

**TRUCK, UTILITY, LIGHTWEIGHT, FFR AND TRUCK, UTILITY, LIGHTWEIGHT, FFR,  
WINCH, MC2 - LAND ROVER 110 4X4**

**PERENTIE FFR-S GSR INTEGRATION KIT INSTALLATION**

**GENERAL 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.

**TABLE OF CONTENTS**

	<b>Page No</b>		<b>Page No</b>
General .....	3	Vibration Isolators .....	9
Introduction .....	3	RSU Frame .....	9
Associated Publications .....	3	Vibration Isolator Covers .....	10
Vehicle Requirements .....	3	Interconnect Cable .....	11
Non Compliant Perentie Vehicles .....	3	Vehicle Power Cable .....	12
Tools .....	4	Cable Rack .....	16
GSR Installation Kit .....	4	Combat Pack Frame .....	16
Vehicle Preparation .....	5	Operator Seat .....	19
Installation .....	6	Removal of GSR Installation Kit .....	22
Isolation Frame .....	6	Refurbishment of Vehicle .....	23
Fixed Tripod Retainer .....	7	Refit of GSR Installation Kit .....	23
Pivoted Tripod Retainer .....	8		

**LIST OF FIGURES**

	<b>Page No</b>		<b>Page No</b>
Figure 1 Orientation Of Isolation Frame .....	7	Figure 12 Vehicle Power Cable at the RSU Frame .....	15
Figure 2 Tripod Retainer Fixed to Isolation Frame .....	8	Figure 13 Location Of Vehicle Cable Power .....	15
Figure 3 Isolation Frame Pivoted Tripod Retainer .....	8	Figure 14 Cable Rack Assembly .....	16
Figure 4 RSU Frame Mounted on Isolation Frame .....	9	Figure 15 Combat Pack Frame Mounting Points .....	17
Figure 5 RSU Frame Fitted to Isolators (Rear View) .....	10	Figure 16 Combat Pack Frame Rear Mounting Point .....	17
Figure 6 Vibration Isolator Covers Fitted (Front) .....	11	Figure 17 Combat Pack Frame Hex Nut .....	18
Figure 7 Interconnect Cable .....	12	Figure 18 Combat Pack Frame .....	19
Figure 8 Vehicle Power Cable .....	13	Figure 19 Operator Seat Sponson Mounting Point .....	19
Figure 9 Vehicle Power Cable Routing .....	13	Figure 20 Operator Seat Coaming Rail Mounting Points .....	20
Figure 10 Vehicle Power Cable Routing (Front View, Driver Side Corner) .....	14	Figure 21 Location for Label, Unit .....	21
Figure 11 Vehicle Power Cable .....	14	Figure 22 Installation Complete (Left Rear View) .....	21
		Figure 23 Installation Complete (Rear View) .....	22

**LIST OF TABLES**

	<b>Page No</b>		<b>Page No</b>
Table 1 General Purpose Tools .....	4	Table 2 Installation Kit, Radar Unit FFR-S AMSTAR Parts List .....	4

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## GENERAL

### Introduction

1. The Australian Manportable Surveillance and Target Acquisition Radar (AMSTAR) vehicle configuration comprises the AMSTAR system fitted to an in-Service Perentie 4x4 Fitted For Radio (FFR) vehicle, NSN 2540-66-128-4220 and NSN 2540-66-128-4221.
2. In this configuration the AMSTAR system can be assembled, initialised and operated with the Radar Sensor Unit (RSU) located remotely from the vehicle.
3. The AMSTAR equipment is mounted within a welded, square tube frame assembly which is in turn mounted to the vehicle floor via vibration isolators.
4. This EMEI details the procedures for the following tasks:
  - a. installation of a Ground Surveillance Radar (GSR) integration kit to a Perentie FFR vehicle;
  - b. removal of a GSR integration kit from a Perentie FFR vehicle; and
  - c. refit of a GSR integration kit to another Perentie FFR vehicle.

### Associated Publications

5. The following documents are required to support this EMEI:
  - a. [SCES 013858/1](#), SCES for 2510-66-153-2223 Installation Kit, Radar Unit FFR-S AMSTAR;
  - b. Signal HVH RAM 3821/01, SAFETY SAFETY SAFETY – Land Rover 4X4 FFR Fitted For Radio, NSN 2540-66-128- 4220 and NSN 2540-66-128-4221 - Radio Anchorage Points in Tray Sponsons;
  - c. [RPS 02190, Issue 3, May 00](#);
  - d. [EMEI VEHICLE G 117-2](#), Issue 2, Oct 06, Relocation of Raven Radio Frame Mountings; and
  - e. Technical Manual User Handbook for Single Channel Radio System Raven B Vehicle and Ground Installations, April 1995, NSN 7610-66-133-5220.

### Vehicle Requirements

6. Verify that the vehicle to be used is a FFR Perentie 4 X 4 vehicle which has been modified to accept Raven radio racks and equipment.
7. The Raven radio equipment mounting points are used to secure the GSR integration kit frames to the body of the vehicle. The mounting points consist of inserts in the body capping and captive nut plates.

### Non Compliant Perentie Vehicles

#### WARNING

**Do not modify any of the items in the AMSTAR GSR Perentie installation kit in any way to try to complete the installation procedure. Unauthorised modification of the frames or mounting holes may compromise the safety of personnel and equipment in the event of a vehicle collision.**

8. A number of FFR Perentie 4 X 4 vehicles in-Service are not suitable to accept the AMSTAR GSR Perentie installation kit due to large variances in the location of the Raven radio equipment mounting holes.
9. If, during installation of the AMSTAR GSR Perentie installation kit, any of the vehicle mounting points do not align with the mounting holes on the frames, the vehicle must be rejected. Do not continue with the installation procedure.
10. Any FFR Perentie 4 X 4 vehicle in which the AMSTAR GSR Perentie installation kit cannot be installed must be brought to the attention of the vehicle fleet manager at Defence Materiel Organisation.

**Tools**

**11. General Purpose Tools.** Table 1 lists the general purpose tools required to install and remove the GSR integration kit.

**Table 1 General Purpose Tools**

Serial	Item	Part Number	Qty
1	Allen keys, metric		Set
2	Open end spanners, metric		Set
3	Spanner adjustable, 6"		1
4	Side cutters		1
5	Flat blade screwdriver		1

**12. Special Tools.** There are no special tools required to install and remove the GSR integration kit.

**GSR Installation Kit**

**13.** Installation Kit, Radar Unit FFR-S AMSTAR (NSN 2510-66-153-2223) contains the items needed to integrate the AMSTAR radar into a FFR-S Perentie Landrover. Table 2 lists the contents of the kit.

**Table 2 Installation Kit, Radar Unit FFR-S AMSTAR Parts List**

Serial	Item	NSN/Part Number	Qty
1	Frame, RSU Assembly	5840-66-153-2903	1
2	Frame, Isolation Assembly	5840-66-153-2904	1
3	Rack, Cable Assembly	5840-66-153-2981	1
4	Seat, Operator	2540-66-153-2976	1
5	Rack, Combat Pack Frame	5840-66-153-2982	1
6	Retainer, Tripod, Pivoted	5840-66-153-2978	1
7	Retainer, Tripod, Fixed	5840-66-153-2977	1
8	Cable, Power Vehicle	5995-66-148-2316	1
9	Cable, Interconnect	5995-66-148-2318	1
10	Label Unit	9125D01099027-001	1
11	Label, Serial Number	9125D01099024-001	1
12	Spacer, 2 mm	9125D05001023-001	2
13	Spacer, 3 mm	9125D05001023-002	2
14	Spacer, 4 mm	9125D05001023-003	2
15	Spacer, 2 mm	9125D05001021-001	10
16	Spacer, 3 mm	9125D05001021-002	20
17	Spacer, 4 mm	9125D05001021-003	10
18	Cover, Isolator	5995-66-153-3050	4
19	Isolator, Radio Frequency Reflection (Enidine)	5985-01-533-0104	4
20	Pull Pin	PULL-625T	1
21	Nylon 12 Tyrap	TYC27MX	20
22	Screw, Csk Hd, M6 x 25	5305-66-153-7096	12
23	Screw, Csk Hd, M6 x 30	D000007022-030	4

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**Table 2 Installation Kit, Radar Unit FFR-S AMSTAR Parts List (continued)**

24	Screw, Cap Hd, M6 x 30	D000007021-030	2
25	Screw, Cap Hd, M8 x 30	D000008021-030	10
26	Screw, Cap Hd, M8 x 60	D000008021-060	2
27	Screw, Cap Hd, M8 x 90	D000008021-090	3
28	Screw, Cap Hd, M10 x 70	D000009021-070	1
29	Screw, Cap Hd, M10 x 30	D000009021-030	2
30	Washer, Flat, M6	D000011021-060	6
31	Washer, Flat, M8	D000011021-080	16
32	Washer, Flat, M10	D000011021-100	4
33	Washer, Spring, M6	D000011022-060	2
34	Washer, Spring, M8	D000011022-080	15
35	Washer, Spring, M10	D000011022-100	2
36	Nut, Hex, Nyloc, M6	D000012022-060	4
37	Nut, Hex, Nyloc, M8	D000012022-080	1
38	Nut, Hex, Nyloc, M10	D000012022-100	3
39	Adhesive, Loctite 242	N/A	10 ml
40	Lining	9125D05001024	1

**Vehicle Preparation**

- 14.** Before installing the GSR installation kit, check that the kit is complete. The contents of the kit are listed in Table 2.
- 15.** Ensure all Raven radio racks are removed prior to installing the GSR installation kit.
- 16.** Remove and retain both vehicle rear radio antenna mounting brackets (if fitted) and fasteners.
- 17.** Remove and retain the two radio operator's rear inward facing seats and fasteners.
- 18.** Remove and retain the two left-hand side Raven frame-to-rear body clamps and associated hardware.
- 19.** Inspect all Raven radio frame anchorage points in accordance with the content of the reference detailed in Para 5.b. to ensure:
  - a.** The retaining plate bracket (RPS 02190, SQ/1 Item 036) is secure (welded and/or riveted to the vehicle sponson).
  - b.** The threaded plate (RPS 02190, SQ1 Item 901) is fitted and fully functional (ie. thread not damaged).
  - c.** The rivnuts in the vehicle coaming are fitted and fully functional.
  - d.** Relocation of the Raven radio frame mountings in accordance with EMEI Vehicle G 117-2 (Para 5.d) has been conducted.

**NOTE**

A copy of Signal HVH RAM 3821/01 is available from the NFM Lt B Vehicle, LV SPO if required.

- 20.** Ensure that a screw (select size as appropriate) can be screwed in by hand into each of the vehicle nutserts and captive nuts. Clean the threads as necessary.

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### NOTE

Manual alignment of these fasteners may be required to ensure that the GSR installation kit frames fit flush against the coaming rail.

Loctite 242 is to be applied to threads of screws used to secure the isolation frame to the vehicle body except where nyloc nuts and mechanical locking devices (spring washers) are used to secure fasteners.

Spacers are supplied as part of the installation kit to correct for variations in chassis between Perentie vehicles. The spacers are to be placed between the GSR installation kit frames and the vehicle.

The GSR installation kit parts list (Table 2) details the spacers supplied. The frames are to remain square to the vehicle body after fitting.

### INSTALLATION

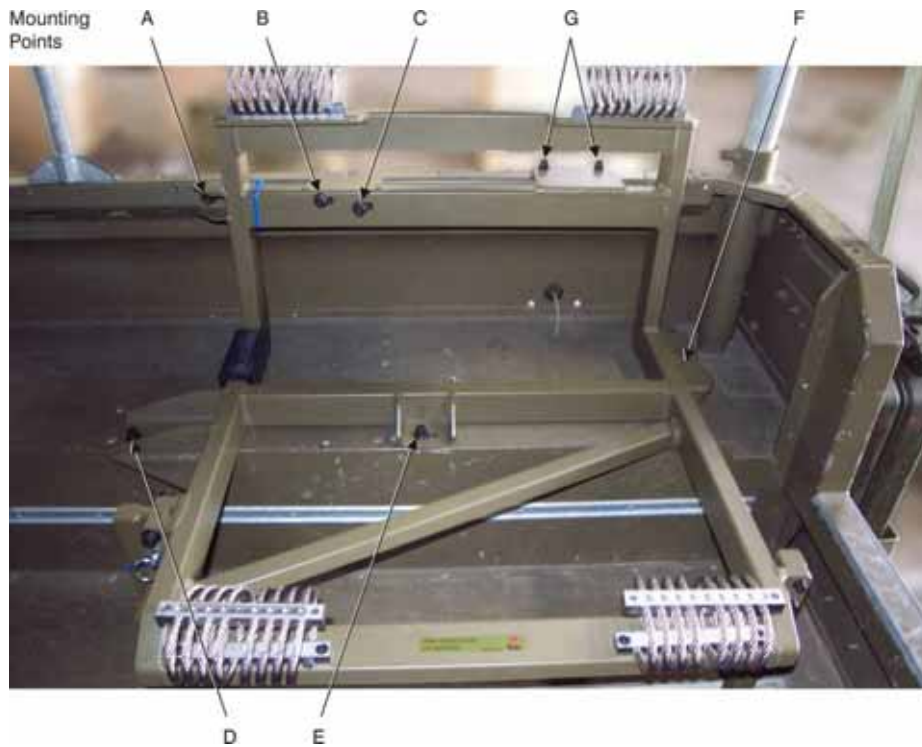
#### Isolation Frame

### NOTE

The isolation frame, RSU frame, cable frame, combat pack rack frame and operator seat are independent items and may be installed independently, in any order.

For example, the Enidine vibration (Table 2, Serial 19) may be fitted to the isolation frame (Table 2, Serial 2) prior to installing the isolation frame in the vehicle.

- 21.** Position the isolation frame (Table 2, Serial 2) on the driver side sponson as shown in Figure 1. Ensure points A, B and C (Figure 1) are flush against the coaming rail and all three mounting holes are aligned with the holes in the coaming rail.
- 22.** Secure the isolation frame at point A (Figure 1) using an M8 X 30 screw (Table 2, Serial 25), spring washer (Table 2, Serial 34) flat washer (Table 2, Serial 31) and spacer (Table 2, Serial 16). Also fit a spacer (Table 2, Serial 16) between the isolation frame and the coaming rail. Fasten the screw to finger tight only.
- 23.** Secure the isolation frame at points B and C (Figure 1) using M8 X 90 screws (Table 2, Serial 27), spring washers (Table 2, Serial 34) flat washers (Table 2, Serial 31) and spacer (Table 2, Serial 16). Also fit a spacer (Table 2, Serial 16) between the isolation frame and the coaming rail at points B and C. Fasten the screws to finger tight only.
- 24.** Secure the isolation frame at points D and E (Figure 1) using M8 X 30 screws (Table 2, Serial 25) spring washers (Table 2, Serial 34), flat washers (Table 2, Serial 31) and spacer (Table 2, Serial 16). Also fit spacers (choose from Table 2, Serials 15, 16 or 17) as required between the isolation frame and the vehicle floor to ensure there is no space between the isolation frame and vehicle floor when the screws are fastened to finger tight.
- 25.** Secure the isolation frame at point F by using an M10 X 30 screw (Table 2, Serial 29), flat washer (Table 2, Serial 32), spring washer (Table 2, Serial 35) and spacer (fitted to the frame side of the mounting point; choose from Table 2, Serials 12, 13 or 14). Also fit additional spacer/s as required between the isolation frame and vehicle body (select as required from Table 2, Serials 12, 13 or 14) and a hex head, nyloc nut (Table 2, Serial 38). Access to the nut is via the vehicle side compartment. Tighten it until it is secure.



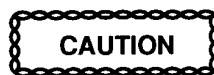
**Figure 1 Orientation Of Isolation Frame**

- 26.** Secure the isolation frame at point G (Figure 1) using two M8 X 30 screws (Table 2, Serial 25), flat washers (Table 2, Serial 31) and spring washers (Table 2, Serial 34).

**NOTE**

If the rear right antenna mounting bracket is required, place the antenna mounting bracket over the isolation frame mount before inserting the two M8 X 30 screws as described in Para 26. so that the mounting screws pass through the antenna mounting bracket then through the isolation frame mount.

- 27.** Tighten all fasteners at each of the isolation frame mounting points until the frame is secure.



**Some antenna mounting brackets may not be able to be adequately secured when used in conjunction with the isolation frame. If the shaft of the lower securing bolts of the antenna mounting bracket is not fully located in the antenna mounting bracket slot after fitting the isolation frame, the antenna mounting bracket is not to be fitted to the vehicle.**

- 28.** Fit and tighten the rear vehicle antenna mounting bracket lower fasteners (if antenna mounting bracket is fitted).

**Fixed Tripod Retainer**

- 29.** Fit the fixed tripod retainer to the isolation frame (Figure 2), using two cap head M6 X 30 screws (Table 2, Serial 24), M6 flat washers (Table 2, Serial 30) and M6 spring washers (Table 2, Serial 33). Use Loctite 242 on the threads of the screws. Tighten the screws.



Fixed Tripod Retainer

Figure 2 Tripod Retainer Fixed to Isolation Frame

Pivoted Tripod Retainer



Do not over tighten the M10 x 70 screw. Ensure the pivoted tripod retainer has full range of movement.

30. Fit the pivoted tripod retainer to the isolation frame using an M10 X 70 screw (Table 2, Serial 28), flat washers (Table 2, Serial 32) and hex head, M10 nyloc nut (Table 2, Serial 38) in the position shown in Figure 3. Ensure the pivoted retainer moves freely. Next, fit the pull-pin (Table 2, Serial 20) in the position shown in Figure 3.



Pull Pin

Pivoted Tripod Retainer

Figure 3 Isolation Frame Pivoted Tripod Retainer

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**Vibration Isolators**

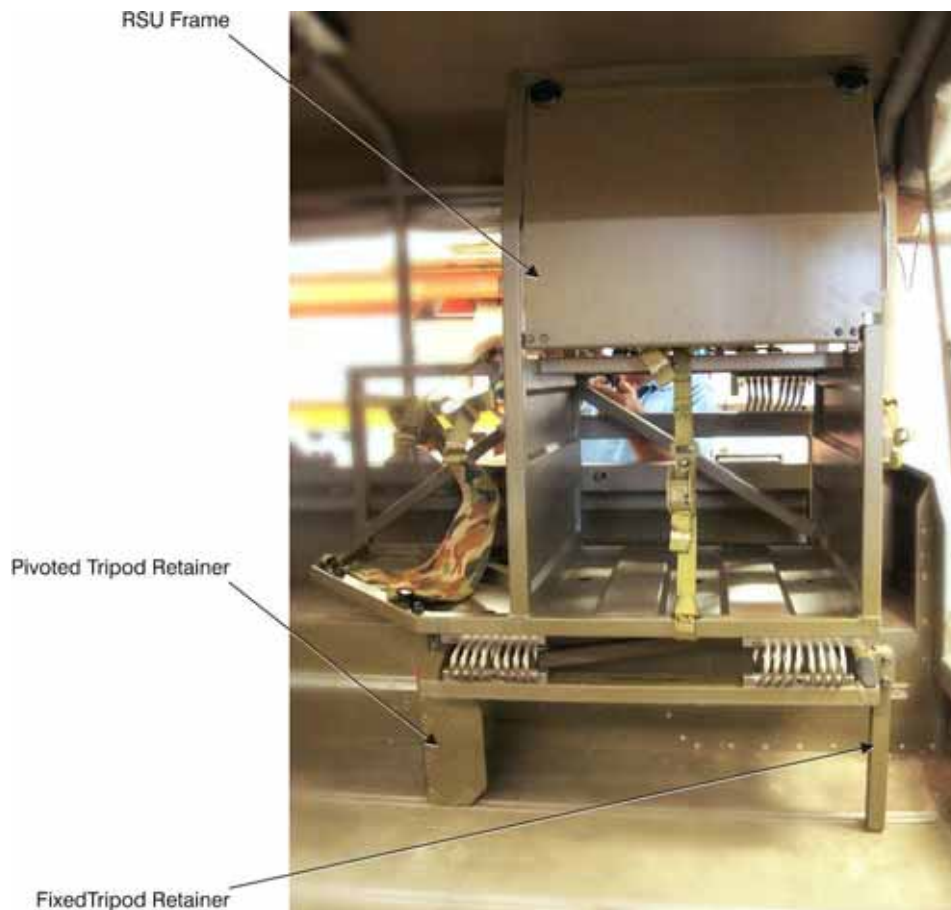
- 31. The vibration isolators provide a measure of protection to equipment housed in the RSU frame during vehicle transit and in the event of a vehicle collision.
- 32. To install the vibration isolators, position the four isolators (Table 2, Serial 19) on the isolation frame as shown in Figure 1.
- 33. Fit and tighten the M6 X 25 mounting screws (Table 2, Serial 22) using Loctite 242 on the threads.

**NOTE**

The mounting screws are fastened directly into the isolation frame. No washers or nuts are required.

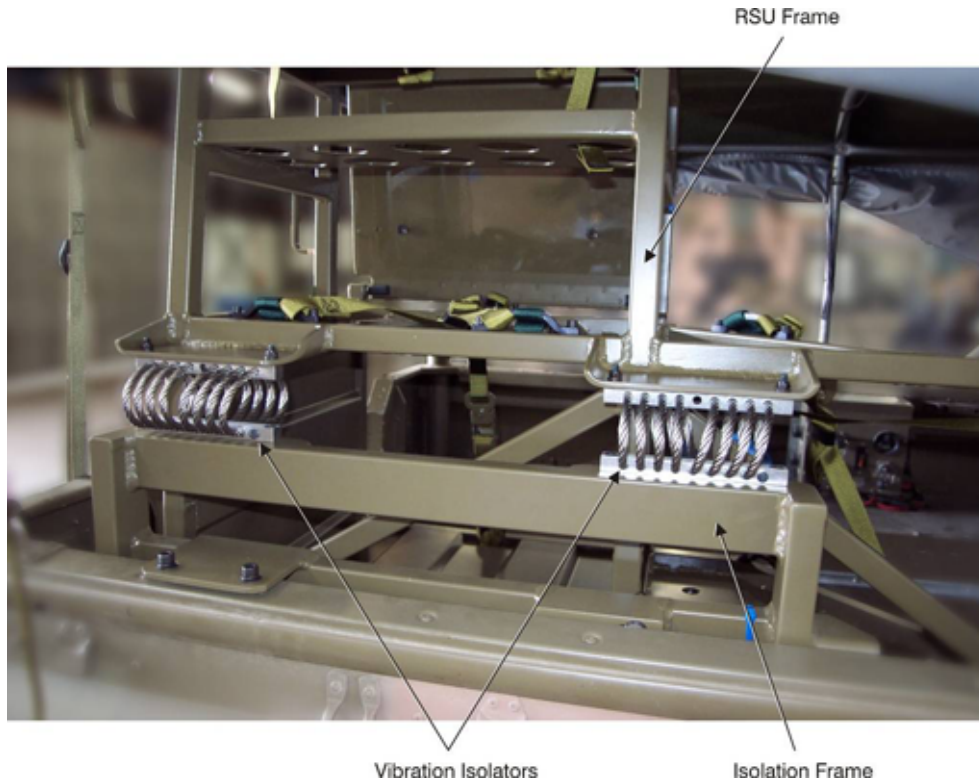
**RSU Frame**

- 34. The RSU frame houses (when fitted) the GSR operator interface, power interface, transmit and receive and signal processing equipment.
- 35. To install the RSU frame, position the frame (Table 2, Serial 1) on top of the isolators and ensure all mounting holes are aligned (Figure 4 and Figure 5).



**Figure 4 RSU Frame Mounted on Isolation Frame**

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**Figure 5 RSU Frame Fitted to Isolators (Rear View)**

- 36. Secure the RSU frame to the rear isolators (Figure 5) using M6 X 30 screws (Table 2, Serial 23), flat washers (Table 1, Serial 30) and hex nuts (Table 2, Serial 36).
- 37. Secure the RSU frame to the front isolators using M6 X 25 mounting screws (Table 2, Serial 22) using Loctite 242 on the threads.

**Vibration Isolator Covers**

- 38. Each canvas vibration isolator cover (Table 2, Serial 18) forms an open ended canvas tube with velcro strips to allow fitting to a vibration isolator.
- 39. To fit the cover, open along the velcro strip and place the cover over and around each vibration isolator (Figure 6). Ensure that the isolators are completely covered and press the velcro strip together to form a tube and secure the cover. Tuck in the ends of the canvas to completely cover the inside of the vibration isolator.

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**Figure 6 Vibration Isolator Covers Fitted (Front)**

**Interconnect Cable**

- 40. The interconnect cable (Table 2, Serial 9) routes power and data from the GSR power interface to the operator interface (when fitted).
- 41. To install the interconnect cable, attach it to the RSU frame using a cable tie (Table 2, Serial 21). Figure 7 shows the cable orientation and location of the cable tie.

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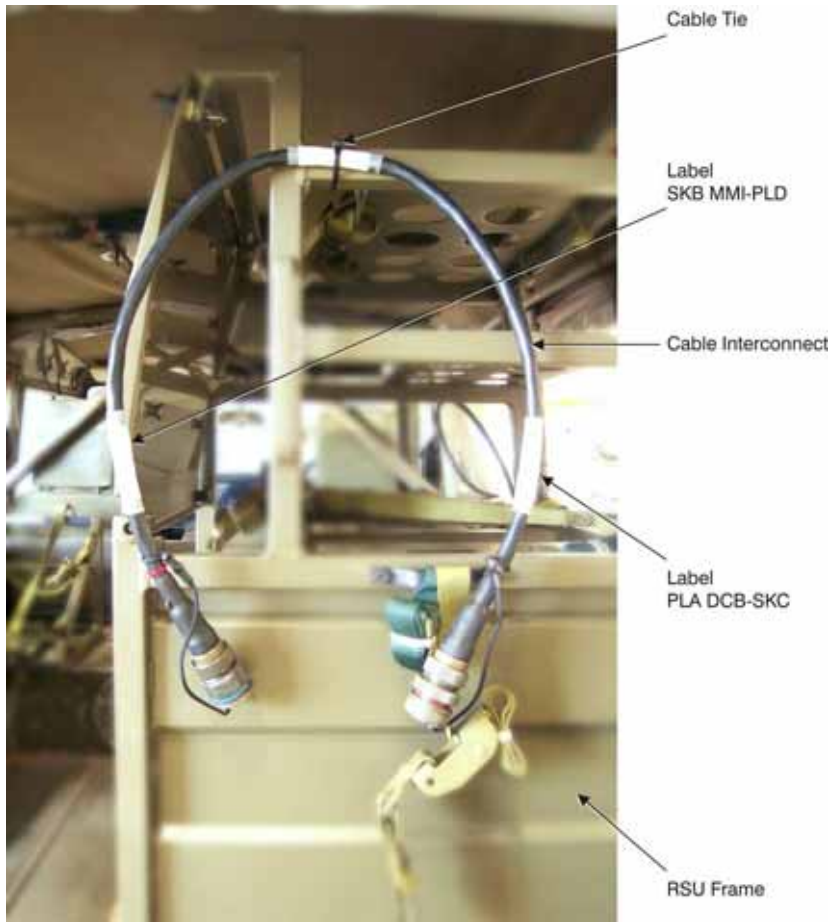


Figure 7 Interconnect Cable

### Vehicle Power Cable

42. The vehicle power cable (Table 2, Serial 8) routes dc power from the vehicle Power Distribution Box (PDB) to the GSR equipment when fitted to the RSU frame.



**Before connecting the vehicle power cable, ensure that the vehicle PDB circuit breaker is off.**

43. To install the vehicle power cable, first route it around the floor of the vehicle beginning at the PDB, forward and across to the right of the vehicle floor, then rearwards to the RSU frame. Secure the cable at the positions shown in Figure 8 to Figure 13 using cable ties (Table 2, Serial 21).

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Cable, Vehicle Power

Figure 8 Vehicle Power Cable



Figure 9 Vehicle Power Cable Routing

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Cable Tie

Figure 10 Vehicle Power Cable Routing (Front View, Driver Side Corner)



Cable Tie

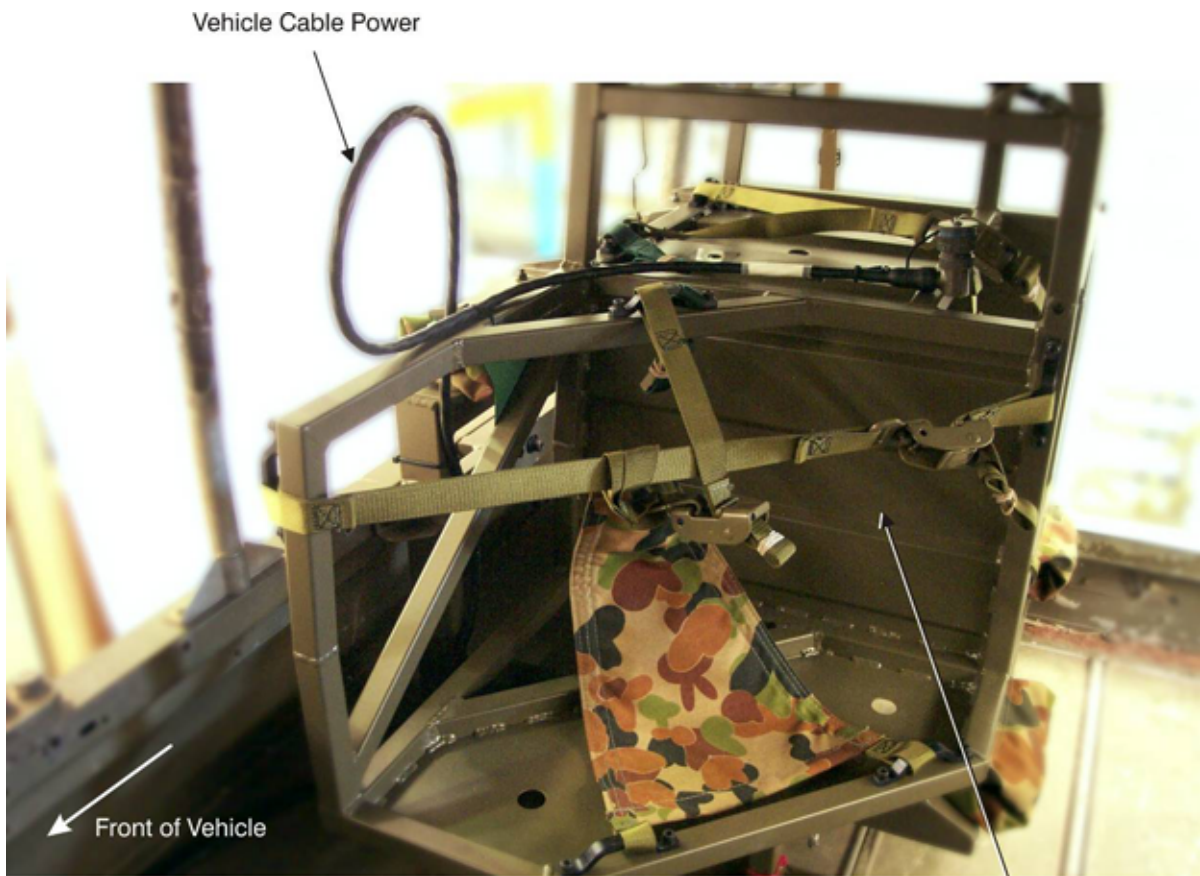
Cable Tie

Figure 11 Vehicle Power Cable



RSU Frame Cable, Vehicle Power, Right Angle Connector  
**Figure 12 Vehicle Power Cable at the RSU Frame**

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Vehicle Cable Power  
Front of Vehicle  
RSU Frame  
**Figure 13 Location Of Vehicle Cable Power**



### Cable Rack

44. The cable rack assembly houses a GSR cable reel, cable reel stand, combat pack and other interconnecting cables during vehicle transit.

45. To install the cable rack assembly, position and orientate the frame in the vehicle as shown in Figure 14. Ensure all mounting holes are aligned (one on the side of the coaming rail and two on the vehicle floor).

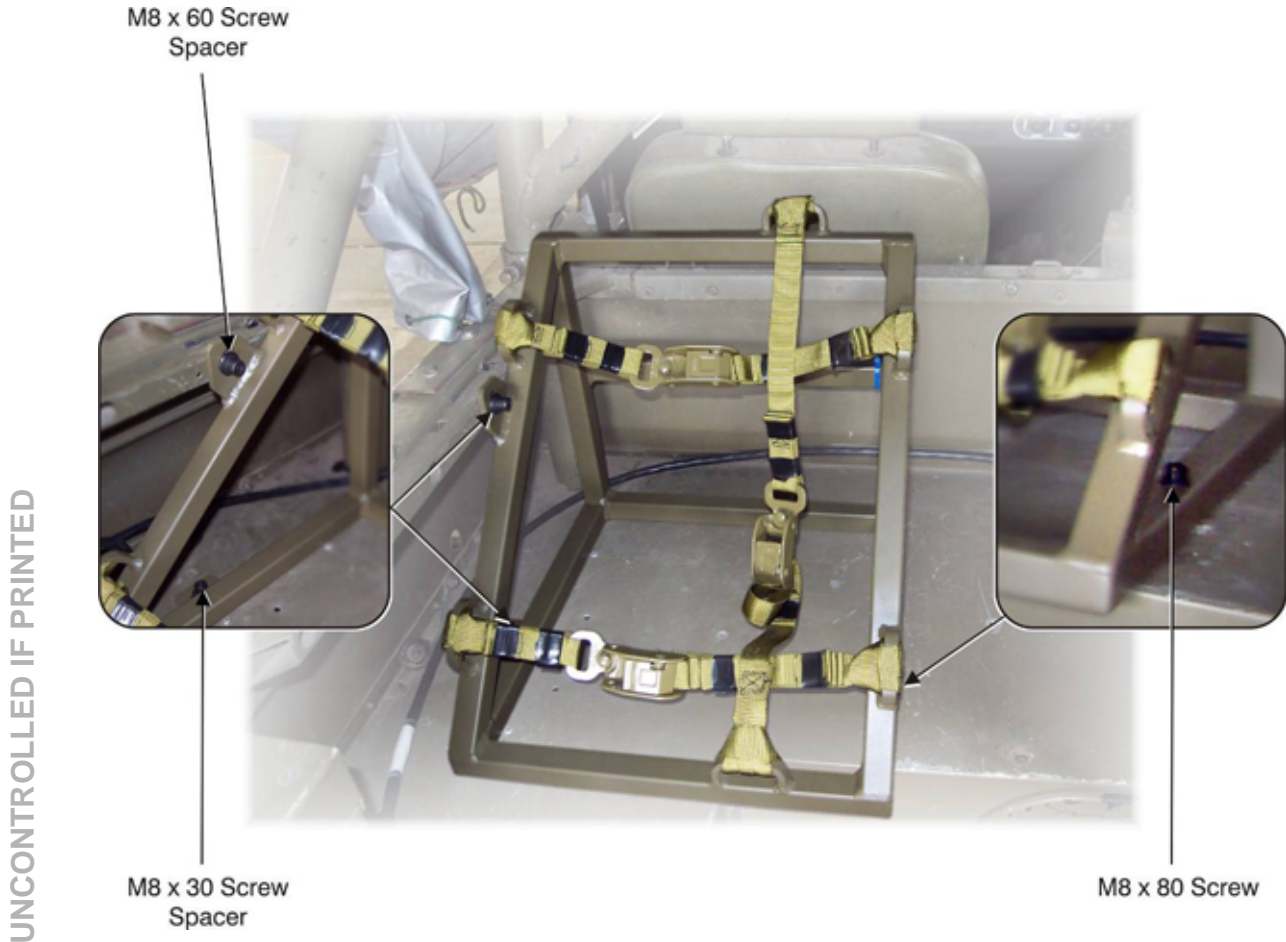


Figure 14 Cable Rack Assembly

#### NOTE

A spacer is fitted to the fastener side of the frame at fastener locations where a slot is the cable rack assembly mounting hole.

46. Loosely fit an M8 X 60 screw (Table 2, Serial 26) to the coaming rail mounting hole using a spacer (Table 2, Serial 16) on the screw head side of the frame, a flat washer (Table 2, Serial 31) and spring washer (Table 2, Serial 34).

47. Loosely fit an M8 X 30 screw (Table 2, Serial 25) to the left tab mounting hole (below the coaming rail) using a spacer (Table 2, Serial 16), flat washer (Table 2, Serial 31) and spring washer (Table 2, Serial 34).

48. Loosely fit an M8 X 90 screw (Table 2, Serial 27) to the right frame base mounting hole using a flat washer (Table 2, Serial 31) and spring washer (Table 2, Serial 34).

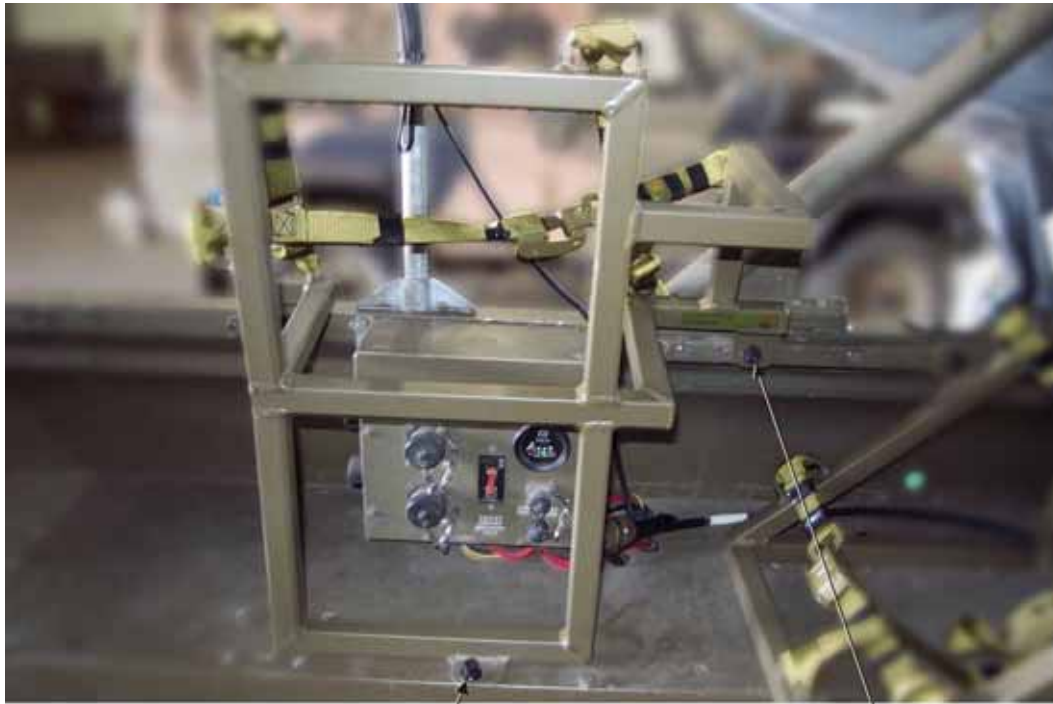
49. Tighten all three mounting screws until the frame is secure.

### Combat Pack Frame

50. The combat pack frame houses the Alice frames associated with the GSR combat packs when the vehicle is in transit.

51. To install the combat pack frame, position and orientate the frame as shown in Figure 15 and Figure 16. Ensure all the mounting holes in the frame are aligned with the mounting holes in the vehicle coaming rail and floor.





Sponson Mounting Point  
M8 x 30 Screw

Forward Mounting Point  
M8 x 60 Screw

**Figure 15 Combat Pack Frame Mounting Points**

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Rear Mounting Point  
M8 x 30 Screw & Spacer

**Figure 16 Combat Pack Frame Rear Mounting Point**



**Figure 17 Combat Pack Frame Hex Nut**

- 52.** A fastener may already be installed at the sponson fastener position. If so, remove and discard it.

**NOTE**

A spacer is not required between the vehicle and the combat pack frame at the forward coaming rail mounting position.

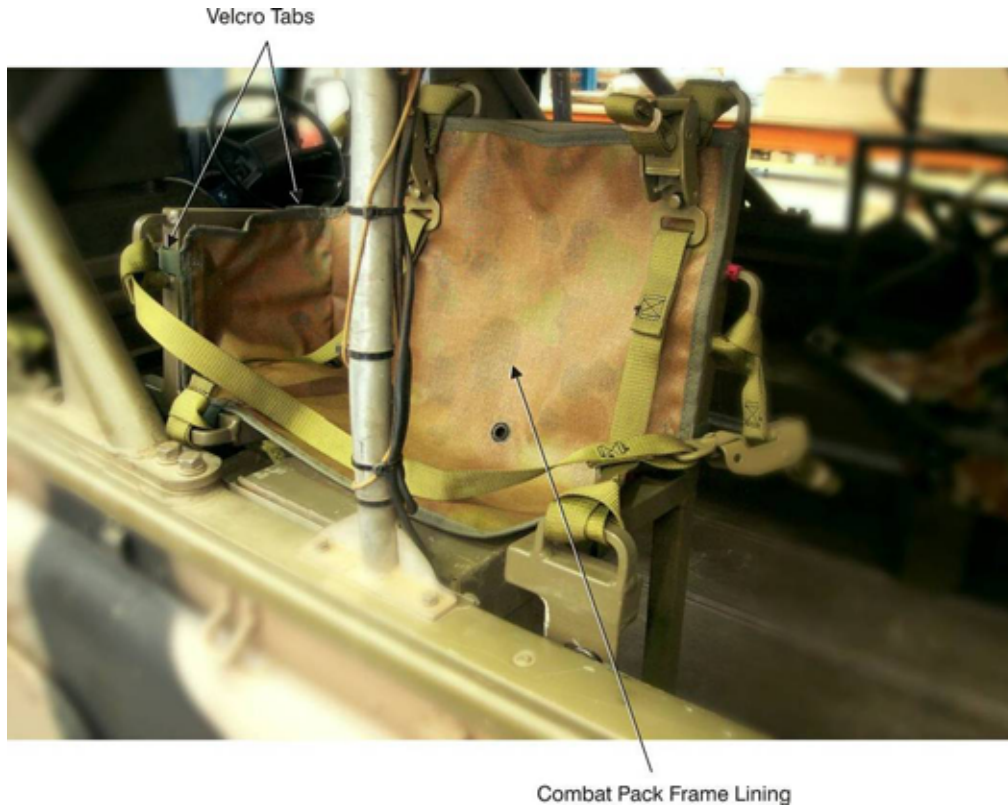
At all fastener locations with a slot in the frame, a spacer is fitted to the fastener side of the frame.

- 53.** Loosely fit one M8 X 30 screw (Table 2, Serial 34) to the rear and one M8 X 60 screw to the forward frame mounting holes against the coaming rail using a flat washer (Table 2, Serial 34) and spring washer (Table 2, Serial 34).

- 54.** Fit an M8 X 30 screw (Table 2, Serial 25) through the bottom tab mount (slotted) using a spacer, (Table 2, Serial 16), flat washer (Table 2, Serial 31) spring washer (Table 2, Serial 34). Fit an M8 hex nyloc nut (Table 2, Serial 37) and washer (Table 2, Serial 31), from the underside of the vehicle tray. Figure 17 (viewed from inside left rear wheel arch) shows the location. Tighten all mounting screws until they are secure.

- 55.** If required, attach the canvas lining (Table 2, Serial 40) to the combat pack frame (Figure 18).

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**Figure 18 Combat Pack Frame**

### Operator Seat

56. The operator seat is used by a GSR operator during surveillance operations when the vehicle is stationary.
57. To install the operator seat, position the seat in the left, rear corner of the vehicle with the upper mounting bracket loosely aligned with the rear left antenna mounting holes on the coaming rail and the lower mounting bracket with the sponson mounting hole (Figure 19 and Figure 20).



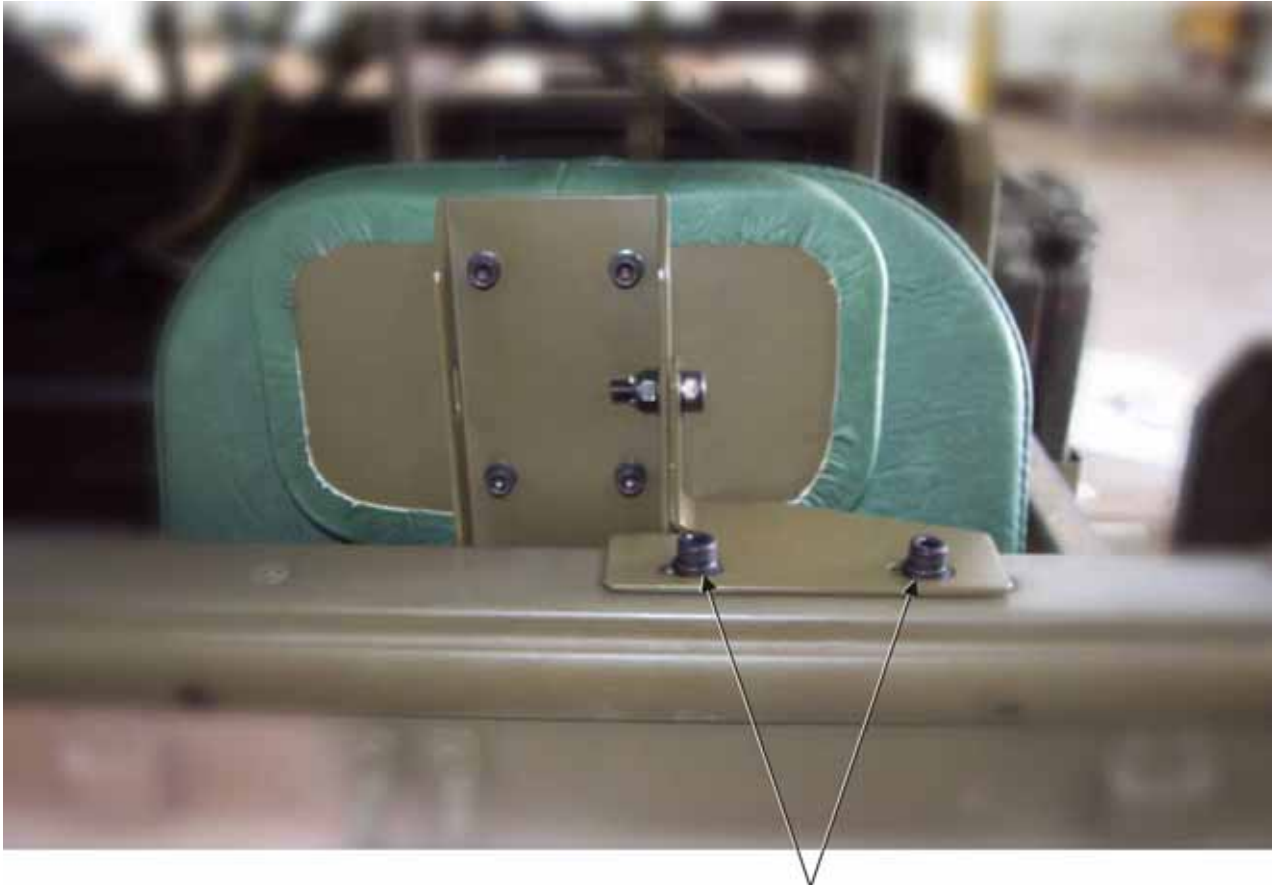
**Figure 19 Operator Seat Sponson Mounting Point**

**NOTE**

Spacers are not required between the operator seat frame and the vehicle.

**58.** Secure the operator seat to the sponson with an M10 X 30 screw (Table 2, Serial 29), spacer (Table 2, Serial 12.), flat washer (Table 2, Serial 32), spring washer (Table 2, Serial 35) and hex nyloc nut (Table 2, Serial 38). Access to the screw is via the vehicle side compartment to the rear of the wheel arch.

**59.** Secure the operator seat to the coaming rail using two M8 X 30 screws (Table 2, Serial 25), two flat washers (Table 2, Serial 31) and two spring washers (Table 2, Serial 34).



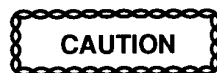
Coping Rail Mounting Points

**Figure 20 Operator Seat Coaming Rail Mounting Points**

**NOTE**

If the left rear antenna mounting bracket is required, reposition and secure it, clamping the seat bracket between the antenna bracket and the top of the coaming rail.

**60.** Tighten all operator seat mounting bracket screws.



**Some antenna mounting brackets may not be able to be adequately secured when used in conjunction with the operator seat. If the shaft of the lower securing bolts of the antenna mounting bracket is not fully located in the antenna mounting bracket slot after fitting the operator seat, the antenna mounting bracket is not to be fitted to the vehicle.**

**61.** Fit and tighten the left rear radio antenna mounting bracket lower fasteners (if antenna mounting bracket is fitted).

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62. Attach the Label, Serial Number (Table 2, Serial 11) to the Label Unit (Table 2, Serial 10) so that all the numbers of the serial number show through the window on the Label Unit. Then attach the Label Unit to the RSU frame as shown in Figure 21.



Figure 21 Location for Label, Unit

63. Refer to Figure 22 and Figure 23 for views of the Perentie FFR vehicle when all GSR installation kit components are installed.

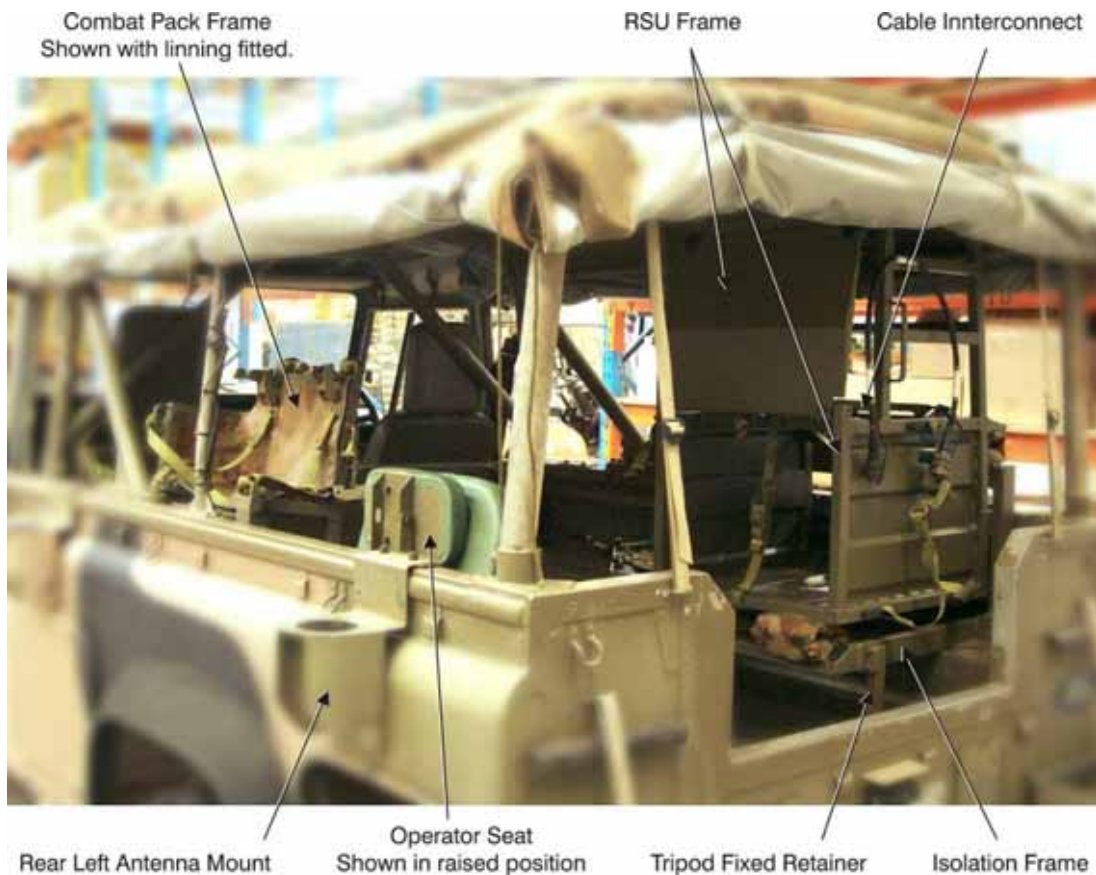
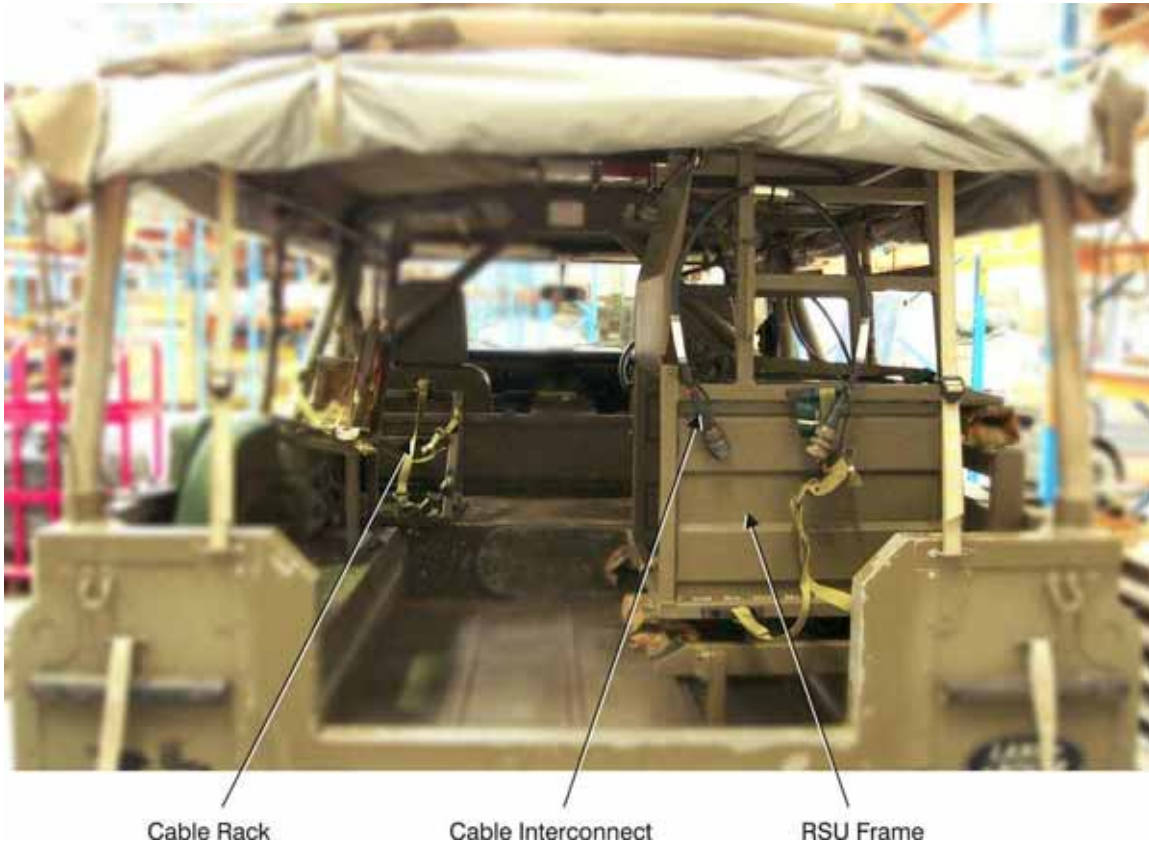


Figure 22 Installation Complete (Left Rear View)

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**Figure 23 Installation Complete (Rear View)**

64. Discard all unused spacers and cable ties.

**REMOVAL OF GSR INSTALLATION KIT**

65. To remove the GSR installation kit, proceed as follows:
- a. Remove and discard the operator seat fasteners and spacers.

**NOTE**

If the vehicle radio antenna mounting bracket is to be refitted to the vehicle, retain the coaming rail fasteners.

- b. Remove the operator seat from the vehicle.
- c. Remove and discard the combat pack frame fasteners and spacers.
- d. Remove the combat pack frame from the vehicle.
- e. Remove and discard the cable rack assembly fasteners and spacers.
- f. Remove the cable rack assembly.
- g. Remove and discard all cable ties securing the vehicle power cable to the vehicle.
- h. Remove the vehicle power cable from the vehicle.
- i. Remove the isolator covers and retain them for refit.
- j. Remove and discard the fasteners securing the RSU frame to the isolators.
- k. Remove the RSU frame from the vehicle.
- l. Remove and discard the isolation frame fasteners and spacers.

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**NOTE**

If the vehicle radio antenna mounting bracket is to be refitted to the vehicle, retain coaming rail fasteners.

- m. Remove the isolation frame from the vehicle.

**REFURBISHMENT OF VEHICLE**

**66.** Once the installation kit is removed from the vehicle, ensure the vehicle is returned to the approved build standard. Refit the rear antenna mounting brackets utilising the coaming rail fasteners removed when removing the GSR installation kit. Ensure the rear radio operators seats are refitted to the vehicle.

**67.** After the vehicle is returned to the approved build standard, the vehicle can be fitted for other roles in accordance with approved documented procedures.

**REFIT OF GSR INSTALLATION KIT**

**68.** Re-installation of the kit into a compliant Perentie FFR vehicle requires an Installation Kit, Perentie Mount AMSTAR (NSN 5840-66-153-2970). This kit contains the fixing items discarded as part of the removal process detailed in Para 65.

**69.** To refit the GSR integration kit to a compliant Perentie FFR vehicle, perform the installation commencing from the description in Para 14 using fixing items from the Installation Kit, Perentie Mount AMSTAR (NSN 5840-66-153-2970).

UNCONTROLLED IF PRINTED

**END**

Distribution List: **VEH G 16.21 – Code 2** (Maint Level)  
(Sponsor: LV SPO Lt B Veh)  
(Authority: CS SPO ECP No 005/08, LV SPO DAC 055/05)