

RENAULT

Technical Note 6015A

All types

Sub-sections concerned: 88A - 88B - 88C

ELECTRICAL WIRING REPAIR

77 11 332 302

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"The repair procedures given by the manufacturer in this document are based on the technical specifications current when it was prepared.

The procedures may be modified as a result of changes introduced by the manufacturer in the production of the various component units and accessories from which his vehicles are constructed."

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ELECTRICAL WIRING REPAIR

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WARNING

This note authorises the repair of electrical wiring in very specific cases only and under certain conditions.
Check that the repair in question is authorised and that the repair conditions are respected.

1 - Result of the fault finding procedure.

Note:

During repair, check that you have the most recently updated version of the technical note.

A preliminary fault finding procedure has enabled a wiring fault to be identified. Follow the investigation procedure below.

Disconnect the battery (see the **MR corresponding to the vehicle, 80A, Battery, Battery: Removal - Refitting**).

Remove the components necessary to access the area to be worked on. The operation area must allow the pliers and the heat gun to be used, without blocking visibility.

WARNING

If the damaged section is not sufficiently accessible, remove the wiring concerned and repair on the bench.

When the damaged section is sufficiently accessible, detach the wires to be repaired from the main wiring.

WARNING

Check if there is a sensitive line. These cases are listed in the specific procedures reference table in this section.

If there is a sensitive line, replace the defective wiring or apply the specific procedure, if one exists. These procedures are indicated in the specific procedures reference table in this section.

Check that the fault is located more than 10 cm from the connector.

WARNING

If the damaged section is located less than 10 cm from the connector, replace the defective wiring, unless a wiring-connector kit (connector with wires) exists. In this case, use the kit to replace the damaged section and the connector.

This note does not authorise operations directly on the connectors and electrical contacts. Only wiring-connector kits allow the replacement of a connector. These kits can have associated procedures.

Note:

To check whether there is a wiring-connector kit, consult DIALOGYS. These kits are generally linked to specific wiring or function diagrams.

Note:

If the fault is located at the electrical contact (in the connector) and if it is linked to a corrosion or heating fault, replace the wiring or fit the wiring-connector kit. Also check the connector complement.

Note:

In all cases, pay particular attention to supply and earth lines and their tightening (refer to the tightening torques in the MRs concerned).

After having carried out these checks (outlined in the **Summary flowchart of the operating procedure**), if the repair is authorised, and it does not require a specific procedure, carry out the generic procedure (see **Wiring: Repair**).

Note:

If you have been referred to this note by a MR, NT or removal-refitting procedure, apply the repair procedure adapted to the case in question. Either the generic repair procedure (see **Wiring: Repair**), or a specific procedure listed in the specific procedures reference table in this section.

2 - Specific procedures reference table.

● **Guidelines for reading the tables below:**

- If not otherwise stated, consider all components or electrical connections to have a link with the functions or equipment listed. For example: For the electric power assisted steering, the function is not specified. It is prohibited to carry out operations on any wire attached to the electric power assisted steering.
- If one case can be found in both tables, give priority to the **Changing the wiring**, recommendations, and then to those for the specific cases:
 - Example 1: For a 22-track airbag connector where more than 10 wires are damaged, the specific cases refer you back to the airbag and pretensioner repair procedure, and the general cases recommend that the wiring is replaced (as there are more than 10 wires involved). Priority is given to **Changing the wiring**.
 - Example 2: For an operation on a pair of twisted wires (general case) for the airbag function (specific case), the specific case refers back to the repair procedure for Airbags and pretensioners, and the general cases refer back to the repair procedure for multiplex lines. Priority is given to the airbag and pretensioner repair procedure. The recommendations for the specific cases take precedent over the general cases.

Wiring: Precautions for repair

● General cases:

Functions or equipment	Precisions	Instructions
Wiring harness	Number of damaged wires 10 or fewer	(see Wiring: Repair)
	Number of damaged wires more than 10	Change the wiring
Equipment and predispositions specific to commercial vehicles and conversions	/	Change the wiring
Electric vehicles	Wiring and power connectors	Change the wiring
Connections or associated components	/	(see Connector: Repair)
Splices	Splice with more than 3 wires	Change the wiring
	3-wire splice which does not need sealing	(see Wiring: Repair)
	Splice with 3 wires or more, which needs sealing (engine and underbody areas and damp areas of the doors and boot)	Change the wiring
Wires outside the loom	Sheathed wires	Change the wiring
	Shielded wires	Change the wiring
	Twisted wires	If the wire cross-sections are 0.5 mm²: (see Multiplex network: Repair)
	Flat cable	Change the wiring
	Wires with specific thermal protection	Change the wiring
	Copper wires with cross-section less than 0.35 mm ²	Change the wiring
	Copper wires with cross-section greater than 6 mm ²	Change the wiring
	Damaged wires less than 10 cm from the connector	(see 88A, Wiring, Connector: Repair)

WIRING

Wiring: Precautions for repair

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● **Specific cases:**

Lines	Device	Instructions
4-wheel steering	/	Change the wiring
ABS	Other ABS lines	Change the wiring
ABS	ABS sensor	Change the wiring
Airbag	Other airbag lines	(see Airbag and pretensioner wiring: Repair)
Airbag	Airbag sensor	(see Airbag and pretensioner wiring: Repair)
Airbag	Airbag computer connector	(see Airbag and pretensioner wiring: Repair)
Airbag	Pretensioner (squib) connector	(see Airbag and pretensioner wiring: Repair)
Airbag	Under seat connector	(see Airbag and pretensioner wiring: Repair)
Airbag	Airbag trigger connectors (pyrotechnic lines)	(see Airbag and pretensioner wiring: Repair)
Preheating unit (Diesel)	Heater plug	Change the wiring
Injection computer (Petrol)	Petrol vapour absorber	Change the wiring
Injection computer	Variable camshaft	Change the wiring
Injection computer	Variable inlet camshaft	Change the wiring
Injection computer	Variable exhaust camshaft	Change the wiring
Injection computer (Petrol)	Pencil coil	Change the wiring
Injection computer (Petrol and Diesel)	Motorised throttle body	Change the wiring
Injection computer	Camshaft sensor	Change the wiring
Injection computer (Petrol and Diesel)	Inlet camshaft sensor	Change the wiring
Injection computer (Petrol and Diesel)	Exhaust camshaft sensor	Change the wiring
Injection computer	Camshaft sensor, row A, B	Change the wiring
Injection computer	Variable exhaust camshaft sensor	Change the wiring
Injection computer (Petrol and Diesel)	Pinking sensor	Change the wiring
Injection computer (Diesel)	Turbine upstream pressure sensor	Change the wiring

WIRING

Wiring: Precautions for repair

88A

● **Specific cases (cont. 1):**

Lines	Device	Instructions
Injection computer (Petrol)	Manifold pressure sensor	Change the wiring
Injection computer (Diesel)	Particle filter differential pressure sensor	Change the wiring
Injection computer (Diesel)	Rail pressure sensor	Change the wiring
Injection computer (Petrol and Diesel)	Turbocharging pressure sensor	Change the wiring
Injection computer	Accelerator pedal sensor	Change the wiring, except for the connector on KANGOO (see Connector: Repair)
Injection computer (Petrol and Diesel)	TDC sensor	See OTS*
Injection computer (Diesel)	Particle filter (downstream) output sensor	Change the wiring
Injection computer (Petrol and Diesel)	Air temperature sensor	Change the wiring
Injection computer (Petrol)	Turbine upstream temperature sensor	Change the wiring
Injection computer (Diesel)	Fuel temperature sensor	Change the wiring
Injection computer (Petrol and Diesel)	Coolant temperature sensor	Change the wiring
Injection computer (Diesel)	Particle filter inlet temperature sensor (upstream)	Change the wiring
Injection computer (Diesel)	Injection air flowmeter	Change the wiring
Injection computer	Camshaft shift, row A, B	Change the wiring
Injection computer (Diesel)	Turbocharger control solenoid valve	Change the wiring
Injection computer (Diesel)	Damper solenoid valve	Change the wiring
Injection computer (Petrol and Diesel)	Injectors	Change the wiring
Injection computer (Diesel)	Diesel heater	Change the wiring
Injection computer (Diesel)	Water in diesel sensor	Change the wiring

*OTS: Special Technical Operation

WIRING

Wiring: Precautions for repair

88A**● Specific cases (cont. 2):**

Lines	Device	Instructions
Injection computer (Diesel/particle filter)	Oil level and temperature sensor	Change the wiring
Injection computer (Diesel)	Nitrogen oxide (Nox)	Change the wiring
Injection computer (Petrol and Diesel)	Upstream oxygen sensor	Change the wiring
Injection computer (Petrol and Diesel)	Downstream oxygen sensor	Change the wiring
Injection computer (Diesel)	Proportional oxygen sensor	Change the wiring
Injection computer (Diesel)	EGR valve	Change the wiring
Injection computer (Diesel)	Heater plug	Change the wiring
EPAS	/	Change the wiring
ETC (4x4 torque distributor)	/	Change the wiring
GMV	GMV	Change the wiring
Multiplex network	CAN	(See Multiplex network: Repair)
UPC (Petrol and diesel)	Air conditioning compressor	Change the wiring
UPC (Petrol)	Oil level sensor	Change the wiring

1 - Purpose and applications.

Description of the content of the Wiring repair kit case as well as the procedure and the field of application.

The kit enables wiring which is damaged or has cut electrical wires to be repaired whilst ensuring that it will be fully functional.

It also allows wiring-connector kits to be used.

All electrical cables and wires with cross-sections between 0.35 mm^2 and 6 mm^2 except "sensitive lines" (defined in this document), are affected.

WARNING

Repair of sensitive lines is prohibited using the generic procedure alone. It can be authorised provided that there is an additional appropriate procedure (see Wiring: Precautions for repair).

The technical nature and the sensitivity of this type of operation requires the adapted equipment contained and described in the Wiring repair kit case.

WARNING

Using tools or components which have not been recommended is strictly forbidden when repairing wiring.

WARNING

For sensitive lines, only automotive electricians, technician agents or cotechs (Level 2 Electricity as a minimum) can carry out the repair described in this note.

2 - Terminology.● **Wiring-connector kit.**

Kit usually made up of a connector the cells of which are populated with crimped wires along with sleeves for joining.

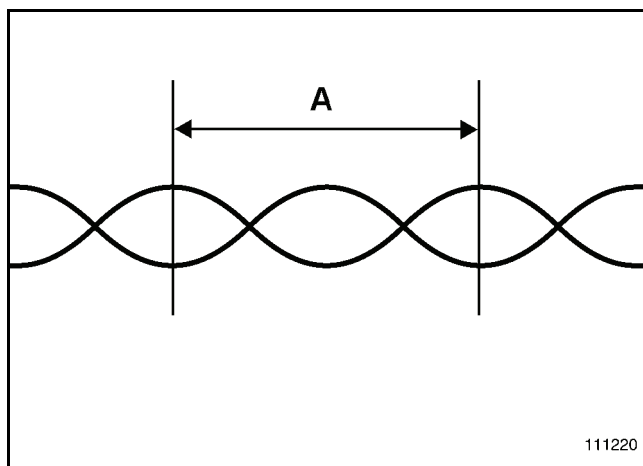
● **Multiplex lines or connections.**

Principal or secondary CAN network lines link the computers together and are made up of twisted pairs of stranded wires.

● **Turns or twists.**

For twisted pairs:

One turn (twist) = (A)

**3 - Operation time (TM).**

For each vehicle, an average repair time is given in the wiring section of the TM.

The corresponding codes are:

- **0500** for replacing a connector (using a connector kit).
- **0501** for repairing wiring.

This times do not include the time taken to access the area to be repaired. The time taken to remove and refit the wiring must be added.

WIRING

Wiring repair kit: Description

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1 - Case and label.

- Case (77 11 420 544).

Part no. 77 11 420 544 corresponds to the new electrical repair case. It replaces case part no. 77 11 229 893.

Both part numbers are authorised for electrical repair.

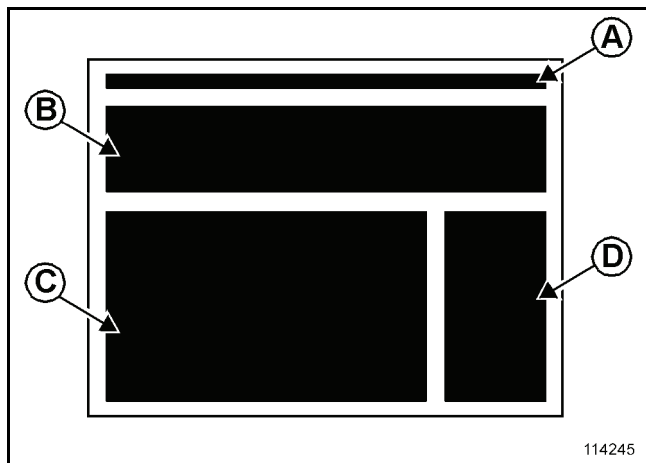
The case contains all the components described in this section. A label lists their part numbers.

- Label.

The label affixed inside the case is made up of 4 sections in English and French.

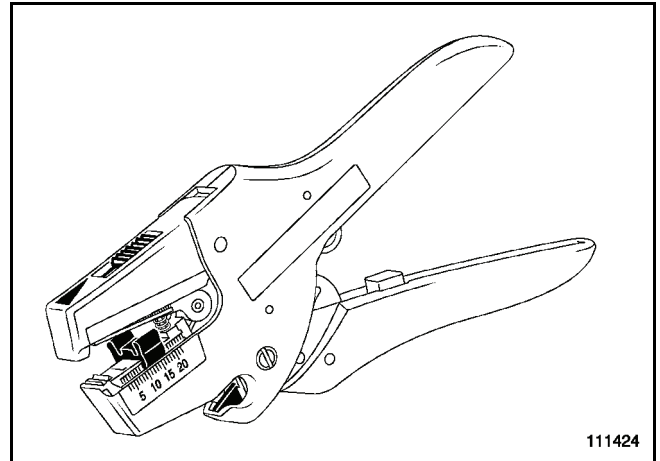
On the upper section, at (A) is the title and number of the note. At (B) are the After-Sales references (for the network) and MABEC code (for factories) which enables the kit to be restocked with consumables or new tools or a new kit to be ordered.

On the lower section, at (C) is a table (not exhaustive) which helps the right sleeve to be chosen, with a summary of the recommendations for each case. And at (D) are the recommendations for use.



2 - Tools.

- Stripping pliers (77 11 230 416).



These are automatic stripping pliers which enable an electrical conductor up to a maximum cross-section of **6 mm²** to be cut or stripped.

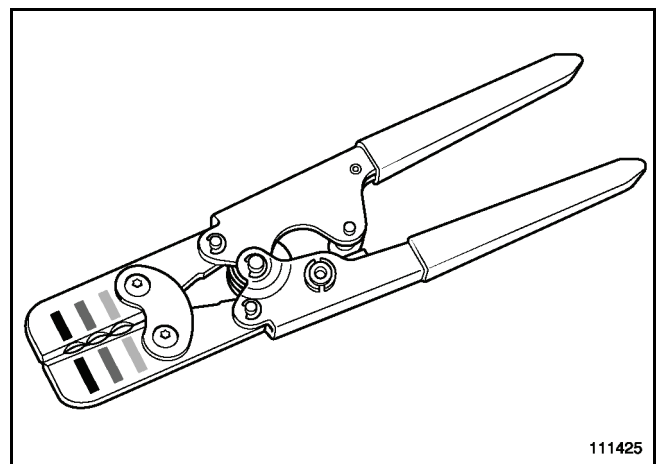
The length of the stripped section can be adjusted up to **20 mm**.

The operating instructions for this kit are described in this document (see **Wiring repair kit: Use**).

- Crimping pliers (77 11 421 296).

Part no. 77 11 421 296 corresponds to the new crimping pliers in the electrical repair kit. It replaces the crimping pliers with part no. 77 11 230 417.

Both part numbers are authorised for electrical repair.



WIRING

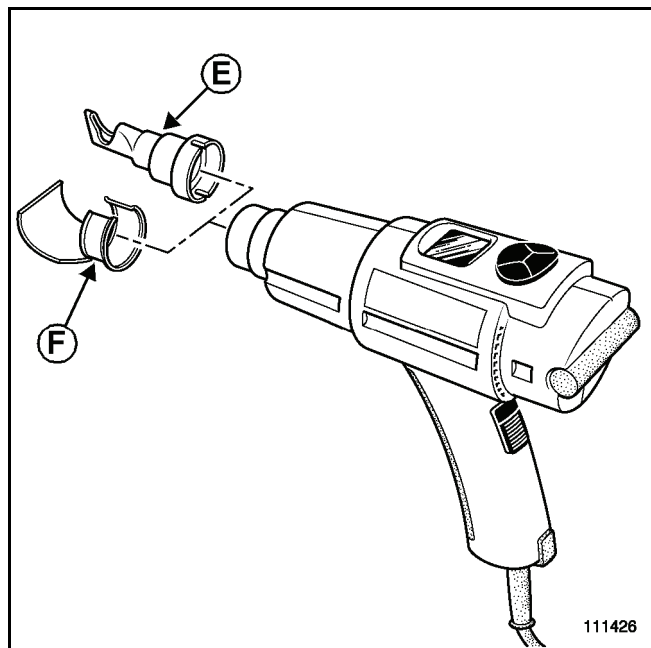
Wiring repair kit: Description

88A

The crimping pliers have three sizes of jaw (red, blue and yellow) which correspond to the crimping sleeves. These pliers are recommended for the crimping the sleeves provided in the kit.

The operating instructions for this kit are described in this document (see **Wiring repair kit: Use**).

● Heat gun (77 11 230 415).



The heat gun is a hot air blower with 2 nozzles which enable it to be adapted for different needs:

- Concentrator nozzle (E), (77 11 237 778).
- Heat shield nozzle (F), (77 11 237 777).

It can be used to solder all self-solder sleeves and to contract the heat-shrinkable parts and sheaths on all sleeves

Its temperature and flow of air are adjustable and are indicated on the screen.

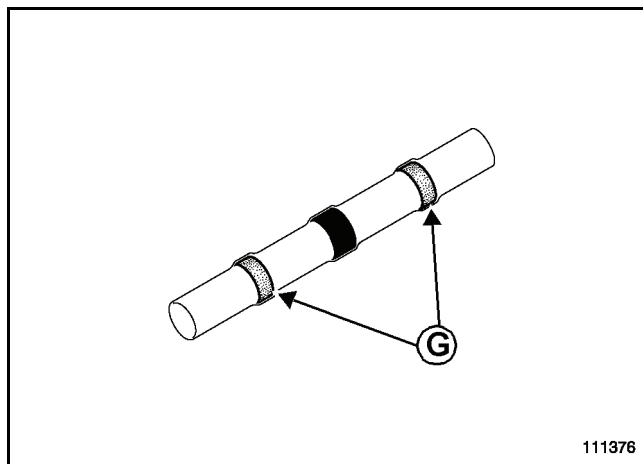
Temperature adjustment from **80°C** to **650°C** in increments of **5°C**.

Air flow adjustment from **200 l/min** to **550 l/min** at 5 levels displayed on the screen.

The operating instructions for this kit are described in this document (see **Wiring repair kit: Use**).

3 - Consumables.

● Self-solder sleeves.



There are three sizes of heat shrinkable self-solder sleeve differentiated by the colour of their rings (G):

- **Clear**, for a total copper section (sum of the 2 wires) between **0.3** and **0.8 mm²** (packet of 20: **77 11 229 418**).
- **Red**, for a total copper section (sum of the 2 wires) between **0.8** and **2.0 mm²** (packet of 20: **77 11 229 419**).
- **Blue**, for a total copper section (sum of the 2 wires) between **2.0** and **4.0 mm²** (packet of 20: **77 11 229 420**).

These are sealing sleeves. The seal is formed when the rings are tightened around the wire when heated.

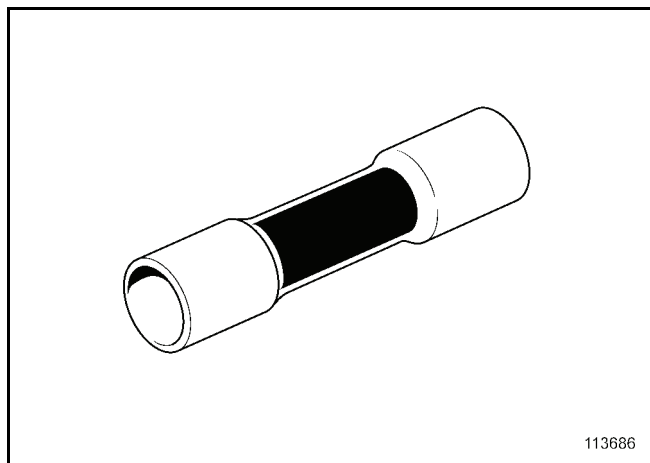
These sleeves are only to be used for connecting one wire with another wire (1-to-1).

WIRING

Wiring repair kit: Description

88A

● Crimping sleeve.



There are three sizes of heat shrinkable crimp sleeve differentiated by the colour of their rings:

- **Red**, for a copper section between **0.5** and **1.5 mm²** (Packet of 20: **77 11 229 410**).
- **Blue**, for a copper section between **1.5** and **2.5 mm²** (Packet of 20: **77 11 229 416**).
- **Yellow**, for a copper section between **3.0** and **6.0 mm²** (Packet of 20: **77 11 229 417**).

These are sealing sleeves. The seal is formed by the inner wall which becomes adhesive when heated.

These sleeves can be used to join one wire with another wire (1-to-1) or two wires with another wire (2-to-1).

In the case where two wires are joined to one wire (2-to-1), the seal is no longer guaranteed. Do not use when a seal is required.

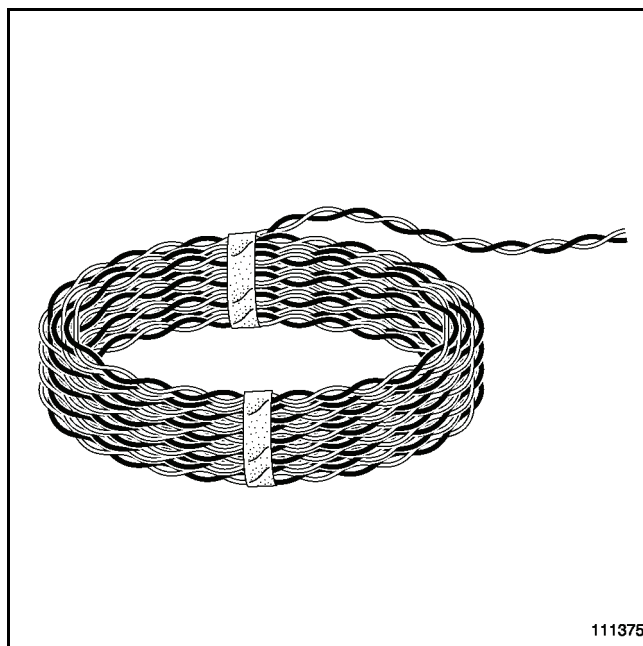
● Thermal protection (77 11 229 424).

The protective heat shield is a **250 mm** by **250 mm** square. It is intended to protect the surrounding area from the flow of hot air from the heat gun.

● Adhesive PVC tape (77 11 170 331).

Use the adhesive PVC tape for taping the wires. Do not use it to protect or insulate electrical parts. It is a contact-adhesive high temperature tape.

● Coil of twisted wires (77 11 229 425).

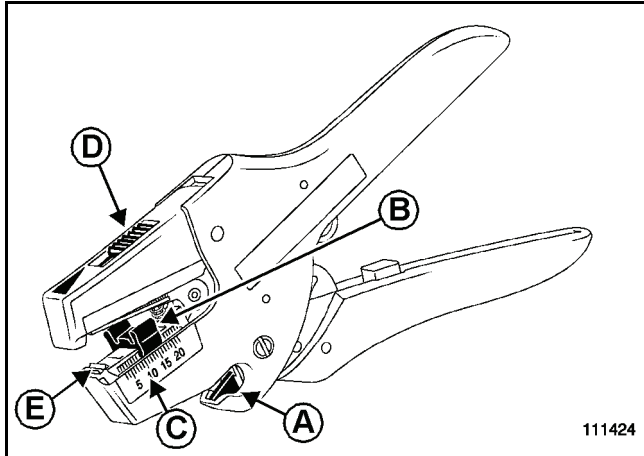


This is a coil of a pair of twisted wires (40 turns/linear m). Ensure these wires remain twisted. The 2 wires have a **0.5 mm²** cross-section and are of temperature class T3. It is possible to fit them in all areas of the vehicle during repairs to twisted wires of the same cross-section.

Note:

This section is an abridged version of the instructions for use of the tools in the kit.

1 - Stripping pliers.



● Description of the stripping pliers:

- (A) = Wire cutter.
- (B) = Stop for adjusting the length to be stripped.
- (C) = Scale (millimetre divisions).
- (D) = Pressure adjustment.
- (E) = Stripping jaws and cutting edges.

● Cutting a wire:

To cut electrical wires up to **6 mm²**, insert the wire into slot (A) and press the handle.

● Stripping a wire:

This pair of stripping pliers is automatic. It does not need adjusting to the cross-section of wire to be stripped (**6 mm²** maximum).

To strip a wire, adjust the length to be stripped by moving the stop (B). Press lightly on the ends to make it slide. The length to be stripped is read on the scale (C) in millimetres (mm).

Adjust the stripping pressure by moving the cursor (D). Press on the cursor to make it slide. The further forward the cursor is, the greater the force.

WARNING

If the pressure is too weak, the cutting edges will not grip the wire's insulation. If the pressure is too strong, the cutting edges can cut through the copper strands. Start with a medium setting and then adjust according to results.

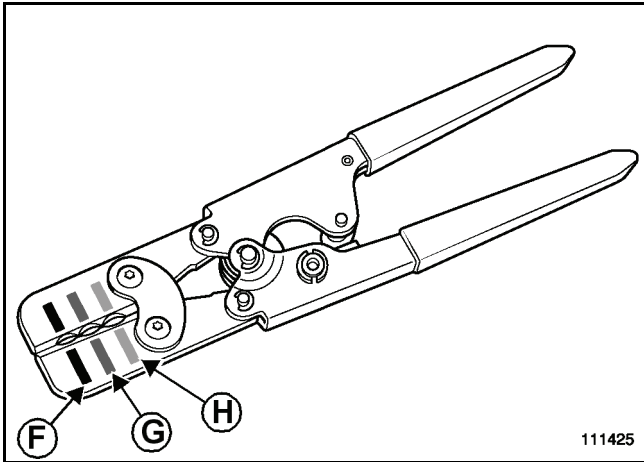
Place the end of the wire against the stop (B) and bring it out through the jaws (E).

Press the handle. The jaws will grip the wire. The cutting edges will automatically adjust their position in relation to the section of wire and strip it.

WARNING

Check the quality of the stripped wire (insulation cleanly removed and no cut copper strands). Start again if necessary.

2 - Crimping pliers.



The crimping pliers are the only pliers recommended for crimping the crimp sleeves in the kit.

They are used on the 3 sizes of crimp sleeve:

- At (F) for crimping the **red** crimp sleeve.
- At (G) for crimping the **blue** crimp sleeve.
- At (H) for crimping the **yellow** crimp sleeve.

Before crimping a sleeve:

- choose the sleeve suitable for the cross-section of the wire (see **Wiring: Repair**),
- strip the recommended length of wire.

● Crimping operation:

Squeeze the handles fully together to unlock the pliers and open the jaws.

On the pliers, find the crimping jaws which correspond to the sleeve being used.

Insert the wire(s) into one end of the sleeve.

Position the pliers' jaws in the middle of the half of the metal shaft where the wire(s) are.

Squeeze the handles fully together to crimp the sleeve onto the wire(s). Crimping is complete once the pliers are opened again.

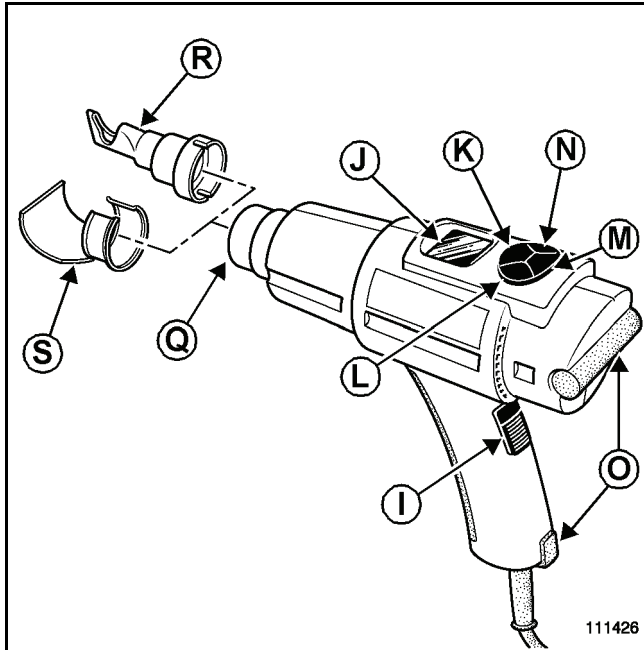
Check that the copper of the wire is correctly crimped and that the plastic part of the sleeve has not been cut.

Repeat the crimping operation on the other end of the sleeve.

Note:

If the wire is not correctly crimped, cut the wire at the sleeve and start the operation again with a new sleeve.

3 - Heat gun.



WARNING

Before using the gun, the user must familiarise themselves with the safety advice in the user's manual provided by the manufacturer.

● Introduction to the gun:

The heat gun is recommended for contracting heat shrinkable sleeves.

For other applications, the user must take the precautions and advice in the user's manual into account.

● Description of the heat gun:

- (I) = On (1)/off (0) switch.
- (J) = Display screen.
- (K) = SELECT MENU button.
- (L) = + button for setting parameters.
- (M) = STANDBY button (pause/cooling).
- (N) = - button for setting parameters.
- (O) = Supports for resting the tool on a bench.
- (P) = Tool air inlet.
- (Q) = Tool air outlet.

● Accessories:

(R) = Concentrator nozzle.

(S) = Deflector nozzle.

Note:

The concentrator nozzle (R) is recommended when using the heat gun on the crimp or self-solder sleeves in the kit.

WARNING

The heat shield nozzle (S) can be used for contracting single heat shrinkable sheaths. Do not use it for contracting the crimp or self-solder sleeves in the kit.

● General information on the setting parameters:

When contracting the sleeves in the kit, use the FREE program and change the settings as recommended. A memory function recalls the program and settings from the last time the gun was used.

● Switching on the gun:

Connect the appliance to the mains electricity supply (230 Vac - 50 Hz or 60 Hz), respecting all precautions. Push the switch (I) on (1).

The appliance will come on using the programs and settings most recently used.

WARNING

The gun starts heating immediately.

WARNING

Before putting the gun away in its case or anywhere else, leave it to cool down to ambient temperature.

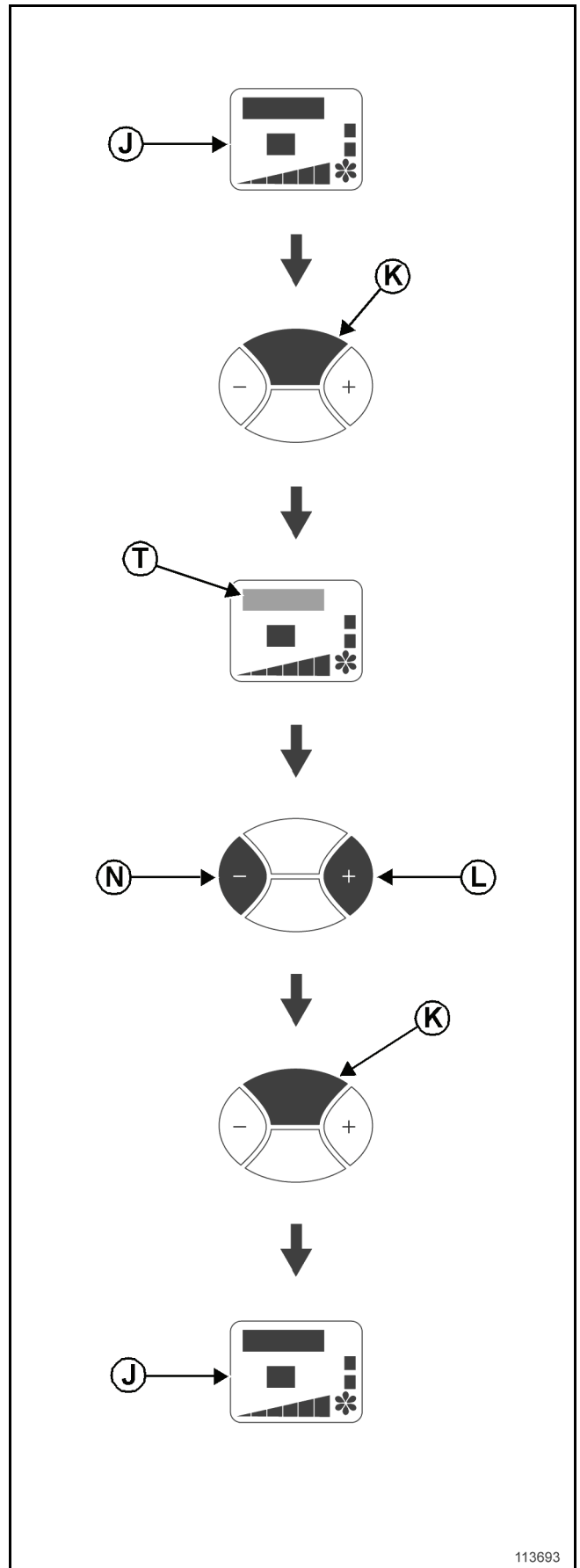
● Operating instructions:

The heat gun is used in two ways. It can either be held in the hand and used directly. Or it can be set down on its supports (O) on a clean and tidy bench. The latter has the advantage of leaving the user with both hands free.

● Programs:

Always work with the FREE program shown on the screen (J) at (T). If it is not shown, perform the following operation:

- press menu selection button (K) once,
- program field (T) on display field (J) flashes,
- select the free program using the + (L) or - (N) buttons,
- press the menu selection button (K) once, so that field (T) on display screen (J) stops flashing.



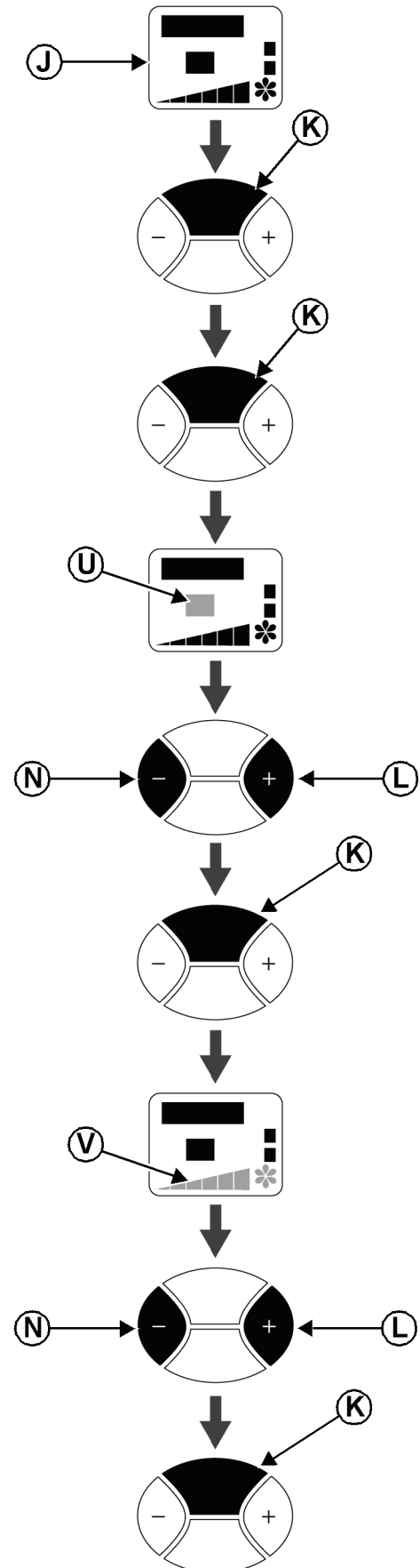
● Temperature and air flow settings:

To change the program settings (the FREE program is recommended), carry out the following operation:

- press menu selection button **(K)** twice,
- temperature field **(U)** on display field **(J)** flashes,
- adjust the temperature using the + **(L)** or - **(N)** buttons,
- press menu selection button **(K)** once,
- air flow field **(V)** on display field **(J)** flashes,
- adjust the air flow using the + **(L)** or - **(N)** buttons,
- press menu selection button **(K)** once, so that the fields on display screen **(J)** stop flashing.

Note:

When using the heat gun on crimp or self-solder sleeves, the air flow is always on the maximum setting, only the temperature varies.



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● Special modes (COOL/PAUSE):

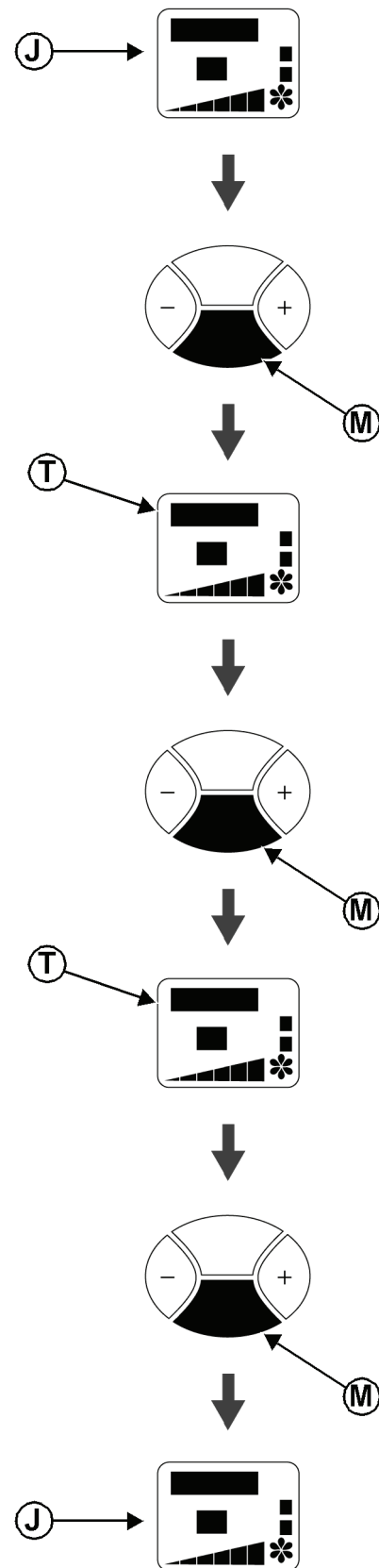
After use and before pushing switch (A) off (0), cool the gun. Similarly, during brief pauses or for lower power consumption, switch the gun to PAUSE mode by carrying out the following operation.

Before switching off the heat gun:

- press STANDBY button (M) once,
- program field (T) on display field (J) shows COOL,
- wait until the temperature goes down to **150°C** and push switch (A) off (0).

To switch to economy mode:

- press STANDBY button (M) once,
- program field (T) on display field (J) shows COOL,
- press STANDBY button (M) once,
- program field (T) on display field (J) shows WAIT,
- the gun is in economy mode,
- press STANDBY button (M) once to recover the previous settings and start heating again.



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Note:
This relates to **the generic repair procedure**.

1 - Choosing the sleeve.

There are two possible techniques available:

- self-solder sleeves,
- crimp sleeves.

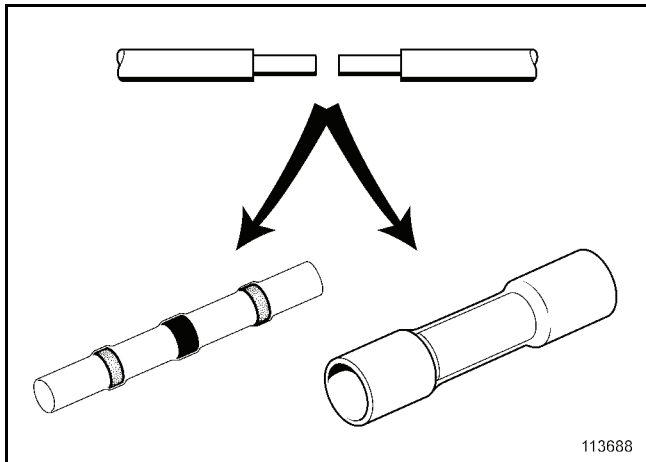
For each technique there are 3 sizes of sleeve.

The choice of sleeve depends on the following criteria:

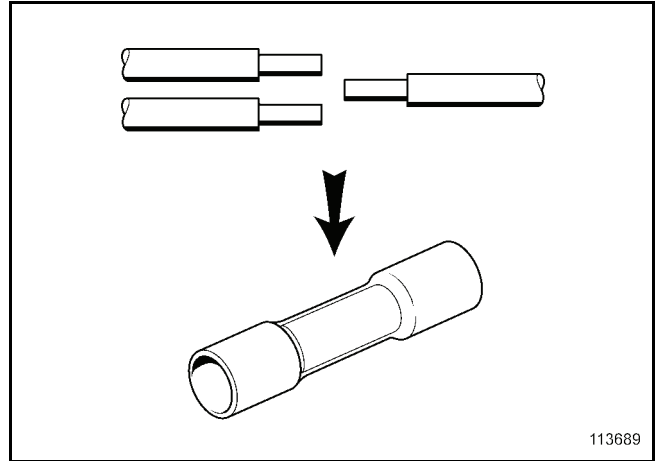
● Type of operation.

Note:
This is **stage 1** when using the label.

If wire to wire (1-to-1), use crimp sleeves or self-solder sleeves.



If 2 wires and 1 wire (2-to-1), **only** use crimp sleeves. In this case, the seal can no longer be guaranteed. Do not use this solution when a tight seal is needed (engine and underbody areas and damp areas of the doors and boot).



● Wire cross-sections.

Note:
This is **stage 2** when using the label.











See the sleeve choice table taken from the label.

Note:
The columns corresponding to the wire cross-sections give a representative overview of the different cases.

Identify the cross-section of the wire which is the subject of the operation. Use the diagram which shows pictures of wires which correspond to the wire cross-sections.

Check that the diagram is at scale 1.

Find the stripped section of wire.

	0,35 mm ²
	0,5 mm ²
	0,75 mm ²
	1 mm ²
	1,5 mm ²
	2 mm ²
	2,5 mm ²
	3 mm ²
	4 mm ²
	5 mm ²

10 mm

114611

Refer to the columns of wire cross-sections to find your case.

Note:

If the case in question is not present, refer to the special cases.

Example 1.

Joining together 2 wires, each **0.5 mm²** (1-to-1 type operation). Look at the upper section of the columns (1-to-1).

Each wire (A and C) has a **0.5 mm²** cross-section. Refer to the line where:

- column A shows **1 x 0.5 mm²**,
- and column C shows **1 x 0.5 mm²**.

Example 2.

Joining 3 wires together (2-to-1 type operation). Look at the lower section of the columns (2-to-1).

On one side, the 2 wires (A and B) both have a **1 mm²** cross-section. On the other side, wire C has a **2 mm²** cross-section. Refer to the line where:

- columns A & B show **2 x 1 mm²**,
- and column C shows **1 x 2 mm²**.

● **Identifying the settings.**

Note:

This is **stage 3** when using the label.

After having found your case in question, follow the corresponding line to find the setting parameters. The settings correspond to the lengths to be stripped and the temperature of the heat gun.

The column corresponding to these parameters gives the recommended sleeve.

Note:

If several sleeves are possible for the same operation, choose the one best adapted for the number of wires to be repaired, the wiring layout and the vehicle layout (thickness of the harness, available room etc.).

As relates to the previous examples.

Example 1.

2 possible sleeves:

- Either the red self-solder sleeve.
- Or the red crimp sleeve.

Example 2.

- Only the blue crimp sleeve is possible.

● **Special cases.**

If the case in question is not shown in the selection table, apply the following rules to select a sleeve.

In all cases, identify the cross-section of each wire (copper strands).

- **Case of a wire joint between 1 wire and 1 wire (most common situation).**

Conditions for self-solder sleeves:

Add together the 2 wire cross-sections (copper strands):

If $0.3 \text{ mm}^2 \leq (\text{section 1} + \text{section 2}) \leq 0.8 \text{ mm}^2$, use the self-solder sleeve with **clear rings**.
Strip **10 mm** from each wire.
The temperature setting is **300°C**.

If $0.8 \text{ mm}^2 \leq (\text{section 1} + \text{section 2}) \leq 2 \text{ mm}^2$, use the self-solder sleeve with **red rings**.
Strip **12 mm** from each wire.
The temperature setting is **340°C**.

If $2 \text{ mm}^2 \leq (\text{section 1} + \text{section 2}) \leq 3 \text{ mm}^2$, use the self-solder sleeve with **blue rings**.
Strip **15 mm** from each wire.
The temperature setting is **400°C**.

Conditions for crimp sleeves:

Consider the section of each wire separately.

If $0.5 \text{ mm}^2 \leq \text{each section} \leq 1.5 \text{ mm}^2$, use the **red** crimp sleeve.
Strip **7 mm** from each wire.
The temperature setting is **280°C**.

If $1.5 \text{ mm}^2 \leq \text{each section} \leq 2.5 \text{ mm}^2$, use the **blue** crimp sleeve.
Strip **7 mm** from each wire.
The temperature setting is **300°C**.

If $3 \text{ mm}^2 \leq \text{each section} \leq 6 \text{ mm}^2$, use the **yellow** crimp sleeve.
Strip **8 mm** from each wire.
The temperature setting is **320°C**.

- **Case of a wire joint between 2 wires and 1 wire (less common situation).**

Conditions for crimp sleeves:

Add together the 2 wire cross-sections (copper strands) found on one side of the sleeve to find **Sum side 1**.

If $0.5 \text{ mm}^2 \leq \text{Sum sections side 1} \leq 1.5 \text{ mm}^2$.
And if $0.5 \text{ mm}^2 \leq \text{wire cross-section side 2 only} \leq 1.5 \text{ mm}^2$, use the red crimp sleeve.
The temperature setting is **280°C**.

If $1.5 \text{ mm}^2 \leq \text{Sum sections side 1} \leq 2.5 \text{ mm}^2$.
And if $1.5 \text{ mm}^2 \leq \text{wire cross-section only side 2} \leq 2.5 \text{ mm}^2$, use the blue crimp sleeve.
The temperature setting is **300°C**.

If $3 \text{ mm}^2 \leq \text{Sum sections side 1} \leq 6 \text{ mm}^2$.
And if $3 \text{ mm}^2 \leq \text{wire cross-section only side 2} \leq 6 \text{ mm}^2$, use the yellow crimp sleeve.
The temperature setting is **320°C**.

For stripping the wires:

7 mm is stripped from the single wire (side 2) for red and blue crimp sleeves and **8 mm** for the yellow sleeve.

If the two wires (side 1) have the same cross-section, strip **10 mm** from them for red and blue crimp sleeves and **11 mm** for the yellow sleeve.

If the 2 wires (side 1) have different cross-sections, then:
For red and blue crimp sleeves, strip **10 mm** from the smaller cross-section and **7 mm** from the larger cross-section.
For the yellow sleeve, strip **11 mm** from the smaller cross-section and **8 mm** from the larger cross-section.

WARNING

If no sleeve corresponds to the case in question, the operator cannot repair the wiring. Replace the wiring harness.

WIRING

Wiring: Repair

88A

- Settings table (taken from the label).

<div>Sleeves</div> <div>Wire cross-sections</div>		Self-solder								Crimp															
		clear				red				blue				red				blue				yellow			
		$0.3^2 \leq A+C \leq 0.8^2$				$0.8^2 \leq A+C \leq 2^2$				$2^2 \leq A+C \leq 3^2$				$0.5^2 \leq A+B \leq 1.5^2$ & $0.5^2 \leq C \leq 1.5^2$				$1.5^2 \leq A+B \leq 2.5^2$ & $1.5^2 \leq C \leq 2.5^2$				$3^2 \leq A+B \leq 6^2$ & $3^2 \leq C \leq 6^2$			
1→1	A	C	L (mm)		T (°C)	L (mm)		T (°C)	L (mm)		T (°C)	L (mm)		T (°C)	L (mm)		T (°C)	L (mm)		T (°C)	L (mm)		T (°C)		
			A	C		A	C		A	C		A	C		A	C		A	C						
	1x0.35 mm ²	1x0.35 mm ²	10	10	300																				
	1x0.35 mm ²	1x0.5 mm ²	10	10	300	12	12	340																	
	1x0.5 mm ²	1x0.5 mm ²				12	12	340				7	7	280											
	1x0.5 mm ²	1x1 mm ²				12	12	340				7	7	280											
	1x0.75 mm ²	1x0.75 mm ²				12	12	340				7	7	280											
	1x0.75 mm ²	1x1 mm ²				12	12	340				7	7	280											
	1x1 mm ²	1x1 mm ²				12	12	340	15	15	400	7	7	280											
	1x1 mm ²	1x1.5 mm ²							15	15	400	7	7	280											
	1x1.5 mm ²	1x1.5 mm ²							15	15	400	7	7	280	7	7	300								
	1x1.5 mm ²	1x2 mm ²													7	7	300								
	1x2 mm ²	1x2 mm ²													7	7	300								
	1x2 mm ²	1x2.5 mm ²													7	7	300								
	1x2.5 mm ²	1x2.5 mm ²													7	7	300								
	1x3 mm ²	1x3 mm ²																8	8	320					
	1x3 mm ²	1x4 mm ²																8	8	320					
	1x6 mm ²	1x6 mm ²																8	8	320					

	A & B	C	L (mm)			T (°C)	L (mm)			T (°C)	L (mm)			T (°C)	L (mm)			T (°C)	L (mm)			T (°C)
			A	B	C		A	B	C		A	B	C		A	B	C		A	B	C	
2→1	2x0.5 mm ²	1x1 mm ²									10	10	7	280								
	1x0.5 mm ² + 1x1 mm ²	1x1.5 mm ²									10	7	7	280	10	7	7	300				
	2x1 mm ²	1x2 mm ²													10	10	7	300				
	1x0.5 mm ² + 1x 1.5 mm ²	1x2 mm ²													10	7	7	300				
	1x0.5 mm ² + 1x3 mm ²	1x3 mm ²																	11	8	8	320
	2x2 mm ²	1x6 mm ²																	11	11	8	320
Stripping/Temperature			mm			°C	mm			°C	mm			°C	mm			°C	mm			°C

In the case of a 1-to-1 type operation, wires **A** and **C** denote the wires which are found at either side of the sleeve.

In the case of an operation where 2 wires are joined to 1 (2 to 1), wires **A** and **B** denote the 2 wires which are found at the same side of the sleeve (**A** is the smaller section). **C** denotes the single wire on the other side.

2 - Preparation.

To start the preparatory stage, check that the wiring is sufficiently accessible and that the sleeves have been chosen.

- Detach the wires from the wiring.
- Check that the operating area is sufficiently spacious and that the sleeves can be fitted staggered (if there is a number of wires).
- Mark the wires to be cut, particularly if there is a number of wires the same colour.
- Cut the damaged wire(s). Stagger the cuts if a lot of wires are marked so that the sleeves are not all on top of each other. The cut must be made at a distance of no less than **50 mm** from the damaged section and in an area where the sleeve will remain straight.
- Cut the replacement wire to length(s) identical to those removed from the harness. If the self-solder sleeves are being used, add **30 mm** for the wire joints.

WARNING

The cross-section of replacement wire must not be less than the original cross-section of wire.

WARNING

Use a **0.5 mm²** wire to repair a **0.35 mm²** wire.

WARNING

The temperature class of the replacement wire must be greater than or equal to class **T3**. For the repair, use the wires recommended by the parts department network, checking that they are suitable for your requirements.

- Strip the ends by the lengths indicated in relation to the sleeve chosen, using the stripping pliers (see **Wiring repair kit: Use**).
- Protect sensitive areas close to the wiring with the heat shield.

3 - Self-solder sleeves.

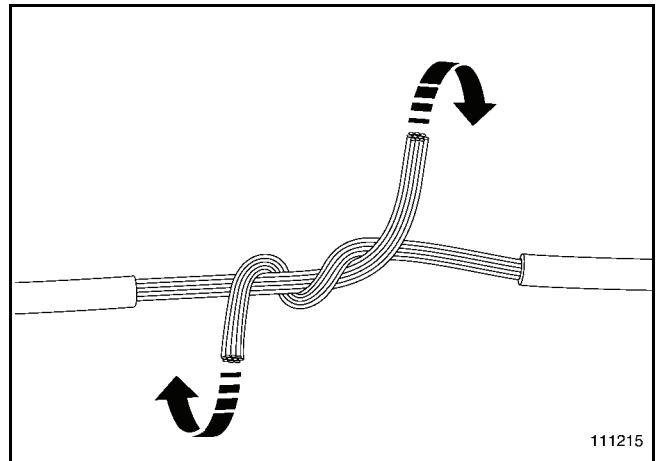
Note:

Fit the self-solder sleeves (connection and heating) line by line, sleeve by sleeve.

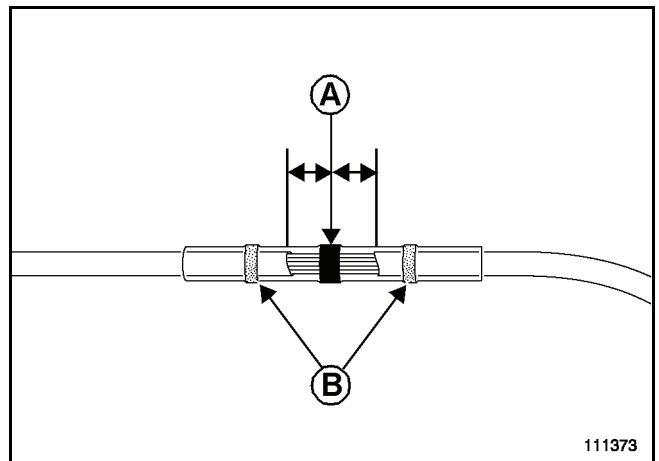
● Connection.

The equipment necessary and the wires are ready for the operation:

- Slip the self-solder sleeve onto one of the wires.
- Connect the wires by twisting the stripped sections around each other.



- Slide the sleeve over the stripped section. The ring of solder should end up in the centre of the stripped and twisted wires (**A**). The stripped and twisted section of the wires must be located between the 2 sealing rings (**B**).



WARNING

When twisting the wires, make sure that your hands are not greasy so that the solder adheres.

WARNING

When the sleeve is positioned, check that all the copper strands remain flat and subsequently are not at risk of perforating the sleeve. Start the operation to join the wires again if necessary.

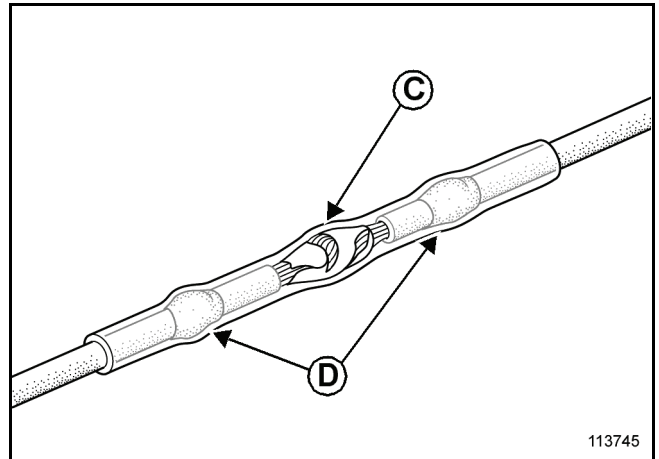
WARNING

The sealing rings must be clearly located on the insulated section of the wires (B) and not on the copper or where the copper and the insulated section meet. Start the operation to join the wires again if necessary.

Once the wires are joined, start the heating operation.

● Heating the self-solder sleeve.

- Switch on the heat gun fitted with the concentrator nozzle after familiarising yourself with the precautions for use (see **Wiring repair kit: Use**).
- Adjust the temperature and the air flow to the values indicated (see **Wiring repair kit: Use**).
- Check that the sensitive areas close to the sleeve and the other electrical wires are not at risk of damage.
- Heat the sleeve starting at the centre, concentrating the heat on the ring of solder and the stripped section of the wires.
- When the copper and the ring of solder become hot enough, the ring of solder melts and runs in between the copper strands (C).
- When the solder has completely melted, move the nozzle to the ends of the sleeve to finish shrinking the sheath.
- The sealing rings of the sleeve tighten around the insulation of the wires (D).

**Note:**

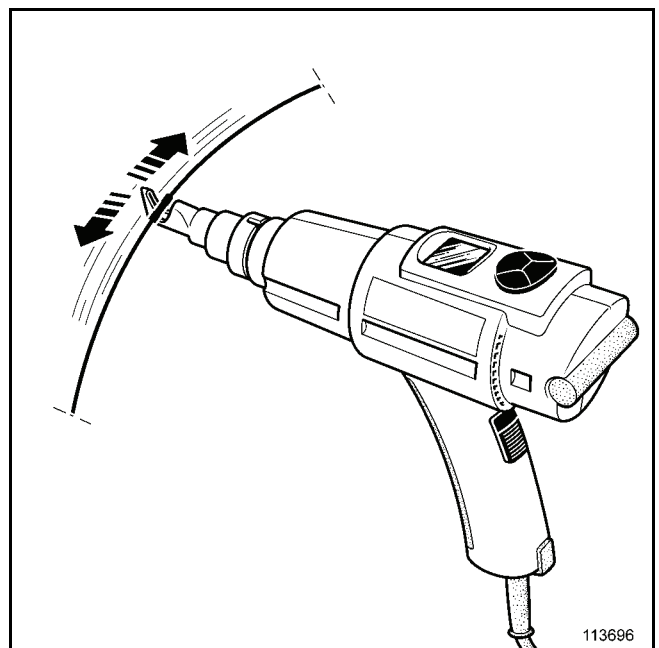
Spend the majority of the recommended time on the ring of solder and the rest of the time on the ends of the sleeve.

The heating operation takes **30 s ± 10**. This time is a guide only. It can be reduced or increased depending on how efficient the heating is.

WARNING

Do not try to heat the sheath too quickly, use a backwards and forwards motion to ensure it does not burn.

Do not direct the flow of hot air onto the insulation of the wires so as not to burn it.



WARNING

Wait for the sleeve to cool before manipulating it to maintain the quality of the solder (minimum waiting period: 1 minute).

Do not bend the sleeve (even when cool) so as to not damage the quality of the solder or the sealing properties of the sleeve.

Note:

- Do not move during installation.
- Do not overheat the sleeve.
- Do not move the sleeve or wires until they have cooled.

If several self-solder sleeves must be positioned, repeat the operation sleeve by sleeve.

When the heating operations have finished, move on to the checking operation (see **Wiring: Check**).

4 - Crimp sleeves.**Note:**

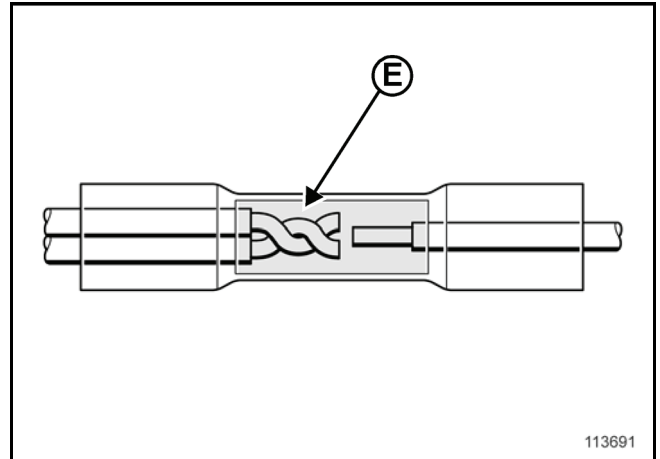
For a wire-to-wire join, go straight to the crimping operation.

● Special notes for joining 2 wires to 1 wire.**WARNING**

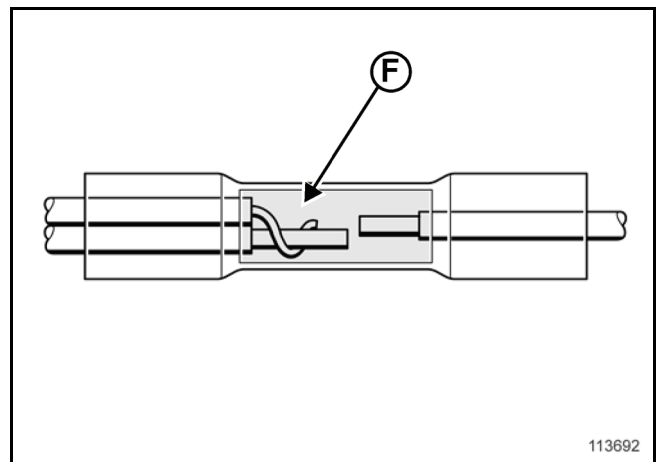
Do not use if a tight seal is needed (engine and underbody areas and damp areas of the doors and boot).

When joining 2 wires to 1 wire, first connect the 2 wires from the same end in the following way:

- If the 2 wires have identical diameters, twist together the stripped section of the 2 wires (E), before putting them into the sleeve.



- If the 2 wires have different diameters, wind the stripped section of the smaller wire around that of the larger wire (F) before inserting them in the sleeve.



● Crimping.

The equipment necessary and the wires are ready for the crimping operation:

- Take the crimping pliers. Squeeze the handles fully together to unlock the pliers and open the jaws (see **Wiring repair kit: Use**).
- On the pliers, find the crimping jaws which correspond to the sleeve chosen.
- Insert the wire(s) into one end of the sleeve up to the stop located inside the metal barrel of the sleeve.
- Position the pliers' jaws around the middle of the section of the metal barrel where the wire(s) are.
- Squeeze the handles fully together to crimp the sleeve onto the wire(s). Crimping is complete once the pliers are opened again.

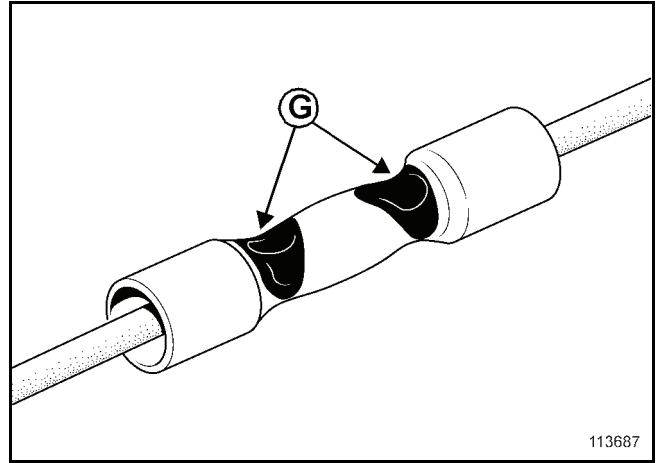
WARNING

Check that the copper of the wire is correctly crimped and that the plastic part of the sleeve has not been cut. If the wire has been stripped by the correct length and correctly inserted in the metal barrel, then the copper of the wire should barely jut out from the shaft.

Note:

If the wire is not correctly crimped, cut the wire before the sleeve and start the operation again with a new sleeve.

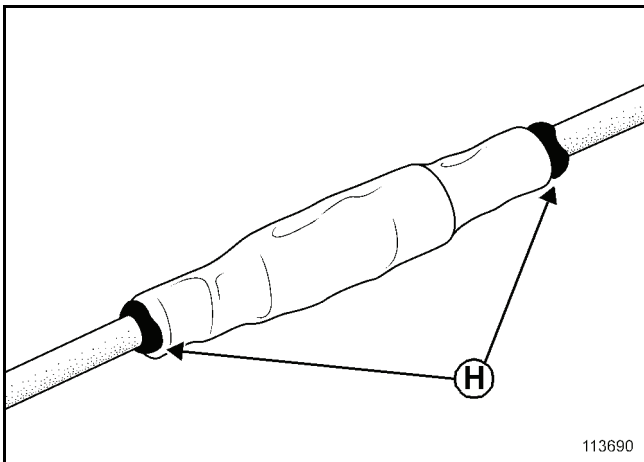
Repeat the crimping operation on the other end of the sleeve to obtain the result below.



The pliers have correctly crimped each wire on the halves of the metal barrel at (G) without damaging the plastic.

● Heating the crimping sleeve.

- Switch on the heat gun fitted with the concentrator nozzle after familiarising yourself with the precautions for use (see **Wiring repair kit: Use**).
- Set the temperature and the air flow to the values indicated, following the procedure in this note (see **Wiring repair kit: Use**).
- Check that the sensitive areas close to the sleeve and the other electrical wires are not at risk of damage.
- Heat the sleeve starting at the centre.
- When the sheath starts to contract, move the nozzle to one of the ends.
- The sheath continues to contract and produces a glue.
- When the end of the sleeve has completely contracted and the glue has correctly covered the opening of the sleeve, repeat the operation on the other end to obtain the result shown at (H).



Note:

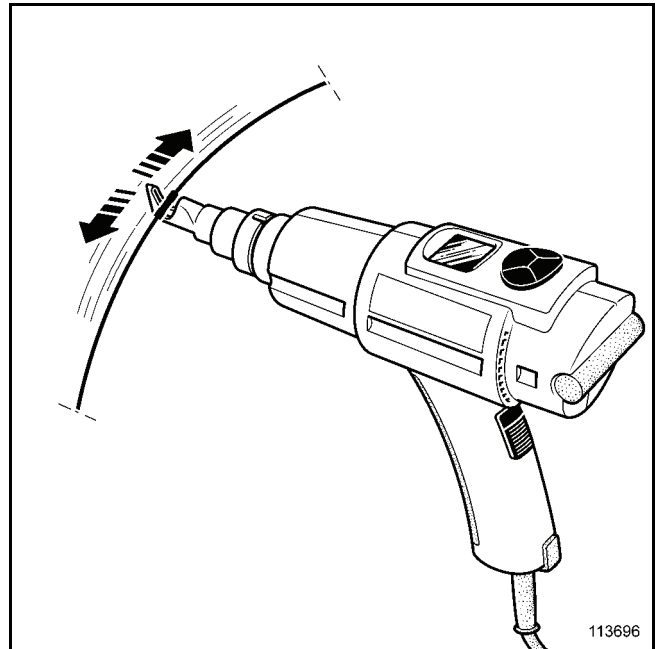
Spend the majority of the recommended time on the metal barrel and the rest of the time on the ends of the sleeve.

The heating operation takes **30 s ± 10**. This time is a guide only. It can be reduced or increased depending on how efficient the heating is.

WARNING

Do not try to heat the sheath too quickly, use a backwards and forwards motion to ensure it does not burn.

Do not direct the flow of hot air onto the insulation of the wires so as not to burn it.



WARNING

Wait for the sleeve to cool before manipulating it to ensure that the sealing properties of the sleeve are not affected (minimum waiting period: 1 minute).

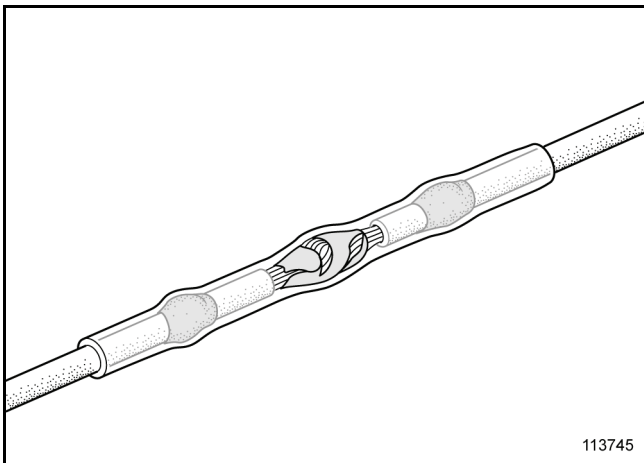
Do not bend the sleeve (even when cool) so as to not damage the sealing properties of the sleeve.

When the heating operations have finished, move on to the checking operation (see **Wiring: Check**).

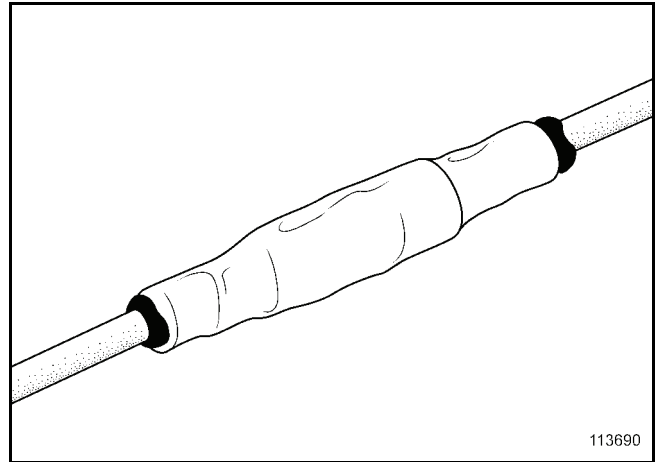
1 - Visual checks.

- The insulation of the wires is within the sleeve.
- (Self-solder sleeves) The sealing rings must be clearly located on the insulated section of the wires.
- (Self-solder sleeves) The solder has completely melted.
- (Crimp sleeves) The adhesive of the crimp sleeves forms a barrier at the ends of the sleeves.
- The sleeves has completely contracted around the insulation of the wires.
- The sleeve is not cut, slit, discoloured or pierced by a copper strand.
- The insulation of the wires does not show any sign of damage caused by overheating.
- The wiring and the area surrounding it have not been damaged by the heating operation.

Result of a correctly applied self-solder sleeve.



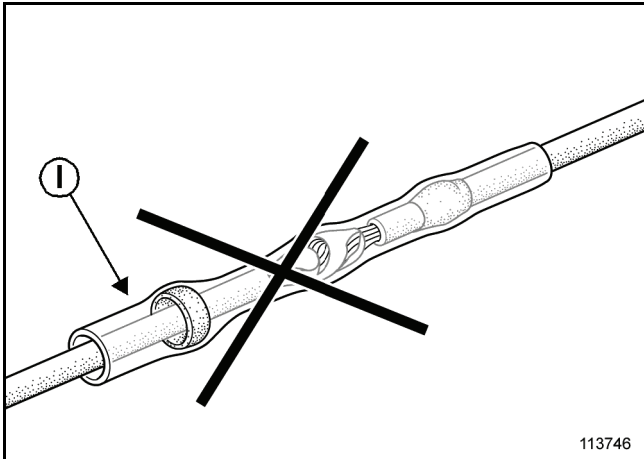
Result of a correctly applied crimp sleeve.



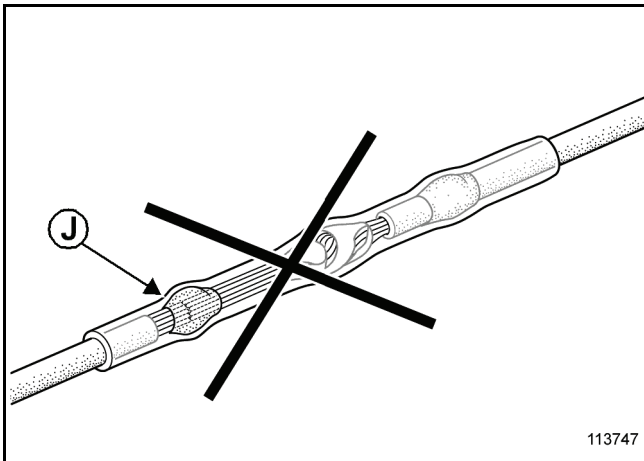
WARNING

The various struck-through cases are strictly forbidden.

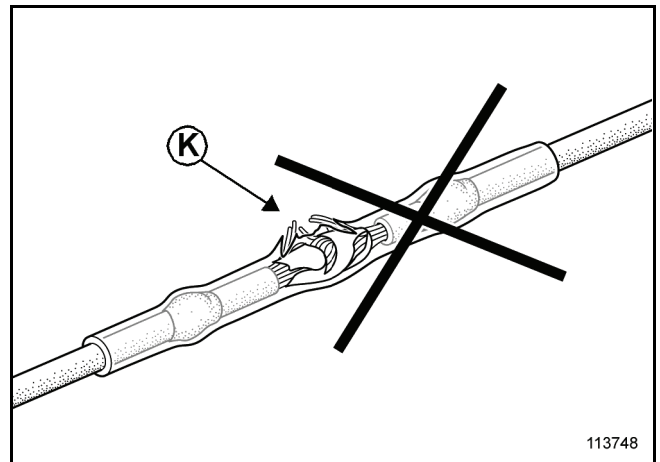
The self-solder sleeve has not been correctly shrunk. At (I), the sealing ring has not contracted around the insulation of the wire.



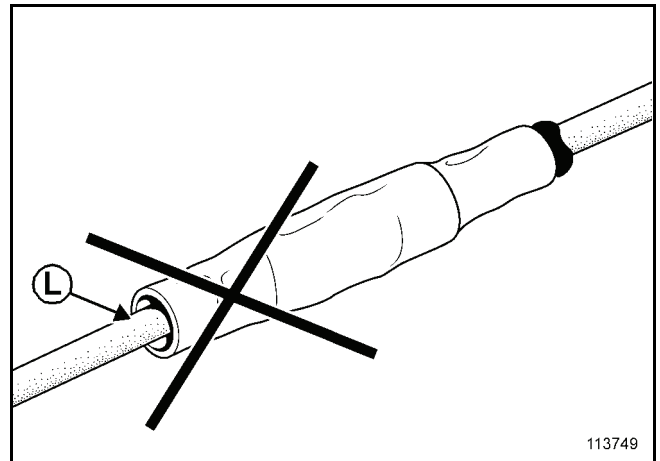
The sealing ring of the self-solder sleeve is directly on the copper of the wire at (J).



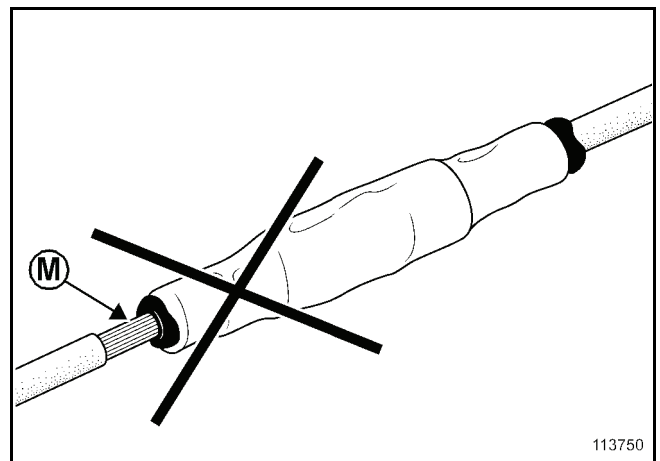
The protruding strands of the wire have pierced the self-solder sleeve at (K) during contraction.



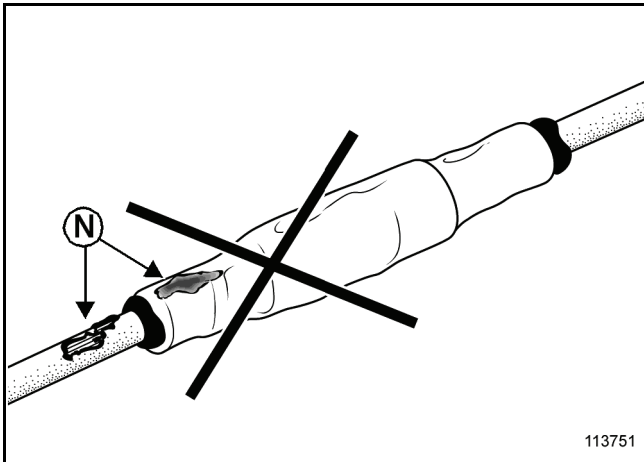
The crimp sleeve has not been correctly shrunk. At (L), the adhesive does not form a barrier at the end of the sleeve.



The adhesive of the crimp sleeve is directly on the copper of the wire at (M).



The sleeve and the insulation of the wire show signs of damage at (N) cause by overheating.



Note:

Reconnect the battery (see the **MR corresponding to the vehicle, 80A, Battery, Battery: Removal - Refitting**).

2 - Check with the diagnostic tool.

When a repaired line can be tested with the diagnostic tool, run this check.

3 - Function check.

Check that the component or the function of the repaired line is working correctly. If the case in question requires it, carry out a test drive.

Note:

Always check for faults after repair.

Refer to the fault finding procedure for the function concerned.

4 - Fitting and protections.

After the operation:

- reposition the wires concerned in the main harness,
- tape up the main harness using adhesive tape,
- protect the harness as it was originally using equivalent (noise or anti-damage) or superior protection with the protections recommended by the Parts Store network.

The part numbers for the protections are as follows:

- **77 11 237 838** - Protective sheath for wiring, diameter **7 mm** (mechanical)
- **77 11 237 839** - Protective sheath for wiring, diameter **18 mm** (mechanical)
- **77 11 237 840** - Protective sheath for wiring, diameter **31 mm** (mechanical)
- **77 11 237 841** - Velour tape for wiring harness (sound insulation)

WARNING

Any repair which requires a specific heat shield for the wiring are forbidden. Replace the wiring harness.

WARNING

Check that the wiring is correctly maintained and protected to avoid any wear by rubbing and any noise disturbance.

5 - Final check.

After any operation on the wiring, check that there are no faults using the diagnostic tools (Clip).

Refer to the corresponding fault finding procedure.

If a fault is present, pass on the vehicle fault finding to a qualified operator: automotive electrician, technician agent or cotech (level 2 minimum).

WARNING

Apply this procedure when there is a connector - wiring kit or wire kit. Unless the kit is linked to one of the sensitive lines listed in the specific procedures reference table (see **Wiring: Precautions for repair**). In this case, apply the specific procedure for the sensitive line concerned.

1 - Wiring-Connector kit.

A wiring-connector kit enables repair to be carried out when the connector is faulty or when the fault is located less than **10 cm** from the connector.

A wiring-connector kit is generally made up of:

- at least 1 connector,
- crimped wires with corresponding contacts,
- sealing components if the connector is sealed,
- the self-solder or crimp sleeves necessary for the repair,
- other components specific to the function concerned (e.g. fuses).

Note:

if there is no kit, it is possible to create a wiring - connector kit if the following rules are respected:

- The connector affected by the repair must be taken from the **new wiring** provided as a spare part and intended for this repair.
- The function affected by the repair must not be covered by a special procedure.
- The connector should not be made up of more than **10 wires**.
- The wires are cut more than **10 cm** away from the connector.
- For each opening, the wires of the connector taken from the new wiring have a cross-section which is equal to or greater than that of the original connector.
- For each opening, the metal contacts of the connector taken from the new wiring are the same material (gilded or tinplated) as those of the original connector.
- The precautions set out in this note are respected (see **Wiring: Precautions for repair**).

2 - Using a wiring-connector kit.

Except in the specific outlined cases, use the wiring-connector kits as follows:

- check that the kit is complete,
- check that the conductor configuration (position of wires in the cells of the connector) corresponds to your needs,
- check that the wire cross-sections of the wiring-connector kit are equal to or larger than the cross-section of wires to be repaired,
- mark the wires to ensure that the tracks are not reversed,

WARNING

The colour of the wires cannot serve as a marker. In certain cases, wiring-connector kits can have different colours to those of the wiring to be repaired.

- Cut the connector wires to be replaced to a length greater than **100 mm** and stagger the cut wires,
- shorten the wiring-connector kit wires so as to provide wires the same lengths as those cut from the wiring to be repaired. For self-solder sleeves, add **30 mm** for the wire joints,
- apply the generic repair procedure for the joint (see **Wiring: Repair**).

3 - Wire kit.

A wire kit is used to perform a repair when the connector is not damaged.

A wire kit is generally comprised of:

- 3 crimp wires
- protection on the metal contacts.

4 - Applying a wire kit.

NOTE

Access the electric documentation for the vehicle on Infotech to obtain the part number of the wire kit required and the removal procedure for the connector.

Except in the specific outlined cases, use the wire kits as follows:

- check that the kit is complete,
- check for the presence of protection on the metal contacts,
- check that the wire cross-sections of the wire kit are equal to or larger than the cross-section of wires to be repaired,
- mark the wires to ensure that the tracks are not reversed,

WARNING

The colour of the wires cannot serve as a marker. Wiring-connector kits may be different colours to those of the wiring to be repaired.

- cut the connector wires to be replaced to a length greater than 100 mm and stagger the cut wires,
- shorten the kit wires so as to provide wires with the same lengths as those cut from the wiring to be repaired. For self-solder sleeves, add 30 mm for the splices,

Apply the generic repair procedure for the joint (see **Wiring: Repair**).

5 - Checking and fitting the repair with wiring-connector kits.

- Carry out the generic repair procedure check (see Wiring: Check) or that for the specific procedures if it is a specific case (see Wiring: Precautions for repair).
- Apply the recommendations from the generic repair procedure concerning the fitting and protection (see Wiring: Check).

6 - Final check.

After any operation on wiring, check for the absence of faults using the diagnostic tools (Clip, etc.).

Refer to the corresponding fault finding procedure.

If a fault is present, pass on the vehicle fault finding to a qualified operator: automotive electrician, technician agent or cotech (level 2 minimum).

This section deals with an electrical contact fault on the connector between the dashboard wiring and the pedal wiring on KANGOO.

1 - Context.

Customer complaint:

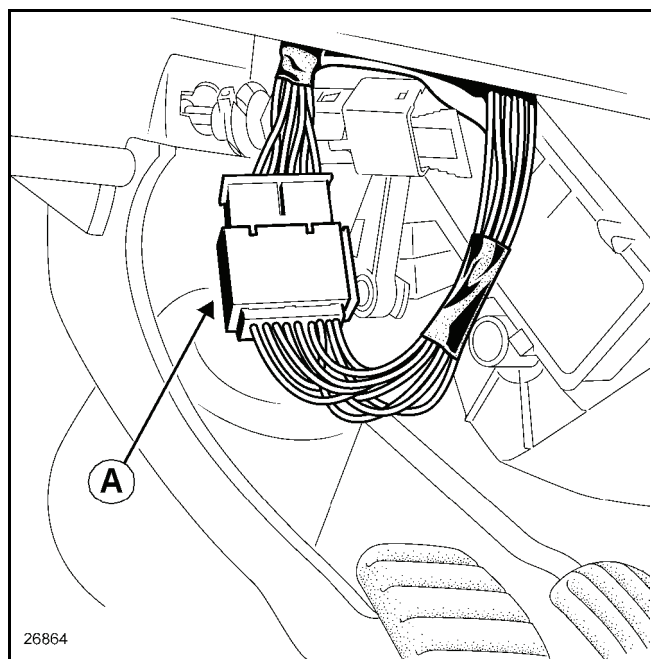
Loss of engine power when driving, with the injection warning light illuminated on Kangoo vehicles with K4M, F9Q, D4F, D7F and K9K engines.

Possible cause:

Loss of contact on the 16-track **R181** connector (dashboard wiring harness and pedal connection).

2 - Description of the repair procedure.

Make the **R181** connector accessible and unclip it from its mounting (**A**).



On the **R181** connector and using the Wiring Diagrams Technical Note corresponding to the vehicle, mark the gangs related to the accelerator potentiometer.

Note:

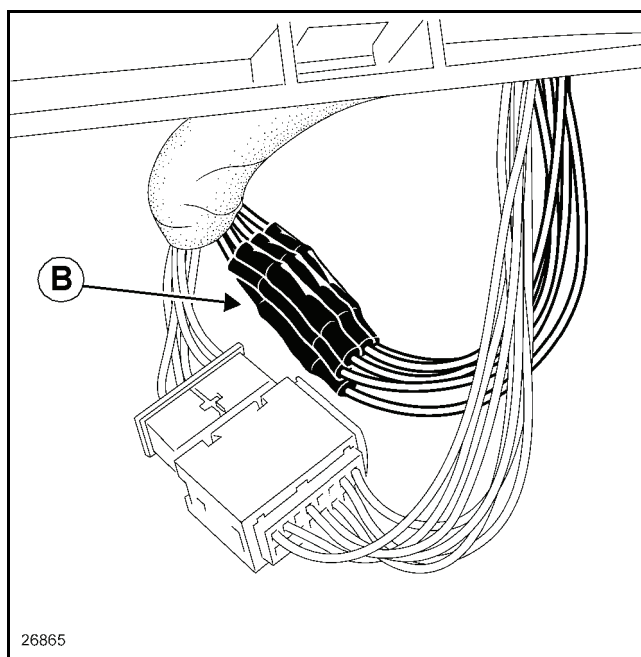
Using the Wiring Diagrams Technical Note or applying a continuity check, check that it concerns gangs B1, B2, B3, B4, B5 and B6.

WARNING

The colour of the wires is not same on either side of the R181 connector.

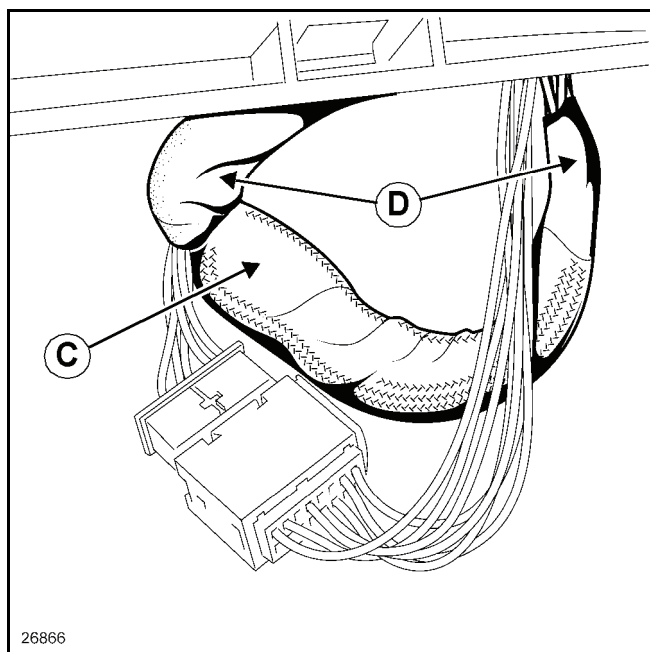
For each gang, proceed in the following manner:

- Cut the electrical wire either side of the connector.
- Make a wire joint with a red self-solder sleeve from the **wiring repair kit**, between the pedal electrical wire and the passenger compartment wiring electrical wire (**B**) (see **Wiring: Repair**).



After having shunted all of the wires concerned:

- Protect the shunted electrical wires (C) with wiring protective sheath with a diameter of **18 mm (77 11 237 839)**.
- Cover the ends of the protective sheath with **Adhesive PVC tape (D)**.
- Refit the **R181** connector on the mounting.
- Secure the shunted lines to the wiring using **Adhesive PVC Tape**.



3 - Repair check.

Continuity:

- Check the continuity of each of the shunted lines.

Function check:

- Clear the faults.
- Check the conformity of the pedal sensor parameters:
 - If it is a DDCR computer, see **Technical Note 3845A, Injection fault finding: DDCR VDIAG 04 - 08 - 10 - 0C - 14 - 18 - 20, Conformity check.**
 - If it is a DCM 1.2 computer, see **Technical Note 6500A, Fault finding - DCM 1.2 Injection Program 4C Vdiag 08, Conformity check.**
 - If it is a SIM 32 computer, see **Technical Note 3878A, Injection fault finding: SIM 32 SOFT D4 - Vdiag 04, Conformity check.**
 - If it is an EDC15 computer, see **Technical Note 3929A, Injection fault finding: DIESEL BOSCH EDC15C3 Vdiag 10 - 14 - 18, Conformity check** or **Technical Note 3930A, Injection fault finding: DIESEL BOSCH EDC15C3 Vdiag 0C, Conformity check** depending on the case.
 - If it is a SIRIUS 34 computer, see **Technical Note 3834A, Injection fault finding: SIRIUS 34-E932 - Vdiag 08, Conformity check.**
- Perform a road test.
- Check the status of the faults (present and stored).

Final check:

- Carry out a complete check with the **CLIP** tool and check that there are no faults.

This section explains how to insulate and immobilise an unused connector when changing the wiring.

2 cases are dealt with:

- Waterproof wiring in damp areas
- Non-waterproof wiring

Refer to the relevant section.

1 - For waterproof wiring in damp areas.

WARNING

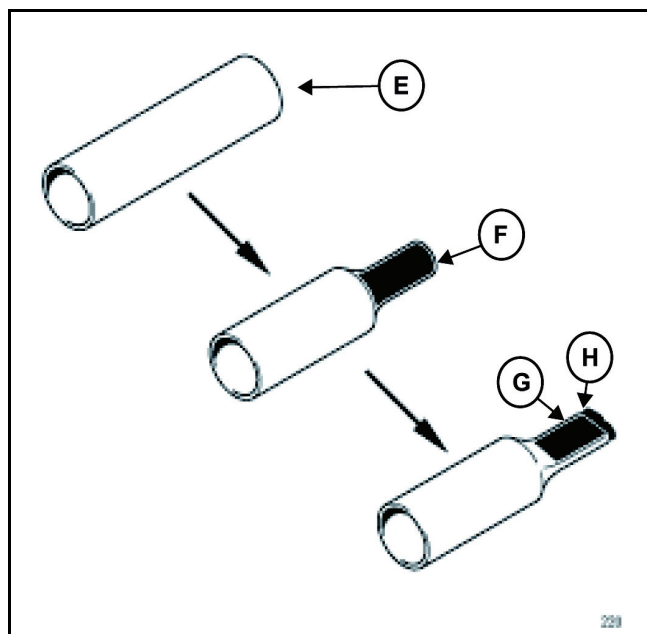
This operation is compulsory for any wiring which is located in damp areas which needs to be waterproof (engine and underbody areas, and damp areas of the opening elements). It applies to all of the unused connectors located on the wiring.

● Equipment required.

- Heat shrinkable waterproof sheath:

Part number of heat shrinkable waterproof sheath	Internal diameter (E) before contraction (mm)	Internal diameter (F) after contraction (mm)
7701 069 915	4 mm	1 mm
7701 033 055	8 mm	2 mm
7701 033 056	19 mm	4 mm

(E) < Diameter of electrical wire with insulation < (F)



- Adhesive **7703 397 035** (cracked cylinder of solid adhesive).

- Wiring repair kit (see **Wiring Repair Kit: Description**).

● Description of the operation.

Plug preparation:

- Mark the unused connector.
- Count the number of wires to be insulated and note their total diameter (copper and insulation).

Note:

The coupling of wires must be preserved. If several wires are connected together in a connector opening, always preserve this connection. The electric wires in the same opening will be connected together using self-solder sleeves or crimp sleeves from the wiring repair kit (See **Wiring repair kit: Description**).

- For every wire, remove **50 mm** of heat shrinkable sheath adapted to each wire diameter. The diameter of the wire must be less than the internal diameter of the sheath before contraction (**E**) and greater than the internal diameter of the sheath after contraction (**F**).

- Heat the end (**G**) of the pre-cut sheath using the heat gun included in the wiring repair kit (See **Wiring Repair Kit: Description**) and contract it approximately 15 mm (**F**).

The heat gun is equipped with the retraction nozzle and its temperature is adjusted to **120°C**, with maximum air flow (See **Wiring Repair Kit: Description**).

WARNING

To avoid burns, always wear gloves during the following operation .

- When the end has been contracted, flatten it in order to bond the surfaces using the internal adhesive of the sheath (**G**).
- Allow the sheath to cool for **1 min**.
- Check the prepared plug. The contracted length should not exceed **15 mm** and the adhesive should completely block the end at (**H**). Do not remove the surplus adhesive at (**H**).

Fitting the plugs:

Note: When replacing the wiring, preferably carry out the operation before refitting the new wiring.

- Mark the unused connector.
- Mark the wire couplings on this connector (wires connected together in the same connector opening). Electric wires in the same opening will be connected together using the self-solder sleeves or crimp sleeves from the wiring repair kit (See **Wiring: Repair**).
- Cut the other wires of the connector equally.
- Fit a plug on each wire (**I**) and contract it using the heat gun included in the wiring repair kit (See **Wiring repair kit: Description**).
The heat gun is equipped with the deflector nozzle and its temperature is adjusted to **120°C**, with maximum air flow (See **Wiring repair kit: Use**).

WARNING

It is forbidden to place 2 wires of different connection codes in a single plug. There is a risk of a short circuit if the wires are live.

- Allow the assembly to cool down for **1 min**.
- Check that the sheath is sufficiently contracted on the wire (**J**). Repeat the operation with a heat shrinkable sheath with a smaller diameter if necessary.

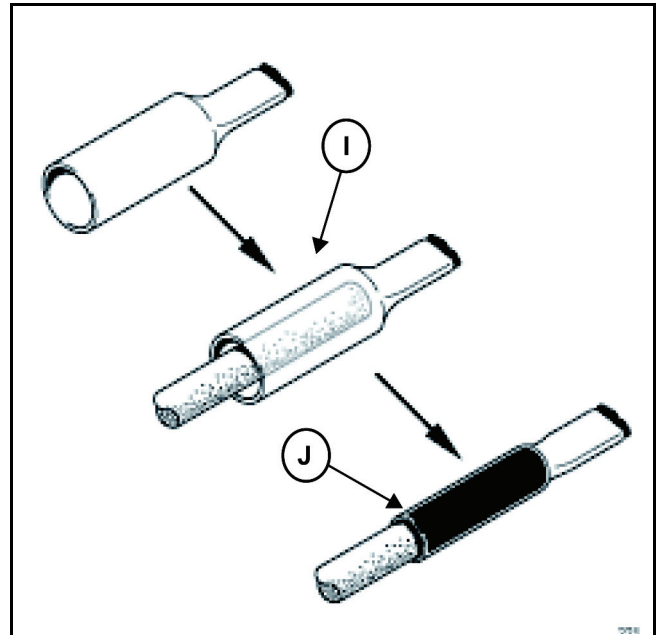
Note:

Do not remove the surplus adhesive.

WARNING

If there is not enough adhesive released by the heat shrinkable sheath, repeat the operation and add some adhesive (see Equipment required) inside the sheath.

- Tape all of the wires and sheaths using adhesive tape included in the wiring repair kit (See **Wiring repair kit: Description**).
- Fit a wiring protector which is equivalent or better than the original (See **Wiring: Check**).
- Secure the assembly to the main wiring using a Colson-type clip which will be fitted level with the sleeves. Use several clips if necessary.



2 - For non-waterproof wiring.

For non-waterproof wiring, only apply the immobilisation procedure.

- Mark the unused connector.
- Secure the connector on the main wiring using a Colson-type clip. Use several clips if necessary.
- Check that the assembly does not produce any interference noises, with the engine running and the vehicle moving. Fit an audible protector if necessary (See **Wiring: Check**).

This section describes how to visually inspect a connector.

Note:

Carry out each requested check visually. Do not remove a connector if it is not required.

Note:

Repeated connections and disconnections alter the functionality of the connectors and increase the risk of poor electrical contact. Limit the number of connections/disconnections as much as possible.

The check is carried out on the 2 parts of the connection. There may be two types of connections:

- Connector / Connector
- Connector / Device

1 - Visual inspection of the connection:

- Check that the connector is connected correctly and that the male and female parts of the connection are correctly coupled.

2 - Visual inspection of the area around the connection:

- Check the condition of the mounting (pin, strap, adhesive tape, etc.) if the connectors are attached to the vehicle.
- Check that there is no damage to the wiring trim (sheath, foam, adhesive tape, etc.) near the wiring.
- Check that there is no damage to the electrical wires at the connector outputs, in particular on the insulating material (wear, cuts, burns, etc.).

Disconnect the connector to continue the checks.

3 - Visual inspection of the plastic casing:

- Check that there is no mechanical damage (casing crushed, cracked, broken, etc.), in particular to the fragile components (lever, lock, openings, etc.).
- Check that there is no heat damage (casing melted, darker, deformed, etc.).
- Check that there are no stains (grease, mud, liquid, etc.).

4 - Visual inspection of the metal contacts:

- Check that there are no bent contacts (the contact is not inserted correctly and can come out of the back of the connector). If the wire is slightly stressed, the contact will come out.
- Check that there is no damage (folded tabs, clips open too wide, blackened or melted contact, etc.).
- Check that there is no oxidation on the metal contacts.

5 - Visual inspection of the sealing:

(Only for watertight connectors)

- Check for the seal on the connection (between the 2 parts of the connection).
- Check the seal at the back of the connectors:
 - For *unit* joints (1 for each wire), check that the unit joints are present on each electrical wire and that they are correctly positioned in the opening (level with the housing). Check that plugs are present on openings which are not used.
 - For a *grommet* seal (one seal which covers the entire internal surface of the connector), check that the seal is present.
 - For gel seals, check for gel in all of the openings without removing the excess or any protruding sections (it does not matter if there is gel on the contacts).
 - For *hotmelt* sealing (heat-shrink sheath with glue), check that the sheath has contracted correctly on the rear of the connectors and electrical wires, and that the hardened glue comes out of the side of the wire.
- Check that there is no damage to any of the seals (cuts, burns, significant deformation, etc.).

MULTIPLEXING

Multiplex network: Repair

88B

WARNING

This procedure is relates to the repair of the multiplex network alone (twisted wires).

1 - Locating the fault.

Use the diagnostic tool (clip) to test the multiplex network (see the fault finding procedure corresponding to the vehicle).

The diagnostic tool can detect the following short circuits on the multiplex network:

- short circuit between CAN L and + 12 V,
- short circuit between CAN H and + 12 V,
- short circuit between CAN H and earth,
- short circuit between CAN L and earth,
- short circuit between CAN L and CAN H,
- open circuits.

Note:

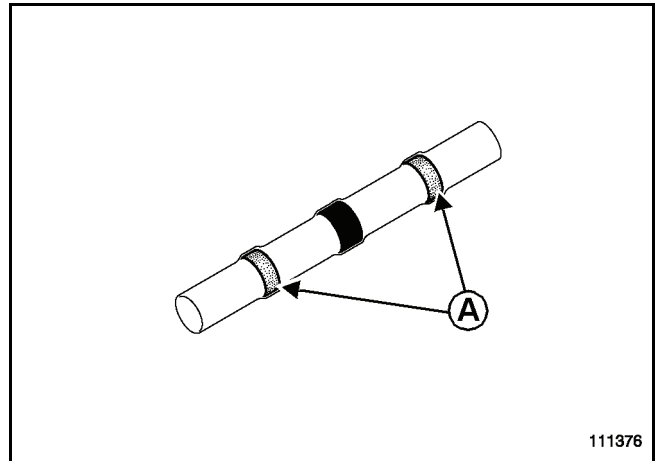
In the case of a short circuit between CAN-L and earth, communication between the different computers which make up the multiplex network is not interrupted. However, the multiplex network becomes sensitive to interference and can be the cause of an intermittent fault.

After having located the multiplex line fault, it is possible to repair it whilst applying all the necessary precautions outlined in this document.

2 - Necessary equipment.

For repairing the multiplex network, use the components of the wiring repair kit (see **Wiring repair kit: Description**).

Use the self-solder sleeves with red rings (A) for making the joints.



MULTIPLEXING

Multiplex network: Repair

88B

3 - Repairing the multiplex line.

WARNING

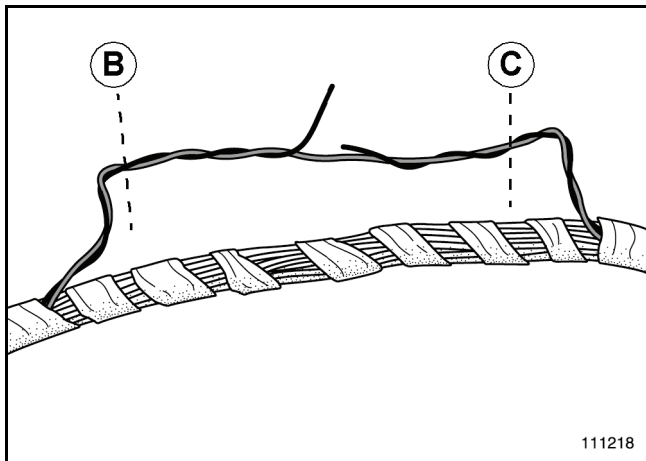
Before starting to repair a multiplex line, it is necessary that you familiarise yourself with the use of the tools relating to this repair (see **Wiring repair kit: Use**).

Disconnect the battery (see the **MR corresponding to the vehicle, 80A, Battery, Battery: Removal - Refitting**).

Remove the components necessary to enable access to the wiring.

Detach the section of wire to be repaired from the main wiring.

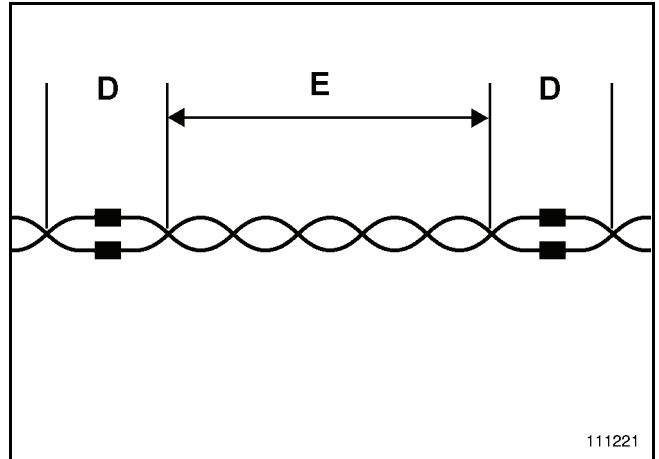
Cut the wires at (B) and (C), **50 mm** on each side of the damage.



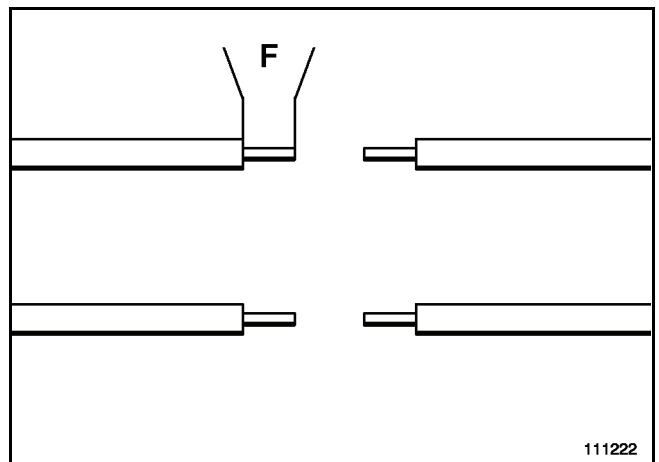
Take from the coil of twisted wires (**0.5 mm²**, specific number of turns) to be used to repair the multiplexing, a length of wire the same as that removed from the harness, **plus 30 mm** for the wire joints (See **Wiring repair kit: Description**).

WARNING

Do not untwist the harness to be repaired more than **100 mm (D)**. The wires at (E) must be twisted uniformly along the repaired length.

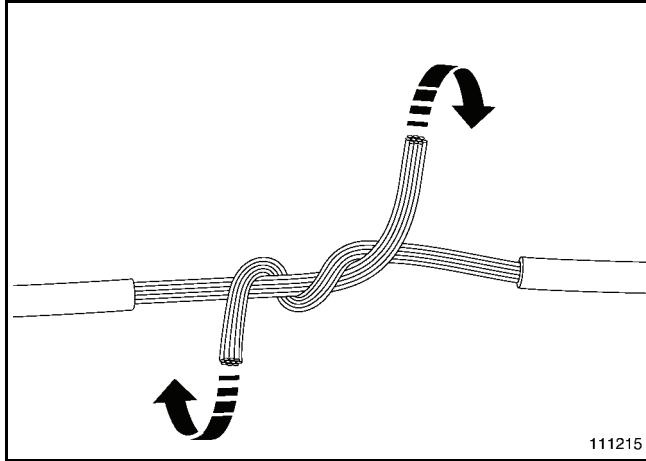


Strip each end of the wires by **10 mm (F)** at each side.



To join the wires, working wire by wire:

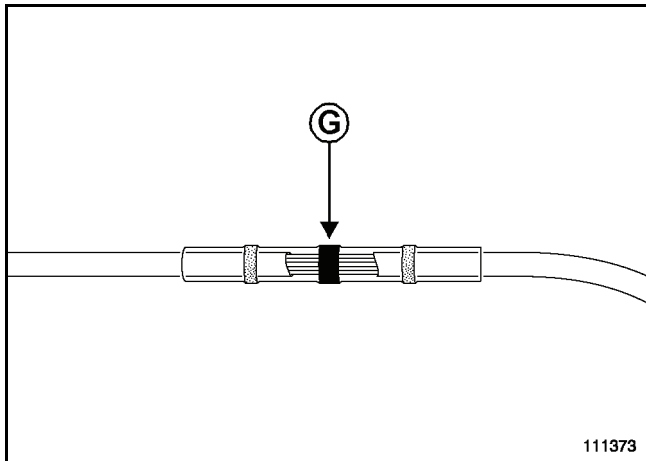
- slip the self-solder sleeve onto the wire,
- twist the end of the wires together.



WARNING

The colour of the wires (CAN H et CAN L) must be respected when they are being joined.

- Position the sleeve with its solder ring in the centre of the wire joint.



- Switch on the heat gun.
- Adjust the temperature of the tool to **340°C** with a ventilation speed set to maximum (See **Wiring repair kit: Use**).
- Heat the sleeve so that the solder ring melts (**G**) onto the wires until the heat shrinkable sheath contracts.

Refer to the precautions for use which relate to using self-solder sleeves (see **Wiring: Repair**).

WARNING

Do not try to heat the sheath too quickly, use a backwards and forwards motion to ensure that it does not burn.

Do not direct the flow of hot air onto the insulation of the wires so as not to burn it.

Note:

For the soldering to be complete and for the sheath to contract, the heating operation should last approximately **30 s ± 10**.

Spend the majority of the recommended time on the ring of solder and the rest of the time on the ends of the sleeve.

The recommended time is given as a guide. It can be reduced or increased depending on how efficient the heating is.

WARNING

Wait for the sleeve to cool before manipulating it to maintain the quality of the solder (minimum waiting period: 1 minute).

Do not bend the sleeve (even when cool) so as to not damage the quality of the solder or the sealing properties of the sleeve.

MULTIPLEXING

Multiplex network: Repair

88B

4 - Checking the multiplex line.

WARNING

After repairing the multiplex line, always check the multiplex network using the diagnostic tool.

Note:

During the check with the diagnostic tool, move the lines forwards and backwards slightly. If a fault is recorded, start the operation again for the faulty line.

Refer to the fault finding procedure for the function concerned.

WARNING

After having checked the multiplex line:

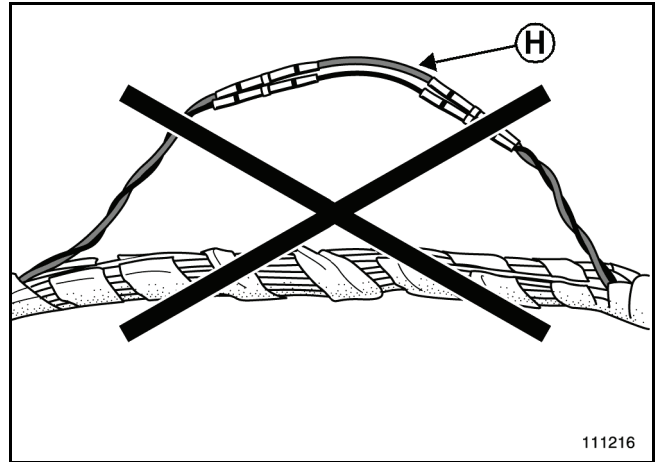
- refit it in the main harness,
- tape it up with adhesive tape.

Apply the recommendations from the generic repair procedure concerning the fitting and fuses (see **Wiring: Check**).

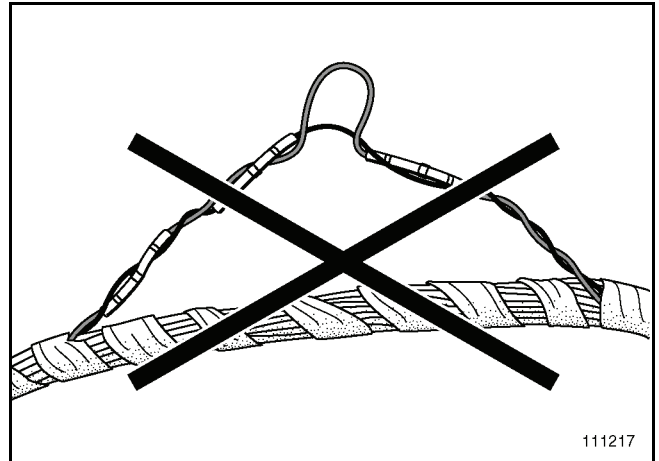
WARNING

The various struck-through cases are strictly forbidden.

No turns (twists) at (H).



The two wires added are of a different length.



5 - Final check.

After any operation on the wiring, check that there are no faults using the diagnostic tools (Clip).

Refer to the corresponding fault finding procedure.

If a fault is present, pass on the vehicle fault finding to a qualified operator: automotive electrician, technician agent or cotech (level 2 minimum).

WARNING

This procedure relates repairing airbag and pretensioner wiring only.

Note: Apply all the precautions and recommendations shown in the MR.

WARNING

All work on airbag and pretensioner systems must be carried out by qualified trained personnel.

WARNING

The pyrotechnic systems (pretensioners or airbags) must not be handled near to a heat source or flame; there is a risk that they may be triggered.

WARNING

Before removing an electronic control unit (ECU) or before any operation on the safety systems or around them, the airbag computer must be locked using the diagnostic tool. When this function is activated all the trigger lines are inhibited, and the airbag warning light on the instrument panel is lit continuously.

WARNING

Before any operation on a pyrotechnic component connection (connector or wiring) found faulty during fault finding, disconnect the pyrotechnic component.

1 - Identify the solution.

The case in question must figure in the table below. Otherwise, replace the wiring.

Airbag and pretensioner components	Solutions
Under seat connector (Airbag warning light on)	<ul style="list-style-type: none"> ● If the connector has more than 10 wires, no operation can be carried out. Replace the wiring unless there is a specific procedure (OTS*). ● If not, shunt the connector. See Under seat connector in this section.
Connector on seat runner	No operation. Replace the wiring unless there is a specific procedure (OTS*).
Pyrotechnic component connectors (squib) (airbag triggers, pretensioner, etc.)	Replace the connector using the airbag connectors kit. See Pyrotechnic component connectors in this section.
Airbag computer connector	No operation. Change the wiring harness except in the following cases: <ul style="list-style-type: none"> ● If there is a specific procedure (OTS*), its application is authorised. ● If the connector lock is broken, replacing the lock authorised.
Airbag and pretensioner harness damage	No operation except in specific conditions. See Airbag and Pretensioner harness damage in this section.

*OTS: Special Technical Operation

WARNING

Any repair linked to the airbag function necessitates a specific check using the network's diagnostic tools.

2 - Under seat connector.

Note:

For a connector on a seat runner, the wiring must be replaced.

When fault finding identifies a under seat connector fault, shunt the under seat connector following the procedure below:

Cut the electrical wires either side of the connector.

Apply the specific procedure for repairing multiplex lines (see **Multiplex network: Repair**), except the part on locating the fault, to shunt the connector.

Note:

Check that the length of replacement wire is the same as that removed from the harness, **plus 30 mm** for the wire joints.

After the operation, check that the wire is not too taut or too long when the seat is furthest forward or back.

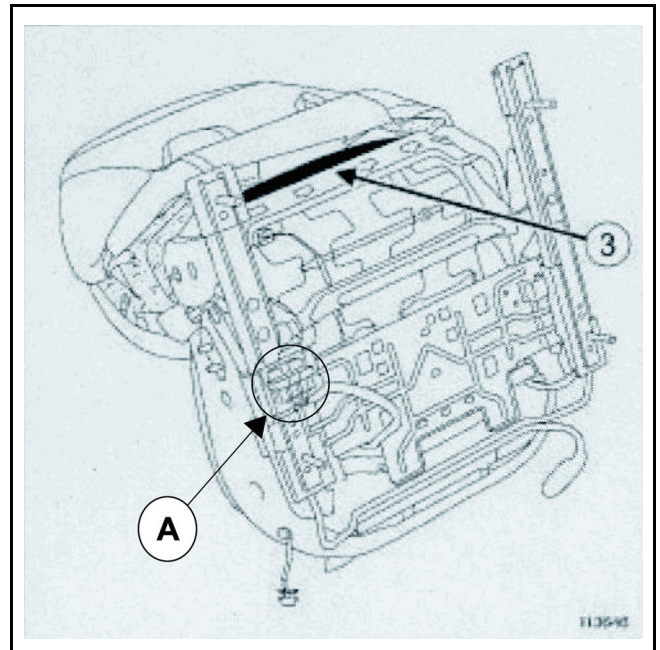
Protect the wires so that they are not damaged and this new branch is correctly maintained. Hanging loops are not allowed, regardless of the wires involved in the repair.

Carry out the specific airbag and pretensioner line repair checks. See **Airbag line repair check** and **Final check** in this section.

Note:

Check that the harness is correctly repositioned after the operation and that it does not obstruct the seat adjusting mechanisms.

Example of a connector on a seat runner (A):



113646

3 - Pyrotechnic component connectors.

These are airbag and pretensioner trigger connectors.

Identify the connector concerned on the vehicle.

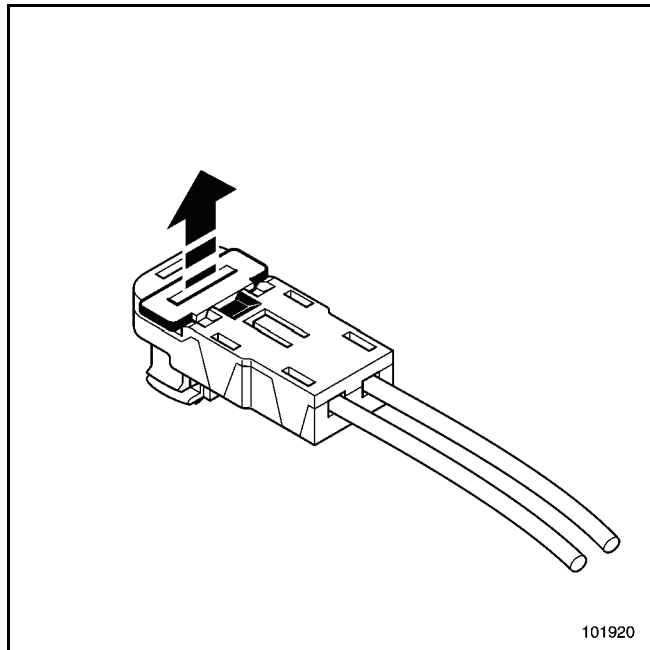
Repair is possible if it is a SQUIB connector.

Find the colour of the connector: Blue, green or orange.

Find the shape of the connector: Straight or angled.

Select the same connector (colour and shape) from the airbag connectors kit (see under DIALOGYS).

Example of an angled SQUIB connector.



Apply the specific procedure for repairing multiplex lines (see **Multiplex network: Repair**), except the section on locating the fault, to replace the connector.

Carry out the specific airbag and pretensioner line repair checks. See **Airbag line repair check** and **Final check** in this section.

4 - Airbag and Pretensioner harness damage.

WARNING

No operation is authorised unless it is possible to check the repair using the diagnostic tool.

Where the repair can be checked with the diagnostic tool:

- if it is a case of twisted wires with a cross-section less than or equal to 0.5 mm^2 , apply the specific procedure for repairing multiplex lines (see **Multiplex network: Repair**), except for the section on locating the fault, for the repair of the lines;
- if it does not concern twisted wires, apply the generic procedure for repairing the harness (see **Wiring: Check**).

Carry out the specific airbag and pretensioner line repair checks. See **Airbag line repair check** and **Final check** in this section.

5 - Airbag lines repair check.

Confirm the airbag line repair to ensure that the repair is correct:

- Check the quality of the operation by reading the impedance reading produced by the computer using the diagnostic tool.
- Unlock the airbag computer using the diagnostic tools.
- The warning light should no longer be on.

Note:

During the check with the diagnostic tool, move the lines forwards and backwards slightly. The resistance measure should remain stable, if variations in resistance are noticed, start the repair operation again for the defective line.

Refer to the airbag and pretensioner function fault finding procedure for the vehicle concerned.

Apply the recommendations from the generic repair procedure concerning the fitting and fuses (see **Wiring: Check**).

6 - Final check.

After any operation on the wiring, check that there are no faults using the diagnostic tools (Clip).

Refer to the fault finding procedure for the airbag and pretensioner function concerned.

If a fault is present, pass on the vehicle fault finding to a qualified operator: automotive electrician, technician agent or cotech (level 2 minimum).