 2/3rd full	

(continued)

TABLE 3 TRANSPORTATION - PREPARATION AND RECOVERY (continued)

Serial (1)	Maintenance Task (2)	Periodicity (3)
10	<u>Battlefield Conditions</u> Remove fuel line blanking caps and connect jerrycan. Fill the onboard fuel tank to approximately 2/3rd full	Following movement on the Battlefield
11	<u>Air Transport</u> Prepare for use in accordance with Chapter 2	Following air transport

EQUIPMENT AND MATERIALS
Special equipment and spares
WARNING

EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.

12 The LFG does not require any special-to-type equipment for its maintenance. The service spares required to carry out the procedures detailed in this Chapter are listed in Table 4.

TABLE 4 SERVICE SPARES

Serial (1)	Spare (2)	NATO Stock Number (3)
1	Acoustic Cover	6115-99-225-8717
2	Manifold Fuelling, Jerrycan Adaptor Assembly	4730-99-151-3452
3	Air Filter	2940-99-355-8118
4	Accessories Bag	5140-99-939-0976
5	Earth Spike	5975-99-901-0148
6	Earth Lead	6150-99-811-2625
7	Exhaust Extension	4720-99-611-7784



13 The items listed in Table 5 are the materials required to carry out the procedures detailed in this Chapter.

TABLE 5 MATERIALS

Serial (1)	Spare (2)	Use (3)
1	Fuel, either Dieso (F54) or AVTUR (F34)	For all operating environmental temperatures
2	Oil, OMD 90, OX 90 or OMD 55 capacity 0.9 litres	Engine lubricating oil
3	Plastic sheet, as required	Wrapping of LFG prior to transportation
4	Adhesive tape, as required	Securing plastic sheet

ROUTINE MAINTENANCE

14 Routine maintenance tasks to be carried out by the Operator are those specified in Table 1.

Physical inspection

15 The following inspection procedures should be carried out on initial receipt of the equipment and then prior to use of the LFG. The inspection involves a physical scrutiny of the equipment to make sure there is no evidence of physical defects, contamination, leakages or the presence of foreign matter which may render the LFG unfit for use. Any defects found shall be reported and repaired in strict accordance with the appropriate maintenance procedures.

Covers

16 Inspect the external and internal surfaces of the Acoustic Cover as follows:

- 16.1 Examine all surfaces for signs of cracks or deformation.
- 16.2 Examine the two securing clips for damage and security of fixing.
- 16.3 Examine the Edge Seal for signs of damage or wear.

17 Inspect the external surfaces of the Louvre and Top Covers as follows:

- 17.1 Examine visible surfaces for signs of cracks or deformation.

Tubular frame

18 Inspect the Tubular Frame structure as follows:

- 18.1 Examine for evidence of physical damage such as dents scratches or corrosion.
- 18.2 Examine welded items for security and damage.
- 18.3 Examine the two Acoustic Cover draw latches for damage and security of fixing.

Cables, connectors and hoses**WARNING**

EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.

19 Inspect Cables, Connectors and Hoses as follows:

19.1 Remove the Acoustic Cover and examine, as far as possible, the cables, hoses and fuel pipes on the engine for signs of overheating, deformation or damage.

19.2 Examine the Connectors and Terminals on the AC and DC Control Panels for signs of damage, the presence of foreign matter and corrosion.

19.3 Examine the jerrycan fuel hoses, quick release connectors, LFG fuel quick disconnect hoses and jerrycan dip tube fuel filter for the presence of foreign matter, evidence of leaks, damage and corrosion.

Recoil starter

20 Pull the Starter Cord fully from the Recoil Starter and examine for signs of wear. Examine the Pull Cord exit hole on the Recoil Starter for signs of wear and corrosion (Figure 1).



Figure 1 Recoil starter exit hole

Engine fuel tank cap and drain

21 With the Acoustic Cover removed, examine the Engine Fuel Tank Cap for signs of damage and security of attachment.

22 Inspect the Fuel Tank Drain Pipe (Figure 2) for signs of water contamination of the fuel. If water is visible within the Fuel Tank Drain Pipe then it should be drained off via the Fuel Tank Drain Tap fitted to the pipe. Refit the Acoustic Cover on completion.

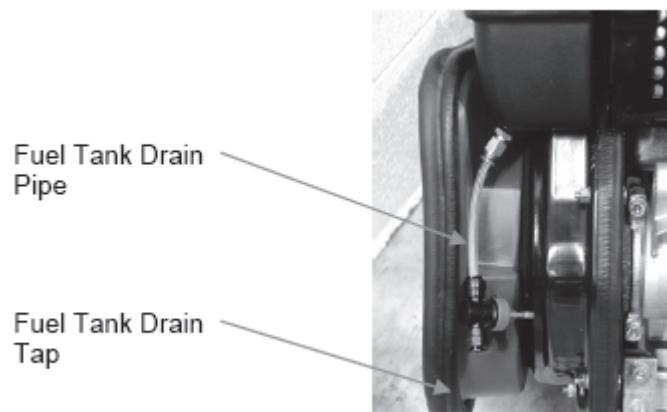


Figure 2 Fuel tank drain pipe and drainage tap

Lubricating oil level - check and top-up

CAUTION

EQUIPMENT DAMAGE. The engine must not be operated with the oil level below the specified minimum level.

23 The engine lubricating oil level should be checked prior to starting the LFG and every 12 hours after that; topping up if required. The Oil Filler Cap is located on the Rocker Cover and the dipstick is located on the DC Control Panel side of the engine.

24 To check and top-up the engine lubricating oil, proceed as follows:

24.1 Place the LFG on a level surface and remove the Acoustic Cover to gain access to the dipstick (Figure) and filler cap.

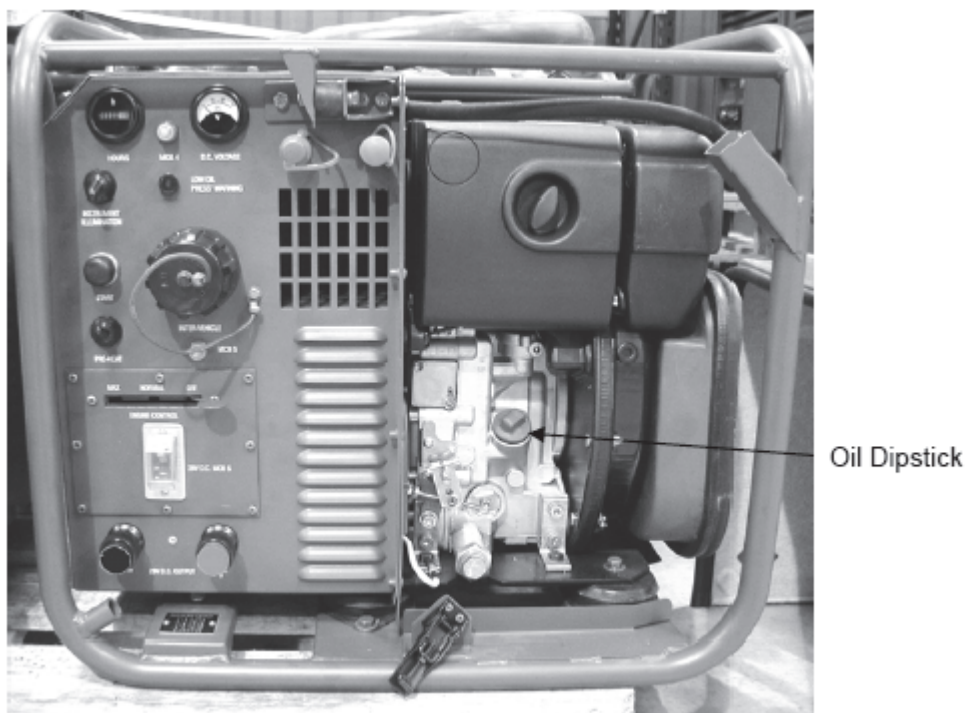


Figure 3 Oil dipstick

24.2 Unscrew the dipstick to remove it, wipe off any excess oil, and re-insert it ensuring it is screwed down correctly. Remove it again and check that the oil level is between the "Min" and "Max" levels marked on the dipstick. If the oil level is below the "Min" level then it should be replenished. The type of oil to be used is dependent on the temperature of the intended operating environment. Refer to Cat 601.

24.3 To replenish with oil, fill via the Oil Filler Cap on the Rocker Cover, fill until the "Max" mark on the dipstick is covered. Fill pouring a little at a time, allowing sufficient time for the oil to settle between each fill before checking the level. Do not overfill.

24.4 On completing the oil level check and top-up procedures, replace the filler cap and dipstick and refit the Acoustic Cover.

Air inlet and outlet vents

25 The LFG has air inlet and outlet vents built into the covers and frame. To ensure efficient cooling of the LFG, every 12 hours, check that the vents are not blocked as follows:

25.1 Remove the Acoustic Cover.

25.2 The Recoil Starter forms part of the air cooling path for the engine. Examine the vents on the Recoil Starter for signs of damage or blockage. Remove any blockages.

25.3 Examine the vent holes in the Bulkhead (Figure 4) for signs of damage or blockage. Clear any blockages.

25.4 Examine all louver vents (both on the Louvre Panel and on either side of the LFG) for signs of damage or blockage. Remove any blockages.

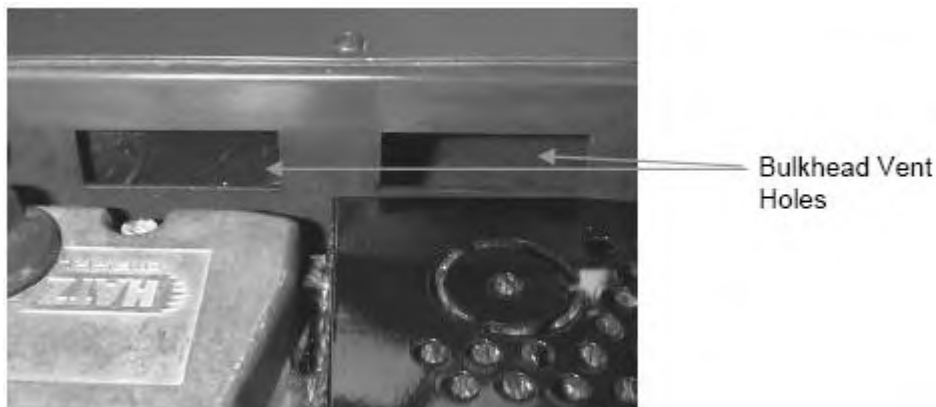


Figure 4 Bulkhead vent holes

Change engine oil

26 Prior to changing the engine oil, ensure that the LFG is standing on level ground and that the oil in the engine is warm, but not hot. To change the oil, proceed as follows:

26.1 Remove the oil filler cap (Fig 5) and oil drain plug (Fig 6) and allow the oil to drain into a suitable container. Dispose of the waste oil in accordance with local regulations.

26.2 Clean the oil drain plug, fit a new washer and refit to the engine housing.

-
- 26.3 Tighten the oil drain plug to a torque of 50 Nm (37 lb ft).
 - 26.4 With the oil filler cap removed, fill with 0.9 litres of oil.
 - 26.5 Check the oil level periodically during filling by wiping the oil dipstick, screwing it back in and then removing it again. Check the oil level on the dipstick and, if necessary, "top up to the "Max" level".
 - 26.6 Finally, replace the filler cap and oil dipstick and wipe off any spilt oil.



Figure 5 Oil filler cap



Figure 6 Oil dipstick and drain plug

Clean/replace engine oil filter strainer**NOTE**

The engine oil must be drained before commencement of this task.

27 To clean or replace the oil filter strainer (Fig 7), proceed as follows:

- 27.1 Slacken the oil filter strainer socket head securing screw, approximately five turns.
- 27.2 Remove the oil filter strainer by drawing it out of the engine by pulling the securing screw.
- 27.3 If cleaning is required, clean by washing in a suitable cleaning fluid/solvent.
- 27.4 If the oil filter strainer is damaged, fully remove the securing screw and the sprung steel plates.
- 27.5 Fit a new O-ring seal to the replacement oil filter strainer, reassemble the sprung steel plates and fit the securing screw.
- 27.6 Fit the oil filter strainer into its housing and tighten the socket head securing screw.



Figure 7 Oil filter strainer assembly

- 27.7 Replenish oil. Refer to Cat 601.

Fuel filter

- 28 To replace the engine fuel tank fuel filter (Fig 8), proceed as follows:
- 28.1 Remove the fuel tank cap and lift up to expose the fuel filter (attached by a cord).
 - 28.2 Remove the fuel filter from the fuel tank and pull off of the fuel pipe.
 - 28.3 Push a replacement fuel filter fully on to the fuel pipe and re-insert in fuel tank.



Figure 8 Engine Fuel Tank Fuel Filter

Labels and warning notices

- 29 Ensure all Labels and Warning Notices are clean, legible and securely attached to the LFG.

UNSCHEDULED MAINTENANCE**WARNINGS**

- (1) **SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.**
- (2) **SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.**

- 30 Unscheduled Maintenance tasks to be carried out by the Operator are those specified in Table 2.

Replacement of components

- 31 Items should be replaced if damage is found during any of the inspections detailed in this Chapter. To replace an item, complete the appropriate replacement procedure as detailed below.

Acoustic cover

- 32 Release the two clips securing the Acoustic Cover to the LFG and remove the Cover. Fit a replacement Acoustic Cover by locating it on the LFG and securing the two retaining clips.

Jerrycan adapter and hoses**CAUTION**

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.

33 Disconnect the hoses from the LFG Fuel Quick Disconnect couplings and remove the jerrycan Adapter from the jerrycan. Fit a replacement Adapter to the jerrycan and connect the hoses to the Quick Disconnect couplings.

Air filter

34 Replace the Air Filter as follows:

34.1 Remove the Acoustic Cover.

34.2 Locate the Air Filter Cover and undo the plastic Air Filter Cover Securing Knob (Figure 9).

34.3 Remove the Air Filter Cover.

34.4 Undo the Air Filter Retaining Nut (Figure 10) and remove the Air Filter. The Air Filter is a tight fit on the centre spindle and may require rotating along the threads to release and withdraw it.

34.5 Replacement is the reverse of removal. Tighten the Air Filter Retaining Nut finger tight only.

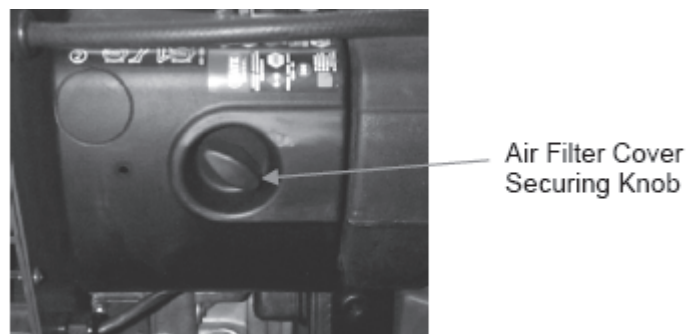


Figure 9 Air filter retaining nut

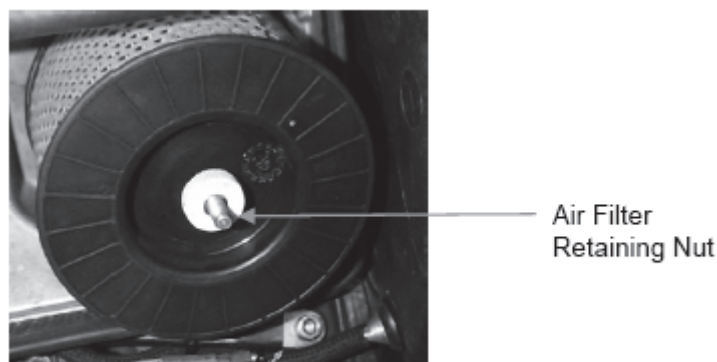


Figure 10 Air filter retaining nut



Accessories bag

35 The Accessories Bag is secured to the LFG end frame by straps. To replace a defective bag: undo the straps and remove the bag from the LFG, transfer its contents to a new bag and secure the new bag to the LFG frame using the available straps. Earth Spike and Earth Lead.

Earth spike and earth lead

WARNING

EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

36 When not in use the Earth Spike is stowed in its transit bracket on the DC side of the generator. The Earth Lead is stored in the Accessories Bag. To replace a defective item, remove it from its stowage/storage position and replace it with a serviceable item.

Exhaust extension

37 The Exhaust Extension will be transported with, but not secured to, the LFG. Therefore, replacement is by exchange of the unserviceable item with a serviceable item.

Fluid level warnings/checks

Engine low oil pressure warning LED illuminated

38 If the Low Oil Press' Warning LED illuminates (Figure 11) the output load Circuit Breakers (CBs) will trip. On illumination of the LED, or when alerted by the tripping of the output load CBs, immediately stop the LFG. Disconnect any loads. Allow the LFG to cool down for at least 5 minutes then check the engine oil level and replenish as detailed in paras 23 and 24. If the fault persists then further investigation is required to locate the fault in the oil circulation and pressure system. Shut down the generator, categorise it as unserviceable and return it to the repair facility.

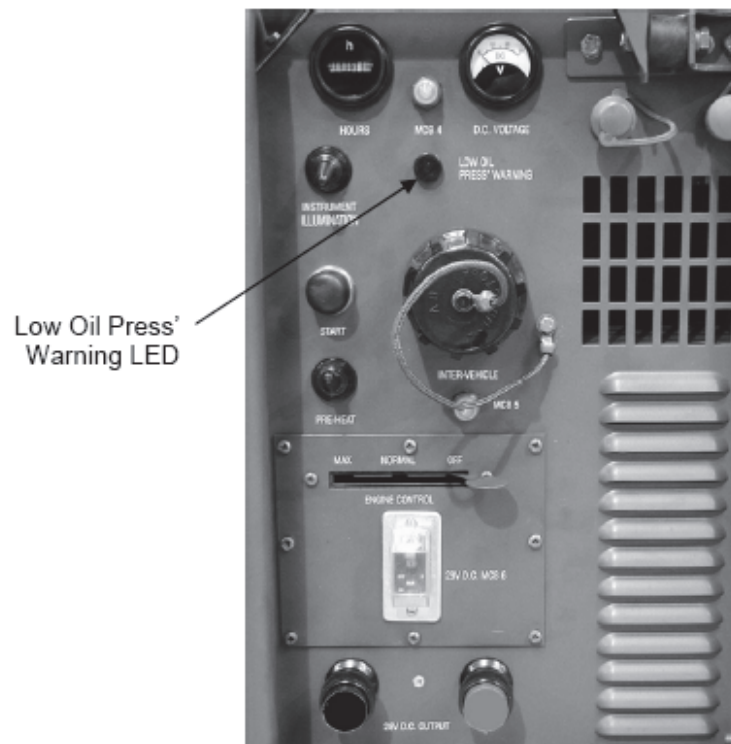


Figure 11 Low oil pressure warning LED

Fuel level

39 Check the level of fuel in the jerrycan and Engine Fuel tank as follows:

39.1 Jerrycan. Remove the jerrycan Adapter and check the level of fuel in the jerrycan; replenish if necessary.

39.2 Engine Fuel Tank. Release the Fuel Tank Cap locking lever (Figure 12), remove the cap and ensure there is fuel in the tank.

39.3 If the tank is empty, fill with 1 - 2 litres of fuel.

NOTE

The Engine Fuel tank does not have to be full for the LFG to operate.

39.4 Refit the cap and secure the locking lever.

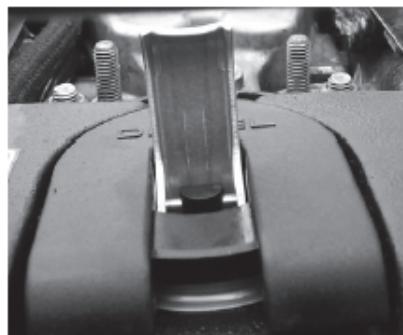


Figure 12 Engine fuel tank cap



TRANSPORTATION

CAUTION

EQUIPMENT DAMAGE. During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

40 Transportation tasks to be carried out by the Operator are those specified in Table 3.

Preparation for transport

Normal operating conditions

41 To prepare the LFG for transport under normal operating conditions, proceed as follows:

- 41.1 Disconnect the jerrycan from the Quick Disconnects and stow jerrycan Adapter in the Accessories Bag.
- 41.2 Drain the fuel from the Engine Fuel Tank, into a suitable container, by releasing the Fuel Tank Drainage Tap located beneath the Fuel Tank (Figure 2).
- 41.3 Ensure the Engine Fuel Tank Cap and Quick Disconnect blanking caps are fitted securely.
- 41.4 Wrap and seal the LFG in plastic sheet if appropriate, see Note below.

NOTE

This is optional dependant upon the weather conditions and method of transport.

Battlefield conditions

42 To prepare the LFG for transport under battlefield conditions, proceed as follows:

- 42.1 Disconnect the jerrycan from the Quick Disconnects and stow jerrycan Adapter in the Accessories Bag.
- 42.2 Ensure the Engine Fuel Tank cap and Quick Disconnect blanking caps are fitted securely.

Air transport

43 Prepare the LFG for Air Transport in accordance with JSP 335, Part II, Section 9, Leaflet 6.

Recovery post transportation

Normal operating conditions

44 To recover the LFG from transportation under normal operating conditions, proceed as follows:

- 44.1 Remove plastic sheeting (if used).
- 44.2 Put 1 - 2 litres of fuel in the Engine Fuel Tank and re-fit fuel tank cap.
- 44.3 Remove fuel line blanking caps and connect jerrycan.
- 44.4 Proceed with normal operating procedures as detailed in Chapter 2.

Battlefield conditions

- 45 To recover the LFG from transportation under battlefield
- 45.1 Remove fuel line blanking caps and connect jerrycan.
 - 45.2 Proceed with normal operating procedures as detailed in Chapter 2.

Air transport

- 46 To recover the LFG from air transportation, proceed as follows:
- 46.1 If the LFG has been transported with the fuel system drained, put 1 - 2 litres of fuel in the Engine Fuel Tank and re-fit the fuel tank cap.
 - 46.2 Remove fuel line blanking caps and connect jerrycan.
 - 46.3 Proceed with normal operating procedures as detailed in Chapter 2.

FAULT FINDING

47 The following Fault Finding procedures are intended for use at Level 1 to enable simple faults to be rectified without recourse to further lines of Maintenance. For Fault Finding it is assumed that the correct grade of fuel and oil is being used for the prevailing climatic conditions as described in CAT 601 Table 2. If these procedures fail to rectify the fault, the LFG must be classified as unserviceable and returned to a suitable repair facility.

Engine associated faults

- 48 Engine fails to start when using Recoil Starter, see Table 6.

TABLE 6 ENGINE FAILS TO START - RECOIL STARTER

Ser. (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Crank engine using Recoil Starter, does the engine turn over when the cord is pulled?	Yes		Go to Serial 2
		No	Recoil Starter failing to engage with engine flywheel.	Categorise as unserviceable & return LFG to repair facility
2	Check the Engine Speed Control Lever setting, is it set at "Max"?	Yes		Go to Serial 3
		No	Engine Speed Control Lever set incorrectly.	Set Engine Control to "Max" position and operate Recoil Starter
3	Check jerrycan fuel, is there fuel in the jerrycan?	Yes		Go to Serial 4
		No		Fill jerrycan and operate Recoil Starter

(continued)

TABLE 6 ENGINE FAILS TO START - RECOIL STARTER (continued)

Ser. (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
4	Check Engine fuel tank cap security, is the cap secure?	Yes		Go to Serial 5
		No	When fuel in the tank is used up it will not be replenished by fuel from the jerrycan as the system requires a small positive pressure to produce this fuel flow. An insecure fuel tank cap will not allow this pressure to build up. Note: The engine may run for a short while with the residual fuel in the tank before stopping.	Secure Engine fuel tank cap and operate Recoil Starter
5	Check Engine fuel tank fuel level, is there a small amount of fuel in the tank?	Yes		Go to Serial 6
		No	A small amount of fuel is necessary to enable the system to pressurise.	Put 1 - 2 litres of fuel in the tank and re-secure the cap. Operate the Recoil Starter.
6	Crank engine using Recoil Starter, does the engine now start?	Yes		Proceed with normal operations
		No		Attempt an Electric Start iaw Table 7 to complete task. Then, categorise LFG as unserviceable & return to repair facility

49 Engine fails to start using the Electric Starter Motor, see Table 7.

TABLE 7 ENGINE FAILS TO START - ELECTRIC STARTER

Ser. (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Check that the Inter-vehicle lead is correctly connected to the generator Inter-vehicle Connector and the external 24VDC power supply. Crank the engine using the Electric Starter, does the engine now start?	Yes		Proceed with normal operations
		No		Go to Serial 2

(continued)

TABLE 7 ENGINE FAILS TO START - ELECTRIC STARTER (continued)

Ser. (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
2	Operate the Electric Starter, can the Starter Motor be heard turning when it is operated?	Yes		Go to Serial 3
		No	a. Insufficient output from power source b. Open circuit in starter motor electrical harness c. Faulty Starter Motor	a. Replace power source b. Categorise LFG as unserviceable and return to repair facility c. Categorise LFG as unserviceable and return to repair facility
3	Can the Engine be heard turning over when the electric start is operated?	Yes		Go to Serial 4
		No	Starter failing to engage with engine flywheel	Categorise as unserviceable and return to repair facility
4	Check the Engine Speed Control Lever setting, is it set at "Max"?	Yes		Go to Serial 5
		No	Engine Speed Control Lever set incorrectly	Set Engine Control to "Max" position and operate Electric Starter
5	Check jerrycan fuel, is there fuel in the jerrycan?	Yes		Go to Serial 6
		No		Fill jerrycan and operate Electric Starter
6	Check Engine fuel tank cap security, is the cap secure?	Yes		Go to Serial 7
		No	When fuel in the tank is used up it will not be replenished by fuel from the jerrycan as the system requires a small positive pressure to produce this fuel flow. An insecure fuel tank cap will not allow this pressure to build up. Note: The engine may run for a short while with the residual fuel in the tank before stopping	Secure Engine fuel tank cap and operate Electric Starter

(continued)

TABLE 7 ENGINE FAILS TO START - ELECTRIC STARTER (continued)

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
7	Check Engine fuel tank fuel level, is there a small amount of fuel in the Engine fuel tank?	Yes		Go to Serial 8
		No	A small amount of fuel is necessary to enable the system to pressurise	Put 1 - 2 litres of fuel in the tank and re-secure the cap. Operate Electric Starter.
8	Crank engine using the Electric Starter, does the engine now start?	Yes		Proceed with normal operations
		No		Categorise the LFG as unserviceable and return to repair facility

Electrical system associated faults

50 AC Circuit Breakers do not open when the RCD push button is pressed, see Table 8.

NOTE

The RCD test will only trip the MCB(s) for the selected output on SW1.

TABLE 8 AC CIRCUIT BREAKERS DO NOT OPEN

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Check the AC Circuit Breakers, are they set to the ON position?	Yes		Go to Serial 2
		No		Set CBs and test again. If test passes, proceed with normal operations
2	Check MCB 3 is closed			Close MCB 3 and test again. If test fails, categorise the LFG as unserviceable and return to repair facility

CHAPTER 4

DESTRUCTION OF EQUIPMENT

CONTENTS

Para

- 1 Mandatory directive
- 3 Degree of damage
- 5 Priorities of destruction
- 6 Methods of destruction
- 8 Mechanical
- 9 Burning (WARNING)
- 10 Gunfire (WARNING)

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1	Priorities of destruction	2
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MANDATORY DIRECTIVE

1 Destruction of the equipment when subject to capture by the enemy will be undertaken by the user arm, ONLY WHEN, in the judgement of the unit commander concerned, such action is necessary in accordance with orders of, or policy established by the Army or Divisional Commanders.

2 The destruction of equipment is to be reported through appropriate command channels.

Degree of damage

3 The degree of damage inflicted, to prevent the equipment being used by an enemy, shall be as follows:

3.1 Methods of destruction should achieve such damage to equipment and essential spare parts, that it will not be possible to restore the equipment to a usable condition in the combat zone either by repair or cannibalisation.

3.2 Classified equipment must be destroyed to such degree as to prevent, whenever possible, duplication, or determination of operation or function by the enemy.

3.3 Any classified documents, notes, instructions or other written material pertaining to function, operation, maintenance or employment, including drawings or parts lists, must be destroyed in a manner to render them useless to the enemy.

4 In general, destruction of essential parts, followed by burning will usually be sufficient to render the equipment useless. However, selection of the particular method of destruction requires imagination and resourcefulness in utilisation of the facilities at hand under the existing conditions. Time is usually critical.

PRIORITIES OF DESTRUCTION

5 The priorities of destruction should be considered, as follows:

5.1 Priority must be given to the destruction of classified equipment and associated documents.

5.2 When lack of time and/or means prevents complete destruction of equipment, priority must be given to the destruction of essential parts. The same parts are to be destroyed on all like equipment and in spare part storage areas.



5.3 A guide to priorities of destruction of the equipment is shown in Table 1.

TABLE 1 PRIORITIES OF DESTRUCTION

Serial (1)	Item (2)	Priority (3)
1	Engine Fuel Tank and Jerrycan Quick Disconnect points	1st
2	Recoil Starter and Electric Starter Motor	2nd
3	Engine Block	3rd
4	Control Panels	4th
5	Inverter/Regulator assembly (if time permits removal of louvre cover panel)	5th

METHODS OF DESTRUCTION

6 If destruction is ordered, due consideration should be given to:

6.1 Selection of a point of destruction that will cause greatest obstruction to enemy movement and also prevent hazard to friendly troops.

6.2 Observance of appropriate safety precautions.

7 The following information is for guidance only. Of the possible methods of destruction, those most generally applicable are mechanical, burning and gunfire.

Mechanical

8 This method requires the use of an axe, pick, crowbar or similar implement. The equipment should be destroyed in accordance with the priorities given on Table 1.

Burning

WARNING

GASOLINE HAZARD. DUE CONSIDERATION SHOULD BE GIVEN TO THE HIGHLY FLAMMABLE NATURE OF GASOLINE. CARELESSNESS IN ITS USE MAY RESULT IN SERIOUS BURNS.

9 This method requires the use of gasoline, oil or other flammables. To destroy the equipment by burning, proceed as follows:

9.1 Remove and retain any portable fire extinguishers until the LFG is destroyed, then discharge.

9.2 If quantities of combustibles are limited, smash all vital elements such as switches, instruments and control levers.

9.3 Place ammunition and charges in and about the equipment so that the greatest damage will result from the explosion.

9.4 Pour gasoline and oil liberally over the equipment.

9.5 Ignite the equipment, using one of the following methods and exercise all necessary personal safety precautions:

- 9.5.1 An incendiary grenade.
- 9.5.2 A burst from a flame thrower.
- 9.5.3 A combustible train of suitable length.
- 9.5.4 Or any other appropriate means.

Gunfire

WARNING

ARTILLERY HAZARD. FIRING ARTILLERY AT RANGES OF 500 YARDS OR LESS, AND FIRING RIFLE GRENADES OR ANTI-TANK ROCKETS SHOULD BE FROM COVER.

10 When destroying equipment by gunfire, proceed as follows:

- 10.1 Remove and retain any portable fire extinguishers until the LFG is destroyed, then discharge.
- 10.2 Smash all vital elements such as switches, instruments and control levers.
- 10.3 Destroy the equipment by gunfire, using any of the following methods:
 - 10.3.1 Tank guns.
 - 10.3.2 Self propelled guns.
 - 10.3.3 Artillery.
 - 10.3.4 Rifle grenades.
 - 10.3.5 Anti-tank rockets from launchers.



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GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-111 EQUIPMENT SUPPORT POLICY DIRECTIVE

Issue No. 003

Amendment No. 003

June 2018

Sponsored for use in the
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PREFACE

Sponsor: Operational Infrastructure (OI)

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INTRODUCTION

1 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

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3 The subject matter of this publication may be affected by Defence Instructions and Notices (DIN), Standard Operating Procedures (SOP) or by local regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication it is to be taken as the overriding authority.

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

4 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
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	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published

Associated publications

5 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201 SEI 14411	Earthing and Earthing Protection Safety Precautions for Electrical Equipment

WARNINGS AND CAUTIONS

WARNINGS

6 There are no WARNINGS applicable to this category.

CAUTIONS

7 There are no CAUTIONS applicable to this category.

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

8 The following abbreviations are used in this category:

AB	Army Book
AC	Alternating Current
AESP	Army Equipment Support Publication
AF	Army Form
Amdt	Amendment
BFPO	British Forces Post Office
BLR	Beyond Local Repair
Cat	Category
CES	Complete Equipment Schedule
CLS	Contractor Logistic Support
DC	Direct Current
DEME(A)	Director Electrical and Mechanical Engineers (Army)
DE&S	Defence Equipment & Support
DGS	Distributed Generation Systems
DIN	Defence Instructions Notices
DLF	Defence Logistics Framework
ECR	Equipment Component Report
EFR	Equipment Failure Report
EMER	Electrical and Mechanical Engineering Regulations
Eqpt	Equipment
ESM	Equipment Support Manager
ESPD	Equipment Support Policy Directive
FRACAS	Failure Reporting Analysis and Corrective Action System
Hz	Hertz
ISD	In-Service Date
JAMES	Joint Asset Management and Engineering Solutions
kg	kilogramme
kW	kiloWatt
LE	Land Equipment
LEUMS	Land Equipment User and Maintenance Standards
LFG	Lightweight Field Generator
LRU	Line Replaceable Unit
mA	milliamperere

MCB	Miniature Circuit Breaker
mm	millimetre
MoD	Ministry of Defence
MOTS	Modified Off The Shelf
NATO	North Atlantic Treaty Organisation
No.	Number
OI	Operational Infrastructure
OSP	Operational Support Programme
Pam	Pamphlet
Para	Paragraph
PDS	Post Design Services
PT	Project Team
RAF	Royal Air Force
REME	Royal Electrical and Mechanical Engineers
RE	Royal Engineers
RLC	Royal Logistic Corps
RM	Royal Marines
RS	Royal Signals
SEI	Service Engineering Instruction
SME	Subject Matter Expert
SOP	Standard Operating Procedures
TDOL	Technical Documents On-Line
Tel	Telephone
UET	Unit Equipment Table
UH	Unit Holding
UK	United Kingdom
UOR	Urgent Operational Requirement
V	Volt
Vol	Volume

SYMBOLS

9 The following symbols are used in this category:

%	percent
±	plus or minus



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EQUIPMENT SUPPORT POLICY DIRECTIVE (ESPD)

INTRODUCTION

- 1 This Equipment Support Policy Directive (ESPD) is concerned with:
 - 1.1 Equipment Designation: Generator Set, Diesel Engine Driven 2kW, 230V/110V AC, 28V DC, (Drumgrange Ltd).
- 2 NATO Stock Numbers and Asset Code
 - 2.1 Standard Variant Bare Set - 6115-99-908-6784
 - 2.2 Asset Code - JR8817 3500
 - 2.3 CES - 6115-99-733-9114
- 3 Quantity
 - 3.1 Standard Variant - 3404
- 4 The policy set out in this ESPD is based upon the planned deployment and role of the equipment, its utilisation and reliability. The policy may be amended in light of experience or with changes in deployment or utilisation.

TECHNICAL DESCRIPTION

5 Technical Description The Lightweight Field Generator (LFG) Set is supplied by Drumgrange Ltd under the terms of contract BFC C1/59 designed to comply with specification in SRD 1038 Issue 1.1. The generator consists of a lightweight air-cooled engine mated to an advanced brushless permanent magnet variable speed alternator. The generator produces 2 kW of power at either 230 Volts or 110 Volts AC allowing simultaneous 28 V DC output, depending on the mode selected. All outputs feature MCB over-current protection and the AC outputs feature 30 mA earth leakage protection. The following details relate to the technical description of the equipment:

5.1 Engine. Hatz 1B20 Series, four stroke, single cylinder, direct injection, normally aspirated engine.

CAUTION

EQUIPMENT DAMAGE. There are two types of Hatz Diesel engines in service; Engine type 1B20-S-204C and Engine type 1B20-S-204D. The Engine type is identified by a data plate which is glued to the air filter housing. It is important to note the correct Engine type when undertaking any maintenance.

5.2 Starting System. Two methods are integral with the system. The first is a recoil cord, pull start, and the second is a 24 V electric starter motor, powered from a remote power source via the interconnecting socket and interconnecting lead.

5.3 Cooling System. Air cooled.

5.4 Fuel System. External Jerry can feed to integral auxiliary 3 litre header tank. The generator is capable of being fuelled by both Dieso (F54) fuel and AVTUR (F34).



CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses or earth cables provided are not to be lengthened or shortened under any circumstances without approval from the design authority.

- 5.5 System Batteries. None fitted.
- 5.6 Weight. 76 kg without fuel.
- 5.7 Dimensions. 600 mm x 500 mm x 540 mm.
- 5.8 Alternator. The alternator is a High Frequency lightweight Permanent Magnet Generator, powering an electronic control unit incorporating an AC Inverter and DC Regulator.
- 5.9 Inverter. Can provide either 230 V or 110 V 50 Hz single-phase AC outputs.
- 5.10 DC Regulator. Provides 28 V DC output.
- 5.11 Output. The generator will provide either 110 V AC or 230 V AC output with simultaneous 28 V DC output. The normal power available is 2 kW continuously; however the generator is capable of sustaining an overload up to 2.2 kW for a maximum duration of one hour in every 10 hours operation.
- 5.12 Instrumentation. Instrumentation provided includes AC Voltage, DC Voltage, Total Percentage Load and Hours Run meter.
- 5.13 Regulation.
- 5.13.1 110 V AC \pm 5%
- 5.13.2 230 V AC \pm 5%
- 5.13.3 28 V DC \pm 4%
- 5.14 Ancillaries. Each equipment is issued the following ancillaries.

CAUTION

EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the design authority.

5.14.1	Exhaust Extension.	4720-99-611-7748	Carried loose with Generator
5.14.2	Feeler Gauge	5210-99-796-7540	Carried inside Air Filter cover
5.14.3	Bag Accessory	5140-99-939-0976	Attached to Generator frame
5.14.4	Earth Spike	5975-99-901-0148	Carried in Frame Transit Brackets
5.14.5	Cable Assembly, Electrical	6150-99-811-2625	Carried in Accessory bag

5.14.6	Aide Memoire	AESP 6115-G-710-211	Carried in Accessory bag
5.14.7	Assembly Fuel Adapter	4720-99-693-0530	Carried in Accessory bag

MANAGEMENT INFORMATION

6 The management responsibility/information relating to this equipment is as follows:

- 6.1 Capability Manager - Capability Directorate Combat Support
- 6.2 Requirements Manager - OI
- 6.3 Equipment Support Manager - Rolls-Royce Distributed Generation Systems (DGS)
- 6.4 Engineering Support - Rolls-Royce DGS
- 6.5 Supply Manager - Rolls-Royce DGS
- 6.6 Main Contractor - Rolls-Royce DGS
- 6.7 Supplier - Rolls-Royce DGS
- 6.8 Contract Number - BFI C1/59

7 Planned Role. The LFG will provide general 2 kW AC and DC power to support tactical and mobile operations world-wide. LFG is required to provide a source of electrical power for general field equipment, including; mobile Command, Control & Communications Information Systems, Field Lighting kits, battery charging and electrical power tools not served by trailer mounted generators. It is to operate in the LAND environment across the spectrum of conflict, in diverse topographical and climatic conditions.

8 Planned Life and Utilisation. The equipment will remain in service until reviewed as part of the Field Power Project.

9 In Service Date (ISD). Dec 04.

10 Logistic Support Date. Nov 04.

11 Utilisation and Availability. The anticipated availability of serviceable equipment is in accordance with Defence Logistics Framework (DLF) guidelines.

MAINTENANCE POLICY

12 Maintenance Policy. The maintenance policy follows normal Generator servicing policy and in-service oils and lubricants are to be used.

13 Repair Policy. Repair Procedures are to be in accordance with AESP 0200-A-090-013.

13.1 Level 1/2 Repairs.

13.1.1 Due to the ease of maintenance and simplicity in design of the generator, Level One Active Corrective Maintenance can be conducted by the operator without the need for tools and within 15 mins. Therefore, the Complete Equipment Schedule (CES) provided with the generator is minimal and contains no hand tools.



13.1.2 Level 2 maintenance is to be carried out by competent REME and R Signals maintainers and is restricted to adjustment or minor repair, failure diagnosis, removal and replacement of LRU's and the removal and replacement of external mechanical or electrical fittings. Level 2 MACMT repair tasks are restricted to those, which can be carried out in the field in 1 hour or less, by REME Tradesmen or Regimental Workshops.

13.2 Level 3 Repairs.

13.2.1 Field Repairs are to be restricted to tasks, which can be completed by one tradesman in 10 hours or less, carried out by Regimental Workshops or other designated REME Battalion Workshop.

13.2.2 The repairs are to be carried out by REME personnel in the supporting second line workshop, and is to consist of the repair, replacement or adjustment of any part of the equipment not requiring complete stripping of a major assembly.

13.3 Level 4 Repair.

13.3.1 These equipment's are classified Category 'C' for Base Repair: i.e. Base Repair to Major Assemblies, mid life improvement or refurbishment will be done by Contract Repair arranged by the ESM.

13.3.2 Contract Repair will only be undertaken when authorised by the Senior REME Officer of the Theatre or Command.

EXAMINATION AND INSPECTION

14 Examination and Inspection of the equipment is to be in accordance with AESP 0200-A-090-013 DEME(A) Engineering Standards.

14.1 REME Inspection. This equipment will subject to an annual REME inspection in accordance with AESP 0200-A-093-013 Land Equipment User and Maintenance Standards (LEUMS) and AESP 0200-A-100-013, Equipment Care Inspection and Mandatory Equipment Inspection, dated Feb 03. This inspection is to be recorded on AFG3650.

14.2 All queries on engineering matters should be directed to the Operational Infrastructure (OI) team.

SUPPLY

15 Initial issue of equipment and CES if applicable, will be authorised by Equipment Sponsors. This equipment is under the management of a Contractor Logistic Support (CLS) contract. Each unit will have a total entitlement, their Unit Equipment Table (UET) and a Unit Holding (UH). It is the UH which the unit will hold permanently, but with the ability to request up to their UET on a MOD Form 2268 for any exercise or operation on a temporary basis.

15.1 Initial demand. Initial demands or any requests for a change to the UET is by completion of AF G8088 (Initial demand/EE demand) in accordance with the Defence Logistics Framework (DLF).

15.2 Replacement. Replacement issues of equipment classified Beyond Local Repair (BLR) will be dealt with by the CLS contractor, through the Joint Supply Chain on receipt of a justified demand/email via the ESM at Rolls-Royce DGS in accordance with the DLF.

15.3 Loan/temporary issue. Units can request loan/temporary issue equipment by completion of MOD Form 2268 (General Purpose Power Equipment Request Form) via the CLS arrangement on a Whole Fleet Management basis in accordance with the DLF.

15.4 Spares. Spares have been scaled and codified and are to be obtained through normal channels, i.e. via the CLS arrangement and delivered directly into the Joint Supply Chain in accordance with the DLF.

15.5 Back loading. Units with a requirement to back load this equipment should do so in accordance with the DLF, by completion of AF G8621 (Request for Disposal/Return Instructions) or by completion of AF G8883 (Consignment Voucher for Fit and Unfit Repairable items).

15.6 CLS supply queries. For any CLS supply queries, Rolls-Royce DGS can be contacted via the Helpdesk on 01606 597442 or via DGShelpdesk@rolls-royce.com.

PUBLICATIONS

16 The supporting publications for this equipment are:

16.1	Purpose and Planning Information	6115-G-710-101
16.2	Equipment Support Policy Directive	6115-G-710-111
16.3	Operating Information	6115-G-710-201
16.4	Special-to-Arms Aides Memoire	6115-G-701-211
16.5	Technical Description	6115-G-710-302
16.6	Maintenance Instructions inc. Failure Diagnosis (Level 2)	6115-G-710-522
16.7	Maintenance Instructions (Level 3)	6115-G-710-523
16.8	Maintenance Schedule	6115-G-710-601
16.9	Illustrated Parts Catalogue	6115-G-710-711
16.10	Complete Equipment Schedule, Service Edition	6115-G-710-741
16.11	Modification Instructions	6115-G-710-812

TRAINING

17 Operator and Maintainer training will be carried out in 2 stages. Stage 1, Conversion (Surge) Training will be co-ordinated through LAND and will be conducted by the contractor who will train unit instructors. These will then cascade the training down to unit personnel. Stage 2 Steady State Training will be under direction of ATRA.

COMPETENT PERSONS

18 Competent persons are detailed in Table 1 - Power Equipment Competency Chart.

NOTE

The LFG 2 kW generator set is not included in this chart as it is considered to be part of the 'All Arms' equipment covered by the All Arms Training.

TABLE 1 POWER EQUIPMENT COMPETENCY CHART

Level of Training	FEPS		VTEG		FEPDS		PMDS		LAPDS	
	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise
Royal Engineer Electrician Class 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Royal Engineer Electrician Class 2	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Royal Signals Electrician Class 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Royal Signals Electrician Class 2	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
REME Electrician Class 1	Yes	No	Yes	No	Yes	No	Yes	No	No	No
REME Electrician Class 2	Yes	No	Yes	No	Yes	No	Yes	No	No	No
RAF Gen Tech E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Royal Marine TECH	Yes	No	Yes	No	Yes	No	Yes	No	No	No

Installation: Prepare the generator, lay out and connect the distribution equipment in accordance with the power plan.

Inspect: Check to ensure that all connections are secure and appropriate earth connections made.

Test: Test that power flows from the source to the final distribution points. Test breakers and RCD switches.

Commission: Certification that the power equipment has been installed, tested and commissioned in line with regulations.

Energise: Apply power across the distribution network.

RELIABILITY

19 The equipment is a Modified Off The Shelf (MOTS) commercial product and a reliability case has been conducted by OI and accepted by the OSP.

19.1 All unexpected, safety related, serious or catastrophic failures are to be reported using one of the following methods and preferably in the order shown dependent on availability:

19.1.1 Joint Asset and Management Solutions (JAMES) Equipment Component Report (ECR).

19.1.2 Electronic Equipment Failure Reports (EFRs).

19.1.3 Paper format EFR to FRACAS BFPO 794.

WARRANTY

20 In accordance with normal MoD contracting procedures, the 2kW Drumgrange Generator is not covered by a specific warranty. The equipment is however protected by the "Sales of Goods Act", under General Law and therefore is designated "Fit for Purpose". Any failure which would normally be considered a Warranty failure should be reported on EFR and advice sought from the ESM on ABW Mil 9679 31341 or Civil +44(0)30 679 31341.

CONFIGURATION MANAGEMENT

21 Modification of the equipment will be authorised by the OI and instructions notified in AESP Category 8.

22 Post Design Services (PDS). PDS will be contracted for as and when required and authorised by OI.

STORAGE

23 The Generator is designed for use in climatic extremes as described. However, the equipment should not be exposed to the elements without further protection for prolonged periods of time when not in use. It is therefore recommended that the generator be stored under cover and not directly exposed to the elements. If for operational reasons, the LFG must be stored outside for prolonged periods, it is recommended that the generator is wrapped in heavy duty plastic. Specific Out of Use Maintenance Instructions are detailed in Cat 601 and include engine inhibiting procedures for out of use storage.

DISPOSAL

24 Disposal of this equipment shall be authorised by the OI.

REPAIR LIMITS

25 Repair limits for the use by the Army Workshops will be published annually in AESP 0200-A-062-013. These limits will be based on a planned life of 12 years but may be revised to reflect in-service experience, so that the generators can be considered for casting at the end of their economic life, this may exceed their original planned life.

AIR DROP

26 This equipment is suitable for normal parachute Air Drop. JATEU 135/03/AD refers.



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ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS (EMER) - FORM 10

*AESP/EMER NUMBER:		*IS THIS SAFETY RELATED?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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Send Form 10 via the Email or Post address. However email is <u>preferred</u>.		Tel	
Email:		Post to	Form 10 Cell FRACAS BFPO 794
(To email this form send as a copy to the email address above)			

ORIGINATORS DETAILS			
*Address		*Name	
		Rank / Grade	
		*Phone	
		*Senders Reference	
		*Date Raised	
* E-Mail		Eqpt Asset Code (if applicable)	

AESP/EMER DETAILS							
*Full Title of AESP/EMER (Not the AESP/EMER Number)							
*Edition	*Amendment	*Chapter	*Page	*Paragraph	Figure	Instruction	Other
*Comments: If additional information is to be supplied, please e-mail with the Form 10 as separate attachments.							

FORM 10 CELL USE			
*Date Received		*Form 10 Reference	
*Date Sent to PT / SME		Problem Report	

PROJECT TEAM / SME RESPONSE TO COMMENTS:			
Project Team (PT) / SME		*Sponsors Name	
*Phone		Rank / Grade	
*Email		*Date Received	
*The following action is to be carried out:	Mark:		Mark:
Issue a revised/amended AESP/EMER:		Under investigation:	
Incorporate comment(s) in future amendments:		No action required:	
Remarks:			
SPONSOR/PT FINAL CLOSURE STEPS	Mark:	Form 10 Cell notified of Date action taken	Date:
Form 10 Originator notified of the action taken:			

* Mandatory Fields for Originator

* Mandatory Fields for Sponsor.

**ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND
MECHANICAL ENGINEERING REGULATIONS (EMER) - FORM 10**

Form 10 Guidance

Form 10 can be found within the AESP or, as a template, from the JAMES Portal (Hot Topic – Forms) & TDOL (FORM10).

Originator responsibility is to enter the following details marked *:

- In the **AESP/EMER Number**: cell enter the full document number e.g. AESP 1256-I-400-711.
- Is this **Safety Related?** – select Yes or No as appropriate.
- Originator Details:
 - Full address Inc Post Code or BFPO NO.
 - Originator email address
 - Senders Reference – that must be unique.
- AESP Details shall enter the following details:
 - The Full Title of AESP/EMER should not include the AESP/EMER Number
 - Enter details in all other mandatory fields marked *.
 - Additional information relating to the Comments (AESP copies, additional text details or photographs) should be attached to the Email at the same time.
- Originator makes up the Form 10 & Sends to Form 10 cell via
 - Post to **Form 10 Cell, FRACAS, BFPO 794** address.
 - Email to [REDACTED]
 - **Any AESP that holds a Security marking higher than 'Restricted' should be securely circulated.**

FORM 10 CELL responsibilities:

The Form 10 Cell enters:

- Date Received
- Form 10 Reference
- Date sent to Sponsor
- Register all Form 10 details in the MOSS Form 10 Tracker.

Sponsor Responsibility

The Sponsor will:

- Enter their name, email address & phone contact details.
- Enter Date Received
- Enter Details in the non-mandatory field as & when required.
- Acknowledge receipt of Form 10, within 5 working days, by email to Form 10 Cell.
- Assess the contents of comments and details received.
- Mark the relevant Action box and fill out the Remarks field.
- Enter date when the Form 10 is returned to Form 10 Cell.
- Email copy of completed Form 10, within 6 weeks, to the Form 10 Cell and Originator.

Form 10 Cell on receipt will:

- Record final stage of the Form 10 into the MOSS Form 10 Tracker.
- Close off the Form 10 and archive.



Ministry of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-101 PURPOSE AND PLANNING INFORMATION

Issue No. 002

Amendment No. 003

June 2018

**Sponsored for use in the
United Kingdom Ministry of Defence
and Armed Forces by DES LE OSP - OI**

KN080

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Publications Authority: DES LE OSP - OI

Operational Infrastructure

Mail Point #1309

Spruce 3a

MOD Abbey Wood

BS34 8JH

Users should forward any comments on this publication using the form attached inside



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AMENDMENT RECORD

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2	INCORPORATED	Mar 17
3	INCORPORATED	Jun 18
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PURPOSE AND PLANNING INFORMATION

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- 1 Equipment identity
- 2 Role
- 3 Brief description
- 4 Physical data
- 5 Performance
- 6 Fuel requirements
- 7 Environmental data
- 8 Transportation data (CAUTION)
- 10 Manning requirements
- 11 Electrical data

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PREFACE

Sponsor: Operational Infrastructure (OI)

Project No.:

File Ref: DG Log (Land) ESS 13/8/18

Publication Authority: OI

INTRODUCTION

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<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201 SEI 14411	Earthing and Earthing Protection Safety Precautions for Electrical Equipment

WARNINGS AND CAUTIONS

WARNINGS

6 There are no WARNINGS applicable to this category.

CAUTIONS

7 There are no CAUTIONS applicable to this category.

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

8 The following abbreviations are used in this category:

A	Ampere
AC	Alternating Current
AESP	Army Equipment Support Publication
Amdt	Amendment
BFPO	British Forces Post Office
CES	Complete Equipment Schedule
dB(A)	decibel (A scale)
DC	Direct Current
DE&S	Defence Equipment and Support
DIN	Defence Instructions and Notices
e.g.	for example
EMER	Electrical and Mechanical Engineering Regulations
Eqpt	Equipment
FRACAS	Failure Reporting Analysis and Corrective Action System
Hz	Hertz
JAMES	Joint Asset Management and Engineering Solutions
kg	kilogramme
kW	kilowatt
LE	Land Equipment
LFG	Lightweight Field Generator
m	metre
mA	milliampere
max	maximum
MCB	Miniature Circuit Breaker
mm	millimetre
MoD	Ministry of Defence
No.	Number
OI	Operational Infrastructure
OSP	Operational Support Programme
Para	Paragraph
PT	Project Team
RAF	Royal Air Force
Ref	Reference

SEI	Service Engineering Instruction
SME	Subject Matter Expert
SOP	Standard Operating Procedures
TDOL	Technical Documents On-Line
Tel	Telephone
UK	United Kingdom
V	Volt

SYMBOLS

9 The following symbols are used in this category:

-	minus
±	plus or minus
%	percent
+	plus



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PURPOSE AND PLANNING INFORMATION

EQUIPMENT IDENTITY

1 The equipment identity data is as follows:

1.1	Equipment designation:	Generator Set, Diesel Engine Driven, 2kW, 230V/110V AC/28VDC (Drumgrange Ltd)
1.2	Asset Code:	JR 8817 3500
1.3	Equipment Identification Number/NSN:	6115-99-908-6784
1.4	Original Manufacturer:	Drumgrange Ltd
1.5	Contract Number:	BFI C1/59

ROLE

2 The Lightweight Field Generator (LFG) provides a portable source of 230/110 VAC and 28 VDC power with a 2kW continuous output. The LFG is powered by a small diesel engine and is capable of running on Dieso (F54) or AVTUR (F34).

BRIEF DESCRIPTION

3 The LFG is housed in a tubular steel frame, with a sound attenuating cover covering the engine, and a sheet aluminium box housing the inverters, rectifiers and control system. Instrumentation is provided for AC Voltage, DC Voltage, Total Percentage Load and Hours Run. Warnings are provided for low oil and earth fault. Starting is by either a recoil (rope) starter or by an integral electric starter motor powered from an external source. The output is produced from a permanent magnet generator, with an inverter and regulator to give 230 VAC, 110 VAC and 28 VDC outputs, all outputs feature MCB over-current protection, and the ac outputs feature 30 mA earth leakage protection.

PHYSICAL DATA

4 The main physical parameters of the assembled equipment are as follows:

4.1	Overall dimensions:	600 mm x 500 mm x 540 mm
4.2	Weight:	76 kg (without fuel)
4.3	Internal Fuel Tank Capacity:	3.0 Litres
4.4	Oil Capacity:	0.9 Litres

PERFORMANCE

5 The LFG performance data is given in Table 1.

**TABLE 1 PERFORMANCE DATA**

Serial (1)	Item (2)	Performance Data (3)
1	Noise Level (Max)	95dB(A) at 1m
2	Electrical Power Output (Continuous)	2 kW
3	Electrical Power Output (Maximum)	2.2 kW

FUEL REQUIREMENTS

6 The fuel requirement for the LFG is either F54 Dieso or F34 AVTUR.

NOTE

A full 20 litre jerry can will allow for approximately 24 hours running at 2 kW. It is not recommended to run the LFG off load for any period of time.

ENVIRONMENTAL DATA

7 The environmental data for the LFG is as follows:

7.1 The LFG is designed for continuous operation in weather conditions ranging from arctic to tropical.

7.2 The engine is capable of starting and running in environments within the range A1 - C2.

7.3 The operational altitude of the LFG is from sea level to 2500 m.

7.4 Storage of the LFG would normally be within a general closed stores environment with the temperature kept above zero degrees Centigrade. However, providing it is correctly protected, it is possible to store the engine outside but under cover for a maximum of one year. Long term storage procedures are detailed in Cat 522.

TRANSPORTATION DATA**CAUTION**

MAGNETIC HAZARD. The LFG contains a permanent magnet generator, care must be taken not to position it in the vicinity of equipment which may be susceptible to a strong magnetic field.

8 The LFG is suitable for transportation by land, sea or air. However, it contains a powerful permanent magnet generator and care must be taken not to position it in the vicinity of equipment which may be susceptible to a strong magnetic field.

9 The LFG is suitable for normal parachute air drop. JATEU 135/403/AD refers.

MANNING REQUIREMENTS

10 The manning requirements for the LFG are as follows:

10.1 One person can start and operate the LFG.

10.2 The generator weighs 76 kg net and 88 kg gross (including Fuel and CES) which is far in excess of a single man lift. Manual handling of the generator must be in accordance with local Manual Handling Assessments carried out in accordance with JSP375. Local manual handling assessments are also to be conducted for the engine (38 kg) and control box assembly (32 kg). Based on the results of these assessments and the local availability of suitable Handling Equipment, the number of persons required to handle the LFG will be determined.

ELECTRICAL DATA

11 The LFG electrical data is given in Table 2.

TABLE 2 ELECTRICAL DATA

Serial (1)	Item (2)	Data (3)
1	AC Output (at 50 Hz)	1 x 230 VAC \pm +1-5% 2 x 110 VAC \pm +/-5%
2	DC Output	1 x 28 VDC
3	Power	2.0 kW Continuous 2.2 kW Overload (for a maximum duration of 1 hour in every 10 hours operation)
4	Circuit Breakers	230 VAC, 11 A 2 x 110 VAC, 23A16 A 28 VDC, 80 A AC Control circuits, 2 A DC Control circuits, 2 A Starter & Heater circuit 24 VDC, 15 A



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Ministry
of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-302 TECHNICAL DESCRIPTION

Issue No. 002

Amendment No. 003

June 2018

Sponsored for use in the
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TECHNICAL DESCRIPTION

Chapter

- 1 General information
- 2 Power unit
- 3 Detailed electrical description



PREFACE

Sponsor: Operational Infrastructure (OI)

Project No.:

File Ref: DG Log (Land) ESS 13/8/18

Publication Authority: OI

INTRODUCTION

1 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

2 AESPs are issued under UK MoD authority and where AESPs specify action is to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores, subject to the provisions of Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DIN), Standard Operating Procedures (SOP) or by local regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication it is to be taken as the overriding authority.

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

4 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
7	1	Illustrated Parts Catalogue	711	*	*	*
	2	Commercial Parts List	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published



Associated publications

5 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201 SEI 14411	Earthing and Earthing Protection Safety Precautions for Electrical Equipment

WARNINGS AND CAUTIONS

WARNINGS

6 There are no WARNINGS applicable to this category.

CAUTIONS

7 There are no CAUTIONS applicable to this category.

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

8 The following abbreviations are used in this category:

A	Ampere
AC	Alternating Current
AESP	Army Equipment Support Publication
Amdt	Amendment
BFPO	British Forces Post Office
C	Celsius
Chap	Chapter
DC	Direct Current
DE&S	Defence Equipment & Support
dia	diameter
DIN	Defence Instructions and Notices
EMER	Electrical and Mechanical Engineering Regulations
FRACAS	Failure Reporting Analysis and Corrective Action System
Hz	Hertz
JAMES	Joint Asset Management and Engineering Solutions
kW	kiloWatt
LE	Land Equipment
LED	Light Emitting Diode
LFG	Lightweight Field Generator
m	metre
mA	milliAmpere
MCB	Miniature Circuit Breaker
mm	millimetre
MoD	Ministry of Defence
nF	nanoFarad
No.	Number
OI	Operational Infrastructure
OSP	Operational Support Programme
Para	Paragraph
PMG	Permanent Magnet Generator
PT	Project Team

RAF	Royal Air Force
SME	Subject Matter Expert
SOP	Standard Operating Procedures
TDOL	Technical Documents On-Line
UK	United Kingdom
V	Volt

SYMBOLS

9 The following symbols are used in this category:

°	Degrees
-	minus
%	percent



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CHAPTER 1

GENERAL INFORMATION

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INTRODUCTION

Purpose and facilities

1 The Lightweight Field Generator (LFG) provides a portable source of 230/110VAC and 28VDC power with a 2kW continuous output. A general view of the LFG, ready to operate with jerrycan connected, is shown in Figure 1. More detailed views, showing component locations, are provided later within this Chapter. These detailed views should be referred to when explanations of component layouts are given.

2 The LFG is powered by a single cylinder, four stroke diesel engine capable of running on either Dieso (F54) or AVTUR (F34) supplied to the engine externally from a jerrycan.

3 The outputs are produced from a Permanent Magnet Generator, with an Inverter and Regulator. All outputs feature MCB over-current protection, and the AC outputs feature 30mA earth leakage protection. The AC and DC Control Panels, with associated outlet points, are mounted on opposite sides of the LFG frame.

4 Instrumentation is provided for AC Voltage, DC Voltage, Total Percentage Load and Hours Run.

5 A warning lamp is provided for low oil pressure.

6 Starting is by either a recoil (rope) starter or by an integral electric starter motor powered from an external source.

7 A removable bag containing all necessary LFG accessories is attached to the tubular frame.



Figure 1 General view of LFG - ready to operate

Construction

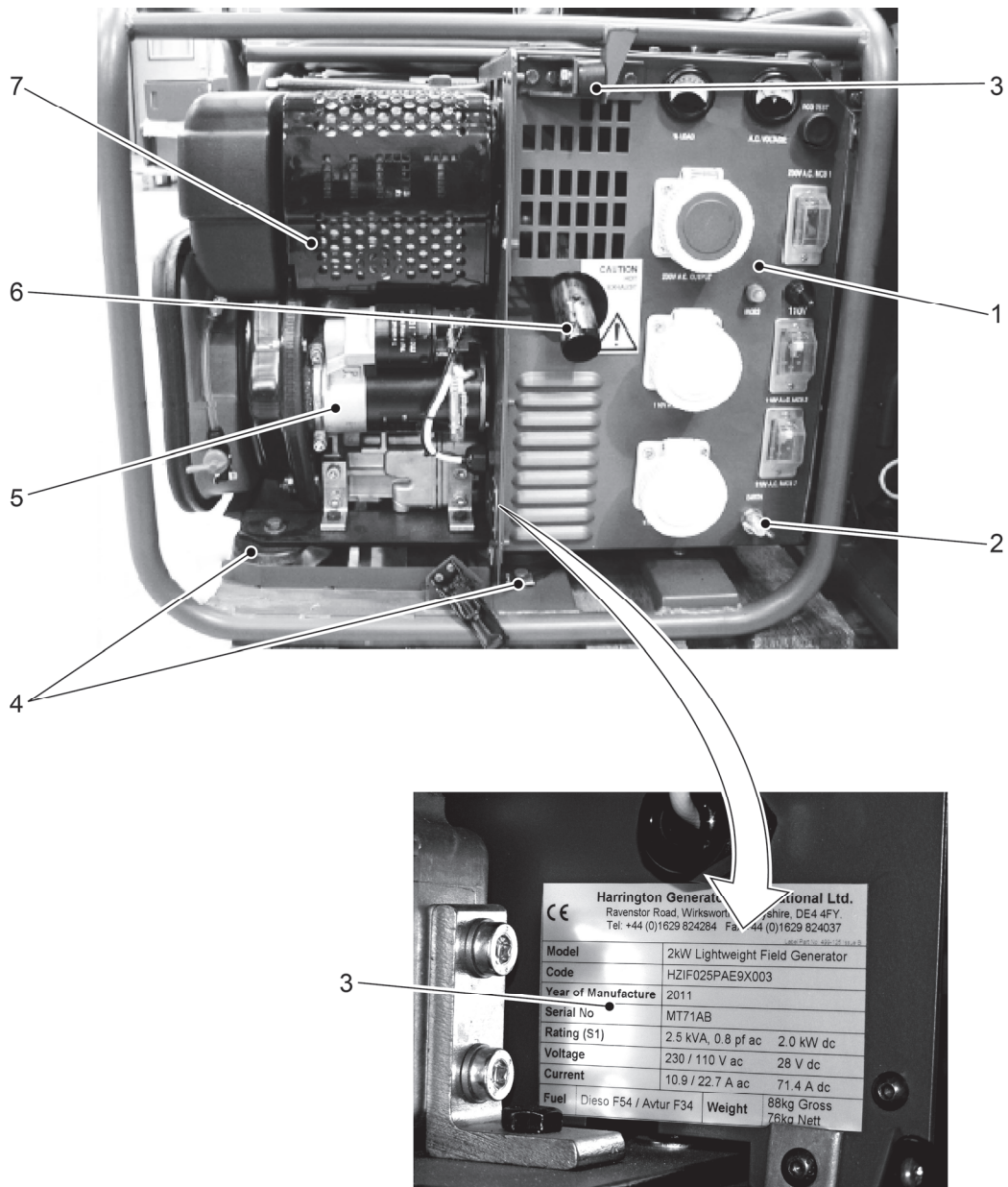
8 The LFG is housed in a tubular steel frame, with a sound attenuating cover covering the engine, and a sheet aluminium box housing the inverters, rectifiers and control system.

9 The main items of the LFG are a single cylinder, four stroke, air cooled engine which drives a Permanent Magnet Generator (PMG). The output of the PMG is fed into an Inverter/DC Regulator whose outputs are fed to the AC and DC Output Control Panels. The Engine and Control Panels are mounted to the frame via anti-vibration mountings.

10 Figure 2 and Figure 3 show views of the LFG, with the Acoustic Cover removed, and indicate the locations of the main items that make up the LFG. The Accessories Bag is not shown.

Acoustic cover

11 The engine is covered by a one piece sound attenuating Acoustic Cover (Figure 1) which provides environmental protection and noise attenuation when the LFG is operating. It is constructed from moulded polyethylene and is secured to the tubular frame by two clips located on the lower edge of the cover. Cooling air is drawn in through vents on the end of the cover.



- | | | | |
|---|-----------------------|---|------------------------|
| 1 | AC Control Panel | 5 | Electric Starter Motor |
| 2 | Earth Stud | 6 | Exhaust Pipe |
| 3 | Equipment Data Plate | 7 | Silencer Heat Shield |
| 4 | Anti Vibration Mounts | | |

Figure 2 Component location - AC panel side (acoustic cover removed)

Equipment data plate

12 An equipment data plate is located beneath the electric starter motor, attached to the control panel casing. The plate details the manufacturer, model, and code, year of manufacture, serial number, power, voltage and current ratings, usable fuel types and weight.

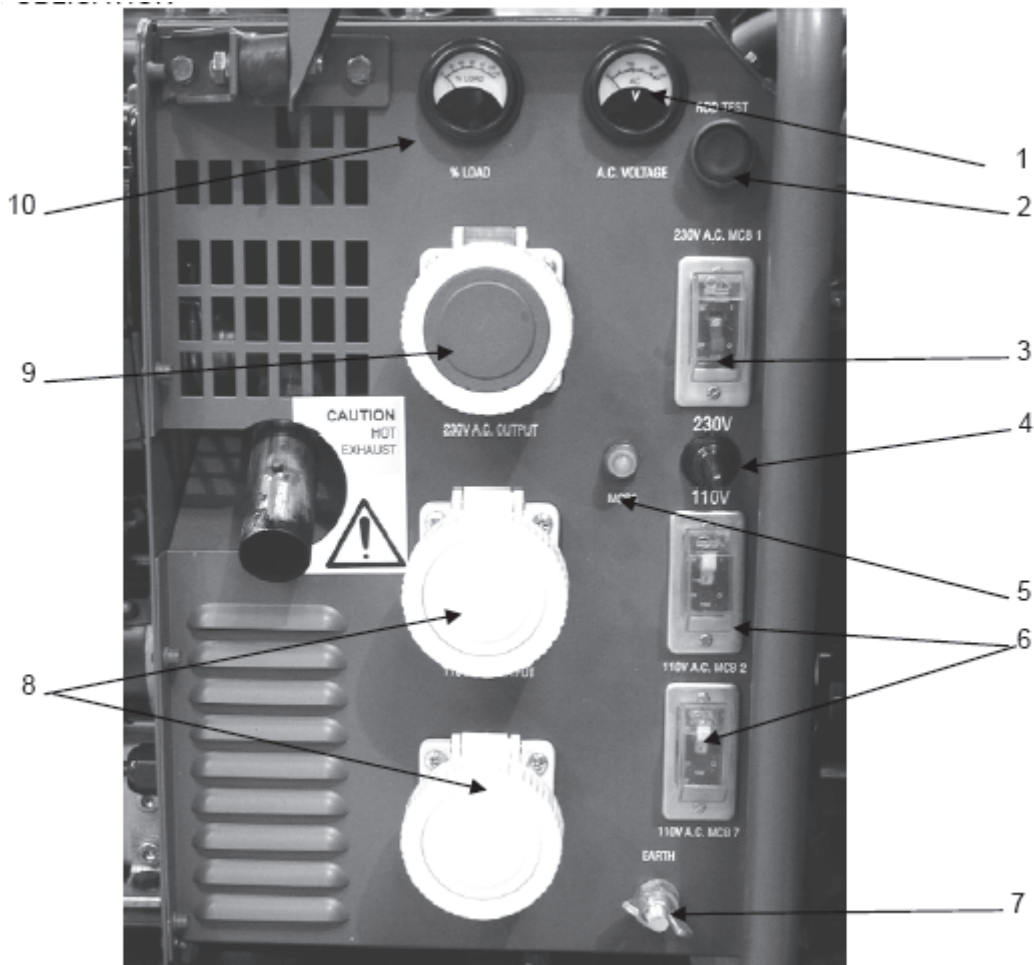


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|---|--------------------------------|---|-------------------------------|
| 1 | Tubular Frame | 5 | Oil Dipstick |
| 2 | Air Filter Cover | 6 | Engine Speed Control Assembly |
| 3 | Air Filter Cover Securing Knob | 7 | Air Vents |
| 4 | Air Duct/Recoil Starter Shroud | 8 | DC Control Panel |

Figure 3 Component location - DC panel side (acoustic cover removed)

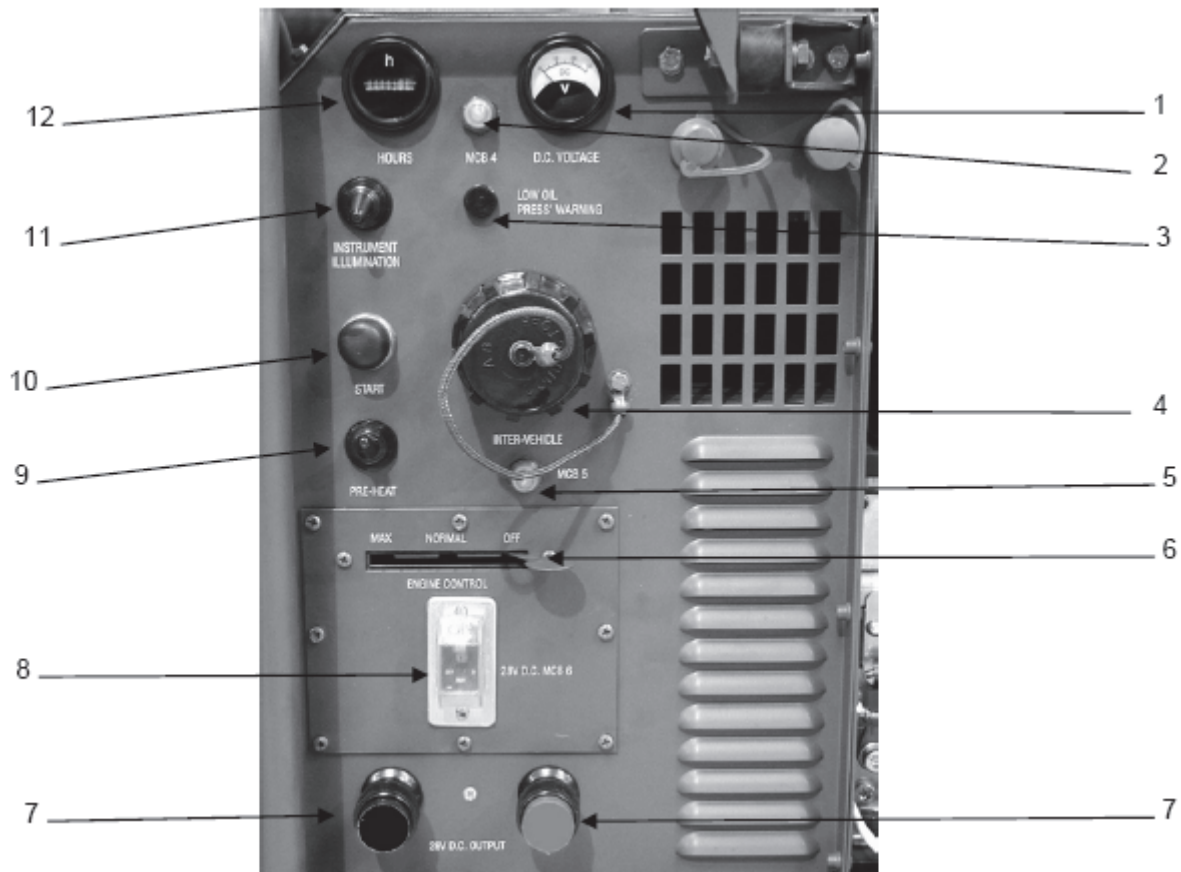
Control panels

13 Two Control Panels (AC and DC) are mounted one on either side of the LFG. They provide the operator controls, the necessary indications for monitoring performance and the output connectors for the AC and DC supplies produced by the LFG. The Engine Speed Control Lever is mounted on the DC Panel. Figure 4 and Figure 5 show component locations for both panels.



- | | | | |
|---|------------------------------------|---|---------------------------------|
| 1 | AC Voltage Meter | 6 | 110V AC Output Circuit Breakers |
| 2 | RCD (Earth Leakage) Test Button | 7 | Earth Stud |
| 3 | 230V AC Output Circuit Breaker | 8 | 110V AC Output Sockets |
| 4 | Voltage Selector Switch | 9 | 230V AC Output Socket |
| 5 | MCB 3 10 Percentage (%) Load Meter | | |

Figure 4 Component location - AC control panel



- | | | | |
|---|-------------------------------|----|--------------------------------|
| 1 | DC Voltage Meter | 7 | DC Output Terminals |
| 2 | MCB 4 | 8 | DC Output Circuit Breaker |
| 3 | Low Oil Pressure Warning LED | 9 | Pre-Heat Switch |
| 4 | Intervehicle Connector Socket | 10 | Start Push Button |
| 5 | MCB 5 | 11 | Instrument Illumination Switch |
| 6 | Engine Speed Control Lever | 12 | Hours Run Meter |

Figure 5 Component location - DC control panel

ENGINE

14 The LFG is driven by a Hatz-Diesel 1B20, single cylinder, four stroke air cooled engine which is capable of operating on either Diesel (F54) or AVTUR (F34). There are two types of Hatz Diesel engines in service; Engine type 1B20-S-204C and Engine type 1B20-S-204D. The engine type is identified by a data plate which is glued to the air filter housing. It is important to note the following when undertaking any maintenance:

14.1 To ensure that the correct Fuel Injector Assembly is fitted to the correct engine type. Engine type 1B20-S-204C, Fuel Injector Assembly identified by white paint dot on top of the item. Engine type 1B20-S-204D, Fuel Injector Assembly identified by yellow paint dot on top of the item.

14.2 To ensure that the correct Fuel Injection Pump Assembly is fitted to the correct engine type. Engine type 1B20-S-204C, Fuel Injection Pump Assembly is identified by the Engine number which should start with 10028 or 10029. Engine type 1B20-S-204D, Fuel Injection Pump Assembly is identified by the Engine number which should start with 30030.

15 The engine can be started by a conventional recoil (rope) type starter or by an electric starter motor. The electric starter motor is powered from an external power source via an interconnecting cable.

16 Lubrication of the engine moving parts is achieved by the pressurised circulation of oil. Oil filtering is achieved by a re-usable fine screen filter in the main oil flow. The oil filler plug/dipstick and drain plug are situated on the lower left side of the engine (as viewed from the recoil starter end).

17 For engine cooling, a cooling fan is incorporated in the flywheel and draws air in through the Recoil Starter and air vents in the Acoustic Cover.

18 Engine speed is regulated by the Engine Speed Control Lever located on the DC Control Panel. This is connected, via a cable link, to the engine mounted Engine Speed Control assembly. Internal to the engine is a mechanical governor which maintains a constant engine speed under varying loads.

ALTERNATOR

19 The alternator is a High Frequency Permanent Magnet Generator (Figure 6) producing 400 V at 400 Hz. The alternator is of the rotating field type with a permanent magnet rotor attached directly to the engine output shaft. The stator is fixed to the bulkhead which separates the engine from the electronics compartment.

20 The alternator output is connected, via a cable harness, to an electronic Control Unit incorporating an AC Inverter and DC Regulator to give 230 V AC, 110 V AC and 28 V DC outputs respectively.

21 Cooling air for the Inverter/Regulator Assembly and the PMG is provided by a fan mounted on the engine output shaft which draws air in through the Louvre Panel vents.

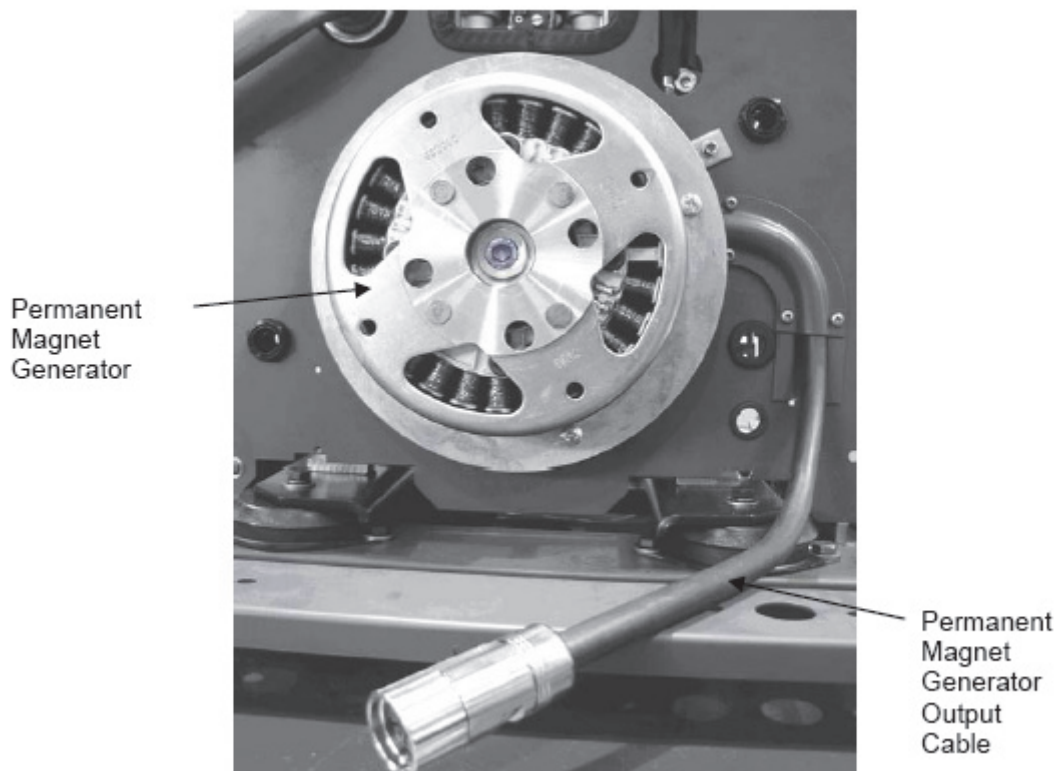


Figure 6 Permanent magnet generator

BRIEF FUNCTIONAL DESCRIPTION

22 The main functional areas of the LFG are shown in Figure 7, which indicates the functional locations of these areas in the generating system in a simplified block schematic form.

23 The engine speed is controlled by an Engine Speed Control Lever situated on the DC Control Panel. It has two settings; "Normal" and "Max". "Normal" is used for the continuous 2 kW output and "Max" is used for the 2.2 kW Overload output condition.

24 The 400 V 400 Hz output of the Permanent Magnet Generator is conditioned by the AC Inverter/DC Regulator Assembly to provide the required AC and DC outputs via overload protection Circuit Breakers. An input socket for the external DC power required for the electric starter is provided.

25 Instrumentation is provided on both Control Panels for displaying output voltages, Percentage (%) Load and Hours Run. Instrument panel lighting is selectable by an ON/OFF switch. Earth Leakage Monitoring/Testing and Low Oil Pressure Warnings are provided.

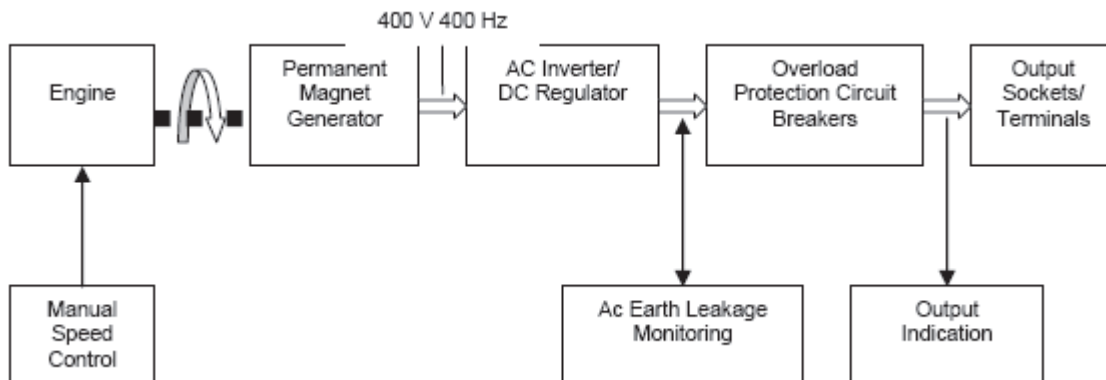


Figure 7 LFG simplified block diagram

CHAPTER 2

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- 1 Introduction
- 2 Air filtering
- 3 Exhaust system
- 4 Lubricating system
- 7 Fuel system
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2	Fuel pulse pump - component index	5

INTRODUCTION

1 The Power Unit consists of an engine, engine mounted accessories and engine support systems. Equipment locations are shown in Chapter 1, Figure 2 and Figure 3. The engine is a Hatz-Diesel 1B20, single cylinder, four stroke air cooled engine which is capable of operating on either Diesel (F54) or the AVTUR (F34). There are two types of Hatz Diesel engines in service; Engine type 1B20-S-204C and Engine type 1B20-S-204D. The engine type is identified by a data plate which is glued to the air filter housing. It is important to note that following when undertaking any maintenance:

1.1 To ensure that the correct Fuel Injector Assembly is fitted to the correct engine type. Engine type 1B20-S-204C, Fuel Injector Assembly identified by white paint dot on top of the item. Engine type 1B20-S-204D, Fuel Injector Assembly identified by yellow paint dot on top of the item.

1.2 To ensure that the correct Fuel Injection Pump Assembly is fitted to the correct engine type. Engine type 1B20-S-204C, Fuel Injection Pump Assembly is identified by the Engine number which should start with 10028 or 10029. Engine type 1B20-S-204D, Fuel Injection Pump Assembly is identified by the Engine number which should start with 30030.

AIR FILTERING

2 Air drawn in from the atmosphere passes through an air cleaning system (Figure 1), which is a dry type air cleaner assembly incorporating a disposable paper filter element and integrated pre-cleaner.

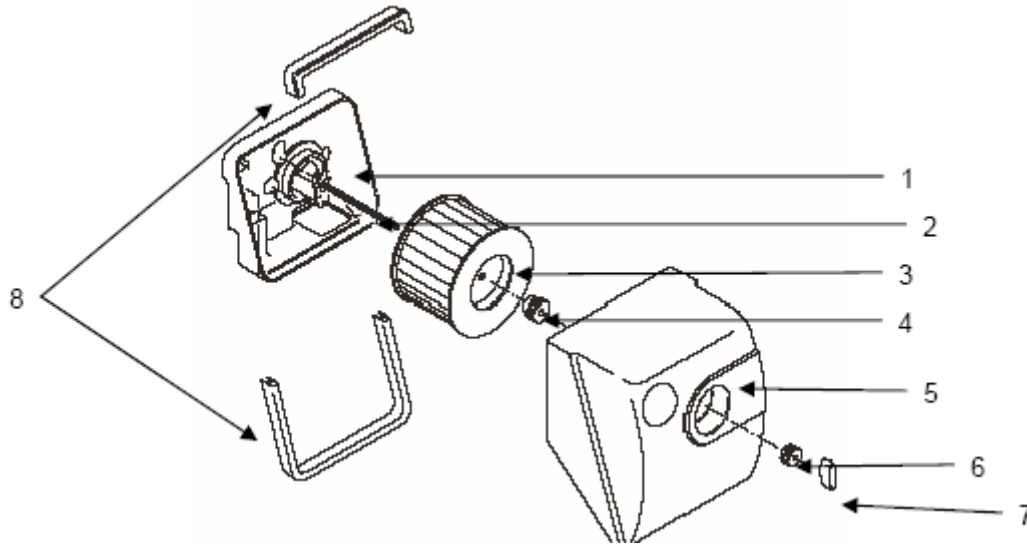


Figure 1 Air cleaner system

TABLE 1 AIR CLEANER SYSTEM - COMPONENT INDEX

1	Air Cleaner Base	5	Cover
2	Cartridge Support Stud Incorporating Cold Start Glow Plug	6	Rubber Grommet
3	Filter Element	7	Cover Securing Nut
4	Filter Element Securing Nut	8	Seals

EXHAUST SYSTEM

3 Exhaust gas expelled from the engine passes directly into a silencer unit located on the AC Control Panel side of the engine. To minimise the possibility of burn injuries through accidental contact with a hot silencer, the silencer is covered by a heat shield. The hot gases are then routed through a short exhaust pipe to vent to atmosphere (see Chap 1,). A flexible Exhaust Extension can be fitted to the exhaust pipe to enable the exhaust gas to be vented clear of occupied areas. Attachment is by a push and twist, bayonet lock, fastening (Figure 2).



Figure 2 Exhaust pipe

LUBRICATING SYSTEM

4 Lubrication of the engine moving parts is achieved by the pressurised circulation of oil. The type of oil to be used is dependent on the temperature of the intended operating environment. Refer to Cat 601.

5 The oil filler cap is located on the Rocker Cover and the Oil Dipstick is on the DC Control Panel side of the engine. The oil drain plug is also situated on the DC Control Panel side of the engine (Figure 3). An Oil Drain Extension pipe is fitted to the crank case oil drain to allow oil to drain clear of the LFG frame.

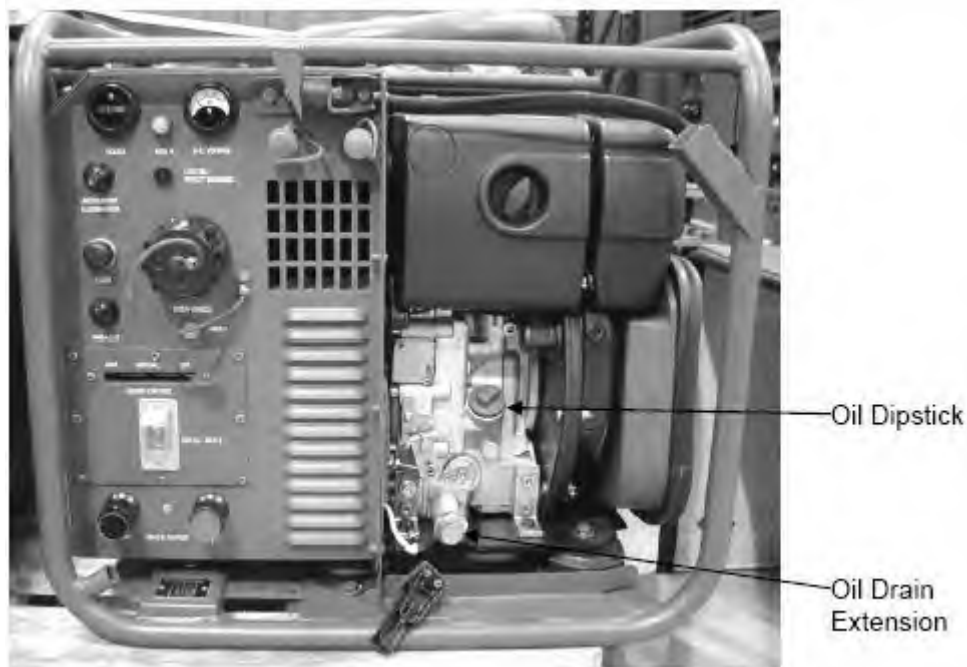


Figure 3 Oil dipstick and oil drain extension

6 Low oil pressure is indicated to the operator by the illumination of the Low Oil Press' Warning LED. The LED is activated by the operation of the Low Oil Pressure Switch which is fitted to the engine. When the switch operates, it energises the Low Oil Pressure Relay (RL1) which, as well as illuminating the LED, will trip any output circuit breakers which are set.

FUEL SYSTEM

7 Fuel is supplied from a jerrycan via the jerrycan Adapter assembly which is normally stowed in the Accessories Bag. The adapter assembly comprises two flexible fuel hoses terminated in male and female quick release couplings, a jerrycan Filler Neck Adapter and a Dip Tube fitted with a Fuel Filter (Figure 4). The Quick Release Couplings are connected to their respective points on the LFG, DC Control Panel side (Figure 5). Whenever the quick release couplings are not connected to the LFG then they should be connected together to provide protection against contamination and ingress of dirt, sand or grit etc.

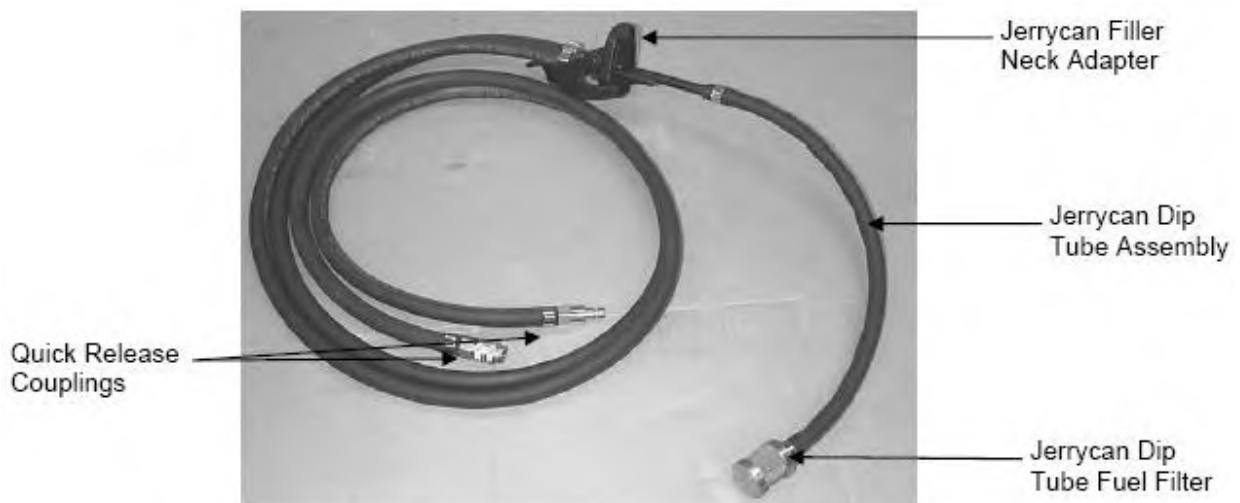


Figure 4 Jerrycan adapter assembly

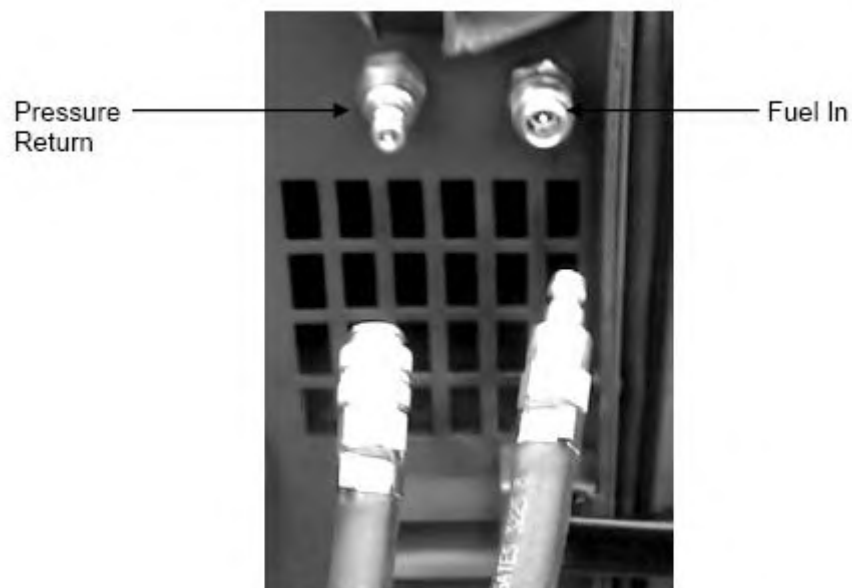


Figure 5 Fuel quick release points

8 The Fuel In Quick Release Point is connected to the fuel Pulse Pump via a short length of hose. The Pulse Pump (Figure 6) is mounted near the top of the Bulkhead, on the Control Panel side, and is actuated by crank case bleed air which is fed via the Crank Case Pressure Hose. The Pulse Pump then feeds fuel to the engine fuel tank. From the engine fuel tank, the fuel is fed to the Fuel Injector Pump, via the Engine Fuel Tank Fuel Filter (Figure 7), and then to the Fuel Injector via a rigid pipe (Figure 8).

NOTES

(1) If undertaking maintenance, ensure that the correct Fuel Injector Assembly is fitted to the correct engine type. The engine type is identified by a data plate which is glued to the air filter housing. Engine type 1B20-S-204C, Fuel Injector Assembly identified by white paint dot on top of the item. Engine type 1B20-S-204D, Fuel Injector Assembly identified by yellow paint dot on top of the item.

(2) If undertaking maintenance, ensure that the correct Fuel Injection Pump Assembly is fitted to the correct engine type. The engine type is identified by a data plate which is glued to the air filter housing. Engine type 1B20-S-204C, Fuel Injection Pump Assembly is identified by the Engine number which should start with 10028 or 10029. Engine type 1B20-S-204D, Fuel Injection Pump Assembly is identified by the Engine number which should start with 30030.

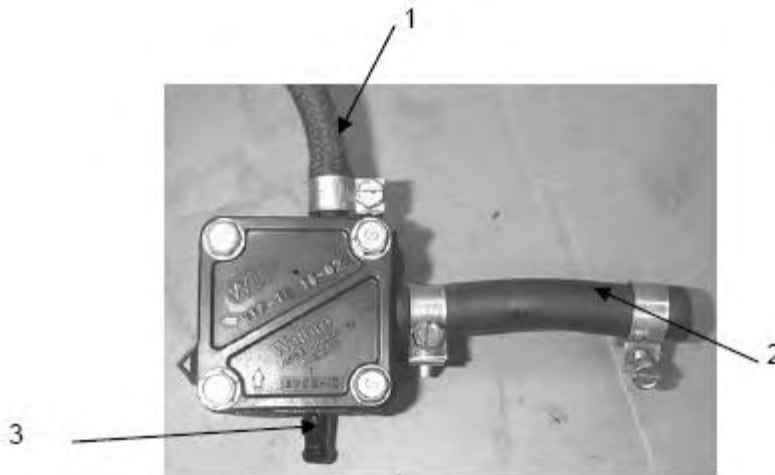


Figure 6 Fuel pulse pump

TABLE 2 FUEL PULSE PUMP - COMPONENT INDEX

1	Fuel Out to Engine Tank	3	Crank Case Pressure Hose
2	Fuel In from Jerrycan		

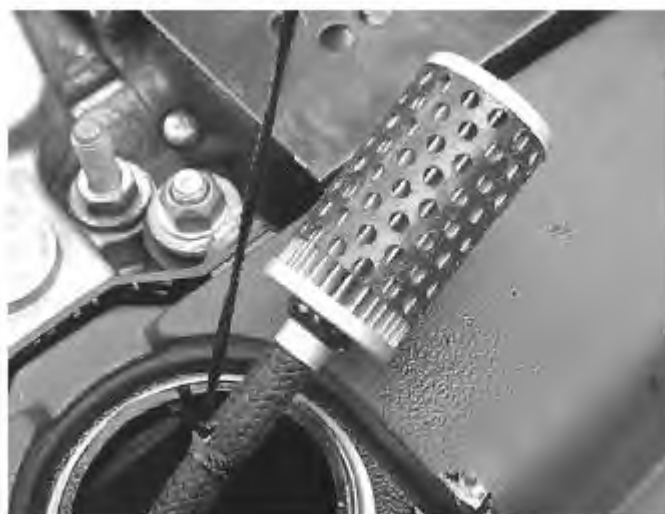


Figure 7 Engine fuel tank fuel filter

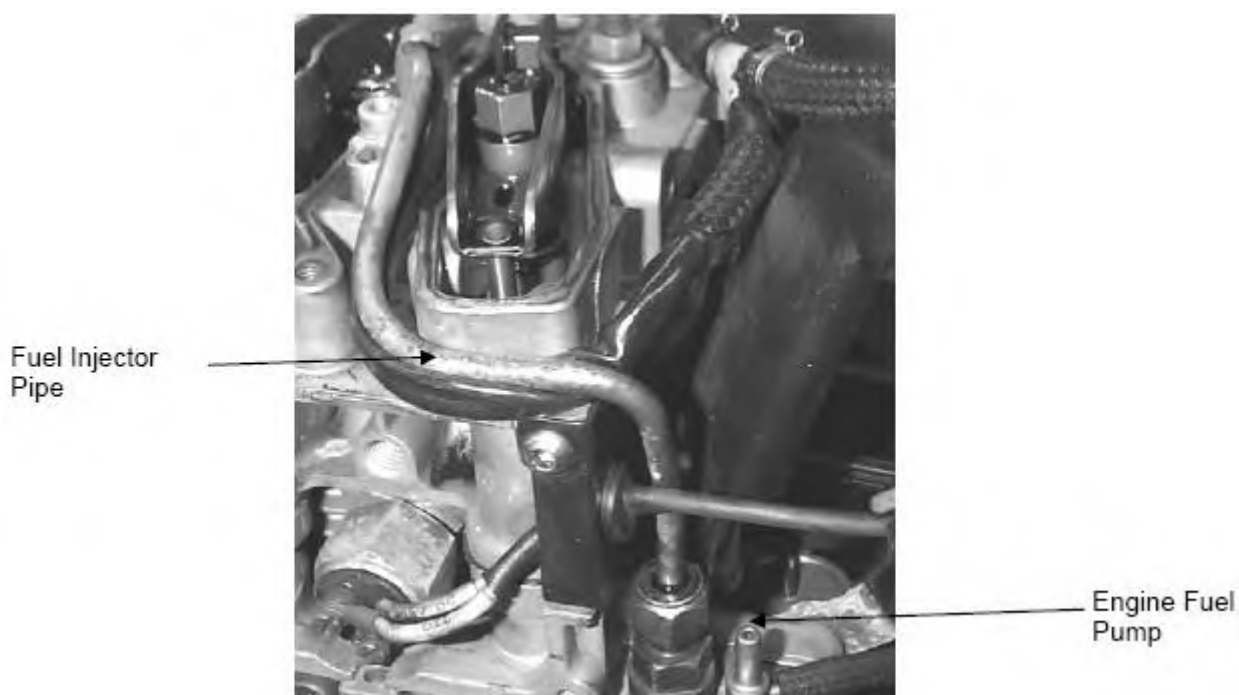


Figure 8 Fuel injector pipe and engine fuel pump

9 The fuel system is a sealed, pressurised and self priming system. The engine fuel tank filler cap must be securely fastened for the system to operate correctly. To complete the pressure circuit, a return hose is connected from the engine fuel tank to the jerrycan via the pressure return Quick Release Coupling.

ENGINE COOLING

10 Cooling air enters the engine compartment via air vents in the Acoustic Cover and grills on the Recoil Starter. A forced airflow around the engine is maintained by the engine flywheel fan which draws air in through the Acoustic Cover vents. This is then channelled via the Recoil Starter Shroud and Engine Cooling Air Intake, through the recoil starter vents, onto the engine. It exits from the slotted vents on the sides of the LFG.

SPEED GOVERNING

11 Engine speed is set by the use of the Engine Speed Control Lever fitted to the DC Control Panel which actuates, via a cable, the engine mounted speed control. The limits of the engine mounted speed control are set on construction and should not require adjustment during normal operation. When engine speed changes due to load variations, the speed governing system restores the set engine speed by adjusting the engine mounted speed control to increase or decrease fuel flow to the injector

STARTING SYSTEM

12 The engine can be started by a conventional recoil (rope) type starter or by an electric starter motor. The electric starter motor is powered from an external power source via an interconnecting cable.

Recoil starter

13 A conventional Recoil (rope) Starting system is incorporated at the non-drive end of the engine (Figure 9). When the starting rope is pulled, the pawl engages with the drive cup and turns the engine. On releasing the rope, the return spring acts to rewind the rope onto the reel.



Figure 9 Recoil starting assembly

Electric starter

14 The electric starter motor is attached to the engine (see Chap 1) and engages the flywheel via a toothed drive. It is powered by an external 24 V DC supply via an interconnecting cable which connects to the Intervehicle Connector on the DC Control Panel. Pressing the Start button (see Chap 1) on the DC Control Panel causes the starter motor to turn the engine.



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CHAPTER 3

DETAILED ELECTRICAL DESCRIPTION

CONTENTS

Para

- 1 Introduction
 - Electrical system functional overview
- 2 Engine
- 3 PMG control and distribution
- 5 Permanent magnet generator
- 8 Power output
- 12 Inverter/regulator assembly
- 14 Control panel assemblies
 - 15 AC panel
 - 16 DS panel
- 17 LFG circuit diagram

Table

Page

- 1 PMG cable - power plug and stator connections 2

Fig

- 1 PMG cable and connector 2
- 2 Inverter/regulator assembly - removed from the electronics frame 3
- 3 LFG circuit diagram 5/6

INTRODUCTION

1 This chapter provides detailed descriptions of the electrical system assemblies and sub-assemblies that make up the LFG. The main items of the system are the Permanent Magnet Generator (PMG), the Inverter/Regulator assembly and the Control Panel assemblies.

Electrical system functional overview

Engine

2 The engine has the facility to be started electrically using an external 24 V DC supply. The connector and controls for the electric start system are located on the DC Control Panel. An external 24 V DC power source is connected to the Intervehicle Connector and engine start is initiated by pressing the Start pushbutton. In cold conditions, there is the facility to pre-heat the engine by holding down the Pre-Heat switch for a short time. Protection for the start and pre-heat circuits is provided by the 15 A Circuit Breaker MCB 5.

PMG control and distribution

3 The 400 V, 400 Hz output of the PMG is fed into the Inverter/Regulator assembly where it is conditioned to provide the required AC and DC outputs. The AC and DC outputs of the Inverter/Regulator are fed via relay contacts and circuit breakers to their respective output sockets or terminals.

4 The AC outputs are further protected by the Earth Leakage Monitor unit which will trip all output circuit breakers if an earth fault is detected.

PERMANENT MAGNET GENERATOR

5 The Permanent Magnet Generator is a High Frequency device producing 400 V at 400 Hz. It is of the rotating field type with a permanent magnet rotor attached directly to the engine output shaft. The stator is fixed to the bulkhead which separates the engine from the electronics compartment. Connection to the Inverter/Regulator assembly is via a cable harness (see Chapter 1).

6 The PMG Cable and connector as shown in Figure 1. The power plug and stator connections for the PMG Cable are detailed in Table 1.

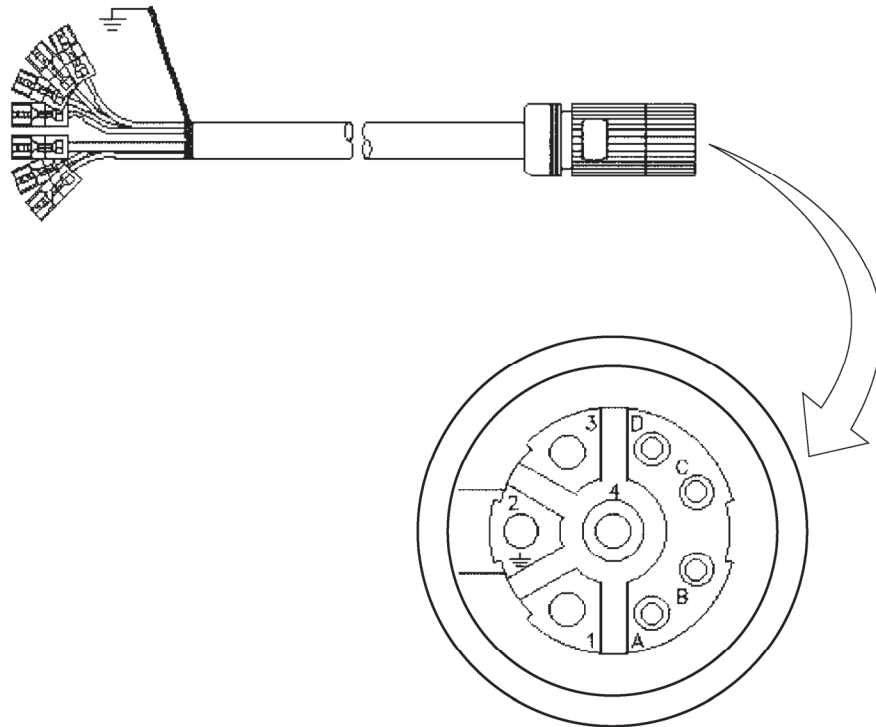


Figure 1 PMG cable and connector

TABLE 1 PMG CABLE - POWER PLUG AND STATOR CONNECTIONS

Serial (1)	POS (2)	Terminal (3)	Wire Colour (4)	Stator Position (5)
1	1	Female, 2 mm dia	Black	Phase 3
2	2	Female, 2 mm dia	Shield	To Earth
3	3	Female, 2 mm dia	Black	Phase 2
4	4	Female, 2 mm dia	Black	Phase 1
5	A	Female, 1 mm dia	Blue	Start Aux 2
6	B	Female, 1 mm dia	Blue	End Aux 2
7	C	Female, 1 mm dia	Brown	Start Aux 1
8	D	Female, 1 mm dia	Brown	End Aux 1

7 Cooling air for the Inverter/Regulator Assembly and the PMG is provided by a fan mounted on the engine output shaft which draws air in through the Louvre Panel vents, which is exhausted through the louvres on the side panels.

Power output

8 The generator will provide either 110 V AC or 230 V AC output simultaneously with 28 V DC output. The maximum power available is 2 kW continuously and it is capable of sustaining an overload up to 2.2 kW for a maximum duration of 1 hour in every 10 hours operation.

9 The required AC output (110 V or 230 V) is selected using the AC Output Voltage Selector Switch (SW1), which should not be operated whilst the generator is running. The 28 V DC output is available simultaneously with either AC output.

NOTE

If the AC Output Voltage Selector Switch (SW1) is inadvertently operated during running, the Inverter may trip off line. If this occurs, shut down and re-start the LFG to clear the trip condition.

10 To ensure the correct engine speed for the load selected, it can be adjusted to either "Normal" (suitable for total loads up to 2 kW) or "Max" (for overload conditions, up to 2.2 kW). The speed is adjusted using the Engine Speed Control Lever, on the DC Control Panel, to the positions as marked.

NOTE

The engine speed must be set to "Max" if the total load exceeds 2 kW, or if it is used at high altitude (above 1500 m). Use of the "Max" (Overload) setting is restricted to a maximum duration of 1 hour in every 10 hours operation.

11 The total LFG output (AC and DC combined) is indicated by the Load Meter (calibrated 0% -110%).

INVERTER/REGULATOR ASSEMBLY

12 The Inverter/Regulator Assembly is a sealed unit which is mounted in the electronics half of the LFG between the two Control Panels. To assist in cooling, as well as cooling air being ducted over it, it is fitted with a large heat sink (Figure 2).

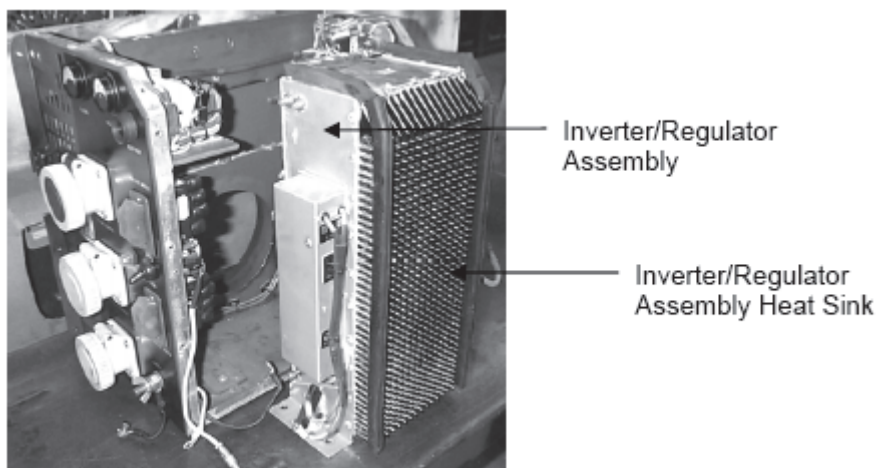


Figure 2 Inverter/regulator assembly - removed from the electronics frame

13 The output of the PMG is fed into the Inverter/Regulator where it is converted and rectified to provide the 110/230 V AC and 28 V DC.



CONTROL PANEL ASSEMBLIES

14 Control of the AC and DC outputs is split between two control panels, one for AC and one for DC. Both panels provide instrumentation to monitor output voltage, circuit breakers to provide output protection and either sockets or terminals to connect loads to.

AC Panel

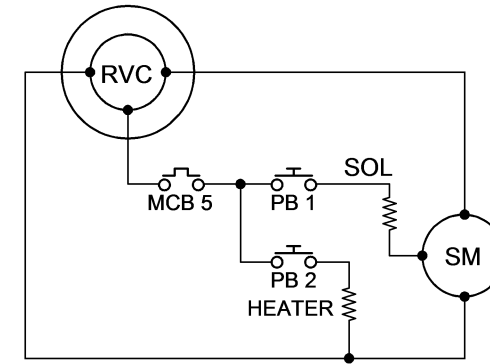
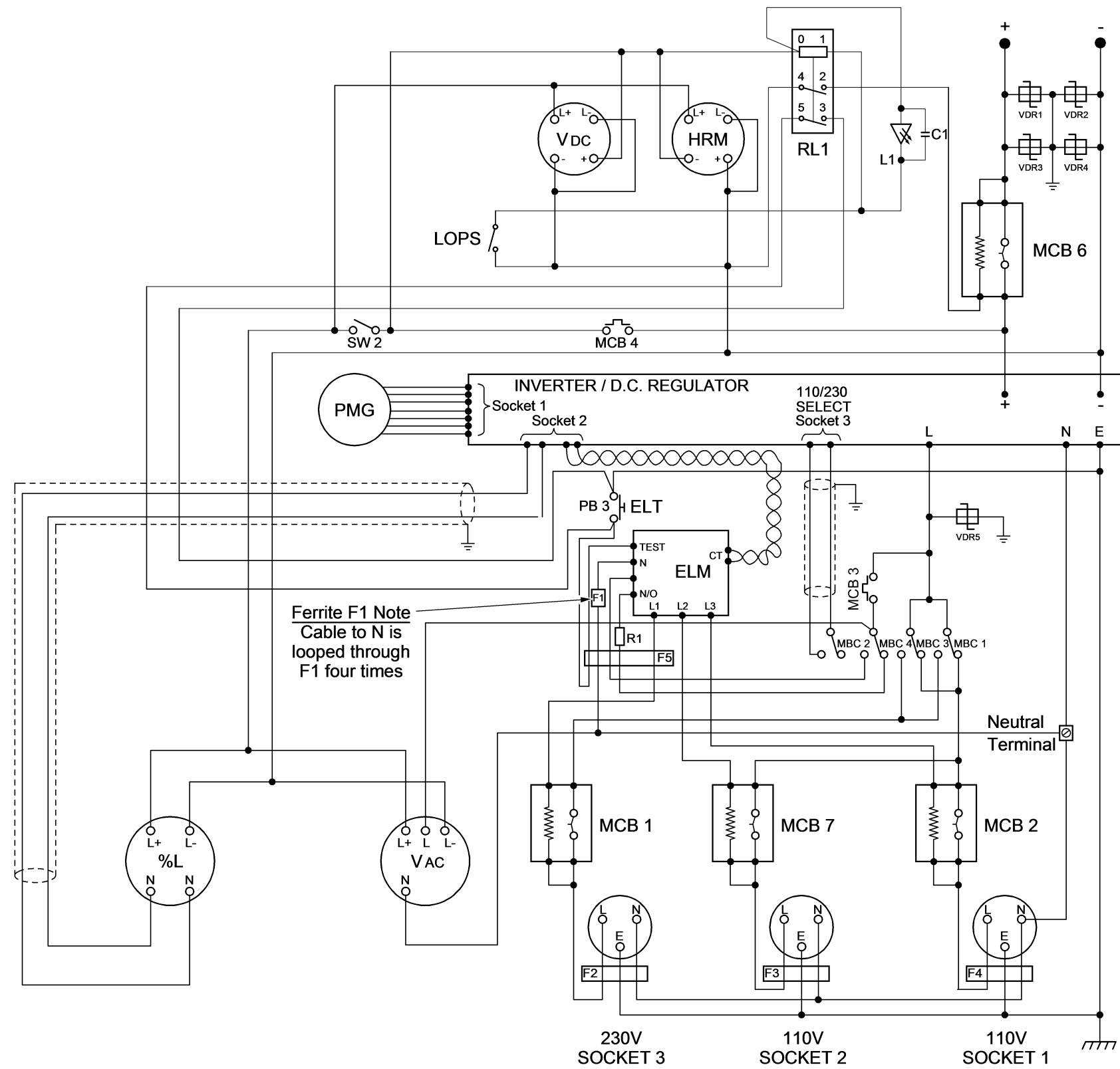
15 Mounted on the AC Panel are three output sockets (2 x 110 V and 1 x 230 V) and their associated circuit breakers, the Percentage (%) Load Meter, the RCD Test (Earth leakage) push button, the Voltage Selector switch and its associated circuit breaker, and the Earth Point.

DC Panel

16 Mounted on the DC Panel are the Output Terminals and their associated circuit breaker, the Hours Run meter, the Low Oil Pressure Warning LED, the Instrument Illumination switch and the Intervehicle connector. The Start push button, Pre-heat switch and their associated circuit breaker plus the Engine Speed Control Lever are also mounted on the DC Panel.

LFG CIRCUIT DIAGRAM

17 A circuit diagram of the LFG, including the Starting/Pre-heat circuit, is provided as Figure 3.



Engine Starting Circuit-24V DC

- %L Percentage Load Meter
- C1 Suppression Capacitor 10nF 100V
- ELM Earth Leakage Monitor
- F1 Ferrite Bead
- F2 to F5 Ferrite Bead
- HRM Hours Run Meter
- L1 Low Oil Pressure Warning LED
- LOPS Low Oil Pressure Switch (Fitted To Engine)
- MCB1 Circuit Breaker - 230V AC output - 11A
- MCB2 Circuit Breaker - 110V AC output - 16A
- MCB3 Circuit Breaker - AC control circuits - 2A
- MCB4 Circuit Breaker - DC control circuits - 2A
- MCB5 Circuit Breaker - 24V DC starter & heater circuits - 15A
- MCB6 Circuit Breaker - 28V DC output - 80A
- MCB7 Circuit Breaker - 110V AC output - 16A
- PB1 Starter Push Button
- PB2 Heater Push Button
- PB3 Earth Leakage Test Push Button
- PMG Permanent Magnet Generator
- R1 Resistor - 100 ohm
- RL1 Low Oil Pressure Warning Relay
- RVC Remote Vehicle Connector
- SM Starter Motor
- SW1 Voltage Selector Switch (Output)
- SW2 Panel Light Switch
- V AC DC Voltmeter
- V DC DC Voltmeter
- VDR1 to 5 Voltage Dependent Resistor

Figure 3 LFG circuit diagram

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Ministry of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-211 AIDE MEMOIRE

Issue No. 002

Amendment No. 003

June 2018

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AIDE MEMOIRE

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- 2 Operating Procedures
- 3 Operator Maintenance
- 4 LFG Transport



PREFACE

Sponsor: Operational Infrastructure (OI)
Project No.:
File Ref: DG Log (Land) ESS/13/8/18

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INTRODUCTION

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RELATED AND ASSOCIATED PUBLICATIONS

Related publications

4 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
7	1	Illustrated Parts Catalogue	711	*	*	*
	2	Commercial Parts List	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published



Associated publications

5 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201	Earthing and Earthing Protection
JSP 515	Hazardous Stores Information System
SEI 14411	Safety Precautions for Electrical Equipment

ADDITIONAL INFORMATION

Applicability details

6 This Aide Memoire relates to the following equipment:

EIN/SNS	Asset Code	Contract
6115-99-908-6784	JR 8817 3500	BFI/CI/59

HAZARDOUS SUBSTANCES

7 Before using any hazardous substance or material, the user must be conversant with the safety precautions and first aid instructions:

- 7.1 On the label of the container it was supplied in.
- 7.2 On the Material Safety Data Sheet.
- 7.3 In local Safety Orders and Regulations.

WARNINGS AND CAUTIONS

WARNINGS

8 The following WARNINGS are applicable to this category:

(1) EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

(2) EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.

-
- (3) F54 DIESEL AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:**
- (3.1) DO NOT RUN THE LFG.**
 - (3.2) DO NOT SMOKE.**
 - (3.3) AVOID ALL NAKED FLAMES.**
 - (3.4) AVOID OVERFILLING THE FUEL TANK/JERRYCAN.**
 - (3.5) WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG.**
- (4) GUARDS AND COVERS. DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.**
- (5) JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.**
- (6) NOISE HAZARD. IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.**
- (7) PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).**
- (8) PERSONAL INJURY. THE LFG ALTERNATOR IS A PERMANENT MAGNET GENERATOR, CARE MUST BE TAKEN WHEN WORKING ON THE GENERATOR DUE TO THE HIGH STRENGTH OF THE MAGNETS WHICH COULD CAUSE PERSONAL INJURY.**
- (9) SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.**
- (10) SHOCK HAZARD. LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.**
-



(11) SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.

(12) TOXIC FUMES. EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.

(13) HEALTH HAZARD. PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLED, BE HAZARDOUS TO HEALTH. PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.

CAUTIONS

9 The following CAUTIONS are applicable to this category:

(1) EQUIPMENT AIRFLOW. The generator should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.

(2) EQUIPMENT DAMAGE. Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.

(3) EQUIPMENT DAMAGE. During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

(4) EQUIPMENT DAMAGE. Operation of the AC Output Voltage Selector Switch (SW 1) when the generator is running underload will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.

- (5) **EQUIPMENT DAMAGE.** The engine must not be operated with the oil level below the specified minimum level.
- (6) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.
- (7) **EQUIPMENT DAMAGE.** The Low Oil Pressure Switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.
- (8) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.
- (9) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

10 The following abbreviations are used in this category:

A	Ampere
AC	Alternating Current
AESP	Army Equipment Support Publication
Amdt	Amendment
BFPO	British Forces Post Office
Cat	Category
CES	Complete Equipment Schedule
Chap	Chapter
dB(A)	decibel (A scale)
DC	Direct Current
DE&S	Defence Equipment & Support
DIN	Defence Instructions and Notices
EMER	Electrical and Mechanical Engineering Regulations
FRACAS	Failure Reporting Analysis and Corrective Action System
JAMES	Joint Asset Management and Engineering Solutions
JSP	Joint Service Publication
kg	kilogramme
kW	kiloWatt
LE	Land Equipment
LFG	Lightweight Field Generator
MCB	Miniature Circuit Breaker

MoD	Ministry of Defence
No.	Number
OI	Operational Infrastructure
OSP	Operational Support Programme
Para	Paragraph
PT	Project Team
Qty	Quantity
RAF	Royal Air Force
Ref	Reference
SME	Subject Matter Expert
SEI	Service Engineering Instruction
SOP	Standard Operating Procedures
TDOL	Technical Documents On-Line
UK	United Kingdom
V	Volt
W	Watt

SYMBOLS

11 The following symbols are used in this category:

°	degree
-	minus
%	percent

CHAPTER 1
GENERAL DESCRIPTION
CONTENTS

Para

- 1 Introduction
- Output control panels
- 3 AC output
- 4 DC output
- 5 Competent persons

Table

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1	AC control panel - controls and connector functions	2
2	DC control panel - controls and connector functions.....	4
3	Power equipment competency chart.....	5

Fig

1	AC Control panel - controls and connectors.....	2
2	DC control panel - controls and connectors	3

INTRODUCTION

1 The Lightweight Field Generator (LFG) provides a portable source of 230/110 V AC and 28 V DC power with a 2 kW continuous output. The LFG is powered by a small diesel engine and is capable of running on AVTUR (F34) or Dieso (F54).

2 The engine can be started by a conventional recoil (rope) type starter or by an electric starter motor. The electric starter motor is powered from an external 24 V DC power source via an interconnecting cable.

OUTPUT CONTROL PANELS

AC output

3 The AC Output Control Panel is on the right hand side of the LFG (as viewed from the recoil starter end), Figure 1. The Controls and Connector locations are shown in Figure 1 and their functions are described in Table 1.

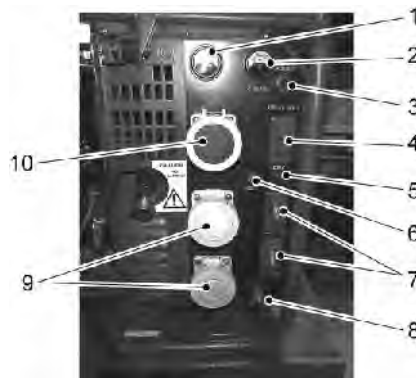


Fig 1 AC Control panel - controls and connectors

TABLE 1 AC CONTROL PANEL - CONTROLS AND CONNECTOR FUNCTIONS

Serial (1)	Control/Connector (2)	Figure Item Ref (3)	Function (4)
1	PERCENTAGE(%) LOAD	1	Displays total percentage (%) load on the generator
2	AC VOLTAGE METER	2	Displays AC output voltage
3	RCD TEST	3	Pushbutton, used to test the operation of the Residual Current Detector
4	230 V AC MCB 1	4	Resettable 11 A circuit breaker providing 230 V output overload protection
5	SW1 230 V / 110 V	6	AC Output Voltage Selector switch
6	MCB 3	5	Resettable 2 A circuit breaker providing overload protection for the AC control circuits
7	MCBs 2 & 7	7	Resettable 16 A circuit breakers providing individual output overload protection for the 110 V outputs
8	EARTH STUD	8	Stud for external earth
9	110 V Output Sockets (Qty 2)	9	Individual 110 V output sockets
10	230 V Output Socket (Qty 1)	10	Single 230 V output socket

DC output

4 The DC Output Control Panel is on the left hand side of the LFG (as viewed from the recoil starter end), Figure 2. The controls and connector locations are shown in Figure 2 and their functions are described in Table 2.

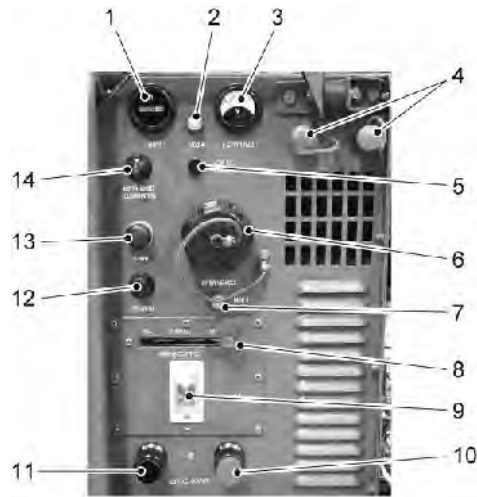


Fig 2 DC control panel - controls and connectors

TABLE 2 DC CONTROL PANEL - CONTROLS AND CONNECTOR FUNCTIONS

Serial (1)	Control/Connector (2)	Figure Item Ref (3)	Function (4)
1	HOURS RUN METER	1	Displays total hours run
2	MCB 4	2	Resettable 2A circuit breaker providing overload protection for the DC control circuits
3	DC VOLTAGE METER	3	Displays DC output voltage
4	JERRYCAN QUICK RELEASE CONNECTIONS	4	Provide for the connection of the jerrycan adaptor pipes
5	LOW OIL PRESSURE WARNING	5	Low oil pressure warning LED
6	INTERVEHICLE CONNECTOR SOCKET	6	Connects external DC source of power for electric starting of the LFG
7	MCB 5	7	Resettable 15A circuit breaker providing protection for the electric starter and pre-heater circuits
8	ENGINE SPEED CONTROL LEVER	8	Controls the speed of the engine
9	MCB 6	9	Resettable 80A circuit breaker providing overload protection for the DC output circuits
10	28V DC OUTPUT +ve (Red)	10	Positive DC output terminal
11	28V DC OUTPUT -ve (Black)	11	Negative DC output terminal
12	PRE HEAT	12	Engine glow plug pre-heater push button
13	START	13	Engine electric start push button
14	INSTRUMENT ILLUMINATION	14	Instrument panel lights ON/OFF switch

COMPETENT PERSONS

5 Competent persons are detailed in Table 3 - Power Equipment Competency Chart.

NOTE

The LFG 2 kW generator set is not included in this chart as it is considered to be part of the 'All Arms' equipment covered by the All Arms Training.

TABLE 3 POWER EQUIPMENT COMPETENCY CHART

Level of Training	FEPS		VTEG		FEPDS		PMDS		LAPDS	
	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise	Installation (Lay-down)	Complete a Power Plan, Inspect, Test Commission, Energise
Royal Engineer Electrician Class 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Royal Engineer Electrician Class 2	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Royal Signals Electrician Class 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Royal Signals Electrician Class 2	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
REME Electrician Class 1	Yes	No	Yes	No	Yes	No	Yes	No	No	No
REME Electrician Class 2	Yes	No	Yes	No	Yes	No	Yes	No	No	No
RAF Gen Tech E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Royal Marine TECH	Yes	No	Yes	No	Yes	No	Yes	No	No	No

Installation: Prepare the generator, lay out and connect the distribution equipment in accordance with the power plan.

Inspect: Check to ensure that all connections are secure and appropriate earth connections made.

Test: Test that power flows from the source to the final distribution points. Test breakers and RCD switches.

Commission: Certification that the power equipment has been installed, tested and commissioned in line with regulations.

Energise: Apply power across the distribution network.



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CHAPTER 2
OPERATING PROCEDURES
CONTENTS

Para

- 1 Introduction
- 5 Pre start activities (WARNING) (CAUTION)
- 8 Starting the LFG (WARNING) (CAUTION)
- 9 Connecting loads (WARNING) (CAUTION)
- 10 Shut down procedure (WARNING) (CAUTION)

Table

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1	Pre start activities.....	2
2	Starting procedures.....	3
3	Connecting loads	4
4	Shut down procedure.....	5

INTRODUCTION

- 1 This part of the Aide Memoire is intended to provide quick reference guidance on the Lightweight Field Generator (LFG) operating procedures.
- 2 More detailed operating information can be found in the AESP Cat 201.
- 3 This Chapter of the Aide Memoire provides the information necessary to enable personnel to prepare the LFG for use and to operate it efficiently.
- 4 The operator must be fully conversant with the equipment and the contents of Chapter 1 before attempting to operate the LFG.

PRE START ACTIVITIES

WARNING

MULTIPLE. REFER TO PRELIMS BEFORE USING GENERATOR.

CAUTION

MULTIPLE. Refer to Prelims before using generator.

- 5 Every time prior to using the LFG, the activities detailed in Table 1 must be carried out.
- 6 Remove the Acoustic Cover before carrying out these activities and re-fit prior to starting the LFG.
- 7 If any anomalies are identified when completing the Pre-Start and Starting activities then these should be reported through the equipment repair chain via the local chain of command.

**TABLE 1 PRE START ACTIVITIES**

Serial (1)	Activity (2)	Procedure (3)
1	Visual Inspection	Inspect all cables, connectors, hoses, hose couplings, linkages, anti vibration mounts, switches, sockets, covers, exhaust extension, attaching parts and earth point etc for signs of damage, distortion or loose fitting Visually inspect engine and hoses for leaks. Inspect all cables, connectors, hoses and hose couplings to be connected during the LFG operation for signs of damage. Damaged items are not to be connected to the LFG
2	Earthing	The LFG must be earthed, using the earth cable and spike provided Wetting the ground into which the earth spike is driven will improve electrical contact
3	Exhaust Extension	Connect exhaust extension then route it so as to discharge the exhaust outside of any confined spaces
4	Lubricating Oil Level	Check oil level. Replenish, if necessary. Refer to Cat 601.
5	Recoil Starter Cord	Inspect the starter cord for signs of wear or damage Inspect exit hole on the recoil starter assembly for signs of damage
6	Fuel Contamination	Check Fuel Tank Drain Pipe for fuel contamination (water presence), drain off water if present

STARTING THE LFG**WARNING**

MULTIPLE. REFER TO PRELIMS BEFORE USING GENERATOR.

CAUTION

MULTIPLE. Refer to Prelims before using generator.

NOTE

If the AC Output Voltage Selector Switch (SW1) is inadvertently operated during running the inverter may trip off line. If this occurs, shut down and re-start the LFG to clear the trip condition.

8 To start the LFG, complete the procedure detailed within Table 2.

TABLE 2 STARTING PROCEDURES

Serial (1)	Activity (2)	Procedure (3)
1	Connect the Fuel Supply	<p>Inspect jerrycan hoses and fuel filter for signs of damage</p> <p>Fill the jerrycan with either F54 Diesel or F34 AVTUR. Connect to the LFG fuel quick disconnect points</p> <p>Ensure integral fuel tank filler cap is securely closed and locked</p>
2	Select Voltage Required	<p>Ensure no output connectors or cables attached to the LFG, check main output CBs are open and select switch SW 1 to either 110VAC or 230VAC output voltage as required</p>
3	Manual Start	<p>Set the Engine Speed Control lever to "Max"</p> <p>Pull the starter handle gently until resistance is felt, release the cord back into the recoil starter, then pull smartly to start the LFG</p> <p>If engine fails to start after three attempts, carry out the Fault Finding procedures detailed in Cat 201</p> <p>Once started and running evenly, set Engine Speed Control to the "Normal" position. Allow engine to warm up for 1 minute</p>
4	Electric Start	<p>Connect 24V DC supply via the Inter-Vehicle Connector</p> <p>Set the throttle lever to "Max". In cold weather conditions hold Pre-Heat switch to Pre-Heat for 20 seconds then release</p> <p>Press Start button and hold until the engine fires, then release</p> <p>If the engine turns over but fails to start, release the Start button and try again</p> <p>If the engine fails to start after three attempts, carry out Fault Finding procedures detailed in Cat 201</p> <p>Once started and running evenly, set throttle to the "Normal" position. Allow engine to warm up for 1 minute</p>
	Earth Leakage Unit Test	<p>With the LFG running and no loads connected, close AC CBs. Press RCD push button and AC CBs should open. If they do not, carry out Fault Finding procedures detailed in Cat 201</p>

CONNECTING LOADS
WARNING

MULTIPLE. REFER TO PRELIMS BEFORE USING GENERATOR.

CAUTION

MULTIPLE. Refer to Prelims before using generator.



9 To connect a load, refer to Prelims **WARNING (10)** then complete procedure detailed in Table 3.

TABLE 3 CONNECTING LOADS

Serial (1)	Activity (2)	Procedure (3)
1	AC Loads	The LFG has two speed settings "Max" and "Normal"; Select Engine Speed Control to "Max" when starting, then "Normal" once started
2		Prior to connecting a load, select either "Normal" for continuous loads of up to 2kW. or "Max" for loads demanding a 2.2 kW (Overload output condition)
3		Connect desired AC load to the correct output socket
4		Close the relevant AC CB(s)
5	DC Loads	<p>NOTE</p> <p>Prior to connecting any DC loads, ensure that the LFG DC terminals are fitted correctly. As you look at the LFG DC Control Panel the Positive (+ ve) Red Terminal should be on the right and the Negative (- ve) Black Terminal should be on the left. If the DC terminals are not fitted according to this note, return the LFG unit to the manufacturer for repair.</p> <p>Connect DC load to DC output terminals ensuring correct polarity of connection</p>
6		Close the DC CB

SHUT DOWN PROCEDURE

WARNING

MULTIPLE. REFER TO PRELIMS BEFORE USING GENERATOR.

CAUTION

MULTIPLE. Refer to Prelims before using generator.

10 To shut down LFG, refer to Prelims **WARNING (10)** then complete procedure detailed in Table 4.

TABLE 4 SHUT DOWN PROCEDURE

Serial (1)	Activity (2)	Procedure (3)
1	Shut Down	Switch off any connected equipment/load Trip the relevant load CBs Disconnect the load from the connector/terminals With the Engine Speed Control set to "Normal", allow the LFG to run off-load for 2 minutes to cool down Move the Engine Speed Control to "Off" to shut down the engine If the LFG is to be moved or not used again soon after shut down, disconnect the fuel hoses, earth lead and remove the earth spike from the ground



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CHAPTER 3
OPERATOR MAINTENANCE
CONTENTS

Para

- 1 Introduction
- 4 Warnings
- 5 Cautions
- 6 Fault finding
- Maintenance
- 7 Operator level routine maintenance
- 9 Operator level unscheduled maintenance
- 11 Level 2 maintenance

Table

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1	Operator routine maintenance schedule	2
2	Operator unscheduled maintenance tasks	2
2	Operator unscheduled maintenance tasks (continued)	3

INTRODUCTION

- 1 This part of the Aide Memoire is intended to provide quick reference guidance on the Lightweight Field Generator (LFG) Operator maintenance procedures.
- 2 This Chapter provides guidance for Operator personnel on the maintenance actions required to maintain the Lightweight Field Generator (LFG) in an operational condition.
- 3 All maintenance tasks that are outside those detailed at Tables 2 and 3 must be carried out by suitably qualified personnel in accordance with the relevant maintenance schedule/repair procedure.

WARNINGS

- 4 Refer to prelims before using or commencing maintenance actions on the generator.

CAUTIONS

- 5 Refer to Prelims before using or commencing maintenance actions on the generator

FAULT FINDING

- 6 Fault Finding procedures are detailed in Cat 201.



MAINTENANCE

Operator level routine maintenance schedule

7 Routine Operator maintenance tasks are restricted to those listed in Table 1 and must be carried out at the intervals specified or at any time that a fault is suspected.

8 Detailed procedure information is contained in Cat 201.

TABLE 1 OPERATOR ROUTINE MAINTENANCE SCHEDULE

Serial (1)	Maintenance Task (2)	Periodicity (3)
1	Carry out physical inspection	Prior to use
2	Check fuel tank drain pipe for fuel contamination (water presence), drain off water if present	Prior to use
3	Oil level - check and top-up	Prior to use and every 12 hours
4	Engine oil - replace	Every 250 hours or 12 months (whichever occurs first)
5	Oil filter strainer - clean/replace only if damaged	Every 1000 hours or 24 months (whichever occurs first)
6	Check air inlet and outlet vents are not blocked	Prior to use and every 12 hours
7	Fuel filter - replace	Every 500 hours or 12 months (whichever occurs first)

Operator level unscheduled maintenance

9 Unscheduled Operator maintenance tasks are restricted to those listed in Table 3 and must be carried out whenever a fault is identified or suspected or if an item is physically damaged or lost. For detailed procedures refer to Cat 201.

10 If, for any reason, it is necessary to revise this task list, then the revision and authorisation must be carried out by appropriately qualified personnel.

TABLE 2 OPERATOR UNSCHEDULED MAINTENANCE TASKS

Serial (1)	Maintenance Task (2)	Periodicity (3)
1	Check engine oil level)
2	Check fuel level)
3	Replace air filter)
4	Replace jerrycan adaptor and hoses)
5	Replace earth spike) As required
6	Replace earth lead 2m)

(continued)

TABLE 3 OPERATOR UNSCHEDULED MAINTENANCE TASKS (continued)

Serial (1)	Maintenance Task (2)	Periodicity (3)
7	Replace exhaust extension)
8	Replace acoustic cover) As required
9	Replace accessories bag)

LEVEL 2 MAINTENANCE

11 In addition to the maintenance tasks identified in Tables 1 and 2, the Operator must be aware that there are a series of Level 2 maintenance tasks to be completed every 250 running hours.

12 Details of the tasks and the responsibility for their completion are provided within the AESP Cat 601.



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CHAPTER 4
LFG TRANSPORTATION
CONTENTS

Para

- 1 Introduction
- 2 Warnings
- 3 Cautions
- 4 Transportation - preparation and recovery

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---	---

INTRODUCTION

1 This Chapter provides guidance for Operator personnel on preparation for and recovery from transportation.

WARNINGS

2 Refer to Prelims before using or handling the generator.

CAUTIONS

3 Refer to Prelims before using or handling the generator.

TRANSPORTATION - PREPARATION AND RECOVERY

4 The tasks required to prepare the LFG for transportation and to recover it to operating condition post transportation are detailed in Table 1.



TABLE 1 LFG TRANSPORTATION - PREPARATION AND RECOVERY

Serial (1)	Maintenance Task (2)	Periodicity (3)
	PREPARATION	
	<u>Normal Operating Conditions</u>	
1	Disconnect jerrycan and drain engine fuel tank	
2	Fit and secure fuel tank filler cap and fuel line blanking caps	
3	Secure all covers	Whenever LFG is to be transported from one location to another
4	Wrap and seal in plastic sheet, if required (dependent on conditions)	
	<u>Battlefield Conditions</u>	
5	Disconnect jerrycan	Whenever LFG is to be moved on the Battlefield
6	Fit and secure fuel tank filler cap and fuel line blanking caps	
	<u>Air Transport</u>	
7	Prepare for air transport in accordance with JSP 335, Part II, Section 9, Leaflet 6	Prior to transportation by air
	RECOVERY POST TRANSPORTATION	
	<u>Normal Operating Conditions</u>	
8	Remove plastic sheeting (if used)	
9	Remove fuel line blanking caps and connect jerrycan. Fill the onboard fuel tank to approximately 2/3 full	After transportation from one location to another
	<u>Battlefield Conditions</u>	
10	Remove fuel line blanking caps and connect jerrycan. Fill the onboard fuel tank to approximately 2/3 full	After movement on the Battlefield
	<u>Air Transport</u>	
11	Prepare in accordance with Cat 201	After air transport

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Ministry of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-522 FAILURE DIAGNOSIS MAINTENANCE INSTRUCTIONS INSPECTION STANDARDS

Issue No. 003

Amendment No. 004

June 2018

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PREFACE

Sponsor: Operational Infrastructure (OI)

Project No.:

File Ref: DG Log (Land) ESS 13/8/18

Publication Authority: OI

INTRODUCTION

1 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

2 AESPs are issued under UK MoD authority and where AESPs specify action is to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores, subject to the provisions of Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DIN), Standard Operating Procedures (SOP) or by local regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication it is to be taken as the overriding authority.

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

4 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
7	1	Illustrated Parts Catalogue	711	*	*	*
	2	Commercial Parts List	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published



Associated publications

5 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 0200-A-210-013	Repair of Threaded Holes by Inserts
AESP 0200-A-238-013	Cable Assembly Repair Techniques
AESP 6150-A-100-201	Earthing and Earthing Protection
JSP 375	MoD Health and Safety Handbook
JSP 515	Hazardous Stores Information System
SEI 14411	Safety Precautions for Electrical Equipment

WARNINGS AND CAUTIONS

HAZARDOUS SUBSTANCES

6 Before using any hazardous substance or material, the user must be conversant with the safety precautions and first aid instructions:

- 6.1 On the label of the container it was supplied in.
- 6.2 On the material Safety Data Sheet.
- 6.3 In local Safety Orders and Regulations.

WARNINGS

7 The following WARNINGS are applicable to this category:

(1) EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

(2) EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.

(3) F54 DIESEL AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:

DO NOT RUN THE LFG.

DO NOT SMOKE.

AVOID ALL NAKED FLAMES.

AVOID OVERFILLING THE FUEL TANK/JERRYCAN.

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG.

(4) GUARDS AND COVERS. DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.

-
- (5) **JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.**
- (6) **NOISE HAZARD. IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.**
- (7) **PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).**
- (8) **PERSONAL INJURY. THE LFG ALTERNATOR IS A PERMANENT MAGNET GENERATOR, CARE MUST BE TAKEN WHEN WORKING ON THE GENERATOR DUE TO THE HIGH STRENGTH OF THE MAGNETS WHICH COULD CAUSE PERSONAL INJURY.**
- (9) **SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.**
- (10) **SHOCK HAZARD. LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.**
- (11) **SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.**
- (12) **TOXIC FUMES. EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.**
- (13) **HEALTH HAZARD. PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLED, BE HAZARDOUS TO HEALTH, PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.**
-



CAUTIONS

8 The following CAUTIONS are applicable to this category:

CAUTIONS

- (1) **EQUIPMENT AIRFLOW.** The generator should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.
- (2) **EQUIPMENT DAMAGE.** Compression testing is not to be carried out as the engine contains decompression devices.
- (3) **EQUIPMENT DAMAGE.** Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.
- (4) **EQUIPMENT DAMAGE.** During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.
- (5) **EQUIPMENT CAPABILITY.** Operation of the AC SW1 when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.
- (6) **EQUIPMENT DAMAGE.** The engine must not be operated with the oil level below the specified minimum level.
- (7) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.
- (8) **EQUIPMENT DAMAGE.** The low oil pressure switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.
- (9) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.
- (10) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

9 The following abbreviations are used in this category:

AC	Alternating Current
AESP	Army Equipment Support Publication
Amdt	Amendment
AQL	Acceptable Quality Levels
AVM	Anti-Vibration Mount
BFPO	British Forces Post Office
Cat	Category
Chap	Chapter
cm	centimetre
dB	decibel
DC	Direct Current
DIN	Defence Instructions and Notices
EMER	Electrical Mechanical Engineering Regulation
Eqpt	Equipment
ESPD	Equipment Support Policy Directive
Fig	Figure
FRACAS	Failure Reporting Analysis and Corrective Action System
Hex	Hexagon
i.e.	that is
JAMES	Joint Asset Management and Engineering Solutions
kg	kilogramme
kW	kiloWatt
JSP	Joint Service Publication
lb ft	pounds feet
LED	Light Emitting Diode
LFG	Lightweight Field Generator
LRU	Line Replaceable Unit
mA	milliAmpere
MACMT	Mean Active Corrective Maintenance Time
MCB	Miniature Circuit Breaker
mm	millimetre
MoD	Ministry of Defence
N/A	Not Applicable
NATO	North Atlantic Treaty Organisation
Nm	Newton metre
No.	Number
NSN	NATO Stock Number
OI	Operational Infrastructure
OSP	Operational Support Programme
Para	Paragraph
PT	Project Team
RAF	Royal Air Force
RCD	Residual Current Device
REME	Royal Electrical and Mechanical Engineers
Ref	Reference
RFI	Radio Frequency Interference
rpm	revolutions per minute
SEI	Service Engineering Instruction
SME	Subject Matter Expert
SOP	Standard Operating Procedures
TDOL	Technical Documents On-Line
T&M	Test and Measurement



UK	United Kingdom
V	Volt

SYMBOLS

10 The following symbols are used in this category:

°	degree
°C	degrees Celsius
>	greater than
<	less than
Ω	ohm
%	percent
±	plus or minus

CHAPTER 1

FAILURE DIAGNOSIS

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- Introduction
- 1 General
- 3 Failure diagnosis procedure format
- 4 Tools and test equipment
- 5 Electrical circuit information
- 6 Failure diagnosis procedures
 - Engine associated faults
 - 8 Engine fails to start - recoil starter
 - 9 Engine fails to start - electric starter
 - 10 Engine fires - but does not run
 - 11 Engine cuts out during operation
 - 12 Engine output and speed both drop
 - 15 Engine output and speed fall with black smoke from the exhaust
 - Electrical system associated faults
 - 17 No output voltage indicated (AC or DC)
 - 18 No indication on hours run or percentage load meters
 - 19 AC circuit breaker does not open when the RCD push button is operated

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INTRODUCTION

General

1 It is assumed for the purpose of this AESP category that the LFG start up procedures, as described in AESP 6115-G-710-201, have been carried out correctly up to the point of failure.

2 Failure diagnosis by the operator is limited to those actions described in Cat 201. When faults occur, action must be initially taken at Unit level (level 2) although the involvement of other levels may subsequently be required.

Failure diagnosis procedure format

3 The failure diagnosis procedures are presented in the form of tables providing step by step information on testing, results, possible cause of failure and the action to be taken. Each procedure must be carried out in the order given.



Tools and test equipment

4 The tools and test equipment required for carrying out the following inspection standards are detailed in Table 1.

TABLE 1 TOOLS AND TEST EQUIPMENT

Item (1)	NATO Stock No. (2)	Designation (3)	Use (4)
1	6625-99-2523606 or 6625-99-8654203	Multimeter	Voltage and continuity measurements
2	5120-01-3551734	Torque Wrench 5 to 75 lb/ft	Tightening various nuts & bolts
3	6680-99-8062943	Tachometer, Optical Hand Held	Checking engine speed
4	5210-99-796-7540	Feeler Gauge	Valve clearance check /adjustment

Electrical circuit information

5 Where a failure diagnosis procedure states a reference to a component of the electrical system, refer to the circuit diagram in Cat 302.

FAILURE DIAGNOSIS PROCEDURES

6 The following procedures assume that the Level 1 Fault Finding processes detailed in Cat 201 have been carried out and the LFG has been subsequently returned for repair.

7 It is assumed that the correct grade of fuel and oil is being used for the prevailing climatic conditions as described in Cat 601.

Engine associated faults

Engine fails to start - recoil starter

8 Engine fails to start using the recoil starting system.

TABLE 2 ENGINE FAILS TO START - RECOIL STARTER

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Crank engine using recoil starter, does the engine turn over when the cord is pulled?	Yes		Go to Serial 2
		No	Recoil starter failing to engage with engine flywheel	Replace recoil starter unit
2	Check fuel feed to fuel injection pump by removing the pump input hose & cranking the engine, is fuel getting to the fuel injection pump?	Yes		Go to Serial 3
		No	a. Blocked fuel hose(s)	Clear blocked hose(s)
			b. Blocked fuel filter(s)	Replace fuel filter(s) as necessary
	c. Faulty fuel pulse pump	Replace pulse pump		

(continued)

TABLE 2 ENGINE FAILS TO START - RECOIL STARTER (continued)

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
		No	Faulty injection pump	Replace pump NOTE When replacing the fuel injection pump assembly, ensure that the correct fuel injection pump assembly is fitted to the correct engine type. The engine type is identified by a data plate which is glued to the air filter housing. Engine type 1B20-S-204C, fuel injection pump assembly is identified by the engine number which should start with 10028 or 10029. Engine type 1B20-S-204D, fuel injection pump assembly is identified by the engine number which should start with 30030
4	Check engine compression, is the resistance felt whilst hand cranking consistent with that experienced when hand cranking a known serviceable engine?	Yes No	a. Incorrect valve clearances b. Worn valves c. Cylinder and/or piston rings worn	Go to Serial 5 Check clearances and adjust if necessary b. Refer to repair authority c. Refer to repair authority
5	Does the engine now start?	Yes No		Return to operational use a. Replace injector assembly NOTE When replacing the fuel injector assembly, ensure that the correct fuel injector assembly is fitted to the correct engine type. The engine type is identified by a data plate which is glued to the air filter housing. Engine type 1B20-S-204C, fuel injector assembly identified by white paint dot on top of the item. Engine type 1B20-S-204D, fuel injector assembly identified by yellow paint dot on top of the item b. Replace engine assembly

Engine fails to start - electric starter

9 Engine fails to start using the electrical starting system, see Table 3.

TABLE 3 ENGINE FAILS TO START - ELECTRIC STARTER

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Press the engine Start push button, does the engine turn over?	Yes No	a. Faulty MCB 5 b. Faulty Start push button c. Open/faulty circuit between start push button and starter motor d. Starter motor failing to engage or turn the flywheel	Go to Serial 2 a. Check MCB 5 is set and there is continuity through it from the Intervehicle connector to the Start push button b. Check push button & replace if necessary c. Replace cable harness(es) as necessary d. Replace starter motor
2	At low temperatures, is the air intake pre-heater operating?	Yes No	a. Faulty pre-heat select switch b. Faulty pre-heat element	Go to Serial 3 a. Replace switch b. Replace element
3	Refer to Table 2 and continue fault diagnosis from Serial (2)			



Engine fires - but does not run

10 Engine fires but fails to run correctly, see Table 4.

TABLE 4 ENGINE FIRES - BUT DOES NOT RUN

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Operate the engine speed control lever on the DC control panel, does the cable run freely between the "Off" and "Max" positions?	Yes No	a. Sticking speed control cable b. Broken speed control cable c. Possible sticking engine speed control assembly	Go to Serial 3 a. Lubricate speed control cable b. Replace speed control cable c. Disconnect the cable at the engine speed control lever assembly and operate by hand. Free movement should be felt, if not replace engine assembly
2	Refer to Table 2 and continue fault diagnosis from Serial (2)			

Engine cuts out during operation

11 If the engine starts and runs correctly but then cuts out of its own accord, carry out the fault diagnosis procedures detailed in Table 2 from Serial 2 onwards.

Engine output and speed both drop

12 If the engine output and speed both drop, ensure that the engine speed control lever is remaining in the desired position by carrying out the fault diagnosis detailed in Table 3.

13 If the engine speed control lever is remaining in the desired position, carry out the fault diagnosis procedures detailed in Table 2 from Serial 2 onwards to ensure the engine fuel supply is operating correctly.

14 Refer to the "engine speed control lever and housing" procedure detailed in Chap 2 to set the engine speed.

Engine output and speed fall with black smoke from the exhaust

15 Engine output and speed fall off with black smoke being emitted from the exhaust, see Table 5.

TABLE 5 ENGINE OUTPUT AND SPEED FALL OFF - BLACK SMOKE FROM EXHAUST

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Check air filter, is it excessively contaminated or airflow to engine otherwise restricted?	Yes	Operating environment and conditions may require more frequent checking and routine replacement of the air filter	Replace air filter or remove restriction to airflow. Increase periodicity of routine checking and replacement until environmental conditions are less harsh, dirty or dusty.
2	Check valve clearances	No	Valve clearances out of adjustment	Go to Serial 2 Check & adjust valve clearances Go to Serial 3
3	Check fuel injector function by carrying out diagnosis detailed in Table 2, Serial 3			
4	Check oil level		Engine overfilled with oil	Drain and replenish oil to correct level

Electrical system associated faults

16 With the exception of the engine starting circuit, all electrical faults relate to the control, distribution and indication of the PMG output.

No output voltage indicated (AC or DC)

17 Neither the AC nor DC voltmeters indicate an output voltage with a load connected, see Table 6.

TABLE 6 NO OUTPUT VOLTAGE INDICATED (AC OR DC)

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Check oil press warning LED, is it illuminated?	Yes	When the oil pressure switch operates it energises the low oil pressure relay (RL1) which, as well as illuminating the LED, will trip any output circuit breakers which are set, thereby removing outputs. The oil pressure switch will operate if: a. Insufficient oil in engine b. Faulty low oil pressure switch	a. Shut down engine and, when cooled down sufficiently, replenish engine oil b. Replace low oil pressure switch
2	Has the voltage selector switch been operated whilst the engine was running?	Yes	Operation of voltage selector switch with the engine running will interrupt the output and may cause the inverter/regulator assembly to trip off line	Shut down generator, select desired voltage output and restart generator
3	Check voltages, is a voltage present when measured between the +ve and -ve terminals of the DC voltmeter or between the 250 and 0 terminals on the AC voltmeter?	No		Go to Serial 3
		Yes	Defective voltmeter	Replace voltmeter
		No	Defective wiring to voltmeter	Replace cable harness(es) as necessary

No indication on hours run or percentage load meters

18 Neither the hours run or percentage (%) load meters indicate when the LFG is operating correctly under load, see Table 7.

TABLE 7 NO INDICATION ON HOURS RUN OR PERCENTAGE (%) LOAD METERS

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Using the multimeter set on volts DC, is there 28V DC present when measured between the +ve and -ve terminals of the hours run meter?	Yes No	Defective meter Defective wiring to hours run meter	Replace meter Repair or replace cable harness
2	Using the multimeter set on mA, is there a current of between 2mA and 4mA present when measured between the two CT terminals on the percentage (%) load meter?	Yes No	Defective meter a. Defective wiring to percentage (%) load meter b. No percentage (%) load output from the inverter/regulator	Replace meter a. Repair or replace cable harness b. Replace inverter/regulator

AC circuit breaker does not open when the RCD push button is operated

19 Either the 230 V or 110 V output circuit breakers do not open when the RCD push button is operated.

NOTE

The RCD test will only trip the circuit breaker(s) respective to the voltage selected, see Table 8.

TABLE 8 AC CIRCUIT BREAKER DOES NOT OPEN WHEN THE RCD PUSH BUTTON IS OPERATED

Serial (1)	Procedure (2)	Result (3)	Possible Cause (4)	Action (5)
1	Is MCB 3 closed?	Yes		Go to Serial 2
2	Are circuit breaker trip coils operating correctly?	Yes No	High resistance coil	Go to Serial 3 Measure trip coil resistances. Values should be as follows: 230 V Coil - 1.45 to 1.75 k Ω , 110 V Coil - 350 to 450 Ω , 28 V Coil - 18 to 20 Ω
3	Is the push button operating correctly?	No	Faulty push button	Check continuity with push button pressed and replace button if necessary



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CHAPTER 2

MAINTENANCE INSTRUCTIONS

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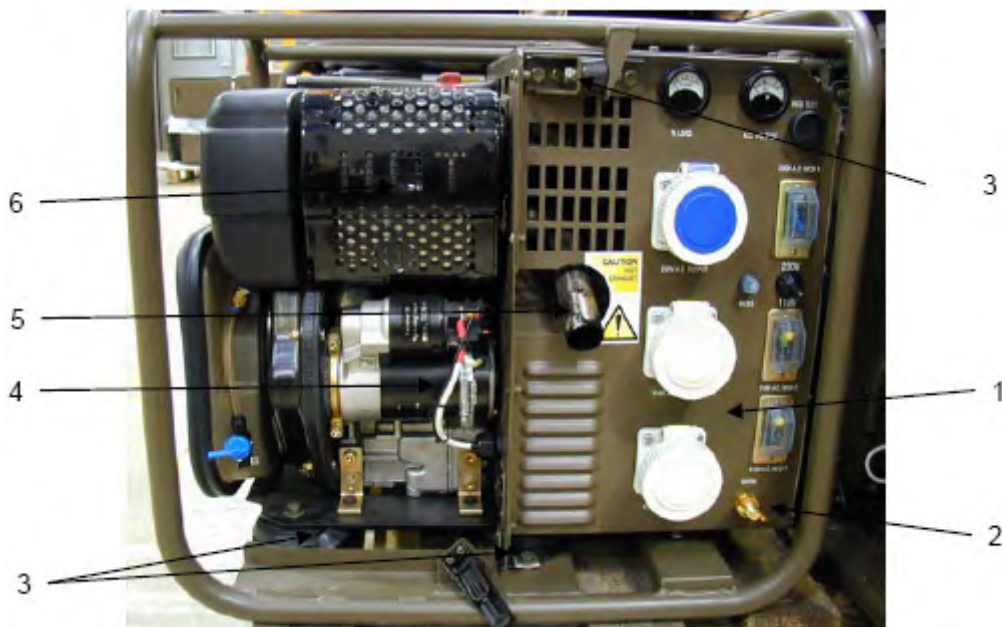
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INTRODUCTION

1 This chapter provides the necessary maintenance instructions to enable the LFG to be repaired and details the procedures required to fulfil the scheduled maintenance and preparation for storage tasks. The instructions/procedures are divided into five parts covering the following areas:

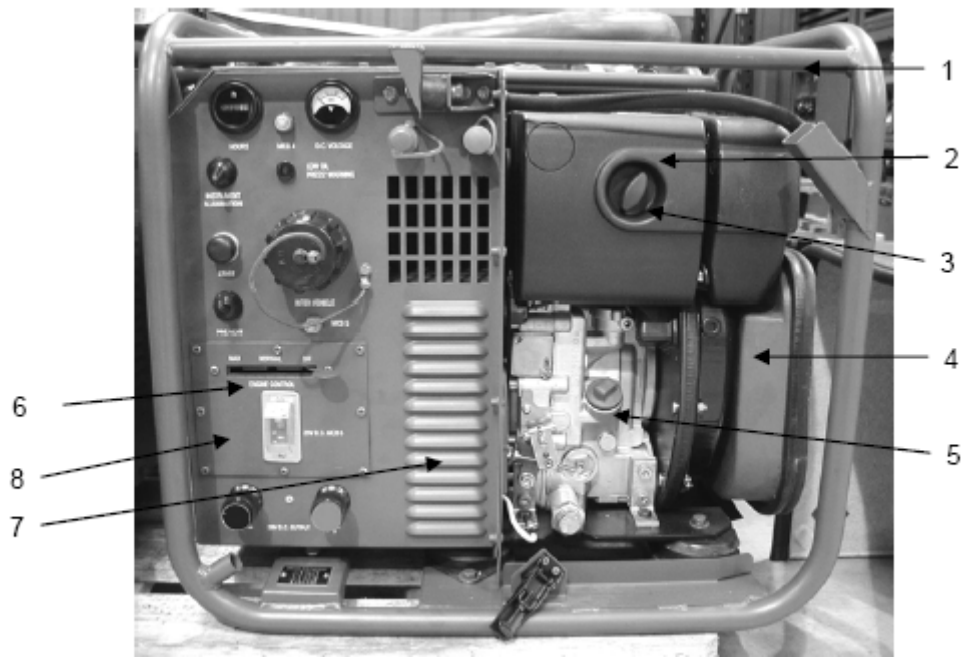
- 1.1 Frame and Covers.
- 1.2 Power Unit (engine and ancillary items).
- 1.3 Electrical System.
- 1.4 Scheduled Maintenance Tasks.
- 1.5 Preparation for Storage.

2 General views of the LFG with the acoustic cover removed are shown at Fig 1 and Fig 2.



- | | |
|-------------------------|--------------------------|
| 1 AC control panel | 4 Electric starter motor |
| 2 Earth stud | 5 Exhaust pipe |
| 3 Anti vibration mounts | 6 Silencer heat shield |

Fig 1 Component location - AC panel side (acoustic cover removed)



- | | | | |
|---|--------------------------------|---|--------------------------|
| 1 | Tubular frame | 5 | Oil dipstick |
| 2 | Air filter cover | 6 | Engine throttle assembly |
| 3 | Air filter cover securing knob | 7 | Air vents |
| 4 | Air duct/recoil starter shroud | 8 | DC control panel |

Fig 2 Component location - DC panel side (acoustic cover removed)

WARNINGS AND CAUTIONS

3 The following WARNINGS and CAUTIONS are applicable throughout this chapter:

WARNINGS

(1) **EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.**

(2) **EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.**

(3) **F54 DIESEL AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:**

DO NOT RUN THE LFG.

DO NOT SMOKE.

AVOID ALL NAKED FLAMES.

AVOID OVERFILLING THE FUEL TANK/JERRYCAN.

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG.

-
- (4) **GUARDS AND COVERS.** DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.
- (5) **JERRYCAN ADAPTOR.** DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.
- (6) **NOISE HAZARD.** IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.
- (7) **PERSONAL INJURY.** THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).
- (8) **SHOCK HAZARD.** DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.
- (9) **SHOCK HAZARD.** LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.
- (10) **SKIN BURNS.** EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.
- (11) **TOXIC FUMES.** EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.
- (12) **HEALTH HAZARD.** PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLED, BE HAZARDOUS TO HEALTH, PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.



CAUTIONS

- (1) **EQUIPMENT AIRFLOW.** The generator should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.
- (2) **EQUIPMENT DAMAGE.** Compression testing is not to be carried out as the engine contains decompression devices.
- (3) **EQUIPMENT DAMAGE.** Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.
- (4) **EQUIPMENT DAMAGE.** During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.
- (5) **EQUIPMENT CAPABILITY.** Operation of the AC SW1 when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.
- (6) **EQUIPMENT DAMAGE.** The engine must not be operated with the oil level below the specified minimum level.
- (7) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.
- (8) **EQUIPMENT DAMAGE.** The low oil pressure switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.
- (9) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.
- (10) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

MAINTENANCE POLICY

4 Details of the maintenance and repair policy for the LFG equipment are provided within the Equipment Support Policy Directive (ESPD), AESP 6115-710-111. In accordance with that directive, responsibilities for the maintenance and repair are split between the Operators and Maintenance engineers at Levels 1, 2 and 3. Level 4 repairs will be arranged via the Equipment Support Manager under contract arrangements.

5 Operator level (Level 1) maintenance responsibilities, tasks and instructions are contained in Cat 201.

6 General fault diagnosis and guidance for tasks beyond Level 1 is provided within Cat 522. In addition, this Chapter provides instructions and guidance for those scheduled maintenance and repair procedures beyond the scope of Level 1.

7 From the ESPD, it is determined that the tasks that are to be undertaken at Level 2 are those that can be completed by competent REME and Royal Signals electricians. These are restricted to adjustment or minor repair, failure diagnosis, removal and replacement of LRUs and the removal and replacement of external mechanical or electrical fittings. Level 2 MACMT repair tasks are restricted to those, which can be carried out in the field in one hour or less, by REME tradesmen or Regimental Workshops.

8 Also from the ESPD, it is determined that field repairs are to be restricted to tasks, which can be completed by one tradesman in 10 hours or less, carried out by Regimental Workshops or other designated REME Battalion Workshop.

9 These Level 3 repairs are to be carried out by REME and Royal Signals electrician personnel in the supporting second line workshop, and are to consist of the repair, replacement or adjustment of any part of the equipment not requiring complete stripping of a major assembly.

10 Based on the limits to be applied in terms of a tradesman's time, all of the scheduled maintenance and replacement tasks detailed within this Chapter can be completed at Level 2.

GENERAL REPAIRS

Repair of stripped threads

11 If a threaded hole is stripped due to excessive force, it may be repaired by use of a coil thread insert, as detailed in AESP 0200-A-210-013 Repair of Threaded Holes by Inserts.

Wiring repairs

12 For details of repair techniques for wiring, refer to AESP 0200-A-238-013 Cable Assembly Repair Techniques.

TESTS AFTER REPAIR

13 Test procedures are provided, when applicable, for checking repaired or replaced assemblies/components.

14 Earth bonding resistance tests must be carried out after repair if the earth bonding integrity has been disturbed.

15 RCD tests must be carried out after any repair to the generator electrical system.

16 When major items are replaced, or when extensive dismantling of the LFG is required to remove/replace certain items, a full functional test of the LFG must be carried out as detailed in Chapter 3 (Inspection Standard)

ASSEMBLY/COMPONENT LOCATIONS

17 The location of the assembly/component to be replaced is described in the relevant repair instruction. However, the general views in Fig 1 and Fig 2 show the locations of the majority of items covered in the following repair instructions. All fasteners, when inserted into captive threads, will be fixed using Loctite 243, unless otherwise stated.



TOOLS, REPAIR PARTS AND CONSUMABLES

18 To enable the complete repair/replacement of the LFG components, there is a requirement to use tools, repair parts and consumables. Table 1 details the tool requirements for the repair/replacement of LFG components

TABLE 1 TOOLS REQUIRED FOR LFG REPAIR

Tool	Size	Quantity
Adjustable Mole Grips	n/a	1
Allen Key	3 mm	1
	4 mm	1
	5 mm	1
	6 mm	1
Box Spanner	27 mm	1
Hose Clamp	n/a	1
Earth Bonding Tester	NSN 6625-99-950-2497	1
Long Nosed Pliers	n/a	1
Optical Tachometer (Handheld)	NSN 6680-99-806-2943	1
Pliers	n/a	1
Plumbing Pliers (Water pump)	n/a	1
Megger RCDDT320-GEN	NSN 6625-99-842-7328	1
Screwdriver	Small electrician	1
	No. 2 Pozi-Drive	1
	Flat Blade	1
Snips	n/a	1
Socket	8 mm	1
	10 mm	1
	13 mm	1
	19 mm	1
Spanner	3/8 AF Combination	1
	9/16 AF Combination	1
	10 mm Combination	1
	10 mm Open Offset	1
	13 mm Combination	1
	30 mm Combination	1
Stanley knife	n/a	1
Torch	n/a	1
Torque Driver	1 - 6 Nm	1
Torque Wrench	8 - 60 Nm	1

19 Table 2 details the repair part and consumable requirements for the repair/replacement of LFG components.

TABLE 2 REPAIR PART AND CONSUMABLE REQUIRED FOR LFG REPAIR

Repair part	Quantity
Air Filter Gasket (3 per unit)	1
Copper Washer for Oil Drain Pipe	1
Oil Filter O-ring seal	1
Oil Filter Assembly	1
Split Pins Stainless Steel 5/64 x 1/2	1
Cable Ties	6
10 mm x 50 mm Screw	1
16 mm x 70 mm Fine Thread Screw	1
Consumable	Quantity
Loctite 243	1 Bottle
Silicone Adhesive Sealant (RTV)	1 Tube

20 It is recommended that prior to undertaking any repair/replacement of any LFG components, a selection of fasteners are available in case of loss/damage. Table 3 details the recommended spare LFG fasteners that should be made available prior to any repair/replacement of any LFG components.

TABLE 3 SPARE LFG FASTENERS

Size	Type	Colour	No. Off
M5 x 10	Hex Head Set	Green	6
M5 x 16	Hex Head Set	Green	2
M5 x 10	Skt Button Head	Green	2
M5	Form A Washer	Green	6
M5	Form A Washer	Zinc Plate	2
M5	Nyloc Nut	Green	2
M6 x 20	Hex Head Set	Green	2
M6	Nyloc	Zinc Plate	2
M8 x 12	Hex Head Set	Green	2
M8	Aerotight Nut	Green	2
M8	Form A Washer	Green	2
M6 x 20	Hex Head Set	Zinc Plate	2
M6	Spring Washer	Zinc Plate	2
M6	Form A Washer	Zinc Plate	4
M6	Form C Washer	Zinc Plate	2
M6	Brass Nut	Brass	1
M5	Nut	Zinc Plate	1
M6	Brass Nut	Brass	1

(continued)

TABLE 3 SPARE LFG FASTENERS (continued)

Size	Type	Colour	No. Off
M5	Nut	Zinc Plate	1
M5	S/Proof Washer	Zinc Plate	1
M4 x 6	Dome Head Slot Screw	Zinc Plate	1
M4	Bifurcated Washer	Zinc Plate	1
M6 x 25	Pozi Pan Screw	Zinc Plate	2
M4 x 10	Pozi Pan Screw	Zinc Plate	2
M8 x 25	Skt Cap Screw	Black	1
M8	Spring Washer	Zinc Plate	2
M8	Form A Washer	Zinc Plate	2
M8 x 50	Skt Cap Screw	Black	1
M8 x 25	Hex Set	Black	1
M8 x 30	Hex Set	Black	1
M8	Form C Washer	Zinc Plate	1
M8	Nyloc	Zinc Plate	1
Hatz fasteners			
M6 x 25	Skt Cap Screw	Zinc/Gold	1
M6 x 15	Cyl Spacer	Zinc/Gold	1
	Pulse Pump Nuts/Washer	Zinc/Gold	1

TORQUE SETTINGS

21 Unless stated otherwise in the text, the following torque settings are to be used:

TABLE 4 TORQUE SETTINGS

Item	Torque Nm
M5	6.4
M6	11.1
M8	27
Oil drain pipe	50
Oil drain plug	35

FRAME AND COVERS

Control box louvre cover

22 The following repair parts may be required to do the following procedure:

22.1 Louvre cover securing screws.

23 To remove the control box louvre cover proceed as follows:

23.1 Remove control box louvre cover top cover screws (Fig 3).

23.2 Remove and retain the 12 louvre cover securing screws fitted around the perimeter of the panel (Fig 3). Note that the two screws in the top corners of the panel are longer than the remainder as they pass through two sections of metal (the top and louvre covers). Care should be taken to ensure that these screws are refitted in the correct positions. Support the panel and ease from frame taking care not to damage the earth bonding lead.

23.3 Disconnect the earth bonding lead and retain the attaching parts.

24 Fitting is the reverse of removal.

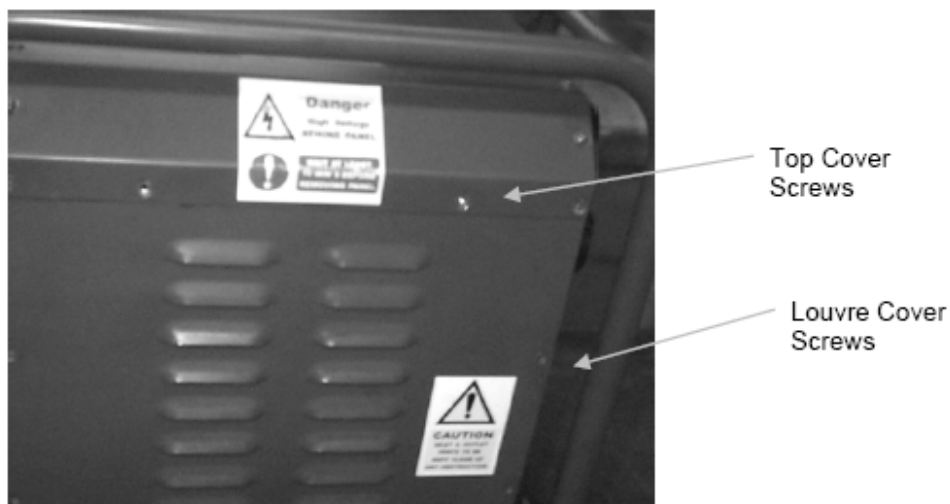


Fig 3 Louvre cover

Control cover top

25 The following repair parts may be required to do the following procedure:

25.1 Louvre cover securing screws.

26 To remove the control cover top, proceed as follows:

26.1 Remove and retain the 16 securing screws fitted around the perimeter of the panel. Note that the two screws in the bottom corners of the panel are longer than the remainder as they pass through two sections of metal (the top and louvre covers). Care should be taken to ensure that these screws are refitted in the correct positions. Support the panel and ease from frame taking care not to damage the earth bonding lead.

26.2 Disconnect the earth bonding lead and retain the attaching parts.

27 Fitting is the reverse of removal. When refitting the panel ensure that the bottom lip of the top cover is positioned on top of the louvre cover top edge thereby overlapping the panel and forming an effective seal via the RFI sealing strips.

Acoustic cover draw latch

28 The following repair parts may be required to do the following procedure:

28.1 Securing screws.

29 To replace an acoustic cover draw latch (Fig 4), proceed as follows:

29.1 Remove the two screws securing the acoustic cover draw latch to the frame from their captive nuts and remove the acoustic cover draw latch.

30 Fitting is the reverse of removal.

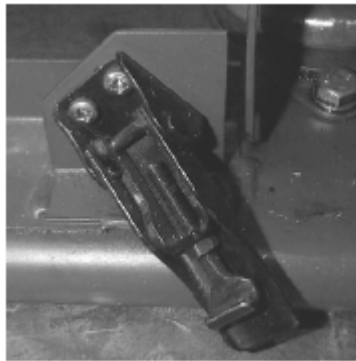


Fig 4 Acoustic cover draw latch

Keeper, black stainless

31 Securing screws may be required to do the following procedure.

32 The keeper, black stainless (Fig 5) is the catch that the draw latch locks on to. To replace it, remove the two securing screws from their captive nuts and remove the keeper.

33 Fitting is the reverse of removal.



Fig 5 Keeper, black stainless

RFI C wrap

34 The RFI C wrap is used to provide additional Radio Frequency Interference (RFI) protection in certain areas of the LFG (Fig 6). It is the form of silvered tape that is attached to the frame as required.

35 To replace damaged portions of the RFI C wrap, cut away the damaged area and replace with fresh tape. To maintain RFI integrity, ensure an overlap is made with the existing tape.

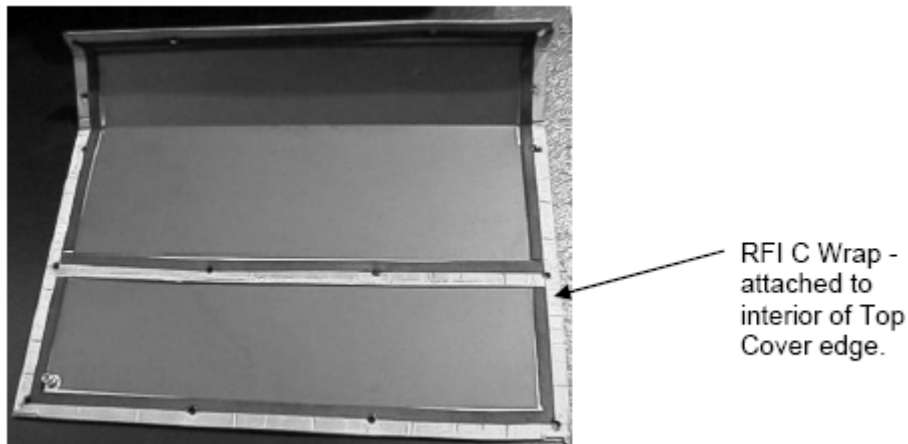


Fig 6 Top panel showing typical C wrap

Side seal

36 Side seals (Fig 7) are fitted around the edge of the acoustic cover and the recoil starter shroud/engine cooling air Intake to provide an airtight seal.

37 To replace a seal, peel it away from the edge of the assembly it is fitted to. Replace by positioning the channel in the seal along the edge of the assembly and pressing down firmly to fit.

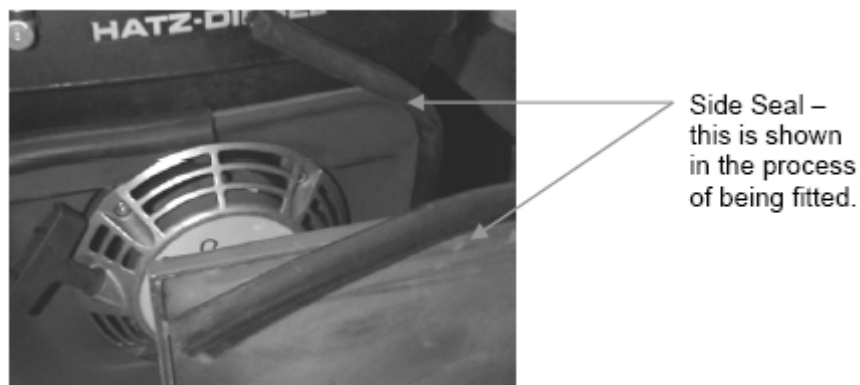


Fig 7 Side seals

Edge protection

38 Louvre cover securing screws may be required to do the following procedure.

39 Edge protection (Fig 8) is fitted to various metal edges to provide anti-chafe protection.

NOTE

The edge protection fitted to the inverter/regulator assembly also provides an airtight seal when the louvre panel is fitted, thus ensuring an adequate airflow for efficient cooling.

40 To remove damaged edge protection, peel away from the edge of the assembly. To replace, position the channel in the seal along the edge of the assembly and press down firmly to fit.

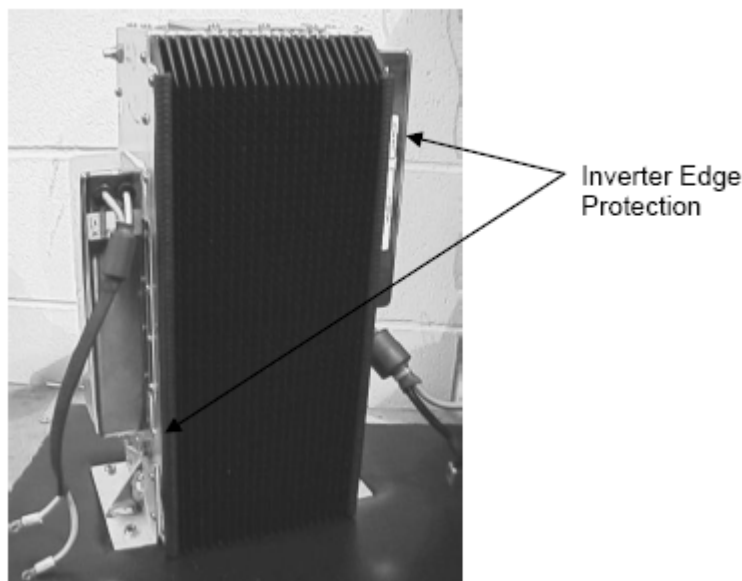


Fig 8 Edge protection

Brass sets, nuts and washers

41 M6 brass sets, brass nuts, brass washers, brass securing screws may be required to do the following procedure.

42 Brass sets, nuts and washers are the terms used to describe the brass components of the LFG earth point (Fig 9). To replace these items, proceed as follows:

42.1 Disconnect the frame bonding lead from the frame earth connection by removing the bolt, nut and washers.

42.2 Remove the wing nut and washers from the main earth point.

42.3 Identify any cables attached to the rear of the earth bolt and mark to ensure correct reconnection.

42.4 Remove the M6 earth bolt, nut and washers.

43 Fitting is the reverse of removal, ensuring the cables previously identified and marked are reconnected.



Fig 9 Earth lead connection point

POWER UNIT

44 The power unit is comprised of the engine, engine mounted accessories and the fuel system. When replacing some of these items it is necessary to apply Loctite 243 (NSN 8030-99-253-6699) to counteract the effect of engine vibration and ensure the long-term security of mounting. Where this application is appropriate, it is detailed within the individual replacement procedure. Loctite 243 should also be applied to the threads of the oil pressure switch if it requires re-securing, as indicated by signs of oil leakage.

Fuel filter

45 To replace the engine fuel tank fuel filter (Fig 10), proceed as follows:

- 45.1 Remove the fuel tank cap and lift up to expose the fuel filter (attached by a cord).
- 45.2 Pull off the fuel filter from the fuel pick-up pipe.
- 45.3 Push a replacement fuel filter fully on to the fuel pipe and re-insert in fuel tank.
- 45.4 Refit and secure fuel tank cap.



Fig 10 Engine fuel tank fuel filter

Air filter

46 To replace the air filter, proceed as follows:

- 46.1 Remove the acoustic cover. The acoustic cover is removed by releasing the two retaining clips that secure it to the LFG.
- 46.2 Locate the air filter cover (Fig 2 (2)) and undo the plastic securing knob.
- 46.3 Remove the air filter cover then undo the air filter retaining nut (Fig 11) and remove the air filter.



Fig 11 Air filter retaining nut

47 Fitting is the reverse of removal. Tighten the air filter retaining nut finger tight only.

Clean/replace engine oil filter strainer

NOTE

The engine oil must be drained before commencement of this task.

48 The following repair parts may be required to do the following procedure:

- 48.1 Oil filter strainer O-ring seal.

49 To clean or replace the oil filter strainer (Fig 12), proceed as follows:

- 49.1 Slacken the oil filter strainer socket head securing screw, approximately five turns.
- 49.2 Remove the oil filter strainer by drawing it out of the engine by pulling the securing screw.
- 49.3 If cleaning is required, clean by washing in a suitable cleaning fluid/solvent.
- 49.4 If the oil filter strainer is damaged, fully remove the securing screw and the sprung steel plates.
- 49.5 Fit a new O-ring seal to the replacement oil filter strainer, reassemble the sprung steel plates and fit the securing screw.
- 49.6 Fit the oil filter strainer into its housing and tighten the socket head securing screw.
- 49.7 Replenish oil. Refer to Cat 601.



Fig 12 Oil filter strainer assembly

Oil drain plug, gasket and extension pipe

NOTE

The engine oil must be drained before commencement of this task.

50 The following repair parts may be required to do the following procedure:

- 50.1 Oil drain plug.
- 50.2 Gasket.
- 50.3 Extension pipe.

51 To ensure that oil does not contaminate the LFG frame when it is drained, an extension pipe is fitted to the oil drain point (Fig 13 and Fig 14). To replace the oil drain pipe, plug and gasket, proceed as follows:

- 51.1 Remove the drain plug and its sealing washer/gasket.
- 51.2 Remove oil drain extension pipe and sealing washer/gasket from the engine.
- 51.3 Fit a new sealing washer/gasket to the replacement extension pipe and fit to the engine.
- 51.4 Fit a new sealing washer/gasket to the drain plug and fit to the extension pipe. Tighten the plug to 50 Nm (37 lb ft).

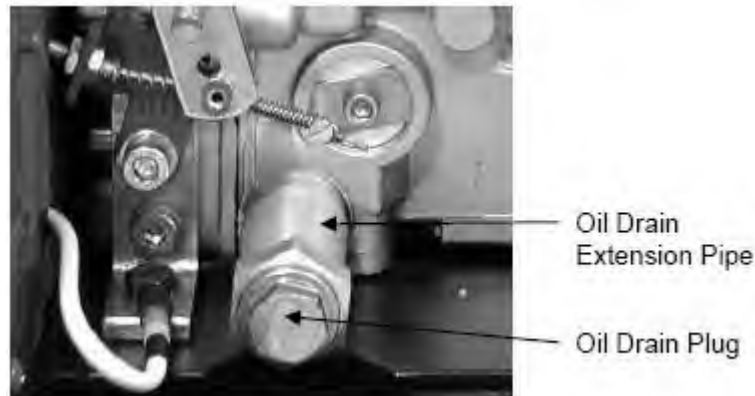


Fig 13 Oil drain extension pipe

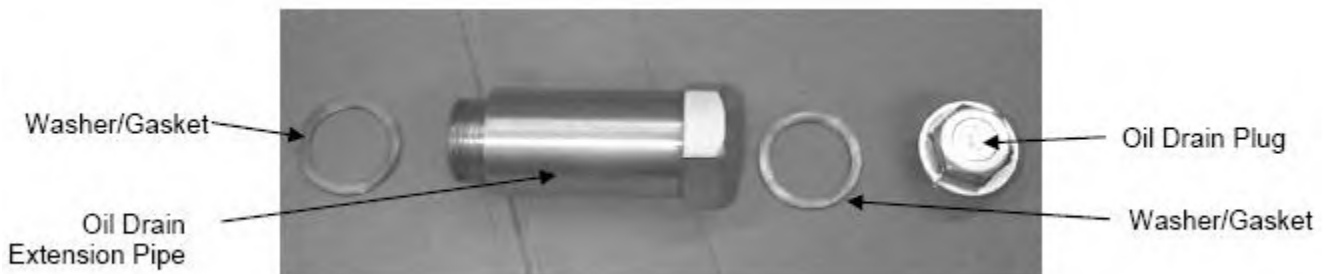


Fig 14 Oil drain extension pipe - expanded view

Recoil starter and recoil basket

52 The following repair parts and consumables may be required to do the following procedure:

- 52.1 M6 x 10 mm socket head screws.
- 52.2 M6 x 20 mm socket head screws.
- 52.3 M6 x 25 mm washers.
- 52.4 Loctite 243.

53 This procedure describes how to remove the recoil starter assembly and recoil basket fitted to the engine flywheel. To remove the recoil starter assembly and the recoil basket (if required), proceed as follows:

- 53.1 Gain access by removing acoustic cover. The acoustic cover is removed by releasing the two retaining clips that secure it to the LFG. Once these are released it can be lifted clear.
- 53.2 The pulley assembly is held clear of the frame by four spacers fitted to four M6 x 20 mm socket head securing screws (Fig 15). Unscrew the four pulley assembly socket head securing screws ensuring that they remain in the Frame to help retain the spacers.

53.3 Remove the four M6 x 10 mm socket head screws and associated M6 spring and M6 x 25 mm large washers securing the air intake cowling (Fig 15) then remove the cowling.

53.4 Remove the three socket head screws and spacers securing the recoil basket to the flywheel (Fig 17).

54 Fitting is the reverse of removal. When refitting the securing screws associated with the recoil starter, recoil basket and air intake cowling, apply Loctite 243 to each of the screw threads. The recoil starter securing screws must be tightened to a torque setting of 11.1 Nm (8 lb ft).



Pulley Securing
Screws (two of four
indicated), Spacers
behind (not shown)

Fig 15 Recoil starter pulley



Air Intake Cowling Securing
Screws and Washers (two of
four indicated)

Fig 16 Air intake cowling

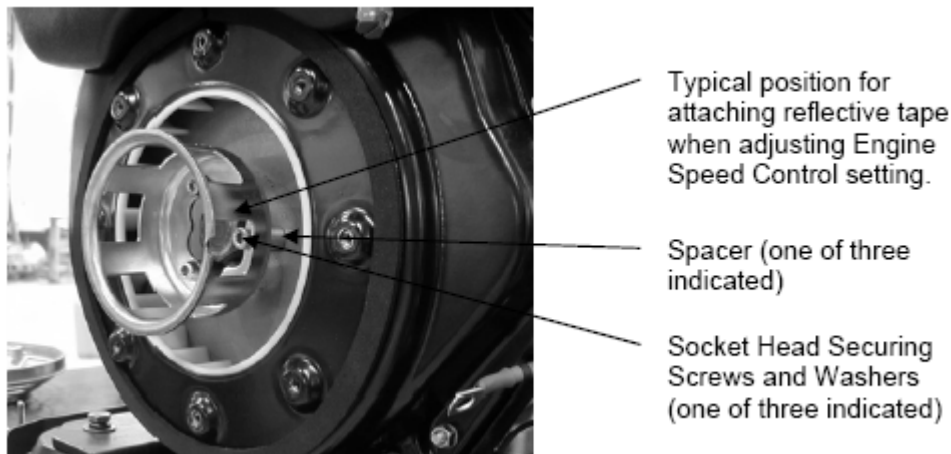


Fig 17 Recoil basket

Fuel system hoses and couplings

55 This procedure describes the removal/replacement of the hoses and couplings associated with the fuel system physically fitted to the LFG; it does not address the Jerrycan hoses.

56 To replace the fuel hoses and couplings, proceed as follows:

56.1 Remove the control box top cover and the acoustic cover for access. The removal procedures for the Control Box Top Cover is detailed in Para 25. The acoustic cover is removed by releasing the two retaining clips that secure it to the LFG. Once these are released it can be lifted clear.

56.2 Quick disconnect hoses; identify, tag and disconnect both hoses from the fuel quick disconnects.

56.3 Quick disconnects; remove the quick disconnects from the control box by undoing the securing nut.

56.4 Fuel return hose; disconnect from the fuel tank and withdraw through the bulkhead grommet.

56.5 Slacken the clips and remove the short length of hose between the fuel inlet quick disconnect and the pulse pump.

56.6 On the fuel feed hose; slacken the clip at the pulse pump end, pull the hose off of the connector at the fuel tank and withdraw through the grommet.

56.7 Fuel tank to engine pipe; pull off of the fuel tank and the injector pump connections.

56.8 Engine return pipe; pull off of the fuel tank connector and off of the one way valve assembly at the fuel injector.

56.9 To remove the injector bypass hose, the fuel injector must first be removed. To gain access to the area of the fuel pump, the air filter must be removed or the system split. The procedure for the removal of the air filter is detailed at Para 46.

Fuel pulse pump

57 To remove the fuel pulse pump, with reference to Fig 18, proceed as follows:

57.1 Slacken the clamps securing the fuel in and fuel out pipes then remove the pipes from the pulse pump.

57.2 Undo the top left and bottom right bolts which secure the pulse pump to the bulkhead.

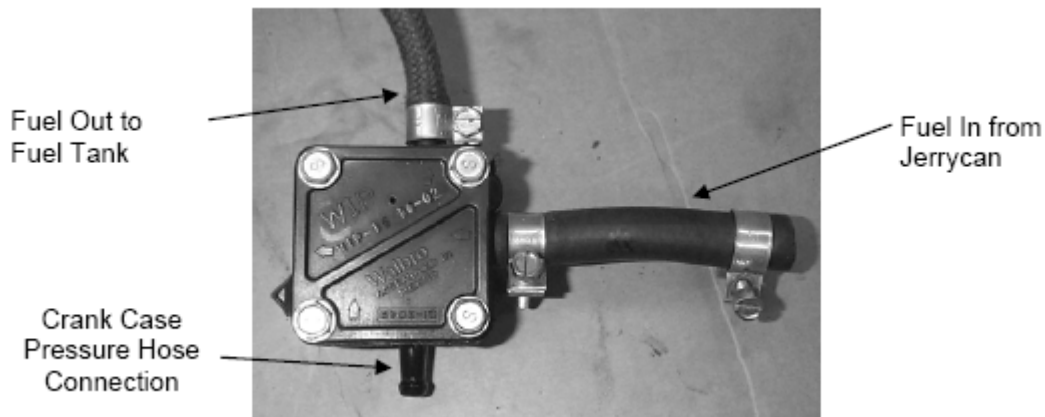


Fig 18 Fuel pulse pump

57.3 Holding the crank case pressure hose connection and pulse pump, lift them clear of the bulkhead.

58 Fitting is the reverse of removal, ensuring that the crank case pressure hose is securely fitted over the crank case pressure outlet pipe.

Engine speed control lever cable

59 The following repair parts and consumables may be required to do the following procedure:

59.1 Split pin stainless 5/64 x 1/2.

59.2 Loctite 243.

59.3 Cable inner and/or outer sheath.

60 This procedure describes the operations required to replace both the inner (wire) and outer (sheath) engine speed control cables.

61 To gain access to the engine speed control cable connections, the control box louvre cover and acoustic cover must be removed. The procedure to remove the control box louvre cover is detailed in Para 23. The acoustic cover is removed by releasing the two retaining clips that secure it to the LFG. Once these are released it can be lifted clear.

62 To replace the engine speed control inner wire cable, proceed as follows:

62.1 Remove the eight screws securing the engine speed control panel to the DC control panel.

62.2 Remove the two screws securing the engine speed control lever assembly to the engine speed control panel.

62.3 With reference to Fig 19, release the clamping screw (1) securing the inner cable at the engine end of engine speed control cable. Remove the clamp body (2) and spring (3).

62.4 Withdraw the inner cable from the ferrule (4) fitted in the engine speed control bracket then remove the ferrule and spring (5). Ensure that the spring (5) is retained separately from the spring (3) as they are not interchangeable.

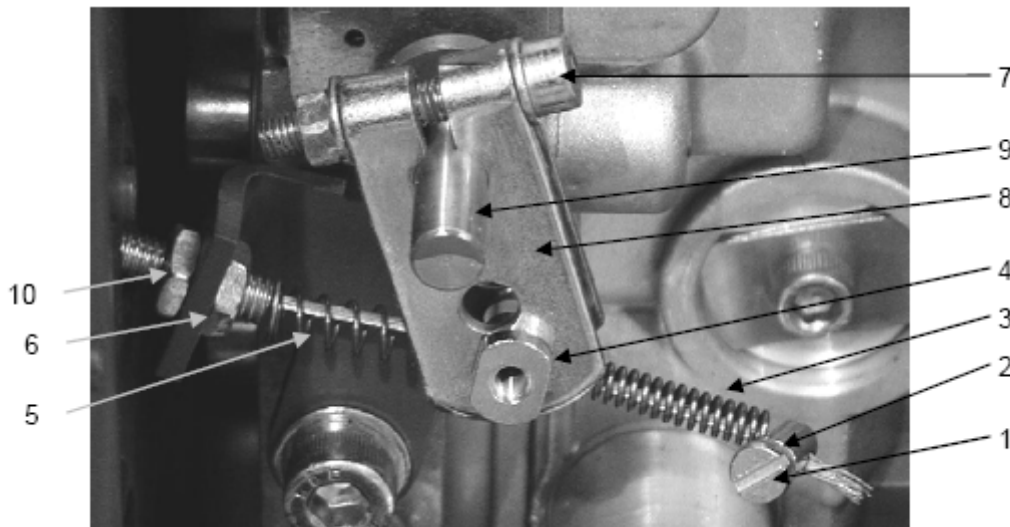


Fig 19 Engine speed control cable - engine end

62.5 Release the locknut (6) and loosen the engine speed control retaining screw (7). The engine speed control bracket (8) can then be pulled off the mounting shaft (9).

62.6 Withdraw the inner cable through to the DC control panel end.

62.7 With reference to Fig 20, unscrew the cable from the brass pivot and completely remove the inner cable.

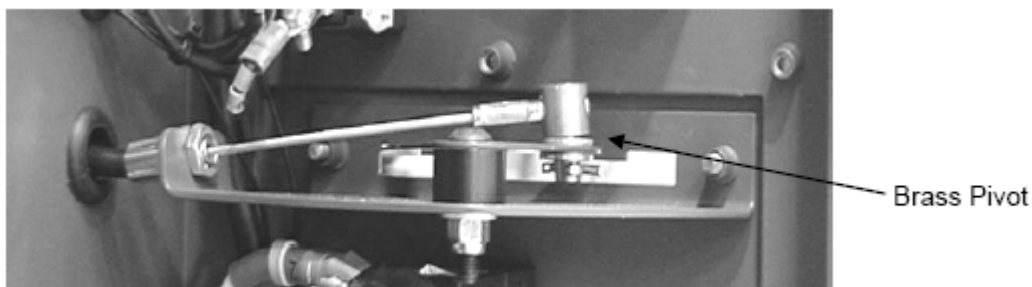


Fig 20 Engine speed control cable - DC panel end - internal view

-
- 62.8 To fit the replacement inner cable, set the engine speed control lever to the Off position.
- 62.9 Apply Loctite 243 to the threaded portion of the replacement inner cable end. Screw the new inner cable threaded portion into the brass pivot.
- 62.10 Feed the free end of the replacement inner cable through the outer sheath until it is exposed at the engine end.
- 62.11 With reference to Fig 19, secure the locknut (6).
- 62.12 Fit the spring (5) over the exposed portion of the inner cable then fit the ferrule (4) into the lower hole within the engine speed control bracket (8), this ferrule is left loose within this engine speed control bracket i.e. it is not secured into the inner of the two holes in the bracket.
- 62.13 Feed the inner cable through the ferrule (4), fit the spring (3) then the clamp (2) leaving approximately 10 mm of cable exposed to the right of the clamp. Secure the clamp using the securing screw (1).
- 62.14 Slide the engine speed control bracket (8) onto the mounting shaft (9) and secure with the retaining screw (7). The bracket should be secured at an angle of approximately 170° when viewed from the front as shown in Fig 19. Final adjustment is made during the setting-up procedure detailed in Para 71 and 72.
- 62.15 Refit the two screws removed at Step 62.2 to attach the engine speed control lever assembly to the engine speed control panel.
- 62.16 Refit the eight screws removed at Step 62.1 to attach the engine speed control panel to the DC control panel.
- 63 To replace the engine speed control cable outer sheath, (assuming the inner wire has already been removed as detailed above) proceed as follows:
- 63.1 With reference to Fig 19, remove the locknut (6) and adjustment nut (10) from the securing/adjusting assembly.
- 63.2 Attach a suitable guide wire or cord to the end of the outer cable and gently pull it through to the DC control panel end pulling the guide wire with it.
- 63.3 To refit, attach the new outer cable securely to the guide wire and carefully draw through to the engine.
- 63.4 Refit the locknut (6) and adjustment nut (10) removed in Para 63.1.
- 63.5 Refit the inner wire as detailed in Para 62.
- 64 Set up the engine speed control, following repair or replacement, in accordance with the procedure detailed in Paras 71 to 73.

Crank case pressure hose

65 The Crank Case Pressure Hose (CCPH) (Fig 21) supplies the operating air pressure for the fuel pulse pump. It is a low pressure hose and, as such, does not require a lower securing clamp.

66 To remove the CCPH, dismount the pulse pump. Undo the securing clip at the pulse pump and then pull the hose off of the crank case and pulse pump connection points. Replacement is the reverse of removal.

NOTE

There is sufficient room in the bulkhead cut out to allow for the hose to be removed/fitted to the crank case.



Fig 21 Crank case pressure hose (control box removed)

Engine speed control lever and housing

67 The following repair parts may be required to do the following procedure:

- 67.1 M4 x 10 mm Pozi Pan screws.
- 67.2 M4 x 16 mm Pozi Pan screws.

68 The engine speed control lever and housing assembly is mounted on the dc control panel assembly. to replace the engine speed control lever and housing assembly, proceed as follows:

- 68.1 Remove the eight M4 x 10 Pozi Pan screws securing the engine speed control panel to the DC control panel.
- 68.2 Remove the two M4 x 10 Pozi Pan screws securing the engine speed control lever assembly to the engine speed control panel.
- 68.3 Refer to Fig 20, release the inner engine speed control cable locknut and remove the cable from the brass pivot.
- 68.4 Remove the nut and washer securing the lever to the frame and remove the engine control lever from the frame.

-
- 69 To remove the engine speed control lever mounting bracket assembly, proceed as follows:
- 69.1 Disconnect the inner engine speed control lever cable from the engine and pull through the outer cable housing, refer to Para 62 for disconnection and removal procedure.
 - 69.2 Disconnect inner cable from the brass pivot.
 - 69.3 Release the locknut securing the outer cable sheath to the mounting bracket assembly and remove the sheath.
 - 69.4 Remove the split pin securing the brass pivot and remove the brass pivot and associated washers.
- 70 For both tasks, fitting is the reverse of removal. Reference should be made to Paras 61 and 62 for guidance on refitting the inner and outer cables.
- 71 On replacement of the engine speed control lever assembly and/or having replaced the engine speed control cable (inner or outer), the associated engine speed must be set-up in relation to the lever position. This procedure assumes that the LFG is fully assembled with the exception of the acoustic cover which must be removed to enable viewing of the engine rotation. This procedure also assumes that fuel is available and that the LFG is capable of being run.
- 72 This procedure should be completed with the engine cold, i.e. at the ambient temperature of the surroundings.
- 73 To set the engine speed control lever assembly and associated engine speed control cable proceed as follows (Steps 71.1 and 71.2 are unnecessary if reflective tape is already in place):
- 73.1 Remove the recoil starter assembly to gain access to the recoil basket, refer to Para 52. Attach a small strip (approximately 2 cm x 1 cm) of reflective tape to one of the horizontal sections of the recoil basket; refer to Fig 17 for position. The reflective tape is supplied with the tachometer, optical hand held kit, see paragraph 73.5. This tape provides a point of reference when viewing the engine speed of rotation and it can be left in place post completion of set-up.
 - 73.2 Refit the recoil starter.
 - 73.3 Disconnect any loads then start the engine.
 - 73.4 Once the engine is started, set the engine speed control lever assembly on the DC control panel to the "Normal" position.
 - 73.5 Using a tachometer, optical hand held, (NSN 6680-99-806-2943), suitably positioned adjacent to the recoil starter assembly vent holes, view the engine rotation in relation to the tachometer via the recoil basket, check the engine speed of rotation.
 - 73.6 If the engine speed control lever assembly and associated engine speed control cable are correctly set then the engine speed should be 2,800 rpm +/- 50 rpm.
 - 73.7 If the engine speed requires adjustment, then the engine speed control cable tension is adjusted at the engine end.
 - 73.8 To adjust the engine speed control cable, release the locknut Fig 19 (6)) and adjustment nut (10) on the engine speed control cable at the engine end. This will enable rotation and adjustment of the tension of the inner cable with a resultant change in engine speed control position and engine speed.
-



73.9 Make the necessary adjustment and re-check the speed of rotation using the optical tachometer.

73.10 Fine adjustments should be completed until both the required rotation speed of 2,800 rpm +/- 50 rpm has been achieved with the engine speed control lever set in the "Normal" position and the engine automatically shuts down once the lever is set in the Off position.

73.11 Once the speed has been set correctly then the engine speed control cable adjuster locknut (6) and adjustment nut (10) is to be re-secured, the engine can be shut-down and the acoustic cover re-fitted.

ELECTRICAL SYSTEM

74 Removal/replacement of the majority of the electrical system components requires that the louvre cover and the control box top cover are removed for access. Removal procedures are detailed within Paras 22 and 25 respectively. The following procedures assume that both covers have already been removed.

Meters/indicators

75 Meter/indicator O-ring seals may be required to do the following procedure.

76 This task refers to the percentage (%) load, AC voltage, DC voltage meters and hours run indicator. To replace the meters/indicator, proceed as follows:

76.1 Identify, tag and disconnect the cables attached to the meter/indicator.

NOTE

The earth leads are soldered to the meter and connected to common earth points on the frame. The earth lead remains part of the indicator, therefore disconnect from the common earth point when replacing a meter/indicator.

76.2 Unscrew the meter locking ring from the rear of the meter/indicator and withdraw through the front of the panel.

76.3 Remove the O-ring seal.

77 Fitting is the reverse of removal, plus the following tasks:

77.1 Connect the earth lead to the common earth point.

77.2 Replace the O-ring seal.

77.3 Ensure the meter face is vertical before fully tightening the locking ring.

External AC connectors

78 To remove an AC connector (Fig 22), proceed as follows:

78.1 Remove the four screws securing the AC connector to the front panel and draw the connector out of the panel.

78.2 Identify, tag and disconnect the cables to the connector and remove the connector.

NOTE

The lower two screws of the upper 110V ac connector and the upper two on the lower 110V ac connector screw into locknuts not captive nuts. These locknuts secure the AC varistor mounting bracket.

79 Fitting of an AC connector is the reverse of removal.

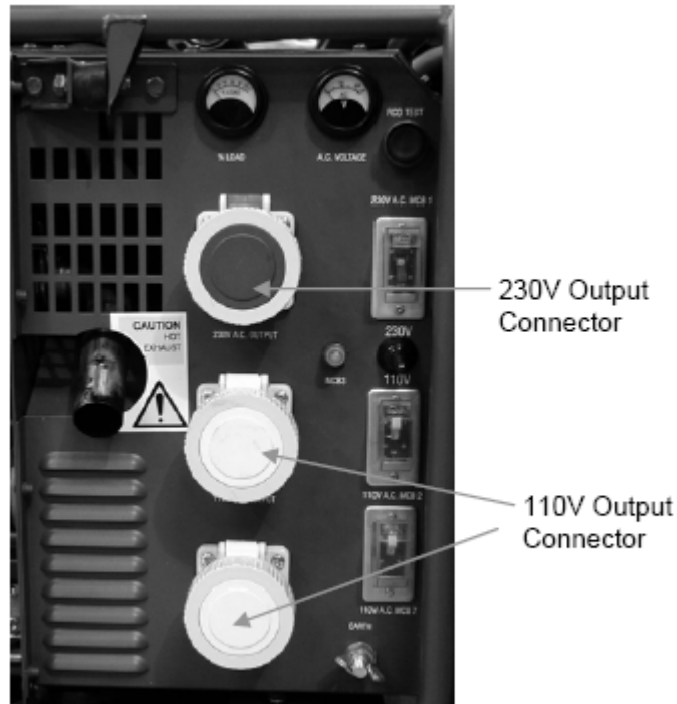


Fig 22 External AC connector

28V DC terminals

80 Locking nuts, washers and insulating rings may be required to do the following procedure.

81 Removal of a DC terminal is the same whether it is the positive or negative terminal. To replace a terminal, proceed as follows:

81.1 Remove the nut securing the lead from the rear of the terminal.

81.2 Remove the locking nut, washer and insulating ring securing the terminal assembly and remove the terminal assembly.

82 Fitting is the reverse of removal. When fitting, ensure that the locator lug, on the terminal post, is located in its locator hole.

Circuit Breakers (CBs)

83 To replace the main AC and DC output circuit breakers (MCBs 1, 2, 6 & 7), proceed as follows:

83.1 Identify, tag and disconnect the cables to the CB.

83.2 Remove the two screws securing the rubber boot cover and remove the cover.

83.3 Withdraw the CB from the rear of the panel.

84 To replace MCBs 3, 4 & 5, proceed as follows:

84.1 Identify, tag and disconnect the cables to the CB.

84.2 Unscrew rubber boot cover securing nut and remove cover.

84.3 Withdraw CB through the rear of the panel.

85 For both types of CB, fitting is the reverse of removal.

Circuit breaker protective boots/covers

86 The removal of circuit breaker protective boots/covers is described in Para 84 above. Fitting a boot/cover is the reverse of removal.

230/110 Voltage selector switch

87 The 230/110 Voltage selector switch (Fig 23) is mounted on the AC control panel. To replace the switch, proceed as follows:

87.1 Identify, tag and disconnect the cables to the selector switch.

87.2 Remove the rubber boot from over the switch toggle and unscrew the cover securing ring.

87.3 Undo the securing nut and withdraw the selector switch from the rear of the panel.

88 Fitting is the reverse of removal.

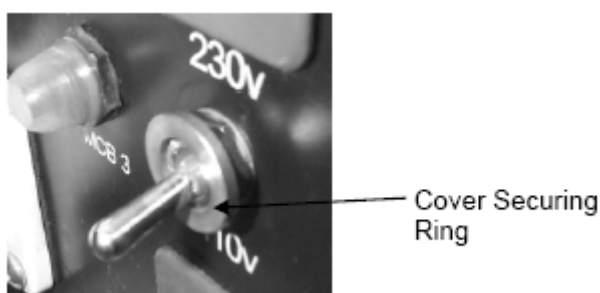


Fig 23 240/110 Voltage selector switch (cover removed)

Instrument illumination on/off switch

89 The procedure for the replacement of the instrument illumination On/Off switch is the same as that for the 230/110 V selector switch detailed in Para 87.

Push buttons

90 To replace the Residual Current Device (RCD) push button, proceed as follows:

90.1 Release the terminal carrier from the rear of the switch (Fig 24) and identify, tag and disconnect the cables.

90.2 Release the intermediate terminal assembly using a small electrician's screwdriver to release the clips, undo the switch locking ring and remove the switch from the front of the panel.

91 To replace the start push button, proceed as follows:

91.1 Identify, tag and disconnect the cables to the button.

91.2 Unscrew the weather cover and remove the switch through the rear of the panel.

92 Fitting of both switch types is the reverse of removal.

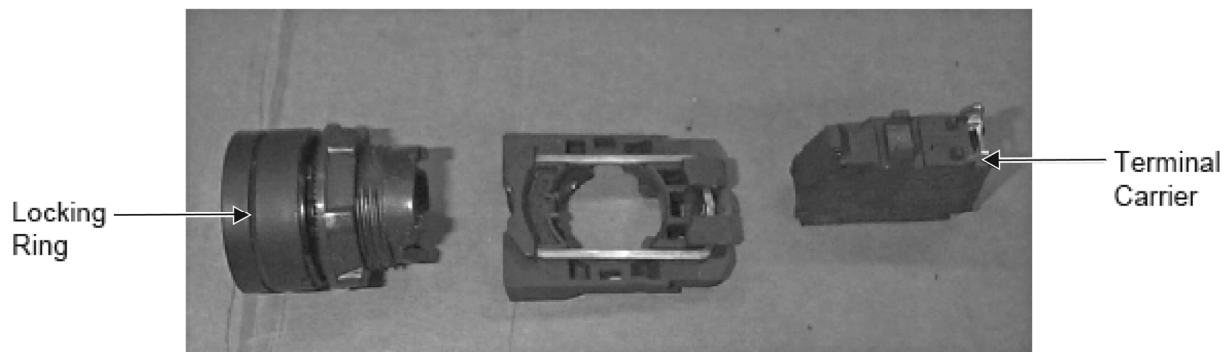


Fig 24 RCD push button connector (exploded view)

Low oil pressure warning LED and seal

93 For access to the LED, remove MCB 4 from the DC control panel but DO NOT electrically disconnect it. To replace the LED, proceed as follows:

93.1 Identify, tag and disconnect the cables to the LED.

93.2 Undo the locking ring and remove the LED and its seal from the panel.

94 Fitting is the reverse of removal, ensuring MCB 4 is re-fitted to the DC control panel.

Switch biased, 10 A momentary (pre-heat switch)

95 This is the pre-heat switch. The procedure for the replacement of the pre-heat switch is the same as that for the 230/110V selector switch detailed in Para 87.

Switch weather covers

96 The removal/replacement of switch protective boots/covers is described in Para 87.

Switch body/collar

97 The removal/replacement of switch bodies and collars is described in Para 87.

Electrical tests

RCD tests

NOTES

(1) The Residual Current Device (RCD) tester depicted in this procedure is a typical RCD tester and may not be the tester detailed in Table 1. However, the functionality is the same.

(2) The RCD tester (Fig 25) has two rotary switches; the RCD RATING (mA) switch (1) and the RCD TEST switch (2).

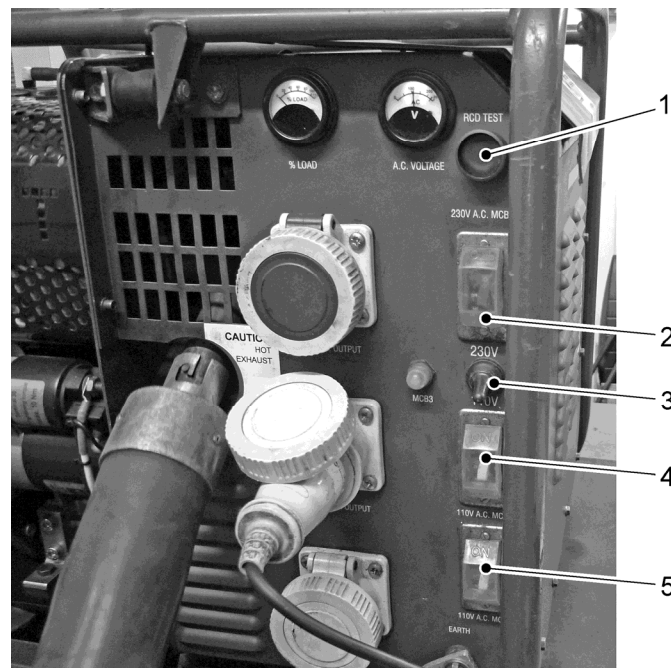


- 1 RCD RATING (mA) switch
- 2 RCD TEST switch dial
- 3 TEST button

Fig 25 RCD tester

98 To carry out a test of the RCDs:

- 98.1 Ensure the RCD test switch is set to the OFF position.
- 98.2 Set the RCD Rating (mA) switch to the 30 mA position.
- 98.3 Connect the RCD tester to the top 110 V AC output of the LFG (Fig 26).
- 98.4 Ensure the 230V/110V selection switch (3) is set to the 110V position.



- | | | | |
|---|------------------------------|---|-----------------|
| 1 | RCD TEST pushbutton | 4 | 110V A.C. MCB 2 |
| 2 | 230V A.C. MCB 1 | 5 | 110V A.C. MCB 7 |
| 3 | 230V / 110V Selection switch | | |

Fig 26 LFG connection and switches

NOTE

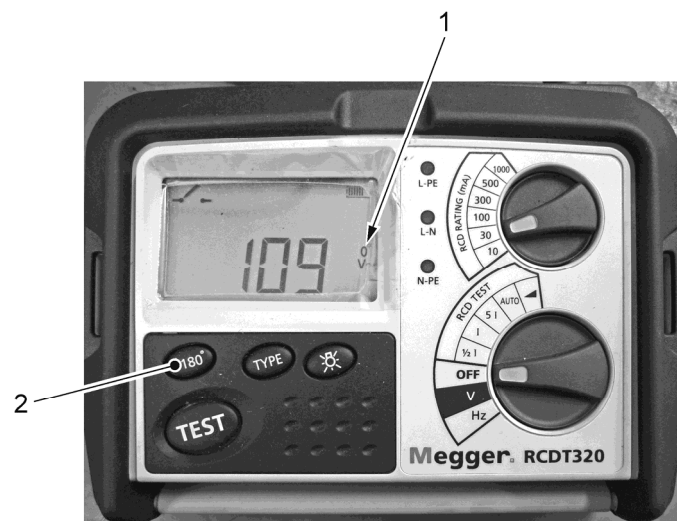
Do not switch between 110V and 230V when the LFG is running.

- 98.5 Start the LFG. Refer to Cat 201.
- 98.6 Set the RCD TEST switch dial (Fig 25 (2)) to the 1/2 I position.
- 98.7 Set the CB to be tested to the ON (upright position).
- 98.8 Press the RCD TEST pushbutton (Fig 26 (1)).
- 98.9 Ensure the 110V A.C. MCB 2 (4) trips.
- 98.10 Reset the 110V A.C. MCB 2.
- 98.11 Press the TEST button (Fig 25 (3)).
- 98.12 Ensure the RCD tester indicates >1999 ms (timed out) (Fig 27) and the 110V A.C. MCB 2 (4) does not trip.



Fig 27 RCD tester - timed out

- 98.13 Set the RCD TEST switch dial (Fig 25 (2)) to the I position.
- 98.14 Ensure the phase indication (Fig 28 (1)) reads 0°. Press the 0°/180° button (2) if required.



- 1 Phase indication
2 0°/180° button

Fig 28 RCD tester

- 98.15 Press the TEST button (Fig 25 (3)).
- 98.16 Ensure the 110V A.C. MCB 2 (Fig 26 (4)) trips and the reading on the RCD tester indicates < 200 ms.
- 98.17 Reset the 110V A.C. MCB 2.
- 98.18 Press the 0°/180° button (Fig 28 (2)) to select to 180°.
- 98.19 Ensure the phase indication (1) reads 180°.
- 98.20 Carry out sub-Paras 98.15 and 98.16 again.
- 98.21 Set the RCD TEST switch dial (Fig 25 (2)) to the 5 I position.

-
- 98.22 Reset the 110V A.C. MCB 2.
 - 98.23 Ensure the phase indication (Fig 28 (1)) reads 0°. Press the 0°/180° button (2) if required.
 - 98.24 Press the TEST button (Fig 25 (3)).
 - 98.25 Ensure the 110V A.C. MCB 2 (Fig 26 (4)) trips and the reading on the RCD tester indicates < 40 ms.
 - 98.26 Reset the 110V A.C. MCB 2.
 - 98.27 Press the 0°/180° button (Fig 28 (2)) to select to 180°.
 - 98.28 Ensure the phase indication (1) reads 180°.
 - 98.29 Carry out sub-Paras 98.24 and 98.25 again.
 - 98.30 Carry out sub-Paras 98.6 to 98.29 again for 110V A.C. MCB 7 (Fig 26 (5)) and the 230V A.C. MCB (1).

NOTE

Ensure the 230V / 110V Selection switch is set to 230V when testing the 230V A.C. MCB.

Earth bonding resistance tests

- 99 Earth bonding resistance tests are to be carried out between earth and the individual sub-assemblies of the generator set.
- 100 Use the earth bonding tester (Table 1) to measure the resistance:
 - 100.1 Between all the LFG earth bonding leads connected between the LFG frame, covers, engine and LRUs required to be earthed and the protective earth terminal, or earth contact.
 - 100.2 Ensure the resistance is 0.05 Ohm or less.

SCHEDULED MAINTENANCE TASKS

FIRST 25 OPERATING HOUR TASKS

Clean/replace oil filter strainer

NOTES

- (1) This task is to be carried out concurrently with the oil change task.
 - (2) The engine oil must be drained before commencement of this task.
- 101 To clean or replace the oil filter strainer (Fig 12), proceed as follows:
 - 101.1 Slacken the oil filter strainer socket head securing screw, approximately five turns.
 - 101.2 Remove the oil filter strainer by drawing it out of the engine by pulling the securing screw.

- 101.3 If cleaning is required, clean by washing in a suitable cleaning fluid/solvent.
- 101.4 If the oil filter strainer is damaged, fully remove the securing screw and the sprung steel plates.
- 101.5 Fit a new O-ring seal to the replacement oil filter strainer, reassemble the sprung steel plates and fit the socket head securing screw.
- 101.6 Fit the oil filter strainer into its housing and tighten the socket head securing screw.
- 101.7 Replenish oil. Refer to Cat 601.

Change engine oil

102 Prior to changing the engine oil, ensure that the LFG is standing on level ground and that the oil in the engine is warm, but not hot. To change the oil, proceed as follows:

- 102.1 Remove the oil filler cap (Fig 29) and oil drain plug (Fig 30) and allow the oil to drain into a suitable container. Dispose of the waste oil in accordance with local regulations.
- 102.2 Clean the oil drain plug, fit a new washer and refit to the engine housing.
- 102.3 Tighten the oil drain plug to a torque of 50 Nm (37 lb ft).
- 102.4 With the oil filler cap removed, fill with 0.9 litres of oil.
- 102.5 Check the oil level periodically during filling by wiping the oil dipstick, screwing it back in and then removing it again. Check the oil level on the dipstick and, if necessary, "top up to the "Max" level".
- 102.6 Finally, replace the filler cap and oil dipstick and wipe off any spilt oil.



Fig 29 Oil filler cap

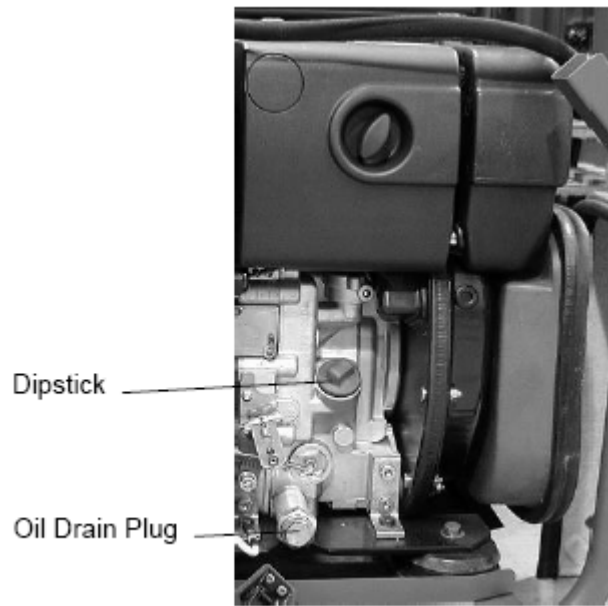


Fig 30 Oil dipstick and drain plug

Check/adjust valve clearances

103 Only carry out adjustments when the engine is cold (10 °C - 30 °C). To check the valve clearances, proceed as follows:

- 103.1 Remove the acoustic cover and gain access to the cylinder head cover. The acoustic cover is removed by releasing the two retaining clips that secure it to the LFG. Once these are released it can be lifted clear
- 103.2 Remove any contamination adhering to the rocker cover.
- 103.3 Remove the two securing screws and remove the cylinder head cover.
- 103.4 Remove the rubber cap from the flywheel cover inspection hole (Fig 31).



Fig 31 Flywheel cover inspection hole

103.5 Turn the engine over in the normal direction of rotation until the valves are in the overlap position (exhaust valve not yet closed, inlet valve starts to open).

103.6 Turn the crankshaft through 360° in the normal direction of rotation and align exactly to the OT marking (Fig 31).

103.7 Check the valve clearances using small feeler gauge (Item 1, Fig 32). The clearance should be 0.10 mm.

NOTE

A small feeler gauge, NSN 5210-99-796-7540, is supplied with each LFG. It is located within the inside of the air filter cover where it is held in place by a magnetic strip attached to the bottom of the cover. It is to be replaced in this position after use.

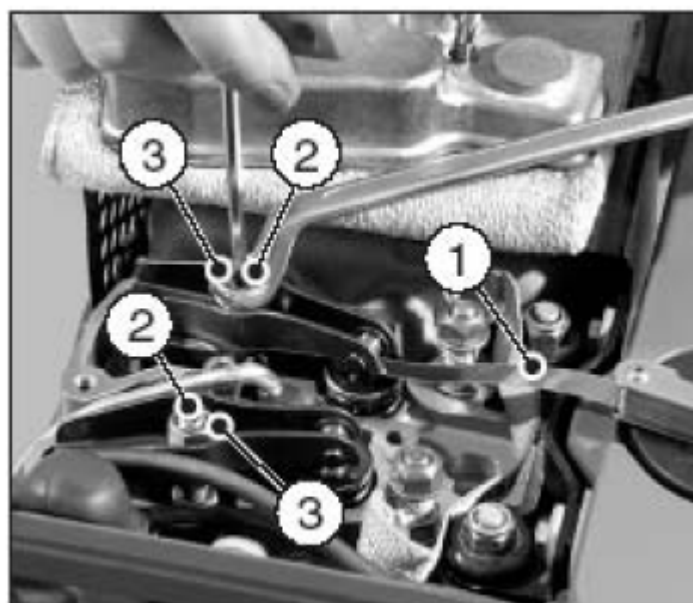


Fig 32 Valve clearance - check and adjustment

104 To adjust the valve clearances refer to Fig 32 and proceed as follows:

104.1 If the valve clearances need adjusting, slacken screw (2) and turn hex nut (3) until feeler gauge can be pulled through with just slight resistance when screw (2) is retightened.

104.2 With the screw tight, check the valve clearance again and ensure it is 0.10 mm.

105 On completion of checks/adjustment:

105.1 Using a new gasket, refit the cylinder head cover and tighten all screws evenly.

105.2 Refit the rubber cap to the flywheel inspection hole.

105.3 Replace the small feeler gauge in its storage position.

105.4 Refit the acoustic cover.

Check screw connections

106 With the exception of the cylinder head bolts, engine governor and injection system adjusting screws, check the tightness of all threaded connections that can be reached during this scheduled maintenance. Tighten as necessary in accordance with torque settings as detailed within Cat 601, Table 3. Take particular care not to over-tighten the attaching parts associated with the fuel tank.

107 Check the tightness of all anti vibration mount fittings, removing the louvre cover to gain access to the control box AVMs.

Check starter motor operation

108 Check the operation of the starter motor by connecting a 24 V dc supply to the inter-vehicle connector, setting the engine speed control lever to the 'Max' position and pushing the Start button (hold the Start button until the engine fires).

109 In cold weather conditions, it may be necessary to operate the pre-heat switch for a short time before attempting to start the LFG.

110 If the starter motor does not turn or the engine does not fire, carry out fault diagnosis in accordance with Chapter 1 of this Category.

250 OPERATING HOUR TASKS

111 The 250 operating hour tasks include (with the exception of the clean engine oil filter strainer task) all of the first 25 operating hour tasks plus the following:

Clean cooling area

112 If the cooling fins on the engine cylinder and the flywheel fan blades are severely contaminated they will not cool the engine as efficiently as they are required.

113 Examine the engine cylinder cooling fins for contamination. Clean as necessary.

114 If accessible, examine the flywheel fan blades for contamination. Clean as necessary.

115 Examine all inlet and outlet vents for signs of blockage or contamination and clean as necessary.



Inspect labels and warning notices

116 Ensure all labels and warning notices are clean, legible and securely attached to the LFG.

500 OPERATING HOUR TASKS

117 The 500 operating hour tasks include all of the 250 operating hour tasks plus the following:

Change air filter

118 Remove the air filter as follows:

118.1 Remove the acoustic cover. The acoustic cover is removed by releasing the two retaining clips that secure it to the LFG.

118.2 Locate the air filter cover and undo the plastic securing knob.

118.3 Remove the air filter cover.

118.4 Undo the air filter retaining nut (Fig 11) and remove the air filter.

119 Fitting is the reverse of removal. Tighten the air filter retaining nut finger tight only.

Change engine fuel filter

120 To replace the engine fuel tank fuel filter (Fig 10), proceed as follows:

120.1 Remove the fuel tank cap and lift up to expose the fuel filter (attached to the cap by a cord).

120.2 Pull off the fuel filter from the fuel pick-up pipe.

120.3 Push a replacement fuel filter fully on to the fuel pipe and re-insert in fuel tank.

121 Refit and secure fuel tank cap.

RCD tests

122 Carry out RCD tests as detailed in Para 98.

1000 OPERATING HOUR TASKS

123 The 1000 operating hour tasks include all of the 250 and 500 operating hour tasks plus the following:

Clean/replace oil filter strainer**NOTES**

(1) This task is to be carried out concurrently with the oil change task.

(2) The engine oil must be drained before commencement of this task.

124 To clean or replace the oil filter strainer (Fig 12), proceed as follows:

124.1 Slacken the oil filter strainer socket head securing screw, approximately five turns.

- 124.2 Remove the oil filter strainer by drawing it out of the engine by pulling the securing screw.
- 124.3 If cleaning is required, clean by washing in a suitable cleaning fluid/solvent.
- 124.4 If the oil filter strainer is damaged, fully remove the securing screw and the sprung steel plates.
- 124.5 Fit a new O-ring seal to the replacement oil filter strainer, reassemble the sprung steel plates and fit the socket head securing screw.
- 124.6 Fit the oil filter strainer into its housing and tighten the socket head securing screw.
- 124.7 Replenish oil. Refer to Cat 601.

LONG TERM STORAGE

PREPARATION FOR LONG-TERM STORAGE - ENGINE

125 The following procedures relate to preparing the engine only for long-term storage. Refer to Para 131 for details of preparing the control box assembly and 133 for the LFG complete. If the procedures detailed in the following paragraphs are carried out correctly, it is possible to store the engine outside but under cover for a maximum of one year. However, after this time, to ensure continued protection, the procedure should be repeated.

126 Storing the engine in a constant temperature, low humidity environment should ensure that it remains in perfect condition for up to four years. However, it should be noted that rubber seals used within the engine may deteriorate over time.

Internal surface conservation procedure

127 To conserve the internal surfaces, proceed as follows:

- 127.1 Test run the engine to confirm serviceability and allow to cool down.

WARNING

SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.

- 127.2 When the engine has cooled down sufficiently to not present a burn hazard, drain the engine oil.
- 127.3 Fill the engine to maximum dipstick level with corrosion protection oil PX-4.
- 127.4 To prevent water contamination of the fuel system, replace the fuel filter.
- 127.5 Fill the fuel system with a mixture of PX-4 and Kerosene F-58 in the ratio 1 part PX-4 to 9 parts F-58.
- 127.6 Start and run the engine at approximately 75% of rated speed to reach an oil temperature of 70 °C - 80 °C.
- 127.7 When the required oil temperature has been reached, stop the engine and allow the oil to cool to 30 °C - 50 °C.
- 127.8 Drain the PX-4 oil from the engine. Retain this oil for use on additional engines if required.



127.9 When the engine has cooled, remove the exhaust silencer and air filter and retain with the engine.

127.10 Spray into the inlet and exhaust ports approximately 2 cm² of PX-4 and turn the engine 5 revolutions to disperse the oil. Do not restart the engine once this procedure has been carried out.

127.11 The PX-4/F-58 mixture should remain in the entire fuel system.

External surface conservation procedure

128 To conserve the exterior of the engine, proceed as follows:

WARNING

SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.

CAUTION

EQUIPMENT DAMAGE. During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

128.1 Treat all parts susceptible to corrosion with PX-4 either by painting or spraying on. If the engine is not part of a complete LFG, pay particular attention to the crankshaft stub shaft.

128.2 Close all engine ports and openings with suitable bungs or cover to prevent the ingress of moisture. Sealing should include the air filter intake, exhaust discharge, fuel system and engine breather system.

128.3 Seal the engine in a plastic enclosure, or other non-permeable enclosure, then place in a crate to protect the enclosure and allow for ease of transport.

RECOVERY FROM LONG-TERM STORAGE - ENGINE

129 To recover the engine from long-term storage, proceed as follows:

129.1 Remove external sealing/wrapping.

129.2 Remove all bungs and covers sealing engine ports and openings.

129.3 Fill the engine with oil. Refer to Cat 601.

129.4 Refit exhaust and air filter assemblies.

130 It is not necessary to remove external conservation providing it does not interfere with external fittings, i.e. attachments to the crank shaft stub shaft. Furthermore, the fuel system can be operated with the inhibiting mixture in situ alongside the normal fuel.

PREPARATION FOR LONG-TERM STORAGE - CONTROL BOX ASSEMBLY

131 If the control box assembly, separated from the LFG, is to be stored for any length of time, protect it as follows:

- 131.1 Ensure any removed covers, panels and their attaching parts are suitably bagged and attached to the control box assembly.
- 131.2 Ensure any loose/open electrical connections are sealed against the ingress of moisture.
- 131.3 Protect instrument glass with suitable padding material.
- 131.4 Wrap and seal control box assembly in protective plastic sheeting.

RECOVERY FROM LONG-TERM STORAGE - CONTROL BOX ASSEMBLY

132 To recover the control box assembly from long-term storage. Remove all protective wrapping/padding from the control box assembly, instrument glass and electrical connectors.

PREPARATION FOR LONG-TERM STORAGE - LFG COMPLETE

133 To prepare the LFG complete for long-term storage, proceed as follows:

- 133.1 Remove the acoustic cover and carry out the engine procedures detailed in Paras 127 and 128. Ensure there is sufficient room left after wrapping the engine in protective sheeting to refit the acoustic cover. Do not attempt to crate the engine.
- 133.2 Carry out, as required, the control box assembly procedures detailed in Para 131.
- 133.3 Connect the fuel adaptor male and female quick release couplings together to prevent dirt ingress and place the fuel adaptor, earth spike and lead within the accessories bag. Attach the accessories bag to the LFG frame and secure.
- 133.4 Coil-up the exhaust extension, place it on top of the LFG and secure it to the frame.
- 133.5 Wrap the entire LFG in plastic sheet and crate for storage and ease of transport.

RECOVERY FROM LONG-TERM STORAGE - LFG COMPLETE

134 To recover the LFG complete from long-term storage, proceed as follows:

- 134.1 Remove all external wrapping.
- 134.2 Detach remove and retain the exhaust extension and accessories bag.
- 134.3 Remove protective wrapping/padding from the control box assembly.
- 134.4 Carry out the engine procedures as detailed in Paras 129 and 130.

PROCEDURE CHECKLIST

135 A checklist showing that the engine procedures have been completed should accompany the engine. An example check list is shown below.

136 The list of engine port sealing bungs is not exhaustive and the person carrying out the conservation procedure should list any additional ports sealed in the vacant rows provided.



ENGINE CONSERVATION PROCEDURE CHECKLIST

Engine Type and Serial Number	
NATO Stock Number	
Order Number (if applicable)	
Conservation Date	
Packaging Date	
Quality/Type of Packaging	

Item	Procedure	Completed (Initials)
	Conservation Process	
1	Internal surfaces, cylinder head and valves treated. Oil drained	
2	Fuel system filled with inhibiting mixture	
3	External Conservation complete	
4	Air Filter Intake sealed	
5	Exhaust sealed	
6	Fuel System sealed	
7	Breather System sealed	
8	Additional Ports sealed (list):	
	Return to Service	
1	Engine filled with oil. Refer to Cat 601	
2	Air Filter Intake sealing removed	
3	Exhaust sealing removed	
4	Fuel system sealing removed	
5	Breather System sealing removed	
6	Additional sealing listed in (8) above removed	
7	Exhaust assembly refitted	
8	Air Filter assembly refitted	

Engine Storage Procedure Complete	
Signature:	
Date:	

Engine Prepared for Use	
Signature:	
Date:	

Fig 33 Engine conservation procedure checklist

CHAPTER 3

INSPECTION STANDARDS

CONTENTS

Para

- 1 Introduction
- 2 Inspection plan
- 5 Inspection/test schedule compliance
- 6 Tools and test equipment
- Inspection schedules
- 7 Static inspection schedules
- 10 Physical inspection schedule
- 11 Functional test schedule

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2	Physical inspection schedule	3
3	Functional test schedule	5

Fig

1	Component location - DC control panel	9
2	Component location - AC control panel	10

INTRODUCTION

1 The purpose of these inspection standards is to define those examinations, inspections and tests that need to be carried out to ensure that the complete generator set meets Acceptable Quality Levels (AQL) as defined in EMER T & M A 028, Chapter 001 06A.

INSPECTION PLAN

2 The inspection plan is divided into two categories designated Static Inspection Schedules and Functional Test Schedule.

3 The inspection/test schedules incorporated within each category, apart from the insulation resistance tests, are presented in tabular form.

4 The content of the schedules is arranged in the sequence given in Paragraphs 9 and 15, but any inspection/test may be performed independently in support of a particular maintenance operation.

Inspection/test schedule compliance

5 When an inspection/test does not meet the specified requirements, the fault must be located and rectified by suitably qualified personnel only, using the failure diagnosis procedures provided in Chapter 1 as a guide.

Tools and test equipment

6 The tools and test equipment required for carrying out the inspections are listed in Table 1.

TABLE 1 TOOLS AND TEST EQUIPMENT

Item (1)	NATO Stock No. (2)	Designation (3)	Schedule Reference (4)
1	6625-99-2523606 or 6625-99-8654203	Multimeter	Functional Test Schedule - Table 3
2	6680-99-8062943	Tachometer, Optical Hand Held	Checking engine speed control settings
3	5210-99-796-7540	Feeler Gauges (supplied with each LFG)	Tappet setting
4	5120-01-3551734	Torque Wrench 5-16 lb ft	Repair and maintenance

INSPECTION SCHEDULES

Static inspection schedules

7 Static inspection schedules are conducted with the engine stationary.

8 The static inspection schedules cover a physical examination of the complete equipment in a logical sequence.

9 The content of the static inspection schedules is as follows:

9.1 Physical inspection schedule (Table 2):

9.1.1 Frames and covers.

9.1.2 Power unit.

9.1.3 Fuel system.

9.1.4 Starting system.

9.1.5 Control box assembly.

Physical inspection schedule

10 Table 2 contains the step-by-step procedures for carrying out a Physical Inspection of the generator set.

TABLE 2 PHYSICAL INSPECTION SCHEDULE

Item (1)	Test/Operation (2)	Reference(s) (3)	Acceptable Quality Level		Result or Sentence (6)	Remarks (7)
			Unit (4)	Field (5)		
	FRAME AND COVERS					
1	Frame	Cat 302	No cracks, dents or corrosion. Fixings secure and anti vibration mounts sound and secure. Paintwork clean and sound			
2	Acoustic cover	Cat 302	Catches serviceable, edge seal intact, air vents free from blockage			
3	Louvre cover top cover	Cat 522	Securely attached to the control box assembly, no damaged to securing screws, air vents free from blockage			
4		Cat 522	Securely attached to the control box assembly, no damaged to securing screws			
5	Earth bonding leads		Securely attached to frame or individual cover. Not physically damaged or corroded			
6	Labels/markings		All labels and markings are intact and legible			
	POWER UNIT					
7	Engine	Cat 302	No discernible leakage of fuel or oil, all fixing bolts secure			
8	Air filter assembly	Cat 302	Securely attached, filter element clean and serviceable			
9	Exhaust system	Cat 302	Silencer unit, heat shield and exhaust pipe intact. Extension pipe not damaged			
10	Lubricating oil	Cat 302	Oil clean and to correct level			

(continued)

TABLE 2 PHYSICAL INSPECTION SCHEDULE (continued)

Item (1)	Test/Operation (2)	Reference(s) (3)	Acceptable Quality Level		Result or Sentence (6)	Remarks (7)
			Unit (4)	Field (5)		
	FUEL SYSTEM					
11	Jerrycan adaptor assembly	Cat 302		All parts securely assembled, jerrycan filler neck adaptor seal undamaged and serviceable, fuel pipes and connectors undamaged with no perishing or cracks, dip tube filter unblocked		
12	LFG mounted quick release connectors and fuel pipes	Cat 302		All parts undamaged and serviceable, all pipes securely attached		
13	Fuel tank	Cat 302		Fuel free from water contamination when viewed via fuel drainage pipe		
	STARTING SYSTEM					
14	Recoil starter	Cat 302		Pull rope not chafed or cut, no binding or slipping when operated, rope withdraws fully into starter casing when released, air vents free from blockage		
15	Electric starter	Cat 302		Securely fixed to engine, all electrical connections sound		
	CONTROL BOX ASSEMBLY					
16	Mountings	Figures 1 & 2		Anti vibration mounts secure and undamaged		
17	Switches and pushbuttons	Figures 1 & 2		Switches and pushbuttons secure, positive in mechanical action		
18	Meters and indicators	Figures 1 & 2		Meters and indicators secure, glasses clean		
19	Labels/markings			All labels and markings are intact and legible		

Functional test schedule

11 The functional test schedule consists of a series of elementary tests designed to highlight any deviation from acceptable operating parameters.

12 The test content of the functional test schedule (Table 3) is as follows:

12.1 Starting sequence.

12.2 Engine operation.

12.3 Alternator output.

13 Table 3 contains the step-by-step functional test procedure for the generator set. The warnings listed in the preface of this document must be strictly observed.

TABLE 3 FUNCTIONAL TEST SCHEDULE

Item (1)	Test/Operation (2)	Reference(s) (3)	Acceptable Quality Level		Result or Sentence (6)	Remarks (7)
			Unit (4)	Field (5)		
1	STATIC INSPECTION A Static inspection must be carried out before performing the following functional tests.	Tables 2, 3 & 4	Static inspection satisfactory			
	STARTING SEQUENCE (MANUAL START)					
2	Connect the fuel supply to the LFG	Cat 201				
3	Select the desired AC output (SW1)	Cat 201				
4	Set the engine speed control lever to the "Max" position	Cat 201				
5	Pull starter handle until resistance is felt, then pull smartly to start	Cat 201	Engine starts Hours run indicator working			Repeat until engine starts (maximum three attempts)
6	Set engine speed control lever to the "Normal" position and allow the engine to warm up for one minute	Cat 201	Engine speed 2800 +/- 50 rpm			

(continued)

TABLE 3 FUNCTIONAL TEST SCHEDULE (CONTINUED)

Item (1)	Test/Operation (2)	Reference(s) (3)	Acceptable Quality Level		Result or Sentence (6)	Remarks (7)
			Unit (4)	Field (5)		
7	Set engine speed control lever to the "Max" position		Engine speed	3300 +/- 50 rpm		
8	Set the engine speed control lever to the "Off" position	Cat 201	Engine stops			
	STARTING SEQUENCE (ELECTRIC START)					
9	Connect the fuel supply to the LFG	Cat 201				
10	Select the desired AC output (SW1)	Cat 201				
11	Set the engine speed control lever to the "Max" position	Cat 201				
12	Connect a 24V DC supply to the LFG via the inter-vehicle connector	Cat 201				
13	Press and hold the "Start" button until the engine fires then release	Cat 201	Engine starts			Repeat until engine starts (maximum three attempts)
			Hours run indicator working			
14	Set engine speed control lever to the "Normal" position and allow the engine to warm up for one minute	Cat 201	Engine speed	2800 +/- 50 rpm		
15	Set engine speed control lever to the "Max" position		Engine speed	3300 +/- 50 rpm		
16	Set engine speed control lever to the "Off" position	Cat 201	Engine stops			

(continued)

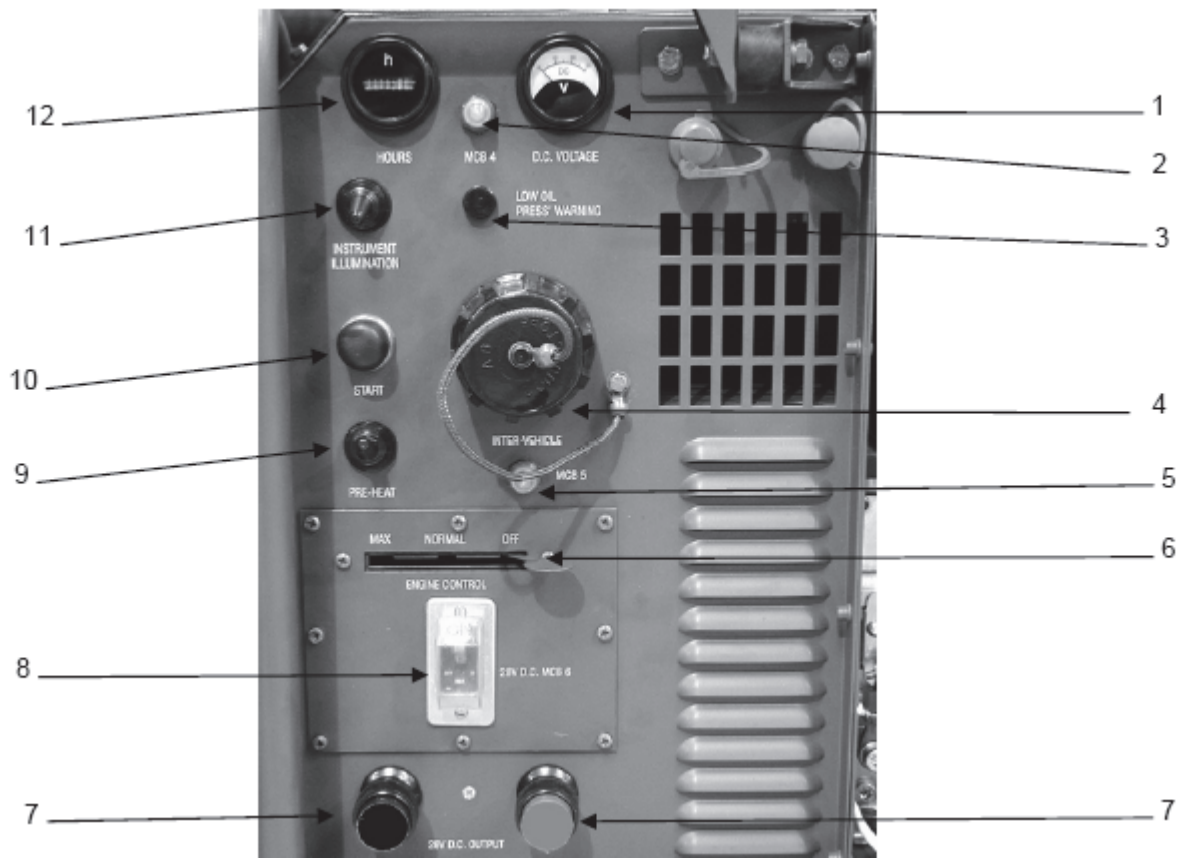
TABLE 3 FUNCTIONAL TEST SCHEDULE (continued)

Item (1)	Test/Operation (2)	Reference(s) (3)	Acceptable Quality Level		Result or Sentence (6)	Remarks (7)
			Unit (4)	Field (5)		
17	ENGINE OPERATION General performance		Engine runs evenly with no abnormal noises. Exhaust fumes normal (not black). No leaks of exhaust, fuel or oil			LFG started and run up to normal operating speed and temperature
18	ELECTRICAL OUTPUT (DC) Connect a DVM to the DC output terminals	Figure 1				
19	Set the DC circuit breaker to "On" (up position)		Ensure output indicated on the DVM is 28 V DC +/- 0.5V			LFG DC voltmeter reading to be approximately 28V DC
20	ELECTRICAL OUTPUT (AC) Set the engine speed control lever to the "Off" position					
21	Select 230V AC Output on SW1	Figure 2				
22	Start the LFG and set the engine speed control lever to the "Max" position					
23	Connect a DVM across the 230V output socket Live and Neutral pins	Figure 2				
24	Set the 230V AC Circuit Breaker to "On" (up position)	Figure 2	Ensure output indicated on the DVM is 230V AC +/- 5.75V			LFG AC voltmeter reading to be approximately 230V AC
25	Set the engine speed control lever to the "Off" position					
26	Select 110V AC Output on SW1	Figure 2				

(continued)

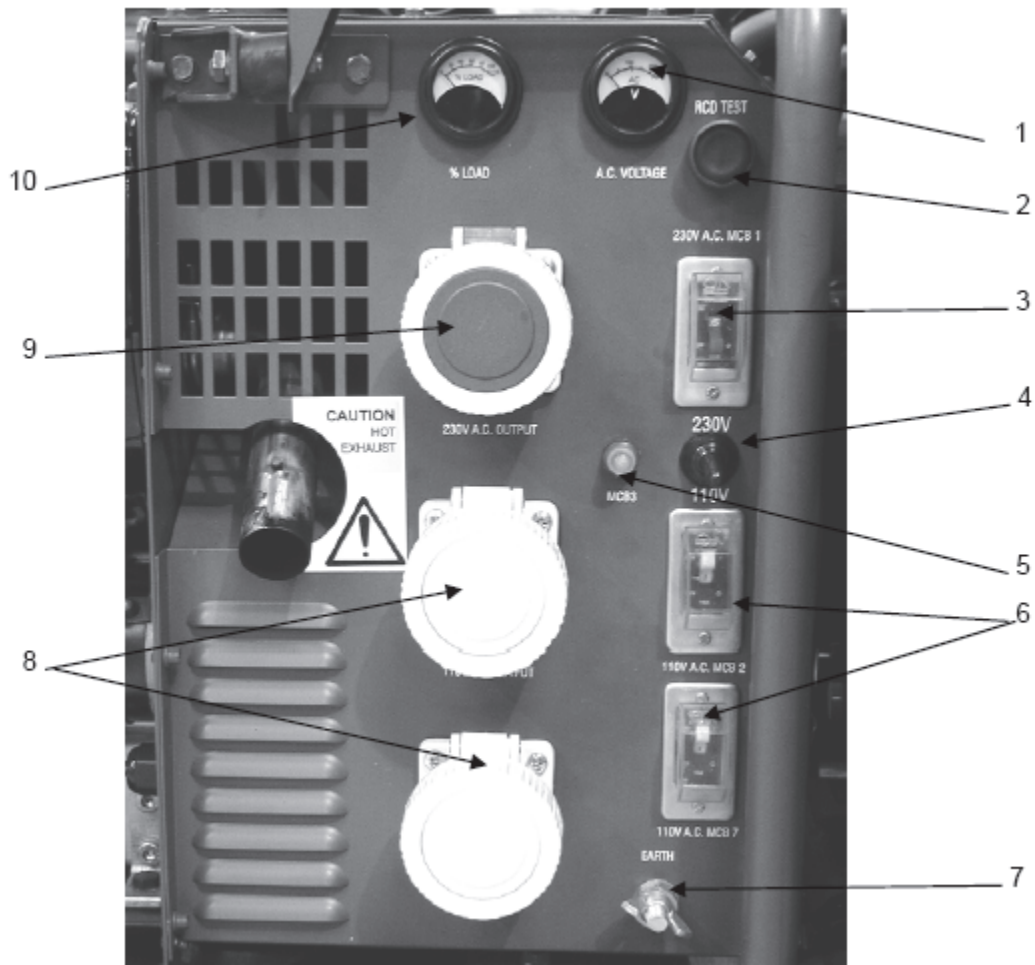
TABLE 3 FUNCTIONAL TEST SCHEDULE (continued)

Item (1)	Test/Operation (2)	Reference(s) (3)	Acceptable Quality Level		Result or Sentence (6)	Remarks (7)
			Unit (4)	Field (5)		
27	Start the LFG and set the engine speed control lever to the "Max" position	Figure 2				
28	Connect a DVM across the 110V output socket Live and Neutral pins					
29	Set the 110V AC Circuit Breaker to "On" (up position)	Figure 2			Ensure output indicated on the DVM is 110V AC +/- 2.75V	LFG AC voltmeter reading to be approximately 110V AC
EARTH LEAKAGE TESTING						
30	Set the engine speed control lever to the "Off" position	Figure 2				
31	Select 230V on SW1					
32	Start the LFG and set the engine speed control lever to the "Max" position	Figure 2				
33	Set 230V AC circuit breakers to "On" (up position)					
34	Push RCD test button	Figure 2			230V circuit breaker trips	
35	Set the engine speed control lever to the "Off" position	Figure 2				
36	Select 110V on SW1					
37	Start the LFG and set the engine speed control lever to the "Max" position	Figure 2				
38	Set 110V AC circuit breakers to "On" (up position)					
39	Push RCD test button	Figure 2			110V circuit breakers trip	



- | | | | |
|---|-------------------------------|----|--------------------------------|
| 1 | DC voltage meter | 7 | DC output terminals |
| 2 | MCB 4 | 8 | DC output circuit breaker |
| 3 | Low oil pressure warning LED | 9 | Pre-heat switch |
| 4 | Intervehicle connector socket | 10 | Start push button |
| 5 | MCB 5 | 11 | Instrument illumination switch |
| 6 | Engine speed control lever | 12 | Hours run meter |

Fig 1 Component location - DC control panel



- | | | | |
|---|---------------------------------|----|---------------------------------|
| 1 | AC voltage meter | 6 | 110V AC output circuit breakers |
| 2 | RCD (earth leakage) test button | 7 | Earth stud |
| 3 | 230V AC output circuit breaker | 8 | 110V AC output sockets |
| 4 | Voltage selector switch | 9 | 230V AC output socket |
| 5 | MCB 3 | 10 | Percentage (%) load meter |

Fig 2 Component location - AC control panel

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Ministry
of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-601 MAINTENANCE SCHEDULE

Issue No. 002

Amendment No. 004

June 2018

Sponsored for use in the
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MAINTENANCE SCHEDULE

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PREFACE

Sponsor: Operational Infrastructure (OI)

Project No.:

File Ref: DG Log (Land) ESS 13/8/18

Publication Authority: OI

INTRODUCTION

1 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

2 AESPs are issued under UK MoD authority and where AESPs specify action is to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores, subject to the provisions of Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DIN), Standard Operating Procedures (SOP) or by local regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication it is to be taken as the overriding authority.

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

4 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
7	1	Illustrated Parts Catalogue	711	*	*	*
	2	Commercial Parts List	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published



Associated publications

5 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201	Earthing and Earthing Protection
JSP 515	Hazardous Stored Information System
SEI 14411	Safety Precautions for Electrical Equipment

HAZARDOUS SUBSTANCES

6 Before using any hazardous substance or material, the user must be conversant with the safety precautions and first aid instructions:

- 6.1 On the label of the container it was supplied in.
- 6.2 On the material Safety Data Sheet.
- 6.3 In local Safety Orders and Regulations.

WARNINGS AND CAUTIONS

WARNINGS

(1) **EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.**

(2) **EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.**

(3) **F54 DIESEL AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:**

DO NOT RUN THE LFG

DO NOT SMOKE

AVOID ALL NAKED FLAMES

AVOID OVERFILLING THE FUEL TANK/JERRYCAN

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG

(4) **GUARDS AND COVERS. DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.**

(5) **JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.**

(6) **NOISE HAZARD.** IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.

(7) **PERSONAL INJURY.** THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).

(8) **PERSONAL INJURY.** THE LFG ALTERNATOR IS A PERMANENT MAGNET GENERATOR, CARE MUST BE TAKEN WHEN WORKING ON THE GENERATOR DUE TO THE HIGH STRENGTH OF THE MAGNETS WHICH COULD CAUSE PERSONAL INJURY.

(9) **SHOCK HAZARD.** DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.

(10) **SHOCK HAZARD.** LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.

(11) **SKIN BURNS.** EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.

(12) **TOXIC FUMES.** EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.

(13) **HEALTH HAZARD.** PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLED, BE HAZARDOUS TO HEALTH. PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.

CAUTIONS

(1) **EQUIPMENT AIRFLOW.** The generator should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.



- (2) **EQUIPMENT DAMAGE.** Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.
- (3) **EQUIPMENT DAMAGE.** During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.
- (4) **EQUIPMENT DAMAGE.** Operation of the AC Output Voltage Selector Switch (SW 1) when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.
- (5) **EQUIPMENT DAMAGE.** The engine must not be operated with the oil level below the specified minimum level.
- (6) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.
- (7) **EQUIPMENT DAMAGE.** The Low Oil Pressure Switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.
- (8) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.
- (9) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

7 The following abbreviations are used in this category:

AC	Alternating Current
AESP	Army Equipment Support Publication
AF	Army Form
Amdt	Amendment
BFPO	British Forces Post Office
BS	British Standard
Cat	Category
CES	Complete Equipment Schedule
dB(A)	decibel (A scale)
DC	Direct Current
DE&S	Defence Equipment and Support
DIN	Defence Instructions and Notices
EFR	Equipment Failure Report

e.g.	for example
EMER	Electrical and Mechanical Engineering Regulations
Eqpt	Equipment
ESM	Equipment Support Manager
ESPD	Equipment Support Policy Directive
FRACAS	Failure Reporting Analysis and Corrective Action System
IEE	Institution of Electrical Engineers
ISD	In-Service Date
JAMES	Joint Asset Management and Engineering Solutions
JSP	Joint Service Publication
kg	kilogramme
kW	kilowatt
lb ft	pound feet
LE	Land Equipment
LED	Light Emitting Diode
LFG	Lightweight Field Generator
LRU	Line Replaceable Unit
mm	millimetre
MoD	Ministry of Defence
NATO	North Atlantic Treaty Organisation
Nm	Newton metre
No.	Number
NSN	NATO Stock Number
OI	Operational Infrastructure
Para	Paragraph
PDS	Post Design Services
PT	Project Team
RAF	Royal Air Force
RCD	Residual Current Device
REME	Royal Electrical and Mechanical Engineers
RE	Royal Engineers
RLC	Royal Logistic Corps
RM	Royal Marines
RS	Royal Signals
SEI	Service Engineering Instruction
SME	Subject Matter Expert
SOP	Standard Operating Procedures
ST	Specialist Task
TDOL	Technical Documents On-Line
Tel	Telephone
UK	United Kingdom
V	Volt
W	Watt

SYMBOLS

8 The following symbols are used in this category:

°C	degrees Celsius
-	minus
±	plus or minus
%	percent



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MAINTENANCE SCHEDULE

INTRODUCTION

- 1 This Maintenance Schedule is the authority for carrying out all scheduled maintenance tasks on the subject equipment and takes precedence over any other conflicting publication.
- 2 The person on a unit or formation with delegated responsibility for the specified equipment, who is also competent and experienced in that role, is responsible for ensuring that the operations detailed in this Maintenance Schedule are properly carried out. The operations are only to be carried out by personnel who, through either professional trade training or an equipment specific formal training course, are appropriately qualified. The aforementioned responsible person may also order any operation to be carried out more frequently than specified, if conditions under which the equipment operated render it necessary.
- 3 Scheduled Maintenance is to be recorded in the appropriate equipment document in accordance with single service regulations.
- 4 Serial numbers left blank in the tables may be taken up by amendment action at a later date.

DEFINITIONS

- 5 As far as this document is concerned, the following definitions apply:
 - 5.1 Examine. Carry out a survey of the condition of an item without dismantling, unless specifically instructed to do so in the relevant task requirement. The condition of an item may be impaired by the following:
 - 5.1.1 Insecurity of attachment.
 - 5.1.2 Cracks or fractures.
 - 5.1.3 Corrosion, contamination or deterioration.
 - 5.1.4 Distortion.
 - 5.1.5 Loose or missing fasteners.
 - 5.1.6 Chafing, fraying, scoring or wear.
 - 5.1.7 Faulty or broken locking devices.
 - 5.1.8 Loose clips or packing, obstruction of, or leakage from pipelines.
 - 5.1.9 Discoloration due to overheating or leakage of fluids.
 - 5.1.10 Damage due to external sources.
 - 5.2 Check. Make a comparison of measurement of time, pressure, temperature, resistance, dimension or other quantity, with a known figure.
 - 5.3 Operate. As far as possible, ascertain that a component or system functions correctly without the use of test equipment or reference to measurement.
 - 5.4 Replenish. Refill a container to a predetermined level, pressure or quantity. This includes any necessary cleaning of orifices, examination of caps, covers, gaskets and washers, renewal of locking devices and clearing of vents.



-
- 5.5 Replace. Remove an item and then fit a new or reconditioned item.

WARNINGS, CAUTIONS AND MAINTENANCE NOTES

6 Before any maintenance task is carried out, the WARNINGS, CAUTIONS and Maintenance NOTES preceding the appropriate table must be read and understood.

MAINTENANCE INTERVALS AND AREAS OF RESPONSIBILITY

NOTE

The information contained in the Tables is equipment specific and should reflect the manufacturer's recommendations and equipment usage.

7 Table 4 - Action on Receipt. The maintenance detailed in Table 4 covers the action taken when the equipment arrives on a unit. These operations will normally be of a once only nature, e.g. the recording of lifting equipment with the appropriate test authority, actions that are necessary to be undertaken before the equipment is put into service or actions that are only required during the running in period. The maintenance detailed in Table 4 maintenance must be carried out by appropriately trained personnel, as described in Para 2.

8 Table 5 - Out of Phase Maintenance. The maintenance tasks detailed in Table 5 covers tasks that do not fall into line with the time/usage interval requirements of Table 6 or 7. The maintenance detailed in Table 5 maintenance must be carried out by appropriately trained personnel, as described in Para 2.

9 Table 6 - Operator Maintenance. The maintenance tasks detailed in Table 6, Maintenance Intervals A, B, C and D are to be carried out by appropriately trained personnel, as described in Para 2, as follows:

- 9.1 A - Daily before use (only on days used).
- 9.2 B - Daily after use (after the equipment has been operated).
- 9.3 C - Every 12 operating hours.

10 Table 7 - Time/Usage Maintenance. The maintenance detailed in Table 7, Maintenance Interval 1st, A, B, C and D must be carried out by appropriately trained personnel, as detailed in Para 2, at the following intervals:

- 10.1 1st - For new or replacement engines - after the 1st 25 operating hours.
- 10.2 A - Every 250 hours or 12 months, whichever occurs first.
- 10.3 B - Every 500 hours or 12 months (Mandated Equipment Inspection), whichever occurs first.
- 10.4 C - Every 1000 hours or 24 months, whichever occurs first.
- 10.5 D - Contains the Area Maintenance indicator which may be used, at the discretion of the responsible person identified at Para 2, to carry out Area Maintenance at the appropriate time/usage intervals.

11 Table 8 - Out of Use Maintenance. The Out of Use Maintenance in Table 8 is to be carried out in accordance with joint service regulations.

TABLE 1 EQUIPMENT APPLICABILITY

Serial (1)	Equipment Identification No. (2)	Designation (3)	Contract Numbers (4)
	6115-99-908-6784	GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V / 110 V AC, 28 V DC. (Drumgrange Ltd)	BFI C1/59

TABLE 2 FUELS, LUBRICANTS AND ASSOCIATED PRODUCTS
NOTES

(1) The products listed below are to be used on this equipment. Alternative products must not be used without the approval of an appropriate equipment support manager.

(2) Oil changes at the -15 °C point shall only be made on the advice of the responsible person identified at Para 2.

(3) The capacities listed are to be used as a guide only. A physical check is to be carried out to ensure that all fluid levels are correct. This check should be carried out with the equipment unladen and standing on level ground whenever possible.

Serial (1)	Assembly (2)	Product		Capacity	
		Above -15°C (3)	Below -15°C (4)	Litres (5)	Pints (6)
	Fuel, general purpose	Either AVTUR F34 or Dieso F54		-	-
	Engine Oil	OMD 90 or OX 90	OMD 55	0.9	-

TABLE 3 EQUIPMENT DATA

Serial (1)	Item (2)	Detail (3)
	Air Filter Housing: Air Filter Housing fastener torque Engine Oil Drain Plug: Engine oil drain plug torque Valves: Valve tappet clearance (cold)	 23 Nm (17 lb ft) 50 Nm (37 lb ft) 0.10 mm (0.004 inches)



TABLE 4 ACTION ON RECEIPT

12 The following WARNINGS and CAUTIONS must be read and understood before commencing these tasks.

WARNINGS

(1) EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.

(2) EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.

(3) F54 DIESO AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:

DO NOT RUN THE LFG

DO NOT SMOKE AVOID ALL NAKED FLAMES

AVOID OVERFILLING THE FUEL TANK/JERRYCAN

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG

(4) GUARDS AND COVERS. DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.

(5) JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.

(6) NOISE HAZARD. IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.

(7) PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).

(8) PERSONAL INJURY. THE LFG ALTERNATOR IS A PERMANENT MAGNET GENERATOR, CARE MUST BE TAKEN WHEN WORKING ON THE GENERATOR DUE TO THE HIGH STRENGTH OF THE MAGNETS WHICH COULD CAUSE PERSONAL INJURY.

(9) SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.

(10) SHOCK HAZARD. LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.

(11) SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.

(12) TOXIC FUMES. EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.

(13) HEALTH HAZARD. PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLES, BE HAZARDOUS TO HEALTH. PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.

CAUTIONS

(1) EQUIPMENT AIRFLOW. The generator should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.

(2) EQUIPMENT DAMAGE. Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.

(3) EQUIPMENT DAMAGE. During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

(4) EQUIPMENT DAMAGE. During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

(5) EQUIPMENT DAMAGE. The engine must not be operated with the oil level below the specified minimum level.

(6) EQUIPMENT DAMAGE. The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.



(7) **EQUIPMENT DAMAGE.** The Low Oil Pressure Switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.

(8) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.

(9) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

Serial (1)	Operation (2)
	Check
1	Equipment for damage
2	Tools and equipment against Complete Equipment Schedule (CES)
	Remove
3	Preservation, sealing and packaging where applicable
	Refit
4	Any components removed to aid transit
	Clean
5	Equipment, tools and attachments
	Read
6	Operator/User Handbook (AESP 6115-G-710-201) and learn position and function of all controls
	Report
7	Any defect or damage
	Service
8	Carry out Column (2) tasks of Table 6

TABLE 5 OUT OF PHASE MAINTENANCE

13 The following WARNING and CAUTIONS must be read and understood before commencing these maintenance tasks.

WARNINGS

(1) **PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).**

(2) **PERSONAL INJURY. THE LFG ALTERNATOR IS A PERMANENT MAGNET GENERATOR, CARE MUST BE TAKEN WHEN WORKING ON THE GENERATOR DUE TO THE HIGH STRENGTH OF THE MAGNETS WHICH COULD CAUSE PERSONAL INJURY.**

(3) SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.

(4) HEALTH HAZARD. PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLES, BE HAZARDOUS TO HEALTH. PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.

CAUTION

ENVIRONMENTAL HAZARD. It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.

MAINTENANCE NOTES

(1) Maintenance tasks bearing the trade task indicators (ST) (Specialist Task) must only be completed by an appropriately qualified person, as defined in Para 2. These tasks are not to be completed by a driver/operator.

(2) The engineering authority for the unit is to deem a person competent (e.g. a class 2 or above technical trade group person) to undertake the RCD test using BS 7671 Institution of Electrical Engineers (IEE) test equipment.

Serial (1)	Action (2)	Interval (3)
1	Renew engine oil filter strainer	On condition (Checked and cleaned every 1000 hrs and replaced only if damaged)
2	Replace Fuel Hoses	8 Years replace following NSNs: Circular pulse pump hose kit: 4720-99-153-8763 Square pulse pump hose kit: 4720-99-911-2739
3	Carry out RCD tests. Refer to Cat 522 (ST). (See Maintenance Notes (1) and (2))	After Level 3/4 repair of generator electrical system
4	Electrical tests. Refer to Cat 522 (ST). (See Maintenance Note (1))	After Level 3/4 repair of generator electrical system and at 12 monthly intervals

TABLE 6 OPERATOR MAINTENANCE

14 The following WARNINGS and CAUTIONS must be read and understood before commencing these tasks.

WARNINGS

(1) EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.



(2) EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.

(3) F54 DIESO AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:

DO NOT RUN THE LFG

DO NOT SMOKE AVOID ALL NAKED FLAMES

AVOID OVERFILLING THE FUEL TANK/JERRYCAN

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG

(4) GUARDS AND COVERS. DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.

(5) JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.

(6) NOISE HAZARD. IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.

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CAUTIONS

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(3) **EQUIPMENT DAMAGE.** During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

(4) **EQUIPMENT DAMAGE.** During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

(5) **EQUIPMENT DAMAGE.** The engine must not be operated with the oil level below the specified minimum level.

(6) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.

(7) **EQUIPMENT DAMAGE.** The Low Oil Pressure Switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.

(8) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.



(9) ENVIRONMENTAL HAZARD. There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

MAINTENANCE NOTES

(1) Maintenance interval C tasks may be carried out at any convenient break in LFG operation within the specified time frame.

(2) Maintenance tasks bearing the trade task indicators (ST) (Specialist Task) must only be completed by an appropriately qualified person, as defined in Para 2. These tasks are not to be completed by a driver/operator.

Serial (1)	Task (2)	Fig/Item No. (3)	Product (4)	Maintenance Interval		
				A (5)	B (6)	C (7)
	Before starting the engine					
1	Remove the Acoustic Cover		OMD 90 or OX 90			
2	Check/top up engine oil level			X		X
3	Check physical condition of Acoustic Cover, Top Cover, Louvre Cover and Tubular Frame			X	X	
4	Check Recoil Starter Pull Cord for signs of wear			X	X	
5	Ensure the engine Fuel Tank Cap is undamaged and securely fitted			X	X	
6	Check serviceability of Cables, Connectors and Hoses			X	X	
7	Ensure all Labels and Warning Notices are clean and legible			X	X	
8	Check Fuel Tank Drain Pipe for fuel contamination (water presence), drain off water if present			X	X	
9	Refit the Acoustic Cover			X		
	Start the engine. Refer to Cat 201					
10	Check for oil and fuel leaks, removing Acoustic Cover if necessary					
11	Check meters/indicators are functioning correctly				X	
12	Listen for any unusual engine noises				X	
13	Carry out Earth Leakage Unit Test. Refer to Cat 201			X	X	

(continued)

TABLE 6 OPERATOR MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/Item No. (3)	Product (4)	Maintenance Interval		
				A (5)	B (6)	C (7)
14	Check air inlet and outlet vents are clear of obstructions At conclusion of work/day					X
15	Shut down LFG				X	
16	Check for damage/faults				X	
17	Ensure equipment is ready for use				X	
18	Check the earth rod and lead is clean, free of paint and has serviceable termination studs and contacts			X	X	
19	Ensure all relevant entries are made in equipment documents In harsh, dusty, or dirty environments				X	
20	Remove the Acoustic Cover and Air Filter Cover. Check engine Air filter for damage and contamination. Replace Air Filter if necessary. Replace the Air Filter and Acoustic Cover NOTE The periodicity should be adjusted in response to the results of the initial series of checks					X

TABLE 7 TIME/USAGE MAINTENANCE

15 The following WARNINGS and CAUTIONS must be read and understood before commencing these tasks.

WARNINGS

(1) **PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).**

(2) **SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.**

(3) **SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.**



CAUTIONS

- (1) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.
- (2) **EQUIPMENT DAMAGE.** The Engine must not be operated with the oil level below the specified minimum level.
- (3) **SERVICING.** Do not attempt to service the generator or carry out any repairs while it is running. During servicing, follow health and safety executive recommendations regarding the handling and disposal of contaminated oil products.

MAINTENANCE NOTES

- (1) Maintenance tasks bearing the trade task indicators (ST) (Specialist Task) must only be completed by an appropriately qualified person, as defined in Para 2. These tasks are not to be completed by a driver/operator.
- (2) The engineering authority for the unit is to deem a person competent (e.g. a class 2 or above technical trade group person) to undertake the RCD test using BS 7671 Institution of Electrical Engineers (IEE) test equipment.

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval				
				1st (5)	A (6)	B (7)	C (8)	D (9)
1	Renew/Replace: Replace engine oil		OMD 90 or OX 90	X	X	X	X	
2	Replace air filter cartridge					X	X	
3	Replace engine fuel tank fuel filter					X	X	
	Clean							
4	Clean engine oil filter strainer (replace only if damaged)			X			X	
5	Clean cooling area/vents				X	X	X	
	Check/Adjust							
6	Check all screw connections for security of attachment			X	X	X	X	
7	Check/Adjust valve clearances			X	X	X	X	
	Inspect							
8	Check all output voltages are correct (ST) (See Maintenance Note (1))			X	X	X	X	
	Test							
9	Carry out RCD tests. Refer to Cat 522 (ST) (See Maintenance Notes (1) and (2))					X		

TABLE 8 OUT OF USE MAINTENANCE

16 The following WARNINGS and CAUTIONS must be read and understood before commencing these tasks.

WARNINGS

(1) **EARTHING. THE EARTH CABLE PROVIDED IS NOT TO BE LENGTHENED OR SHORTENED UNDER ANY CIRCUMSTANCES WITHOUT APPROVAL FROM THE DESIGN AUTHORITY.**

(2) **EARTHING. THE EQUIPMENT MUST BE PROPERLY EARTHED BEFORE ATTEMPTING TO OPERATE THE GENERATOR SET. WHEN USED WITH ANCILLARY EQUIPMENT, IT IS ESSENTIAL THAT THE EARTHING INSTRUCTIONS FOR THAT EQUIPMENT BE FOLLOWED. THE LFG EARTH SHOULD NOT BE REMOVED UNLESS SPECIFICALLY REQUIRED IN THE EARTHING INSTRUCTIONS FOR THE ANCILLARY EQUIPMENT.**

(3) **F54 DIESEL AND F34 AVTUR. DIESEL AND AVTUR FUELS ARE HIGHLY FLAMMABLE. WHEN REFUELLING:**

DO NOT RUN THE LFG

DO NOT SMOKE AVOID ALL NAKED FLAMES

AVOID OVERFILLING THE FUEL TANK/JERRYCAN

WIPE UP ANY SPILT FUEL PRIOR TO STARTING THE LFG

(4) **GUARDS AND COVERS. DO NOT OPERATE THE GENERATOR WITH LOOSE OR MISSING COVERS OR GUARDS. DO NOT REMOVE ANY COVERS OR GUARDS UNTIL AT LEAST 10 MINUTES AFTER THE GENERATOR HAS STOPPED.**

(5) **JERRYCAN ADAPTOR. DO NOT OPERATE THE GENERATOR UNLESS A JERRYCAN IS CONNECTED VIA THE JERRYCAN ADAPTOR AND PIPES SUPPLIED WITH THE GENERATOR. FAILURE TO COMPLY MAY CAUSE THE LFG FUEL TANK TO COLLAPSE.**

(6) **NOISE HAZARD. IF PERSONNEL ARE EXPOSED FOR PROLONGED PERIODS TO NOISE LEVELS IN EXCESS OF 80 DB(A), HEARING PROTECTION SHOULD BE PROVIDED AND WORN. THE LFG EMITS A MEASURED NOISE LEVEL OF BETWEEN 90 - 100 DB(A) THEREFORE HEARING PROTECTION MUST BE PROVIDED AND WORN WHEN WORKING WITHIN 1 METRE OF AN OPERATING LFG.**

(7) **PERSONAL INJURY. THE GENERATOR WEIGHS 76 KG NET AND 88 KG GROSS (INCLUDING FUEL AND CES). MANUAL HANDLING OF THE GENERATOR MUST BE IN ACCORDANCE WITH LOCAL MANUAL HANDLING ASSESSMENTS CARRIED OUT IN ACCORDANCE WITH JSP375. LOCAL MANUAL HANDLING ASSESSMENTS ARE ALSO TO BE CONDUCTED FOR THE ENGINE (38 KG) AND CONTROL BOX ASSEMBLY (32 KG).**

(8) **PERSONAL INJURY. THE LFG ALTERNATOR IS A PERMANENT MAGNET GENERATOR, CARE MUST BE TAKEN WHEN WORKING ON THE GENERATOR DUE TO THE HIGH STRENGTH OF THE MAGNETS WHICH COULD CAUSE PERSONAL INJURY.**

(9) **SHOCK HAZARD. DO NOT ATTEMPT TO SERVICE THE GENERATOR OR CARRY OUT ANY MAINTENANCE OR REPAIRS WHILST IT IS RUNNING.**



(10) **SHOCK HAZARD. LETHAL VOLTAGES ARE PRESENT IN THE GENERATOR EQUIPMENT. ENSURE THAT THE CIRCUIT BREAKERS ARE OPEN WHEN CONNECTING OR DISCONNECTING LOADS. CHECK THE RESIDUAL CURRENT DEVICE (RCD) OPERATION FOR EACH VOLTAGE SETTING. DO NOT CONNECT OR DISCONNECT LOADS WHILST THE GENERATOR IS RUNNING.**

(11) **SKIN BURNS. EXERCISE EXTREME CARE WHEN CARRYING OUT TASKS ADJACENT TO THE ENGINE AND ITS EXHAUST PIPE AS BOTH ITEMS CAN RETAIN HEAT FOR SEVERAL MINUTES AFTER SHUT DOWN. ALLOW SUFFICIENT TIME FOR THE EQUIPMENT TO COOL DOWN BEFORE CARRYING OUT ANY MAINTENANCE TASKS.**

(12) **TOXIC FUMES. EXHAUST GASES ARE TOXIC AND CAN QUICKLY REACH HARMFUL CONCENTRATIONS IF PRECAUTIONS ARE NOT FOLLOWED. THE EXHAUST GASES MUST ALWAYS BE VENTED TO FREE AIR. THIS CAN BE ACHIEVED EITHER BY POSITIONING THE LFG OUTDOORS OR BY USE OF THE EXHAUST EXTENSION WHICH SHOULD BE ROUTED SO AS TO TERMINATE IN FREE AIR. THE EXHAUST MUST NOT BE MUFFLED OR RESTRICTED IN ANY WAY AS THE RESULTING BACK PRESSURE COULD CAUSE ADDITIONAL LEAKS TO OCCUR OR DAMAGE THE ENGINE. EXTREME CARE MUST BE TAKEN TO ENSURE THAT EXHAUST GASES ARE VENTED SAFELY AWAY FROM ANY PERSONNEL WORKING IN THE VICINITY, WITH DUE CONSIDERATION GIVEN TO THE TOPOGRAPHY AND PREVAILING WIND CONDITIONS. HARMFUL CONCENTRATIONS CAN BE ODOURLESS AND NOT VISUALLY PERCEPTIBLE.**

(13) **HEALTH HAZARD. PERSONNEL MUST BE AWARE OF THE HAZARDS INVOLVED WITH PRODUCTS THAT CAN, IF NOT PROPERLY HANDLES, BE HAZARDOUS TO HEALTH. PERSONNEL MUST ADHERE TO THE INFORMATION DETAILED IN JSP 515 AND THE CURRENT SAFETY DATA SHEET. PERSONNEL MUST WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN REQUIRED.**

CAUTIONS

(1) **EQUIPMENT AIRFLOW.** The generator should be operated in an open space with free air flow on all sides and at least 1 metre from other equipment and buildings. The surrounding area should be free of combustible material.

(2) **EQUIPMENT DAMAGE.** Damage to the engine will occur if the generator is operated at very low loads for a prolonged period. A minimum running load of 500 W should always be applied. A 500 W load is displayed as approximately 25% when viewed on the % Load meter on the AC Control Panel. Additionally, if the generator is operated on a low load for a prolonged period, then a significantly higher load (approximately 70%) should be applied for a period of about 30 minutes before switching Off or for up to 1 hour until moisture condensate no longer emerges from the exhaust.

(3) **EQUIPMENT DAMAGE.** During operation the engine and exhaust pipes can get very hot. Allow sufficient time for the equipment to cool down before carrying out tasks such as wrapping the LFG in plastic sheet during the preparation for transport.

(4) **EQUIPMENT DAMAGE.** Operation of the AC Output Voltage Selector Switch (SW 1) when the generator is running under load will cause the inverter to trip out. Shut down must be carried out by the LFG operator to reset the inverter safety circuit.

(5) **EQUIPMENT DAMAGE.** The engine must not be operated with the oil level below the specified minimum level.

(6) **EQUIPMENT DAMAGE.** The fuel flow and return hoses provided are not to be lengthened or shortened under any circumstances without approval from the Design Authority.

(7) **EQUIPMENT DAMAGE.** The Low Oil Pressure Switch does not automatically shut down the engine. It only provides a warning via the illumination of the LED and, secondarily, the loss of output to any connected loads. Shut down must be carried out manually by the LFG operator.

(8) **ENVIRONMENTAL HAZARD.** It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants. Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use only authorized waste disposal sites.

(9) **ENVIRONMENTAL HAZARD.** There is NO requirement to place the LFG on a drip tray prior to operation; the design is such that it is capable of operating without such addition. Any contaminants found on the floor after use should be cleaned up as per local regulations and also investigated as this may indicate an issue with the LFGs operation.

TABLE 8 OUT OF USE MAINTENANCE (continued)

Serial (1)	Operation (2)	Fig/ Item No. (3)	Product (4)
1	<p>Equipments are to be stored, where possible, under cover. If equipments have to be stored in the open they should not be placed under overhanging trees or structures. The equipment should be sealed in heavy duty plastic sheeting.</p> <p>Periodic maintenance, if circumstances permit, is to coincide with inspection at the following intervals:</p> <p style="padding-left: 40px;">6 months - open storage</p> <p style="padding-left: 40px;">12 months - covered storage</p> <p>Prior to equipment entering storage:</p> <p>1 The Generator is to be fully inspected and necessary repairs completed.</p> <p>2 The Generator is to be thoroughly cleaned, signs of rust removed and coats of primer and finishing paints applied to surfaces as necessary.</p> <p>3 Items liable to rust are to be smeared with a coating of oil or grease.</p> <p>Annual whilst equipment in storage</p> <p>4 During storage equipments are to be visually inspected annually or more frequently if considered necessary, for signs of deterioration due to age or storage conditions.</p> <p>5 Annually during storage, or more frequently if considered necessary, carry out Table 6 Operator Maintenance Checks and run the engine to full working temperature.</p> <p>NOTE</p> <p style="padding-left: 40px;">The engine should be rotated at least 5 times by hand, with the Engine Speed Control Lever at stop, prior to start up, to allow the engine lubricating oil to circulate.</p>		



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ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS (EMER) - FORM 10

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*Full Title of AESP/EMER (Not the AESP/EMER Number)							
*Edition	*Amendment	*Chapter	*Page	*Paragraph	Figure	Instruction	Other
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**ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND
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Form 10 Guidance

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- AESP Details shall enter the following details:
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Ministry
of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-711 ILLUSTRATED PARTS CATALOGUE

Issue No. 003

Amendment No. 004

June 2018

Sponsored for use in the
United Kingdom Ministry of Defence
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Operational Infrastructure

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Amdt No.	Incorporated by (Signature)	Date
1	INCORPORATED	Oct 14
2	INCORPORATED	Feb 15
3	INCORPORATED	Mar 17
4	INCORPORATED	Jun 18
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ILLUSTRATED PARTS CATALOGUE

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PREFACE

Sponsor: Operational Infrastructure (OI)
Project No.:
File Ref: DG Log (Land) ESS 13/8/18

Publication Authority: OI

INTRODUCTION

1 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

2 AESPs are issued under UK MOD authority and where AESPs specify action is to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores, subject to the provisions of Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DIN), Standard Operating Procedures (SOP) or by local regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication it is to be taken as the overriding authority.

4 This Illustrated Parts Catalogue (IPC) is designed as an aid to the identification of components, parts or assemblies of parts of the equipment and to provide information necessary for demanding spares.

5 This IPC may list some or all of the parts comprising the equipment concerned, but only those parts assigned a NATO Stock Number, Service Catalogue or Reference Number will normally be available as spares. Should there be a requirement for an item not assigned a number, demands may be submitted quoting AESP, Item Number, Figure reference and Item Name. Where a manufacturer's reference is known, this should also be quoted.

Quantity

6 The figure in the 'Number Off' column specifies the quantity for the unit (or assembly, sub-assembly etc); it does not indicate the quantity to be demanded.

Demands

7 When demanding Spare Parts the following particulars must be quoted:

- 7.1 Management Code (Man Code).
- 7.2 NATO Stock Number.
- 7.3 Item Name.
- 7.4 Name of equipment for which the part is required.
- 7.5 Manufacturer's reference, if known.

NOTE

Alternatives quoted apply only to the equipment covered by this IPC.

Modification state

8 When appropriate, a list at the front of each chapter or sub-chapter will indicate the modification numbers which have been incorporated in the IPC by amendment action, subsequent to initial issue.

Annotations

9 The following notations are used in this publication:

9.1 A/R When appearing in the 'Number Off' column indicates that the quantity is 'as required'.

9.2 NI (Not Illustrated) when appearing with a number in the 'Fig Item' column indicates that the item is not illustrated.

9.3 NP (Non Provisioned) when appearing in the 'NATO Stock Number' column indicates that the item may be illustrated, but not available from stock as a replacement item.

9.4 REF In the 'Number Off' column indicates that the item is listed for reference purposes only.

Abbreviations

10 Abbreviations and symbols used in the IPC have been approved and are listed separately.

Amendments

11 Amendments to the catalogue will be published as and when necessary. They will be numbered consecutively, and the amendment record sheet is to be completed for each amendment list embodied.

12 New or amended material will be highlighted by side lining to show the extent of the amendment.

Indentations

13 Items are listed in a logical assembly/disassembly order and are indented by the 'dot system' in which each 'dot' depicts the relationship of the item to the main assembly:

MAIN ASSEMBLY

Attaching parts for main assembly

. FIRST LEVEL OF BREAKDOWN (Sub-assembly or detailed part of main assembly)

. Attaching parts for the first level

. . SECOND LEVEL OF BREAKDOWN (Sub-sub-assembly or detailed part of Sub-assembly)

. . Attaching parts for second level

. . . THIRD LEVEL OF BREAKDOWN (Sub-sub-sub-assembly or detailed part of Sub-sub-assembly)

. . . Attaching parts for third level

. . . . FOURTH LEVEL OF BREAKDOWN (Sub-sub-sub-assembly or detailed part of Sub-sub-assembly)

. . . . Attaching parts for fourth level



NOTES

- (1) Attaching parts for the Main Assembly are listed at the end of the text of the Main Assembly.
- (2) NATO Stock Numbers (NSNs) quoted in this IPC will supersede any number that may have been allotted previously.

Description

14 The item Description and Annotation Block is also to convey additional information to the IPC user, such as:

- 14.1 Related location details, i.e. another AESP or Chapter/Item within the AESP.
- 14.2 Circuit reference numbers relating to the illustration.

Source, maintenance, recoverability

15 The Source, Maintenance, Recoverability (SMR) codes indicates the manner of acquiring items for maintenance, repair or overhaul of end items, maintenance levels authorised to perform required maintenance functions and disposition action to be taken on unserviceable items. The following SMR codes with their detail could be used (Table 1):

TABLE 1 SOURCE, MAINTENANCE, RECOVERABILITY CODES

SOURCE		MAINTENANCE		RECOVERABILITY	Reserved for User					
		USE	REPAIR							
1st Position	2nd Position	3rd Position		4th Position	5th Position	6th Position				
P	Procurable	A	O	Remove/replace at Organizational Level	Z	No repair	Z	Non-repairable Condemn at 3rd Position Level		
		B							E	Support Equipment Stocked
		C								
		D	F	Support Equipment Non-stocked						
		E			G	Life of System Support				
		F	K	Component Of a Repair Kit			F	Repair at Intermediate	F	Repairable Condemn at Organizational (or Field or Depot)
G	M	Manufacture			O	Organizational				
H			A	Assemble			D	Intermediate	D	Overhaul at Depot
I	X	Non-procured			D	Remove/replace at Depot Level				
J			A	Requisition NHA						
K							B	Reclamation or Requisition by Part Number		
L	C	Mfg Drawings								

Interchangeability

16 The Interchangeability (ICY) indicates the interchangeability of two or more items at the same location either for the same configuration or, when a Part Number change is involved, across two different Configuration Standards. The column contains two characters: the first character is used to indicate the item's ICY with the succeeding item listed, eg -9, 9- and 99. The following ICY codes with their detail could be used (Table 2):

TABLE 2 ICY CODES

CODE	DETAIL
0	Item not interchangeable
1	Obsolescent item - Fully interchangeable
2	Replacement item - Fully interchangeable
3	Pre-modified item not to be used to replace another item at a different Configuration Standard
4	Fully interchangeable with but not identical to other ICY '4' items. It is only used when items are presented at the same Configuration Standard
5	Item interchangeable with the ICY '3' item above
6	Qualified interchangeability, see related location detail in Item Description column
9	Fully interchangeable item with same NSN but different part number

Usable on Code Equipment

17 The Usable on Code Equipment (UCE) identifies Equipment Variants and Configurations (V/C) and provides the means of relating the applicability of breakdown parts to their respective equipments. It is represented by an alpha character 'A' to 'H' with remaining characters space filled. It is not shown if there is only one build standard. Breakdown parts are represented by the alpha code of their appropriate equipment V/C and the remaining spaces in the column are filled with hyphens '-'.

Usable on Code Assembly

18 The Usable on Code Assembly (UCA) identifies Equipment V/C and provides the means of relating the applicability of breakdown parts to their respective assemblies. It is represented by an alpha character 'A' to 'F' with remaining characters space filled and where printed will be prefixed by a double asterisk (**). Breakdown parts are represented by the alpha code of their appropriate equipment V/C and the remaining spaces in the column are filled with hyphens '-'.

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

19 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.



Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
7	1	Illustrated Parts Catalogue	711	*	*	*
	2	Commercial Parts List	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published

Associated publications

20 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201 SEI 14411	Earthing and Earthing Protection Safety Precautions for Electrical Equipment

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

21 The following abbreviations are used in this category:

A	Ampere
AC	Alternating Current
AESP	Army Equipment Support Publication
Amdt	Amendment
AP	Air Publication
A/R	As Required
assy	Assembly
AVM	Anti-Vibration Mounting
BFPO	British Forces Post Office
Chap	Chapter
contd	Continued
dc	Direct Current
DE&S	Defence Equipment and Support
dim	dimension(s)
DMC	Domestic Management Code
e.g.	for example
EMER	Electrical and Mechanical Engineering Regulations
Eqpt	Equipment
Fig	Figure
FRACAS	Failure Reporting Analysis and Corrective Action System
ICY	Interchangeability
ID	Inside Diameter
in.	Inch(es)
IPC	Illustrated Parts Catalogue
JAMES	Joint Asset Management and Engineering Solutions
kW	kiloWatt
LE	Land Equipment
LED	Light Emitting Diode
LFG	Lightweight Field Generator
lg	Length (long)
LH	Left Hand
m	metre
MCB	Miniature Circuit Breaker
mm	millimetre(s)
MoD	Ministry Of Defence
MR	Metre(s)
NATO	North Atlantic Treaty Organisation
NI	Not Illustrated
No.	Number
NP	Not-Provisioned
NSCM	NATO Supply Code for Manufacturers
NSN	NATO Stock Number
OI	Operational Infrastructure

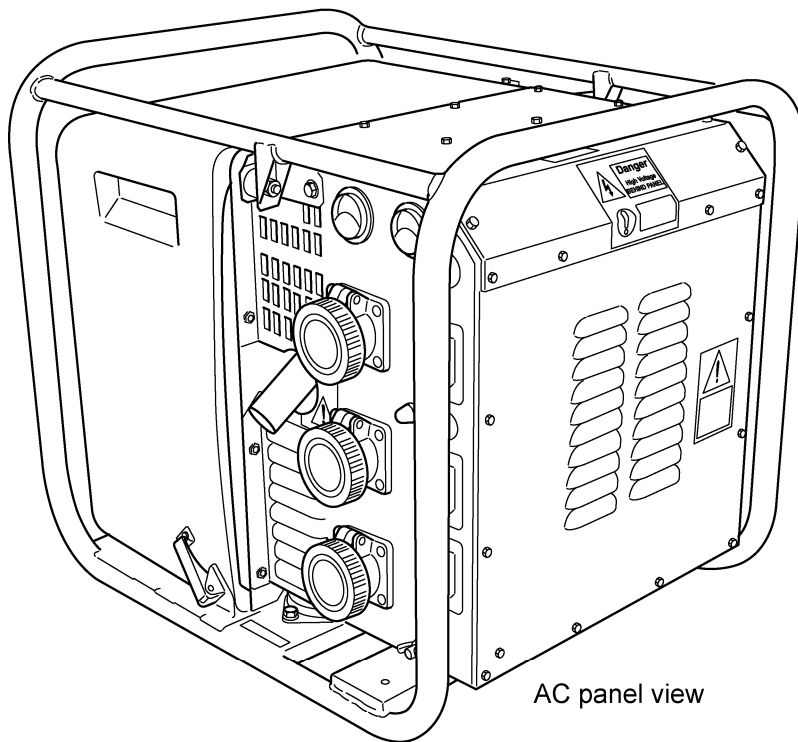
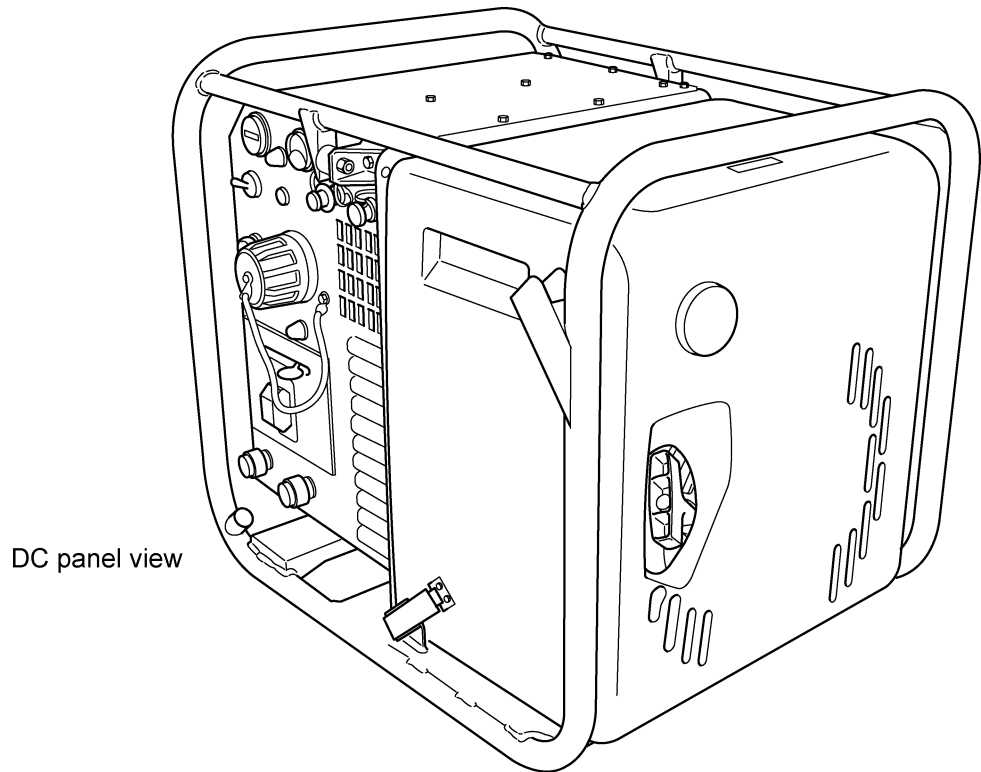
OSP	Operational Support Programme
PT	Project Team
RAF	Royal Air Force
Ref	Reference
RH	Right Hand
SEI	Service Engineering Instruction
SME	Subject Matter Expert
SMR	Source, Maintenance, Recoverability
TDOL	Technical Documents On-Line
Tel	Telephone
UCE	Usable on Code Equipment
UK	United Kingdom
V	Volt
V/C	Variants and Configurations
w	width
UCA	Usable on Code Assembly
UCE	Usable on Code Equipment
UK	United Kingdom
V	Volt
V/C	Variants and Configurations
V-TEG	Variable Tactical Electrical Generator

SYMBOLS

22 There are no symbols applicable to this category.

CHAPTER 1
GENERAL INFORMATION
CONTENTS

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Index of related IPCs and sub-chapters.....	3
Index of main assemblies and sub-assemblies to related IPCs or part/drawing numbers and chapter	4
Index of illustrations to chapter and figure numbers	5



Lightweight Field Generator (LFG)

INDEX OF RELATED IPCs AND SUB-CHAPTERS

Chap Plan No.	Chap 2 Sub-Chap No.	Item Name and (if applicable) Related IPC Reference No.	Part No./ Drawing No.	DMC Amry	NATO Stock No.



**INDEX OF MAIN ASSEMBLIES AND SUB-ASSEMBLIES
TO
RELATED IPCs OR PART/DRAWING NUMBERS AND CHAPTER**

Item	Part No.	Chapter

**INDEX OF ILLUSTRATIONS
TO
CHAPTER AND FIGURE NUMBERS**

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Accessories	2	14
Crankcase	2	9
Crankshaft.....	2	8
Cylinder head	2	6
Engine components	2	4
Generator set, diesel engine driven, 2 kW, 230/110V ac, 28V dc (Drumgrange Ltd).....	2	1
Injection equipment	2	11
Inverter and starters	2	3
Maintenance kit	2	15
Mounts, covers and frame.....	2	2
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Panels and cables	2	12
Piston, con rod and cylinder	2	7
Rotor, stator and pulse pump.....	2	13
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CHAPTER 2
PARTS LIST
GENERATOR SET DIESEL ENGINE DRIVEN
CONTENTS

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Record of modifications	3



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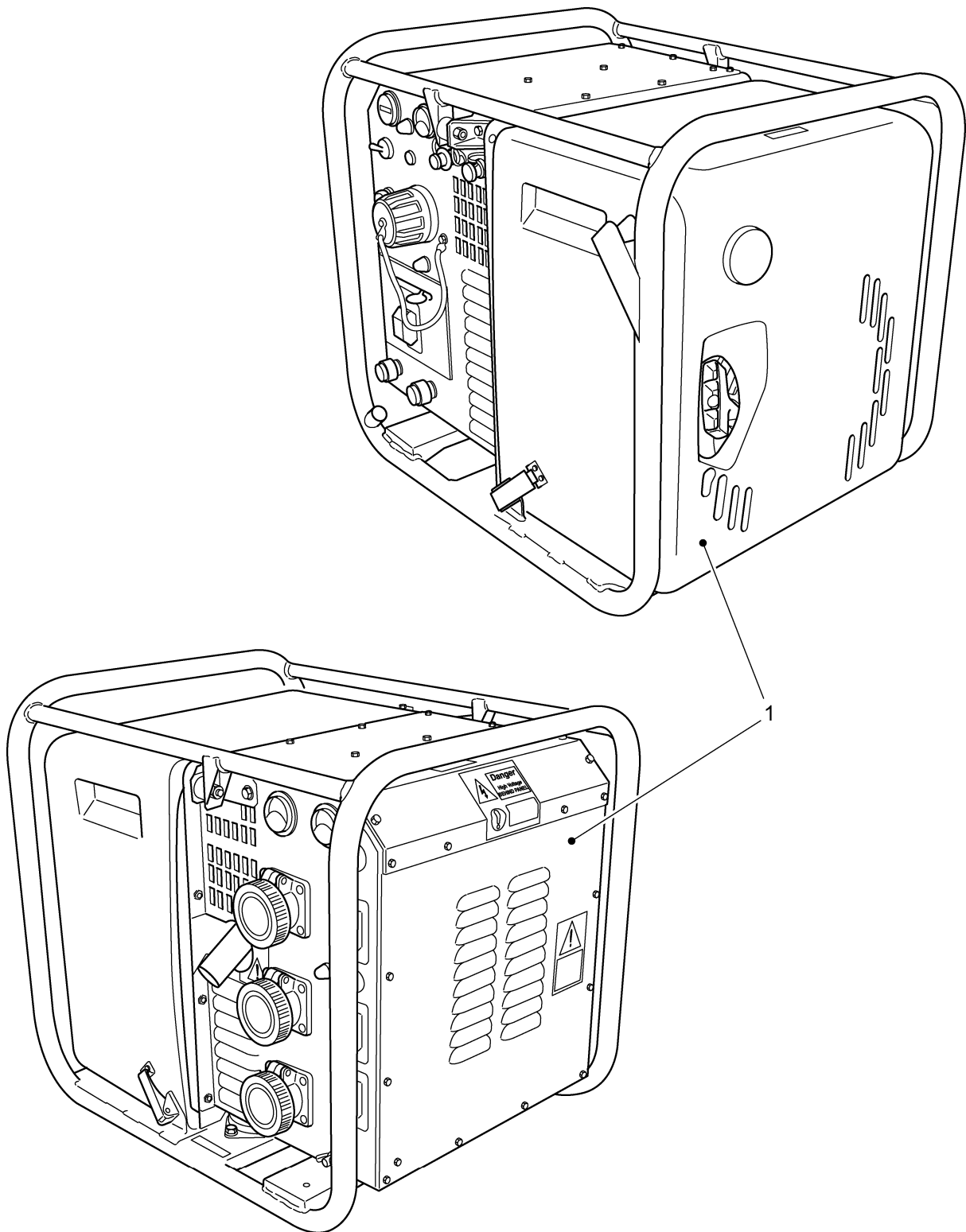


Fig 1 Generator set, diesel engine driven, 2 kW, 230/110 Vac, 28 Vdc (Drumgrange Ltd)

PARTS LIST

Fig 1 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
1	LFG2kW	6115-99-908-6784	GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230/110 VAC, 28 VDC (DRUMGRANGE LTD)		REF	Asset Code JR 88173500
NI 2			. MOUNTS, COVERS AND FRAME			Refer to Fig 2
NI 3			. INVERTER AND STARTERS			Refer to Fig 3
NI 4			. ENGINE COMPONENTS			Refer to Fig 4
NI 5			. PANELS AND CABLES			Refer to Fig 12
NI 6			. ROTOR, STATOR AND PULSE PUMP			Refer to Fig 13
NI 7			. ACCESSORIES			Refer to Fig 14
NI 8			. MAINTENANCE KITS			Refer to Fig 15

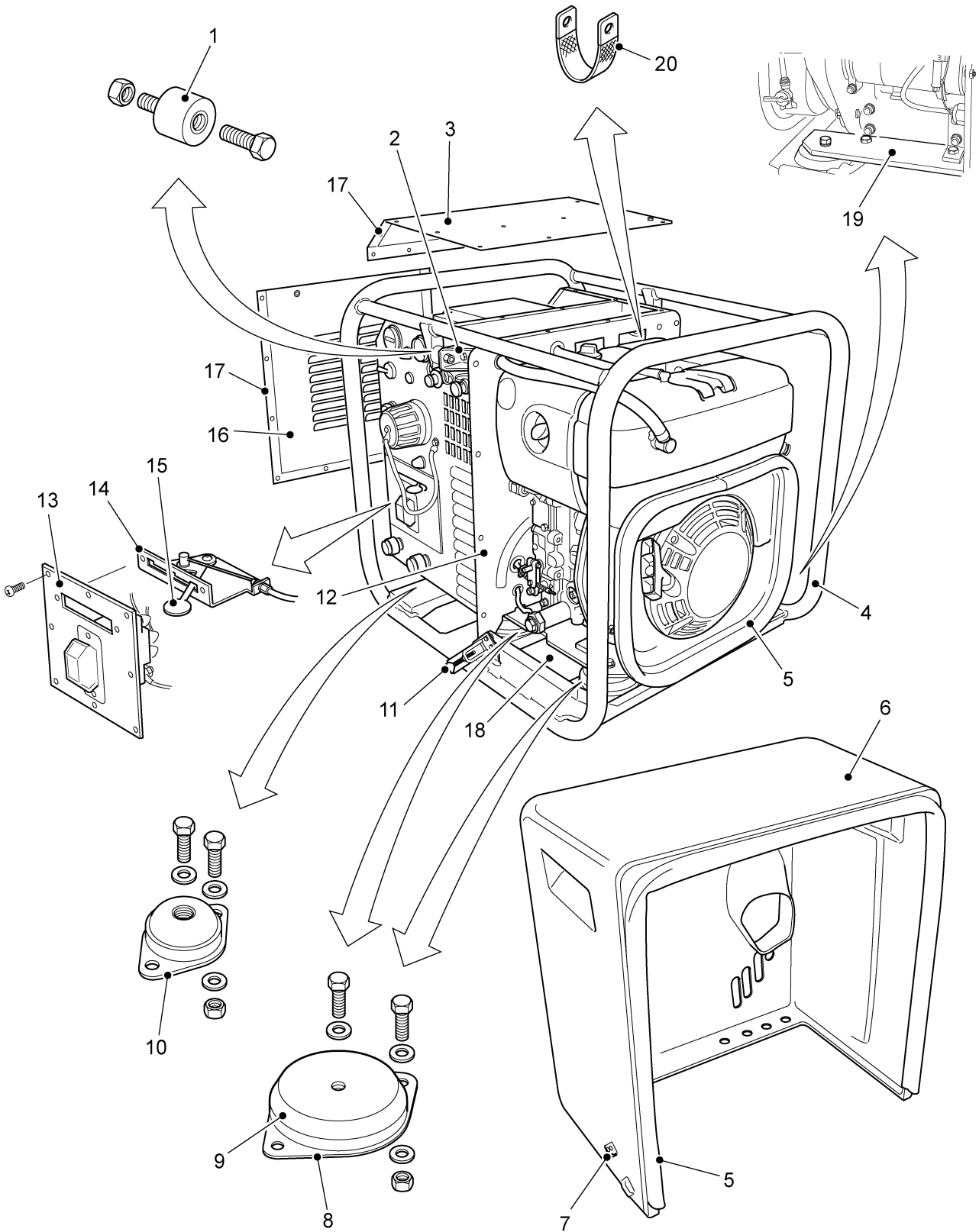


Fig 2 Mounts, covers and frame

PARTS LIST

Fig 2 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			MOUNTS, COVERS AND FRAME			
1	LFG2kW	5340-99-346-4393	. AVM TOP CONTROL BOX	2520MF13-45(M8)	2	
2	LFG2kW	5340-99-837-0498	. CONTROL BOX TOP MOUNT	040-749/28	1	
3	LFG2kW	5340-99-724-3007	. CONTROL COVER TOP	040-749/13B	1	
4	LFG2kW	5999-99-748-2206	. TUBULAR FRAME ASSEMBLY	040-749/15	1	
5	LFG2kW	9390-14-501-5754	. SIDE SEAL	1011-12	2.9 MR	A/R
6	LFG2kW	6115-99-225-8717	. ACOUSTIC COVER	040-749/01	1	
7	LFG2kW	5340-99-131-9231	. KEEPER, BLACK STAINLESS	K4/2338-63	2	
8	LFG2kW	5340-99-571-7178	. AVM ENGINE	FM8027-45C	4	
9	LFG2kW	6115-99-151-8414	. PLASTIC COVER AVM	070-496	4	
10	LFG2kW	5340-99-549-8878	. AVM WITH TOECAP	FM209/9/9/45	2	
11	LFG2kW	5340-01-521-5980	. DRAW LATCH	91-512-25	2	
12	LFG2kW	2815-99-979-1693	. ENGINE COVER BAFFLE	040-749/129	1	
13	LFG2kW	5340-99-226-1119	. PANEL, CONTROL BOX SIDE	040-749/36	1	
14	LFG2kW	5340-99-994-6063	. BRACKET, THROTTLE CONTROL	040-749/31	1	
15	LFG2kW	5340-99-476-6407	. THROTTLE CONTROL LEVER	040-749/30	1	
16	LFG2kW	5340-99-794-9587	. CONTROL COVER LOUVRE	040-749/46	1	
17	LFG2kW	5999-99-519-4302	. RFI C-WRAP 18 MM x 2 MM	RFI-CWRAP-18X2-15	10 MR	A/R
18	LFG2kW	2510-99-925-1095	. ENGINE SUPPORT BRACKET, RH	040-749/16X	1	
19	LFG2kW	2510-99-851-0661	. ENGINE SUPPORT BRACKET. LH	040-749/23X	1	
20	LFG2kW	6150-99-702-8025	. BRAID FLAT 10 SQ MM, 85 MM LONG, M8 TO M5	017607	1	Exhaust manifold to control panel housing

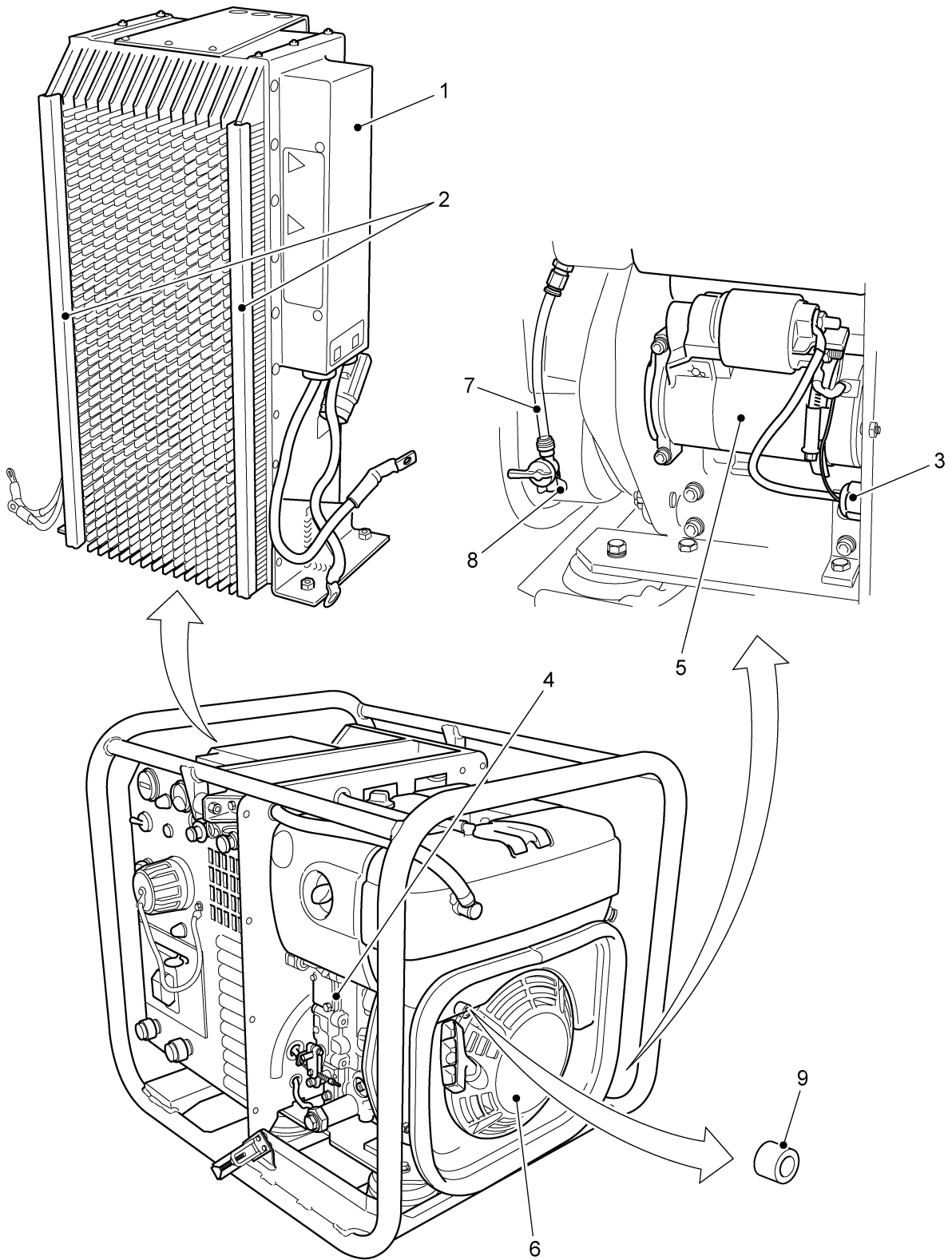


Fig 3 Inverter and starters

PARTS LIST

Fig 3 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			INVERTER AND STARTERS		REF	
1	LFG2kW	6130-99-375-9457	. INVERTOR/REGULATOR	022-002	1	
2	LFG2kW	9390-12-363-1368	. EDGE PROTECTION	1010-10	0.7 MR	A/R
3	LFG2kW	5975-99-254-5275	. CABLE GLAND	135 313	1	
4(1)	LFG2kW	2815-12-369-9447	. ENGINE ASSEMBLY	017 961 03		
				1B20-S-204C	1	
4(2)	LFG2kW	2815-12-366-5933	. ENGINE ASSEMBLY	017 961 04		
				1B20-S-204D	1	
5	LFG2kW	2920-12-363-2214	.. START MOTOR, ELECTRIC	50483300	1	
6	LFG2kW	2990-01-523-7100	.. STARTER, RECOIL	014938	1	
7	LFG2kW	4720-99-727-1554	.. FUEL DRAIN ASSEMBLY	170-482	1	
8	LFG2kW	5340-99-216-0558	.. SPRING CLIP	151-206	1	
9	LFG2kW	5365-12-365-8529	. STAND-OFF (PULL START MECHANISM)	04139000	4	
NI 10	LFG2kW	5340-12-389-3251	.. CLAMP MOUNTING, STARTER MOTOR	14099100.100 3	1	

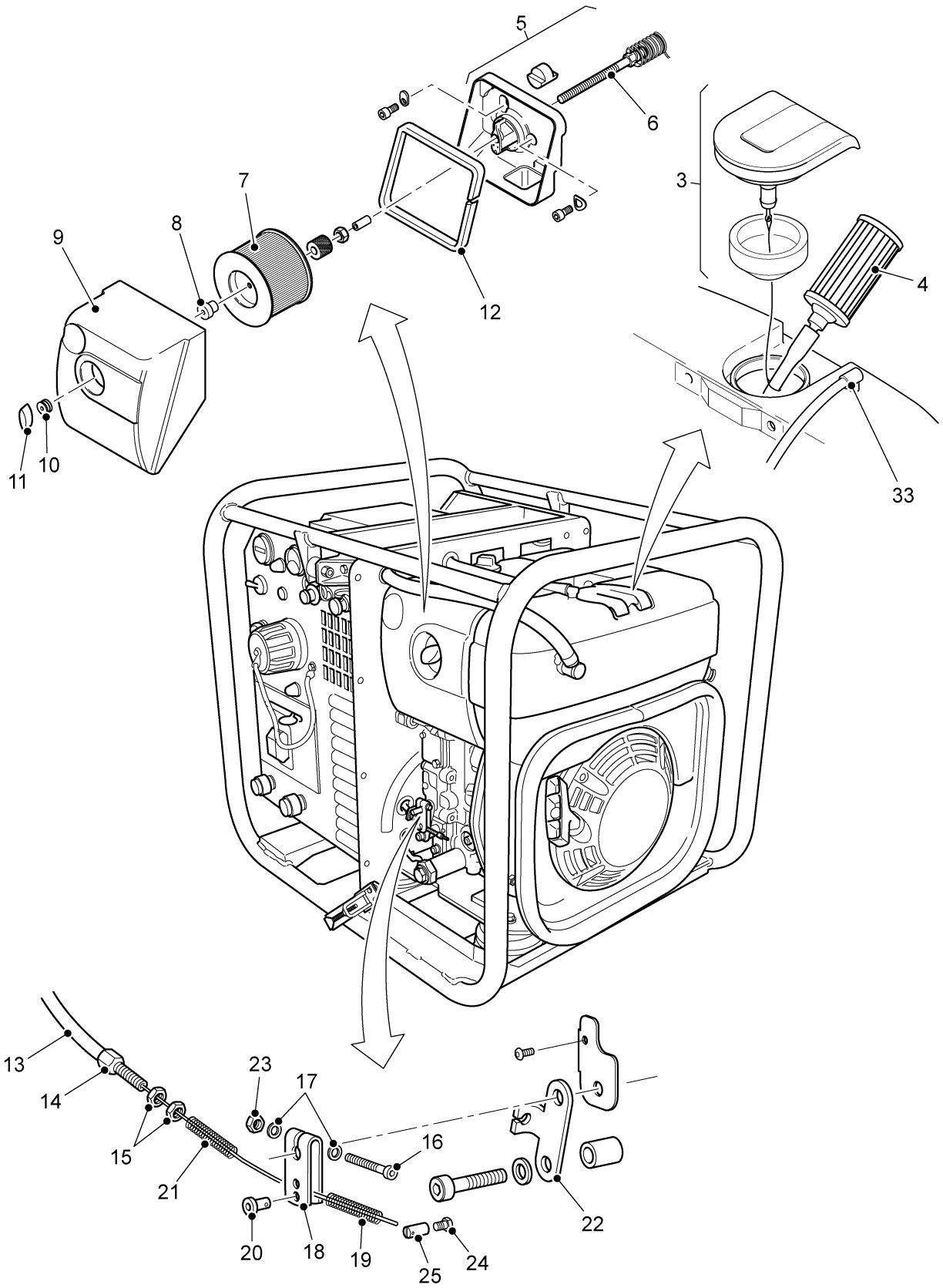


Fig 4 Engine components

PARTS LIST

Fig 4 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			ENGINE COMPONENTS		REF	
1(1)	LFG2kW	2815-12-369-9447	. ENGINE ASSEMBLY	017 961 03	1	1B20-S-204C
1(2)	LFG2kW	2815-12-366-5933	. ENGINE ASSEMBLY	017 961 04	1	1B20-S-204D
2	LFG2kW	2910-99-870-2841	.. HOT CLIMATE FUEL TANK	017533	1	
3	LFG2kW	2590-12-366-2518	.. CAP FILLER OPENING (FUEL CAP)	015 353 02	1	
4	LFG2kW	2910-12-364-1980	.. FILTER ELEMENT, FUEL	017 854 00	1	
5	LFG2kW	2940-12-387-0459	.. AIR FILTER HOUSING, BASE ASSEMBLY	014996	1	
6	LFG2kW	2920-12-364-6611	... GLOW PLUG (COLD START DEVICE/ ELEMENT RETAINER)	017 353 00	1	
7	LFG2kW	2940-12-355-8118	.. AIR CLEANER, ELEMENT	017 343 00	1	
8	LFG2kW	5310-12-366-0198	.. KNURLED NUT M6 (AIR CLEANER ELEMENT SECURING)	504 543 00	1	
9	LFG2kW	5340-14-543-5711	.. COVER, AIR FILTER HOUSING	016 991 01	1	
10	ONAN	5325-12-365-9377	.. WASHER (AIRFILTER SECURING)	504 358 00	1	
11	LFG2kW	5310-01-525-7464	.. NUT, PLAIN WING (AIR FILTER COVER)	504 522 00	1	
12	LFG2kW	5330-12-363-4243	.. SEALING STRIP AIR FILTER	052 161 00	1	
13	LFG2kW	2990-99-260-9337	.. CABLE, ENGINE SPEED CONTROL	060-806	1	
14	LFG2kW	4730-12-383-4040	.. ADJUSTER THROTTLE CABLE	051 412 00	1	
15	G1	5310-12-156-4991	.. 1/2 NUT M6 (LOCKING THROTTLE CABLE ADJUSTER)	501 444 00	2	
16		NP	.. BOLT M5 x 30 MM 8.8 A3C	505 119 00	1	
17	4ND	5310-12-174-2405	.. WASHER 5.3 MM ID	502 163 00	2	
18	LFG2kW	1680-01-524-5920	.. THROTTLE LEVER	051 177 00	1	
19	LFG2kW	5360-12-383-2069	.. SPRING, THROTTLE CABLE (HATZ)	504 846 00	1	
20	LFG2kW	4320-01-526-2833	.. CABLE STOPPER (THROTTLE)	504 831 00	2	
21	LFG2kW	5360-99-613-6131	.. SPRING, THROTTLE CABLE (HGI)	151-225	1	
22	LFG2kW	5340-99-151-8402	.. CLAMP, THROTTLE CABLE	040-749/32	1	
23		NP	.. NUT	500 943 00	1	
24		NP	.. BOLT M4 x 10 MM	500 250 00	1	
25		NP	.. TERMINATION, CABLE	504 830 00	1	
NI 26			.. TIMING CASE COVER			Refer to Fig 5
NI 27			.. CYLINDER HEAD			Refer to Fig 6
NI 28			.. PISTON, CON ROD AND CYLINDER			Refer to Fig 7
NI 29			.. CRANKSHAFT			Refer to Fig 8
NI 30			.. CRANKCASE			Refer to Fig 9
NI 31			.. OIL PUMP			Refer to Fig 10
NI 32			.. INJECTION EQUIPMENT			Refer to Fig 11
33		4730-12-380-7642	. ELBOW HOSE	017603	1	

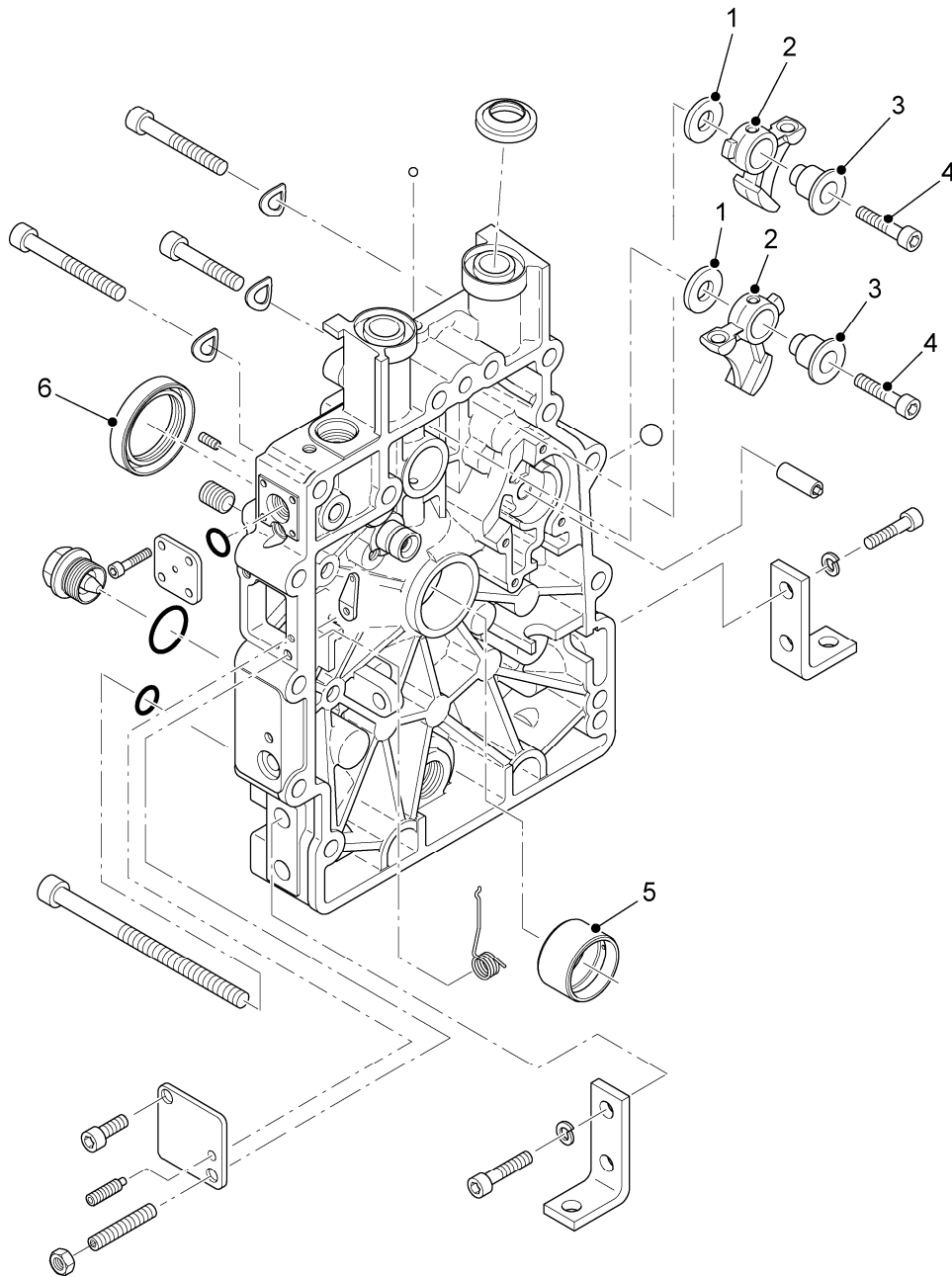


Fig 5 Timing case cover

PARTS LIST

Fig 5 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			TIMING CASE COVER		REF	
1	LFG2kW	5310-12-337-2909	. WASHER, (CAM FOLLOWER)	037 941 00	2	
2	LFG2kW	2815-12-365-8868	. CAM FOLLOWER	050 534 00	2	
3	LFG2kW	3120-12-337-3889	. CAM FOLLOWER SPINDLE	037 942 01	2	
4	LFG2kW	5306-01-549-8680	. CAP HEAD BOLT M6 x 25 MM	504 579 00	2	
5	LFG2kW	3120-12-365-8866	. BUSHING, CRANKSHAFT MAIN BEARING (TIMING COVER END)	050 531 00	1	
6	LFG2kW	5330-99-380-7136	. SEAL, CRANKSHAFT TIMING CASE END	400 337 01	1	

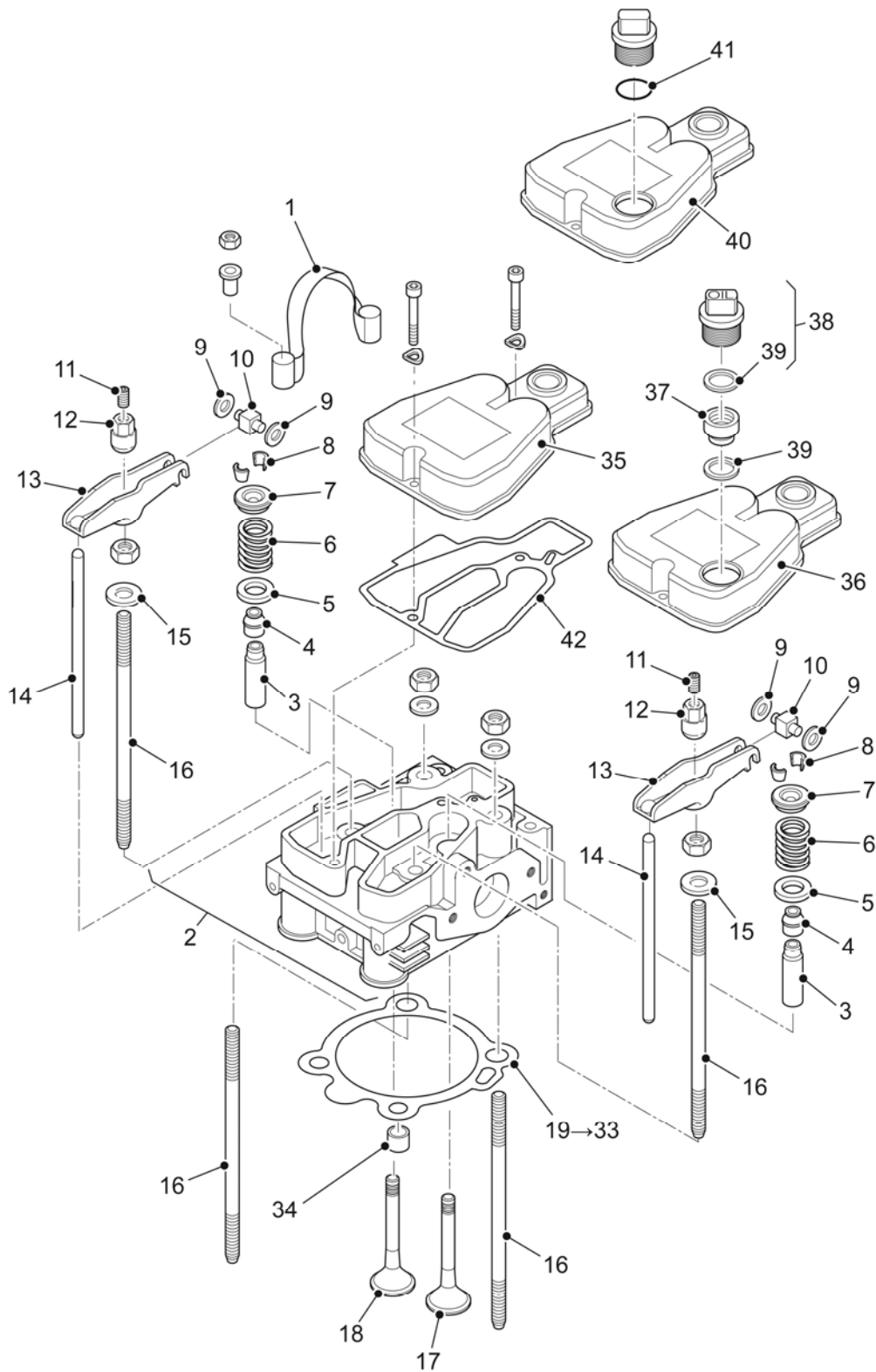


Fig 6 Cylinder head

PARTS LIST

Fig 6 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			CYLINDER HEAD		REF	
1	LFG2kW	3940-12-366-2519	. LIFTING STRAP, ENGINE	041 176 10	1	
2(1)	LFG2kW	4310-12-366-0650	. CYLINDER HEAD COMPLETE W/VALVE GUIDES (EPA 1)	015 002 40	1	For Engine #s 10028xxxxxxx
2(2)	LFG2kW	2815-12-384-9815	. CYLINDER HEAD COMPLETE W/VALVE GUIDES (EPA 2)	018 576 02	1	For Engine #s 30030xxxxxxx
2(3)	LFG2kW	2815-12-384-0514	. CYLINDER HEAD COMPLETE W/VALVE GUIDES	015 002 42	1	
3	LFG2kW	4310-12-366-0651	. VALVE GUIDE	051 194 00	2	
4	LFG2kW	2815-12-365-8862	. SEAL, VALVE STEM	504 258 00	2	
5	LFG2kW	5310-12-365-9900	. WASHER, (VALVE SPRING BASE SEAT)	040 937 00	2	
6	LFG2kW	5360-12-365-8671	. VALVE SPRING	040 936 00	2	
7	LFG2kW	5310-12-366-0649	. SPRING SEAT, VALVE	040 938 00	2	
8	LFG2kW	2815-12-365-8861	. COLLET, VALVE	504 257 00	4	
9	LFG2kW	5310-12-365-9899	. WASHER, VALVE TAPPET	052 407 00	4	
10	LFG2kW	5340-12-365-8531	. VALVE TAPPET	050 911 01	2	
11	LFG2kW	5305-12-181-3588	. SCREW GRUB M8 (VALVE CLEARANCE ADJUSTMENT)	505 131 00	2	
12	LFG2kW	5310-12-366-0314	. NUT/ROCKER SEAT	050 547 00	2	
13	LFG2kW	2815-12-385-2178	. ROCKER ARM, ENGINE POPPET VALVE OPENING	050 509 02	2	
14	LFG2kW	2815-12-365-8863	. PUSHROD	050 540 00	2	
15	LFG2kW	5310-12-365-9901	. WASHER, CYLINDER HEAD STUD	050 612 01	4	
16	LFG2kW	5307-12-366-0066	. STUD, CYLINDER HEAD M8 x 128 MM	050 625 00	4	
17	LFG2kW	2815-12-365-8864	. VALVE INTAKE	050 532 00	1	
18	LFG2kW	2815-12-365-8865	. VALVE EXHAUST	050 533 00	1	
19	LFG2kW	5330-12-366-0954	. GASKET CYLINDER HEAD (SHIM) 0.3 MM	050 594 00	1	} Refer to Cat 523 to determine correct size required
20	LFG2kW	5330-12-384-0595	. GASKET CYLINDER HEAD (SHIM) 0.35 MM	042 520 00	1	
21	LFG2kW	5330-12-366-0955	. GASKET CYLINDER HEAD (SHIM) 0.4 MM	050 595 00	1	
22	LFG2kW	5330-12-384-0598	. GASKET CYLINDER HEAD (SHIM) 0.45 MM	042 521 00	1	
23	LFG2kW	5330-12-366-0956	. GASKET CYLINDER HEAD (SHIM) 0.5 MM	050 596 00	1	
24	LFG2kW	5330-12-384-0600	. GASKET CYLINDER HEAD (SHIM) 0.55 MM	042 522 00	1	
25	LFG2kW	5330-12-366-0957	. GASKET CYLINDER HEAD (SHIM) 0.6 MM	050 597 00	1	
26	LFG2kW	5330-12-384-0636	. GASKET CYLINDER HEAD (SHIM) 0.65 MM	042 523 00	1	
27	LFG2kW	5330-12-366-0958	. GASKET CYLINDER HEAD (SHIM) 0.7 MM	050 598 00	1	
28	LFG2kW	5330-12-384-0638	. GASKET CYLINDER HEAD (SHIM) 0.75 MM	042 524 00	1	
29	LFG2kW	5330-12-366-0959	. GASKET CYLINDER HEAD (SHIM) 0.8 MM	050 599 00	1	
30	LFG2kW	5330-12-384-0640	. GASKET CYLINDER HEAD (SHIM) 0.85 MM	042 525 00	1	
31	LFG2kW	5330-12-366-0960	. GASKET CYLINDER HEAD (SHIM) 0.9 MM	050 600 00	1	
32	LFG2kW	5330-12-362-7292	. GASKET CYLINDER HEAD (SHIM) 0.95 MM	042 526 00	1	
33	LFG2kW	5330-12-366-0961	. GASKET CYLINDER HEAD (SHIM) 1.0 MM	050 601 00	1	
34	LFG2kW	5330-12-366-0962	. LOCATING RING, CYLINDER HEAD & GASKET	040 075 00	1	
35	LFG2kW	2815-12-383-4138	. ROCKER COVER ENGINE	050 473 21	1	

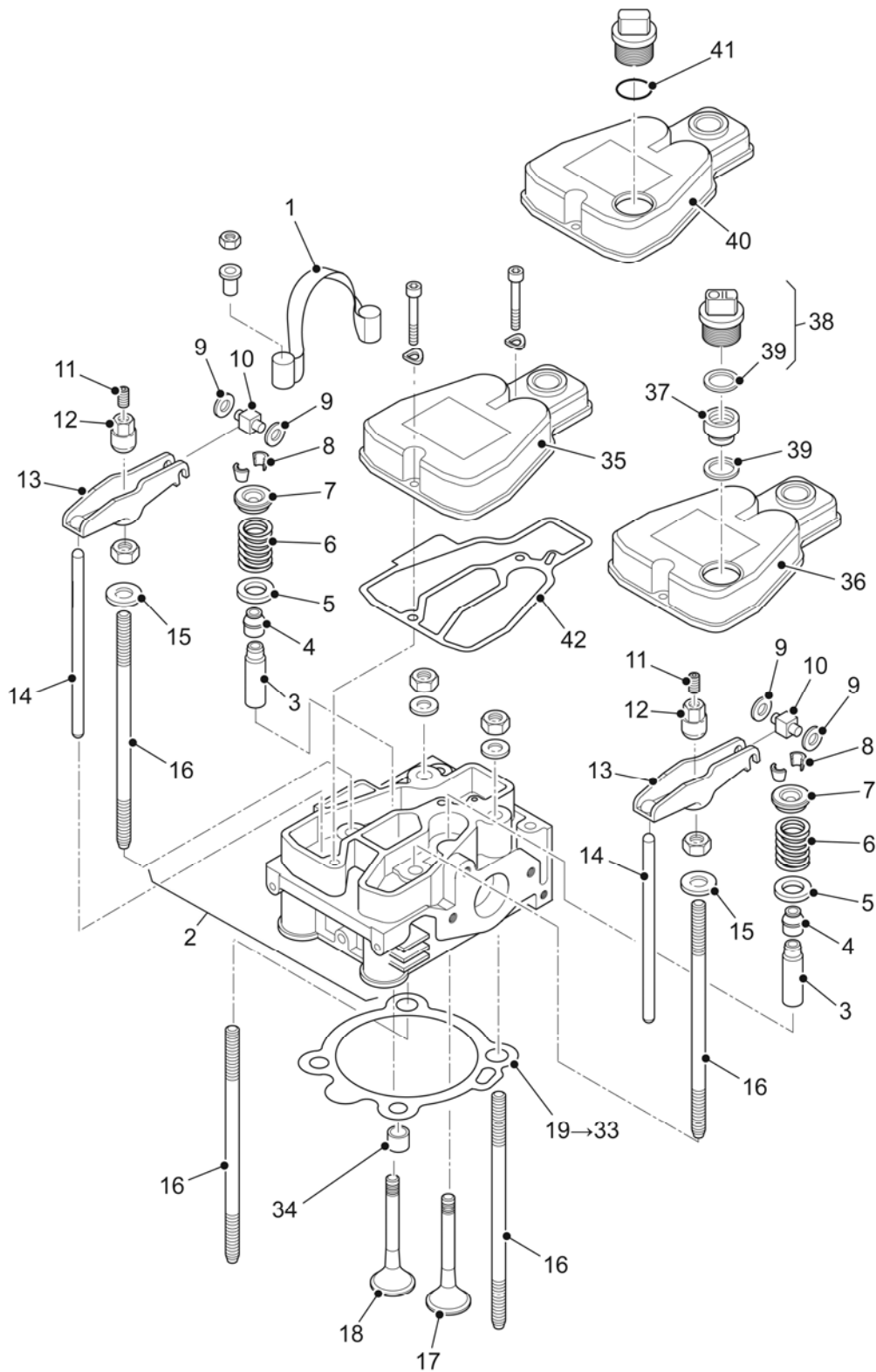


Fig 6 Cylinder head

PARTS LIST

Fig 6 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
36	LFG2kW	2815-12-383-0051	CYLINDER HEAD - Contd . ROCKER COVER WITH FILLER NECK (ENGINE)	051 374 31	1	For Engine #s 30030xxxxxxx
37	LFG2kW	2815-12-383-4124	. EXTENSION/FILLER NECK (ENGINE ROCKER COVER)	053 211 00	1	For Engine #s 30030xxxxxxx
38	LFG2kW	2590-01-282-5087	. FILLER CAP (ENGINE ROCKER COVER)	019 365 00	1	For Engine #s 30030xxxxxxx
39	LFG2kW	5330-12-383-2647	. . O- RING FILLER NECK & CAP	052 784 01	2	For Engine #s 30030xxxxxxx
40		NP	. ROCKER COVER ENGINE	051 374 30	1	For Engine #s 10028xxxxxxx
41		NP	. O-RING, FILLER CAP	052 784 00	1	For Engine #s 10028xxxxxxx
42	LFG2kW	5330-12-356-4207	. GASKET, ENGINE ROCKER COVER	050 557 00	1	

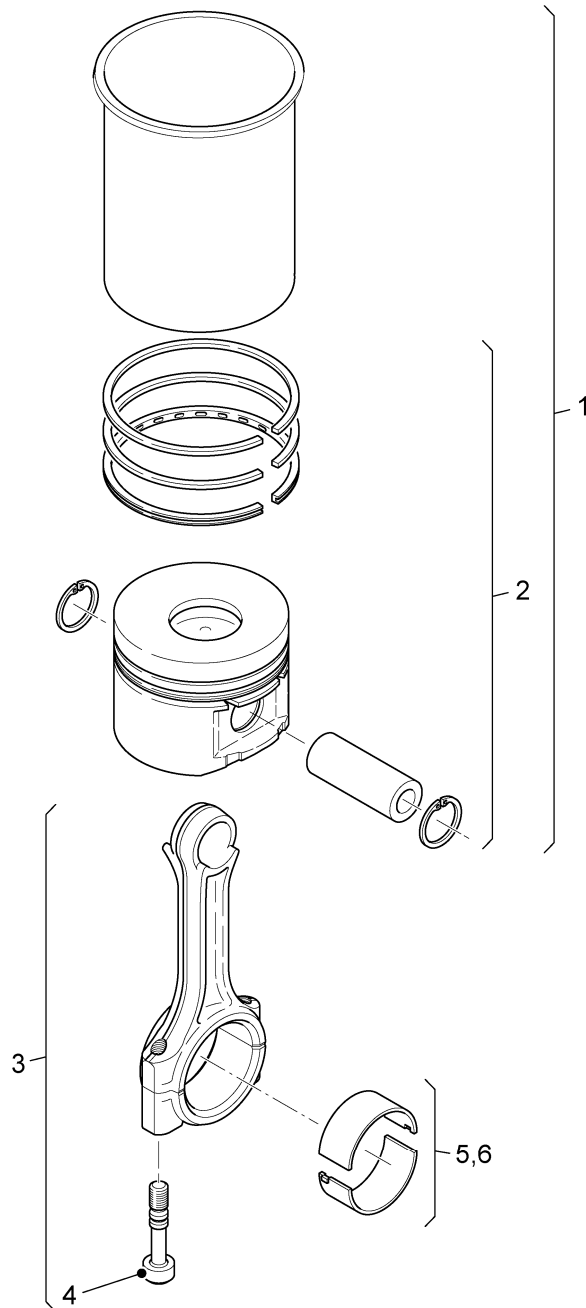


Fig 7 Piston, con rod and cylinder

PARTS LIST

Fig 7 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			PISTON, CON ROD AND CYLINDER		REF	
1(1)	LFG2kW	2815-01-546-4611	. CYLINDER LINER W/PISTON	015 545 20	1	For Engine #s 30030xxxxxxxx
1(2)	LFG2kW	2815-12-384-0473	. CYLINDER LINER W/PISTON	015 545 10	1	For Engine #s 10028xxxxxxxx
2(1)	LFG2kW	2815-12-365-8871	. . PISTON COMPLETE WITH PIN & RINGS	013 481 10	1	For Engine #s 10028xxxxxxxx
2(2)	LFG2kW	2815-12-384-0475	. . PISTON COMPLETE WITH PIN & RINGS	013 481 20	1	For Engine #s 30030xxxxxxxx
3	LFG2kW	2815-12-365-8872	. CONNECTING ROD COMPLETE	015 001 00	1	
4	LFG2kW	5305-12-366-0316	. . BOLT, CON ROD BIG END CAP	050 469 00	1	
5	LFG2kW	3120-01-527-3744	. BEARING SHELL BIG END	015 757 00	1	
6	LFG2kW	3120-12-384-0467	. BEARING SHELL BIG END (0.5 MM UNDER SIZE)	015 819 00	1	

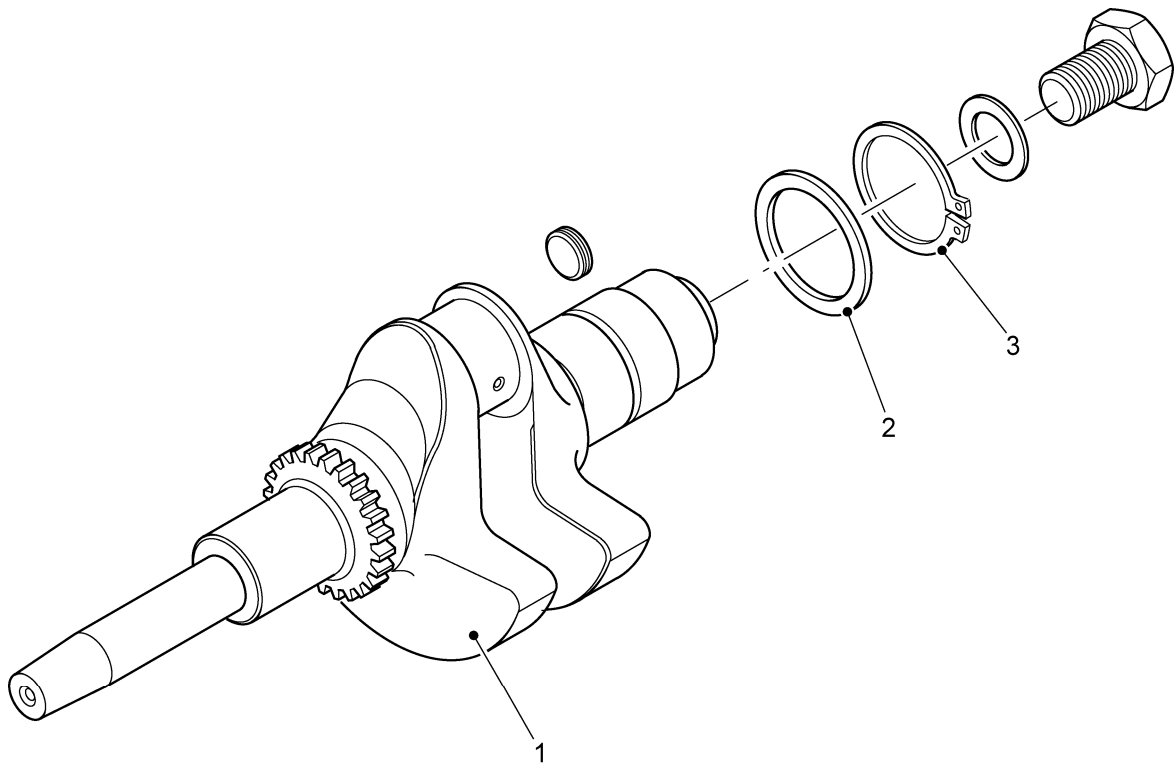


Fig 8 Crankshaft

PARTS LIST

Fig 8 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			CRANKSHAFT		REF	
1	LFG2kW	2815-12-384-0477	. CRANKSHAFT	018 609 00	1	
2	LFG2kW	5365-12-174-2626	. WASHER/PACKING (CRANKSHAFT FLY WHEEL END)	400 325 00	1	
3	6MT1	5325-99-910-8246	. CIRCLIP/SPRING CLIP (CRANKSHAFT FLY WHEEL END)	501 206 00	1	

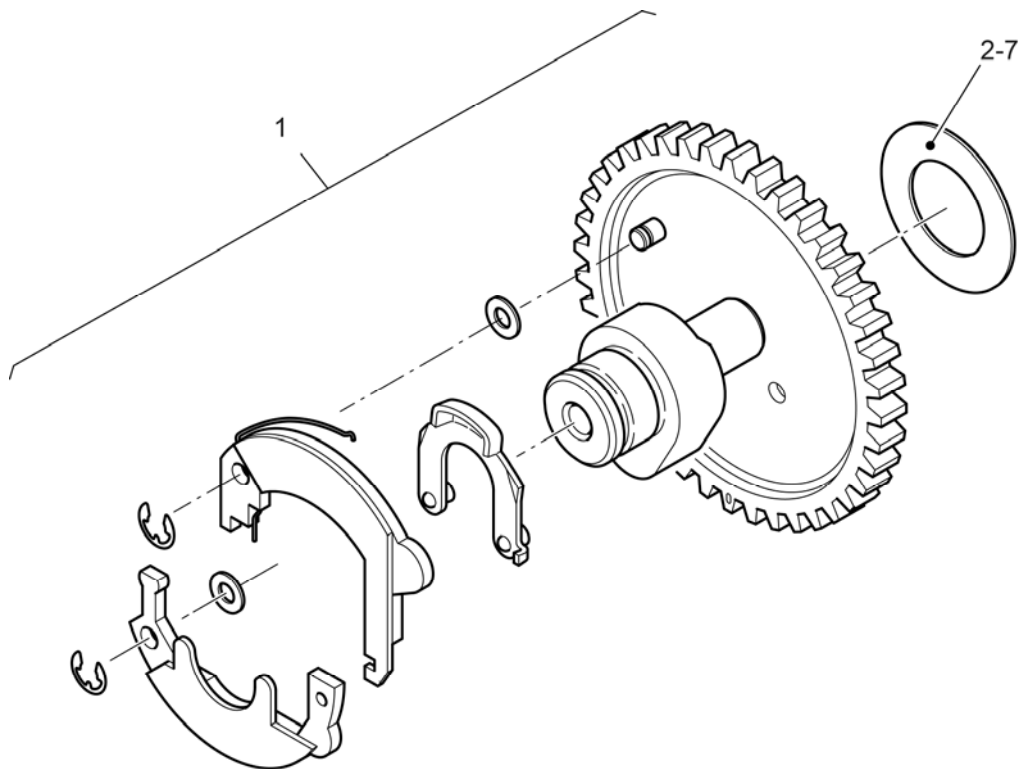


Fig 9 Camshaft

PARTS LIST

Fig 9 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			CAMSHAFT		REF	
1(1)	LFG2kW	2815-12-365-8870	. CAMSHAFT	015 035 22	1	For Engine #s 10028xxxxxxxx
1(2)	LFG2kW	2910-12-386-9673	. CAMSHAFT	015 035 23	1	Engine #s 30030xxxxxxxx
2	LFG2kW	5310-12-366-0069	. SHIM 0.9 MM	041 217 00	1	
3	LFG2kW	5310-12-365-9903	. SHIM 1.0 MM	041 121 00	1	
4	LFG2kW	5310-12-365-9904	. SHIM 1.1 MM	041 122 00	1	
5	LFG2kW	5310-12-365-9905	. SHIM 1.2 MM	041 123 00	1	
6	LFG2kW	5310-12-365-9906	. SHIM 1.3 MM	041 251 00	1	
7	LFG2kW	5310-12-365-9907	. SHIM 1.4 MM	041 252 00	1	

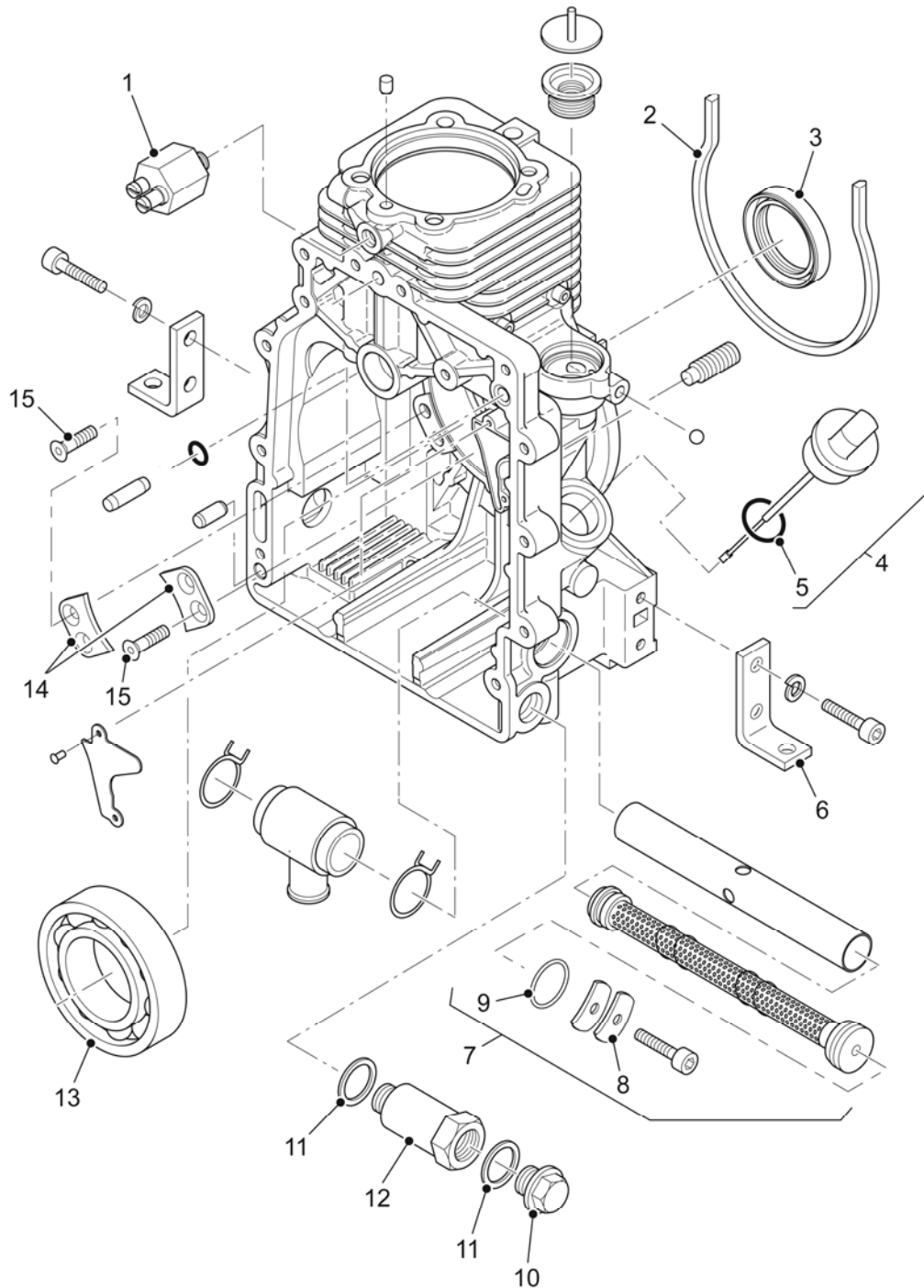


Fig 10 Crankcase

PARTS LIST

Fig 10 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			CRANKCASE			REF
1	LFG2kW	5930-12-176-2232	. SWITCH, OIL PRESSURE	501 555 00	1	
2	LFG2kW	5330-12-366-1913	. SEAL, CRANKCASE - FLYWHEEL HOUSING	040 980 00	1	
3	LFG2kW	5330-01-525-9672	. SEAL, CRANKSHAFT FLYWHEEL END	504 232 00	1	
4	LFG2kW	6680-12-383-0185	. FILLER CAP WITH DIP STICK (OIL LEVEL)	013 160 00	1	
5	LFG2kW	5330-12-355-7484	. . O- RING, DIP STICK	041 250 00	1	
6	LFG2kW	5342-12-366-2148	. L- BRACKET, ENGINE MOUNT	040 993 02	4	
7	LFG2kW	2940-12-346-9235	. STRAINER, ENGINE OIL FILTER	015 427 02	1	
8	LFG2kW	5360-12-363-5186	. . SPRING, ENGINE OIL FILTER	051 482 00	2	
9	LFG2kW	5331-12-363-4241	. . O-RING, ENGINE OIL FILTER	504 759 01	1	
10	7SDP	5365-12-142-8108	. PLUG, OIL DRAIN	503 731 00	1	
11	LFG2kW	5330-12-156-4535	. GASKET, OIL DRAIN	504 698 00	2	
12	LFG2kW	4730-99-154-2856	. OIL DRAIN PIPE	040-749/40	1	
13	LFG2kW	3110-01-527-3743	. BALL BEARING, CRANKSHAFT MAIN BEARING (CRANKCASE)	504 233 00	1	
14	LFG2kW	3110-12-365-8873	. PLATE RETAINING, CRANKSHAFT MAIN BEARING (CRANKCASE)	040 944 00	2	
15	LFG2kW	5305-99-213-6935	. SCREW COUNTER SUNK, (RETAINING PLATE) (M6 x 16 MM)	505 643 00	4	

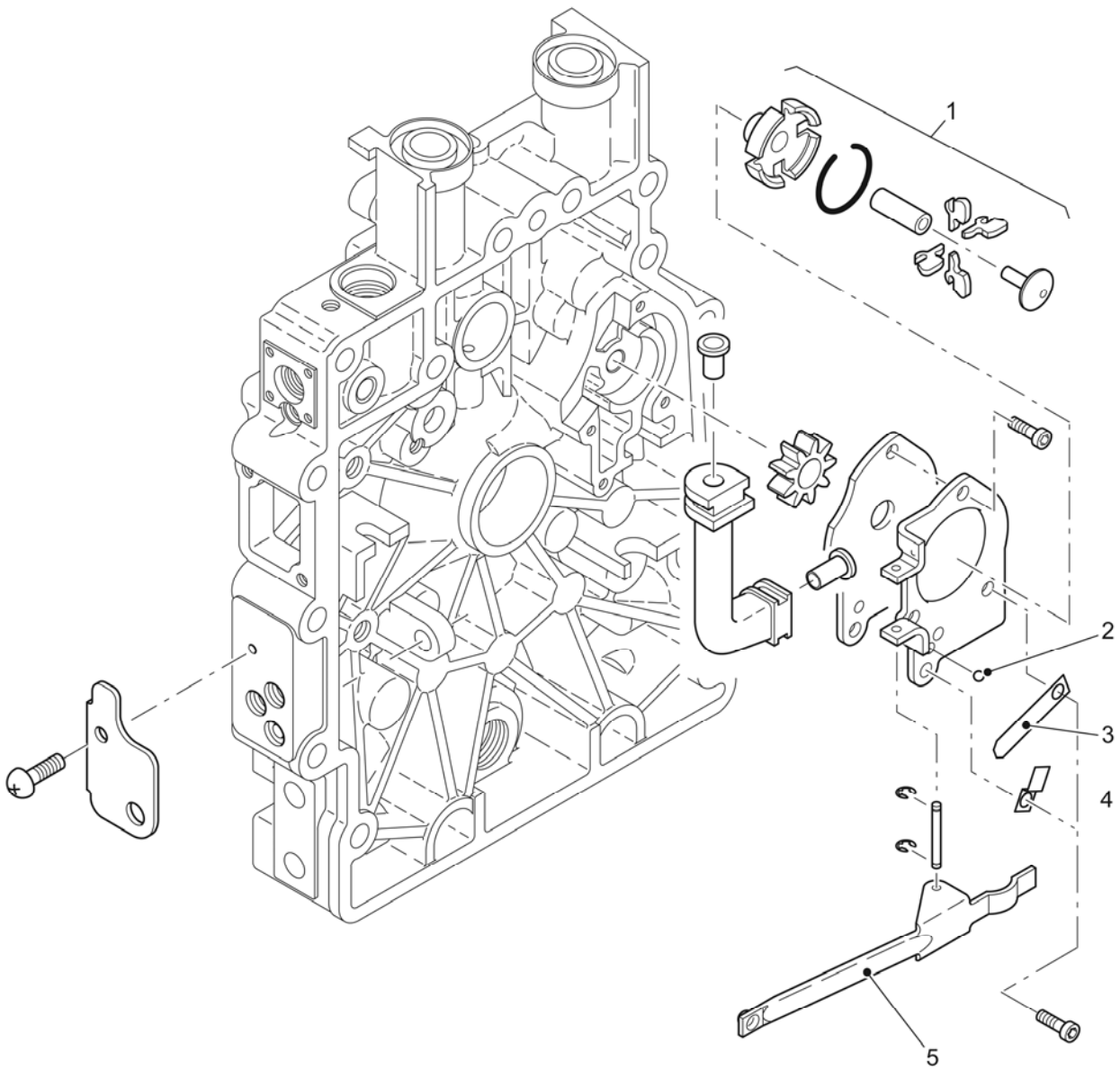


Fig 11 Oil pump

PARTS LIST

Fig 11 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			OIL PUMP		REF	
1	LFG2kW	2990-12-384-0484	. OIL PUMP ENGINE	018 321 00	1	
2	LFG2kW	3110-01-525-1043	. BALL VALVE, (OIL PRESSURE RELIEF VALVE)	504 479 00	1	
3	LFG2kW	5360-12-365-8676	. LEAF SPRING, (OIL PRESSURE RELIEF VALVE)	050 973 00	1	
4	LFG2kW	5340-12-365-8675	. RETAINING CLIP, (OIL PRESSURE RELIEF VALVE)	050 971 00	1	
5	LFG2kW	2910-12-365-9076	. REVERSE MOTION LEVER	050 794 01	1	

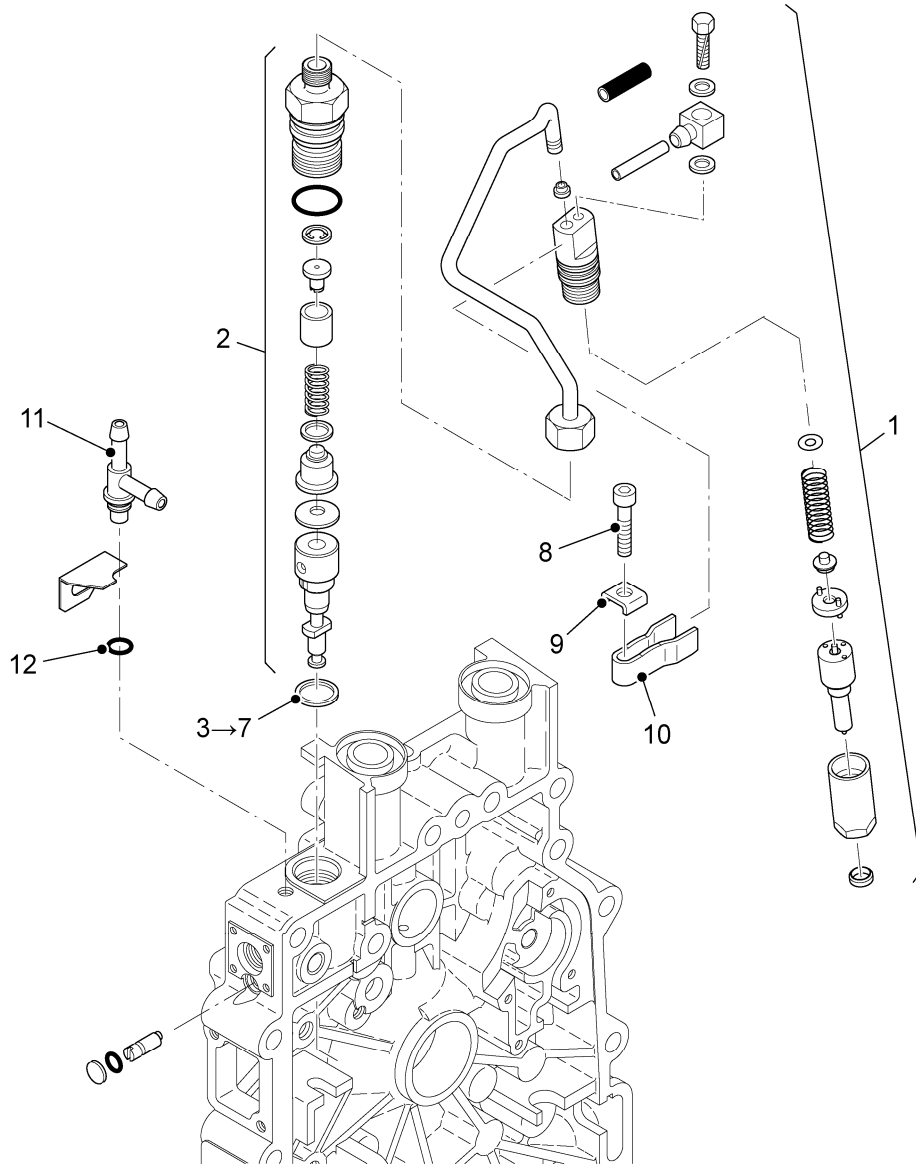


Fig 12 Injection equipment

PARTS LIST

Fig 12 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			INJECTION EQUIPMENT		REF	
1(1)	LFG2kW	2910-12-363-2210	. INJECTOR ASSY, FUEL (WHITE DOT) (EPA 1)	016 498 10	1	Engine Assembly 01796103 1B20-S-204C ONLY
1(2)	LFG2kW	2910-12-369-9446	. NOZZLE, FUEL INJECTION (YELLOW DOT) (EPA 2)	013 938 00	1	Engine Assembly 01796103 1B20-S-204D ONLY
2(1)	LFG2kW	2910-12-363-2212	. INJECTOR ASSY FUEL (DISTRIBUTION VALVE) (WHITE DOT) (EPA 1)	013 222 11	1	Engine Assembly 01796103 1B20-S-204C ONLY
2(2)	LFG2kW	2910-12-369-9444	. PUMP, FUEL METERING & DISTRIBUTION (YELLOW DOT) (EPA 2)	013 222 20	1	Engine Assembly 01796103 1B20-S-204D ONLY
3	LFG2kW	5365-12-365-8664	.. PACKING/SHIM FIP TIMING 0.2 MM	040 963 00	1	
4	LFG2kW	5365-12-365-8665	.. PACKING/SHIM FIP TIMING 0.3 MM	040 964 00	1	
5	LFG2kW	5365-12-365-8666	.. PACKING/SHIM FIP TIMING 0.4 MM	040 965 00	1	
6	LFG2kW	5365-12-365-8667	.. PACKING/SHIM FIP TIMING 0.5 MM	040 966 00	1	
7	LFG2kW	5365-12-365-8668	.. PACKING/SHIM FIP TIMING 0.6 MM	040 967 00	1	
8	LFG2kW	5305-01-406-0008	. BOLT M6 x 30 DIN 912-8.8 A3C, INJECTOR CLAMP	503 239 00	1	
9	LFG2kW	5310-12-365-9523	. PLATE, INJECTOR CLAMP	050 893 00	1	
10	LFG2kW	2910-12-365-9072	. CLAMP INJECTOR	050 567 00	1	
11	LFG2kW	4730-12-365-8442	. NIPPLE, (FUEL TEE PIECE)	017 568 00	1	
12	LFG2kW	5331-12-311-8239	. O-RING, 7.5 MM I/D X 1.5 MM THICK RUBBER	018418	1	

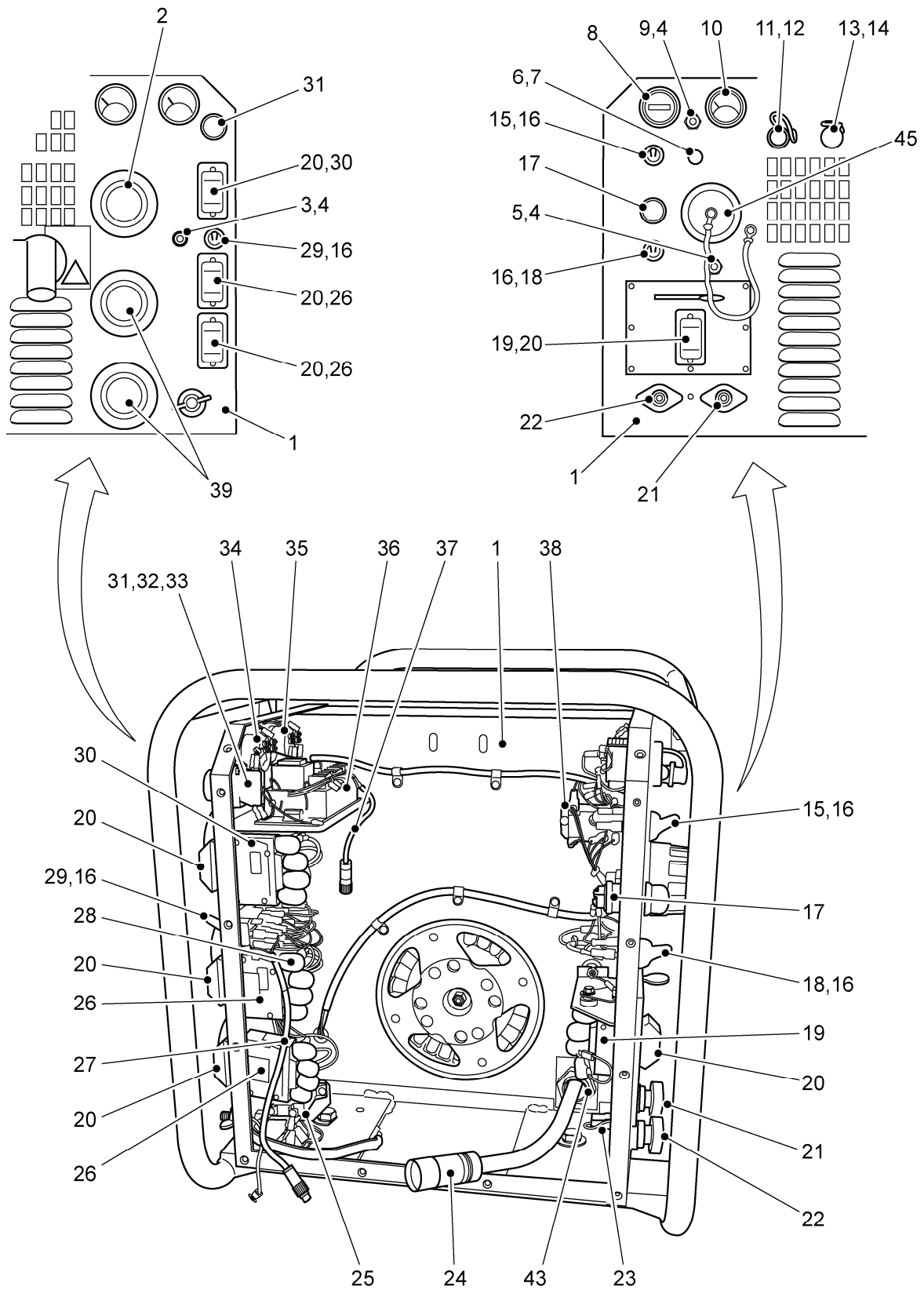


Fig 13 Panels and cables

PARTS LIST

Fig 13 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
1	LFG2kW	6110-99-877-8189	PANELS AND CABLES		REF	
2	LFG2kW	5935-12-363-1629	. CONTROL PANEL (CASING)	685-009	1	
3	LFG2kW	5925-99-264-0446	.. SOCKET STRAIGHT 16 A 240 V 2P + E IP67	419306	1	
4	LFG2kW	5930-01-523-7018	.. MCB 2 A 240 VAC 1-POLE	BFBA0012	1	
5	LFG2kW	5925-99-349-6534	.. MCB PROTECTIVE BOOT B FRAME	NC3030H M12-1	3	
6	LFG2kW	6210-14-413-7999	.. MCB 15 A 1-POLE	BFBA0014	1	
7	LFG2kW	6210-14-413-7999	.. LED, 12 MM RED 24 VDC	XVLA334	1	PKT 10
8	LFG2kW	5330-14-497-7501	.. SEAL, LED	XVLZ912	1	
9	LFG2kW	6445-99-854-4157	.. HOURS COUNTER, 24 VDC	085-308	1	
10	LFG2kW	5925-99-862-5192	.. MCB 2 A 32 VDC 1-POLE	BFBA0013	1	
11	LFG2kW	6625-99-880-6963	.. VOLTMETER 0-30 VDC	085-060	1	
12	LFG2kW	4730-12-366-6413	.. COUPLING, HALF QUICK DISCONNECT - BULKHEAD FITTING, MALE 8 MM	170-325	1	
13	LFG2kW	5340-12-365-1557	.. FUEL QUICK COUPLING DUST CAP (MALE)	SK12S	2	
14	LFG2kW	4730-12-366-6412	.. BULKHEAD FITTING, FEMALE 8 MM	21KBTS08MM XS	1	
15	LFG2kW	5340-12-365-1558	.. FUEL QUICK COUPLING DUST CAP (FEMALE)	SK16S	2	
16	LFG2kW	5930-01-067-0970	.. SWITCH, TOGGLE 1-POLE 10 A	2FA53-73/TABS	1	
17	LFG2kW	5930-99-657-8708	.. WEATHER COVER, SWITCH TOGGLE	SX0550	3	
18	LFG2kW	5930-01-520-8661	.. STARTER SWITCH	4546	1	
19	LFG2kW	5930-99-862-2775	.. SWITCH BIASED 10 A MOM	6GA5B-73	1	
20	LFG2kW	5925-99-811-2628	.. MCB, 80 A 1-POLE	DAJM0004	1	
21	LFG2kW	5340-00-007-7578	.. MCB PROTECTIVE BOOT D FRAME	HE-1015	1	
22	LFG2kW	5940-99-868-0204	.. KIT STUD TERMINAL POSITIVE	018401	1	
23	LFG2kW	5940-99-181-0927	.. KIT STUD TERMINAL NEGATIVE	018402	1	
24	LFG2kW	5915-99-724-2779	.. VARISTOR PACK DC	136-510	1	
25	LFG2kW	6150-99-754-0066	... PMG CABLE	014944	1	
26	LFG2kW	5905-12-186-7958	.. VARISTOR AC	Q69-X3310	1	
27	LFG2kW	5925-99-836-4181	.. MCB, 16 A 1-POLE	D2AHXA0031	2	
28	LFG2kW	6150-99-549-6757	.. VOLTAGE SELECT CABLE ASSEMBLY	022-005	1	
29	LFG2kW	5935-99-961-3236	.. CIRCUIT BREAKER TERMINAL COVER	MTC1PA1R	12	
30	LFG2kW	5930-01-525-0871	.. SWITCH, TOGGLE, 4-POLE	IL01-73XHG1	1	
31	LFG2kW	5925-99-131-9245	.. MCB, 11 A 1-POLE	D2AHXA0029	1	
32	LFG2kW	5930-14-541-9360	.. SWITCH PUSHBUTTON	ZB5AA26	1	
33	LFG2kW	5975-14-539-8100	.. SWITCH BODY/COLLAR	ZB5-AZ0009	1	
34	LFG2kW	5930-14-520-8093	.. CONTACT BLOCK	ZBE101	1	
35	LFG2kW	6625-99-212-6663	.. AC VOLTMETER	085-095	1	
36	LFG2kW	6625-99-682-6561	.. LOAD METER	085-104	1	

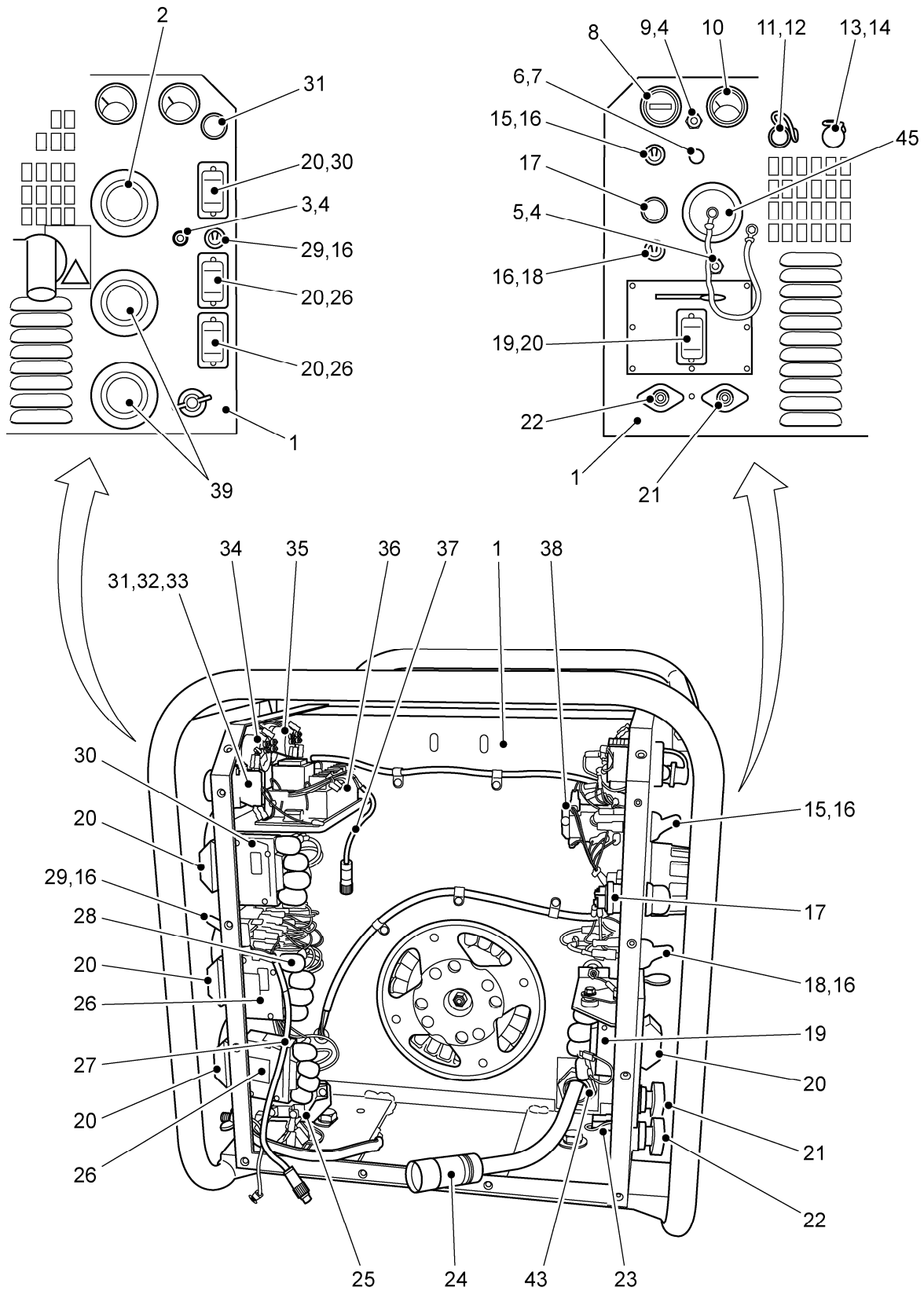


Fig 13 Panels and cables

PARTS LIST

Fig 13 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
			PANELS AND CABLES - Contd			
			CONTROL PANEL (CASING) - Contd			
36	LFG2kW	5925-99-363-2415	.. EARTH LEAKAGE UNIT, 30 A	110-903	1	
37	LFG2kW	6150-99-336-6870	.. CABLE ASSEMBLY CT	022-004	1	
38	LFG2kW	5945-99-732-6717	.. RELAY, 30 A DPNO 24 VDC	T92P7A22-240	1	
39	LFG2kW	5935-12-363-1630	.. SOCKET STRAIGHT, 16 A 110 V 2P + E IP67	419304	2	
NI 40	LFG2kW	5340-99-551-8158	.. HARDWARE KIT, MECHANICAL (FIXING KIT FOR DC TERMINALS ITEM 20 AND 21)	615-692	2	
NI 41	LFG2kW	5975-99-995-0740	.. COVER, PMG CABLE	040-749/58	1	
NI 42	LFG2kW	6150-99-377-5672	.. EMC STRAP (EARTH STRAP ADAPTOR TO BULKHEAD)	136-018	1	
43	LFG2kW	5975-99-990-6988	.. CONNECTOR, SPLIT NYLON AND LOCK NUT	135-514	1	
NI 44	LFG2kW	5905-99-333-0183	.. RESISTOR, FIXED, FILM (R1 100 OHMS)	220-6151	1	Refer to Cat 302, LFG circuit diagram
45	C46MT4	5935-99-802-8442	.. COVER ELECTRICAL (INTER VEHICLE SOCKET)	FV627996	1	

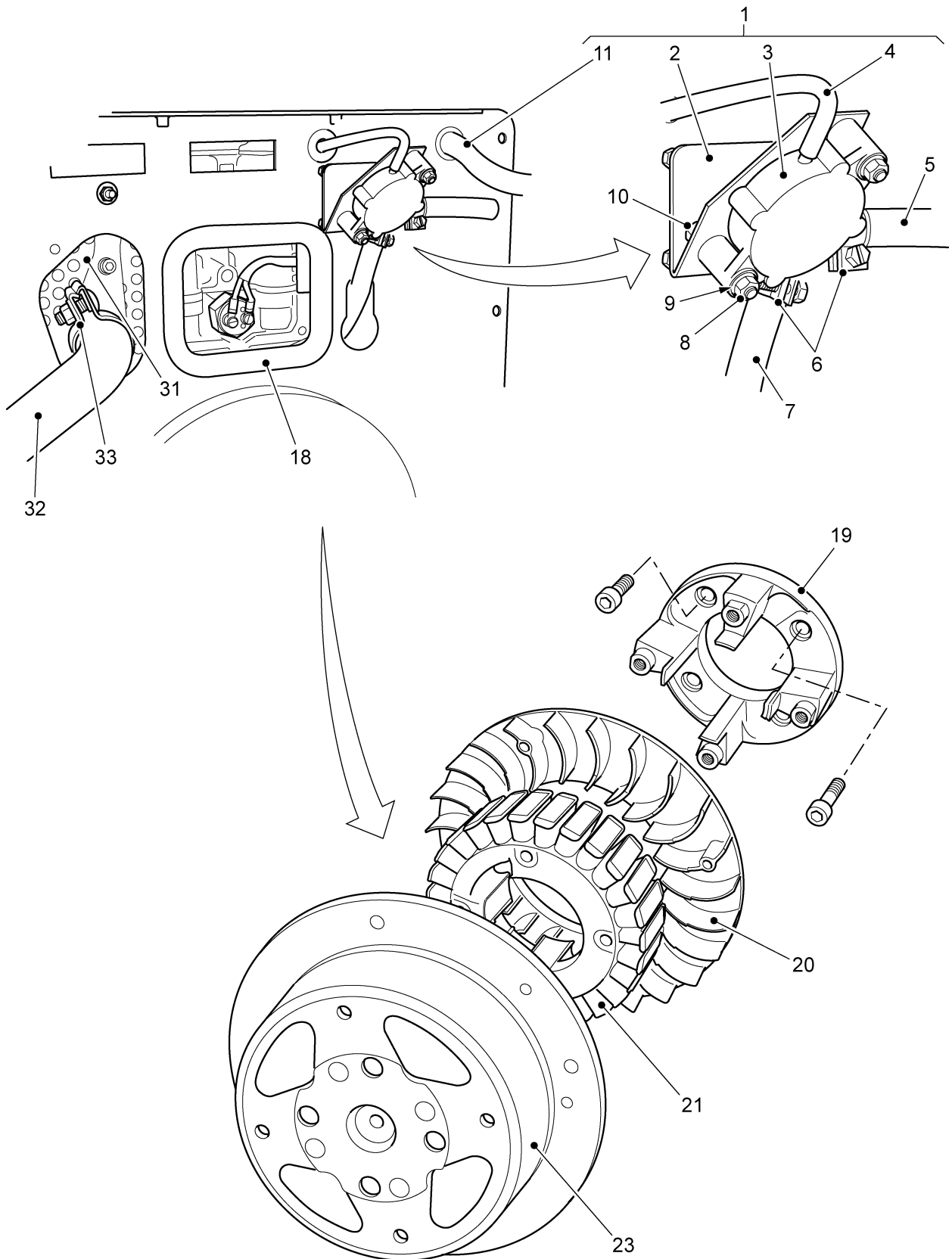


Fig 14 Rotor, stator and circular pulse pump

PARTS LIST

Fig 14 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
			ROTOR, STATOR AND CIRCULAR PULSE PUMP			REF
1	LFG2kW	2910-99-152-1495	. PULSE PUMP ASSY, KIT	665-016	1	
2		NP	.. PULSE PUMP ADAPTOR	040-749/68	1	
3		NP	.. PULSE PUMP	170-966	1	
4	LFG2kW	4720-99-232-3545	.. FUEL HOSE TO TANK	017280	1	
5	LFG2kW	4720-99-262-7603	.. FUEL HOSE TO QUICK COUPLER	017414	1	
6		5340-99-836-4196	.. FUEL HOSE CLIP	170-122	2	
7	LFG2kW	4720-99-876-5782	.. FUEL HOSE FROM PULSE PUMP	017415	1	
8		NP	.. NUT, NYLOC, M6 - BZP	150-197	2	
9		NP	.. WASHER, FLAT, M6 - BZP	150-246	2	
10		NP	.. BOLT, HEX HEAD, M6 x 50 LG - BZP	150-588	2	
11	LFG2kW	4720-99-731-8837-	.. HOSE, TANK RETURN TO QUICK COUPLER	017141	1	
NI 12	LFG2kW	4720-99-668-8536	. FUEL PIPE, TANK TO FUEL FILTER	017404	1	
NI 13	LFG2kW	4720-99-322-3899	. FUEL HOSE, RETURN TO Y CONNECTOR	017401	1	
NI 14	LFG2kW	4720-99-153-6089	. FUEL HOSE, INJ TO Y CONNECTOR	017402	1	
NI 15	LFG2kW	4720-99-562-9393	. FUEL PIPE, TANK TO Y CONNECTOR	017403	1	
NI 16	LFG2kW	4720-99-839-4652	. FUEL HOSE, TANK TO FUEL PUMP	017405	1	
NI 17	LFG2kW	4720-99-839-4654	. FUEL HOSE, FUEL PUMP TO RETURN VALVE	017406		
18	LFG2kW	9390-14-501-5754	. SIDE SEAL (MANUFACTURE FROM)	1011-12	A/R	
19	LFG2kW	3040-99-131-9232	. STATOR ADAPTOR	022-007	1	
20	LFG2kW	6115-99-164-9129	. COOLING FAN	040-749/03	1	
21	LFG2kW	6115-99-158-5533	. STATOR	022-006	1	
NI 22	LFG2kW	5975-99-862-1655	.. PMG CONNECTOR	022-021	2	
23	LFG2kW	6115-99-246-6355	. ROTOR ASSEMBLY	022-010	1	
NI 24	LFG2kW	4720-12-385-1582	. HOSE, NONMETALLIC, FUEL	259-012-00	1	
NI 25	LFG2kW	5970-12-385-3819	. SLEEVE, HEAT RESISTANT	239-016-11	1	
NI 26	LFG2kW	4730-12-385-1083	. CLAMP/FERRULE, FUEL HOSE	505-779-00	1	
NI 27	LFG2kW	5975-99-166-5827	. CABLE TAB	040-749/67	1	
NI 28	LFG2kW	5310-99-850-4155	. WASHER, RETAINING (ROTOR)	040-749/65	1	
NI 29	LFG2kW	TBA	. SKT CAP HD SET SCREW, M10 x 70 MM		1	
NI 30	LFG2kW	5330-12-387-0517	. GASKET, EXHAUST	050 802 00	1	
31	LFG2kW	2990-12-387-0460	. EXHAUST, SILENCER	018 642 01	1	
32	LFG2kW	2990-12-388-2895	. EXHAUST, ELBOW	017052	1	
33	LFG2kW	6115-99-727-2730	. EXHAUST, CLAMP	017053	1	

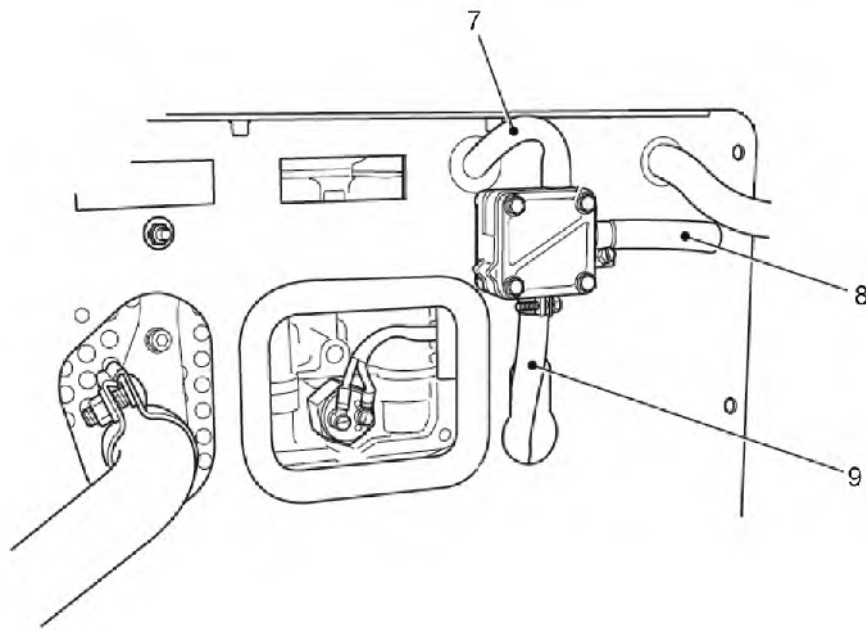


Fig 15 Square pulse pump

PARTS LIST

Fig 15 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
NI 1	LFG2KW	4720-99-668-8536	SQUARE PULSE PUMP		REF	
NI 2	LFG2KW	4720-99-322-3899	. FUEL PIPE, TANK TO FUEL FILTER	017404	1	
NI 3	LFG2KW	4720-99-153-6089	. FUEL HOSE, RETURN TO Y CONNECTOR	017401	1	
NI 4	LFG2KW	4720-99-562-9393	. FUEL HOSE, INJ TO Y CONNECTOR	017402	1	
NI 5	LFG2KW	4720-99-839-4652	. FUEL PIPE, TANK TO Y CONNECTOR	017403	1	
NI 6	LFG2KW	4720-99-839-4654	. FUEL HOSE, TANK TO FUEL PUMP	017405	1	
7	LFG2KW	4720-99-839-4654	. FUEL HOSE, FUEL PUMP TO RETURN VALVE	017406		
8	LFG2KW	4720-99-164-9135	. HOSE, PULSE PUMP TO TANK	175-043	1 EA	
9	LFG2KW	4720-99-153-7121	.. HOSE, QUICK COUPLER TO PULSE PUMP	175-044	1 EA	
	LFG2KW	4720-99-608-9412	.. HOSE, CRANK CASE PRESSURE	175-040	1 EA	

PARTS LIST

Fig 16 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
			ENGINE FUEL HOSES		REF	
1	LFG2kW	4720-99-668-8536	. FUEL PIPE, TANK TO FUEL FILTER	017404	1	
2	LFG2kW	4720-99-322-3899	. FUEL HOSE, RETURN TO Y CONNECTOR	017401	1	
3	LFG2kW	4720-99-153-6089	. FUEL HOSE, INJ TO Y CONNECTOR	017402	1	
4	LFG2kW	4720-99-562-9393	. FUEL PIPE, TANK TO Y CONNECTOR	017403	1	
5	LFG2kW	4720-99-839-4652	. FUEL HOSE, TANK TO FUEL PUMP	017405	1	
6	LFG2kW	4720-99-839-4654	. FUEL HOSE, FUEL PUMP TO RETURN VALVE	017406		
7	LFG2kW	4730-12-365-8431	. CONNECTOR, TUBING STRAIGHT	017597	1	
8	LFG2kW	4730-12-359-6950	. CLAMP, HOSE	017598	1	
9	LFG2kW	4730-12-365-8432	. CONNECTOR, TUBING STRAIGHT	017599	1	
10	LFG2kW	4730-12-396-3088	. TEE HOSE	017604	1	
11	LFG2kW	5325-12-365-9378	. GROMMET, NON METALLIC	017600	1	
12	LFG2kW	4820-12-370-3860	. VALVE, VENT	017601	1	
13	LFG2kW	5325-12-365-9380	. GROMMET, NON METALLIC	017602	2	

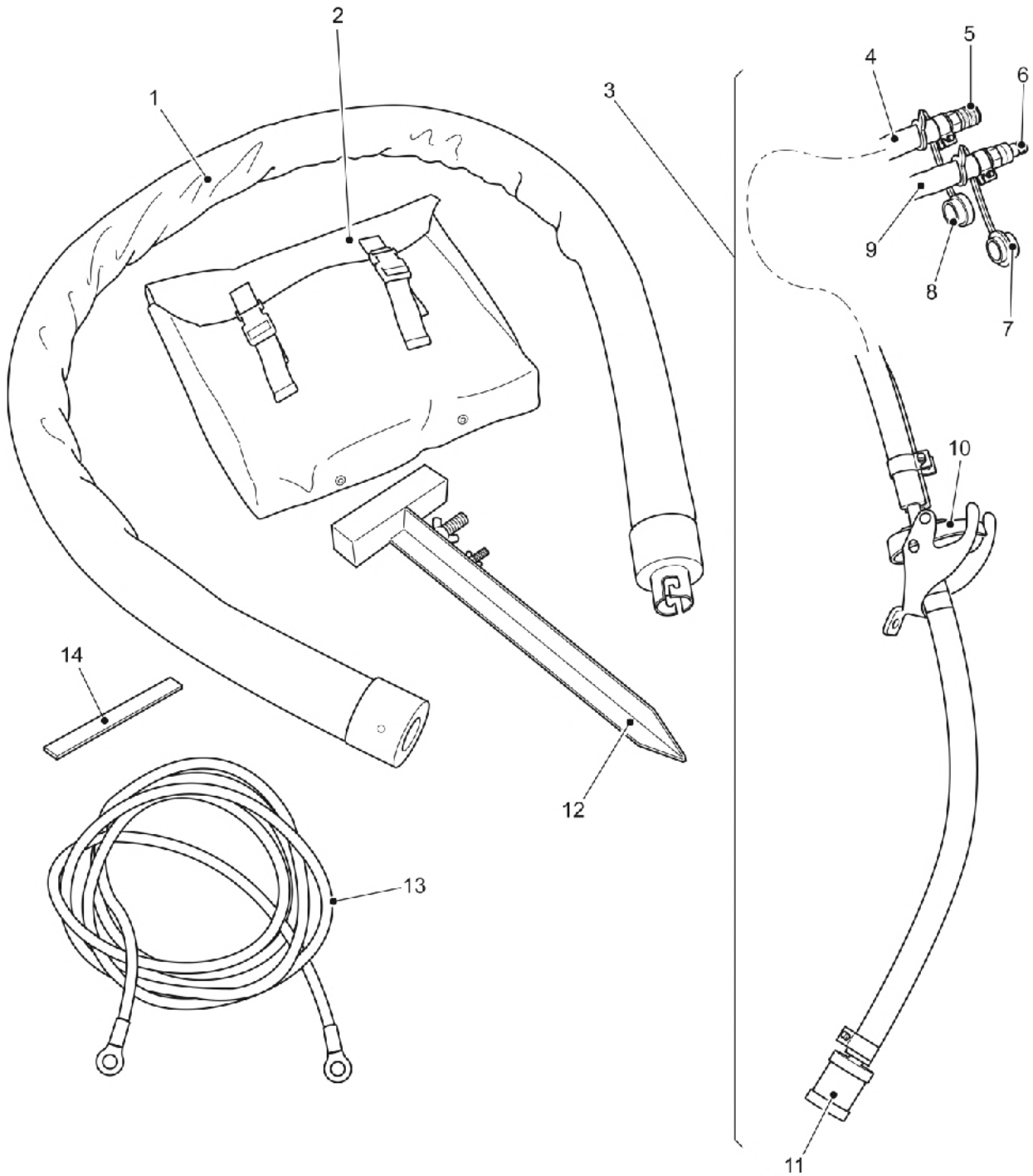


Fig 17 Accessories

PARTS LIST

Fig 17 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
			ACCESSORIES		REF	
1	LFG2kW	4720-99-611-7784	. EXHAUST EXTENSION	180-815	1	
2	LFG2kW	5140-99-939-0976	. ACCESSORIES BAG	061-069	1	
3	LFG2kW	4730-99-151-3452	. MANIFOLD FUELLING, JERRY CAN ADAPTOR	065-552	1	
4	LFG2kW	4720-99-259-0012	.. HOSE, FUEL RETURN	014997	1	
5	LFG2kW	4730-12-366-6410	.. HOSE FITTING, FEMALE 8 MM	21KBTF08MM XS	1	
6	LFG2kW	4730-12-366-6411	.. COUPLING, HALF QUICK DISCONNECT - HOSE FITTING, MALE 8 MM	170-323	1	
7	LFG2kW	5340-12-365-1557	.. DUST CAP, FUEL QUICK COUPLER (MALE)	SK12S	2	
8	LFG2kW	5340-12-365-1558	.. DUST CAP, FUEL QUICK COUPLER (FEMALE)	SK16S	2	
9	LFG2kW	4720-15-178-0471	.. HOSE, FUEL FLOW (MANUFACTURE FROM)	015050	1	
10	LFG2kW	4720-99-693-0530	.. ADAPTOR, JERRY CAN		1	
11	LFG2kW	2940-99-549-7839	.. FILTER FUEL, JERRY CAN	170-315	1	
12	LFG2kW	5975-99-901-0148	. EARTH SPIKE	IE/B59367	1	
13	LFG2kW	6150-99-811-2625	. EARTH LEAD, 2 M	136-012	1	
14	LFG2kW	5210-99-796-7540	. FEELER GAUGE (LOCATED IN AIR FILTER COVER)	501-815	1	
NI 15	LFG2kW	7690-99-481-9849	. DECAL SET, WARNING LABELS	499-903	1	

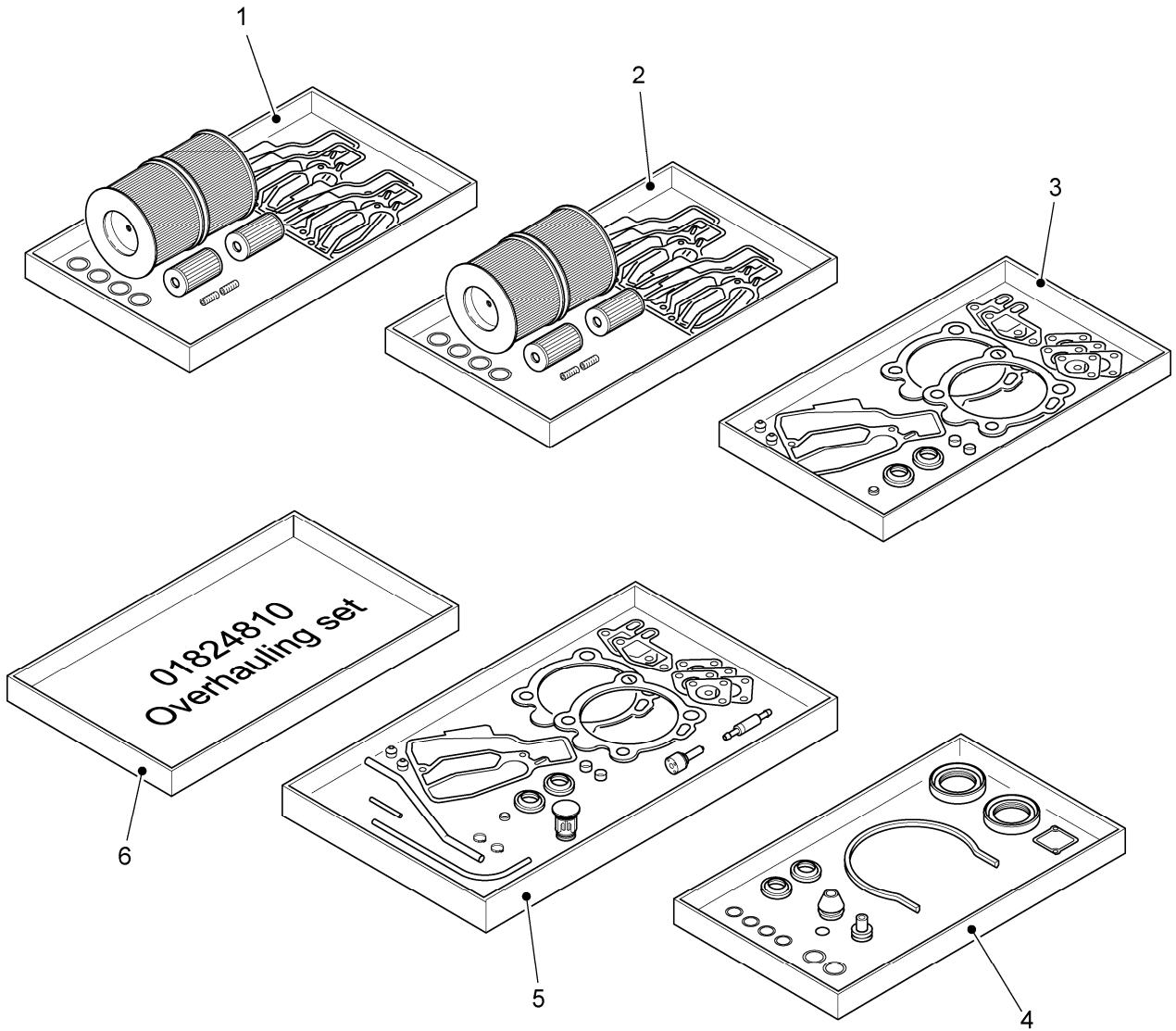


Fig 18 Maintenance kit

PARTS LIST

Fig 18 Item	DMC Army	NATO stock number	Item name	Part No./ Dwg No.	No. Off	Annotation (NSCM)
0			MAINTENANCE KITS		REF	
1	LFG2kW	2815-12-383-1507	. 1,000 HR MAINTENANCE KIT	018 191 00	1	
2	LFG2kW	2940-01-527-2810	. SERVICE MAINTENANCE KIT	015 543 11	1	
3	LFG2kW	5330-12-383-1406	. GASKET SET, CYLINDER HEAD	015 541 01	1	
4	LFG2kW	5330-12-383-1569	. GASKET SET, CRANKCASE	015 542 02	1	
5	LFG2kW	2815-12-383-1468	. EMERGENCY KIT	018 192 10	1	
6	LFG2kW	2815-12-383-1469	. OVERHAULING KIT (EPA 2)	018 248 10	1	For Engine #s 30030xxxxxxx
NI 7	LFG2kW	5305-99-252-6216	. M10 GRUB SCREW x 35 MM, C/SHAFT PROTECTION	530	1	Rotor removal Unbrakco
NI 8	G1B	5305-12-132-9425	. M16 SCREW CAP, FINE THD, 140 MM LG/44 MM THD LG	0636 020 262	1	Rotor removal ZF GB Ltd



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- 3-3 Not issued.
- 3-4 Not issued.
- 3-5 Not issued.

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- 1 This chapter identifies the number of indexes provided in support to the main Parts List.



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ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS (EMER) - FORM 10

*AESP/EMER NUMBER:		*IS THIS SAFETY RELATED?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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(To email this form send as a copy to the email address above)			

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*Edition	*Amendment	*Chapter	*Page	*Paragraph	Figure	Instruction	Other
*Comments: If additional information is to be supplied, please e-mail with the Form 10 as separate attachments.							

FORM 10 CELL USE			
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Incorporate comment(s) in future amendments:		No action required:	
Remarks:			
SPONSOR/PT FINAL CLOSURE STEPS	Mark:	Form 10 Cell notified of Date action taken	Date:
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**ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND
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Form 10 Guidance

Form 10 can be found within the AESP or, as a template, from the JAMES Portal (Hot Topic – Forms) & TDOL (FORM10).

Originator responsibility is to enter the following details marked *:

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- Is this **Safety Related?** – select Yes or No as appropriate.
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 - Full address Inc Post Code or BFPO NO.
 - Originator email address
 - Senders Reference – that must be unique.
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 - The Full Title of AESP/EMER should not include the AESP/EMER Number
 - Enter details in all other mandatory fields marked *.
 - Additional information relating to the Comments (AESP copies, additional text details or photographs) should be attached to the Email at the same time.
- Originator makes up the Form 10 & Sends to Form 10 cell via
 - Post to **Form 10 Cell, FRACAS, BFPO 794** address.
 - Email to [REDACTED]
 - **Any AESP that holds a Security marking higher than 'Restricted' should be securely circulated.**

FORM 10 CELL responsibilities:

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- Date Received
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Sponsor Responsibility

The Sponsor will:

- Enter their name, email address & phone contact details.
- Enter Date Received
- Enter Details in the non-mandatory field as & when required.
- Acknowledge receipt of Form 10, within 5 working days, by email to Form 10 Cell.
- Assess the contents of comments and details received.
- Mark the relevant Action box and fill out the Remarks field.
- Enter date when the Form 10 is returned to Form 10 Cell.
- Email copy of completed Form 10, within 6 weeks, to the Form 10 Cell and Originator.

Form 10 Cell on receipt will:

- Record final stage of the Form 10 into the MOSS Form 10 Tracker.
- Close off the Form 10 and archive.



Ministry
of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-741 COMPLETE EQUIPMENT SCHEDULE SERVICE EDITION (SIMPLE EQUIPMENT)

Issue No. 002

Amendment No. 002

June 2018

Sponsored for use in the
United Kingdom Ministry of Defence
and Armed Forces by DES LE OSP - OI

KN080

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2	INCORPORATED	Jun 18
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COMPLETE EQUIPMENT SCHEDULE, SERVICE EDITION (SIMPLE EQUIPMENT)

Chapter

- 1 General information - Not issued
- 2 Complete equipment schedule, Generator Set, Diesel Engine Driven, 2kW230V/110VAC, 28VDC, (Drumgrange Ltd)
 - 2-1 Generator Set
 - 2-1-1 Accessories
 - 2-1-2 Tools
 - 2-1-3 Spares - Not Issued
 - 2-1-4 Equipment literature
- 3 Indexes - Not issued



PREFACE

Sponsor: Operational Infrastructure (OI)
Project No.:
File Ref: DG Log (Land) ESS 13/8/18

Publication Authority: OI

INTRODUCTION

1 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

2 AESPs are issued under UK MoD authority and where AESPs specify action is to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores, subject to the provisions of Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DIN), Standard Operating Procedures (SOP) or by local regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication it is to be taken as the overriding authority.

Instructions for use by units

4 Detailed instructions for use by units are given in Joint Service Publication (JSP) 336 Volume 12.

Initial issues by Royal Logistics Corps

5 Initial issues by Royal Logistics Corps (RLC) are as described below:

5.1 One copy of the CES will be attached to the Unit's copy of the issue voucher and one further copy accompanying every equipment.

5.2 Deficiencies (if any) will be enfaced on the covering issue voucher by reference to the Serial Number of the items listed in the simple CES.

5.3 'To follow' vouchers will not be created.

5.4 All items listed in the CES can be issued separately. If any listed herein becomes unserviceable it should be extracted and exchanged and the equipment retained pending receipt. Transfers between equipment holders should normally be complete to CES.

In lieu items

6 Authorized 'in lieu' items held against this CES will not be replaced until such time as they are no longer serviceable. When replacement becomes necessary the correct item, as listed in the CES, will be demanded.

General notes

7 Certain items may be annotated as follows:

7.1 (E) - Expendable stores, consumable stores and material, 'NON LEDGER' spare parts of minor value.

- 7.2 (X) - ESSENTIAL ITEMS without which the RLC will not issue the equipment.
- 7.3 (*) - This asterisk indicates the accountability classification of the item.
- 7.4 (NI) - (Not Illustrated) when appearing with a number in the 'Fig Item' column indicates that the item is not illustrated.
- 7.5 (NIV) - (Not In Vocabulary) indicates that the item is not available within the stores system.

Amendments

8 Amendments to the catalogue will be published as and when necessary. These will be numbered consecutively, and the Amendment record sheet is to be completed for each amendment list embodied. New or amended material will be highlighted by side lining to show the extent of the amendment.

Indentations

9 Items are listed in a logical assembly/disassembly order and are indented by the 'dot system' in which each 'Dot' depicts the relationship of the item to the assembly.

MAIN ASSEMBLY

Attaching parts for main assembly

- . FIRST LEVEL OF BREAKDOWN (Sub-assembly or detailed part of main assembly)
- . Attaching parts for the first level
- . . SECOND LEVEL OF BREAKDOWN (Sub-sub-assembly or detailed part of Sub-assembly)
- . . Attaching parts for second level
- . . . THIRD LEVEL OF BREAKDOWN (Sub-sub-sub-assembly or detailed part of Sub-sub-assembly)
- . . . Attaching parts for third level
- FOURTH LEVEL OF BREAKDOWN (Sub-sub-sub-sub-assembly or detailed part of Sub-sub-sub-assembly)
- Attaching parts for fourth level

Description

10 The Item Description and Annotation Block is also to convey additional information to the CES user, which will appear in brackets i.e. related location detail, e.g. another AESP or Chapter/Item within this AESP.

ADDITIONAL INFORMATION

Applicability details

11 This CES relates to the following equipment:

<u>NSN</u>	<u>Veh Code</u>	<u>Contract</u>
6115-99-908-6784	JR 8817 3500	BFI C1/59

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

12 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked on TDOL.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directive	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Mémoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	*	*
	2	Maintenance Instructions	201	522	523	*
	3	Inspection Standards	*	522	*	*
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedule	601	*	*	*
7	1	Illustrated Parts Catalogue	711	*	*	*
	2	Commercial Parts List	*	*	*	*
	3	Complete Equipment Schedule, Production	741	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	*	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	812	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Category/sub-category not published

Associated publications

13 The following associated publications should be read in conjunction with this category:

<u>Reference</u>	<u>Title</u>
AESP 6150-A-100-201 SEI 14411	Earthing and Earthing Protection Safety Precautions for Electrical Equipment

ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

14 The following abbreviations are used in this category:

AC	Alternating Current
AESP	Army Equipment Support Publication
Amdt	Amendment
BFPO	British Forces Post Office
CES	Complete Equipment Schedule
Chap	Chapter
DC	Direct Current
DE&S	Defence Equipment and Support
DIN	Defence Instructions and Notices
DMC	Domestic Management Code
D of Q	Denomination of Quantity
EA	Each
e.g.	for example
EMER	Electrical and Mechanical Engineering Regulations
Eqpt	Equipment
Fig	Figure
FRACAS	Failure Reporting Analysis and Corrective Action System
JAMES	Joint Asset Management and Engineering Solutions
JSP	Joint Service Publication
kW	kilowatt
LE	Land Equipment
m	metre
MoD	Ministry of Defence
NATO	North Atlantic Treaty Organisation
No.	Number
NI	Not Illustrated
NIV	Not In Vocabulary
NSCM	NATO Supply Code for Manufacturers
NSN	NATO Stock Number
OI	Operational Infrastructure
OSP	Operational Support Programme
Para	Paragraph
PT	Project Team
RAF	Royal Air Force
Ref	Reference
RLC	Royal Logistic Corps
SEI	Service Engineering Instruction
SME	Subject Matter Expert
SOP	Standard Operating Procedures
TDOL	Technical Documents On-Line
Tel	Telephone
UK	United Kingdom
V	Volt



SYMBOLS

15 There are no symbols used in this category.

CHAPTER 2-0

COMPLETE EQUIPMENT SCHEDULE (SERVICE)

SIMPLE EQUIPMENT

GENERATOR SET

Chapter

2-1 Generator Set, Diesel Engine Driven, 2kW, 230/110V AC, 28V DC (Drumgrange Ltd)

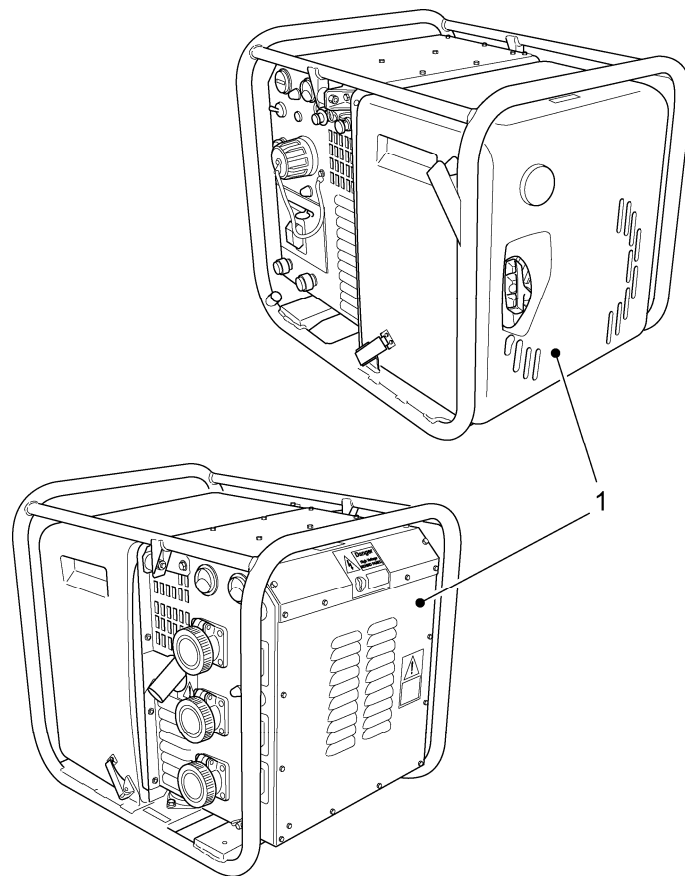


Fig 1 Generator Set, Diesel Engine Driven 2kW, 230V/110V AC 28V DC (Drumgrange Ltd)



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CHAPTER 2-1**COMPLETE EQUIPMENT SCHEDULE (SERVICE)****SIMPLE EQUIPMENT****GENERATOR SET**

Chapter

- 2-1 Generator Set
- 2-1-1 Accessories
- 2-1-2 Tools
- 2-1-3 Spares - Not Issued
- 2-1-4 Equipment literature



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CES

Fig No. Item No.	DMC NSCM	Army NSN Part Number	Item Description and Annotations	No. Off D of Q	Quantity on Issue
1				REF	
NI 0		NIV	SUMMARY OF ITEMS FORMING COMPLETE EQUIPMENT SCHEDULE	EA	
NI 1		NIV	. ACCESSORIES (Refer to Chap 2-1-1)	1 EA	
NI 2		NIV	. TOOLS (Refer to Chap 2-1-2)	1 EA	
NI 3		NIV	. SPARES - Not Issued (Refer to Chap 2-1-3)	1 EA	
NI 4		NIV	. EQUIPMENT LITERATURE (Refer to Chap 2-1-4)	1 EA	



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CHAPTER 2-1-1

COMPLETE EQUIPMENT SCHEDULE (SERVICE)

SIMPLE EQUIPMENT

ACCESSORIES

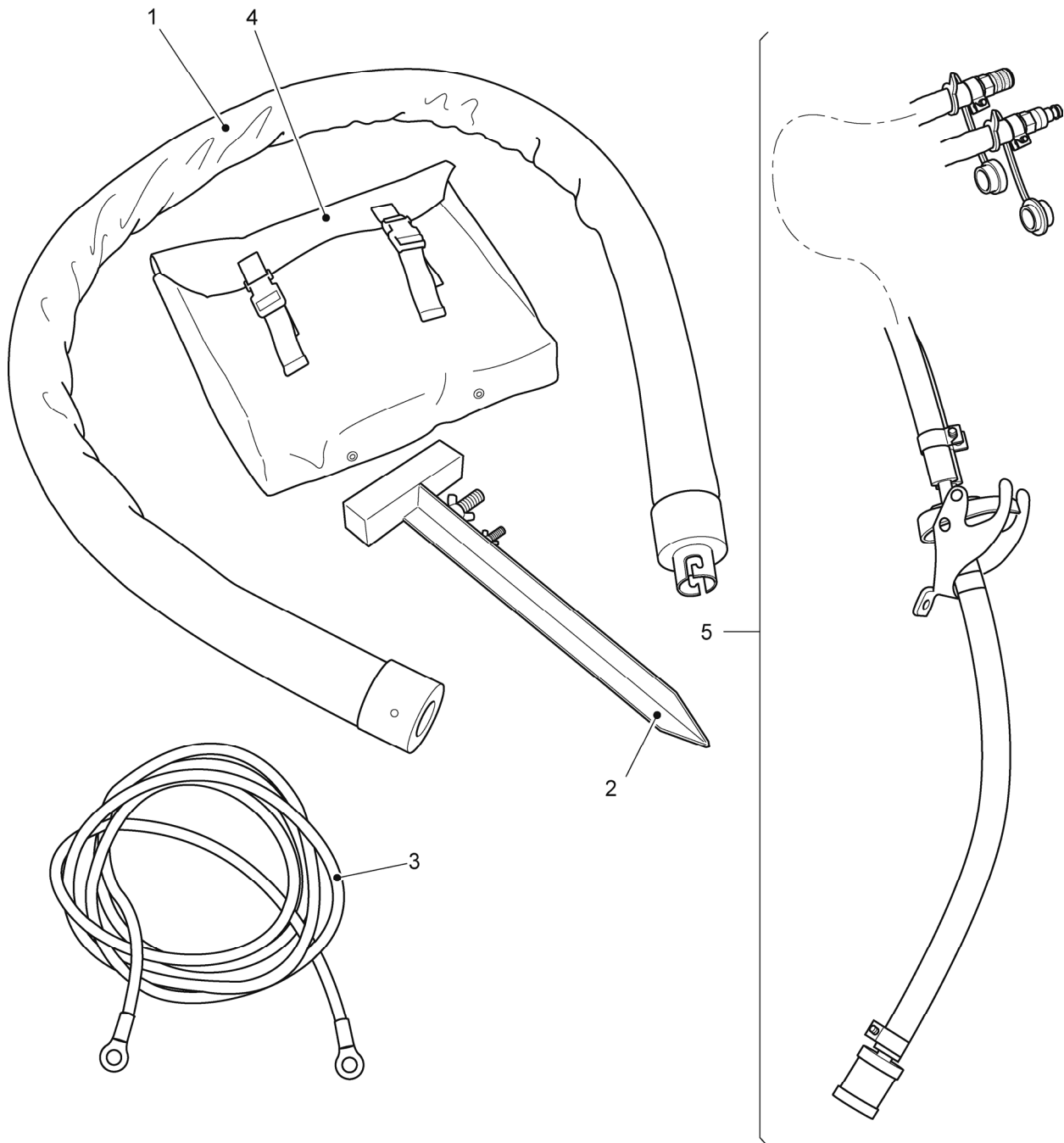


Fig 1 Accessories

CES

Fig No. Item No.	DMC NSCM	Army NSN Part Number	Item Description and Annotations	No. Off D of Q	Quantity on Issue
1				REF	
0	LFG2kW	6115-99-733-9114	. ACCESSORIES SET	EA	
1	LFG2kW	4720-99-611-7784 180-815	.. EXHAUST EXTENSION	1 EA	
2	LFG2kW	5975-99-901-0148 040-749/27	.. EARTH SPIKE	1 EA	
3	LFG2kW	6150-99-811-2625 SF29001	.. CABLE ASSY, ELECTRICAL (1.5 m) (X*)	1 EA	
4	LFG2kW	5140-99-939-0976 061-069	.. BAG ACCESSORIES	1 EA	
5	LFG2kW	4730-99-151-3452	.. MANIFOLD FUELLING, JERRYCAN ADAPTER ASSEMBLY (X*)	1 EA	



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CHAPTER 2-1-2

COMPLETE EQUIPMENT SCHEDULE (SERVICE)

SIMPLE EQUIPMENT

TOOLS



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CES

Fig No. Item No.	DMC NSCM	Army NSN Part Number	Item Description and Annotations	No. Off D of Q	Quantity on Issue
1				REF	
NI 0		NIV	. TOOLS	EA	
NI 1	LFG2kW	5210-99-796-7540	.. FEELER GAUGE (X)	1 EA	



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CHAPTER 2-1-3

COMPLETE EQUIPMENT SCHEDULE (SERVICE)

SIMPLE EQUIPMENT

SPARES - NOT ISSUED



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CHAPTER 2-1-4

COMPLETE EQUIPMENT SCHEDULE (SERVICE)

SIMPLE EQUIPMENT

EQUIPMENT LITERATURE



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CES

Fig No. Item No.	DMC NSCM	Army NSN Part Number	Item Description and Annotations	No. Off D of Q	Quantity on Issue
1					
NI 0		NIV	EQUIPMENT LITERATURE	REF EA	
NI 1		AB408	. RECORD OF UNIT INSPECTIONS OF PLANT (X)	1 EA	Record on JAMES
NI 2		AB446	. EQUIPMENT RECORD BOOK (X)	1 EA	Record on JAMES
NI 3		4610-B-106-211	. ARMY EQUIPMENT SUPPORT PUBLICATION (AESP), SPECIAL-TO-ARMS AIDES MEMOIRE (X)	1 EA	Available on TDOL



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ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS (EMER) - FORM 10

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* E-Mail		Eqpt Asset Code (if applicable)	

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Remarks:			
SPONSOR/PT FINAL CLOSURE STEPS	Mark:	Form 10 Cell notified of Date action taken	Date:
Form 10 Originator notified of the action taken:			

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- Assess the contents of comments and details received.
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Form 10 Cell on receipt will:

- Record final stage of the Form 10 into the MOSS Form 10 Tracker.
- Close off the Form 10 and archive.



Ministry
of Defence

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 kW, 230 V/110 V AC/28 V DC (Drumgrange Ltd)

6115-G-710-812 MODIFICATION INSTRUCTIONS

Issue No. 001

Amendment No. 001

June 2018

Sponsored for use in the
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KN080

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PREFACE

Sponsor: Operational Infrastructure (OI)
 Project No.:
 File Ref: DG Log (Land) ESS 13/8/18
 Publication Authority: OI

INTRODUCTION

- 1 The Publication Sponsor is responsible for the allocation of instruction numbers.
- 2 All modification instructions as issued are to be recorded in manuscript by the recipient on the Numerical Modification Instruction Index provided. Amendments to individual instructions are to be recorded on the instruction amendment record. All extant instructions and amendments can be found listed in the main AESP index.

NOTE

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- 3 Service users should forward any comments on this publication using the procedures and templates provided on the Joint Asset Management and Engineering Solutions (JAMES) or Technical Documents On-Line (TDOL) portals. A Form 10 is also provided at the end of this publication; it may be copied and used for forwarding comments if JAMES or TDOL is not available.

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MODIFICATION INSTRUCTION INDEX

Priority (Pty) is shown as: Immediate: I Routine: R

Instr No. (1)	Pty (2)	Page Nos. (3)	Amend-ment No. (4)	Subject (5)	Approval No./ Remarks (6)
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2	R	1-2		Hot climate fuel tank	
3					



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ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS (EMER) - FORM 10

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*The following action is to be carried out:	Mark:		Mark:
Issue a revised/amended AESP/EMER:		Under investigation:	
Incorporate comment(s) in future amendments:		No action required:	
Remarks:			
SPONSOR/PT FINAL CLOSURE STEPS	Mark:	Form 10 Cell notified of Date action taken	Date:
Form 10 Originator notified of the action taken:			

**ARMY EQUIPMENT AND SUPPORT PUBLICATION (AESP) AND ELECTRICAL AND
MECHANICAL ENGINEERING REGULATIONS (EMER) - FORM 10**

Form 10 Guidance

Form 10 can be found within the AESP or, as a template, from the JAMES Portal (Hot Topic – Forms) & TDOL (FORM10).

Originator responsibility is to enter the following details marked *:

- In the **AESP/EMER Number**: cell enter the full document number e.g. AESP 1256-I-400-711.
- Is this **Safety Related?** – select Yes or No as appropriate.
- Originator Details:
 - Full address Inc Post Code or BFPO NO.
 - Originator email address
 - Senders Reference – that must be unique.
- AESP Details shall enter the following details:
 - The Full Title of AESP/EMER should not include the AESP/EMER Number
 - Enter details in all other mandatory fields marked *.
 - Additional information relating to the Comments (AESP copies, additional text details or photographs) should be attached to the Email at the same time.
- Originator makes up the Form 10 & Sends to Form 10 cell via
 - Post to **Form 10 Cell, FRACAS, BFPO 794** address.
 - Email to [REDACTED]
 - **Any AESP that holds a Security marking higher than 'Restricted' should be securely circulated.**

FORM 10 CELL responsibilities:

The Form 10 Cell enters:

- Date Received
- Form 10 Reference
- Date sent to Sponsor
- Register all Form 10 details in the MOSS Form 10 Tracker.

Sponsor Responsibility

The Sponsor will:

- Enter their name, email address & phone contact details.
- Enter Date Received
- Enter Details in the non-mandatory field as & when required.
- Acknowledge receipt of Form 10, within 5 working days, by email to Form 10 Cell.
- Assess the contents of comments and details received.
- Mark the relevant Action box and fill out the Remarks field.
- Enter date when the Form 10 is returned to Form 10 Cell.
- Email copy of completed Form 10, within 6 weeks, to the Form 10 Cell and Originator.

Form 10 Cell on receipt will:

- Record final stage of the Form 10 into the MOSS Form 10 Tracker.
- Close off the Form 10 and archive.

GENERATOR SET, DIESEL ENGINE DRIVEN, 2 KW, 230 V/110 V AC/28 V DC (DRUMGRANGE LTD)

MODIFICATION INSTRUCTION No. 2

Sponsor: Operational Infrastructure Programme (OIP)
 Project No.:
 File Ref: DG Log (Land) ESS 13/8/18
 Publication Authority: OIP

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
1		
2		
3		

Amdt No.	Incorporated By (Signature)	Date
4		
5		
6		

SUBJECT: Introduction of Lightweight Field Generator (LFG) Hot Climate Fuel Tank

INTRODUCTION

1 The LFG Fuel Tank NSN 2910-12-366-7857 has been unconditionally superseded by the LFG Hot Climate Fuel Tank NSN 2910-99-870-2841. The replacement tank allows the LFG to operate safely in extreme high ambient climatic conditions.

2 Limitations on use of equipment. Nil.

APPLICABILITY

3 Fitted to subject equipment held by user units.

REASON FOR MODIFICATION

4 Code 1 – To improve safety (when operating in extreme high ambient climatic conditions).

PRIORITY

5 ARMY: Routine.

ESTIMATED TIME REQUIRED

6 N/A.



MODIFICATION IMPLEMENTATION PLAN

7 This instruction is to be implemented by:

- 7.1 ARMY - Units authorized to carry out levels 2, 3 or 4 maintenance.
- 7.2 Associated instructions. Nil.
- 7.3 Strike plate action: Strike through MoD Record label No. 2.

Action required by

8

8.1 Units and establishments holding equipment.

8.1.1 ARMY - User units are to request REME to modify the equipment, on condition, i.e. equipment failure or equipment damage necessitating replacement or prior to deploying to extreme high ambient climatic conditions.

8.1.2 Units with 1st Line REME support demand the Hot Climate Fuel Tank NSN 2910-99-870-2841.

8.1.3 Record the AESP and instruction number in equipment documents.

8.2 Army units authorized to carry out levels 2, 3 and 4 maintenance and RAF units.

8.2.1 ARMY - When requested by units, obtain the Hot Climate Fuel Tank (NSN 2910-99-870-2841) and replace the LFG Fuel Tank (NSN 2910-12-366-7857) with the new item as detailed in AESP 6115-G-710-523.

8.2.2 Strike through MoD Record label No. 2.

8.2.3 Record the modification details on the Joint Asset Management and Engineering Solutions (JAMES) portal.

8.3 All recipients of this instruction. Add particulars to the Mod Instr. Index.