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CARRIER, INSTALLATION, FULL TRACKED, MKs 2 AND 2/1 (FV439)

REPAIR INSTRUCTIONS

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- 2-0 Final drives, suspension and tracks - List of chapters
- 3 Hull, fittings and controls
- 4 Environmental control system
- 5 Electrical system
- 6 Special to role equipment

PREFACE

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INTRODUCTION

1 Service users should forward any comments concerning this Publication through the channels prescribed in AESP 0100-P-011-013. An AESP Form 10 is provided at the end of this document; it should be photocopied and used for forwarding comments on this AESP.

2 AESPs are issued under Defence Council authority and where AESPs specify action 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 provision of Para 3 below.

3 The subject matter of this publication may be affected by Defence Council Instructions (DCIs), Standard Operating Procedures (SOPs) 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. All references are prefixed with the first eight digits of this Publication. The availability of the publications can be checked by reference to the relevant Group Index (see AESP 0100-A-001-013).

Category/Sub-category			Information level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	101	101	101
	1	Equipment Support Policy Directives	*	*	*	*
2	0	Operating Information	201	201	201	201
	1	Aid Memoire	*	*	*	*
	2	Training Aids	221	*	*	*
3		Technical Description	201	302	302	302
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	522	522
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	3	Inspection Standards	*	*	*	*
	4	Calibration Standards	*	*	*	*
6		Maintenance Schedules	*	*	*	*
7	1	Illustrated Parts Catalogues	711	711	711	711
	2	Commercial Parts Lists	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	741	741	741
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	811	811	811	811
	2	General Instructions, Special Technical Instructions and Servicing Instructions	821	821	821	821
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Categories/Sub-categories not published

Associated Publications

5 A comprehensive list of associated publications will be found in AESP 2350-T-250-522. The following publications are additional to that list.

<u>Reference</u>	<u>Title</u>
AESP 2350-T-251-Octad	Carrier Personnel, Full Tracked, FV432 Mk 2 & 2/1
AESP 5895-H-514-Octad	Secondary Access Switch / Message Centre (TKD) in AFV439
AESP 5895-H-515-Octad	Radio Relay Installation in Carrier Full TKD FV439
AESP 6115-G-251-Octad	Generator set diesel engine driven DC 3KW 28V
Army Code 33069	CARRIER FULL TRACKED FV439 (Mk 2/1) Fitted for communication system (Forming part of Complex 30155)
Army Code 33070	CARRIER FULL TRACKED FV439 Mk 2/1 fitted for RS C50/R236
Army Code 46162	INSTALLATION KIT Electronic Equipment for S.H.F. Radio UK/TRC 481 in FV439
EMER Power P 410/8 - P 419/8	Fan Motor Unit No. 12 Mk 1
EMER Power P 410/9 - P 419/9	Control Box No. 10 Mk 1 (NBC)
EMER Power P 410/10 - P 419/10	Fan Motor Unit No. 13 and 20 Mk 1 and 2

ABBREVIATIONS

6 Throughout this Publication, any reference to right or left is as seen from the rear of the vehicle looking forward, unless otherwise stated. Where non standard abbreviations are used, the full meaning is written out in full the first time the subject is mentioned in the text, followed by the abbreviation in brackets.

WARNINGS

- (1) **PERSONAL HAZARD. ENSURE THAT ALL LOCAL STANDING OPERATING PROCEDURES AND ALL CURRENT HEALTH AND SAFETY REGULATIONS ARE COMPLIED WITH, WHEN CARRYING OUT ANY OF THE PROCEDURES DETAILED WITHIN THIS PUBLICATION.**
- (2) **PERSONAL HAZARD. BEFORE USING ANY HAZARDOUS SUBSTANCE OR MATERIAL, ENSURE THAT YOU KNOW THE SAFETY AND FIRST AID INSTRUCTIONS:**
 - (2.1) **ON THE LABEL OF THE CONTAINER IT WAS SUPPLIED IN.**
 - (2.2) **ON THE MATERIAL SAFETY DATA SHEET.**
 - (2.3) **IN THE LOCAL SAFETY ORDERS AND REGULATIONS.**
- (3) **PERSONAL HAZARD. TAKE PARTICULAR CARE WHEN WORKING ON ROOF AS NO HANDRAIL IS PROVIDED.**
- (4) **PERSONAL HAZARD. A CURRENT CONSUMPTION OF 100 AMPERES IS USED BY THIS VEHICLE. IT IS ESSENTIAL THAT NONE OF THE POWER DISTRIBUTION COMPONENTS OR CABLING IS INTERFERED WITH DURING OPERATION. IF A POWER CABLE IS BROKEN OR DISLODGED, SWITCH OFF THE EQUIPMENT.**
- (5) **HEAVY WEIGHT. THE LDA MUX (Local Distribution Access Multiplexer) WEIGHS 55kg (121.3 lbs). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS.**
- (6) **HEAVY WEIGHT. THE LASE EQUIPMENT (Local Access Switching Equipment) WEIGHS 58kg (128 lbs). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS.**

(7) HEAVY WEIGHT. THE ULSIE (Unit Level Switchboard Interface Equipment) WEIGHS 36kg (79.4lbs). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS.

(8) HEAVY WEIGHT. THE TELEPRINTER WEIGHS 36.5kg (80.5lbs). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS.

CHAPTER 1-0

POWER PACK ASSEMBLY – LIST OF CHAPTERS

CONTENTS

Fiche No.	Frame	Para	
1	B2	1	List of chapters (this chapter)

LIST OF CHAPTERS

1 This chapter is further sub-divided as follows:

Fiche No.	Frame	Chap	
1	C1-C2	1-1	Power pack
	D1-D2	1-2	Engine
	E1-E2	1-3	Fuel system
	F1-F2	1-4	Cooling system
	G1-G2	1-5	Transmission

CHAPTER 1-1
POWER PACK
CONTENTS

Fiche No.	Frame	Para	
1	C2	1	General

GENERAL

1 The power pack for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) is identical to that used on FV430 Series, Vehicles, All Marks. Unit repairs to the power pack are detailed in AESP 2350-T-250-522.

CHAPTER 1-2

ENGINE

CONTENTS

Fiche No.	Frame	Para	
1	D2	1	General

GENERAL

1 The engine for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) is identical to that used on FV430 Series, Vehicles, All Marks. Unit repairs to the engine are detailed in AESP 2350-T-250-522.

CHAPTER 1-3

FUEL SYSTEM

CONTENTS

Para

1 General

GENERAL

1 The fuel system for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) is similar to that used on all FV430 Series, Vehicles, All Marks. Unit repairs to the fuel system are detailed in AESP 2350-T-250-522.

2 In addition to the standard fuel system, there is a fuel feed from the R/H fuel tank (SAS/MC only) via a 3-way valve to the roof of the vehicle. This fuel supply feeds the two roof mounted generators when fitted.

3 Currently there are no repair instructions for the fuel pump or fuel tap that feed the roof mounted generators on the FV439 SAS/MC variant

CHAPTER 1-4
COOLING SYSTEM
CONTENTS

Fiche No.	Frame	Para	
1	F2	1	General

GENERAL

1 The cooling system for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) is identical to that used on all FV430 Series, Vehicles, All Marks. Unit repairs are detailed in AESP 2350-T-250-522.

CHAPTER 1-5
TRANSMISSION
CONTENTS

Fiche No.	Frame	Para	
1	G2	1	General

GENERAL

1 The transmission for the Carrier, Installation, Full Tracked (FV439) is identical to that used on all FV430 Series, Vehicles, All Marks. Unit repairs are detailed in AESP 2350-T-250-522.

CHAPTER 2-0

FINAL DRIVE, SUSPENSION AND TRACKS – LIST OF CHAPTERS

CONTENTS

Fiche No.	Frame	Para	
2	B2	1	List of chapters (this chapter)

LIST OF CHAPTERS

1 This chapter is further sub-divided as follows:

Fiche No.	Frame	Chap	
2	C1-C2	2-1	Final drives
	D1-D2	2-2	Suspension and tracks

CHAPTER 2-1

FINAL DRIVE

CONTENTS

Fiche No.	Frame	Para	
2	C2	1	General

GENERAL

1 The final drive for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) is identical to that used on the Carrier Maintenance Full Tracked, FV434 MK 1 and 1/1. Unit repairs are detailed in AESP 2350-T-252-522.

CHAPTER 2-2
SUSPENSION AND TRACKS
CONTENTS

Fiche No.	Frame	Para		Page
2	D2	1	General	
	D2	2	Workshop special tools	
	D2	3	Torsion bars	
			Table	
2	D2	1	Workshop special tools	1/2

GENERAL

1 The suspension and tracks for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) are identical to those used on all FV430 Series, Vehicles, All Marks, except as detailed below. Common item unit repairs are detailed in AESP 2350-T-250-522.

Workshop special tools

2 Table 1 lists the workshop special tools required to carry out the procedures detailed in this chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Serial (1)	NSN/Part No (2)	Designation (3)	FV No (4)
1	N/A	Gauge, axle arm setting	FV952509
2	N/A	Gauge, axle arm setting	FV952510

TORSION BARS

3 The suspension loading requires a different initial setting of the torsion bars.

4 These are to set up as per AESP 2350-T-250-522 Chap 2-2 but must use axle arm setting gauge FV 952509, (Table 1, Ser 1), for Secondary Access Switch / Message center role vehicles, and FV 952510, (Table 1, Ser 2), for Radio Relay role vehicles.

CHAPTER 3
HULL, FITTINGS AND CONTROLS

CONTENTS

Para

1 General

GENERAL

1 The hull, fittings and controls for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) are identical to those used on all FV430 Series, Vehicles, All Marks with the exception of special to role equipment detailed in Para 2. Common item unit repairs to the vehicle are detailed in AESP 2350-T-250-522 Chap 3.

2 The following publications are necessary to repair the special to role equipment:

- 2.1 AESP 5895-H-514-Octad Secondary Access Switch / Message Centre (TKD) in AFV439
- 2.2 AESP 5895-H-515-Octad Radio Relay Installation in Carrier Full TKD FV439
- 2.3 AESP 6115-G-251-Octad Generator Set, Diesel driven DC 3KW 28V

CHAPTER 4
ENVIRONMENTAL CONTROL SYSTEM

CONTENTS

Para

- 1 General
NBC SYSTEM (FV439 SAS/MC ONLY)
- 2 Introduction (WARNINGS)
- 6 Unit Repairs
- 7 NBC/VENT system test
- 8 Flap valves
- 9 Line voltage test
- 10 Visual inspection (CAUTION)
- NBC pack
- 11 Removal (WARNING) (CAUTION)
- 12 Refitting
- 13 Testing
- NBC Control Box No. 10 Mk 1
- 14 Removal
- 15 Refitting
- 16 Testing
- 17 Generator set (APU)
- 18 Removal
- 19 Operation of System
- 24 NBC Pack No 7 Mk 1
- 38 Filters
- 39 Second Stage filter
- 42 Third Stage filter
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- 50 Filter access doors
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- 55 The scavenge fan
- 59 The vent fan
- 65 The NBC fan
- 68 Control Box
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- 73 Pressure Relief Valve
- 75 Description
- 79 Valve Setting

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2	NBC/Ventilation system, diagrammatic	7
3	Circuit Diagram	8
4	NBC/Ventilation pack No. 7 Mk 1	9
5	NBC/Ventilation control box.....	10
6	Vehicle pressure relief valve.....	11
7	NBC/Ventilation filters.....	12

GENERAL

1 The ventilation control system fitted to the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) Radio Relay is similar to that fitted to all FV430, Vehicles, All Marks. Unit repairs are detailed in AESP 2350-T-250-522.

NBC SYSTEM (FV439 SAS/MC ONLY)**INTRODUCTION**

- 2 This publication details unit repairs peculiar to Carrier Installation, Full Tracked, FV439 SAS/MC and should be read in conjunction with AESP 2350-T-250-522.
- 3 The NBC system is contained within two main assemblies, the control box No. 10 Mk 1 and the NBC pack No. 7 Mk 1. These units are connected by multi-core cables.
- 4 The supply for the system is taken from the distribution panel No. 6 Mk 1 via contact breaker H. An isolating relay RL1 is included in the control box circuit to inhibit the system unless a generator is on line.
- 5 To ensure efficient operation of NBC and Ventilation (VENT) system, all hull sealing must be maintained in a serviceable condition.

WARNINGS

- (1) **THE VOLTAGES USED IN THIS EQUIPMENT CAN ENDANGER HUMAN LIFE. REPAIRS AND MODIFICATIONS ARE TO BE CARRIED OUT BY QUALIFIED TRADESMEN ONLY, USING AUTHORIZED TOOLS AND TEST EQUIPMENT.**
- (2) **PERSONAL HAZARD. TAKE PARTICULAR CARE WHEN WORKING ON ROOF AS NO HANDRAIL IS PROVIDED.**
- (3) **PERSONAL HAZARD. A CURRENT CONSUMPTION OF 100 AMPERES IS USED BY THIS VEHICLE. IT IS ESSENTIAL THAT NONE OF THE POWER DISTRIBUTION COMPONENTS OR CABLING IS INTERFERED WITH DURING OPERATION. IF A POWER CABLE IS BROKEN OR DISLODGED, SWITCH OFF THE EQUIPMENT.**

UNIT REPAIRS

- 6 Unit repairs are limited to the following tasks.
 - 6.1 NBC/VENT system test.
 - 6.2 Flap valve, renew.
 - 6.3 Line voltage, test.
 - 6.4 Visual inspection.
 - 6.5 NBC, pack, remove and refit.
 - 6.6 NBC control box, remove and refit.
 - 6.7 NBC, VENT and scavenge fan motors, remove and refit.

NBC/VENT system test

- 7 Vehicles referred to unit workshops due to failure of NBC/VENT system, are to be retested to confirm and identify area of failure using, 'Test Sequence Procedure' in AESP 2352-T-250-522 Chap 4.

Flap valves

- 8 Damaged or broken flap valves are to be renewed immediately. Ventilation flap valve (Fig 1 (3)) can be removed in situ. To exchange NBC flap valve (17), partial removal of NBC pack will aid access (Para 10.1 to 10.10 refers). Retest NBC/VENT system in accordance with AESP 2352-T-250-522 Chap 4.

Line voltage test

9 To test line voltage of 28.5 ± 0.5 volts at engine speed of 2000 rev/min see AESP 2350-T-250-522 Chap 5.

NOTE

Low line voltage will cause low-pressure readings on the differential pressure gauge, mounted on NBC control box.

Visual inspection

10 Visually inspect pneumatic pipes, connectors and scavenge outlet. Low or negative pressure readings on the differential pressure gauge will indicate:

10.1 Damaged pneumatic pipes or loose connectors - inspect pneumatic pipes for chafing and connectors for tightness. This will require removal of NBC pack (Para 10) and control box (Para 13).

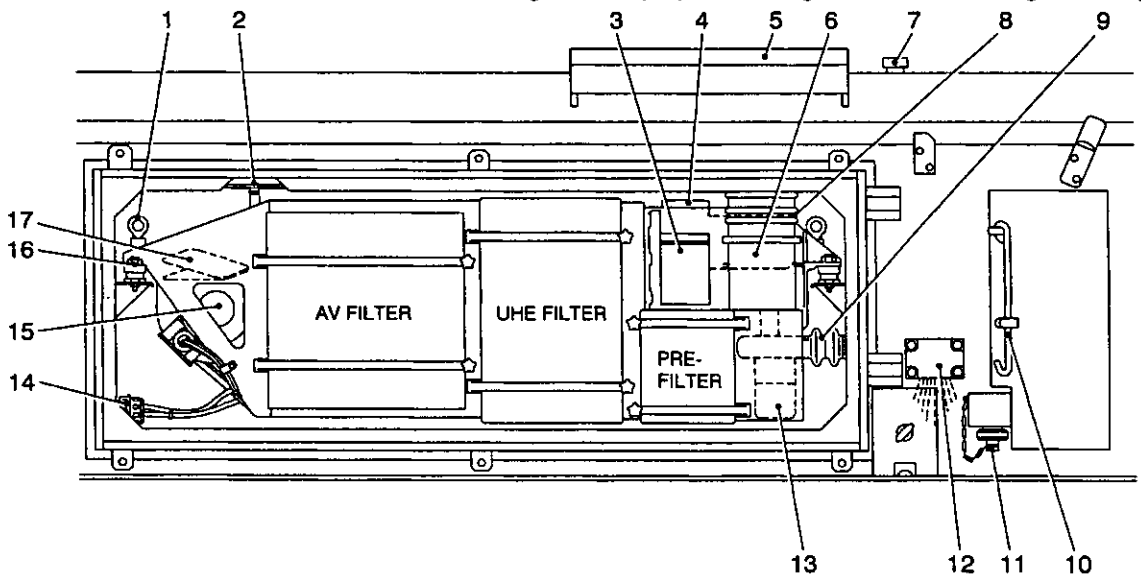
CAUTION

Ensure connectors are tightened firmly to affect a seal, but care should be taken not to over tighten.

10.2 Scavenge fan inoperative, this is confirmed if air is being drawn into scavenge outlet (12) when NBC or VENT fans are operating.

NOTE

An air blast will be emitted from scavenge outlet (12) if scavenge fan is functioning correctly.



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- | | | | |
|---|--------------------------|----|---------------------------------|
| 1 | Lifting eye | 10 | Doorstay bar |
| 2 | Earth strap | 11 | Scavenge plug (stowed position) |
| 3 | Vent flap valve | 12 | Scavenge outlet |
| 4 | Vent fan motor | 13 | Scavenge fan motor |
| 5 | Air intake | 14 | Power connector |
| 6 | Cyclone filter | 15 | NBC fan motor |
| 7 | Ambient pressure tapping | 16 | Mounting bolts |
| 8 | Rubber bellows - inlet | 17 | NBC flap valve |
| 9 | Rubber bellows - outlet | | |

Fig 1 NBC compartment (with armoured door removed)

NBC packRemoval

11

WARNING

HEAVY WEIGHT. NBC PACK WEIGHS 124.4 kg. DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS.

- 11.1 Ensure master switch is off and handbrake is applied.
- 11.2 Obtain access to NBC pack by opening armoured door, secure with door stay bar (10).
- 11.3 Disconnect rubber bellows - outlet (9).
- 11.4 Disconnect rubber bellows - inlet (8).
- 11.5 Remove earth strap (2).
- 11.6 Disconnect NBC power connector (14) at bulkhead.
- 11.7 Note position of four coloured pneumatic pipes and disconnect at bulkhead.
- 11.8 Temporarily secure power supply harness and pneumatic pipes to NBC pack to prevent damage during removal.
- 11.9 Remove bolts (16) securing NBC pack to anti-vibration mounts (2 per side).
- 11.10 Carefully withdraw NBC pack along mounting rails until lifting eyes (1) are just proud of compartment.

WARNING

HEAVY WEIGHT. NBC PACK WILL FALL OUT OF NBC COMPARTMENT IF WITHDRAWN FURTHER THAN REQUIRED TO ATTACH SLING TO LIFTING EYES.

- 11.11 Using suitable sling support weight (124.4 kg) of pack and fully withdraw NBC pack.

CAUTION

Equipment Damage. NBC pack must be lowered carefully on to suitable supports to prevent damage to filter doors and fastenings protruding below base of pack.

Refitting

- 12 Refit in reverse order to removal.

Testing

- 13 Retest NBC/VENT system in accordance with AESP 2352-T-250-522 Chap 4.

NBC Control box No. 10 Mk 1Removal

14

- 14.1 Ensure master switch is off and handbrake applied.

- 14.2 Disconnect power supply connector on l/h side of control box.
- 14.3 Remove mounting bolts (two per side) and allow control box to rest on NBC compartment roof.
- 14.4 Remove clips retaining harness and pneumatic pipes to allow sufficient movement to enable connector and pneumatic coloured pipes (note their position) at rear of control box to be disconnected.
- 14.5 Remove control box.

Refitting

- 15 Refit in reverse order to removal.

Testing

- 16 Retest NBC/VENT system in accordance with AESP 2352-T-250-522 Chap 4.

GENERATOR SET (APU)

- 17 Unit repairs to Gen Set are detailed in AESP 6115-H-101-522.

Removal

- 18 To remove engine/generator approximate weight 520 kg (1150 lb) proceed as follows:
 - 18.1 Ensure vehicle and generator remote control and instrument panel master switches are off, and handbrake applied, with vehicle on level ground.
 - 18.2 Disconnect imported power connector if in use.
 - 18.3 Remove bolts securing armoured enclosure roof plate, approximate weight 180 kg (400 lb) and lift clear using appropriate sling. Place on suitable supports.
 - 18.4 Disconnect fuel supply and return pipes at quick release couplings.
 - 18.5 Disconnect electrical supply at vehicle interface panel terminal 3 and plug (PL) 4.
 - 18.6 Disconnect electrical harnesses from:
 - 18.6.1 Engine control panel.
 - 18.6.2 Protection unit.
 - 18.6.3 Junction box.
 - 18.6.4 Distribution box.
 - 18.6.5 Fire extinguisher.
 - 18.6.6 Dropper resistor.
 - 18.6.7 Air outlet ducting sensor No. 4
 - 18.6.8 Earth stud.
 - 18.6.9 PLZ on power condition unit.

- 18.6.10 PLJ, SKG, SKH and SKI on vehicle interface panel.
- 18.7 Remove air outlet ducting screws.
- 18.8 Remove exhaust and silencer system.
- 18.9 Slacken fuel sedimenter mounting bolts for access.
- 18.10 Fit suitable sling to lifting eyes, take up slack.
- 18.11 Remove split pins and nuts from engine/generator mounting bolts.

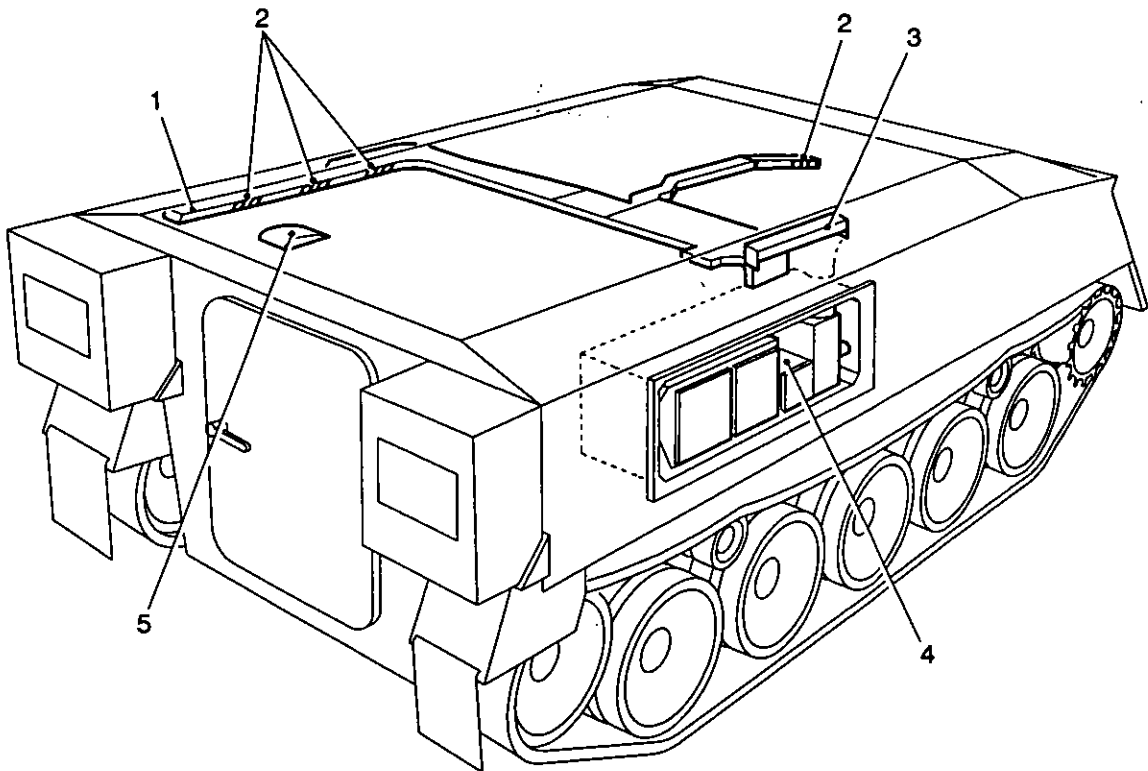
NOTE

Access to Generator Set mounting bolts inside vehicle will necessitate removal of covers.

- 18.12 Lift engine/generator clear of vehicle and place on suitable supports.

OPERATION OF SYSTEM

- 19 A circuit diagram of the system is shown in Fig 3. When the fan speed selector switch SWI is moved from the OFF position, the rear wafer contacts will energise the isolating relay RL1 which will operate the scavenge fan via TB2W, TB2Y, the scavenge fan circuit breaker and SK1L on the control box.
- 20 The selector switch is moved to any of the NBC positions, the NBC relay RL2 will be energised via the centre wafer contacts C1 and D1. The closing of relay contacts 3 and 4 will then supply power to the NBC fan via SK1X.
- 21 Setting the selector switch to any of the VENT positions will similarly operate the vent fan by energising the vent relay RL3 and supplying power via SK1W.
- 22 The speed of the NBC and vent fans is controlled by the front wafer of SW1, which introduces resistors into the field windings of the motors via SW1G and SW1M, as the switch is rotated.
- 23 The NBC air filtration system (Fig 2) is provided to both ventilate the interior of the vehicle under normal uncontaminated conditions and to protect the crew from nuclear fallout and bacteriological or chemical attacks.



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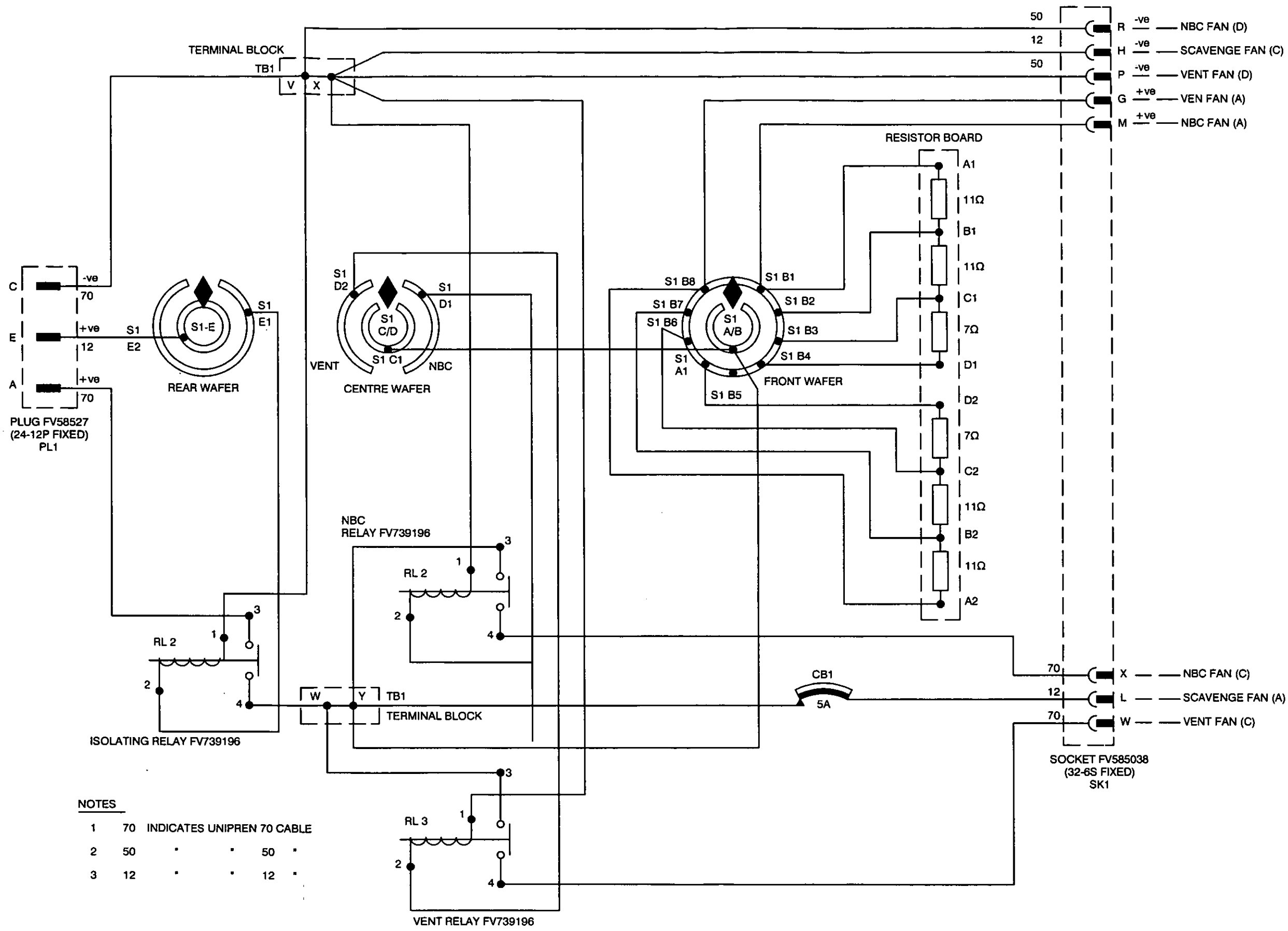
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|---|---------------------|---|-----------------------------------------------------------|
| 1 | Ducting | 4 | NBC/Ventilation pack |
| 2 | Diffusers | 5 | Armoured air outlet from
vehicle pressure relief valve |
| 3 | Armoured air intake | | |

Fig 2 NBC/Ventilation system, diagrammatic

NBC PACK, No. 7 Mk 1

24 The NBC pack, No. 7 Mk 1 (Fig 4), is mounted within a compartment set in the right side of the vehicle (Fig 2(4)). A hinged armoured access door forms the outer side of the compartment and is secured by captive bolts.

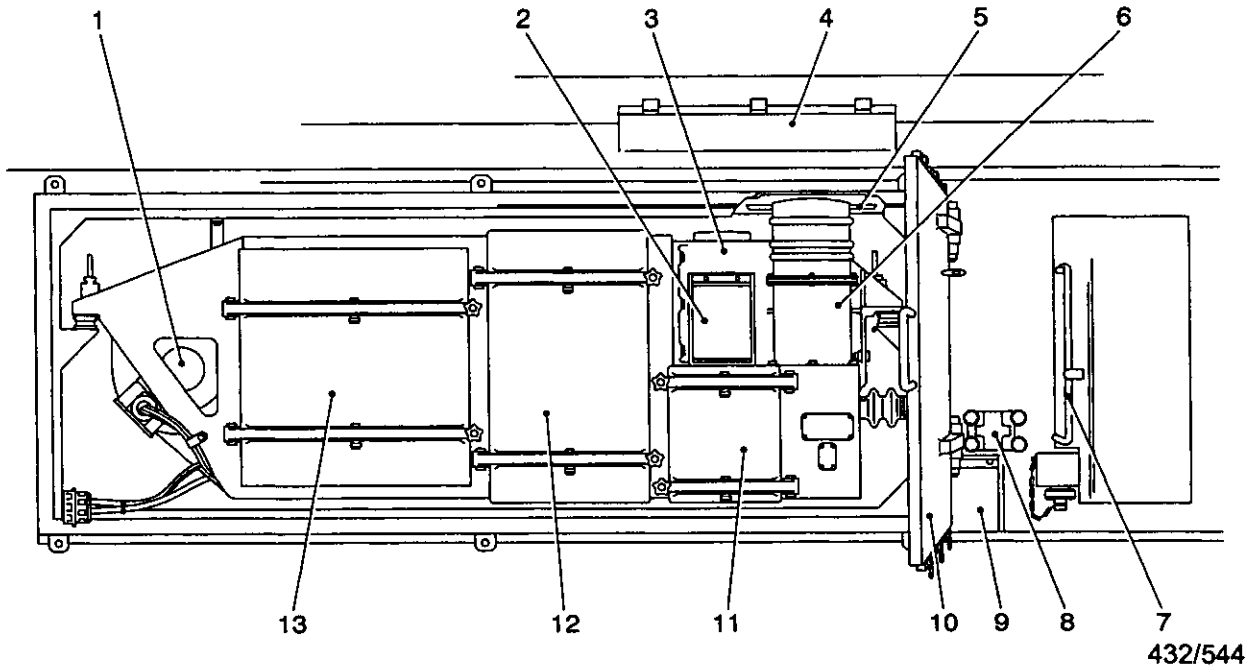
25 The pack consists of a ventilation fan (Fig 4 (3)), an NBC fan (1), a scavenge fan and four separate stages of filtration.



- NOTES**
- 1 70 INDICATES UNIPREN 70 CABLE
 - 2 50 " " 50 "
 - 3 12 " " 12 "

Fig 3 Circuit Diagram

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- | | | | | | |
|---|-------------------------------------------------------|---|--------------------------------------------|----|--------------------------------|
| 1 | NBC fan | 6 | First stage (CYCLONE) filter | 10 | Armoured door |
| 2 | Vent fan outlet flap valve | 7 | Stay bar | 11 | Second stage (PRE) filter door |
| 3 | Vent fan | 8 | Scavenge fan outlet | 12 | Third stage (UHE) filter door |
| 4 | Armoured air intake | 9 | Rubber flap, over fire extinguisher handle | 13 | Fourth stage (AV) filter door |
| 5 | Outlet from the NBC/Vent pack to the vehicle interior | | | | |

Fig 4 NBC/Ventilation pack No. 7 Mk 1

26 Mounted inside the vehicle is the control box (Fig 5) containing a fan speed selector switch (8) and a differential pressure gauge (5) with its selector rotary knob (4).

27 Fitted in the vehicle roof is a pressure relief valve (Fig 6), which permits spillage of excess air to the atmosphere.

28 The NBC pack comprises a sheet metal prefabricated casing of welded assembly. Bolted to the casing are four main assemblies and housed in three apertures in the casing are the filter units.

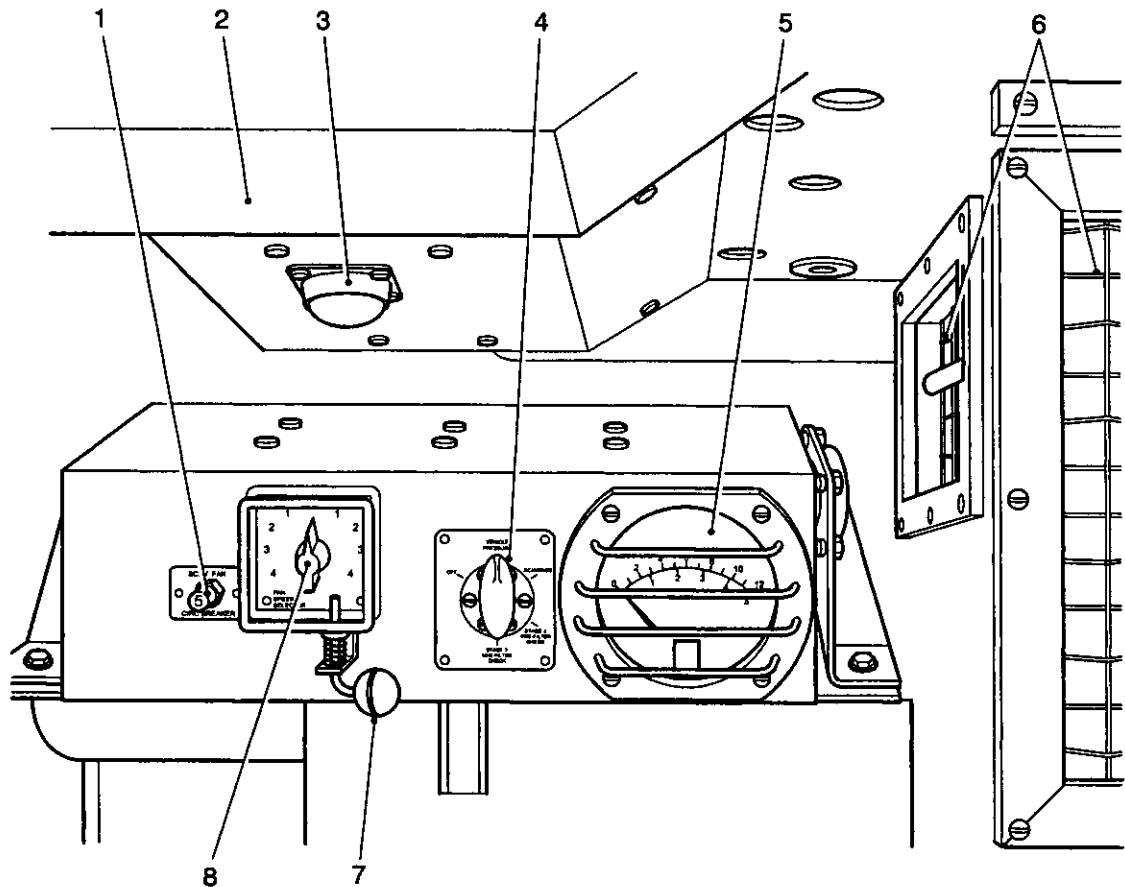
29 The four assemblies are, the NBC fan support assembly, the vent fan support assembly, the scavenge fan assembly and the cyclone pack.

30 The NBC fan support assembly is a cast aluminium frame on which is bolted the NBC fan. The frame forms the mounting point for one end of the pack and has a lifting eye screwed into a boss between the two securing boltholes.

31 The mating faces of the NBC fan support assembly and the pack casing are sealed to prevent leakage of air between the two assemblies.

32 The vent fan support assembly is bolted to the opposite end of the pack casing from the NBC fan support assembly and is sealed to the casing to prevent leakage of air. The assembly consists of a cast aluminium frame with the vent fan bolted onto it. The frame forms the other mounting point for the NBC pack and has a lifting eye screwed into a boss between the two securing bolts holes.

33 Bolted to the pack casing, below the vent fan support assembly motor, is the scavenge fan assembly consisting of cast aluminium frame and the scavenge fan which is bolted to it.



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- | | | | | | |
|---|---------------------------------|---|----------------------------------------------|---|------------------------------|
| 1 | Scavenge fan
circuit breaker | 4 | Pressure differential
gauge selector knob | 6 | ACU ducting louvres |
| 2 | NBC/Ventilation ducting | 5 | Pressure differential
gauge | 7 | Safety catch |
| 3 | NBC/Ventilation diffuser | | | 8 | Fan speed selector
switch |

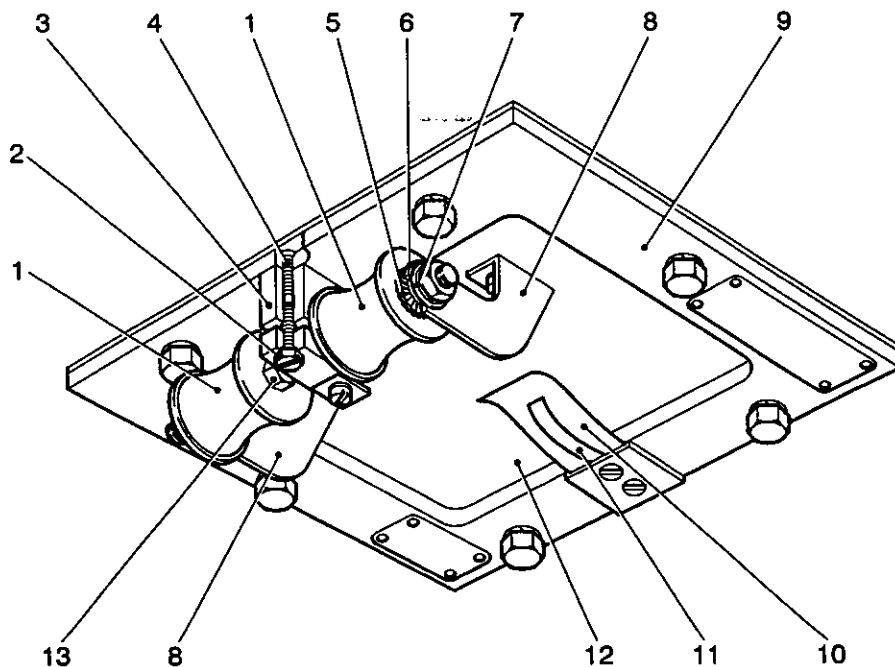
Fig 5 NBC/Ventilation control box

34 The cyclone pack (Fig 4(6)) is bolted onto the casing above and to one side of the scavenge fan. The cyclone pack is sealed to the casing to prevent air leakage and the lower part of the casing has a stub pipe welded to the side nearest the scavenge fan. This stub pipe is joined to the scavenge fan inlet using a flexible hose secured at either end with a hose clamp. The scavenge fan outlet connects to a pipe in the front of the NBC compartment using flexible bellows secured with a hose clamp at either end.

35 Flexible bellows are used to connect the armoured inlet (4) in the top of the NBC compartment to the inlet of the cyclone pack. The top of the bellows is circular to fit the connection in the top of the NBC compartment to which it is secured using a hose clamp. The bottom of the bellows is of rectangular section, which is secured to the cyclone pack using a clamping place, and bolts.

36 The NBC pack is supported on resilient mountings by the use of a rail at either end of the pack, which enables the pack to be withdrawn from the compartment. By attaching a sling to the two lifting eyes or by supporting the pack on a forklift it can be removed for servicing or repair.

37 The NBC pack is bonded to the vehicle by a bonding strip fitted from the top of the NBC fan support casting to the top of the NBC pack compartment. Because jointing compound and gaskets are used to seal all the major components to the pack casing, bonding strips are fitted between the casing and the NBC fan support assembly, the vent fan support assembly and the scavenge fan assembly.



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- | | | |
|----------------------------|-----------------------------|------------------------|
| 1 Metalastic rubber spring | 6 Plain washer | 10 Nylon rubbing strip |
| 2 Clamping screw | 7 Single coil spring washer | 11 Spring |
| 3 Slotted pillar | 8 Hinge bracket | 12 Flap valve |
| 4 Pillar mounting screw | 9 Flap seating and mounting | 13 Bush hexagon |
| 5 Shakeproof lock washer | | |

Fig 6 Vehicle pressure relief valve

Filters

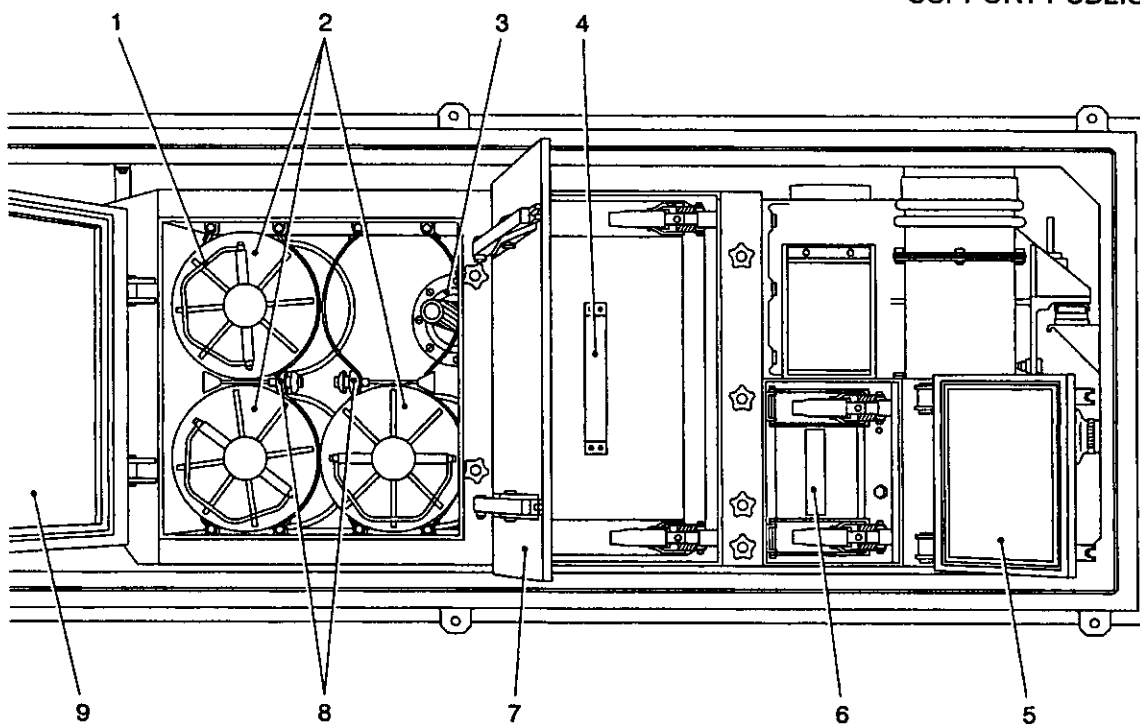
38 The first filtration stage consists of cyclone separator pack bolted to the top front end of the NBC pack casing. The outer casing encloses eleven tubes with swirl vanes fitted in their upper ends. Mounted inside the lower ends of the tubes are conical tubes with a space between the two tubes. Air is drawn through the tubes and as it passes over the swirl vanes a rotary motion is imparted to the airflow. Heavy dust particles are thrown outwards under the influence of centrifugal forces and pass down between the two tubes to the bottom of the unit where the scavenge fan extracts the dust particles and passes them to the atmosphere. The air in the tube centre now depleted of dust particles passes through the centre of the conical tubes and on to the second stage filter.

Second stage filter

39 The second filtration stage is the two-layer synthetic fibre pre-filter element assembly (Fig 7(6)). The pre-filter element is housed in a rectangular sheet metal frame with expanded wire mesh screens either end. The element is a two-layer synthetic fibre pleated cloth, with corrugated PVC separators, which stiffen the folds.

40 The pre-filter assembly is clamped to the second/third stage bulkhead by means of a frame and two toggles. An expanded silicone rubber gasket fixed to the outer face of the filter makes the seal with the bulkhead.

41 The pre-filter clamp frame is centrally pivoted on the two clamp assemblies to distribute the load evenly when securing the filter position. The filter can be removed and cleaned when it becomes clogged.



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1	Carrying handle	5	Second stage (PRE) filter door	8	Filter clamp hand nuts
2	Fourth stage (AV) filters	6	Second stage (PRE) filter handle	9	Fourth stage (AV) filter door
3	O-ring seal	7	Third stage (UHE) filter door		
4	Third stage (UHE) filter handle				

Fig 7 NBC/Ventilation filters

Third stage filter

42 The third stage filter (4) is the first of the two critical NBC filtration stages and is the ultra high efficiency (UHE) particulate filter.

43 The UHE filter contains a pleated length of glass fibre paper material, which is inside a sealed unit. This filter cannot be cleaned and if damaged cannot be repaired, therefore, damaged or clogged filters must be replaced.

44 The filter unit must be handled with care to avoid damaging the glass fibre filtration material inside and the expanded silicone rubber gasket fitted on the outlet side of the filter unit. The third/fourth stage bulkhead is a machined casting sealed to the steel casing with a gasket and secured by bolts through the steel casing. The filter unit is clamped to the bulkhead by a clamping arrangement similar to that used on the second stage filter and the gasket on the outlet side of the filter forms a seal.

Fourth stage filter

45 The fourth filtrations stage comprises four removable cylindrical anti-vapour (AV) filters (2) and forms the second critical NBC filtration stage. The filters use activated charcoal packed between inner and outer finely perforated sleeves capped at either end to form a cylinder. One end cap has a centrally disposed air passage, which is threaded for filter mounting purposes. The other end cap has a carrying handle (1), which is also used for hand tightening when fitting onto the mounts.

46 The AV filters are located in the rear compartment of the NBC pack casing. Bolted to the back of the compartment are four perforated conical mounting spigots with an external thread at their base. The AV filters are positioned over the spigots and screwed onto the threads until hand tight. An O-ring (3) seated in a groove in the facing of each spigot base, seals the filter end cap to the spigot base and prevents air from bypassing the filter.

47 The carrying handle ends of the filters are secured in metal bane clamps, which are secured by hand nuts (8). The bands support and also prevent the filters becoming unscrewed.

48 Air flow is radially inwards through the outer finely perforated sleeves, there being a tendency for the flow to be distributed throughout the filtration media due to the presence of the perforated cones. The air passes through the base of the cones into the chamber formed at the rear of the NBC pack casing and onto the NBC fan inlet.

49 The filters cannot be cleaned and if the charcoal requires changing the filter must be removed for re-filling. The AV filters must not be exposed to vapours from the paint, Benzine, CTF etc, because they seriously shorten the useful life of the filter.

Filter access doors

50 Access to the filters is by opening the appropriate filter door, which has a seal on the face that mates with the pack casing. The cast aluminium doors ((5), (7) and (9)) are supported on two arms that are secured to the casing by pivot pins, washers and split cotter pins. The arms are secured, when the doors are shut, with two hand nuts and swing bolt assemblies. The doors pivot on the arms at the central position allowing the doors to seal with an evenly distributed load when the hand nuts are tightened.

Pressure sensing points

51 Pressure sensing points are provided on the NBC pack to enable the pressure differential across the filters to be checked using the control panel rotary valve and pressure gauge. These sensing points are fitted at the following positions:

- 51.1 Scavenge fan inlet on the rubber elbow through a tube insert and elbow fitting.
- 51.2 Pre-filter inlet through bulkhead coupling and elbow fitting at back of NBC pack casing.
- 51.3 UHE filter inlet through bulkhead coupling and elbow fitting at back of NBC pack casing.
- 51.4. UHE filter outlet through bulkhead coupling and elbow fitting at back of NBC pack casing.
- 51.5 An ambient air pressure tapping is supplied through a hole in the vehicle roof in front of the armoured air intake for the NBC pack.

52 These five sensing points are connected by colour coded nylon tubes to the rotary valve on the control panel. The nylon tubes from the NBC pack pass through the rear of the NBC pack compartment by the use of four bulkhead couplings.

Fans

53 The three fans used in the NBC pack are the vent fan, NBC fan and scavenge fan. All are supplied with 28.5V dc from the control box - inside the vehicle through harnesses via bulkhead connectors fitted in the rear of the NBC compartment.

54 The fans are all of unit construction with a centrifugal fan being driven by a 28.5V dc motor. The vent and NBC fans are of identical construction.

The scavenge fan

55 The scavenge fan operates in both the vent and the NBC conditions and draws the dust particles from the cyclone pack and passes it to the atmosphere.

56 The fan is of unit construction with a 3.8in. diameter impeller mounted direct onto the shaft of a 28.5V dc motor and is enclosed in a volute casing.

57 The direction of rotation is anti-clockwise viewed from the inlet side of the impeller.

58 The fan is bolted on the forward left side of the NBC pack casing. The outlet from the cyclone pack is connected by a rubber elbow and two hose clamps to the scavenge fan intake. The outlet from the scavenge fan is connected, using rubber bellows and two hose clamps, to the stub pipe in the front end of the NBC pack compartment. The stub pipe is welded into the bulkhead and passes through the side plate to atmosphere. This outlet is protected by a scavenge outlet block with a threaded outlet facing downwards. Adjacent to the outlet is a stowage block, which houses a screwed plug. The screwed plug is secured to the vehicle side by a short length of chain. The plug is to be screwed into the scavenge outlet when washing down the vehicle.

The vent fan

59 The vent fan is of unit construction with a 5.1 in. diameter centrifugal impeller mounted direct onto the shaft of a 28.5V dc motor and enclosed in a volute casing. The direction of rotation is anti-clockwise when viewed on the inlet to the impeller.

60 Four bolts secure the vent fan to the aluminium casting which forms the support frame for the forward end of the NBC pack

61 Both inlet and outlet apertures are sealed with neoprene seals fitted to the fan before bolting the fan to the casting.

62 The outlet has a polythene, flap type, non-return valve (Fig 4(2)) bolted to the casting on the opposite side to the fan.

63 When the vent fan support assembly is secured to the NBC pack casing the vent fan inlet seat presses against the casing between the second and third stage filters.

64 When the fan is running it draws air through the cyclone pack and pre-filter and blows it through the non-return valve at the fan outlet into the NBC pack compartment. From the compartment the air passes through the vent ducting (Fig 2(1)) and diffuser nozzles (2) into the vehicle or direct to the personal respirators through the hose adaptors in the vent ducting. The air pressure in the NBC compartment forces the NBC fan non-return valve to shut and prevents air passing back through the NBC fan and filters.

The NBC fan

65 Identical to the vent fan in construction the NBC fan is mounted at the rear of the NBC pack. Four bolts secure the fan to the aluminium frame that forms the rear support for the NBC pack. Sealing the inlet and outlet apertures is the same as for the vent fan and the outlet is fitted with the same polythene, flap type, non-return valve.

66 The fan draws air through the cyclone pack, pre-filter, UHE filter and the AV filters and blows the air through the non-return valve into the NBC pack compartment. The air pressure in the compartment forces the non-return valve of the vent fan shut.

67 Air from the NBC compartment passes through holes (Fig 4(5)) in the top near the front end of the compartment and into the vent ducting to the interior of the vehicle or respirators as required.

Control box

68 The No. 10 Mk 1 control box is mounted with anti-vibration mountings and brackets to the top forward left side of the NBC bulkhead. The control box is connected via a harness to the vehicle electrical distribution box. Nylon tubes are used to transmit atmospheric pressure through the NBC pack to the NBC assembly.

Description

69 The control box comprises the following:

- 69.1 Vent/off NBC fan speed selector switch (Fig 5(8)).

- 69.2 Differential pressure gauge (5).
- 69.3 Selector switch (4) for monitoring pressure differentials across filter stages of the NBC pack.
- 69.4 Circuit breakers (1) for protection of the scavenge fan.
- 69.5 Two fixed electrical connectors.
- 69.6 Five colour coded pressure connectors.

70 The fan speed selector switch cannot be switched to the vent position unless the spring-loaded latch (7) beneath it has first been pulled down. This is a safety precaution against the possibility of only partially filtered air entering the vehicle from a contaminated environment.

71 The differential pressure gauge is used to indicate the depression at the scavenge fan inlet and the vehicle internal air pressure. The NBC pack second and third stage filters condition can be indicated by the measurement of the pressure drop across them. These various pressures are fed to the differential pressure gauge via a rotary valve referred to as the selector switch.

72 The pressure gauge is calibrated from 0-12.5 millibars (0-59in. water gauge).

Pressure relief valve

73 A pressure relief valve (Fig 6) is fitted in the vehicle roof under an armoured cover adjacent to the rear vehicle door.

74 The valve ensures an adequate supply of air to the vehicle interior by permitting spillage of excess air to the atmosphere. This occurs particularly during vent operations when, due to the lower flow restriction resulting from only the first two filtration stages, a higher air flow is induced by the vent fan.

Description

75 The valve seating and mounting (9) is a rectangular plate frame bolted to and overlapping the aperture in the roof. The flap valve (12) is secured by the tow hinge brackets (8) and metalastic rubber springs (1) to a pillar (3) secured to the front edge of the seating and mounting plate frame.

76 A gasket is interposed between the frame and roof and another between the frame and flap valve. These gaskets effectively seal the aperture in the roof when the valve is shut by the rubber springs.

77 Mounted on the opposite side to the hinge is a nylon-rubbing strip (10) with a flat spring (11) pressing it into contact with the flap valve. The rubbing strip opposes the rubber springs shutting action and prevents the flap valve banging shut onto the valve seat gasket.

78 The spindles of the rubber springs screw into either end of a bush which passes through a split hole in the mounting pillar. The bush can be rotated to increase or decrease the operating pressure of the valve and can be secured in the desired position by clamping screw (2) through the split in the mounting pillar. The bush has a hexagon on one end, for use when adjusting the spring tension, the opposite end is drilled through, after screwing in the spindle, and a split cotter pin is fitted to retain the spindle.

Valve setting

79 On initial installation the rubber springs are rotated through 25° and the clamping screw tightened.

80 The final pressure setting of 7.5millibars (3 in. standard water gauge) is obtained by pressurising the vehicle and adjusting the rubber springs tension. This is done by releasing the clamping screw, and using a spanner on the hexagon (13) rotate the bush until the desired pressure is reached then tighten the clamping screw.

CHAPTER 4
ENVIRONMENTAL CONTROL SYSTEM
CONTENTS

Fiche No.	Frame	Para	
2	F2	1	General

GENERAL

1 There is currently no information available relating to unit repairs for the environmental control system fitted to the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439).

CHAPTER 5
ELECTRICAL SYSTEM
CONTENTS

Para

- 1 General
- 3 Test Equipment
- 4 General Description
- 5 Dismantling
- 6 Assembling
- 7 Testing
 - Continuity testing
 - Insulation testing
 - Pneumatic testing

Table

Page

1	Workshop special tools	1
2	Testing of control box No. 10 Mk 1	3

GENERAL

1 The electrical system for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) is identical to that fitted to all FV430 Series, Vehicles, All Marks, with the exception of the special to role equipment detailed in Para 2. Common item unit repairs to the vehicle are detailed in AESP 2350-T-250-522 Chap 3. The remainder of the information in this chapter is applicable to the FV439 SAS/MC electrical components applicable to the environmental control system.

2 The following publications may be necessary to repair special to role equipment:

- 2.1 AESP 5895-H-514-522 for Secondary Access Switch / Message Centre (TKD) in AFV439.
- 2.2 AESP 5895-H-515-522 for Radio Relay installations in Carrier Full Tracked FV439.

Test equipment

3 Table 1 lists the workshop special tools required to carry out the procedures detailed in this chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Serial (1)	NSN (2)	Designation (3)
1	Z4/6625-99-620-9108	Megohmmeter set, four voltages 100, 250, 500, 1,000 Volts
2	Z4/6625-99-650-2822	Multimeter No. 1 Mk 3 set (If not available use another suitable multimeter).

General description

4 The control box No 10 Mk 1 consists of a box with a front panel on which is mounted a 5 amp circuit breaker, fan speed selector switch, switch guard, vehicle pressure switch and a differential air pressure gauge. Electrical and pneumatic connections to the box are via connectors at the sides. When these are detached the box can be removed for repair or component replacement, by releasing the two screws on each side of the box. The control box operates on 28-20 volts dc supply to input plug 1, +ve to pins A and E, -ve to pin C (Circuit Diagram Fig 3 refers). The isolating relay is operated by the fan speed selector switch, selecting Vent or NBC positions 1 to 4 or 5 to 8. This operates the vent or NBC relay which ever is selected, operating relay RL1 that feeds the 5-amp circuit breaker for constant speed Scavenge fan. Speed control of vent and NBC fans is by the selector switch position 2, 3, 4 for NBC and 6, 7, 8 for vent fan through the selected resistors on the resistor board to output socket 1. The vehicle pressure switch is a pneumatic valve, for connection, and the differential pressure gauge is calibrated 0-5 inches water gauge (0-12.5 millibars) it is coupled by the position of the selector valve to the pressure vents over which the pressure difference is to be monitored.

Dismantling

CAUTION

Ensure that the battery supply is switched OFF before disconnecting any plug or sockets.

5

- 5.1 Remove the two screws from each side of the control box and remove front panel.
- 5.2 Remove four retain screws and remove bottom lid.
- 5.3 Remove four retaining screws and withdraw resistance panel to the full extent of the leads.
- 5.4 No special dismantling instructions are required for the removal of the remaining components.

Assembling

6 Assemble in the reverse order to dismantling.

Testing

7

NOTES

- (1) Check that plug 1 has a supply of 28-30 volts dc, before removing control box.
- (2) Unit, field and base repairs to control box No. 10 Mk 1 are permitted only when a serviceable vehicle is available to test the repaired unit in Situ.

Continuity testing

7.1 Using a suitable multimeter, checks are to be carried out using Table 2.

Insulation testing

7.2 Test the insulation resistance with all circuits paralleled should not be less than 5 M Ω when measured at 250V dc.

7.3 Place the control box in a serviceable vehicle and functionally test as part of the NBC ventilation system.

Pneumatic testing

7.4 Check for damage to connection unions, pneumatic loom, losses connection, blocked piping or if any air connections unions are disturbed they should be tightened firmly but care should be taken not to over tighten.

7.5 Individual components of the inner assembly are replaceable AESP 2350-T-251-711 refers.

7.6 Place the control box in a serviceable vehicle and functionally test as part of the NBC ventilation system.

TABLE 2 TESTING OF CONTROL BOX No. 10 Mk 1

Serial (1)	Test (2)	Results (3)
1	Check resistance from terminal 4 on relays 1, 2 and 3 to terminals L, X and W in turn.	All should be less than 0.50 ohms.
2	Check resistance from terminal 4 on relay 1 to terminal M on socket 1 and terminal 2 on relay 2 with switch in NBC speed 1 position.	All should be less than 0.50 ohms.
3	Check resistance from terminal 4 on relay 1 to terminal 2 on relay 3 and terminal G on socket 1 with switch set to VENT speed 1 position.	Both should be less than 0.50 ohms.
4	Check resistance from terminal 4 relay to terminal M on socket 1. Selecting speed 2 NBC Selecting speed 3 NBC Selecting speed 4 NBC	Speed 2 11 ohms ± 1.50 ohms Speed 3 22 ohms ± 1.50 ohms Speed 4 29 ohms ± 1.50 ohms
5	Check resistance from terminal 4 relay to terminal G on socket 1. Selecting speed 2 VENT Selecting speed 3 VENT Selecting speed 4 VENT	Speed 2 11 ohms ± 1.50 ohms Speed 3 22 ohms ± 1.50 ohms Speed 4 29 ohms ± 1.50 ohms
6	Apply (28 volts) -ve to C and +ve to terminals A and E on plug 1 with switch in OFF position test terminals R, H, P, G, M, X, L and W socket 1 from terminal 3 on relay 1.	Terminals R, H and P should be 28 volts all other terminals should be zero.
7	Apply (28 volts) -ve C and +ve to terminals A and E on plug 1. With the switch in the speed 1 NBC. Relays No. 1 and 2 should close. Test terminal M, X and L socket 1 from terminal X on terminal block. TB1	All should be with respect to +ve 28 volts.
8	Apply (28 volts) -ve C and +ve to terminals A and E on plug 1. With the switch in the speed 1 VENT. Relays No. 1 and 3 should close. Test terminal G, L and W on socket 1 from terminal X on terminal block.	All should be with respect to +ve 28 volts.

CHAPTER 6
SPECIAL TO ROLE EQUIPMENT
CONTENTS

Fiche No.	Frame	Para	
3	B2	1	General

GENERAL

1 Repairs to the special to role equipment for the Carrier, Installation, Full Tracked MKs 2 and 2/1 (FV439) are detailed in the AESP's detailed below:

- 1.1 AESP 5895-H-514-522 for Secondary Access Switch / Message Centre (TKD) in AFV439.
- 1.2 AESP 5895-H-515-522 for Radio Relay installations in Carrier Full Tracked FV439.
- 1.3 AESP 6115-G-251 for Generator set diesel engine driven DC 3KW 28V

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