

TRUCK, SURVEILLANCE RECONNAISSANCE VEHICLE (SRV-SF), LIGHTWEIGHT, FFR, W/WINCH, MC2, LAND ROVER 110, 4X4, ISUZU DIESEL ENGINE

INSTALLATION OF A DUAL ALTERNATOR 12VDC & 24VDC ELECTRICAL POWER SYSTEM

MODIFICATION INSTRUCTION

This instruction is authorised for use by command of the Chief of Army. It provides direction, mandatory controls and procedures for the operation, maintenance and support of equipment. Personnel are to carry out any action required by this instruction in accordance with EMEI General A 001.

INTRODUCTION

1. This instruction details the modifications required to convert the Land Rover 110 4x4 Surveillance and Reconnaissance Vehicle – Special Forces (SRV-SF) from a single alternator, dual battery 12-volt dc electrical power system to a dual alternator 12/24-volt dc power system similar to most Land Rover ‘fitted for radio’ (FFR) configurations.
2. The modified power system retains the existing Hitachi 12-volt dc 70-amp alternator and a single relocated Odyssey heavy duty battery to power the vehicle’s main 12-volt vehicle electrical systems. All other ancillary equipment and systems are to be connected to a new electrically separate 24-volt auxiliary power system consisting of a bank of two or four Odyssey heavy duty batteries mounted in one or both of the vehicle’s side battery bins and an LEA 28-volt dc 100-amp alternator. The new configuration also includes the relocation of the main 24-volt load centre from the lower left corner of the front bulkhead in the cargo area to the bulkhead behind the driver’s seat, and the addition of four 24-volt dc general purpose outlets under the heavy weapon mount in the rear cargo area.
3. **Associated Publications.** Reference may be necessary to the latest issue of the following documents:
 - a. Technical Regulation of Army Materiel Manual (TRAMM) (available from DTR-A website <http://intranet.defence.gov.au/armyweb/Sites/DTRA>);
 - b. TRAMM, Volume 3, Section 2, Chapter 2, Fleet Engineering Change Management Process;
 - c. Defence Supply Chain Manual (DSCM), Volume 4, Section 3 – Supply Management Processes, Stores Accounting General (DSCM website <http://dknl009.car.defence.gov.au/dscm/index.htm>);
 - d. DSCM, Volume 6 – Manage Repairable Items;
 - e. EMEI Vehicle G177-1 – Truck, Surveillance Reconnaissance Vehicle (SRV-SF), Lightweight, FFR, W/Winch, MC2, Land Rover 110, 4x4, Isuzu Diesel Engine - Installation and Removal of Land Electronic Warfare Self Protection System (ODIN) and Communication System (MBITR) Vehicle Installation Kit;
 - f. RPS 02188 - Truck, Utility Lightweight, MC2, 4x4, 1 Tonne, 3.9 Litre Diesel Engine, Manual Transmission, 12V, Land Rover Model 110 (Base Scale);
 - g. RPS 02190 - Truck, Utility Lightweight, MC2, 4x4, 1 Tonne, 3.9 Litre Diesel Engine, Manual Transmission, FFR, 12/24V, Land Rover Model 110 (Supplement); and
 - h. Defence Supply Chain Manual (DSCM), Volume 7, Section 3, Chapter 10, para 20 – Work order administration and labour hours (DSCM website <http://dknl009.car.defence.gov.au/dscm/index.htm>).
4. **Authority.** LVSP0 ECO 026/07 is the authority to carry out this modification.

GENERAL

5. **Modification Application.** This modification is to be applied to all Land Rover 110 4x4 SRV-SF vehicles on issue or in service storage.
6. **Items Affected.** This modification alters a number of assemblies and vehicle sub-systems as detailed below:
 - a. The 12-volt main vehicle battery is relocated from the left-hand side battery tray into the left-hand rear sponson tool box.
 - b. The 12-volt auxiliary battery is completely removed from the left-hand side battery tray.

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- c. The solid state battery isolator module is removed from the left-hand guard arch in the engine bay.
 - d. A new opening through the top of the left-hand sponson is made to provide access to the relocated main vehicle battery. The left-hand side facing rear seat mounting points are modified to accommodate the cover assembly fitted over the new opening.
 - e. A new mounting frame and clamp for the main vehicle battery is installed on the floor of the left-hand rear sponson toolbox. A new heavy duty battery isolation switch that is easily accessible through the existing tool box side door is installed to provide for emergency isolation of the main vehicle electrical system.
 - f. A new heavy duty cable and conduit assembly is installed to connect the main vehicle battery to the starter motor.
 - g. An FFR type extended lower mounting bracket for the Hitachi 12-volt 70-amp alternator is fitted to provide clearance for installation of the new auxiliary alternator.
 - h. A new FFR type LEA 28-volt dc 100-amp auxiliary alternator is installed on the left-hand side of the engine block below the existing 12-volt alternator. This installation includes:
 - (1) fitting an FFR type left-hand engine mount bracket;
 - (2) installing new FFR compatible vacuum pump oil lines and dip stick guide tube;
 - (3) fitting a new main crankshaft drive pulley and a jockey pulley assembly to provide for twin V belt drive of the auxiliary alternator;
 - (4) fitting an additional spacer behind the fan to provide extra clearance between the fan blades and the auxiliary alternator drive pulley and belts (only applicable to vehicles fitted with a six-blade fan); and
 - (5) fitting a 'standard' LEA 28-volt dc 100-amp alternator and a modified cable harness.
 - i. A new digital auxiliary voltmeter is installed in the cabin to allow the vehicle crew to monitor performance of the 24-volt auxiliary power system.
 - j. The ODIN/MBITR VIK 12-volt to 24-volt dc to dc converter is removed.
 - k. A new 24-volt load centre is installed on the cabin bulkhead behind the driver's seat. The centre incorporates the two ODIN/MBITR VIK circuit breakers plus a third new breaker and a common earth terminal strip to provide an easily accessible, central connection point for communications, EW and mission specific ancillary systems.
 - l. Four new 24-volt dc general purpose outlets (GPOs) are fitted in the rear cargo to provide power for miscellaneous ancillary equipment such as the refrigerator.
 - m. A new two or four battery 24-volt auxiliary battery bank that can be configured to match ancillary system load demands is installed in the vehicle's FFR type side battery enclosures.
 - (1) **Standard Four Battery Bank.** A new pair of Odyssey PC1700 MJT heavy duty batteries are fitted to the left-hand side battery tray. The right-hand side storage bin is removed and replaced by a battery tray to accommodate an additional pair of batteries. Both pairs of batteries are paralleled together and linked to the load centre via a crossover harness and two 150-amp circuit breakers so that the right-hand side pair of batteries can be removed (or isolated) without altering the cabling installation.
 - (2) **Optional Two Battery Bank.** Only the left-hand pair of batteries is fitted. The right-hand side storage bin is retained.

NOTE

If the optional two battery 24-volt configuration is to be installed, the output current rating of the alternator (Ref EMEI Electrical P 412) must be adjusted to 80A **before** the alternator is installed.

- 7. **Priority – Group 2.** All applicable equipment is to be modified:
 - a. as and when available in accordance with operational requirements;
 - b. when next in a workshop for Light, Medium or Heavy Grade Repair; or

NOTE

Where modification would delay priority issues of depot or pool stock, equipment may be issued unmodified providing the equipment record book is endorsed appropriately.

- c. prior to issue from depot or pool stock.

8. Action Required. Actions detailed in this instruction are to be performed by technical maintenance organisations authorised to carry out Light, Medium or Heavy Grade Repairs. The trade approved to complete this modification is ECN 418 – Technician Electrical, assisted by ECN 229 – Vehicle Mechanic, or civilian equivalents.

NOTE

On receipt of this instruction, enter all relevant information other than date completed in the modifications section of the GM 120 – Record Book for Service Equipment.

9. Task Recording. A MMM standard job number has been raised to carry out and record modifications. The conduct of this modification is to be recorded in a SDSS Work Order using MMM Standard Job Number: 7182. The standard job number is correct at the time of publication. Confirm the number is correct after 12 months from date of issue.

10. Estimated Workhours. For initial planning purposes only, it is estimated that this modification will take 25 workhours to perform.

11. Stores Required. All stores required are included in the modification kit as detailed in Table 1. The modification kit is to be obtained through JLU-V.

Table 1 Stores Required

Item	NSN	Manufacturer Part No	Designation or Description	Unit of Issue	Qty Per Kit	Qty Per Equip
1	2920-66-157-2170		Modification Kit, 12/24 Volt Conversion, SRV-SF, comprising items 2 to 89	ea	-	1
2	5342-66-128-5242	AYG427	Bracket, Engine Accessory, 12-volt alternator mounting	ea	1	1
3	5305-66-128-5318	SH210251	Screw, Steel, Hex Head, zinc plated, M10x25 mm	ea	4	4
4	5305-99-122-8373	BH110241	Bolt, Machine, Steel, Hex Head, zinc plated, M10x120 mm	ea	1	1
5	5310-99-138-9228	WL110001L	Washer, Lock, Spring Steel, zinc plated, 10 mm	ea	13	13
6	5310-66-098-4403	FN110041	Nut, Plain, Hex, grade 8, cad plated, M10, 16 mm A/F	ea	1	1
7	5305-66-128-5276	SH214251	Screw, Hex Head, Steel, zinc coated, M14x25 mm	ea	1	1
8	5310-66-128-5277	AYG33	Washer, Flat, Copper, 14 mm hole, 25 mm OD, 1 mm thick	ea	1	1
9	4730-66-128-5285	BYG2177	Elbow, Pipe to Tube, 7/16" UNF ext to 1/8" BSP ext	ea	1	1
10	4720-66-128-5286	AYG2804	Hose Assembly, Rubber, 7/16" UNF swivel to 25/64" banjo, 300 mm long	ea	1	1
11	4730-66-128-5282	8942239890	Bolt, fluid passage	ea	1	1
12	5330-66-128-4404	9095720100	Packing, Synthetic Rubber with Steel Retainer, 10 mm ID, 19 mm OD, 2 mm thick	ea	2	2
13	4720-66-128-5283	AYG430	Hose, Non-metallic, 12 mm ID, 19 mm OD, 170 mm long	ea	1	1
14	4710-66-128-5291	AYG449	Pipe, Metallic, Dipstick Guide	ea	1	1
15	NIC	AYG2680	Spacer, Fan to Engine, mild steel, zinc plated, 4 x 9 mm holes, 78 mm OD, 32 mm ID, 5 mm thick	ea	1	1
16	5306-66-097-0722	SH108401	Bolt, Machine, hex head, M8x40 mm	ea	4	4
17	3030-66-128-5238	AYG441	Belt, V Fan, Rubberised Fabric, Notched	ea	1	1
18	3020-66-128-5239	AYG400	Pulley, Crankshaft, 2 Groove, Cast Iron, 164 mm OD, 78 mm ID, 33 mm wide	ea	1	1
19	5305-66-139-2018	FS108207	Screw, Hex Head, zinc plated, M8x20 mm	ea	11	11

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Table 2 Stores Required (Continued)

Item	NSN	Manufacturer Part No	Designation or Description	Unit of Issue	Qty Per Kit	Qty Per Equip
20	5310-99-138-9227	WL108001L	Washer, Lock, Spring Steel, zinc plated, 8 mm	ea	15	15
21	3030-66-128-5059	AYG2751	Belt, V Drive, A Section, 1040 mm long, 100-amp alternator drive belt	ea	2	2
22	RPS 02190, Group BCA, Items 1 to 12		Jockey Pulley Assembly, complete	ea	1	1
23	2510-66-128-5314	AYG464	Bracket, Engine Mount, left-hand side, steel	ea	1	1
24	5306-66-128-5313	BH210111	Bolt, Machine, Hex Head, steel, zinc coated, M10x55 mm	ea	1	1
25	5305-66-128-5289	SH310301	Screw, Hex Head, steel, zinc coated, M10x30 mm	ea	6	6
26	5310-99-122-6476	WA110061	Washer, Flat, Steel, zinc plated, 10.5 mm ID, 21 mm OD, 2 mm thick	ea	15	15
27	RPS 02190, Group QGB, Items 13 to 16 and Group QGC, Item 1		Alternator Assembly, 28-volt, 100-amp, c/w axial impeller fan and 3 groove pulley	ea	1	1
28	5340-66-128-5332	AYG489	Clamp, Loop Steel, 170 mm diameter	ea	2	2
29	5306-66-139-0108	FB108101	Bolt, Machine, Steel, hex head, zinc coated, M8x50 mm	ea	4	4
30	5310-99-499-8033	FN108047L	Nut, Plain Hex, Extended Washer, steel, zinc plated, M8	ea	4	4
31	5306-66-128-5292	BH112321	Bolt, Machine, Steel, hex head, zinc coated, M12x160 mm	ea	1	1
32	5310-99-138-9229	WL112001	Washer, Lock, Spring Steel, zinc plated, 12 mm ID	ea	1	1
33	5310-66-128-5086	NH112041	Nut, Plain, Hex, steel, medium tensile, zinc plated, M12	ea	1	1
34		AYG9918 (mod)	Cable Harness, Auxiliary Alternator to Battery Enclosure, 3.6 metres long	ea	1	1
35		Tenix 00363-13A	Extension Plate, Seat Base, Aluminium, 370 mm x 80 mm	ea	1	1
36	5310-99-122-5496	NY108041L	Nut, Self Locking, Hex, Steel, zinc plated, M8, 13 mm A/F	ea	4	4
37		Tenix 00363-10-2B	Cover Assembly, Aluminium, Main Battery Box, 500 mm x 256 mm	ea	1	1
38		Tenix 00363-12B	Cover Frame Assembly, Aluminium, Main Battery Box, 541 mm x 292 mm	ea	1	1
39		Tenix 00363-4B	Mounting Frame, Main Battery, Steel	ea	1	1
40		Tenix 00363-6B	Battery Clamp Plate, Main Battery, 210 mm x 40 mm x 5 mm	ea	1	1
41	5306-66-128-5383	AYG9734	Bolt, Hook Steel (J bolt), 236-238 mm long, M8 thread	ea	4	4
42	5310-99-122-6475	WA108051	Washer, Flat, Steel, zinc plated, 8 mm ID, 17 mm OD, 1.6 mm thick	ea	6	6
43		Tenix	Cable Assembly, Inner Earth Link, black, 35 mm ² x 250 mm with 8 mm lug one end, 10 mm lug other end	ea	1	1
44		Tenix	Cable Assembly, Outer Earth Link, black, 35 mm ² x 850 mm with 8 mm lugs both ends	ea	1	1
45	5305-12-141-9870	FS108351L	Screw, Cap, Steel, hex head, zinc coated, M8x35 mm	ea	1	1
46	5310-99-139-0313	NT108041	Nut, Plain, Hex, steel, zinc coated, M8, 13 mm A/F	ea	3	3
47		Baxters	Switch, Heavy Duty, Single Pole with Detachable T Handle	ea	1	1
48			Edge Protector Strip, plastic covered	cm	120	120
49		Tenix	Cable Assembly, Main Battery to Starter Motor, 2 x 70 mm ² , 4.4 metres long, 1 x 8 mm lug (red) and 1 x 12 mm lug (black) one end, 2 x 10 mm lugs the other end	ea	1	1
50		Tenix 00363-14A	Plate, Battery Harness Protector, Aluminium, 2 mm thick	ea	1	1
51		Tenix	Cable Assembly, Isolation Switch to Main Battery, black, 70 mm ² x 500 mm long with 10 mm lugs both ends			
52		Baxters	Clamp, Positive Battery Terminal Post, brass with 10 mm stud	ea	5	5

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Table 3 Stores Required (Continued)

Item	NSN	Manufacturer Part No	Designation or Description	Unit of Issue	Qty Per Kit	Qty Per Equip
53		Baxters	Clamp, Negative Battery Terminal Post, brass with 10 mm stud	ea	5	5
54		185150F-12-1	Circuit Breaker, Single Pole, Switchable, HI-AMP 150-amp	ea	2	2
55	5925-01-542-4124	185060F-12-1	Circuit Breaker, Single Pole, Switchable, HI-AMP 60-amp	ea	1	1
56	5305-99-796-7536	SE106201	Screw, Pan Head, steel, zinc coated, Phillips #2, M6x20 mm	ea	10	10
57	5310-66-144-6236	NY106047L	Nut, Self Locking, hex, nylon insert, zinc plated, M6	ea	10	10
58	5310-99-122-6474	WA106001L	Washer, Flat, Steel, zinc plated, 6.5 mm ID, 12.5 mm OD, 1.6 mm thick	ea	10	10
59		Tenix	Cable Assembly, Crossover Harness to Load Centre, 2 x 35 mm ² x 1700 mm long with 6 mm lugs both ends	ea	1	1
60		Tenix	Cable Assembly, Crossover, Left Bank to Right Bank, 2 x 35 mm ² x 2.55 metres long with 6 mm lugs one end, 10 mm lugs the other end	ea	1	1
61		Tenix	Cable Assembly, Earth Link, black, 35 mm ² x 920 mm long with 8 mm lug one end, 10 mm lug the other	ea	2	2
62		Tenix	Cable Assembly, Circuit Breaker to Battery, red, 35 mm ² x 800 mm long with 6 mm lug one end, 10 mm lug other end	ea	1	1
63		Tenix	Cable Assembly, Circuit Breaker to Battery, black, 35 mm ² x 900 mm long with 6 mm lug one end, 10 mm lug other end	ea	1	1
64		Tenix	Cable Assembly, Load Centre Link, red, 20 mm ² x 90 mm long with 6 mm lugs both ends	ea	2	2
65		Tenix 00363-16A	Terminal Strip Assembly, brass, 160 mm long c/w four M6x30 mm SS studs, eight 6 mm SS lock washers and eight SS M6 nuts	ea	1	1
66		Tenix	Wiring Harness, Electrical, alternator sense line and digital voltmeter, c/w relay	ea	1	1
67	5305-99-135-0430	SE105161	Screw, Pan Head, steel, zinc coated, Phillips #2, M5x16 mm	ea	1	1
68	5310-99-122-5494	NY105041	Nut, Self Locking, nylon insert, zinc plated, M5	ea	1	1
69	5310-99-122-3032	WA105001	Washer, Flat, Round, steel, zinc plated, 5 mm nominal bolt size	ea	1	1
70		Tenix	Voltmeter Assembly, Digital Readout, c/w conduit and twin Quickcrimp® connector	ea	1	1
71			Screw, Countersunk Head, self tapping, 4 mm x 12 mm long	ea	1	1
72		Tenix	Cable Assembly, 24-volt General Purpose Outlets, c/w two GPO socket boxes, 12 mm conduit and 6 mm cable lugs	ea	1	1
73			Bolt, Machine, Steel, hex head, zinc coated, M10x12 mm	e	4	4
74		Tenix	Cable assembly, battery bridge, 35 mm ² x 320 mm long with 10 mm lugs both ends	ea	2	2
75		Tenix	Cable Assembly, Sense Line Fuse, 4 mm ² x 200 mm long with 10 mm lug one end, bullet connector the other	ea	1	1
76		Tenix	Decal, Self Adhesive, SRV-SF auxiliary battery circuit	ea	1	1
77	6160-66-139-0119	AYG9888	Tray Assembly, FFR battery, right hand, steel, 3 mm thick	ea	1	1
78		Tenix 15013770	Clamp, battery pair, Odyssey	ea	1	1
79	6140-01-521-8419	Odyssey PC1700MJT	Battery Storage, 12-volt DC, 65 amp-hour, sealed rechargeable drycell	ea	4	4
80			Bag, Plastic, Heavy Duty PVC film, 75 mm x 120 mm	ea	2	2
81		Tenix	Battery Mat, Rubber/fabric, 320 mm x 175 mm x 3 mm thick	ea	1	1
82			Bullet Connector, Female, 3 mm wire, crimp connect, insulated	ea	1	1
83			Bullet connector, male, 3 mm wire, crimp connect, insulated	ea	1	1

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Table 4 Stores Required (Continued)

Item	NSN	Manufacturer Part No	Designation or Description	Unit of Issue	Qty Per Kit	Qty Per Equip
84			"P" Clip, PVC coated, 32 mm	ea	15	15
85			"P" Clip, PVC coated, 16 mm	ea	5	5
86			Screw, Self Drilling and Tapping, hex head, Tek 10-24x16 mm	ea	20	20
87			Cable Tie, 290 mm long x 4.8 mm wide	ea	30	30
88	99-120-9002		Pop Rivet, 4.8 mm x 15 mm	ea	50	50
89			Sealer, black	tube	1	1
90	99-728-1611	AFU4173	Cable Tie, 770 mm long x 14 mm wide	ea	1	1

12. Items to be Removed. The items to be removed are listed in Table 5. All stores removed are to be processed in accordance with DSCM, Volume 4, Section 3 – Supply Management Processes, Stores Accounting General.

Table 5 Items to be Removed

Item	NSN	Manufacturer Part No	Designation or Description	Qty Per Equip
1	6140-01-521-8419	Odyssey PC1700MJT	Battery Storage, 12-volt dc, 65 amp-hour, sealed rechargeable drycell	1
2	6150-66-128-6149	BYG9029	Lead, Storage Battery, 800 mm long (AUX Battery negative to Chassis)	1
3	6150-66-128-6153	BYG9125	Lead, Storage Battery, 685 mm long (MAIN Battery negative to Chassis)	1
4	6150-66-128-6148	BYG9030	Lead, Storage Battery, 3.6 metres long (AUX Battery positive to Isolator)	1
5	6150-66-128-6154	BYG9124	Lead, Storage Battery, 2.95 metres long, positive terminal (MAIN Battery positive to Starter motor)	1
6	2929-66-128-6185	BYG9097	Battery Isolator, Negative Ground, anodized finish	1
7	5930-66-128-6218	BYG9108	Switch, Toggle Voltmeter	1
8	NIC	HYG3956	Stowage Bin Assembly, slide out, right hand, complete	1 (Note 1)
9	6130-66-154-3404		DC to DC Converter, 12 to 24 V dc, 25-amps	1
10	6150-66-154-1191		Cable Assembly, Special Purpose Electrical, Input Power, DC/DC Converter (W5)	1
11	6150-66-154-1192		Cable Assembly, Special Purpose Electrical, Output Power, 24 V Branched, (W6)	1 (Note 2)
12	6150-66-154-1193		Cable Assembly, Special Purpose Electrical, Output Power, 24 V (W7)	1 (Note 2)
13	5306-66-128-4460	0501410350	Bolt, Machine, Steel, hex head, c/w flat & lock washer, M10x35 mm, 14 mm A/F	2 (Note 3)
14	3030-66-128-4283	8941528120	Belt, V Rubberised Fabric, 1178 mm nominal length	1
15	5342-66-128-4716	8941004510	Bracket, Engine Accessory Support for Alternator (Perentie)	1 (Note 3)
16	5306-66-128-4572	9019110250	Bolt, Machine, Steel, hex head, M10x25 mm	1 (Note 3)
17	5306-66-128-4573	8941655180	Bolt, Machine, Steel, hex head, c/w lock washer, M10x90 mm, 14 mm A/F	1 (Note 3)
18	5306-66-128-4613	5090000890	Bolt, Machine, Steel, hex head, c/w lock washer, M10x55 mm, 14 mm A/F	1 (Note 3)
19	4720-66-128-4287	8941578370	Tubing, Synthetic Rubber, 10 mm ID, 17.5 mm OD, 135 mm long	1 (Note 4)
20	4730-66-128-4440	5096600330	Adaptor, Straight, Hose to Boss, steel, M14 thread to 12 mm hose	1 (Note 4)
21	5310-66-128-4372	9095716140	Washer, Flat, Copper, 14 mm ID, 21 mm OD, 1 mm thick	1 (Note 4)
22	4710-66-128-5002	8941590480	Tube Assembly Metal	1 (Note 4)
23	4730-66-128-4440	5096600330	Adapter, Straight, Pipe to Boss, M10 thread to 1/8" PTS	1 (Note 4)
24	2815-66-128-5037	8941509980	Dipstick Guide	1 (Note 4)

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Table 6 Items to be Removed

Item	NSN	Manufacturer Part No	Designation or Description	Qty per Equip
25	5306-66-128-4399	9019108350	Bolt, Machine, Steel, hex head, M8x35 mm, 12 mm A/F,	4 (Note 5)
26	5306-66-128-5637	8943134650	Bolt, Machine, M10x25 mm	4 (Note 4)
27	5310-66-128-4424	089151401A	Washer, Lock, Steel, 10.5 mm ID, 18 mm OD, 2 mm thick	4 (Note 4)
28	2510-66-128-5041	AYG2773	Bracket, Engine Mount, front left-hand	1 (Note 4)
29		HYG4670	Plate Switch Facing, Fuel Tank Selector, Driving Lights and Voltmeter	1

NOTES

1. Retained in a two-battery auxiliary system installation.
2. Cable W6 applies to ODIN 2 and cable W7 applies to ODIN 1.
3. Not applicable if vehicle is already fitted with an extended lower alternator mounting bracket.
4. Not applicable if vehicle is already fitted with FFR type left hand engine mount.
5. Not applicable if vehicle is fitted with an eight blade fan.

13. Special Tools Required. The special tools detailed in Table 7 are supplementary to the normal range of common hand tools and have been included in the modification kit to facilitate installation of the modification under operational conditions.

Table 7 Special Tools Required

Item	NSN	Designation or Description
1	NIC	8 mm x 1.25 mm pitch finishing tap
2	NIC	10 mm x 1.25 mm pitch finishing tap
3	NIC	32 mm hole saw
4	NIC	20 mm hole saw
5	NIC	100 mm cutting blade
6	NIC	Arbor
7	NIC	Arbor adaptor

MODIFICATION DETAILS

PREPARATION OF THE VEHICLE

14. Installation of this modification kit involves the removal and replacement of some major vehicle components and working beneath the vehicle. The selected work area should include sufficient space to store the removed components, including the bonnet and both the driver's and commander's seat assemblies, and provide for easy technician access from all sides and beneath the vehicle. At least one wheel on each side of the vehicle should be securely chocked to prevent any movement of the vehicle during the modification.

15. Carry out the following actions to prepare the vehicle.

- a. Disconnect the folding bonnet support prop, lift the bonnet up to a near vertical position and remove it from the vehicle.
- b. It is recommended to degrease and rinse the engine bay and thoroughly wash the underside of the vehicle if facilities are available.

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Always disconnect the negative (earth) lead from a battery first.

- c. Slide out the left-hand side battery tray and disconnect all four battery terminal post clamps from the main and auxiliary battery terminals, remove the battery clamp and then completely remove both batteries from the tray. Put the main vehicle battery, the battery clamp, 'J' bolts, nuts and washers aside for later reinstallation in the vehicle.

NOTE

The auxiliary battery (Table 2, Item 1) may be retained as a spare main vehicle battery, but must NOT be mixed with new batteries in any 24-volt multi-battery parallel configuration, except under emergency operational circumstances.

- d. Disconnect the chassis connections on the two battery earth cables (Table 2, Items 2 and 3) and remove both cables.
- e. Remove all cable ties and/or P clips securing the two battery positive cables (Table 2, Items 4 and 5) running into the engine compartment. Disconnect the cables from the starter motor solenoid stud and the #2 terminal on the battery isolator module and then completely remove both cables.

NOTE

There can be one or two (brown or red) wires of the '1' terminal on the battery isolation module. Both need to be connected to the Alternator + terminal.

- f. Disconnect the brown alternator (A+) wire from the 'A' (centre) terminal on the isolator module and discard the cable (see Figure 1). Disconnect the cable(s) running from terminal #1 on the isolator module and connect to the Alternator + terminal. Unbolt and completely remove the isolator module (Table 2, Item 6).

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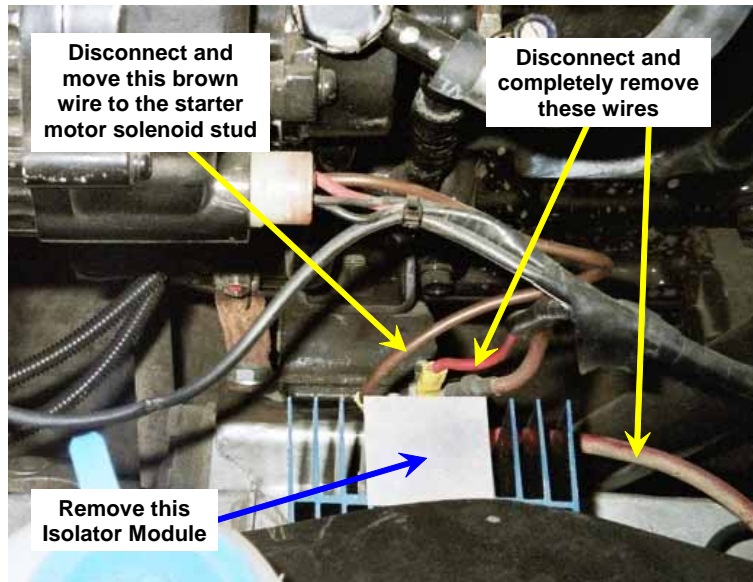


Figure 1 Removal of the Battery Isolator Module

- g. Loosen the large hose clips securing the air cleaner inlet and outlet hoses to the air cleaner body, release the wing nuts securing the main body clamps and remove the air cleaner assembly. Remove and set aside the wiring loom protection plate on the firewall immediately behind the air cleaner.

NOTE

To provide easier access behind the instrument panel during removal, disconnect the speedometermeter cable from the trip meter transducer in the engine bay before disconnecting the other end from the back of the speedometermeter.

- h. Remove and set aside the four screws securing the instrument panel (see Figure 2) and move it clear of the dash cowlings. Do not disconnect the main wiring harness from the instrument panel.



Figure 2 Instrument Panel Securing Screws

- i. Remove the MAIN BATT – AUX BATT test switch (Table 2, Item 7) from the dash. Disconnect and completely remove the brown 3 mm wire that runs back from the switch to the auxiliary battery in the left-hand side battery enclosure.
- j. Disconnect the green (12-volt ignition) wire and the white (voltmeter positive) wire from the test switch and discard the switch. Cut the existing quick connect terminals from these two wires, fit a female bullet terminal (Table 1, Item 82) to the green wire and a male bullet terminal (Table 1, Item 83) to the white wire and then connect them together.
- k. Remove the Plate Switch Facing, Fuel Tank Selector, Driving Lights and Voltmeter from the dash by removing the M5 machine screws and Driving Light and Fuel Tank Selector switches. Fit the replacement Plate Switch Facing, Fuel Tank Selector and Driving Lights. Refit the Driving Light and Fuel Tank Selector switches. A new Driving Light switch is supplied in the kit, if the existing switch is damaged during removal.

NOTE

For a two battery auxiliary power system installation, the storage bin assembly will be refitted later in this procedure. For a four battery installation, the bin assembly will be replaced by a battery tray later in this procedure.

- l. Slide out the storage bin assembly (Table 2, Item 8) in the driver's side battery enclosure, remove the stop bolt on the right-hand slide and then remove the storage bin assembly.
- m. Undo and set aside the four bolts securing the back of the vehicle commander's riser seat assembly to the top combing of the cabin rear bulkhead and the four bolts securing the base frame to the cabin seat base. Remove the complete seat assembly.
- n. Undo and set aside the four bolts securing the driver's seat runners to the cabin seat base and remove the complete seat assembly.

16. Removal of the DC to DC Converter. The 12-volt to 24-volt dc to dc converter originally fitted as part of the ODIN/MBITR VIK (Ref EMEI Vehicle G 177-1) is no longer required once the new 24-volt auxiliary power system is installed. To remove the converter, proceed as follows:

- a. Remove the equipment protection barrier
- b. Remove the ODIN/MBITR mount bracket mounted on the bulkhead in the rear cargo area. Remove and discard the four bolts securing the dc to dc converter (Table 2, Item 9) to the bracket and separate the converter and all attached cables from the bracket. Set aside the bracket and its mounting hardware for reinstallation later in this procedure.

- c. Disconnect the W5 dc to dc converter input cable (Table 2, Item 10) from the EW isolator switch and the earth bridge and then completely remove the converter and the attached W5 cable along with the W6 (Table 2, Item 11) and/or W7 (Table 2, Item 12) cables. The EW isolator switch is to remain.

NOTE

New 24-volt power input cables for the ODIN 1/2 system and instructions for their installation and connection to the new load centre are supplied with the ODIN 4/5 upgrade VIK.

- d. Disconnect and completely remove all the remaining cables connected to the two circuit breakers and the earth bridge mounted on the lower left side of the bulkhead. Remove the earth bridge and the circuit breakers from the bulkhead – the breakers are to be relocated to the new 24-volt load centre behind the driver's seat later in this procedure.

17. Reconfiguration of the Smoke Grenade Launcher System Cabling.

NOTE

In ODIN fitted vehicles, the power cable is connected to one of the circuit breakers mounted on the lower left corner of the cabin bulkhead in the cargo area. Where ODIN has not been fitted, the power cable is connected directly to the auxiliary battery in the left-hand side battery enclosure.

- a. Disconnect the smoke grenade launcher system power cable, remove all associated cable ties and/or P clips, and pull the full length of the cable back into the engine bay.
- b. Reconnect the positive lead of the power cable to the 8 mm main power input stud on the starter motor solenoid. Connect the earth lead to one of the 5 mm screws securing the solenoid switch mounting plate to the solenoid body.
- c. Run the cable back towards the firewall along the existing wiring loom alignment and secure it in place with cable ties (Table 1, Item 87). Loop the remaining excess length of cable backwards and forwards across the centre of the firewall until the excess has been taken up. Use cable ties to secure the loops to the hydraulic line running across the firewall behind the air cleaner.

18. Remove and Modify the Left-hand Rear Side Facing Seat Assembly.

- a. Remove and retain the two M10 x 25 mm bolts and associated washers and nuts securing the bottom of the seat frame to the top of the sponson. Remove and retain the four M6 x 16 mm bolts, washers and nuts securing the back of the seat frame to the angled brackets mounted to the top of the side combing and then remove the complete seat assembly.

INSTALLATION OF THE 28-VOLT AUXILIARY ALTERNATOR

19. This part of the modification involves the installation of a new LEA type 28-volt 100-amp auxiliary alternator onto the left-hand side of the engine block below the existing Hitachi 12-volt 70-amp alternator. When completed, the engine bay installation is virtually identical to a standard 4x4 Land Rover FFR configuration. The changes required to accommodate the new alternator include fitting an FFR type left hand engine mount bracket and an extended lower mounting bracket for the 12-volt alternator, the addition of a new twin groove crankshaft drive pulley and jockey pulley assembly and modifications to the vacuum pump oil lines and the dip stick guide tube made necessary by the change in engine mount configuration. On vehicles fitted with a 6-blade fan, the conversion also requires the fitting of an additional spacer between the fan and the water pump pulley.

NOTE

Some vehicles may already be configured with some or all of the changes required to accommodate the auxiliary alternator installation. Select the steps from the following procedure that are appropriate to the particular vehicle configuration.

20. Carry out the following actions to install the new alternator and associated drive belt components:

NOTE

If the optional two battery 24-volt configuration is to be installed, the output current rating of the alternator (Ref EMEI Electrical P410) must be adjusted to 80 amps **before** the alternator is installed.

- a. Remove the 12-volt alternator and vacuum pump assembly as follows:
- (1) Disconnect both oil lines and the vacuum line from the vacuum pump. Cover the vacuum line on the engine and all the openings on the vacuum pump with suitable plugs or material.
 - (2) Unplug the wiring harness and disconnect the B+ output lead from the alternator.
 - (3) Remove and set aside the top bolt securing the alternator to the slide adjustment bracket. Remove and discard the two M10 x 35 mm pivot bolts (Table 2, Item 13) securing the alternator to the lower mounting bracket and then put aside the alternator and vacuum pump assembly for later reinstallation.
 - (4) Remove the existing notched fan belt (Table 2, Item 14) and loop the new longer notched fan belt (Table 1, Item 17) into position over the water pump and crankshaft drive pulleys.

NOTE

Always fit the new longer notched belt supplied in the modification kit, even if the vehicle is already fitted with a longer belt. Do NOT reuse an old fan belt in this installation.

- b. Remove the standard lower alternator mounting bracket and replace it with the extended bracket shown in Figure 3.

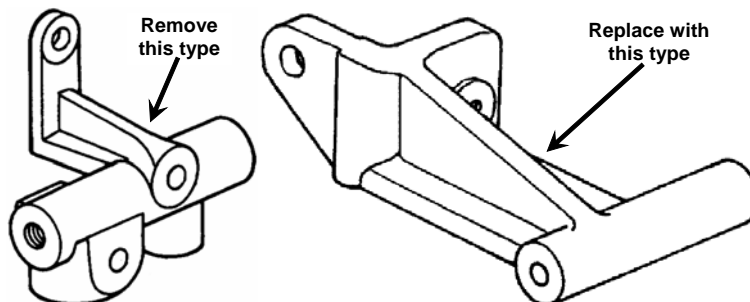
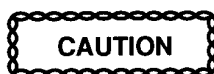


Figure 3 Original and Replacement Lower Alternator Mounting Brackets

- (1) Remove the M10 x 40 mm bolt through the water pump housing that is adjacent to the top mounting bolt on the standard alternator mounting bracket.
 - (2) Remove the three bolts (Table 2, Items 16, 17 and 18) securing the bracket to the side of the engine block and remove the bracket (Table 2, Item 15).
 - (3) Secure the new extended type bracket (Table 1, Item 2) in position by fitting a new M10 x 45 bolt (NSN 66-128-5331) into the water pump housing through the front facing hole and two M10 x 25 mm bolts (Table 1, Item 3) with 10 mm lock washers (Table 1, Item 5) screwed into two of the original mounting holes in the side of the engine block.
- c. Remove the early type vacuum pump oil lines and dip stick guide tube and replace them with late type FFR compatible fittings.



It is imperative to keep foreign matter out of the lubrication system. Ensure dirt and dust is not introduced onto oil ports, hoses and pipes.

- (1) Remove the rubber vacuum pump oil return hose (Table 2, Item 19) from the hose adapter fitting in the block. Remove both hose clips from the old hose and retain them for later use.

- (2) Remove the oil return hose adapter fitting (Table 2, Item 20) and the old copper washer (Table 2, Item 21) from the block (see Figure 4). Discard the copper washer. Apply a small amount of thread sealer to the filler plug (Table 1, Item 7) and then fit the plug and a flat aluminium washer (Table 1, Item 89) to close the oil return hole.
- (3) Remove the vacuum pump oil feed line (Table 2, Item 22) and the straight banjo adapter fitting (Table 2, Item 23) from the block (see Figure 4).
- (4) Apply a small amount of thread sealer to the elbow union (Table 1, Item 9) and then fit the elbow into the oil feed hole in the block. Position the elbow outlet facing upwards and at a 45 degree angle to the rear, apply a small amount of thread sealer, and then fit the new vacuum pump oil feed line (Table 1, Item 10) to the elbow.

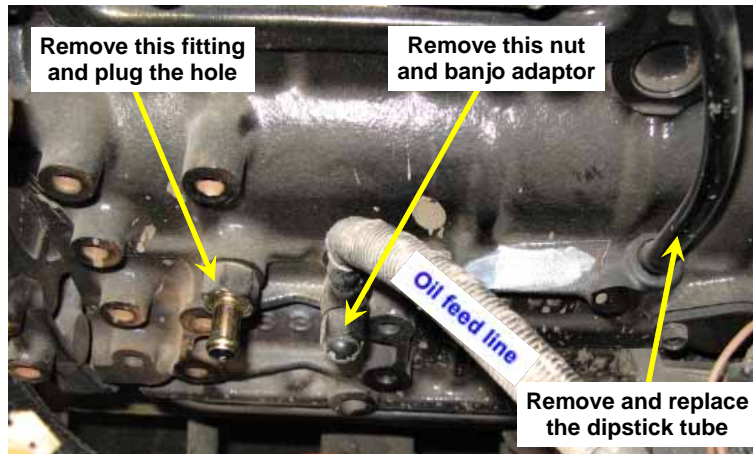


Figure 4 Vacuum Pump Oil Line Fittings

- (5) Remove and set aside the dip stick. Remove the dip stick guide tube (Table 2, Item 24). Apply a light coat of clean engine oil or grease to the seal and fit the new FFR type guide tube (Table 1, Item 14) (see Figure 5). Ensure the bottom seal is properly seated before tightening the top mounting bolt. Replace the dip stick in the new guide tube.

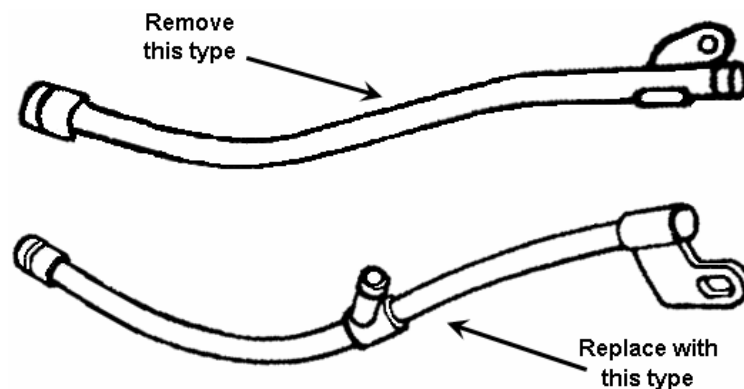


Figure 5 Original and Replacement Dip Stick Guide Tubes

- d. Fit an additional spacer between the fan and the upper pulley as follows:

NOTE

This step is not required if the engine is fitted with an eight-blade fan.

- (1) Remove the passenger side radiator mount bracket. Unbolt the driver's side radiator mount bracket and slide along coolant hose to move it out of the way.
- (2) Remove the three screws holding the fan shroud to the radiator and move the shroud back from the radiator as far as possible.
- (3) Working from above in the space between the fan shroud and the radiator, remove the four M8 x 35 mm bolts (Table 2, Item 25) securing the fan, and then remove the fan from the top pulley shaft.

- (4) Remove the 20 mm spacer from the pulley hub.
 - (5) Fit the additional fan spacer (Table 1, Item 15) over the shaft and then refit the 20 mm spacer and the fan using four new M8 x 40 mm bolts (Table 1, Item 16) fitted with 8 mm lock washers taken from the original fan mounting bolts. Ensure the new fan belt is loosely retained in the correct pulley alignment.
 - (6) Refit the fan shroud to the radiator.
 - (7) Refit the top radiator mount brackets.
- e. Fit a new double groove crankshaft pulley and the new jockey pulley assembly as follows:
- (1) Working from below the engine, use an M8 x 1.25 mm pitch finishing tap (Table 3, Item 1) to clean the four threaded holes on the harmonic balancer (see Figure 6). It may be necessary to manually rotate the engine to gain easier access to the threaded holes on the harmonic balancer.

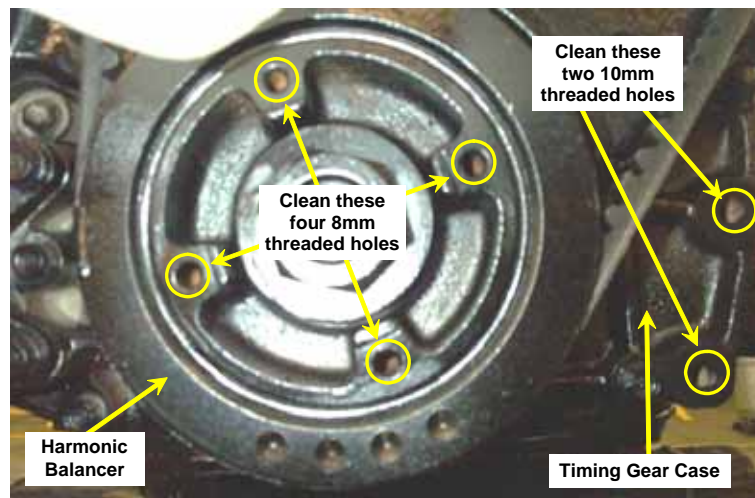


Figure 6 Threaded Holes to be Cleaned

- (2) Fit the twin grooved crankshaft drive pulley (Table 1, Item 18) to the harmonic balancer using four M8 x 20 mm bolts (Table 1, Item 19) and four 8 mm lock washers (Table 1, Item 20).
- (3) Using an M10 x 1.25 mm pitch finishing tap (Table 3, Item 2), clean the two threaded holes on the left-hand front face of the timing gear case (see Figure 6).
- (4) Fit the Jockey Pulley Assembly (Table 1, Item 22) to the timing gear case using two M10 x 25 mm bolts (Table 1, Item 3) and two 10 mm lock washers (Table 1, Item 5) as shown in Figure 7.

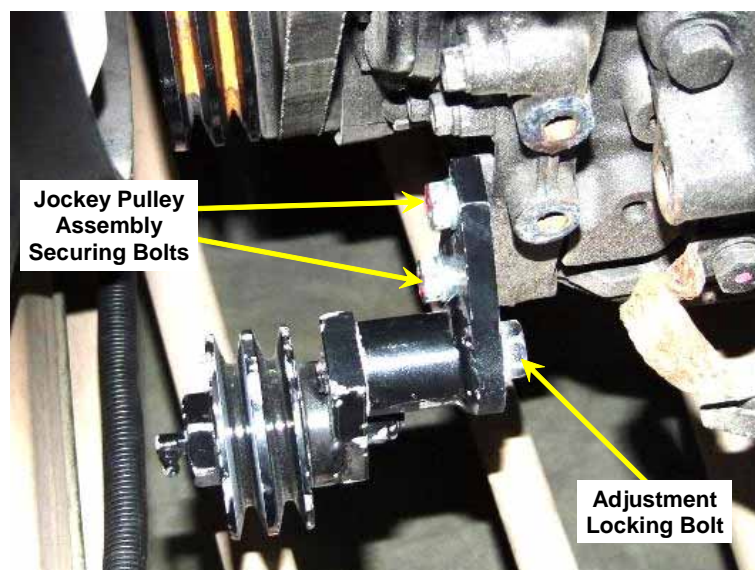


Figure 7 Jockey Pulley Assembly Fitted

- f. Remove and replace the left-hand front engine mount assembly as follows:

NOTE

This step is not required if the engine is already fitted with an FFR type engine mount as illustrated in Figure 8.

WARNING

Check that the vehicle wheels are securely chocked before taking the weight of the engine on the jack.

CAUTION

When raising the engine with a jack, extreme care must be taken to prevent damage to any pipes, hoses or wiring harness and the front exhaust pipe.

- (1) Crack loose the two bolts securing the left-hand front engine mount resilient block to the chassis and the four bolts securing the engine mount bracket to the engine block.
- (2) Place a suitable block of wood on a jack, position the jack under the engine oil pan (sump) and then raise the jack so that it just takes the weight of the engine.
- (3) Remove and discard the four M10 x 25 mm bolts (Table 2, Item 26) and lock washers (Table 2, Item 27) securing the engine mount bracket to the engine. Remove and set aside for later reinstallation the earth strap and the two bolts and washers securing the resilient block to the chassis.
- (4) Use the jack to raise the engine just enough to enable the complete resilient block and engine mount bracket assembly to be removed.
- (5) Fit the new resilient block to the new FFR type engine mount bracket (Table 1, Item 23) as shown in Figure 8. Ensure that the locating pin on the resilient block is correctly aligned to the hole in the bracket and then tighten the nut on the back of the bracket.

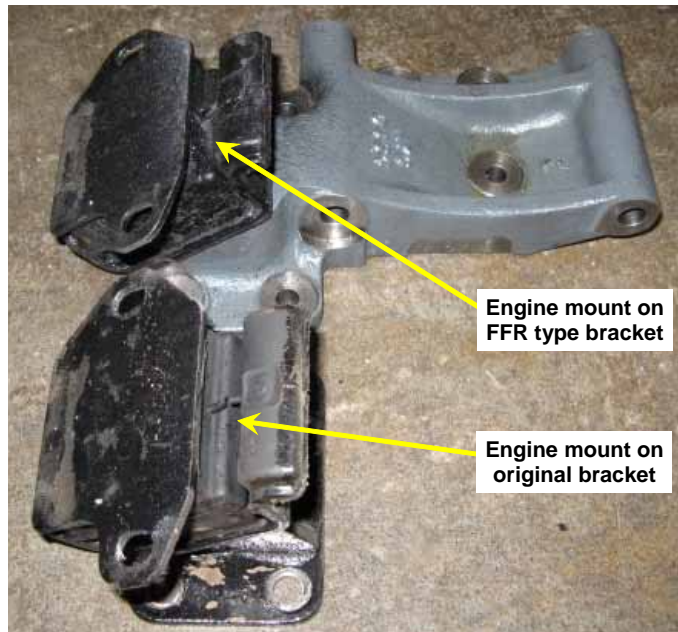


Figure 8 Left-Hand Engine Mount - Old and New

WARNING

Some manipulation of the jack holding the engine weight may be required during the refitting process. Keep hands and fingers clear of all pinch points when refitting the engine mount. Ensure that all fastenings are correctly seated and tightened before releasing the jack.

- (6) Fit the new resilient block and bracket assembly in position. Use the original bolts and washers to secure the resilient block and the earth strap to the chassis. Use one new M10 x 55 mm bolt (Table 1, Item 24) and six M10 x 30 mm bolts (Table 1, Item 25) fitted with 10 mm lock washers (Table 1, Item 5) to secure the bracket and the earth strap to the block. Adjust the position of the vacuum pump oil feed line elbow union as required to maintain clearance from the rear edge of the engine mount bracket. Some removal of material from the engine mount bracket may be required to maintain clearance.
 - (7) Remove the jack and transfer the engine weight onto the new left-hand engine mount.
- g. Fit the new 28-volt auxiliary alternator and drive belts.
- (1) Loosely fit two M8 x 50 mm clamp bolts (Table 1, Item 29), 8 mm lock washers (Table 1, Item 20) and M8 nuts (Table 1, Item 30) to each alternator clamp ring (Table 1, Item 28) and position them on the alternator assembly (Table 1, Item 27) ready for mounting onto the left-hand engine mount bracket as shown in Figure 9.

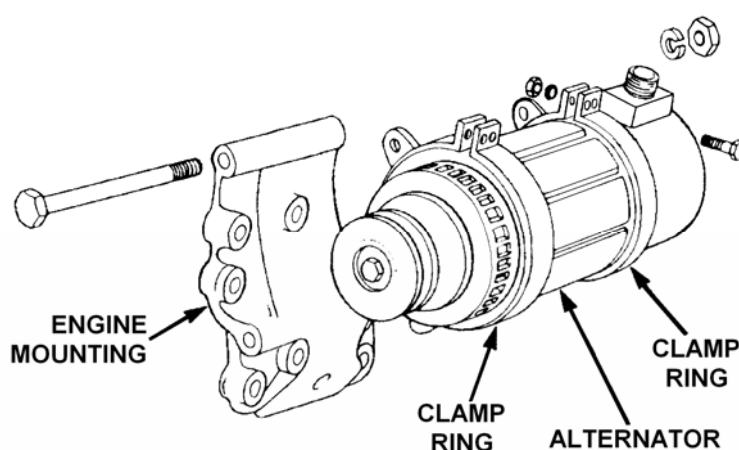


Figure 9 Auxiliary Alternator Clamp Rings and Engine Mount Arrangement

WARNING

The alternator is very heavy. Use appropriate lifting aids and/or restraints to avoid crush injuries when handling and fitting the alternator. Be careful not to damage the output connector socket during installation.

- (2) Mount the alternator onto the engine mount bracket with an M12 x 160 mm upper pivot bolt (Table 1, Item 31) inserted from the front, a 12 mm lock washer (Table 1, Item 32) and an M12 nut (Table 1, Item 33).
- (3) Insert the lower M12 x 160 mm bolt (Table 1, Item 31) from the front and tighten it with a 12 mm lock washer (Table 1, Item 32) and an M12 nut (Table 1, Item 33). Tighten the upper bolt.
- (4) Adjust the longitudinal position of the alternator within the clamp rings so that the front two belt grooves on the three groove drive pulley are correctly aligned with the two grooves on the crankshaft pulley and the jockey pulley.
- (5) Rotate the alternator in the clamp rings so that the output connector is tilted slightly off vertical towards the left side of the vehicle as shown in Figure 10. Tighten the four clamp ring bolts and the upper pivot bolt when adjustments are complete.

NOTE

Before fitting the two new outer belts, ensure that the inner notched fan belt is correctly looped around the harmonic balancer and fan pulleys so that it can be refitted to the 12-volt alternator pulley later in this procedure.

- (6) Fit the two alternator V drive belts (Table 1, Item 21) around the crankshaft, jockey and alternator pulley grooves. Use the adjustable arm on the jockey pulley assembly to tension the belts so that there is a maximum of 5 mm to 10 mm deflection on the longest span of the belts and then securely tighten the adjustment locking bolt (see Figure 7).

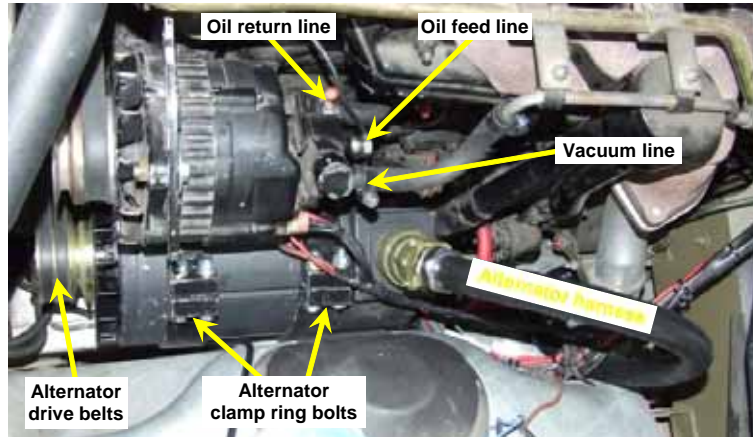


Figure 10 General Arrangement of the Completed Auxiliary Alternator Installation

- h. Install the auxiliary alternator cable harness (Table 1, Item 34) as follows:
 - (1) Fit the plug on the harness to the upwards facing connector on the alternator. Loop the harness back downwards to the guard arch just forward of the exhaust pipe as shown in Figure 10, and then route it inboard and under the cabin along the top of the left-hand chassis rail into the left-hand side battery enclosure as shown in Figure 11.
 - (2) Use two P clips (Table 1, Item 84) and M6 x 16 mm bolts, nyloc nuts and flat washers to secure the front part of the harness to the guard arch in the engine bay and the conduit rear end of the harness in the upper left-hand corner of the battery enclosure as shown in Figure 11.
 - (3) Securing the alternator harness along the top of the chassis rail is carried out as part of the main battery-to-starter motor cable installation procedure later in this instruction. Connecting the harness in the battery enclosure is carried out as part of the battery installation procedure later in this instruction.

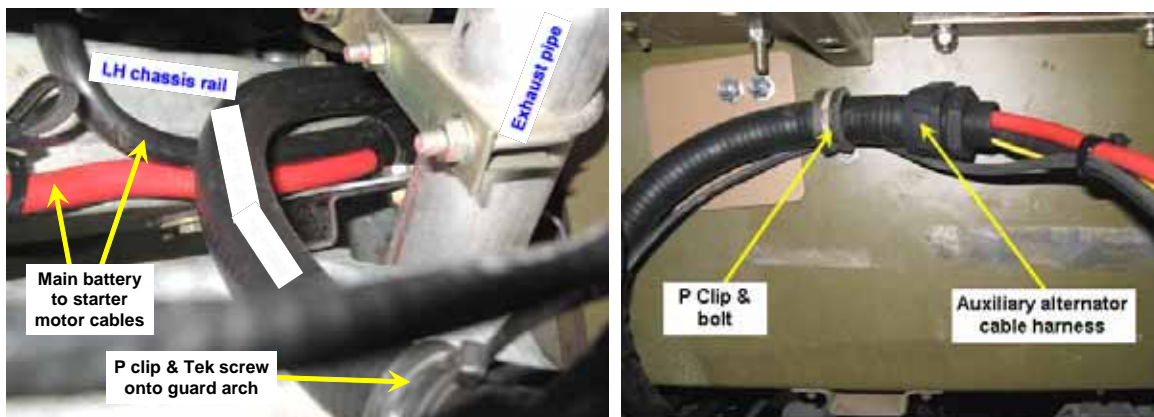


Figure 11 Securing the Front and Rear of Auxiliary Alternator Harness

- i. Refit the 12-volt alternator and vacuum pump assembly as follows:
 - (1) Mount of the Hitachi 12-volt alternator and vacuum pump assembly on the new lower alternator mounting bracket using an M10 x 120 mm bolt (Table 1, Item 4) inserted from the rear, a 10 mm lock washer (Table 1, Item 5) and an M10 nut (Table 1, Item 6).

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- (2) Position the new notched fan belt in the pulley groove and then refit the top mounting bolt through the slotted top mounting bracket. Adjust the belt tension so that there is a maximum of 5 mm to 10 mm deflection on the longest span of the belt and then tighten both the top and bottom alternator mounting bolts.
- (3) Fit the hollow bolt (Table 1, Item 11) to the banjo fitting on the new oil feed line and then to the back of the vacuum pump. Use new packing washers (Table 1, Item 12) on either side of the banjo fitting.
- (4) Fit one end of the new vacuum pump oil return line (Table 1, Item 13) to the barbed fitting on the side of the new dip stick guide tube and secure it with one of the hose clips removed from the old oil return hose at sub-para c(1) above.

NOTE

The new oil return hose will need to be trimmed to length so as not to pinch the hose and restrict the flow.

- (5) Loosen and re-direct to the rear of the engine, the barbed oil return fitting at the rear of the vacuum pump. Tighten the hollow bolt.
- (6) Using the second of the hose clamps set aside at para c(1) above, fit the free end of the new oil return hose (Table 1, Item 13) onto the barbed oil return fitting on the bottom of the vacuum pump and then tighten the clamps at both ends of the hose.
- (7) Refit the vacuum line to the fitting on the top of the vacuum pump and then reconnect the field excitation plug and the brown wire from the starter motor solenoid to the B+ terminal on the alternator.

INSTALLATION OF THE 12-VOLT MAIN VEHICLE BATTERY MOUNTING FRAME AND CABLES

21. The 12-volt main vehicle battery is relocated into the existing left-hand rear sponson tool box and new heavy duty cables are run to the starter motor. As the battery is larger than the existing side access door, a new opening is cut through the top of the sponson into the tool box cavity and a new battery box cover and frame assembly is fitted. The mounting points of the left-hand side-facing seat are adjusted to accommodate the extra height of the battery box cover. The installation also includes an emergency heavy duty battery isolation switch that can be easily accessed through the existing side opening into the tool box.

22. Carry out the following actions to fit the new battery box and associated cabling.

- a. Cut a new top opening for the battery box and fit the main vehicle battery mounting frame as follows:

NOTE

The hole must leave the new battery box side wall flange intact. Drill a locating hole from the new battery box to judge the edge of the flange.

- (1) Measure and mark the location for a new 200 mm x 355 mm top opening into the battery box on the top of the left-hand side sponson as shown in Figure 12. Use a 32 mm hole saw (Table 3, Item 3) to drill out the four corners of the opening.

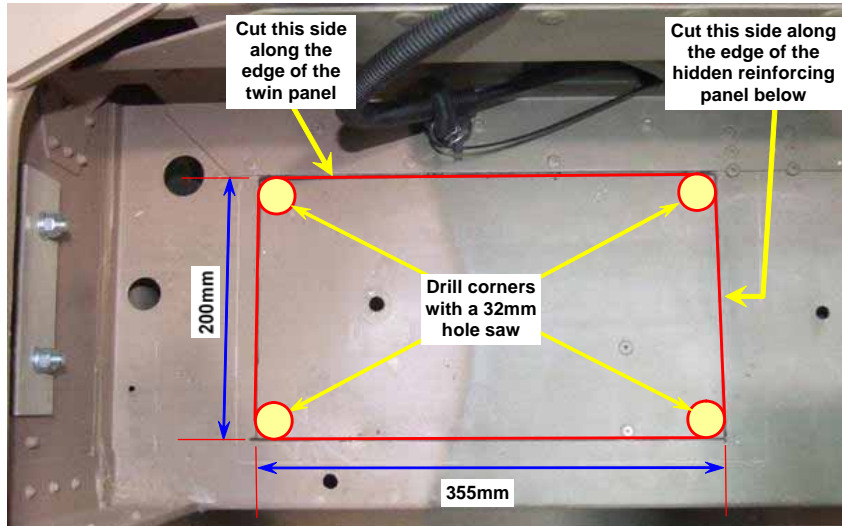


Figure 12 Location and Dimensions of the New Battery Box Opening

WARNING

Always wear PPE when using an angle grinder to avoid personal injury.

NOTE

Leave the radius from the hole saw in the opening corners.

- (2) Using an angle grinder with a cutting blade (Table 3, Item 5), cut the panel out and clean up with a file as shown in Figure 14.
- (3) Cut the edge protection trim (Table 1, Item 48) to length and fit it around the new top opening into the battery box. Arrange the installation so that the join in the trim is approximately midway along the outer side of the opening as shown in Figure 13.
- (4) Remove and discard the wooden floor piece in the new vehicle battery box (if fitted).
- (5) Clean about 10 mm around the top of the isolation switch bracket hole (8 mm dia) back to bare metal.

NOTE

The battery isolation switch is to the front and outside of the new vehicle battery box. See Figure 13

- (6) Place the battery mounting frame (Table 1, Item 39) into the battery box and centralise its position to the vertical view as shown in Figure 14. Using the six pre-drilled 5 mm holes around the battery mount frame as a template, drill through the battery box floor and secure the frame in position with six pop rivets (Table 1, Item 88).



Figure 13 Orientation Of The Battery Mount Frame

- (7) Using the pre-drilled hole in the isolation switch bracket (attached to the battery mount frame) as a template, drill an 8 mm hole through the battery box floor.
- (8) Clean back to bare metal, around the hole on the underside of the battery box floor.
- (9) From inside the battery box, fit the 8 mm terminal lug on one end of the short inner earth link cable (Table 1, Item 43) onto an M8 x 35 mm bolt (Table 1, Item 45) and fit the bolt into the 8 mm hole drilled in the previous step.



Figure 14 Battery Box Opening Showing Battery Mounting Frame in Position

WARNING

Always wear eye protection when working beneath the vehicle to avoid personal injury from drill swarf and other falling debris.

- (10) From underneath the vehicle, secure the bolt with an M8 nut (Table 1, Item 46) and 8 mm lock washer (Table 1, Item 20). This will leave about 20 mm of thread available to make the outer earth link connection.
- (11) Fit the 8 mm terminal lug on one end of the long outer earth link cable (Table 1, Item 44) onto the protruding bolt thread and secure it with an M8 nut (Table 1, Item 46) and an 8 mm lock washer (Table 1, Item 20) as shown in Figure 15. The sequence is 8 mm flat washer, lug, lock washer and nut

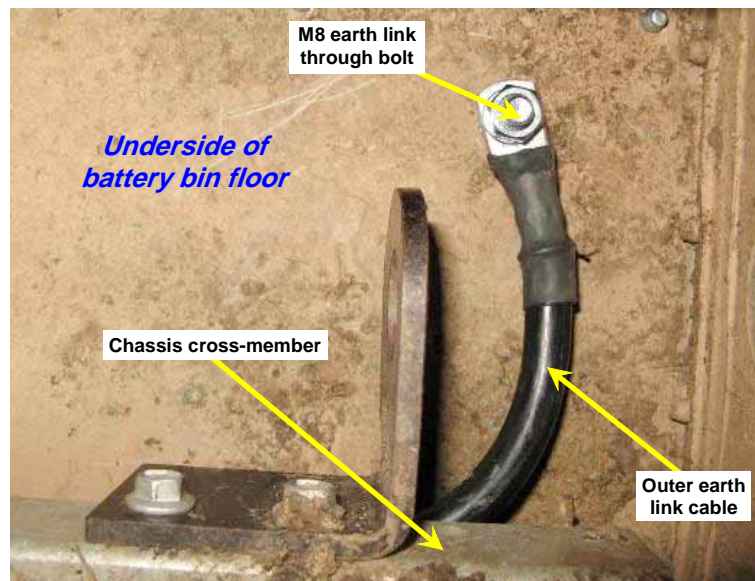


Figure 15 Main Battery Bin Earth Link Connection

- (12) Route the outer earth link cable along the chassis cross-member towards the middle of the vehicle.
- (13) Secure the 10 mm lug on the free end to one of the existing holes in the spare wheel bracket (not used) with an M10 x 30 mm bolt (NSN 99-122-4911), 10 mm Flat washer (NSN 99-142-6475), an 10 mm lock washer (Table 1, Item 20), and M10 nut (Table 1, Item 46).
- (14) Secure the cable along the cross member with cable ties (Table 1, Item 87) as shown in Figure 16.

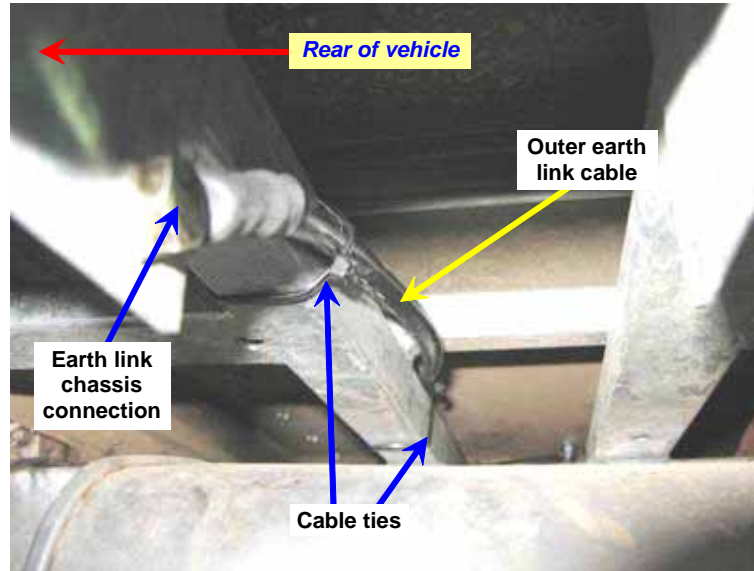


Figure 16 Main Battery Outer Earth Link to Chassis Connection

- (15) Fit the battery isolation switch (Table 1, Item 47) to the bracket on the outer side of the battery mounting frame. Use an Allen key to fit the 'T' handle.
 - (16) Temporarily fit the 10 mm terminal lug on the free end of the inner earth link cable to the inside terminal of the battery isolation switch. Final connections to the switch are made later in this procedure.
- b.** Fit the main vehicle battery box cover and frame assembly as follows:
- (1) Locate the battery box frame onto the top of the sponson. The notch is to fit around the rear strengthening rib. The right-hand inner edge of the frame is to line up with the inner edge of the sponson.
 - (2) Using the frame as a guide, drill through each of the holes with a 5 mm drill.
 - (3) Apply a thin bead of sealer (Table 1, Item 89) to the bottom face of the frame around the line of pre-drilled mounting holes and carefully place the frame onto the sponson.

NOTE

Depending upon the type of riveter available, the slope of the inner side panel may make it necessary to install most of the outer row of rivets from inside the battery box cavity.

- (4) Attach the frame with pop rivets (Table 1, Item 88). Remove any excess sealer.

NOTE

The relieved side flange of the battery box cover is to go the outside of the vehicle.

- (5) Temporarily mount the battery box cover on the frame.
- (6) Rest the side seat frame removed earlier on the battery box cover.
- (7) Align the seat frame with the centreline of the holes in the upper seat mount brackets. Using the seat frame as a guide, mark and drill two 10 mm holes through the battery box cover.

- (8) Mount the seat frame onto the top of the new battery box cover (Table 1, Item 37) using the two M10 x 25 mm bolts and associated washers and nuts removed in para 18.a.
- (9) Complete the relocation of the upper seat mounting brackets by drilling through the upper seat mounting brackets into the seat frame with a 6 mm drill (Figure 17).
- (10) Temporarily remove the seat and the attached cover to be installed later in the process.



Figure 17 Position of the Holes to be Drilled Through the Upper Seat Mount Bracket

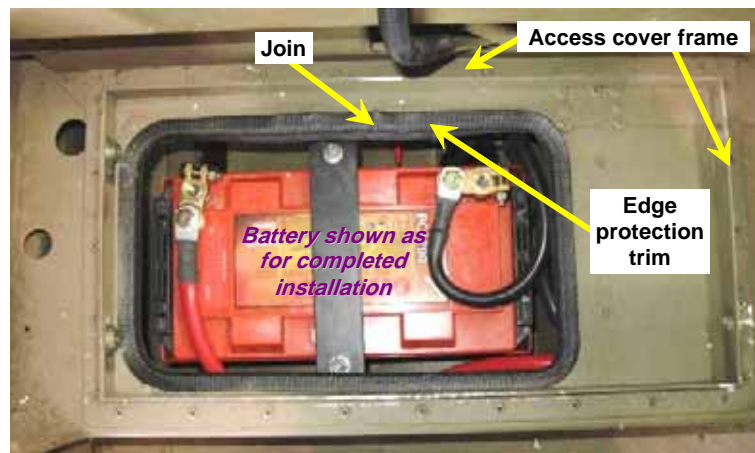


Figure 18 Top View of New Battery Access Opening with Edge Protection Trim Fitted

- (11) Touch up the paint around the battery box cover and frame as required.
- c. Install the main vehicle battery to starter motor cable harness as follows:

WARNING

Always wear eye protection when working beneath the vehicle to avoid personal injury from drill swarf and other falling debris.

- (1) Measure and mark the location for a cable access hole through the back of the left-hand inside guard arch into the new vehicle battery box as shown in Figure 19. Drill the hole with a 32 mm hole saw (Table 3, Item 3) and then clean and de-burr on both sides of the panel.

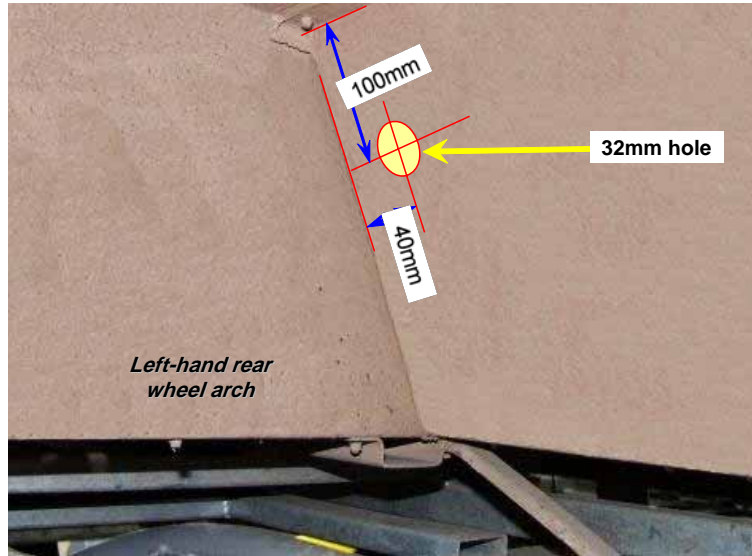


Figure 19 Location of the Cable Entry Hole into the Main Battery Box

- (2) Lay the heavy duty main battery-to-starter motor cable harness (Table 1, Item 49) beneath the vehicle along the general line of the left-hand chassis rail with the gland (battery box) end of the conduit towards the rear of the vehicle.
- (3) Starting from behind the rear axle, route the front of the harness forward so that it lies along the inside of the chassis rail to a point just forward of the left-hand top link mounting bracket, and then pass it upwards and onto the top of the chassis rail between the rear stabiliser bar and the body support bracket as shown in Figure 20.

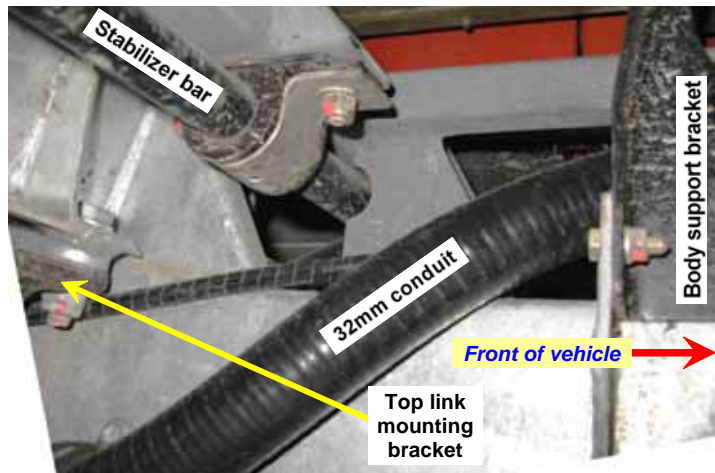


Figure 20 Conduit Routing at the Crossover from Inside to Top of Chassis Rail

NOTE

Ensure the 32 mm conduit is secured to the vehicle chassis. If necessary, use 770 mm long cable ties (Table 1, Item 90) to secure the conduit to the chassis. See Figure 21

- (4) Continue to route the harness along the general line of the top of the chassis rail until the front of the harness passes the inner side of the firewall support bracket and enters the engine bay.



Figure 21 Securing the Conduit to the Chassis Rail

- (5) At the rear, pass the gland end of the harness up and over the top of the chassis rail and into the left-hand rear wheel arch as shown in Figure 22. Pass the cable ends into the battery box and fit the conduit gland into the 32 mm hole in the back of the wheel arch. The cable connections inside the battery box will be completed later in this procedure.
- (6) Starting at the rear, use P clips (Table 1, Item 84) and Tek screws (Table 1, Item 86) to secure the conduit at suitable locations along the side of the chassis rail up to a point just forward of the top link mounting bracket (Figure 22A).
- (7) Just aft of the top link mounting bracket, there is a pre-existing hole. This hole is used to mount the small right-angle bracket with a M6 x 20 bolt (NSN 99-122-5061), 18 mm OD flat washer and M6 nyloc nut. The small right-angled bracket is used to mount a P clip with a M6 x 16 bolt, flat washer and M6 nyloc nut to secure the 32 mm conduit (Figure 22B).

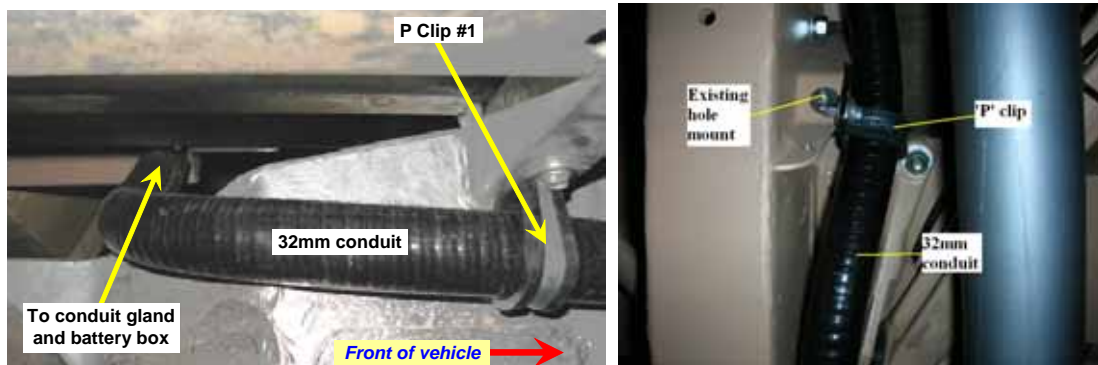


Figure 22 Conduit Routing at the Rear and Along the Side of the Left-hand Chassis Rail

- (8) After the conduit passes onto the top of the chassis rail, use another P clip and a Tek screw to secure it just below the left-hand side battery tray slide rail as shown in Figure 23.

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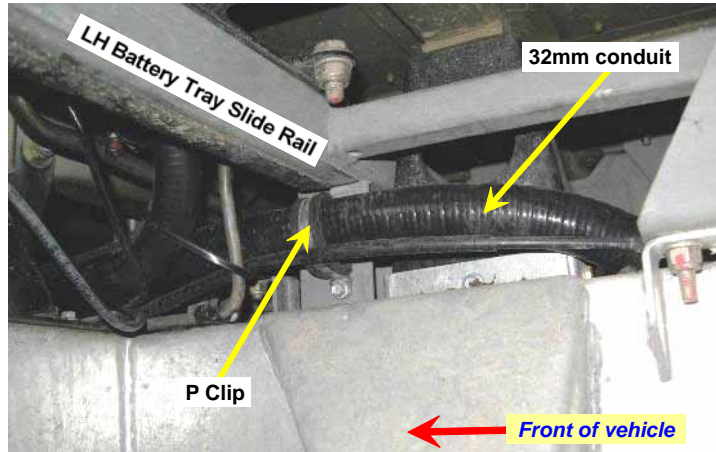


Figure 23 First Attachment Point on the Top of the Left-hand Chassis Rail

- (9) Under the cabin, use additional P clips and Tek screws and cable ties (Table 1, Item 87) to secure both the battery to starter harness and the previously fitted alternator harness to the top of the chassis rail at convenient locations. Figure 11A shows the location of the cable in the engine bay.

NOTE

Adjust the conduit routes as necessary to ensure that both conduits do not interfere with fuel or hydraulic lines and they are kept clear of sharp edges and the exhaust system.

- (10) Working from under the left-hand front guard arch, drill a 5 mm hole in the firewall support bracket 20 mm along the fold line from the rear of the vehicle and secure the end of the battery harness to the bracket with a cable tie (Table 1, Item 87) as shown in Figure 24.

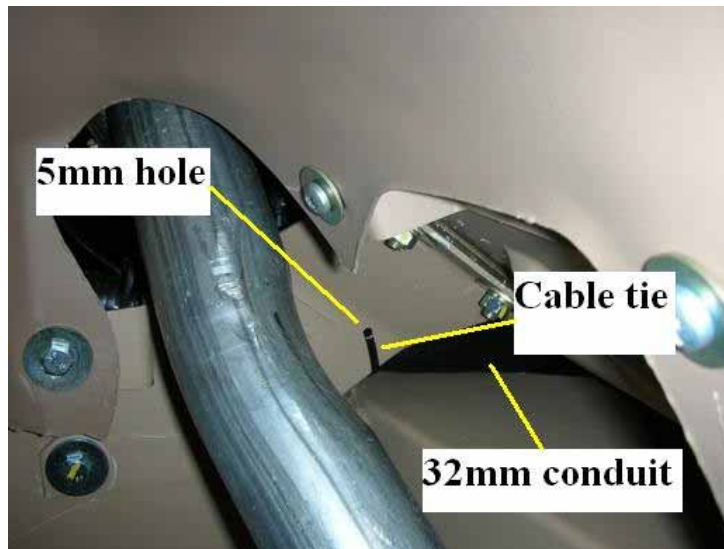


Figure 24 Last Attachment Point of the Battery to Starter Motor Harness

- (11) Connect the 8 mm lug on the end of the red (positive) cable to the 8 mm terminal stud on the starter motor solenoid and the 12 mm lug on the end of the black (earth) cable to the lower starter motor mounting stud as shown in Figure 25. Scrape the starter motor housing around the mounting stud back to bare metal to ensure a good earth connection.

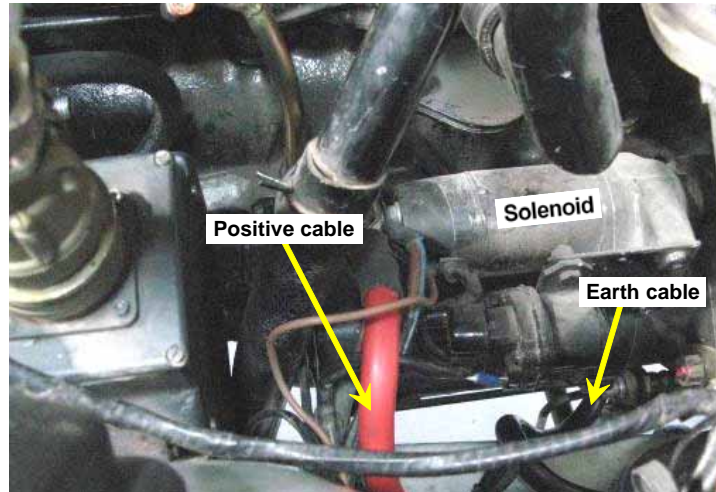


Figure 25 Starter Motor Connections

NOTE

The harness protector plate is to be located onto the rear wheel arch guard, drilled and secured with pop rivets before securing to the side wall of the sponson.

- (12) Under the left-hand rear guard arch, use the harness protector plate (Table 1, Item 50) as a template to drill and fit the plate in position over the conduit entry point into the battery box with pop rivets (Table 1, Item 88) as shown in Figure 26. Pop rivet from inside the cargo tub area to secure the plate to the side wall of the sponson.

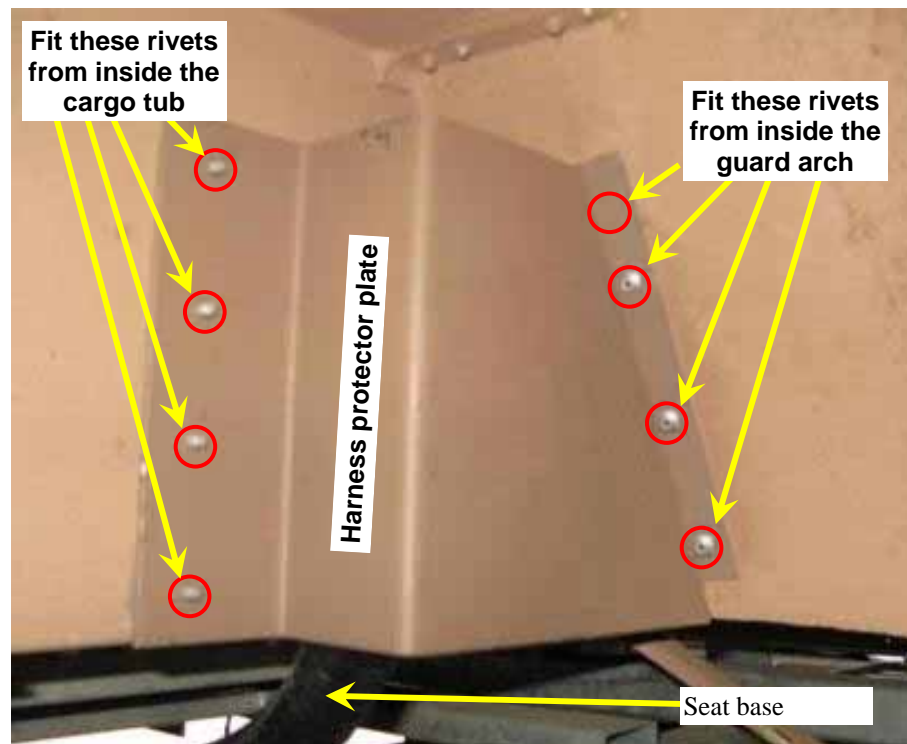


Figure 26 Installation of the Harness Protector Plate

- (13) Working inside the battery box, connect the 10 mm lug on the end of the 70 mm² black (negative) cable from the starter motor and the 10 mm lug on the free end of the inner earth link cable to the inside 10 mm terminal stud on the isolation switch (see Figure 27).
- (14) Connect one of the 10 mm lugs on the 70 mm² black (negative) main battery to isolation switch cable (Table 1, Item 51) to the outer 10 mm terminal stud on the isolation switch as shown in

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Figure 27. Fit a negative battery terminal post clamp (Table 1, Item 53) to the 10 mm lug on the other end of the cable.

- (15) Fit a positive battery terminal post clamp (Table 1, Item 52) to the 10 mm lug on the end of the 70 mm² red (positive) cable from the starter motor.
- (16) Leave the isolation switch in the OPEN ('T' handle near vertical) position.

NOTE

The switch in Figure 27 is in the closed position

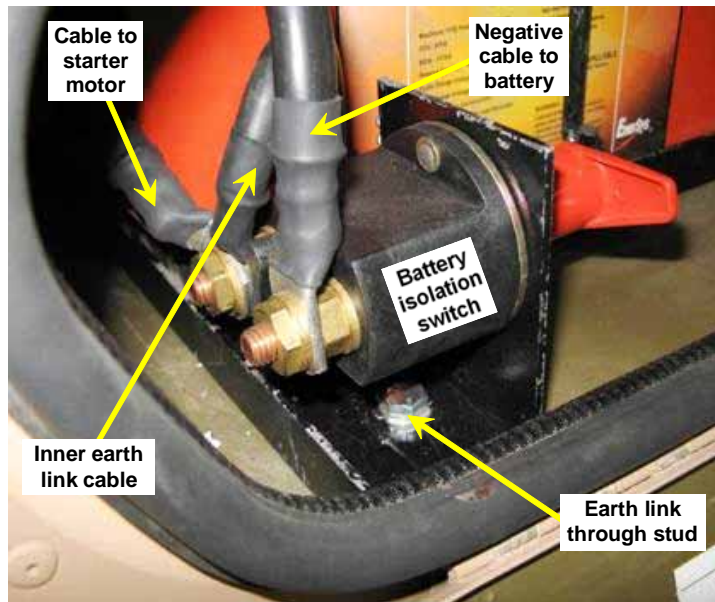


Figure 27 Cable Connections Inside the Battery Box

INSTALLATION OF THE 24-VOLT AUXILIARY BATTERY CABLING AND LOAD CENTRE

23. This part of the modification involves fitting two wiring harnesses that link the left-hand pair of auxiliary batteries to the optional right-hand pair of batteries and the new 24-volt auxiliary load centre on the bulkhead behind the Driver's seat. The two leads for the right-hand pair of batteries are connected to the two linking harnesses through a pair of 150-amp circuit breakers so that they can be isolated if the right-hand batteries are not fitted.

24. Carry out the following actions to install the crossover harness and the load centre harness and associated auxiliary power system hardware.

- a. Install the circuit breakers and the right-hand side crossover to load centre harness as follows:
 - (1) Using a HI-AMP 150-amp circuit breaker (Table 1, Item 54) as a template, mark out and drill four 6 mm holes to mount the two isolation circuit breakers inside the driver's side battery enclosure as per the dimensions in figure 28 on the upper half of the right-hand rear guard arch. Use four M6 x 25 mm bolts (Table 1, Item 56), four flat mudguard washers M6 x 22 mm (NSN 66-128-4934) and four M6 nyloc nuts (Table 1, Item 57) to secure the breakers in position.

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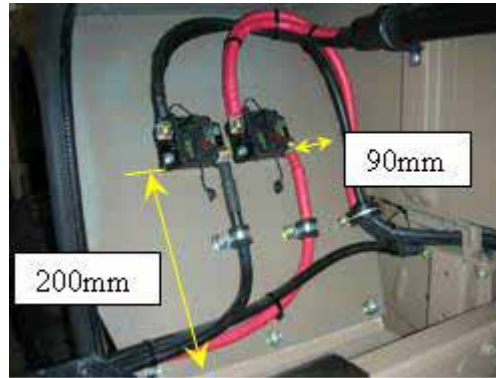


Figure 28 Mounting the Isolation Circuit Breakers in the Driver's Side Battery Enclosure

- (2) The supplied Bracket, Circuit Breaker is used as a drilling guide to mount the three 60-amp HI-AMP circuit breakers (Table 1, Item 55).

NOTE

Ensure the Bracket, Circuit Breaker is mounted the correct way up. Each Circuit Breaker is numbered from CB1 to CB3, with CB1 to the top.

- (3) Position the Bracket, Circuit Breaker such that the outer edge of the bracket is 575 mm from the right-hand vehicle body side, as measured along the bulkhead middle strengthening rib and just above the attaching flange of the bulkhead middle strengthening rib as shown in Figure 29. Mark and drill six 6 mm holes.

NOTE

The three 60-amp HI-AMP circuit breakers consist of two removed previously in para 16.d. and one new circuit breaker (Table 1, Item 55).

NOTE

The orientation of the circuit breakers is such that all three reset levers are on the inboard side of the breakers.

- (4) Use six M6 x 25 mm bolts (Table 1, Item 56), six flat washers (Table 1, Item 58) and six M6 nyloc nuts (Table 1, Item 57) to secure the bracket and 60-amp HI-AMP circuit breakers (Table 1, Item 55) in position.
- (5) Stick the '24V' decal to the bulkhead combing above the Bracket, Circuit Breaker (Figure 39)



Figure 29 Mounting of the 24-volt Auxiliary Load Centre Circuit Breakers

- (6) Mark out and use a 32 mm hole saw (Table 3, Item 3) to drill a conduit access hole through the bulkhead behind the Driver's seat as shown in Figure 30. Clean and de-burr the hole.

NOTE

Fuel filler pipe placement can vary. Adjust to ensure gland nut is sitting flush on wall.

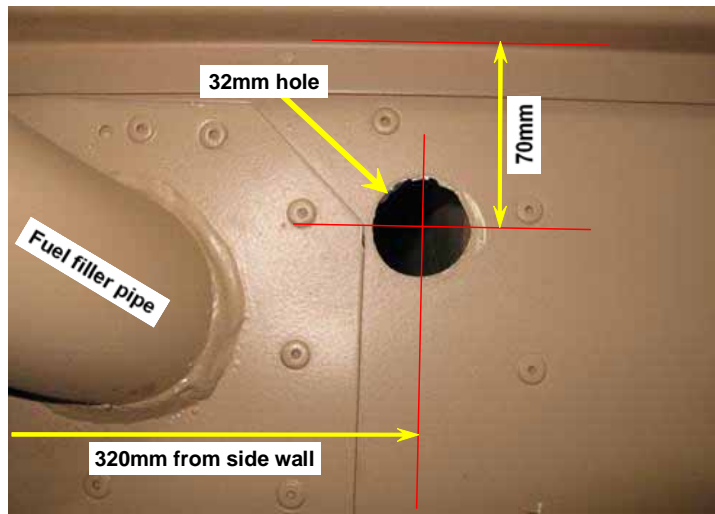


Figure 30 Load Centre Cable Entry Hole Behind the Driver's Seat

- (7) Working from inside the Driver's side battery enclosure, feed the gland end of the crossover-to-load centre harness (Table 1, Item 59) into the cabin through the hole in the bulkhead. Fit the gland nut to secure the conduit in place (Figure 31).

NOTE

The conduit must be secured as high as possible to allow tool box or battery tray fitting. If possible, the P clips should be touching the sponson ribs.

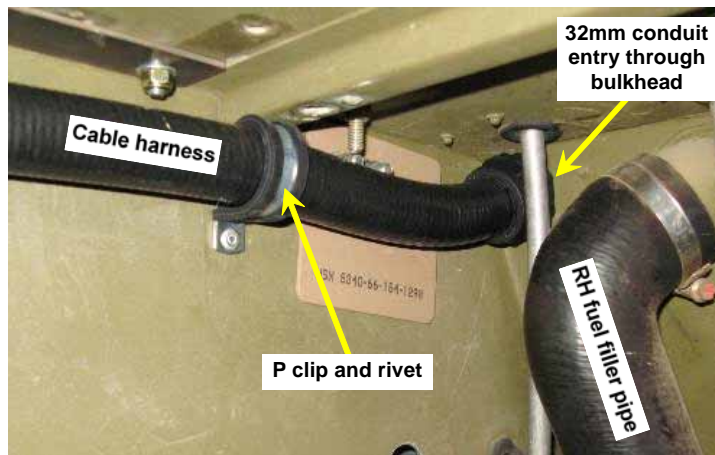


Figure 31 Routing and Securing the Crossover-to-load Centre Harness - Front

- (8) Route the conduit section of the harness along the upper inner edge of the enclosure towards the 150-amp circuit breakers mounted on the guard arch. Use P clips (Table 1, Item 84) and pop rivets (Table 1, Item 88) to secure the harness in position as shown in Figures 31 and 32.

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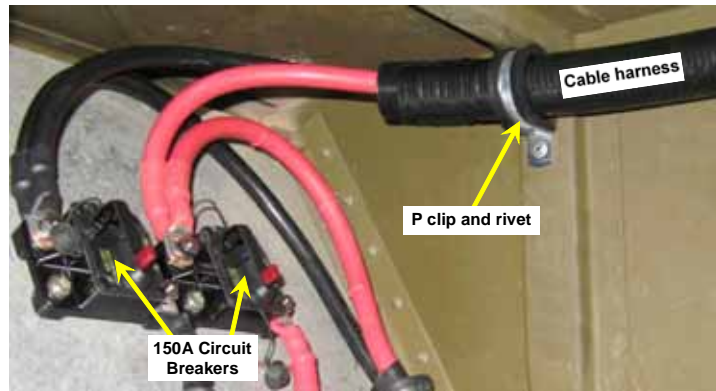


Figure 32 Securing the Crossover-to-load Centre Harness - Rear

- (9) Inside the battery enclosure, temporarily fit the 6 mm lugs on the ends of the red and black cables to the upper terminals on the circuit breakers as shown in Figure 32. The final connections on both ends of this harness will be made later in this procedure.
- b. Install the left battery bank to right battery bank crossover harness as follows:
- (1) Working from beneath the centre of the vehicle, position the conduit section of the crossover harness (Table 1, Item 60) centrally along the cross-member just forward of the rear stabiliser bar with the 6 mm lugged ends facing the right side of the vehicle. Route the sleeved ends of the harness along the cross-member and into the side battery enclosures through the body support brackets as shown in Figure 33.

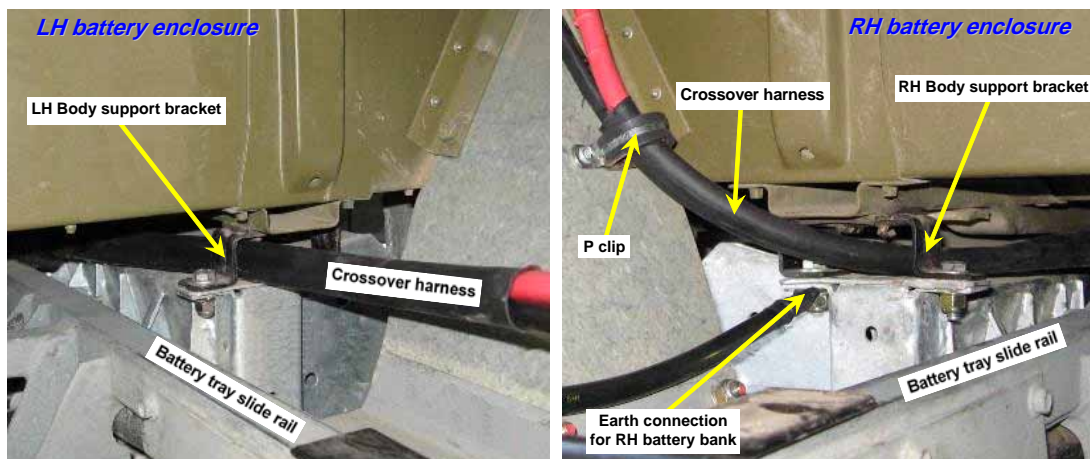


Figure 33 Crossover Harness Routing and RH Earth Link Connection

- (2) Use cable ties (Table 1, Item 87) to secure the conduit centre section of the harness to the chassis cross-member between the body support brackets as shown in Figure 34.

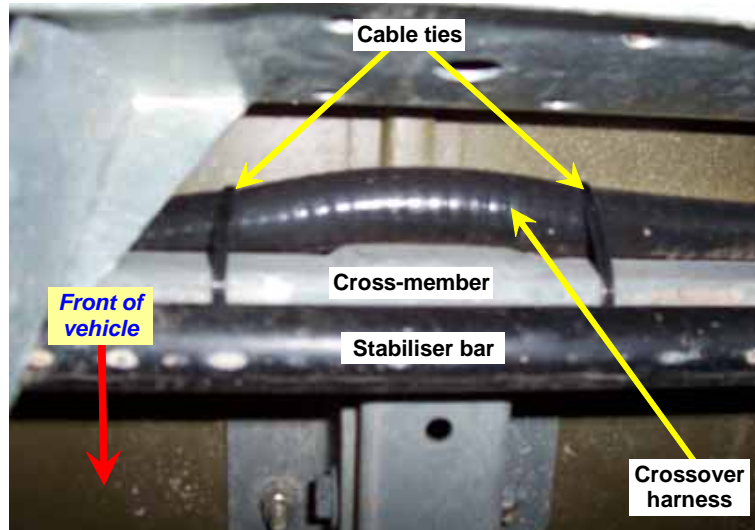


Figure 34 Securing the Centre of the Crossover Harness

- (3) Remove the rear bolt and nut from the body support bracket and clean the chassis metal around the underside of the bolt hole. Refit the bolt, fit the 8 mm terminal lug on one end of the earth link cable (Table 1, Item 61) so that it makes good contact with the chassis and then refit and tighten the nut (see Figure 35B).
- (4) In the left-hand battery enclosure, route the crossover harness and the earth link connection upwards towards the top of the enclosure and secure it in position with a P clip (Table 1, Item 84) and pop rivet (Table 1, Item 88) as shown in Figure 35B.
- (5) Use cable ties (Table 1, Item 87) to attach the earth link lead to the close-in section of the crossover harness as shown in Figure 35B so that these combined cables and the alternator harness will be able to move freely across the top of the batteries when they are installed later in this procedure.



Figure 35 LH Side Crossover Harness Routing and Earth Link Connection

- c. Install and connect the cabling in the right-hand side battery enclosure as follows:
- (1) In the right hand battery enclosure, use a P clip (Table 1, Item 84) and pop rivet (Table 1, Item 88) to secure the sleeved section of the crossover harness as shown in Figure 36.
 - (2) Connect the 6 mm terminal lugs on the ends of the positive (red) and negative (black) cables from the crossover harness and the load centre harness to the top terminals on the 150-amp circuit breakers as shown in Figure 36.

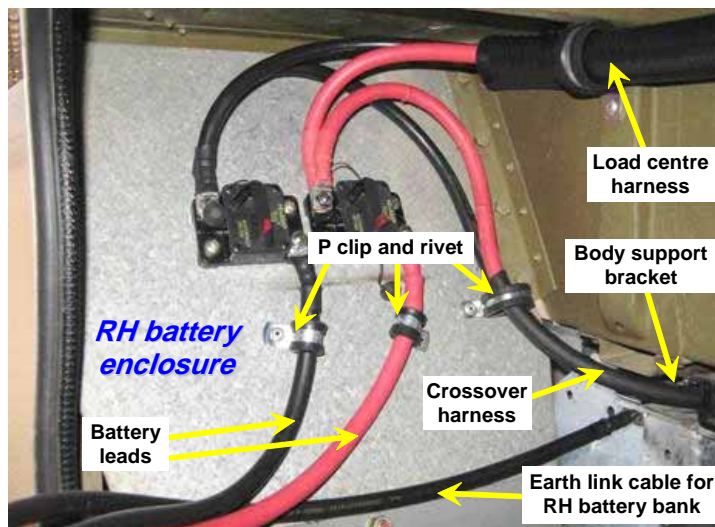


Figure 36 RH Side Battery Enclosure Cabling

- (3) Remove the rear bolt and nut from the body support bracket and clean the chassis metal around the underside of the bolt hole. Refit the bolt, fit the 8 mm terminal lug on one end of the earth link cable (Table 1, Item 61) so that it makes good contact with the chassis and then refit and tighten the nut as shown in Figure 33.
 - (4) Connect the 6 mm terminal lug ends of the positive and negative battery leads (Table 1, Items 62 and 63) to the lower terminals on the 150-amp circuit breakers and secure both leads to the guard arch with two small P clips (Table 1, Item 85) and pop rivets (Table 1, Item 88), 80 mm below the 150-amp circuit breakers, as shown in Figure 36.
 - (5) Fit a positive battery terminal post clamp (Table 1, Item 52) to the 10 mm lug on the free end of the red battery lead. Fit a negative battery terminal post clamp (Table 1, Item 53) to connect together the 10 mm lugs on the free ends of the black battery lead and the earth link cable. Final terminations for these leads are made later in the installation.
 - (6) Set both of the 150-amp circuit breakers to the OPEN position.
- d. Install the new auxiliary load centre earth terminal strip and make the load centre connections.
- (1) Using the load earth terminal strip (Table 1, Item 65) as a drilling guide, locate the earth strip 15 mm from the inner edge of the Bracket, Circuit Breaker to sit flush against the top of the attaching flange of the bulkhead middle strengthening rib. Drill two 6 mm holes (Figure 37).
 - (2) Secure the earth terminal strip in place with two M6 x 20 mm bolts, 6 mm flat washers and M6 nyloc nuts as shown in Figure 37.



Figure 37 Installation of the Load Centre Earth Terminal Strip

- (3) Fit the two short load centre link cables (Table 1, Item 64) to the left-hand side (input) terminals on the circuit breaker as shown in Figure 47.

- (4) Route the two heavy duty sleeved cables from the conduit gland through the bulkhead across to the load centre as shown in Figure 38. Connect the 6 mm lug on the red (positive) cable to the left-hand terminal on the bottom circuit breaker (Noted as CB3) and the 6 mm lug on the black (earth) cable to the bottom stud on the earth terminal strip. Set the three circuit breakers to the OPEN position.
- (5) Secure the sleeved section of the harness in position with a cable tie (Table 1, Item 87) around the fuel filler pipe and two P clips (Table 1, Item 84) and pop rivets (Table 1, Item 88) as shown in Figure 38.



Figure 38 Routing and Securing of Load Centre Cables

- (6) Slip on and trim to length, the plastic edge protection around the 50 mm hole under the auxiliary (cigarette lighter) power point. The joint should be to the top of the hole.
- (7) Route the auxiliary (cigarette lighter) power cable through the 50 mm hole under the auxiliary (cigarette lighter) power point. Route it along under the top sponson to the circuit breakers. Cut it to length and crimp on the supplied 6 mm terminals. Connect the red wire to the output of the top circuit breaker (CB1). Connect the black wire to the top earth bar point.
- (8) Remove and discard the 15 A blade fuse from the auxiliary power source fuse holder behind the power point. Insert replacement 7.5 A blade fuse.
- (9) Stick the 24 V decal in the position shown in Figure 39

NOTE

Figure 39 does not show the hole edge protection strip.



Figure 39 Location Of The 24 V Decal

NOTE

Do not connect any ancillary equipment cabling (e.g. ODIN or MBITR) to the load centre until post modification testing has been completed.

INSTALLATION OF THE 24-VOLT ALTERNATOR SENSE WIRE AND VOLTMETER HARNESS

25. This part of the modification involves the installation of a new wiring harness that enables the 28-volt auxiliary alternator sense wire to be disconnected from the battery terminals when the 12-volt vehicle ignition is turned OFF and makes provision for the installation of a 'press-to-read' digital voltmeter that allows the vehicle crew to monitor the status of the auxiliary power system.

NOTE

The SRV-SF is NOT fitted with an ammeter or auxiliary alternator charge warning light. With the engine running, the new digital voltmeter shows the auxiliary alternator charging voltage – it should be above 28 volts if the charging system is operating correctly.

Provided the auxiliary batteries have not been used (charged or discharged) for at least 6 hours and the engine is NOT running, the digital voltmeter reading can be used to give an indication of the auxiliary battery bank's state of charge.

With fully charged batteries at 25°C, the reading should be 25.6 volts or higher under no load conditions. A reading below 23.5 volts indicates that the batteries require recharging.

- a. Carry out the following actions to install the auxiliary alternator sense wire harness:
- (1) Working from behind the instrument cluster, remove the relay in the sense wire harness (Table 1, Item 66) from its base block. Use the existing RH self tapping screw for the air demister pipe (may be hard to see, black on black), to mount the block on the existing hole in the bracket as shown in Figure 40, and then refit the relay into the base block.

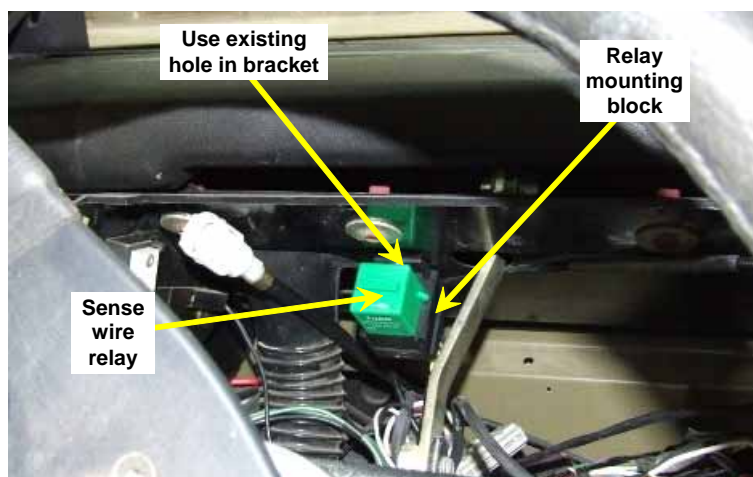


Figure 40 Sense Wire Relay Mounting Behind the Instrument Panel

- (2) Route the yellow and brown wires in the long sheathed leg of the sense wire harness through the same grommet in the firewall as the speedometer cable (Figure 41) and the pull the full free length of these sheathed wires into the engine bay.
- (3) In the engine bay, route the sheathed wires behind the adjacent cable looms and into the firewall recess that is covered by the harness protector plate behind the air cleaner (Figure 41). Continue across to the left side of the vehicle and then down the firewall and under the cabin into the left-hand side battery enclosure along the same line as the auxiliary alternator harness.
- (4) Use cable ties (Table 1, Item 87) to secure the sense wire harness across the firewall and along the line of the alternator harness into the side battery enclosure. All final connections in the left-hand side battery enclosure will be made later in this procedure.

- (5) At the back of the instrument panel, disconnect the positive (white) and negative (black) wires from the quick disconnect terminals on the voltmeter.
- (6) Connect the two piggyback terminals in the sense wire harness to the positive (white wire, although it can be green) and negative (black wire) terminals on the voltmeter, and then reconnect the original positive (white/green) and negative (black) wires to the corresponding piggyback terminals.

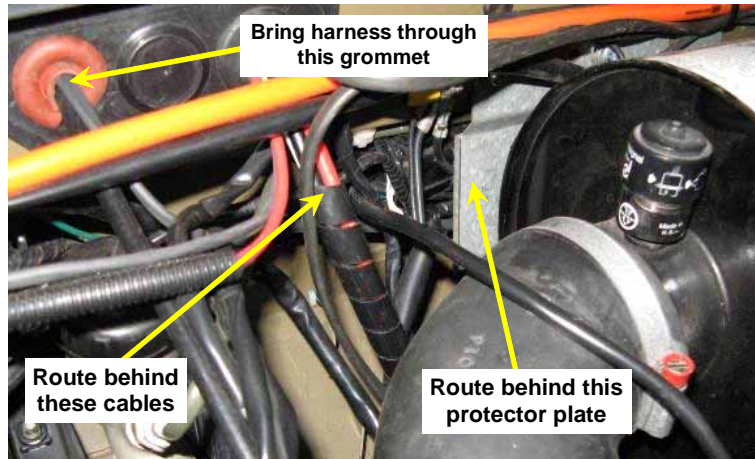


Figure 41 Sense Wire Harness Routing Through Firewall

- (7) Remove the cover from the central fuse and relay panel on the dash. Remove the two screws securing the panel (Figure 42) and ease the panel away from the dash.

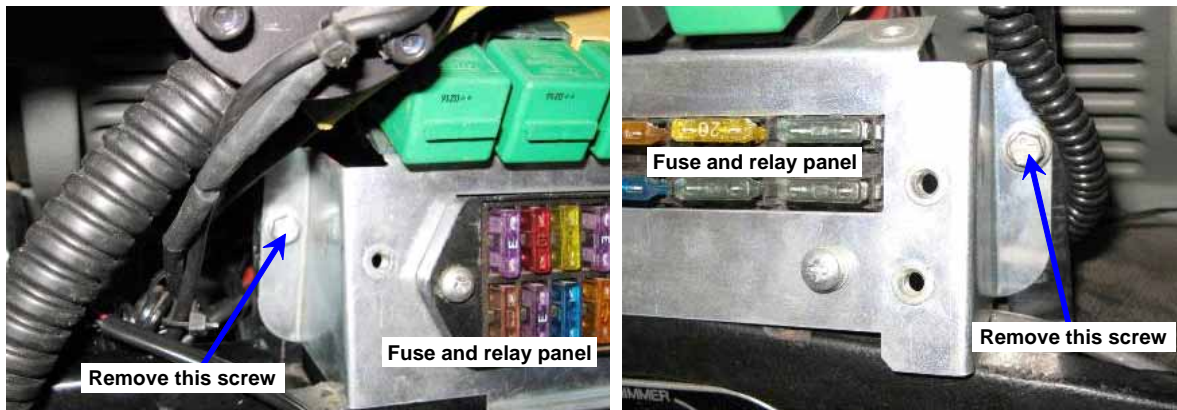


Figure 42 Fuse and Relay Panel Securing Points

NOTE

Check that all wiring is clear of pinch points before refitting the fuse panel.

- (8) Route the lead on the sense wire harness fitted with a twin quickcrimp connector across the centre of the dash behind the fuse panel so that the connector extends just past the left-hand side of the fuse panel.
- b. Carry out the following actions to install the 'press-to-read' digital voltmeter:
- (1) Using the digital voltmeter (Table 1, Item 70) as a template, mark the holes such that the voltmeter is located 60 mm from the map light clamp and 70 mm up from the lower lip of the dash. Drill four 3 mm holes and mount the voltmeter on the underside of the dash with four countersunk self-tapping screws (Table 1, Item 71) as shown in Figure 43.

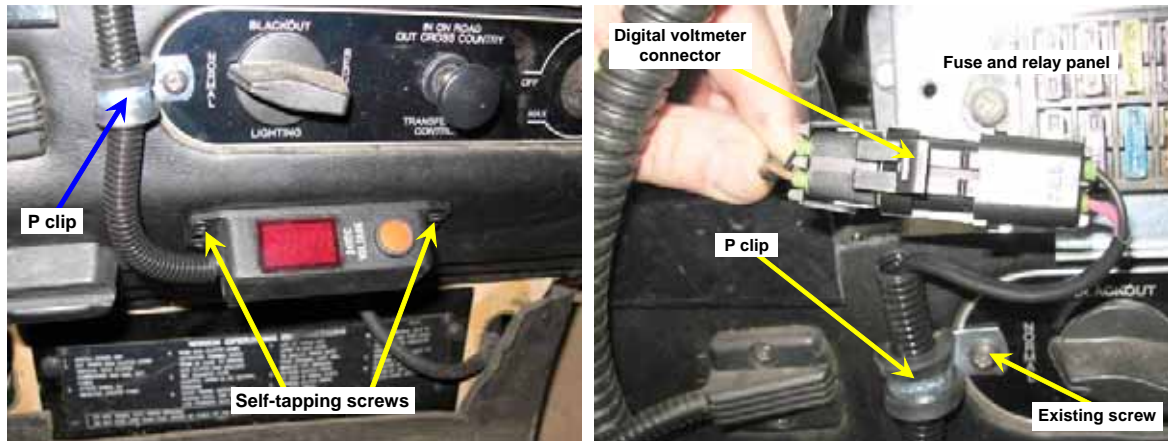


Figure 43 Mounting and Connecting the Digital Voltmeter

- (2) Connect the twin plug on the voltmeter lead to the twin socket on the sense wire harness and secure the short conduit attached to the voltmeter in place with a small P clip (Table 1, Item 85) and the existing screw on the dash panel as shown in Figure 43.
- (3) Tidy the plug/socket and any excess cabling behind the left side of the fuse and relay panel and refit the panel cover.
- (4) Refit the instrument panel and reconnect the speedometer cable.
- (5) Tidy the wiring in the engine bay and then refit the harness protector plate to the firewall and the air cleaner.

INSTALLATION OF THE 24-VOLT GENERAL PURPOSE OUTLETS

26. A new pre-assembled wiring harness that provides four overload protected 24-volt dc general purpose outlets (GPO) in the rear cargo area is installed under the side and rear rims of the heavy weapon mount and connected to the auxiliary load centre behind the driver's seat. Each GPO socket is supplied with a matching plug fitted with an adjustable right-angled backshell to allow the user to choose the most suitable connecting cable orientation. The outlets have a four pin configuration wired with pairs of pins paralleled so that pins 1 and 2 are +24 volts and pins 3 and 4 are earthed. The matching plugs have screw type terminal connections and two sizes of cable grip ring that will allow for simple and secure connection to a variety of ancillary equipment power cords with a minimum of tools.

- a. Carry out the following actions to install the GPO harness:
 - (1) Working from the driver's side cabin, mark a point 70 mm to the right of the seam and centre as shown in Figure 44. Use a 20 mm hole saw (Table 3, Item 4) to drill a hole through the top of the bulkhead combing. Clean and de-burr the hole.

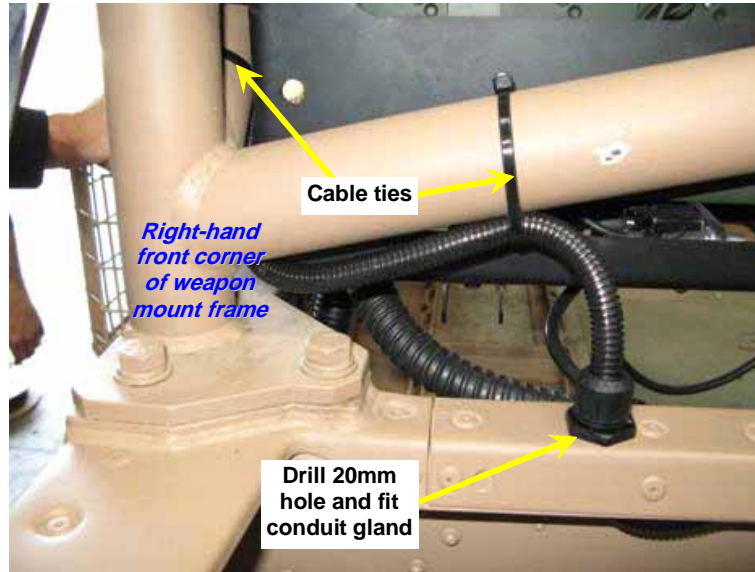


Figure 44 24-volt GPO Harness Entry Through the Cabin Bulkhead Combing

- (2) Lay the GPO harness (Table 1, Item 72) around the weapon mount frame along the general route illustrated in Figure 45 and so that the GPO boxes finish in the positions illustrated in Figure 46.

NOTE

The 'spare' thread depth available in the weapon mount top plate clamps may vary from hole to hole. If required, fit additional flat washers to the mounting bolts to ensure that the GPO boxes are firmly secured to the bottom face of each clamp.

- (3) Secure each box in place by screwing two M10 x 12 mm bolts (Table 1, Item 73) fitted with 10 mm lock washers and 10 mm flat washers (Table 1, Item 26) into the existing threaded holes in the top plate clamps.

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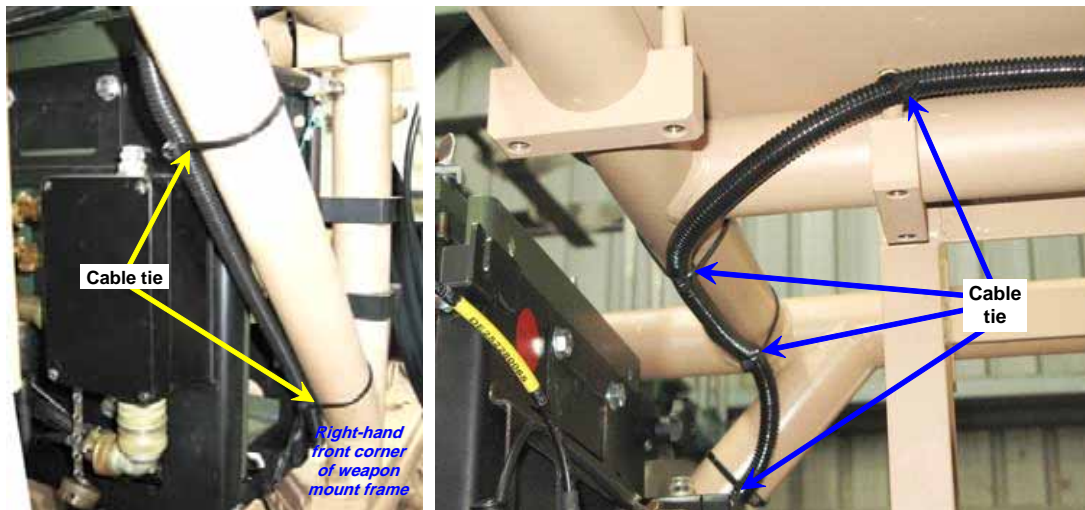


Figure 45 GPO Conduit Routing

- (4) Secure the conduit in place with cable ties (Table 1, Item 87) looped around the exposed sections of the inner bolt in each top plate clamp across the back and down the right-hand side of the top plate, and then around the weapon mount frame support members back to the bulkhead combing gland as illustrated in Figures 44, 45 and 46.

NOTE

Adjust the alignment and cable tie attaching points of the GPO harness as necessary to accommodate vehicles fitted with Javelin mounting brackets.

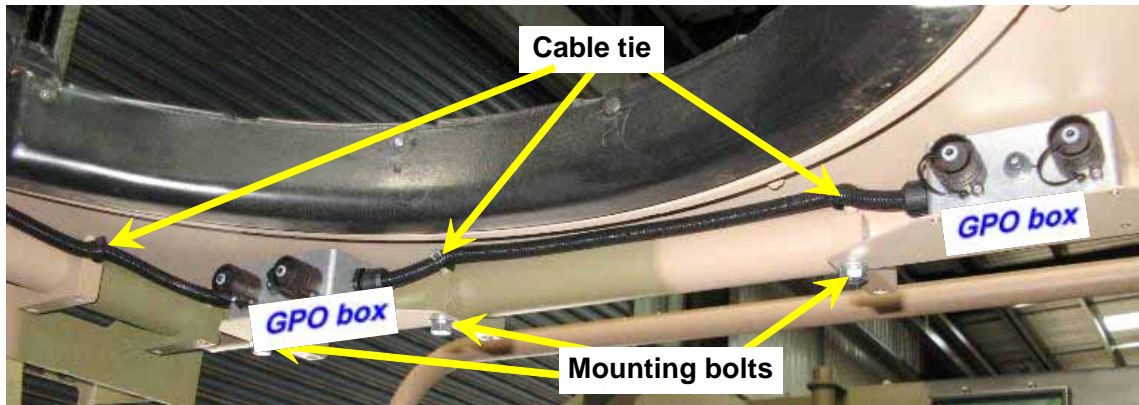


Figure 46 GPO Box Mounting

- (5) Pass the free end of the cables in the GPO harness through the hole and fit the gland onto the combing as shown in Figure 44. Route the cables along the underside of the combing towards the auxiliary load centre and secure them to the combing with cable ties (Table 1, Item 87) through existing holes wherever possible. Drill extra 5 mm holes if necessary as shown in Figure 47.



Figure 47 Cable Route Along the Underside of the Combing

- (6) Connect the 6 mm lug on the two red wires to the output side of the top circuit breaker (Noted as CB1). Connect the 6 mm lug on the two black wires to the top stud on the earth terminal bar.

INSTALLATION OF THE 24-VOLT BATTERY BANK

27. This stage of the procedure involves the fitting and connecting of the new 24-volt auxiliary battery bank into the battery enclosures on either side of the vehicle. The 'standard' four battery 130 amp-hour capacity configuration has a pair of series connected Odyssey batteries (nominal 24-volts) installed on the slide out trays on both sides of the vehicle. The two battery pairs are paralleled together by a crossover harness and then connected through the back of the right-hand battery enclosure to the 24-volt auxiliary load centre mounted on the bulkhead behind the driver's seat. The batteries are charged by the 28-volt auxiliary alternator which has its output cables and regulator sense wire connected directly to the 28-volt alternator output loom.

28. The connections between the right-hand battery bank and the crossover harness are made through a pair of 150-amp circuit breakers so that no main cabling configuration changes are required if only one pair of batteries is fitted in the left hand enclosure and the existing slide-out storage bin is retained in the right-hand enclosure.

WARNING

Exercise extreme care when handling and connecting the batteries. Each battery weighs 28kg and requires normal heavy lift precautions. Only use the built in handles to lift the batteries.

To avoid accidental short circuits, keep the protective terminal post caps fitted until the final connections to each battery are made.

Ensure that all connections are made **ONLY** in the sequence described below.

- a. Carry out the following actions to install and connect a pair of batteries in the left-hand battery enclosure – these two batteries **must** be fitted in every installation:
 - (1) Position two new Odyssey PC1700 MJT batteries (Table 1, Item 79) on the existing battery tray with their terminals in the orientation shown in Figure 48 and Figure 49. Align the backs of the batteries so that they do not protrude beyond the lip at the back of the battery tray – this slightly forward position stops the battery cases from rubbing on the back wall of the enclosure when the tray is locked in the closed position. See Figure 52

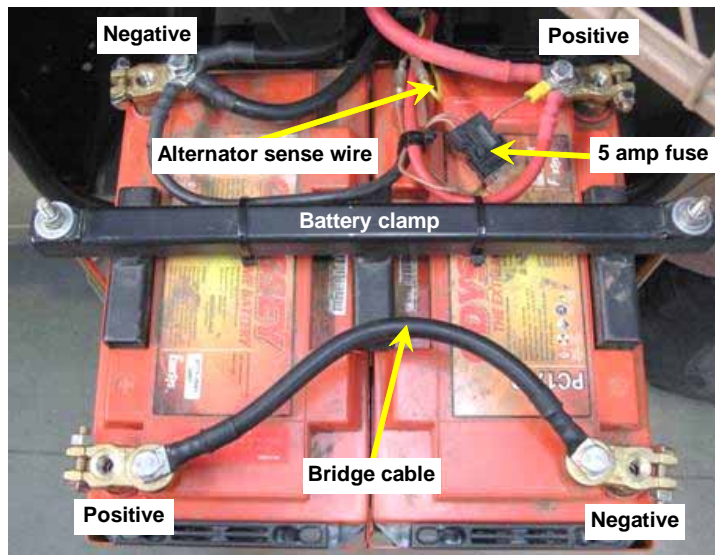


Figure 48 Left-hand Auxiliary Battery Bank Installation

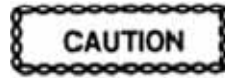


Figure 49 Alternative View of the Left-hand Battery Bank Installation

- (2) Fit the original battery clamp and 'J' bolts removed earlier in this procedure to secure the batteries in place.

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- (3) Connect the three negative (black) leads from the crossover harness which consist of: the left-hand earth link cable, the alternator harness and the chassis earth wire to the 10 mm stud on a negative battery terminal post clamp (Table 1, Item 58) and then fit the clamp to the inner negative terminal on the battery as shown in Figure 48.



The brass terminal posts fitted to Odyssey batteries are screwed onto the top of the battery case and can come loose if excessive torque is applied to the posts when making battery connections. Always tighten the bolts connecting cables to the terminal post clamps BEFORE fitting the clamps to the batteries.

If a battery terminal post becomes loose, use a 5 mm Allen key inserted through the threaded hole in the top of the post to retighten the post onto the battery. Tighten to a maximum of 6.8Nm.

- (4) Connect the two positive (red) leads from the crossover harness and the alternator harness along with the 10 mm terminal lug end of the sense line fuse assembly (Table 1, Item 75) to the 10 mm stud on a positive terminal post clamp (Table 1, Item 52) and fit the clamp to the inner positive terminal on the battery as shown in Figure 48 and represented in Figure 50.
- (5) Do NOT fit the bridge cable shown in Figure 48 at this stage.
- (6) Connect the bullet connector on the yellow wire from the sense line harness to the matching connector on the yellow sense wire in the alternator harness and the bullet connector on the brown wire from the sense line harness to the matching connector on the sense line fuse assembly (Figure 50).
- (7) Use cable ties (Table 1, Item 87) to form the cables into a flexible, curved loom above the batteries and attach it to the battery clamp as shown in Figure 48. Make any adjustments necessary to ensure that the battery tray can slide freely in or out and can be locked in the closed position without obstruction.
- (8) Remove the existing circuit diagram decal from the inside of the left-hand battery enclosure door. Clean the inside of the door with a suitable solvent, remove the backing from the new decal (Table 1, Item 76) and press it into position centrally on the door as shown in Figure 51.

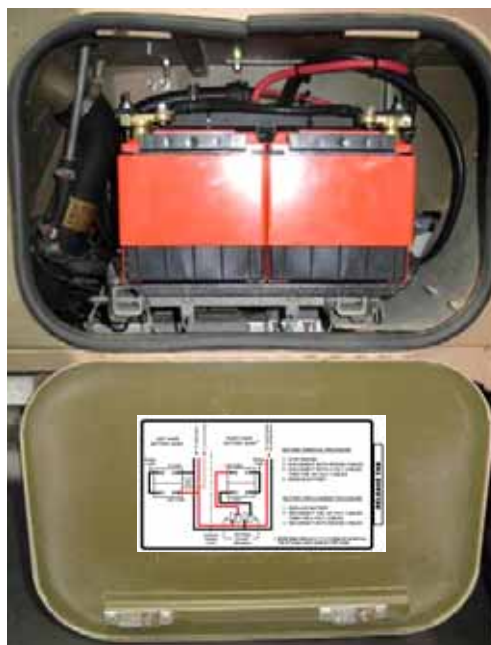


Figure 51 Auxiliary Battery Circuit Diagram Decal

- b. Carry out the following actions to install and connect a pair of batteries in the right-hand battery enclosure – these batteries are fitted in the ‘standard’ 130 amp-hour capacity four-battery installation:
 - (1) Fit a new battery tray (Table 1, Item 77) onto the slide rails and lock it in place with the M10 x 30 mm stop bolt, washer and M10 Nyloc nut supplied in the kit
 - (2) Position two new Odyssey PC1700 MJT batteries (Table 1, Item 79) on the tray with their terminal orientation as shown in Figure 53. Align the backs of the batteries so that they do not protrude beyond the lip at the back of the battery tray – this slightly forward position stops the battery cases from rubbing on the back wall of the enclosure when the tray is locked in the closed position (Figure 52).

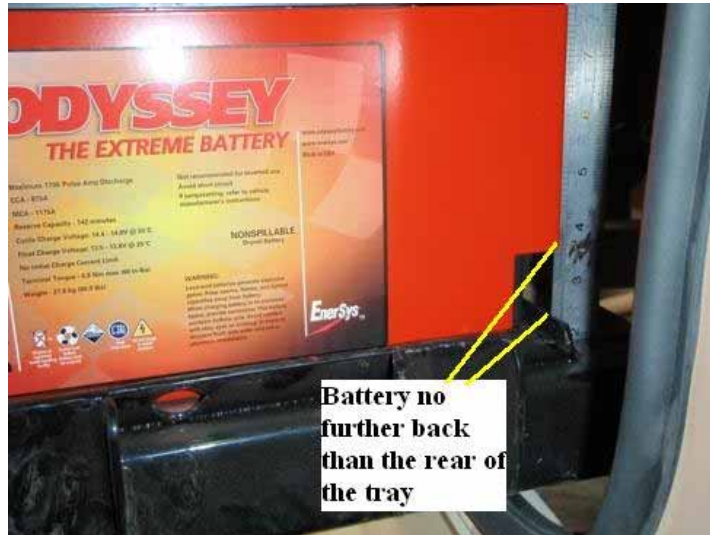


Figure 52 Alignment Of Batteries With Rear Of Tray

- (3) Secure the batteries in place with a battery clamp (Table 1, Item 78) and two 'J' bolts (Table 1, Item 41) fitted with 8 mm flat washers (Table 1, Item 42) and M8 nyloc nuts (Table 1, Item 36) as shown in Figure 53.
- (4) Connect the negative battery terminal post clamp on the pair of black cables in the enclosure to the inner negative battery terminal as shown in Figure 53.
- (5) Connect the positive battery terminal post clamp on the red cable in the enclosure to the inner positive battery terminal as shown in Figure 53.
- (6) Do NOT fit the bridge cable shown in Figure 53 at this stage.
- (7) Use cable ties (Table 1, Item 87) to form the cables into a flexible, curved loom above the batteries and attach it to the battery clamp as shown in Figure 53. Make any adjustments necessary to ensure that the battery tray can slide freely in or out and can be locked in the closed position without obstruction.

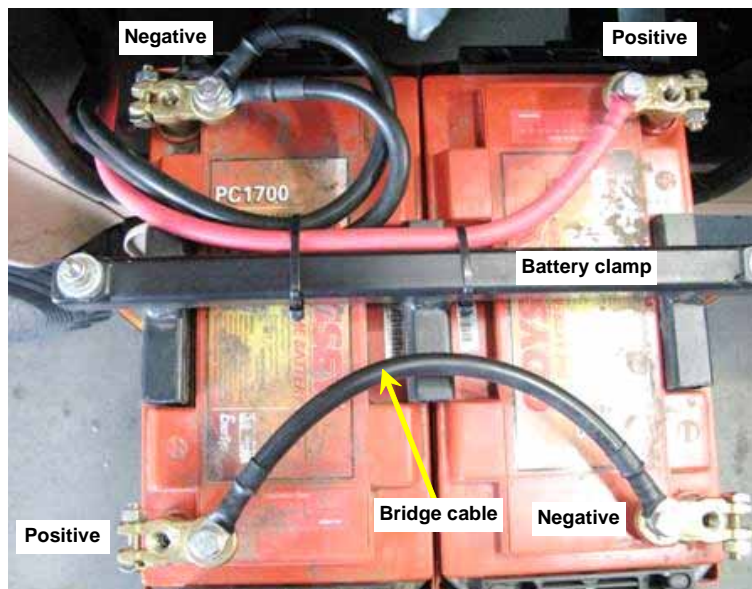
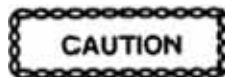


Figure 53 Right-Hand Battery Bank Installation

- c. Carry out the following actions to secure the battery leads and reinstall the storage bin in the right-hand battery enclosure – these actions are required to complete a reduced capacity (65 amp-hour) two-battery installation:

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Check that the auxiliary alternator output has been set to 80 amps before proceeding with a two-battery installation in accordance with EMEI Electrical P 412.

- (1) Ensure that the two 150-amp circuit breakers mounted on the guard arch in the rear of the enclosure remain set in the OPEN position.
 - (2) Place the supplied 'heat shrink' over the battery terminal post clamp on the end of each cable and secure it in place with a cable tie (Table 1, Item 87) and electrical tape.
 - (3) Coil both battery leads together and use additional cable ties to secure the coiled cables and their covered ends to the crossover harness in the upper rear corner of the enclosure so that to the cables will be well clear the sliding storage bin.
 - (4) Refit the sliding storage bin assembly onto the carrier rails and refit the stop bolt on the front slide rail.
- d. Carry out the following actions to complete the auxiliary battery bank installation:
- (1) Prepare each bridge cable assembly by fitting a positive battery terminal post clamp (Table 1, Item 52) to one end of a bridge cable (Table 1, Item 74) and a negative battery terminal post clamp (Table 1, Item 53) to the other end.
 - (2) If four batteries have been installed, fit a bridge cable assembly to the outer pair of positive and negative terminals on the right-hand battery bank, and then set the two 150-amp circuit breakers in the rear of the enclosure to the CLOSED position.
 - (3) Complete the auxiliary battery bank installation by fitting a bridge cable assembly to the outer pair of positive and negative terminals on the left-hand battery bank.

INSTALLATION OF THE MAIN VEHICLE BATTERY

29. The final stage of this procedure involves the installation and connection of the 12-volt main vehicle battery in the new main vehicle battery box at the left hand rear of the vehicle. Carry out the following actions to install and connect the main vehicle battery:

- a. Place the two rubber mats (Table 1, Item 81) on the floor of the battery box inside the mounting frame. The smaller of the two mats fits within the securing frame and the larger one goes on top.
- b. Position the main vehicle battery put aside earlier in this procedure in the mounting frame with the terminal's orientation as shown in Figure 54.
- c. Secure the battery in place with the battery clamp plate (Table 1, Item 40) and two short 'J' bolts each fitted with an 8 mm flat washer (Table 1, Item 42) and an M8 nyloc nut (Table 1, Item 36) as shown in Figure 54.

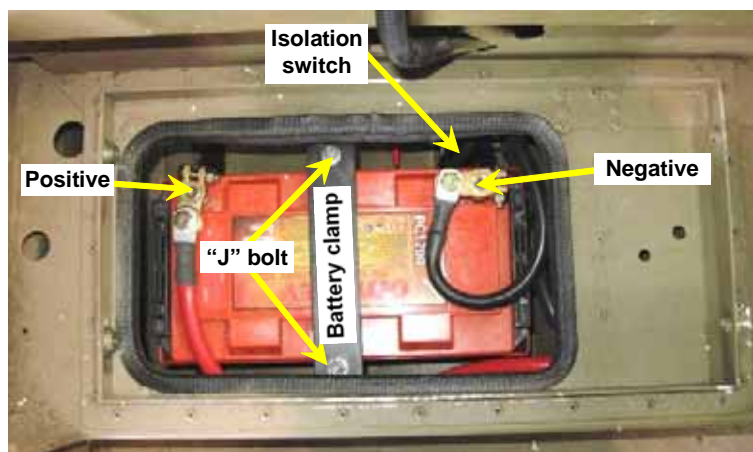


Figure 54 Main Vehicle Battery Orientation and Connections

- d. Check that the isolation switch is set to the OPEN ('T' handle vertical) position.

- e. Fit first the positive and then the negative battery terminal post clamps to the respective battery terminals. Check that all connections within the battery box are correctly orientatd and secure.
- f. Install the side-facing seat and battery box cover assembly as shown in Figure 55. Use the original hardware to secure the seat back frame to the side combing and four M8 x 20 mm bolts (Table 1, Item 19) fitted with 8 mm flat and lock washers (Table 1, Item 20) to secure the cover to the 8 mm nut inserts in the frame around the access opening on top of the sponson.



Figure 55 Main Battery Box Cover and Side-facing Seat Installed

POST MODIFICATION TESTING

30. Testing of the 12 and 24-volt Systems. Carry out the following actions to test for correct operation of the vehicle's 12-volt and 24-volt power systems:

- a. Turn the battery isolation switch to the CLOSED ('T' handle nearly horizontal) position.
- b. Turn the ignition switch ON and check for correct operation of all the normal 12V vehicle system warning lights and the voltmeter in the instrument panel. Turn the ignition switch OFF.
- c. Use a multimeter to check the auxiliary battery bank output voltage between the positive input side of the circuit breakers and the earth terminal strip at the load centre behind the Driver's seat. New fully charged batteries should read 25.6 volts or higher at 25°C.

NOTE

A slightly lower voltage may be observed if the temperature is significantly below 25°C.

- d. Press the red button on the dash mounted digital voltmeter – the reading should be the same (to one decimal place) as that measured at the load centre above.
- e. Turn the ignition switch ON and start the engine. Check that the 12-volt alternator warning light is no longer illuminated. Raise the engine revs to about 1 500rpm and check that the voltmeter in the instrument panel reads in the upper portion of the green zone.
- f. With the engine revs still at about 1 500rpm, press the red button on the dash mounted digital voltmeter – a reading of 28.8 volts or higher indicates correct operation of the auxiliary charging system.

RESTORE VEHICLE

31. Carry out the following actions to complete the modification:
- a. Check all locations where new wiring and conduits have been installed and existing wiring harnesses or conduits have been disturbed to ensure that they are appropriately secured with clips or cable ties and are clear of hot surfaces, sharp edges and all hydraulic or fuel lines.
 - b. Refit the ODIN/MBITR mount bracket to the bulkhead in the rear cargo area.

NOTE

Until direction is released authorising alternate connection methods from sub-systems, the following connection of the MBITR and ODIN 1/2 power cable can take place. The allocation of circuit breakers is as follows:

CB1 – Auxiliary sub-systems
CB2 – TASAT and MBITR
CB3 - ODIN

- c. Re-route the MBITR power cable from the cargo area through the 50 mm hole under the auxiliary (cigarette lighter) power point such that the terminals can reach the top earth bar point and the output of the middle circuit breaker (CB2). Install the cables.
- d. Re-route the ODIN 1/2 power supply cable to the EW Isolator Switch through the 50 mm hole under the auxiliary (cigarette lighter) power point such that the terminals can reach the output of the middle circuit breaker (CB3). Install the cable.
- e. Use cable ties to secure the MBITR and ODIN cables along with the auxiliary (cigarette lighter) power cable to appropriate holes in the lower edge of the bulkhead combing.
- f. Use surplus cable ties to secure excess MBITR power cable to the ODIN/MBITR Mount Bracket within the cargo area.
- g. Replace the equipment protection barrier with the bolt heads to be inserted into the sponson sidewall from the battery box side. Ensure the Backing plate is refitted. Fit the flat washers and new M8 nyloc nuts. Tension to 20 N.m.
- h. Refit the driver's seat assembly.
- i. Refit the vehicle commander's riser seat assembly.
- j. Close and secure the battery trays (or storage bin) in the stowed position with the locking pins.
- k. Refit the bonnet.

32. **Recording Action.** On completion of the modification, the following action is to be taken in accordance with TRAMM, Volume 3, Section 2, Chapter 2, Annex D:

- a. Deface the number 41 on the vehicle modification record plate.
- b. Complete the modification details in the GM 120 – Record Book for Service Equipment.
- c. When the work order is completed, the mod strike status, under the reference codes tab (MSQ600), is to be annotated with a 'Y' against the Mod Strike #41 and in the Free Text field input 'Complete against EMEI Veh G177-6, dd/mm/yyyy'.
- d. Forward the modification completion details using form GM 119 – Advice of Change in Build State (TRAMM, Volume 3, Section 2, Chapter 3, Annex C) to:

National Fleet Manager Light B Vehicles
LV SPO, DMO
Victoria Barracks, St Kilda Rd
SOUTHBANK VIC 3006

END

Distribution List: **Veh G 16.9 – Code 1** (Maint Code)
(Sponsor: LV SPO, Lt B Veh)
(DMO ECO 026/07)