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CHAPTER C

AIR CONDITIONING

On early Standard S1 and early Continental S1 cars, the air conditioning system is basically similar to the Intermediate System described below, the main difference being that a manually operated by-pass valve is incorporated in the heater tap (see inset Fig. C1).

On these early cars, the heater tap and by-pass valve is mounted on the right-hand side of the car, to the rear of the blower motor housing; on later cars, the heater tap is adjacent to the de-mister tap on the left-hand side of the car.

SECTION C1—INTERMEDIATE SYSTEM

All S1 cars and coachbuilt S2 cars are fitted with variants of this system.

In the Intermediate System, fresh air is drawn through gauze covered grilles in the front wings and is boosted by blower motors through a heat exchange matrix mounted under each front wing (see Figs. C1 and C2); the heated air then passes into a transfer duct below the facia. The transfer duct is divided obliquely by a longitudinal separator and air passing into the duct from the left impinges on this separator and is directed upwards through the windscreen de-misting slots; air moving from the right is directed downwards to heat the car interior.

The separator consists of a thin aluminium shield which allows transference of heat between the De-misting and Heating Systems and provides a further degree of heat control. For example, with the de-mister on 'cold' and the heater on 'hot', the de-misting air will be slightly warmed by heat transference through the separator.

Air passing through the right-hand (heater) matrix is also ducted through an extension tube to provide ventilation for the rear of the saloon.

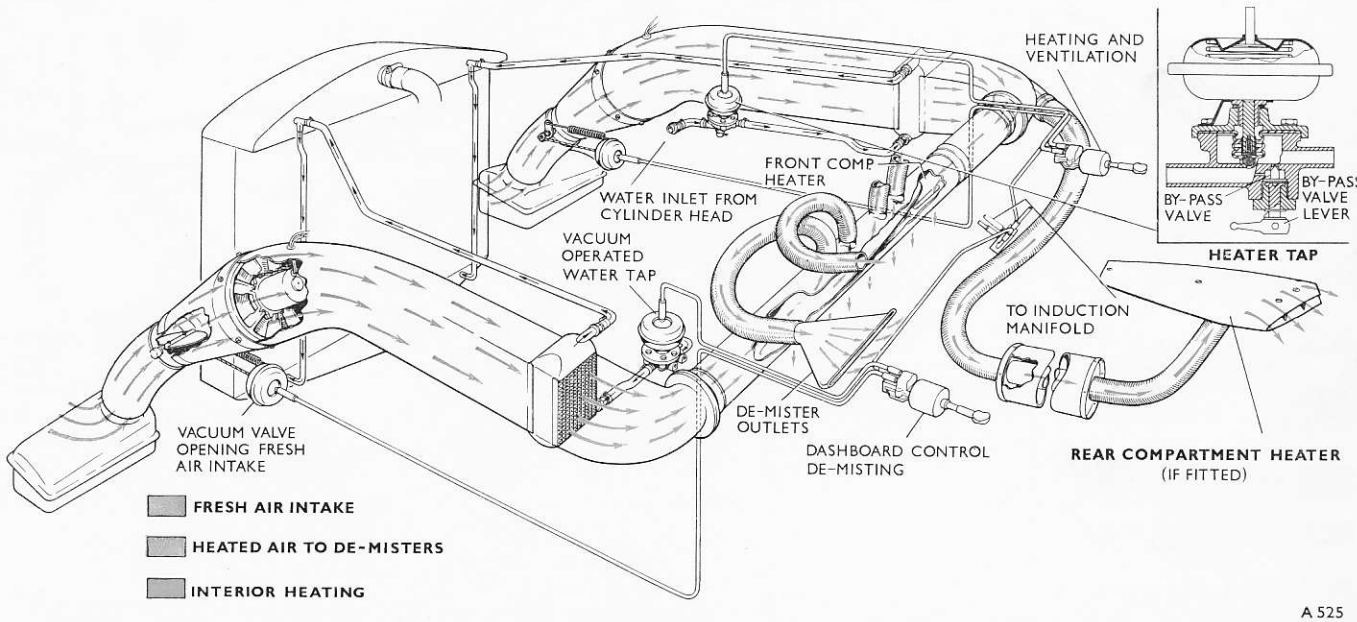

Fig. C1 Early System as fitted to early Standard S1 and early Continental S1 cars

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On S1 and Continental S2 cars, the rear outlet grille is fitted below the driver's seat; **on Long Wheelbase Saloons,** the outlet grille is fitted at the base of the division wall and a butterfly valve is incorporated in the transfer duct. Thus, on Long Wheelbase Saloons, the main flow of warm air is to the rear compartment, but by opening the butterfly valve the driver may divert some of the heated air to the front compartment for his own comfort.

Phantom V cars are provided with additional matrices below the rear seat, together with a recirculatory blower motor (see Fig. C2). The extension duct, which provides the rear compartment with fresh air, is connected to the main ducting *forward* of the heater matrix and thus the air entering the compartment remains at ambient temperature until it is drawn into the recirculatory heater below the rear seat. The extension duct contains a two-speed blower motor to boost rear compartment ventilation when required.

Stale air is exhausted from the car interior through the water drain holes in the door cavities and via the parcel shelf through apertures in the floor of the luggage boot.

The air intakes are positioned in the front wings so that the forward motion of the car constantly forces air through them. Most of this air passes straight through the rear aperture of the air scoop but the overspill flows through the ducting into the car interior without any assistance from the blower motors.

Situated at the forward end of the ducting is a vacuum operated butterfly valve which prevents air from flowing into the ducting when ventilation is not required. The butterfly valve on the de-mister side is, however, perforated by a $\frac{3}{8}$ in. diameter hole and when the valve is closed, this hole allows a small current of air to flow over the windscreen whilst the car is in motion.

The heat exchange matrices are supplied with hot engine coolant by vacuum operated taps. These taps and the vacuum operated valves are actuated by induction manifold depression and are controlled, together with the blower motors, by multi-purpose switches on the facia or division.

On late S1 cars and all coachbuilt S2 cars, each vacuum tap is provided with a by-pass which is

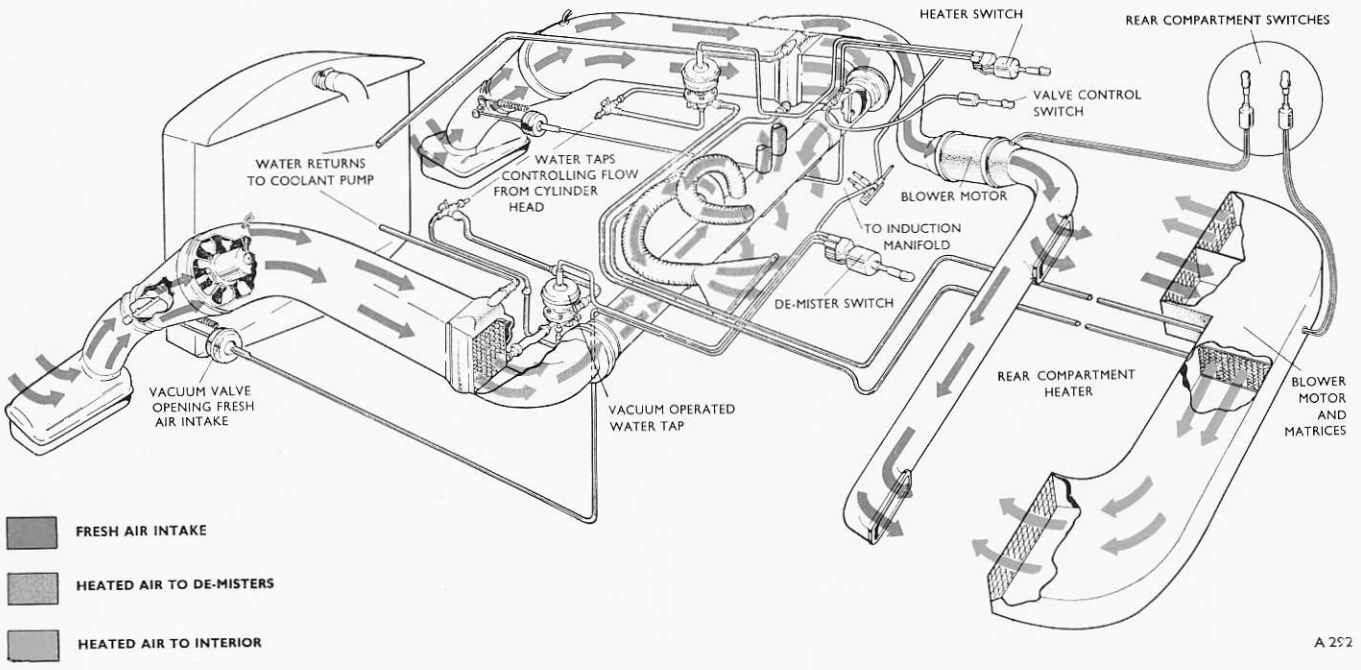

Fig. C2 Intermediate System (shown in the form used on Phantom V cars). Variants of this system are fitted to coachbuilt S2 cars and to S1 cars other than early Standard S1 and early Continental S1 cars

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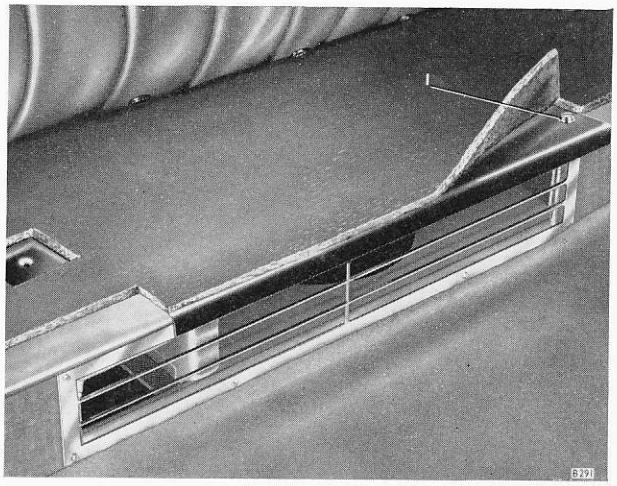

Fig. C3 Access to Phantom V underseat heater

1. COVER RETAINING SCREW

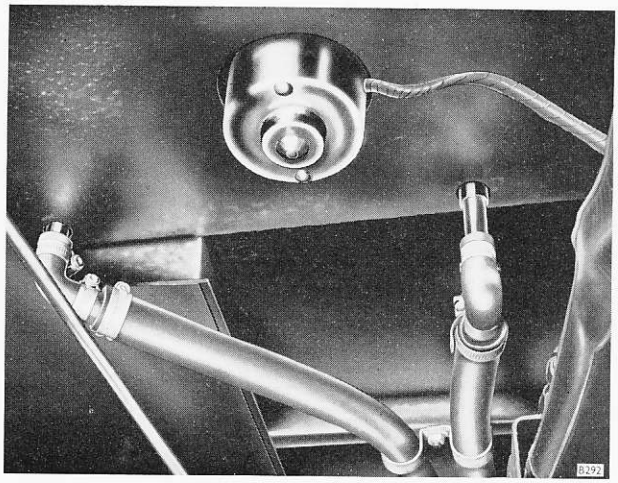

Fig. C4 Motor and supply hoses — Phantom V underseat heater

controlled manually by a separate two-position tap. Each manual tap is marked 'Summer' and 'Winter'; in the 'Winter' position, a capillary supply of hot coolant, in addition to the main flow through the vacuum tap, passes directly to the matrix. In the 'Summer' position, the by-pass is closed and only a reduced flow of coolant is allowed to circulate through the matrix.

The 'Heater' and 'De-mister' control switches are similar units and operate in the same way. Each switch can be withdrawn to either of two stops and at the same time can be turned to either of two clockwise positions. Withdrawal of the control knob to its first stop causes the butterfly valve in the air intake to open; withdrawal of the knob to its second stop opens the vacuum tap and allows hot engine coolant to flow through the heat exchanger. The clockwise positions of the switch operate the blower motor at half and full speed respectively.

The effects produced by the various positions of these switches can be summarised as follows:

HEATER AND DE-MISTER SWITCH		RESULTS	
Withdrawal Stops	Clockwise Positions	Water Tap Summer Position	Water Tap Winter Position
1st	OFF	Cool air — No fan	Warm air — No fan
	1st	Cool air — Half fan	Warm air — Half fan
	2nd	Cool air — Full fan	Warm air — Full fan
2nd	OFF	Warm air — No fan	Hot air — No fan
	1st	Warm air — Half fan	Hot air — Half fan
	2nd	Warm air — Full fan	Hot air — Full fan

Variations in the effects shown above can be obtained by using the various positions of the 'De-mister' in conjunction with those of the 'Heater'

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Ducting — to dismantle

Raise the front of the car with a jack and remove the wheel on the required side.

Disconnect the blower motor leads at their snap connectors.

Remove the rubber tube connecting the motor ducting to the intake grille.

Disconnect the butterfly valve actuating mechanism (see Fig. C9); remove the spring, the three 2 B.A. nuts and the spindle setscrew.

Remove the two $\frac{1}{4}$ in. (·250 in.) nuts and bolts securing the duct retaining bracket to the valance; the ducting can then be 'broken' where it joins the forward edge of the matrix. Withdraw the section which contains the butterfly valve and blower motor.

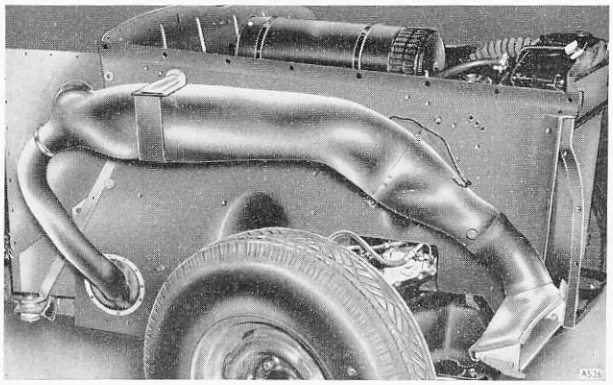

Fig. C5 Ducting — Intermediate System

Ducting — to assemble

The assembly of the ducting is carried out by reversing the procedure for removal outlined above. In addition, it is essential that all ducting joints are rendered waterproof by coating with underseal compound.

Finally, ensure that the butterfly valve can still move freely and will fully close.

Blower Motor and Fan — to remove

Remove the ducting as described above.

Unscrew the seven 2 B.A. screws securing the front section to the centre section of the ducting. Withdraw the front section.

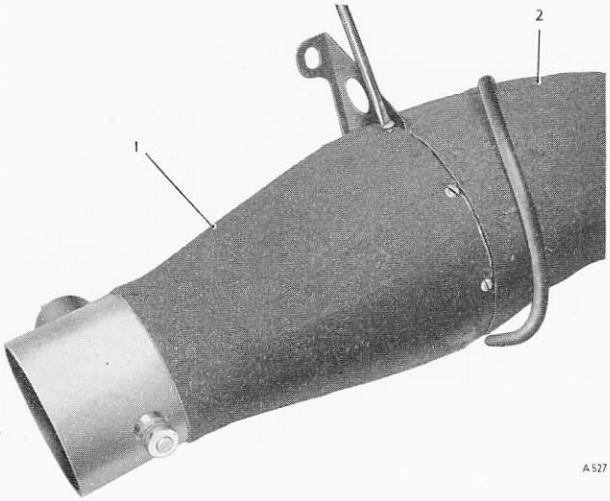

Fig. C6 Disconnecting front ducting — Intermediate System

1. FRONT DUCTING
2. CENTRE DUCTING

Remove the sleeve and grommet from the motor leads.

Unscrew the setscrews supporting the motor in the centre of the ducting, then remove the motor and fan as one unit.

Unscrew the single 7 B.A. setscrew and withdraw the fan from the motor spindle.

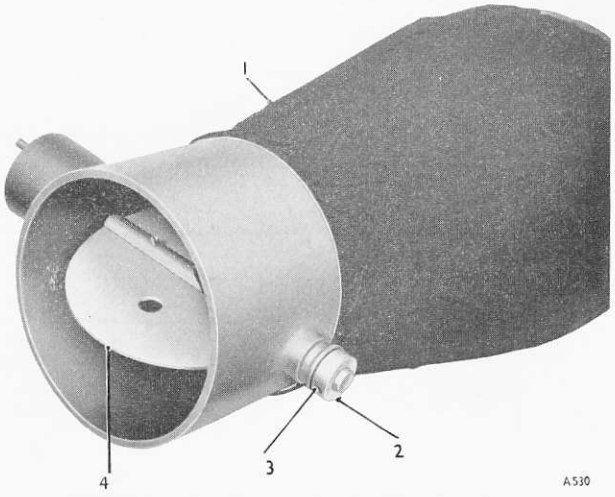

Fig. C7 Intake butterfly valve (de-mister)

1. FRONT DUCTING
2. RETAINING COLLAR
3. ALLEN SCREW
4. DE-MISTER BUTTERFLY VALVE

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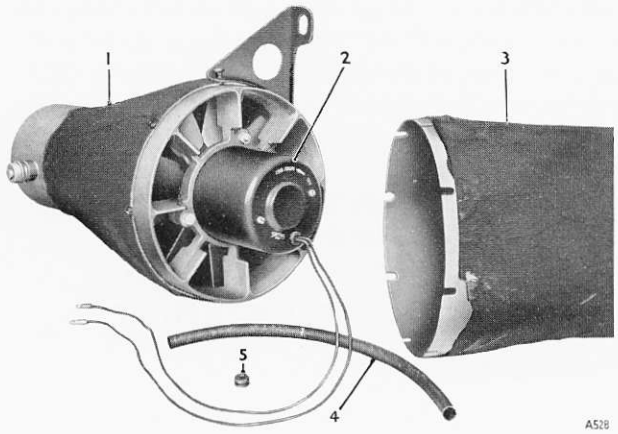


Fig. C8 Blower motor and fan — Intermediate System

1. FRONT DUCTING
2. MOTOR AND FAN
3. CENTRE DUCTING
4. RUBBER SLEEVE
5. GROMMET

Blower Motor — to inspect

The motor is a Smith's Accessories unit, Type CHS 720/4, which utilises CM3H brushes.

Remove the motor cover and inspect the brushes for freedom in their holders; ease them if necessary. Renew them if they are unduly worn.

Check the tension of the brush springs (see Chapter M); renew any that show loss of tension.

Clean the commutator if necessary (see Chapter M for the full procedure).

In the event of an internal fault in the motor, a replacement unit should be fitted.

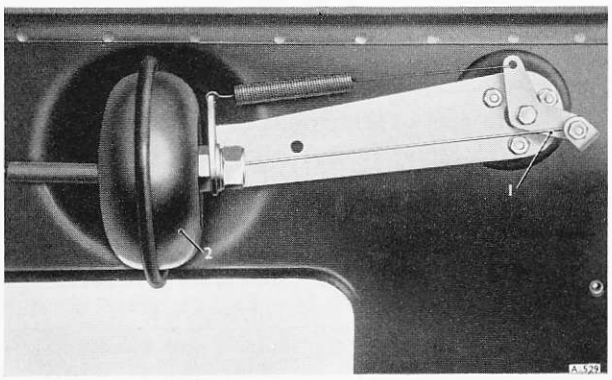


Fig. C9 Butterfly valve actuating mechanism

1. ACTUATING MECHANISM
2. VACUUM VALVE

Heat Exchange Matrix — to remove

Remove the ducting as described above.

Drain the engine cooling system (see Chapter L).

Slacken the worm drive clips and remove the hoses from the matrix.

Remove from the inlet and outlet pipes the two $\frac{3}{4}$ in. (·750 in.) nuts securing the matrix to the valance.

Remove the matrix and the rubber sealing bands from the ducting joints.

Intake Butterfly Valve

Check the valve for freedom of movement. End float in the spindle should not exceed 0·006 in. and may be adjusted by means of the end collar which is secured to the spindle by an Allen screw. The collar end of the spindle is protected from mud etc. by a rubber cap.

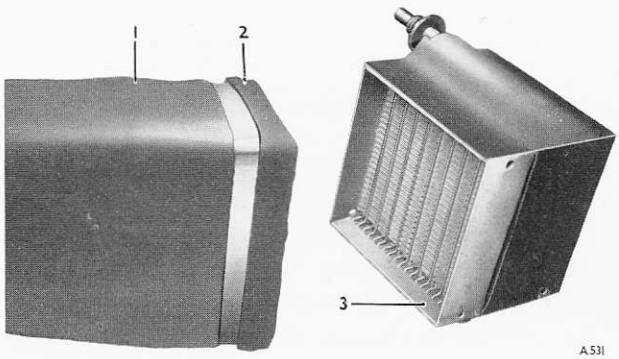


Fig. C10 Heater matrix — Intermediate System

1. CENTRE DUCTING
2. RUBBER SEAL
3. MATRIX

VACUUM CONTROL UNITS

Description

Vacuum valves are used to open the butterfly valves in the intake ducts (see Fig. C9) and also to operate the coolant taps in the pipes between the engine and the heat exchange matrices (see Fig. C11). All vacuum units are operated by inlet manifold depression and therefore function only when the engine is running.

Vacuum Operated Taps — to remove

To remove a vacuum operated tap, drain the engine cooling system and proceed as follows:

Disconnect the hoses and the by-pass line (if fitted) from the tap casing.

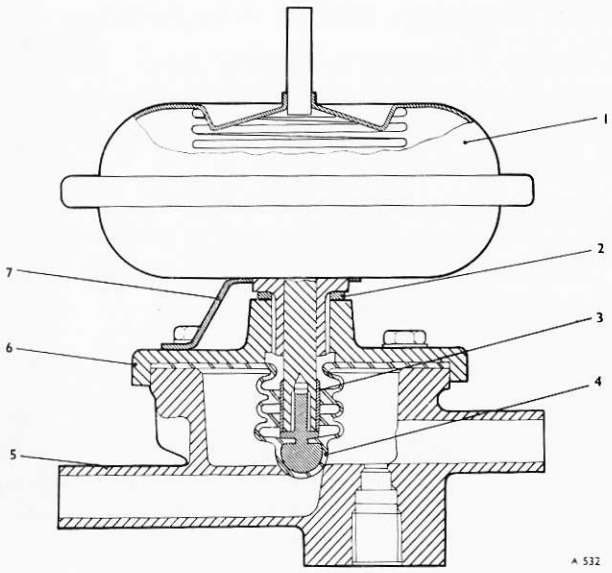


Fig. C11 Section view — vacuum operated tap

1. VACUUM UNIT
2. ADJUSTMENT WASHER
3. DISTANCE PIECE
4. DIAPHRAGM
5. BOTTOM HALF CASING
6. TOP HALF CASING
7. LOCKING PLATE

Remove the vacuum pipe from the top of the vacuum unit.

Remove the four cheesehead screws securing the right-hand tap mounting bracket to the valance; remove the tap and bracket.

Remove the two screws securing the left-hand tap to its mounting bracket; remove the tap.

In the event of unsatisfactory operation of a vacuum unit, it should be renewed. Do not attempt to unscrew the vacuum unit from a tap; withdraw it after removing the six setscrews by which it is retained.

If a tap is dismantled for any reason, it is essential that, on re-assembly, the distance sleeve is re-fitted; otherwise operation of the tap will rapidly render the diaphragm unserviceable.

Vacuum Operated Taps — to assemble

To assemble a vacuum tap, first screw the top half of the tap casing on to the vacuum unit. Screw the rubber diaphragm on to its spindle until finger tight and then offer up the bottom half of the coolant casing, carefully aligning the six screw holes.

Without compressing the spring but with the valve on its seat, check that a gap of 0·050 in. to 0·100 in. exists between the flange of the bottom half casing and the lower surface of the diaphragm flange, if this is not the case, insert an aluminium washer of suitable thickness between the vacuum unit and the top half of the casing (see Fig. C11). Insertion of this washer necessitates the removal of the top half of the casing; before it is re-assembled, fit the locking plate to the hexagon of the vacuum unit (see Fig. C11).

CONTROL SWITCH

Description

The Heating and De-misting Systems are each controlled by a unit combining an electrical switch with a valve applying inlet manifold depression to the vacuum operated units of the system.

It is essential that the terminals and contacts of the switch be kept clean; otherwise no maintenance of the electrical components is necessary.

If the switch is removed for any reason, the wiring should be re-connected as follows:

TERMINAL	COLOUR OF WIRE	
	HEATER SWITCH	DE-MISTER SWITCH
1	Yellow	Blue
2	Blue	Yellow
3	Purple and black	Purple and black

The control valve as shown in Figure C12 contains a sliding rubber seal which in its three positions closes or connects combinations of three ports in the valve body.

Two spring-loaded balls and a register plate accurately locate the seal in its centre position.

The valve port combinations in the three positions of the switch are as follows (see Fig. C12):

SWITCH POSITION	SEAL POSITION	PORT COMBINATION
Off	Forward	Ports 8 and 11 open to atmosphere, Port 9 closed
Withdrawn to first stop	Centre	Ports 8 and 9 connected, Port 11 open to atmosphere
Withdrawn to second stop	Rear	Ports 8, 9 and 11 connected

No regular maintenance of the valve is necessary but the register plate screws must be kept tight (see Fig. C12).

Control Valve — to dismantle

In the event of leakage at the seal, the seal must be renewed. Dismantle the valve as follows:

Slide the seal to its centre position so that the balls are located in the holes in the register plate.

Lightly holding the register plate against the spring pressure, remove the two screws and slide the plate clear of its groove.

Remove the seal from its housing and fit a new seal in its place. One corner of the seal is chamfered to indicate its location. Check that the seal is not laterally compressed and distorted by the housing.

Control Valve — to assemble

Re-assemble the valve by reversing the procedure for dismantling outlined above.

Ensure that the vacuum pipes are fitted to the correct ports of the valve. The valve port marked 'T' must be connected to the vacuum operated tap and the port marked 'A' to the vacuum unit actuating the air intake butterfly flap. The third port must be connected to the engine inlet manifold.

Should the knob of the switch require renewal, it can be removed after pressing the spring-loaded location peg in the neck of the knob.

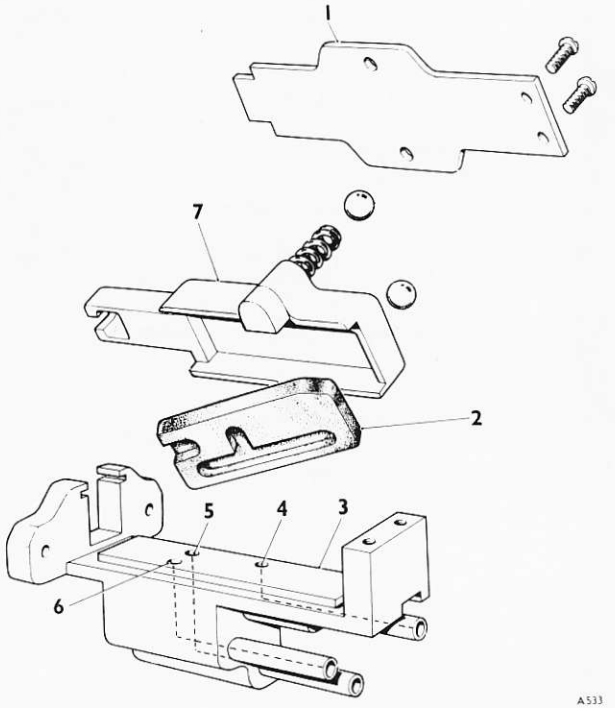


Fig. C12 Control switch valve — Intermediate System

1. REGISTER PLATE
2. RUBBER SEAL
3. VALVE BODY
4. VALVE PORT TO VACUUM FLAP
5. VALVE PORT TO INLET MANIFOLD
6. VALVE PORT TO VACUUM TAP
7. SEAL HOUSING

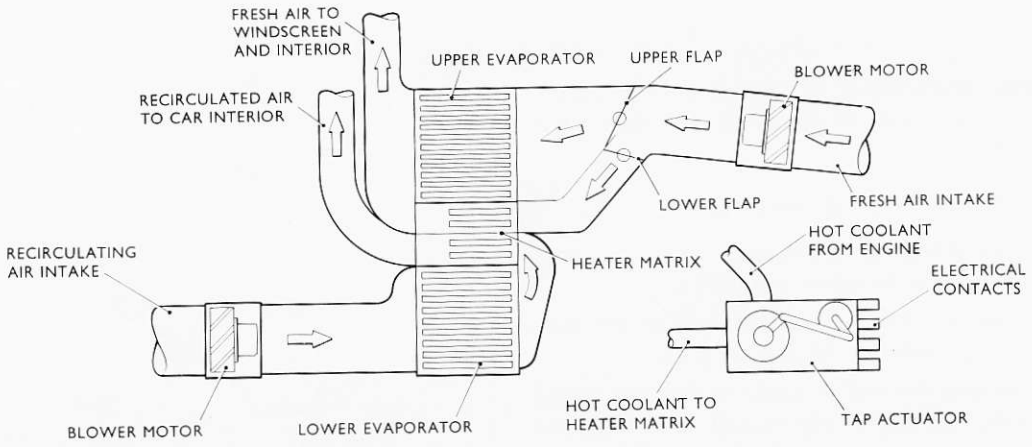
SECTION C2 — THE UNDERWING AIR CONDITIONING UNIT

On standard Silver Cloud II and Bentley S2 cars, the De-misting, Heating and Ventilation System is built into a single underwing unit which, at the owner's request, may also contain the Refrigeration System.

The Refrigeration System is the subject of a separate publication — the Air Conditioning Manual (TSD 723).

Fresh air passes through a gauze covered grille in the right-hand front wing of the car and is boosted by a blower motor through the upper half of a heat exchange matrix mounted under the wing. The heated air passes along a cross-duct below the facia and is admitted to the car interior through the windscreen de-misting slots and the adjustable outlets in the capping rail. Additional fresh air passes through a similar gauze covered grille in the left-hand front wing and flows without assistance into the car interior through a grille in the left-hand scuttle wall. A butterfly valve, which is cable operated from the facia, is fitted to control the air flow through the ducting.

A recirculatory heating system is also incorporated in the unit and draws air from the car interior through an intake grille below the driver's seat. A blower motor boosts this air through the lower half of the heat exchange matrix and returns the heated air to the saloon through ducts below the facia.



UPPER

ANTI-CLOCKWISE

1 — LOWER / UPPER
UPPER FLAP OPEN
LOWER FLAP CLOSED
WATER TAP CLOSED
BLOWER MOTOR MEDIUM SPEED
TEMPERATURE - AMBIENT

2 — LOWER / UPPER
UPPER FLAP OPEN
LOWER FLAP OPEN
WATER TAP CLOSED
REFRIGERATION SWITCHED IN
TEMPERATURE - COOL

3 — LOWER / UPPER
UPPER FLAP OPEN
LOWER FLAP CLOSED
WATER TAP CLOSED
REFRIGERATION SWITCHED IN
BLOWER MOTOR MEDIUM SPEED
TEMPERATURE - COLD

WITHDRAW KNOB FOR FULL SPEED IN ANY ANGULAR POSITION EXCEPT 'OFF'

CLOCKWISE

1 — LOWER / UPPER
UPPER FLAP OPEN
LOWER FLAP CLOSED
* WATER TAP LEAK
BLOWER MOTOR MEDIUM SPEED
TEMPERATURE - AMBIENT

2 — LOWER / UPPER
UPPER FLAP 2/3 OPEN
LOWER FLAP 2/3 OPEN
* WATER TAP LEAK
BLOWER MOTOR MEDIUM SPEED
TEMPERATURE - TEPID

3 — LOWER / UPPER
UPPER FLAP 1/3 OPEN
LOWER FLAP 2/3 OPEN
* WATER TAP LEAK
BLOWER MOTOR MEDIUM SPEED
TEMPERATURE - WARM

4 — LOWER / UPPER
UPPER FLAP CLOSED
LOWER FLAP OPEN
* WATER TAP LEAK
BLOWER MOTOR MEDIUM SPEED
TEMPERATURE - HOT

LOWER

ANTI-CLOCKWISE

1 — LOWER / UPPER
WATER TAP CLOSED
REFRIGERATION SWITCHED IN
RECIRCULATORY BLOWER SLOW SPEED
TEMPERATURE - COOL

2 — LOWER / UPPER
WATER TAP CLOSED
REFRIGERATION SWITCHED IN
RECIRCULATORY BLOWER FULL SPEED
TEMPERATURE - COLD

CLOCKWISE

1 — LOWER / UPPER
WATER TAP LEAK
RECIRCULATORY BLOWER SLOW SPEED
TEMPERATURE - WARM

2 — LOWER / UPPER
WATER TAP OPEN
RECIRCULATORY BLOWER SLOW SPEED
TEMPERATURE - HOT

3 — LOWER / UPPER
WATER TAP OPEN
RECIRCULATORY BLOWER FULL SPEED
TEMPERATURE - HOT

* **NOTE**:- THE WATER TAP LEAK POSITION CAN ONLY BE SELECTED BY THE UPPER AIRSTREAM SWITCH WHEN THE LOWER AIRSTREAM SWITCH IS 'OFF' OR IN POSITION 1 CLOCKWISE. IF THE LOWER AIRSTREAM SWITCH IS IN POSITION 2 OR 3 CLOCKWISE, THEN THE WATER TAP IS FULLY OPEN EVEN IF THE UPPER SWITCH IS IN A COLD POSITION.

TO CLOSE THE WATER TAP, SELECT 'OFF' WITH ONE OF THE SWITCHES AND POSITION 1 ANTI-CLOCKWISE WITH THE OTHER FOR 30 SECONDS BEFORE RETURNING TO ZERO. HOWEVER, WITH BOTH SWITCHES 'OFF' NO HEATING OCCURS AS ALL FLAPS ARE CLOSED AND BLOWER MOTORS STATIONARY.

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Fig. C13 Underwing A.C.U. switch diagram

The unit is controlled by two rotary switches mounted on the facia and marked UPPER and LOWER.

The UPPER switch controls the fresh air ventilation and has eight positions — 'Off' (vertical), four clockwise positions which control the Heating System and three anti-clockwise positions which control the Refrigeration (if fitted).

The LOWER switch controls the recirculatory system and has five positions in addition to 'Off'. The three clockwise positions control the Heating System and the two anti-clockwise positions control the Refrigeration (if fitted).

Upper Airstream Switch

This switch controls the heater and evaporator flap actuators, the fresh air blower motor, the compressor clutch and the water tap actuator.

The switch utilises eight angular positions which are the vertical or 'Off' position, four positions clockwise and three positions anti-clockwise.

With the switch knob 'in', the fresh air blower motor operates at medium speed in all seven operating positions.

When the switch knob is withdrawn, all seven conditions are duplicated but with the blower motor operating at full speed. This is achieved by the provision of a contact sleeve at the end of the switch spindle. This sleeve connects two fixed contacts when the knob is withdrawn and by-passes the resistance in the blower motor circuit.

The main switch mechanism consists basically of five sets of moving contacts which rotate when the control knob is turned. Lobes on these contacts 'make' and 'break' with eleven sets of fixed contacts spaced around the arc of travel.

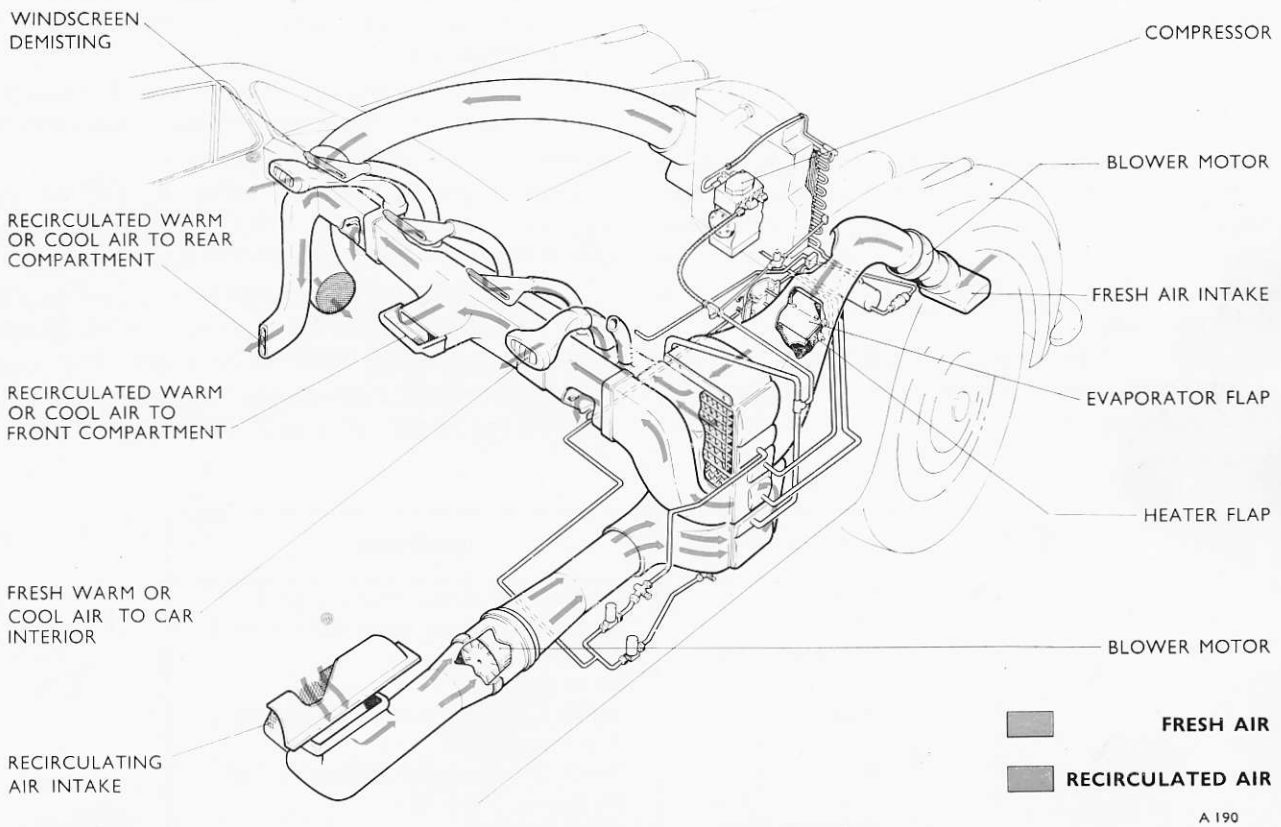

Fig. C14 The underwing air conditioning unit

A numbered disc is attached to the rear of the switch for terminal identification as follows:

TERMINAL NUMBER	COLOUR OF WIRE	FUNCTION
1	White	Water tap 'leak'
2	Red and white	Evaporator flap closed
3	Purple and black	Supply
5	Blue	Heater flap $\frac{2}{3}$ open
6	Purple	Heater flap fully open
7	Brown and red	Water tap closed
8	Red and green	Heater flap closed
9	Blue and green	Compressor clutch 'in'
10	Red	Evaporator flap fully open
11	Brown	Blower motor medium speed
12	Yellow	Blower motor full speed
13	Blue and black	Evaporator flap $\frac{2}{3}$ open
14	Purple and green	Evaporator flap $\frac{1}{3}$ open

Lower Airstream Switch

This switch controls the recirculatory blower motor, the water tap actuator and the compressor clutch.

Six positions are utilised; they are the vertical or 'Off' position, three positions clockwise and two positions anti-clockwise.

The construction and operation of the mechanism is similar to that of the UPPER airstream switch except that the knob cannot be withdrawn for blower motor full speed — full speed is only obtained in position three clockwise and position two anti-clockwise.

Lobes on four contacts which rotate with the switch spindle complete circuits in combination with nine fixed contacts.

Note: The system will not provide warm fresh air and cold recirculated air simultaneously.

If the LOWER airstream switch is in a 'cold' position (anti-clockwise), the water tap will remain *closed* for all positions of the UPPER airstream switch.

If the LOWER airstream switch is 'Off' or in position 1 clockwise, the UPPER airstream switch selects water tap *leak* for all clockwise positions.

If the LOWER airstream switch is in positions 2 or 3 clockwise, the UPPER airstream switch selects water tap *open* for all clockwise positions.

A numbered disc is attached to the rear of the switch for terminal identification as follows:

TERMINAL NUMBER	COLOUR OF WIRE	FUNCTION
1	Yellow	Recirculation blower motor full speed
2	Blue	Recirculation blower motor medium speed
3	Purple and black	Supply
4	Green and white	Water tap 'leak'
5	White	Supply from upper airstream switch No. 1
7	Red and black	Water tap closed
8	Brown and red	Supply from upper airstream switch No. 7
9	Green and yellow	Compressor clutch 'in'
11	Green and black	Water tap open

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Right-hand Front Wing — to remove

It is necessary to remove the wing in order to gain access to the underwing unit; the following procedure should be closely followed:

The right-hand front door and the radiator shell must first be removed in order to expose the wing securing bolts (see Chapter S).

Open the right-hand front door and place a suitable support beneath the door.

Remove the split pin and withdraw the clevis pin from the checkstrap.

If electrically operated windows are fitted, remove the three screws securing the wiring conduit to the hinge post.

Unscrew the six hinge bolts and remove the door; if electrically operated windows are fitted, the door should be moved rearwards to the full extent of the wires.

Unscrew the four bolts which secure the top of the radiator shell to the matrix and the bonnet centre stay, also the eight bolts securing the lower end of the shell to the undertray and front apron.

Remove the four bolts securing the front apron to the side fairings, also the four nuts, bolts and washers securing the right-hand side fairing to the wing.

Remove the side fairing, the front apron and the radiator shell.

Disconnect the headlamp and sidelamp wiring and remove the wing as follows:

Remove the six bolts from the rear vertical edge of the wing, also two self-tapping screws and one bolt which secure the stainless steel strip to the lower edge of the wing.

Remove six bolts from the lower edge and the front vertical edge of the wing.

Supporting the weight of the wing, remove the ten bolts securing the wing to the valance. Remove the wing.

> **Note:** Should the wiring for the electrically operated window have prevented complete removal of the door, it will be advisable to temporarily re-secure the hinges.

Underwing Unit — to remove

Should the detection of a leaking matrix or similar fault necessitate the removal of the matrices and underwing ducting, proceed as follows:

Remove the right-hand front wing as described above.

If refrigeration is fitted:

Discharge the refrigerant from the system (see the appropriate section of the Air Conditioning Manual, TSD 723).

Forward-seat the compressor low pressure service valve by turning it clockwise to the full extent of its travel. Disconnect the evaporator return pipe at the union adjacent to the flap actuators.

Disconnect the two pipe unions from the forward ends of the solenoid valves.

To prevent loss of engine coolant when removing the hoses from the heater matrix, drain the cooling system; alternatively, seal the heater hoses immediately they are removed by inserting $\frac{5}{16}$ in. bolts into their bores and clamping the hoses with worm drive clips.

Slacken the worm drive clip sealing the forward end of the recirculation ducting.

Disconnect the transfer duct.

Unscrew the seven nuts securing the underwing unit to the valance.

Disconnect the fresh air blower motor leads at the snap connectors, then slide the underwing unit off the motor housing, allowing the motor leads to pass through the hole in the ducting; remove the unit from the car.

Remove the two actuator coupling tubes from within the rubber seals protruding through the valance.

Underwing Unit — to dismantle

If the unit contains refrigeration equipment, the insulating jacket must first be unlaced and removed in order to gain access to the unit and its securing screws.

Remove the self-tapping screws securing the ducting to the matrix block and remove the ducting.

Remove the twelve nuts, bolts and washers holding the three sections of the matrix block together;

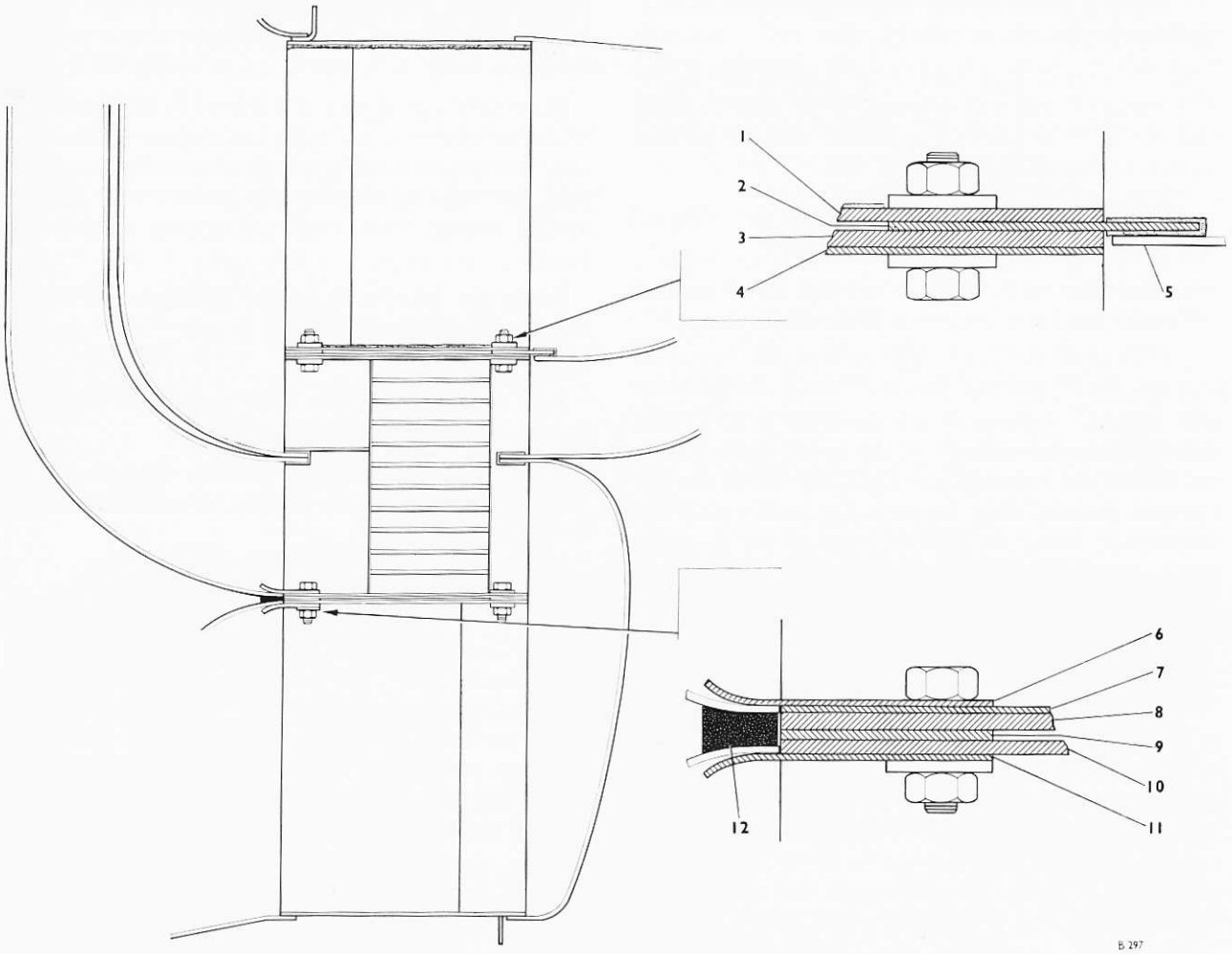

Fig. C16 Section view of matrix block — underwing A.C.U.

1. UPPER (DUMMY) EVAPORATOR
2. FELTED PACKING STRIP
3. UPPER SUPPORT BRACKET
4. HEATER MATRIX
5. DUCTING SEPARATOR PLATE
6. RETAINER PLATE
7. HEATER MATRIX
8. LOWER SUPPORT BRACKET
9. PACKING STRIP
10. LOWER (DUMMY) EVAPORATOR
11. RETAINER PLATE
12. RUBBER SEALING STRIP

Connect the evaporator return pipe union at the 'Tee' junction on the valance.

Evacuate and sweep the Refrigeration System, then check the system for leaks (refer to the appropriate Sections of the Air Conditioning Manual TSD 723).

Charge the system with 7 lb. of refrigerant (see the appropriate Section of the Air Conditioning Manual TSD 723).

Re-fit the wing (reversing the procedure described on page C11 for removal of the wing).

Check and, if necessary, re-set the actuator adjustment.

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ACTUATORS

Description

The heater flap, evaporator flap and water tap actuators are identical units, consisting of small electric motors driving through reduction gear trains. The shaft carrying the final gear in the train also carries a contact disc which has a portion removed. This disc conveys current to the motor through any one of four fixed contacts whenever the circuit is completed by the UPPER or LOWER airstream switch.

Operation of the motor causes the disc to rotate until the gap in the disc reaches the fixed contact, thus breaking the circuit.

Attached to the end of each actuator gear shaft is a crank lever, which is linked to a similar lever fixed either to the water tap spindle or to an extension of the heater or evaporator flap spindle.

The extension spindles protrude through the actuator mounting platform and flexible couplings transmit the drive, through holes in the valance, to the flap spindles. Rubber sleeves are provided between the valance and the ducting to protect these couplings.

The water tap actuator is situated low down at the forward end of the right-hand valance (see Fig. C18).

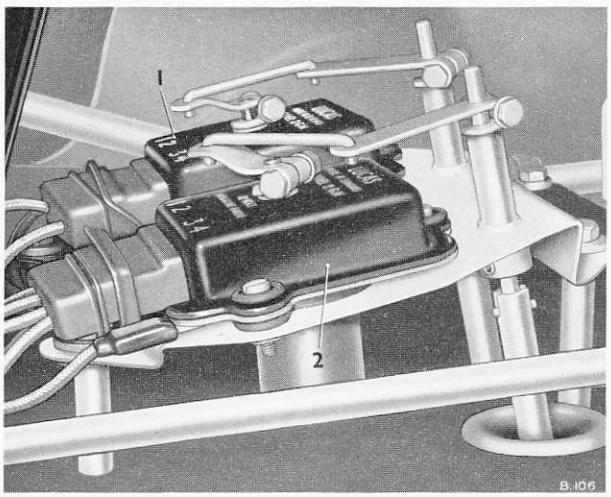

Fig. C17 Flap actuators — underwing A.C.U.

1. LOWER FLAP ACTUATOR MOTOR
2. UPPER FLAP ACTUATOR MOTOR

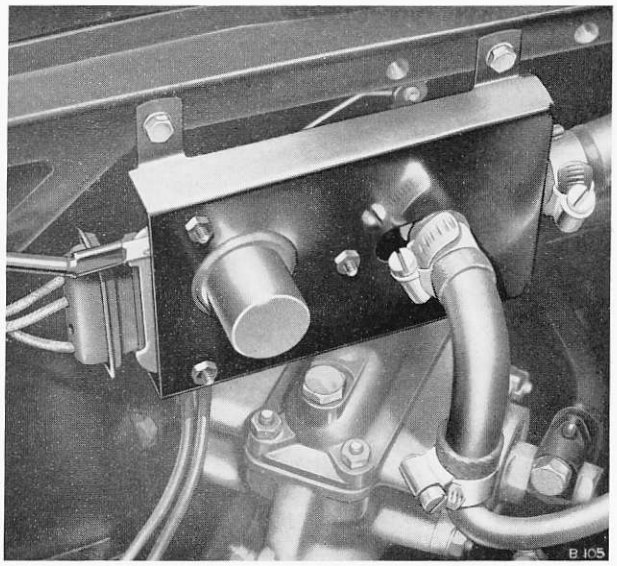

Fig. C18 Water tap actuator — underwing A.C.U.

The heater and evaporator flap actuators are mounted together on a single platform midway along the valance, adjacent to the forward brake fluid reservoir (see Fig. C17).

Actuators — to adjust

Whenever the underwing unit or the wing panel has been removed, it will be necessary to check and possibly adjust the actuator setting. This should be carried out only after the wing has been re-fitted.

The procedure to be adopted is as follows, noting that instructions 2, 3 and 4 do not apply if the wing **only** has been removed:

1. Slacken the four bolts which clamp the crank levers to the extension spindles and gear shafts, also slacken the two Allen screws retaining the collars on the extension spindles.
2. Remove the single nut and washer securing the forward end of the mounting platform to the valance and slacken the two rear securing nuts.
3. Move the forward end of the mounting platform away from the valance and insert the two coupling tubes through the valance holes, locating them on the driving dogs of the flap spindles.
4. Insert the extension spindle dogs into the slots in the coupling tubes and secure the mounting platform to the valance.

TSD 729

5. Press the extension spindles fully 'home' into the coupling tubes, then tighten the clamping bolts of the two extension spindle crank levers.
6. Slowly withdraw the extension spindles about $\frac{1}{16}$ in. and tighten the Allen screw to lock the collars against the end faces of the bearing tubes.
7. Detach the two crank levers from the gear shafts and rotate the extension spindles by means of their crank arms. The spindles should be free to rotate through 90 deg. Movement through a larger angle indicates that the coupling tubes are not engaged with the dogs on the spindles and the procedure must be repeated from instruction 3.
8. Ensure that the UPPER and LOWER airstream switches are in the 'Off' position, then switch on the ignition for approximately 30 seconds to allow the actuator motors to fully close. The actuators must then be adjusted separately as follows:

Evaporator Flap (upper) Actuator

1. Rotate the extension spindle anti-clockwise (when viewed over the left-hand wing) until resistance is encountered.
2. Slightly slacken the crank lever clamping bolt and rotate the crank lever further anti-clockwise until it slopes forward and upward at 45 deg.
3. Press the gear shaft crank lever loosely into position on the gear shaft.
4. Adjust the position of the extension spindle crank lever so that when the gear shaft crank is rotated clockwise on the shaft, resistance is encountered for a few degrees to each side of the fully rearward position. (This indicates that the flap is being pressed tightly into its fully closed position). Tighten the clamping bolt to lock the extension spindle crank.
5. Rotate the gear shaft crank to the fully rearward end of its stroke (i.e. when the gear shaft crank and the connecting link are parallel), then tighten the clamping bolt.

Heater Flap (lower) Actuator

1. Rotate the extension spindle clockwise (when viewed over the left-hand wing) until resistance is encountered.
2. Slightly slacken the crank lever clamping bolt and rotate the crank lever further clockwise until it slopes 60 deg. forward of the vertical downward position.
3. Place the gear shaft crank lever loosely in position on the gear shaft.

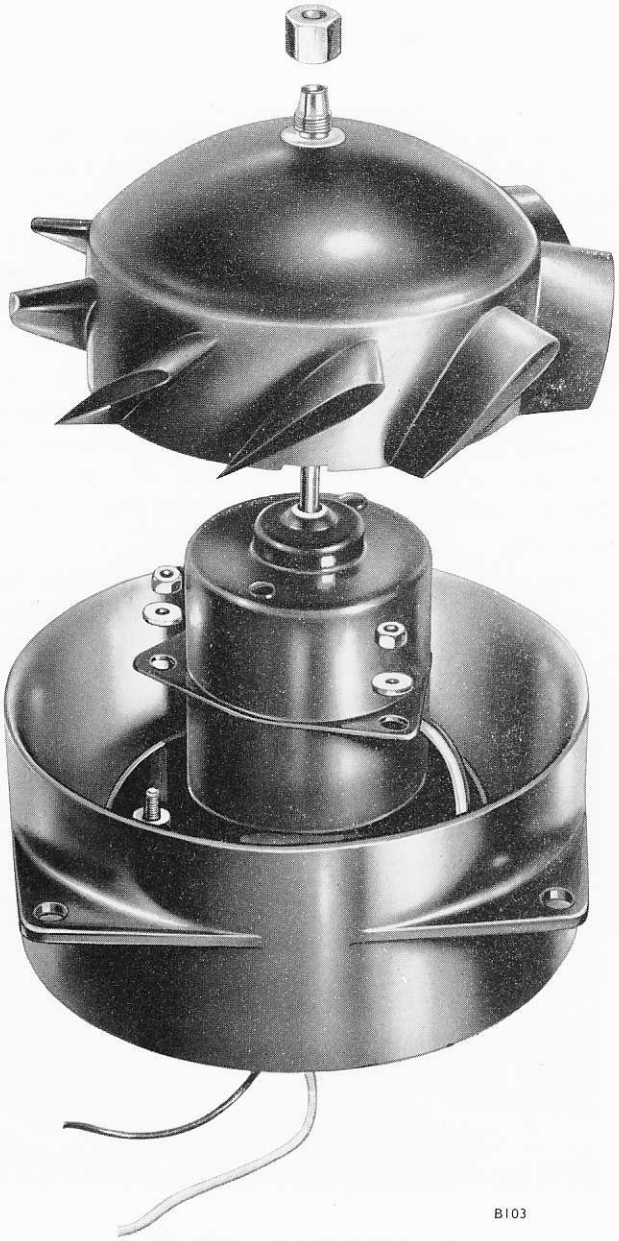

Fig. C19 Blower motor and fan — underwing A.C.U.

4. Adjust the position of the extension spindle crank lever so that when the gear shaft crank is rotated clockwise on the shaft, resistance is encountered for a few degrees to each side of the fully rearward position. Tighten the clamping bolt to lock the extension spindle crank.
5. Rotate the gear shaft crank to the fully rearward end of its stroke (i.e. when the gear shaft crank and the connecting link are parallel), then tighten the clamping bolt.

Operate the switches and visually check that the actuators are functioning correctly.

The Blower Motors

Model ... Smiths FHM 5342/01

Two identical motors are fitted in the system: the fresh air blower is situated in the inlet ducting beneath the wing, and the recirculation blower is mounted in the recirculation inlet duct beneath the front floor (see Fig. C14).

Each motor and fan is mounted in a cast aluminium housing (see Fig. C19).

The motor shaft is carried in self-lubricating spherical bushes which are self-aligning to ensure smooth operation.

Two speeds — medium and high — are provided, by the incorporation in the motor circuit of a resistance, which is by-passed when the UPPER airstream control knob is withdrawn or when the LOWER airstream switch is turned either to the third position clockwise or to the second position anti-clockwise.

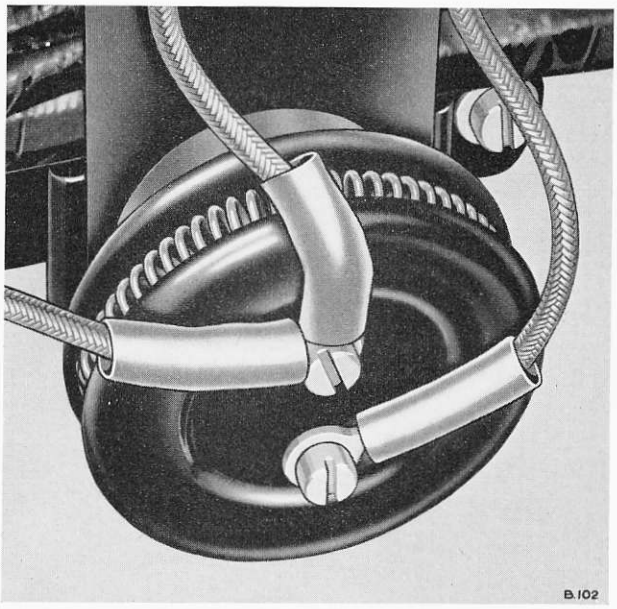

Fig. C20 Blower resistance — underwing A.C.U.

Resistances — Blower motors

Two resistances — one for each blower motor, slow the motors to medium speed when included in the circuit.

The two resistances are mounted on the bulkhead; the resistance for the fresh air blower is mounted on the upper right-hand side and that for the recirculation blower on the upper left-hand side.

Each resistance consists of a 66 in. length of oxidised wire forming a winding of 70 turns with a resistance of 2·8 ohms. The resistance is held in a spool shaped ceramic insulator bolted to a mounting block on the bulkhead (see Fig. C20).

TSD 729

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CHAPTER C

AIR CONDITIONING

SECTION C2

The underwing air conditioning unit
(Page C 7 in Workshop Manual)

Note The air conditioning system fitted to Continental S3 and Phantom V cars is the same as that described in the Workshop Manual.

For S3 cars read as follows

On standard Silver Cloud III and Bentley S3 cars the de-misting, heating and ventilation system is built into a single unit mounted under the right-hand front wing. This unit can supply fresh and recirculated air at the desired temperature to all regions of the car, through concealed ducting.

The air supply of a non-refrigerated car can be considered as two independent systems; one system heating fresh air drawn from outside the car and the second system heating air recirculated within the car interior. As the upper section of the heating unit is devoted to one system and the lower section to the other, the systems are identified as 'Upper' and 'Lower' as shown in Figure C1(S) of this Supplement.

'Upper' or fresh air system

In the 'Upper' system, fresh air is admitted through an intake in the right-hand front wing of the car and is filtered through a fine gauze. It is then boosted, if so required, by a blower motor through the heat exchange matrix in the main air conditioning unit. The air then passes along a cross-duct below the facia and is admitted to the front compartment through the windscreen de-misting slots and the adjustable outlets in the facia capping rail.

The flap valves controlling the air flow through the heat exchanger matrix are controlled by electric actuators, as is the tap controlling the flow of hot engine coolant to the 'Upper' heater matrix.

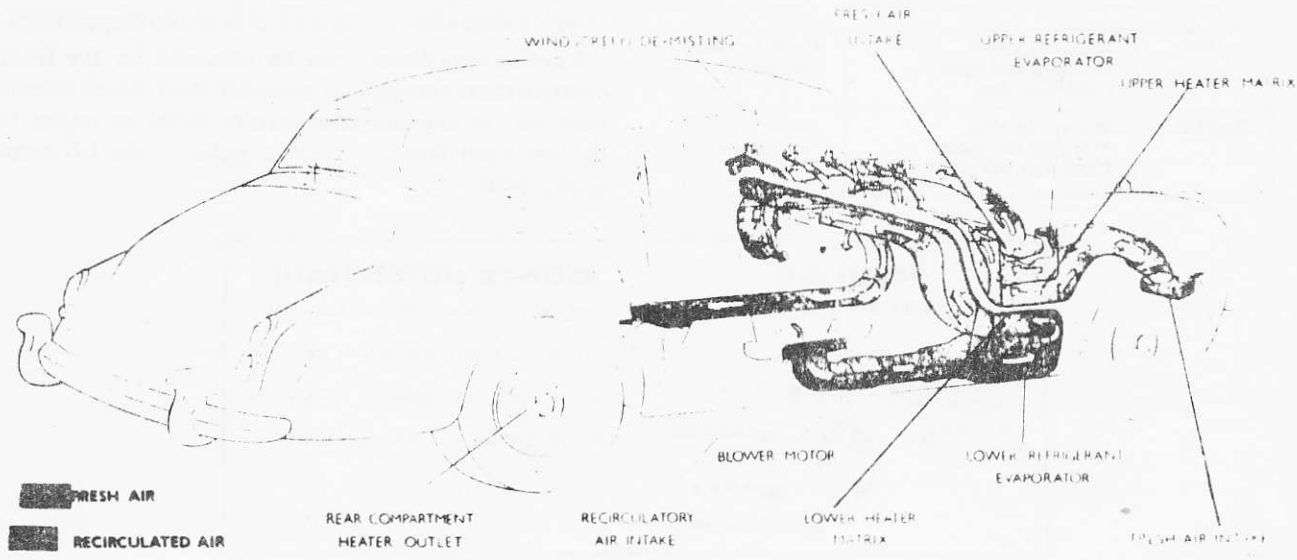

Fig. C1(S) Air circulation diagram

'Upper' airstream switch
(Page C 9 in Workshop Manual)

S3 cars only

This switch controls the heater and evaporator flap actuators, blower motor, water tap actuator and refrigeration compressor clutch (if fitted).

The switch utilises seven angular positions which are: vertical 'off' position, four positions clockwise and two positions anti-clockwise. If refrigeration is fitted a third anti-clockwise position is incorporated.

With the switch knob 'in' air enters the saloon only through ram effect induced by the forward motion of the car. When the switch is withdrawn to its first or second position, air flow is increased by a blower motor operating at half and full speed respectively. This is achieved by the provision of a contact sleeve at the end of the switch spindle; this sleeve connects with two fixed contacts, one of which is placed slightly forward of the other. When the knob is withdrawn to the first position, the most forward of the two contacts connects with the contact sleeve and introduces a resistance into the blower motor circuit, causing the blower motor to operate at half speed. When the knob is withdrawn to the second position the second fixed contact connects with the contact sleeve and by-passes the resistance in the blower motor circuit.

SWITCH POSITION	CORRESPONDING POSITION OF FLAPS AND ACTUATORS	EFFECT PRODUCED
1st right	Water tap leak Hot flap full open Cold flap full open	Tepid air
2nd right	Water tap leak Hot flap full open Cold flap two-thirds open	Warm air
3rd right	Water tap full open Hot flap full open Cold flap one-third open	Hot air
4th right	Water tap full open Hot flap full open Cold flap shut	Very hot air
1st left	Water tap shut Hot flap full open Cold flap shut	Fresh air low volume
2nd left	Water tap shut Hot flap full open Cold flap full open	Fresh air full volume

'Upper' switch terminal identification is as follows

TERMINAL NUMBER	COLOUR OF WIRE	FUNCTION
1	Brown and black	Water tap leak
2	Red and white	Evaporator flap closed
3	Purple and black	Supply
4	Green and purple	Water tap fully open
6	Purple	Heater fully open
7	Brown and red	Water tap closed
8	Red and Green	Heater flap closed
10	Red	Evaporator flap fully open
11	Brown	Blower motor medium speed
12	Yellow	Blower motor full speed
13	Blue and black	Evaporator flap two-thirds open
14	Purple and green	Evaporator flap one-third open

The main switch mechanism consists basically of five sets of moving contacts which rotate when the control knob is turned. Lobes on the contacts 'make' and 'break' with fixed contacts spaced around the arc of travel. The effect produced by each position of the switch is described in Figure C2(S) of this Supplement.

Further ventilation may be obtained for the front compartment through an auxiliary duct which directs fresh air, at ambient temperature, from an intake in the left-hand front wing to a grille in the left-hand scuttle wall.

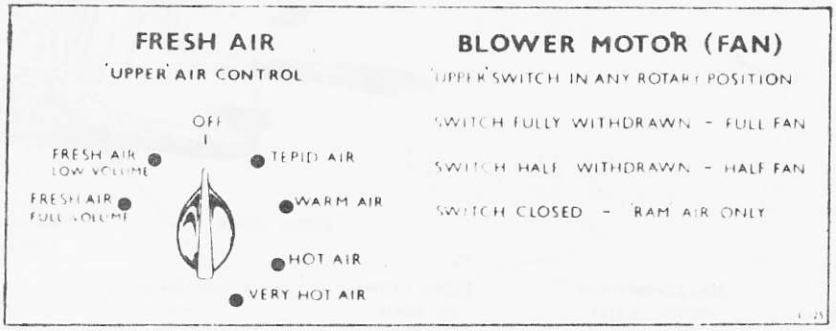

Fig. C2(S) Switch positions heating unit 'Upper' system

Air flow through this duct is controlled by a butterfly valve which is cable operated by an independent control beneath the facia adjacent to the steering column. On long wheelbase cars with a division this control is marked 'Fresh Air' and is positioned adjacent to the 'Upper' switch.

'Lower' or recirculatory system

S3 cars only

The air intake grille for this system is positioned at the right-hand side of the driver's seat, projecting into both the front and rear compartments. Air is drawn through this grille by the action of a blower motor and passed through the lower heat exchanger matrix.

The air then enters the interior of the car via the cross-duct beneath the facia and a centre duct which passes beneath the front seats to the rear compartment.

'Lower' airstream switch

(Page C 10 in Workshop Manual)

For S3 cars the 'Note' is not applicable.

The effect produced by each position of the switch is described in Figure C3 (S) of this Supplement.

SWITCH POSITION	CORESPONDING OPERATIONS OF WATER TAP AND BLOWER MOTOR	EFFECT PRODUCED
1st right	Motor half speed Water tap leak	Warm air Half fan
2nd right	Motor half speed Water tap full open	Hot air Half fan
3rd right	Motor full speed Water tap full open	Hot air Full fan
1st left	Motor half speed Water tap shut	Unheated air Half fan
2nd left	Motor full speed Water tap shut	Unheated air Full fan

'Lower' switch terminal identification is as follows

TERMINAL NUMBER	COLOUR OF WIRE	FUNCTION
1	Yellow	Blower motor full speed
2	Blue	Blower motor medium speed
3	Purple and black	Supply
4	Green and white	Water tap leak
7	Red and black	Water tap closed
8	Purple and black	Supply
11	Green and black	Water tap open

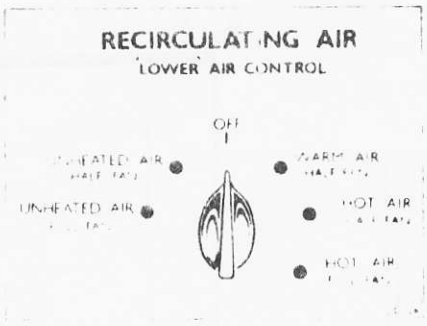

Fig. C3 (S) Switch positions heating unit 'Lower' system

Right-hand front wing To remove

(Page C 11 in Workshop Manual)

For S3 cars the second to sixth paragraphs are not applicable. The seventh and eighth paragraphs to read

Unscrew the four bolts which secure the top of the radiator to the matrix and the bonnet centre stay, also the bolts securing the lower end of the shell to the undertray and front apron.

Remove the bolts securing the front apron to the side fairing, also the four nuts, bolts and washers securing the right-hand side fairing to the wing.

For S3 cars the following three paragraphs should be read in place of the eleventh

Remove the interior trim from the right-hand scuttle wall; this exposes the bolts which secure the rear vertical edge of the wing.

Remove the four bolts from the right-hand scuttle wall. Open the door approximately half way and remove the bolt which secures the rear lower edge of the wing to the sill.

Open the door fully and remove the bolt which secures the rear top edge of the wing to the scuttle wall. Remove also the two self-tapping screws and one bolt which secure the stainless steel strip to the lower edge of the wing.

For S3 cars the paragraph headed 'Note' is not applicable.

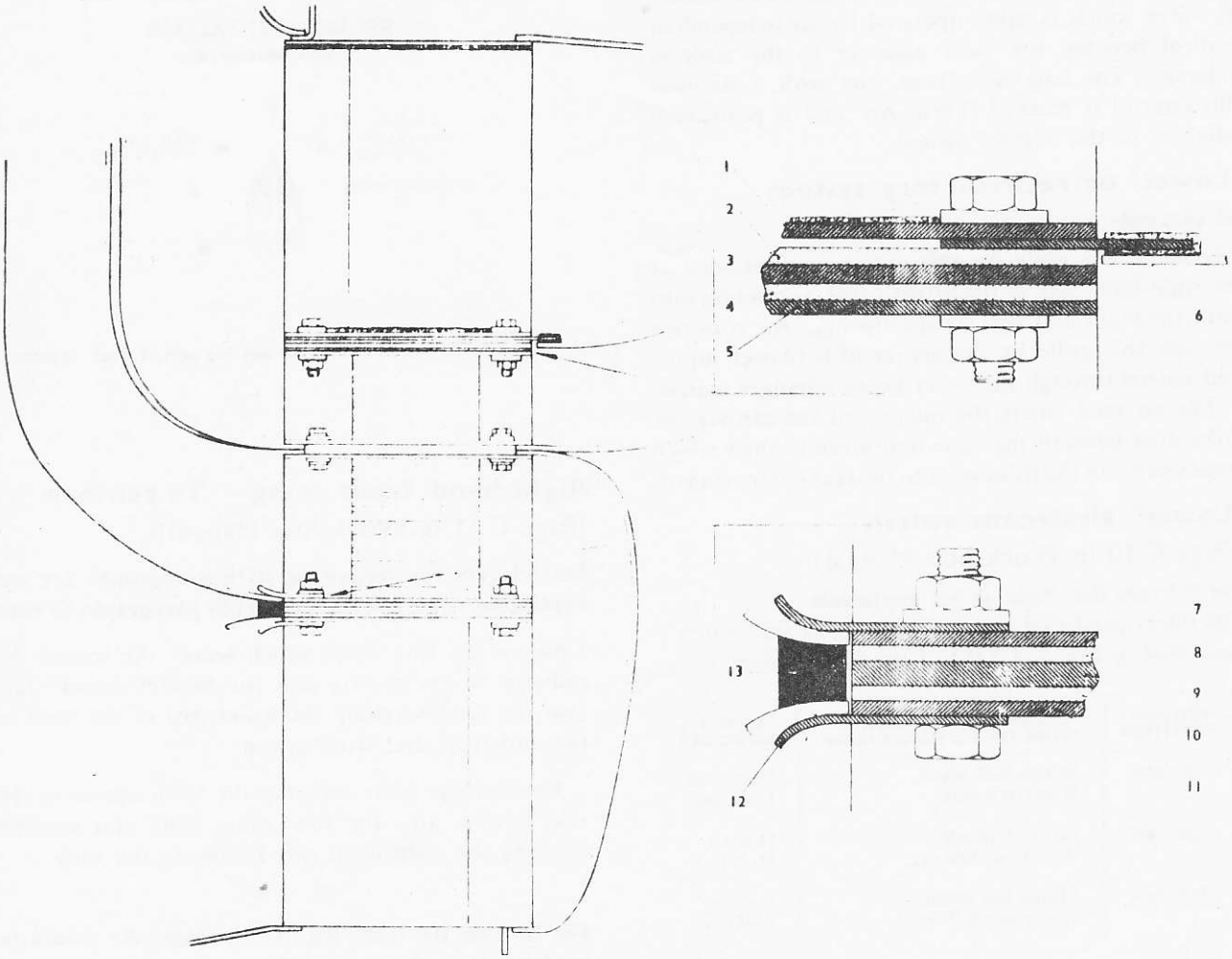

Fig. C4 (S) Sectional view of heating unit

1 UPPER (DUMMY) EVAPORATOR
2 FEROBESTOS PACKING PIECE
3 UPPER SUPPORT BRACKET
4 FEROBESTOS PACKING PIECE
5 UPPER HEATER MATRIX
6 FELTED PACKING STRIP
7 LOWER HEATER MATRIX
8 FEROBESTOS PACKING PIECE
9 LOWER SUPPORT BRACKET
10 FEROBESTOS PACKING PIECE
11 LOWER (DUMMY) EVAPORATOR
12 RETAINER PLATE
13 RUBBER SEALING STRIP

Underwing unit — To dismantle
(Page C 11 in Workshop Manual)

For S3 cars the third paragraph to read

Remove the eighteen nuts, bolts and washers securing the four sections of the matrix block together; separate the sections and retain the packing strips and brackets held between them.

Underwing unit — To assemble
(Page C 13 in Workshop Manual)

S3 cars only

Fit the 'Ferobestos' packing piece between the 'Upper' and 'Lower' matrices, positioning the 'Upper' matrix so that the outlet or straighter of the two pipes face

towards the valance plate; then using six nuts, bolts and twelve plain and 'Ferobestos' washers bolt the two matrices together as shown in Figure C4 (S) of this Supplement.

Continue to assemble the heating unit, following the procedure described on page C13 in Workshop Manual.

For S3 cars the first to fourth paragraphs to read

Fit the main support brackets to the heater matrix block, fitting one of the thinner 'Ferobestos' packing pieces between the upper support bracket and the matrix block, and another one between the lower support bracket and matrix block. The upper bracket is the one with the larger flange.

Fit the upper 'dummy' evaporator above the matrix and bracket placing a thin 'Ferobestos' packing between the evaporator and the bracket. Ensure that the diagonal stiffener of the upper 'dummy' evaporator is to the rear of the assembly as shown in Figure C4 (S) of this Supplement. Refit the felt covered sealing strip between the evaporator and the 'Ferobestos' packing pieces as shown in Figure C4 (S) of this Supplement. If a new felted strip is fitted, the outer edge must be trimmed to fit the ducting; then using six $\frac{1}{4}$ in. nuts, bolts and plain washers, bolt the assembly together.

Repeat the above procedure with the lower 'dummy' evaporator noting that in this case the diagonal stiffener must be to the front of the assembly. Two 'Ferobestos' packing pieces are used, one each side of the mounting bracket, and in addition two curved plates are bolted along the lower edge of the matrix to locate and secure the rear ducting as shown in Figure C4 (S) of this Supplement.

Attach the three ducts to the rear of the matrix block, fitting the edges of the ducts into the slots formed in the matrix block. Coat the adjacent surfaces of the lower two ducts with Bostik adhesive, then press a $9\frac{3}{4}$ in. length of rubber sealing strip between them to wedge the ducts into position.

For S3 cars the eighth paragraph to read

Fit the forward pair of ducts to the matrix block, ensuring that the lower edge of the upper duct and the upper edge of the lower duct fit into the slot formed in the matrix block. Secure the ducting to the matrix block with self-tapping screws and reinforcement strips.

Underwing unit — To fit

(Page C 13 in Workshop Manual)

For S3 cars the following two paragraphs should be read in place of the fourth.

Connnect the coolant hoses to the pipes of the heater matrices; the hose from the water tap on the right-hand valance should be connected to the lower pipe on the 'Lower' heater matrix. The hose from the water tap on the left-hand valance should be connected to the 'Upper' heater matrix. The 'Upper' heater matrix return pipe is connected to the matrix inside the engine compartment.

Secure the hoses with worm drive clips. When fitting the clips, position the screwdriver slots so that when the wing is in position, it will be possible to remove the heater hoses.

ACTUATORS

Description

(Page C 15 in Workshop Manual)

For S3 cars the fifth paragraph to read

The water tap actuators are situated low down, at the forward end of both the left and right-hand valance plates. Figure C18 in the Workshop Manual shows the water tap which is situated on the right-hand valance and controls the flow of hot coolant to the 'Lower' heater matrix.

Actuators — To adjust

(Page C 15 in Workshop Manual)

For S3 cars the fourth to eighth instructions inclusive are not applicable.

Evaporator flap (Upper) actuator — To adjust

(Page C 16 in Workshop Manual)

S3 cars only

1 Push the extension spindle fully 'home' into the flap coupling tube, then tighten the pinch bolt securing the crank lever to the extension spindle.

2 Withdraw the extension spindle and crank lever about $\frac{1}{16}$ in., then tighten the grubscrews securing the collar against the end face of the spindle bearing tube.

3 Remove the crank lever from the actuator gear shaft and check that the extension spindle is free to rotate through 90°. Any movement through more than 90 indicates that the flap coupling tube is not engaged with the extension spindle dogs and requires rectification.

4 Switch on the ignition and turn the 'Upper' and 'Lower' switches to their off positions. Allow approximately 30 seconds for the actuator to return to the fully closed position.

5 Position the actuator crank lever so that it points to the No. 1 position on the actuator motor casing, then tighten the pinch bolt.

6 Slacken the pinch bolt securing the crank lever on the flap extension spindle. Turn the extension spindle anti-clockwise (when viewed over the left-hand wing) to close the flap valve. With the flap valve held closed, adjust the position of the extension spindle crank lever so that the link arm between the two crank levers can just be fitted under slight tension. Fit new split pins on the link arms.

Heater flap (Lower) actuator
To adjust
(Page C 16 in Workshop Manual)

S3 cars only

Repeat the operations 1–4 as described for the evaporator flap.

5 Position the actuator crank lever so that it points to the No. 3 position on the actuator motor casing. Tighten the pinch bolt.

6 Slacken the pinch bolt securing the crank lever on the flap extension spindle. Turn the extension spindle clockwise (when viewed over the left-hand wing) to close the flap valve. With the flap valve held closed, adjust the position of the extension spindle crank lever so that the link arm between the crank levers can just be fitted under slight tension. Fit new split pins on the link arms.

Water tap opening — To check

S3 cars only

To ascertain that the water taps are closed, turn both the 'Upper' and 'Lower' airstream switches to either the 'Off' or one of the anti-clockwise positions, wait 30 seconds to allow the actuator motor to operate and then return the switches to the 'Off' position. Before continuing the check, allow sufficient time for the coolant in the heater matrices to cool; to facilitate this turn both the 'Upper' and 'Lower' airstream switches to the second anti-clockwise position, withdrawing the 'Upper' airstream switch to its full extent. This action causes the blower motor to operate, thereby cooling the heater matrices. After a sufficient time period return the switches to their 'Off' position.

If the taps are closed and the engine is warm, the three pipes which lead to the heater matrices under the right-hand front wing should be cold; if one of the taps is leaking then the pipes will be warm. The pipe which is connected to the 'Upper' heater matrix is in turn connected to the water tap on the left-hand valance. The two pipes connected to the 'Lower' heater matrix are in turn connected to the water tap on the right-hand valance.

If the pipes are warm, adjust each water tap in turn using the following procedure.

'Lower' water tap — To check

S3 cars only

1 Drain the coolant into a suitable container, or disconnect the two pipes connected to the water tap on the right-hand valance and plug them with suitable wooden pegs to prevent any loss of coolant.

2 Close the water tap by turning the 'Lower' air-stream switch anti-clockwise and waiting 30 seconds, then turn the switch back to the 'Off' position.

3 If the coolant has been drained, disconnect the two hoses to the water tap. Remove the four bolts securing the tap and actuator motor to the wing valance, then lift out the tap.

4 Check whether the tap is open or closed by passing air through the tap from the inlet side.

5 If the tap is not properly closed, slacken the clamping bolt on the actuator and push the tap lever to the closed position. Hold the lever in the closed position and tighten the clamping bolt.

6 Check the functioning of the tap, and if correct, fit the tap and actuator motor on the wing valance.

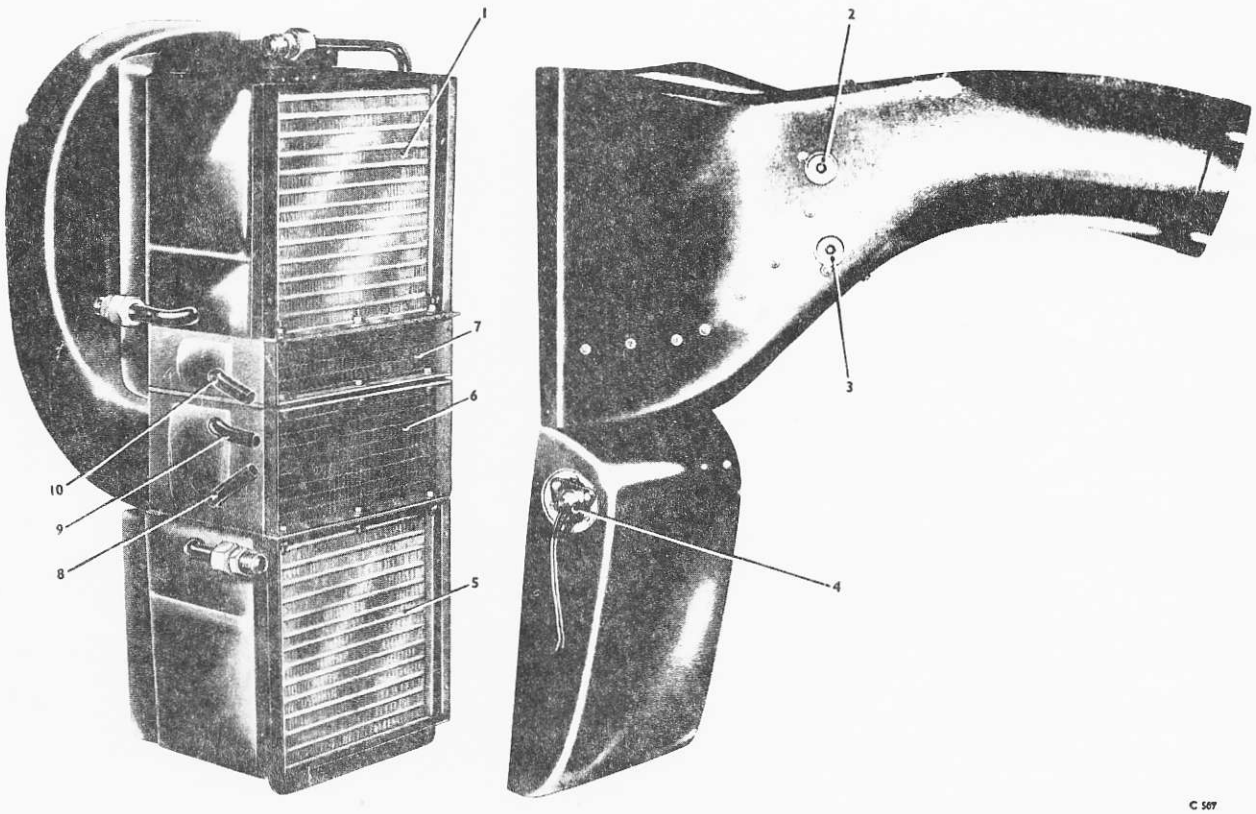

Fig. C5 (S) Access to matrices

1 UPPER EVAPORATOR MATRIX
2 COLD FLAP SPINDLE
3 HOT FLAP SPINDLE
4 THERMOSTATIC SWITCH
5 LOWER EVAPORATOR MATRIX
6 LOWER HEATER MATRIX
7 UPPER HEATER MATRIX
8 LOWER HEATER MATRIX INLET
9 LOWER HEATER MATRIX OUTLET
10 UPPER HEATER MATRIX INLET

'Upper' water tap — To check

S3 cars only

Repeat the operations described for the 'Lower' water tap, noting that the 'Upper' airstream switch controls the 'Upper' tap actuator and that the tap and actuator motor are mounted low down at the forward end of the left-hand valance plate.

Figures C13, C14, C15 and C16 in the Workshop Manual are not applicable to the S3 Air Conditioning Unit.

The remaining information in this Section which applies to S2 cars is also applicable to S3 cars.