

Section C8

**Detailed circuit description
and operation
Contents**

	Page
Interlock and Inhibit circuit	C8 - 3
A.C.U. function switch	C8 - 4
Temperature selectors	C8 - 5
Servos	C8 - 5
Servo modules	C8 - 6
Recirculation actuators	C8 - 6
Lower quantity actuator	C8 - 8
Mode actuator	C8 - 9
Voltage stabiliser	C8 - 9
Fan speed module	C8 - 10

Section C8

Detailed circuit description and operation

Interlock and Inhibit circuits

Interlock circuit

The wiring diagram is shown in Figure C22.

Both the fan and compressor, and the servo circuits are fed from the fan and compressor fuse. The fan and compressor feeds are switched by the fan and compressor relay and the servo feed is taken from the fan and compressor feed but via the servo isolation relay. Therefore the fans and compressor are switched on when the fan and compressor relay is energised, and the servos are switched on when the fan and compressor relay is energised and the servo isolation relay is not energised. The yellow/black switched fan feeds are taken from C1 on the fan and compressor relay, through toeboard socket E and then directly to the fan speed module. A yellow/black switched feed is taken from C2 on the servo isolation relay to the compressor thermostat and then to the compressor clutch. The contacts on the compressor thermostat break when the ambient temperature falls below 0 °C. The compressor clutch is earthed via the fan delay relay, the 14 blue/purple switched earth line running from the compressor clutch, through toeboard socket D and then to the fan delay relay. Thus the compressor clutch is engaged when the fan and compressor relay is energised, the fan delay relay is not energised, and the ambient temperature is above 0 °C. The switched feed to the servos is taken by the pink wire from C3 on the servo isolation relay, through toeboard socket D and then directly to the servos. A pink wire is looped from the servos to feed the voltage stabiliser module.

The coils which operate the fan and compressor relay and the servo isolation relay are fed by the A.C.U. fuse. To achieve the required switching combinations both the live and earth sides of both these relay coils are switched as described below.

The fan and compressor relay is energised when the ignition is switched on, except when the A.C.U. function switch is 'OFF' and or when the engine is cranking. This is achieved by feeding the relay coil via the A.C.U. function switch, and earthing it through the starter motor. The starter motor provides a low resistance earth path at all times except when the motor is fed with 12 volts which neutralises the feed to the fan and compressor relay coil causing it to become de-energised. The feed to the A.C.U. function switch is taken from the A.C.U. fuse by the red/brown wire. The switched feed to the fan and compressor relay coil is taken from the A.C.U. function switch by the brown/

pink wire, through toeboard socket D to the relay coil. This brown/pink wire is live for all A.C.U. function switch positions except 'OFF'. The earth line for this relay coil is the brown/blue wire which is routed directly from the relay coil to the starter motor.

The servo isolation relay is energised when the ignition and the A.C.U. are switched on and the oil pressure transmitter contacts are closed, that is, when there is no oil pressure. The live feed to the relay coil is switched by the A.C.U. function switch, the brown/pink switched feed being taken from the switch at the same point as the feed to the fan and compressor relay. However, this feed to the servo isolation relay is routed via a diode in the A.C.U. diode board and is brought out on the white/blue wire, through toeboard socket D, to the servo isolation relay coil. The white/brown earth line for this relay is taken to the pressure transmitter via toeboard socket F, the wire being fed into the car at this point and then to the oil pressure warning lamp switch.

The sequence of events for the interlock circuits is that when the ignition is switched on, and if the A.C.U. function switch is at 'LOW', 'AUTO', 'HIGH' or 'DEF', the fan and compressor relay is energised and so supplies a feed to the fan speed module, the compressor clutch and the servo isolation relay.

The servo isolation relay is also energised due to the lack of an oil pressure signal and so the feed to the servos is broken by this relay. Whilst the engine is being cranked the fan and compressor relay becomes de-energised, thus breaking the feed to the fan speed module, the compressor clutch and the servo isolation relay. Thus, even if oil pressure builds up during cranking and the servo isolation relay becomes de-energised, there will be no feed to the servos because it has been broken by the fan and compressor relay. Although the fan speed module was receiving a live feed when the ignition was first switched on, the fans will not operate due to the action of the inhibit circuits.

The purpose of routing the switched feed to the servo isolation relay through a diode is to prevent the oil warning light from finding an earth path through the servo isolation relay coil and then through the fan and compressor relay coil to earth through the starter motor, when the A.C.U. function switch is at 'OFF'. Therefore if this diode has failed and is short-circuit, the oil pressure warning light will glow dimly when the A.C.U. is switched off. The symptoms of an open-circuit failure of this

diode are more obvious.

It can be seen therefore, that under normal working conditions the engine of the car must be running before any A.C.U. checks can be carried out. If this is not convenient the oil pressure transmitter can be disconnected by removing the white/brown wire. The A.C.U. circuits will then operate as soon as the ignition is switched on.

Inhibit circuits

The wiring diagram is shown in Figure C23.

The inhibit circuits are used to hold off the fans and compressor for a number of required temporary periods by means other than switching off their voltage supplies. The fans and compressor are held off for three conditions:- when the ignition is first switched on before the engine has been started; when the coolant temperature is below 44 °C. and the system is in the screen mode and so demanding hot air, and also when the system is in the screen mode and the lower quantity flap is in any position other than fully open, regardless of coolant temperature. Both the fans and compressor are held off for these periods by the fan module switch off relay. This relay has its moving contact, C2, connected to earth and its normally closed contact, C3 is connected by the blue/purple wire to the compressor clutch, via toeboard socket D. The normally open contact C1 is connected by the blue/black wire to the fan speed module. When this blue/black wire is connected to earth it holds off the output transistor in the fan speed module which then prevents the fans from being switched on. Therefore when the fan module switch off relay is not energised the compressor clutch is earthed by the relay and can operate normally and the blue/black wire to the fan speed module is open-circuit thus enabling the fans to be switched on. When the relay is energised the earth line to the compressor clutch is interrupted, preventing it from becoming engaged and the fan module is earthed so holding off the fans. The fan module switch off relay coil receives a switched live feed on the brown/pink wire from the A.C.U. function switch and so is live when the ignition is switched on and the switch is at any position other than OFF. The coil of the fan module switch off relay has two possible routes to earth. One earth path is the yellow/pink wire, through the A.C.U. diode board and then via the white/brown wire through toeboard socket F to the oil pressure transmitter to earth. The relay is energised using this earth route when the ignition and the A.C.U. are switched on and there is no oil pressure. This is how the fans and compressor are inhibited when the ignition is first switched on before starting the engine. The second earth route is the yellow/pink wire, through toeboard socket D to the fan delay relay. If the fan delay relay is energised, the fan module switch off relay is then earthed on the yellow/green wire either by the lower quantity flap micro-switch, via toe-

board socket D or by the fan delay thermostat via toeboard socket D, and the A.C.U. diode board where the earth line emerges on the yellow/brown wire, and back through toeboard socket D. Thus this second earth route can only operate the fan module switch off relay when the fan delay relay is energised.

This relay is energised when the A.C.U. is operating in the screen mode except when 'DEF' has been selected. The feed to the fan delay relay is switched by the 25% mode change micro-switch in the upper servo. When the mode is to screen, the orange/purple wire from the upper servo is live and this feeds the fan delay relay via the A.C.U. diode board and the yellow wire which is routed through toeboard socket D. The fan delay relay coil is earthed by the orange wire through toeboard socket E to the A.C.U. function switch. This line is earthed for all switch positions except 'DEF'. This second earth route for the fan module switch off relay provides the necessary signal to hold off the fans and compressor when the coolant is below 44 °C. and the mode is to the screen, and when the lower quantity flap is not fully open when the mode is to screen. This circuit also prevents the fans from being held off when 'DEF' has been selected.

The reason for the lower quantity flap micro-switch inhibiting the fans is to initiate a fixed sequence of events when the fan delay thermostat operates, as a further refinement to the system. When the coolant temperature is below 44 °C. and the fan delay thermostat is shorting the yellow/brown wire to earth not only are the fans and compressor inhibited but the lower quantity relay is also held closed. Thus when the coolant temperature exceeds 44 °C. and the contacts on the fan delay thermostat open, the fans do not start immediately due to this being inhibited by the lower quantity flap micro-switch. However, when the thermostat does operate the lower quantity flap begins to open and when fully open it engages with the lower quantity flap micro-switch which starts the fans and engages the compressor clutch. The fans do not operate until the lower quantity flap is open to stop the effects of the fans starting up and causing a sudden surge of airflow to the upper system whilst the lower quantity flap is opening. The circuit controlling the lower quantity actuator will be described later.

The diode between the white/brown and yellow/pink wires is to prevent the oil pressure warning lamp from finding an earth through the fan module switch off relay coil and the fan and compressor relay coil, through the starter motor. If this diode has failed short-circuit, the oil pressure warning light will glow dimly when the A.C.U. is switched off.

A.C.U. function switch

The A.C.U. switch has two double wafers, connected by 10 flying leads into the A.C.U. loom behind the instrument board. Therefore this switch

can be completely disconnected locally making replacement a simple operation. A chart giving details of which wires are joined to which for all switch positions is shown in Figure C49. It is not recommended that the first procedure for suspected faulty switch operation is to check the switch in accordance with this chart unless the instrument board trim has already been removed as it is quite possible that the fault is in the inter-connections and associated components connected to the switch and these can be checked by removing far less trim.

Temperature selectors

These are two 10K Ω logarithmic potentiometers mounted on the instrument board, the upper potentiometer is inverse logarithmic and the lower is logarithmic, each potentiometer is shunted by a fixed resistance. If the potentiometers are disconnected from the A.C.U. loom, the resistance of the upper one should be between 370 Ω and 150 Ω and the lower one between 440 Ω and 190 Ω , both measured with the knobs in mid-position.

Temperature flap servos

The temperature flap servos are each driven by a small D.C. motor which drives a large gearwheel on the servo output shaft through a reduction gearbox.

The temperature flap levers are connected to the output shaft by means of a spring which is strong enough to operate the temperature flaps, but allows the servos to continue to rotate when the flap levers are restrained by stops, to give a characteristic as shown in Figures C55 and C56. This controlled

servo overtravel is designed to make in-car temperatures have a linear relationship to servo angular position. On the lower servo, this overtravel occurs on heating, where the in-car temperature increases after the flap is at full hot due to the servo still opening the water tap and increasing the fan speed. The overtravel occurs on the upper servo on cooling, where the temperature flap is moved to full cold before the servo is at full cold and extra cooling effort is obtained solely by the servo increasing the fan speed.

Two small gearwheels are driven by the gearwheel on each servo output shaft which drive two potentiometers, a fan speed potentiometer and a servo position potentiometer. The servo position potentiometers are each connected to their relative servo modules and the fan speed potentiometers are connected in parallel and then to the fan speed module. Also connected to the servo output shaft is a nylon disc which has two sets of cams moulded into it; microswitches are positioned to engage with these cams to be operated at particular servo angular positions. The upper servo is fitted with four micro-switches but the lower servo only has two. Two of the micro-switches on each servo are used as limit switches so that the electrically driven servo motors are switched off at the required extremes of servo travel. The remaining two micro-switches on the upper servo are used to switch relays or actuators associated with the A.C.U. system. One switch operates at 15% servo travel and is used to signal the lower quantity actuator, the other switch operates at 25% servo travel and signals the facia/screen mode actuator.

The output shaft of the lower servo is used

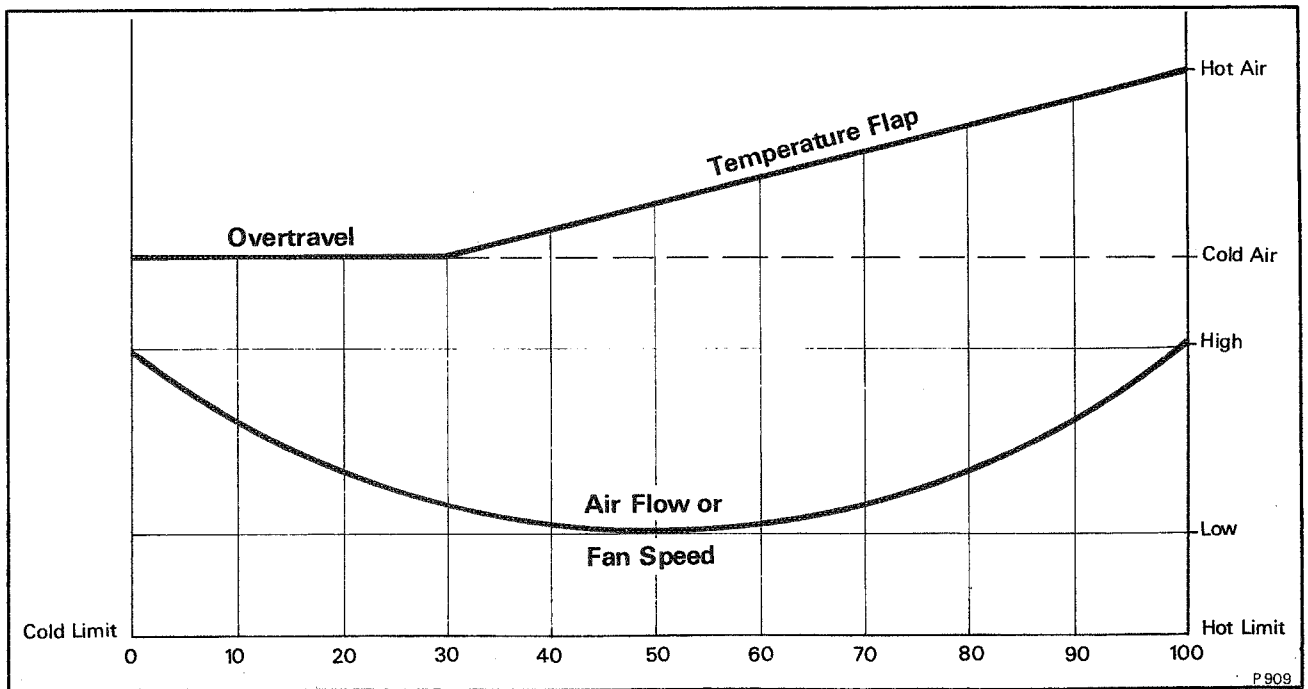


Fig. C55 Servo operation - upper system

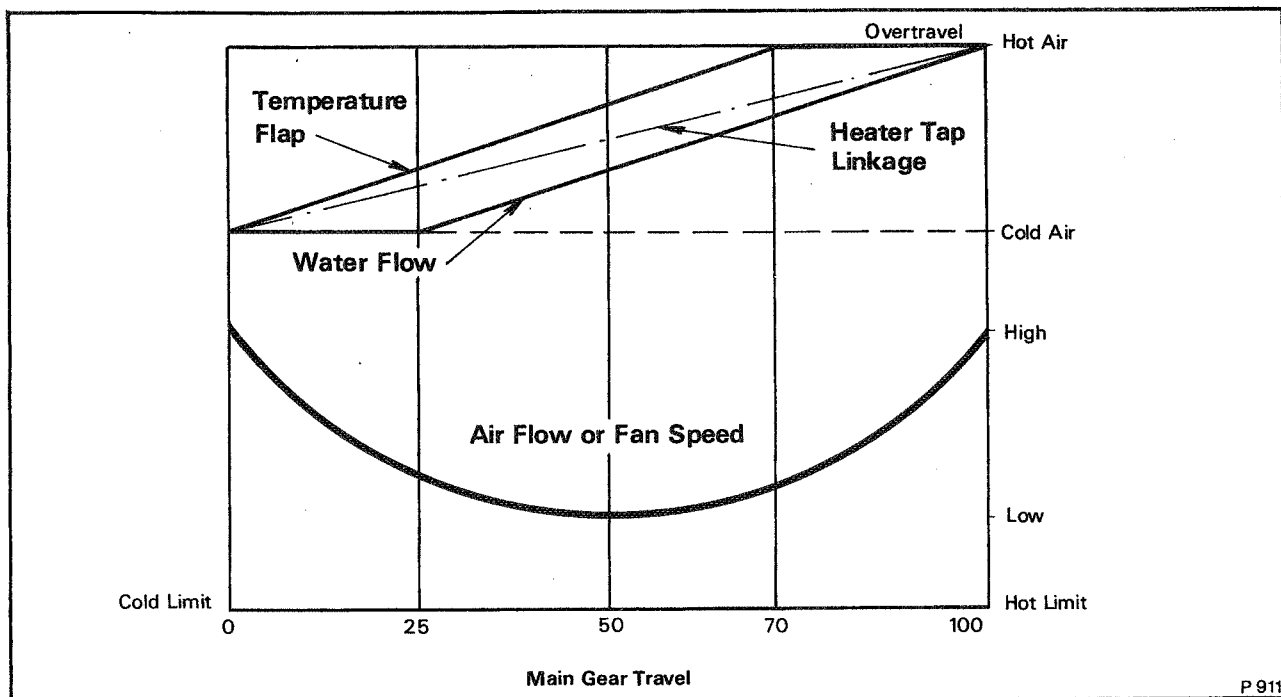


Fig. C56 Servo operation - lower system

to operate the water tap, but the output shaft of the upper servo is not used to perform any external function. The potentiometers and micro-switches in the servos have been set up very carefully using specialist test equipment. Therefore it is inadvisable to dismantle any part of the servo mechanism as these settings will invariably be altered. Not only will this cause the servo not to operate satisfactorily but it could easily be damaged by potentiometers being forced past their mechanical stops or the flap lever stalling the servo by fouling the servo mechanism due to incorrect setting of the limit switches.

The servo motor used is a small permanent magnet D.C. unit, which is bi-directional depending upon the polarity of its supply voltage. It will be seen from Figure C57 that when RL1 is energised point A is at earth potential and point B is at +7 volts but when RL2 is energised point B is at earth potential and point A is at +7 volts. The relay control circuits are so designed that only one relay at a time can be energised. Thus when RL1 is energised the servo moves in the cold direction, the supply being broken when the servo reaches the cold limit micro-switch. When RL2 is energised the servo moves in the hot direction, the supply being broken when the servo reaches the hot limit micro-switch. In order to prevent a P.M. motor from running on once the supply is cut off, the armature must be shorted out to provide dynamic braking. Figure C57 shows that dynamic braking is provided by the relay contacts and the limit switch contacts. In the interests of current economy, the

stabiliser circuit is switched on only when the servo motor is running. This is done by means of the two current routing diodes D1 and D2. Thus when RL1 is energised, the relay contacts carry both the motor current plus the Zener diode bleed current.

Servo modules

A faulty servo module is difficult to diagnose on the car. If possible a servo module test box should always be used. If this is not available a servo module fault should normally be checked by substitution. As a faulty servo module will almost certainly result in the servo not operating it is recommended that fault flow chart 1 is followed.

Recirculation actuators

The two recirculation actuators are connected in parallel through two diodes to prevent them from running on by one actuator feeding the other. It is normal for the right-hand actuator to sometimes turn through two revolutions. The two actuators are fed from the recirculation relay, the centre contact C2 being fed directly from fuse number 3. The relay winding is fed from the same fuse but is switched by the A.C.U. switch such that W2 is live for all switch positions except off. The relay winding is earthed through an in-line diode and the upper servo cold limit micro-switch. This earth path is broken only when the upper servo moves to full cold. To check the operation of this switch it is essential to be positive that the servo has moved to full cold and has operated the limit switch. This is

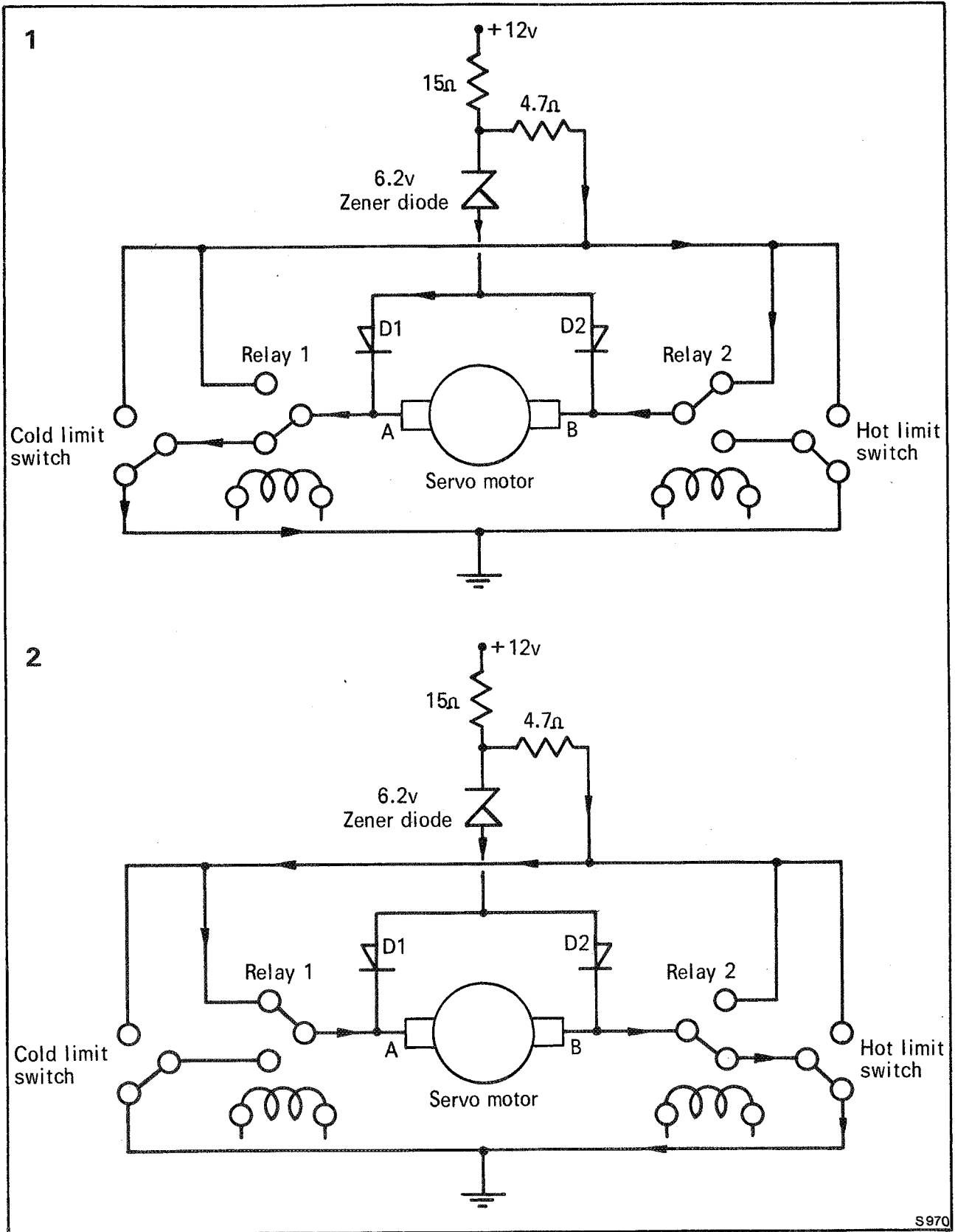


Fig. C57 Servo motor circuits

1 Servo moves to 'Full cold'

2 Servo moves to 'Full hot'

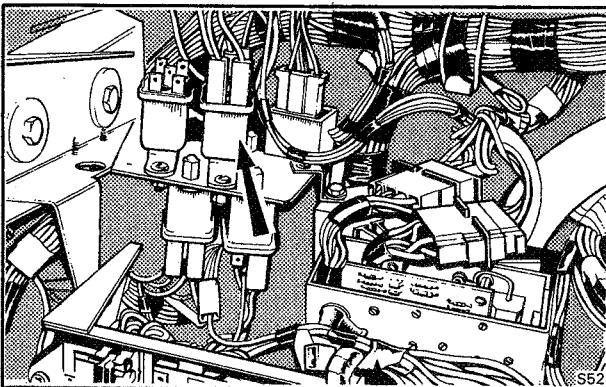
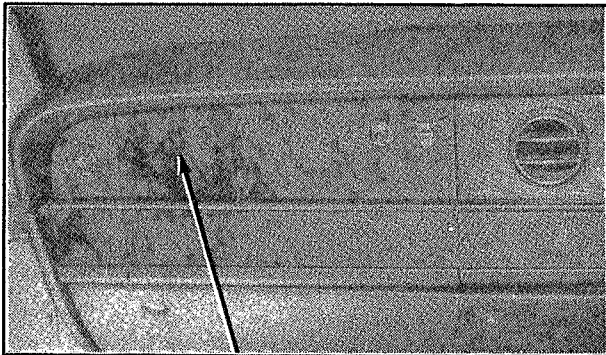


Fig. C58 Recirculation relay
Right-hand drive cars

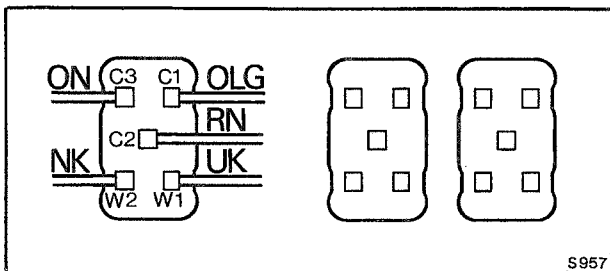


Fig. C59 Recirculation relay
Left-hand drive cars

most easily achieved by using the A.C.U. test box. N.B. It is by no means true to say that the servo will always move to full cold when minimum temperature has been selected.

When the cold limit switch has operated, the blue/pink wire becomes live and the purpose of the in-line diode is to prevent this voltage from being fed back along the brown/pink wire through the relay coil as it is possible for this to latch in any of the other relays being fed from this line.

Lower quantity actuator

The lower quantity actuator is operated primarily by the upper servo 15% micro-switch such that the quantity actuator is closed on the cold side of 15% and open on the hot side. However this is complicated by two overriding conditions. The lower quantity flap is always closed when 'DEF' is selected on the A.C.U. function switch, or when the coolant temperature is below 44 °C. Therefore fault finding is simplified by ensuring that neither of these overriding conditions exists. Check therefore that the A.C.U. switch is not at 'DEF' and disconnect the yellow/brown wire on the fan delay thermostat to simulate the coolant being warm. (Obviously if the coolant is warm and disconnecting this yellow/brown wires cures the trouble then the thermostat is faulty). With the aid of an A.C.U. test box, motor the upper servo to full hot where the lower quantity flap should be in the open position. A positive feed should now be present at the orange/white wire to the lower quantity actuator, having been fed from the pink feed into the servos, through the upper servo 15% micro-switch, out to the A.C.U. function switch, through the lower quantity relay which should not be energised, and finally through the A.C.U. diode board. The feed to the servos via the pink wire is fed from the servo isolation relay. If the pink wire is not live, see Interlock circuits.

Motor the upper servo to full cold where the 15% micro-switch should have changed over to feed the green/pink wire to the lower quantity actuator, which should make the actuator run to the closed position.

If 'DEF' is selected, the orange/white actuator feed is broken by the A.C.U. function switch, and a new supply is fed directly from the A.C.U. fuse by the A.C.U. function switch, via the diode board to the actuator feed which drives the actuator to the closed position.

If the A.C.U. function switch is at 'LOW', 'AUTO' or 'HIGH', the upper servo is on the hot side of 15%, and the coolant temperature is above 44 °C. (i.e. the yellow/brown wire is not being earthed) the lower quantity flap should be open as described previously. However, if the coolant is cold (i.e. the yellow/brown wire is connected to earth) the lower quantity relay should be energised, joining C1 to C2. Thus the 15% micro-switch signal will be overridden and the closed contact of the lower quantity actuator will be fed from C1 on the lower

quantity relay.

A diode between the orange/white and blue/white cables prevents the lower quantity relay contacts being fed from the lower quantity actuator when it is travelling towards the closed position. Such a feed would cause the lower quantity relay to vibrate continuously as the coil would be fed through its own contacts. A diode between the normally open contacts of the lower quantity relay and the green/pink cable of the actuator prevents the lower quantity relay coil from being fed through its own normally open contacts. A feed back to C1 would cause the relay to latch in once the coil had been energised.

The diode between the A.C.U. switch and the green/pink cable to the upper servo prevents a feed from the servo, which is not ignition switched, from being fed back to the A.C.U. fuse when 'DEF' has been selected. If this were permitted to occur the A.C.U. circuits would feed into the ignition switched circuits and it would be impossible to switch off the engine when operated on 'DEF'.

The fan delay thermostat and the lower quantity flap microswitch inhibit the fans but the lower quantity relay must only be energised by the thermostat therefore a diode is inserted between the yellow/brown cable of the relay and the yellow/green cable of the microswitch.

Mode actuator

The mode actuator is controlled by the upper servo 25% micro-switch which is fed by the pink wire from the servo isolation relay and if this is not live the interlock circuits are at fault. When the upper servo is to the cold side of 25% servo position the micro-switch gives a feed to the orange/blue wire which is connected directly to the mode actuator. Thus the mode flap is driven to the facia position. When the servo is to the hot side of 25% servo position the orange/purple becomes live which is fed to the A.C.U. diode board and emerges on the orange/red wire which drives the mode actuator to screen. These are the only circuits which control the mode actuator, there being no overriding circuits, however the upper servo 25% micro-switch is used to command other functions.

The diode between the orange/red and orange/purple cable prevents the mode actuator from feeding the fan delay relay whilst it is being driven to the facia position.

Voltage stabiliser

This is the unit which supplies the 9.1V supply to the servo modules and the two 7.0V supplies to the servo motors. The circuit diagram is shown in Figure C60. The three stabilised voltages are obtained from three independent zener diode networks, all of which obtain their unstabilised 12 volt supply from the pink wire which is fed from the servo isolation relay via toeboard socket D and the servo connections. The 9.1V volt servo module supply

consists of a simple divider network comprising a 15 Ω resistor and 9.1 volt zener diode. The resistor is fed from the pink wire and is connected in series with the diode which is earthed by the black/pink wire and then through the black wire to the L.H. A post earth point. The pink/red 9.1 volt line is taken from the junction of the resistor and diode, the voltage remaining constant across the diode by leaking varying amounts of current to earth such that the unstabilised portion of the supply voltage is developed across the resistor. This 9.1 volt line is tested by the A.C.U. test box, if the test box reading is between 86 and 96 the circuit is correct.

A reading in excess of 100 indicates that the circuit is not stabilising due either to the earth line being open-circuit or the zener diode itself being faulty. A reading of zero can be due to either an open or short-circuit in any of the stabiliser connections. A short-circuit in the pink/red wire will not damage the stabiliser and a short-circuit in the pink wire will blow the fan and compressor fuse. It is also worthwhile to check the servo earth as the module may be operating correctly but the test box may not be finding an earth through the servo earth.

The 7.0 volt supplies are identical to each other and independently serve the two servo motors. These supplies cannot be tested using the A.C.U. test box and so a fault can be difficult to diagnose. If one or both of these supplies are faulty then almost certainly the relative servo will either not run, or run much too quickly. If a servo will not run the first action should be to follow fault flow chart C42 as this will eliminate all other possible causes of servo failure. If servo power supplies are then shown to be the cause of the fault, proceed as follows:-

Lower servo power supply

The 12 volt unstabilised supply is the pink wire which is fed from the fan and compressor fuse. The stabiliser consists of a 15 Ω resistor, fed from the pink wire, in series with a 6.2 volt zener diode. The diode has two alternative earth paths, through D1 or D2 which are switched by the servo module. Thus the pink/black and pink/brown wires from these diodes are routed to the lower servo module.

The module connects either one of these wires to earth, via the relays on the servo module to the tunnel earth point, depending upon the direction of servo travel. The stabilised 7.0 volt line is brought out from the junction of the 15 Ω resistor and zener diode, through a 4.7 Ω current limiting resistor to the pink/light green wire which is taken to the lower servo module. The current limiting resistor prevents the servo motor from burning out if it becomes mechanically stalled. To test the stabiliser, disconnect the 9 way plug and socket and connect a 12V feed to the pink wire and connect the black/pink to 0V. Now connect a voltmeter across the pink/light green and black/pink wires and the

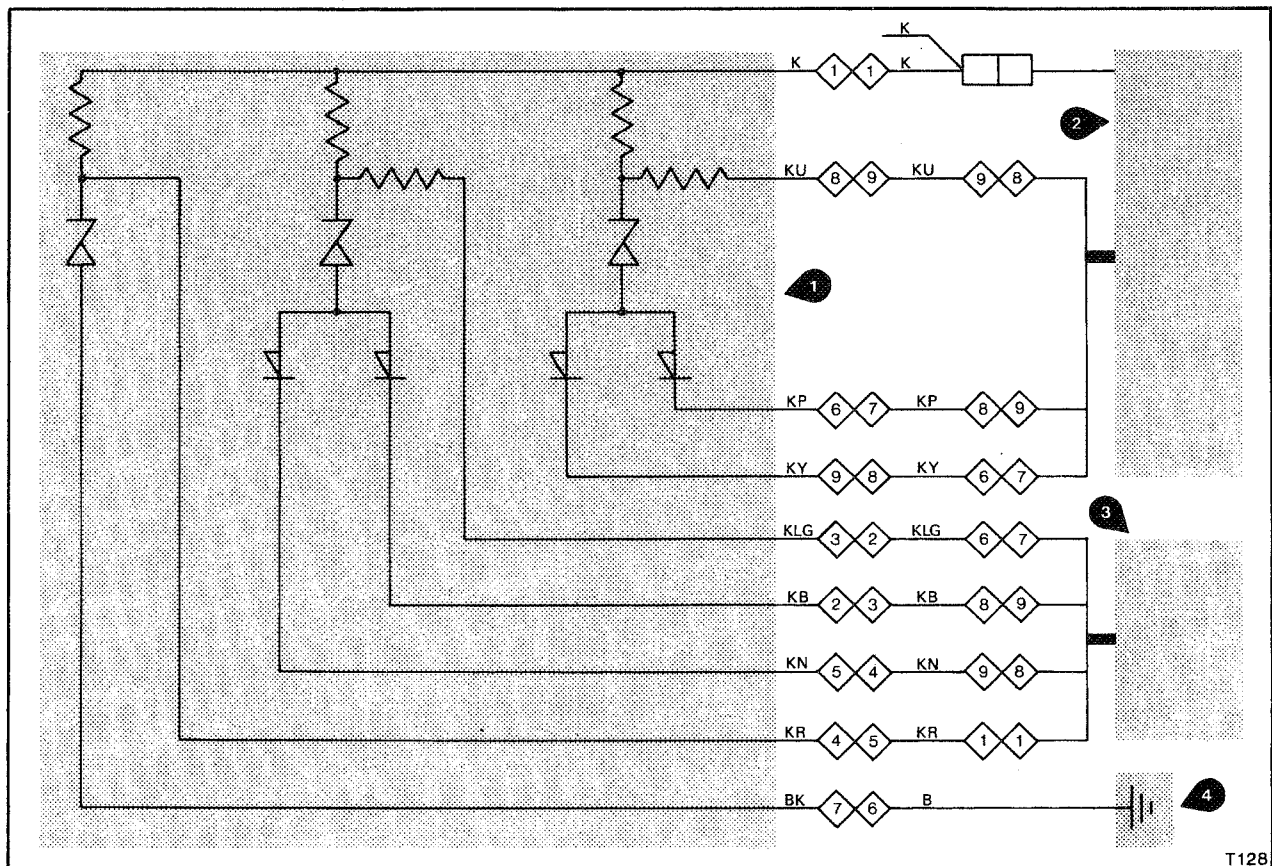


Fig. C60 Voltage stabiliser - Schematic diagram

- 1 Voltage stabiliser
2 Upper servo

- 3 Lower servo
4 Left-hand 'A' post earth

reading should be 12 volts. Next connect the pink/black wire to the black/pink and the reading should fall to $7.0V \pm 0.5V$. Disconnect the pink/black wire and connect the pink/brown wire to the black/pink wire and the reading should fall to $7.0V \pm 0.5V$. With a 12Ω resistor connected as a load across the voltmeter repeat the two tests, and in this mode neither voltage reading should be less than 4.5 volts.

If any of these readings are incorrect the module is faulty and should be replaced.

Upper servo power supply

This is identical to the lower servo power supply

To test the stabiliser, disconnect the 9 way plug and socket and connect a 12 volt feed to the pink wire and connect the black/pink wire to 0V. Now connect a voltmeter between the pink/blue and black/pink wires and the reading should be 12 volts. Next connect the pink/purple wire to the black/pink and the reading should fall to $7.0V \pm 0.5V$.

Disconnect the pink/purple wire and connect the pink/yellow wire to the black/pink wire and the reading should fall to $7.0 \pm 0.5V$. With a 12Ω resistor connected across the voltmeter as a load, repeat the two tests, and in this mode neither

voltage reading should be less than 4.5 volts. If any of these readings are incorrect the module is faulty and should be replaced.

The stabiliser unit consists only of the U-shaped chassis with three large diodes mounted on it.

If the stabiliser unit is found to operate correctly and the fault persists, the loom connecting the module to the servos should be checked.

Fan speed module

Fan speed is controlled by an electronic circuit which supplies the fan motors with a positive going square wave at a frequency of 150 Hz at an amplitude of 12 volts. At this frequency the inertia of the fan motors is sufficient to integrate these pulses of energy such that the motors run smoothly at a speed relative to the mean power of the square wave. Speed is made variable by changing the shape of the square wave such that the ratio of time for which the motors are switched on, to the time for which they are switched off is varied, thus changing the mean power of the waveform.

The fan speed module consists of a waveform generator feeding a power switching circuit which drives the fan motors. The waveform generator, or switching circuit, used in the fan speed module can

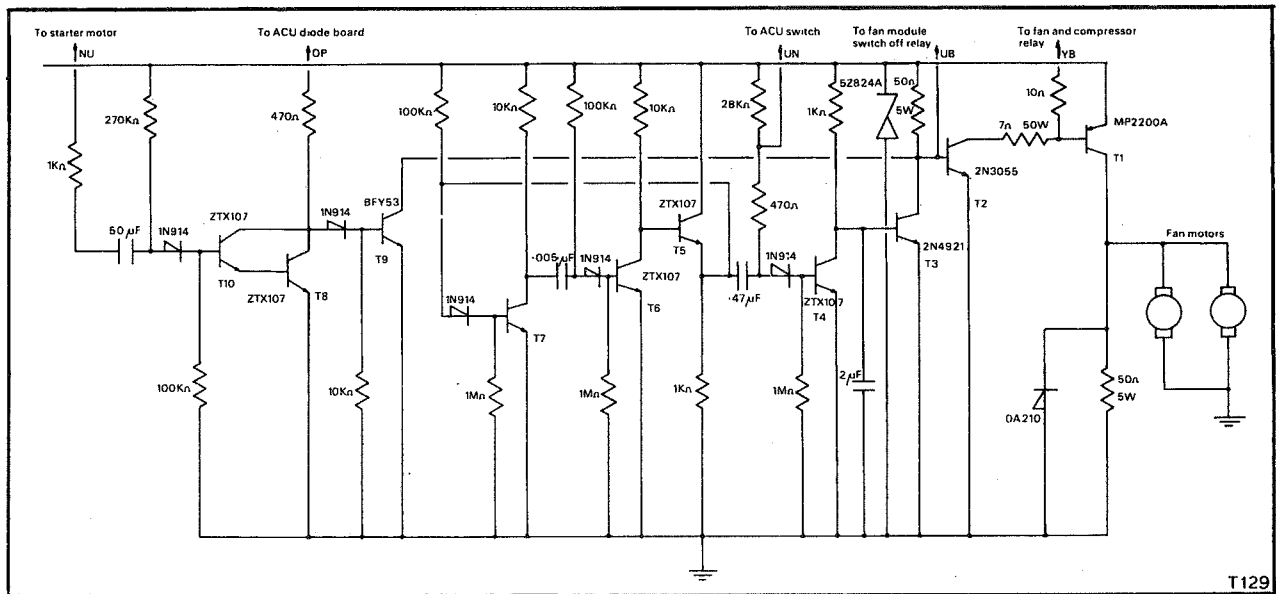


Fig. C61 Fan speed module - Theoretical diagram

change the percentage on-time from 20 to 100%, resulting in a speed variation of 1200 r.p.m. to maximum, which is in the region of 3,500 r.p.m. depending upon the supply voltage and the duct loading. At maximum fan speed, when the fans are switched on permanently, the volt-drop across the fan speed module is less than 1 volt and so power loss can be considered to be negligible.

The supply for the fan speed module is the 44 yellow/black wire which is fed from the fan and compressor fuse, via the fan and compressor relay and through toeboard socket E. (Thus the supply to the fan speed module is switched on when the fan and compressor relay is energised). The purpose of the yellow/black wire which runs in parallel with the 44 yellow/black wire is to reference the base connection of the output transistor to as low an impedance positive supply as possible to prevent thermal runaway in the output transistor. The two fan motors are fed by the 44 yellow/green wires, the feeds being routed separately from each fan motor, through the toeboard connections and back to the fan speed module. Although the fan speed module is protected by the fan and compressor fuse, a short on one of the 44 yellow/green wires can damage the output transistor, as it is quite possible for the transistor to blow more quickly than the fuse. Therefore it is essential that if it is suspected that a fan module is faulty, the 44 yellow/green lines must be tested for short-circuits before the module is replaced.

A connection to the base of T2 (see Fig. C61) is brought out of the module on the blue/black wire to facilitate fan inhibit. This wire is connected to the fan module switch off relay and the fans should be inhibited when this relay is energised. If the fans will not operate it is always advisable to first disconnect the blue/black wire from the relay to

find which circuit, the inhibit, or the fan module circuit, is at fault.

The blue/brown wire is connected in the fan module to the switching circuit to facilitate external variation of the resistance in the time-constant circuit which controls fan speed. To obtain the required fan speeds the blue/brown wire is connected directly to the A.C.U. function switch which connects various resistors between the blue/brown and a positive feed, the yellow/black, for the different switch positions. On 'LOW', 36KΩ is connected between the blue/brown wire and the yellow/black, on 'AUTO', the fan speed potentiometers in series with 6.8KΩ are connected across these wires, and on 'HIGH' and 'DEF', the potentiometers are connected directly across these wires. Thus if the blue/brown wire is open-circuit the fans will run very slowly or stop, and if the blue/brown wire is shorting to a 12 volt line the fans will run at maximum speed.

The fan speed potentiometers are connected such that the two ends of the track are connected together and then two wires are connected to each potentiometer, one to this junction and one to the sliding contact. The result of this is that the resistance between the two potentiometer wires is zero at both extremes of potentiometer travel and a quarter of the resistance of the potentiometer track when the sliding contact is in mid-position. The two potentiometers, upper and lower fan speed, are then connected in parallel having the effect that the resistance of this network is zero when either or both potentiometers are at either extreme of their sliding contact positions, and a maximum resistance of one eighth of the potentiometer track resistance only when both sliding contacts are in mid-position. The resistance of each fan speed potentiometer is 200KΩ giving a maximum effective resistance of

25K Ω when both servos are in mid-position. This network enables both upper and lower A.C.U. systems to share a common fan system because the fans will always run at the speed required by the system which is demanding the larger quantity of hot or cold air. The 6.8K Ω resistor in series with the fan speed potentiometers is to limit the maximum fan speed on 'AUTO', true maximum being obtainable only by selecting 'HIGH' or 'DEF'. The 12 volt supply to the fan speed potentiometers is the yellow/black wire which is fed directly to the servos. The return from the fan speed potentiometers is the orange/yellow wire which is fed from the servo connections directly to the A.C.U. function switch where it is switched onto the blue/brown wire via the 6.8K resistor on 'AUTO' but directly to the blue/brown on 'HIGH'.

The fan speed module also incorporates the fan delay circuit which prevents the fans from running for 13 seconds after starting the car when the system is on the screen mode and is not being inhibited by the fan delay thermostat.

The fan delay circuit is mounted on the printed circuit board inside the module, the supply to the delay circuit is the orange/purple wire which is live only when the upper system is on the screen mode. The 14 brown/blue wire from the starter motor initiates the delay, the delay period beginning at the end of the cranking period. The orange/purple wire is connected from the fan module to the A.C.U. diode board and from here back to the upper servo 25% micro-switch via the upper servo plug and socket. The 14 brown/blue wire from the starter motor is run via the fan and compressor relay and toeboard socket C, back to the fan speed module.