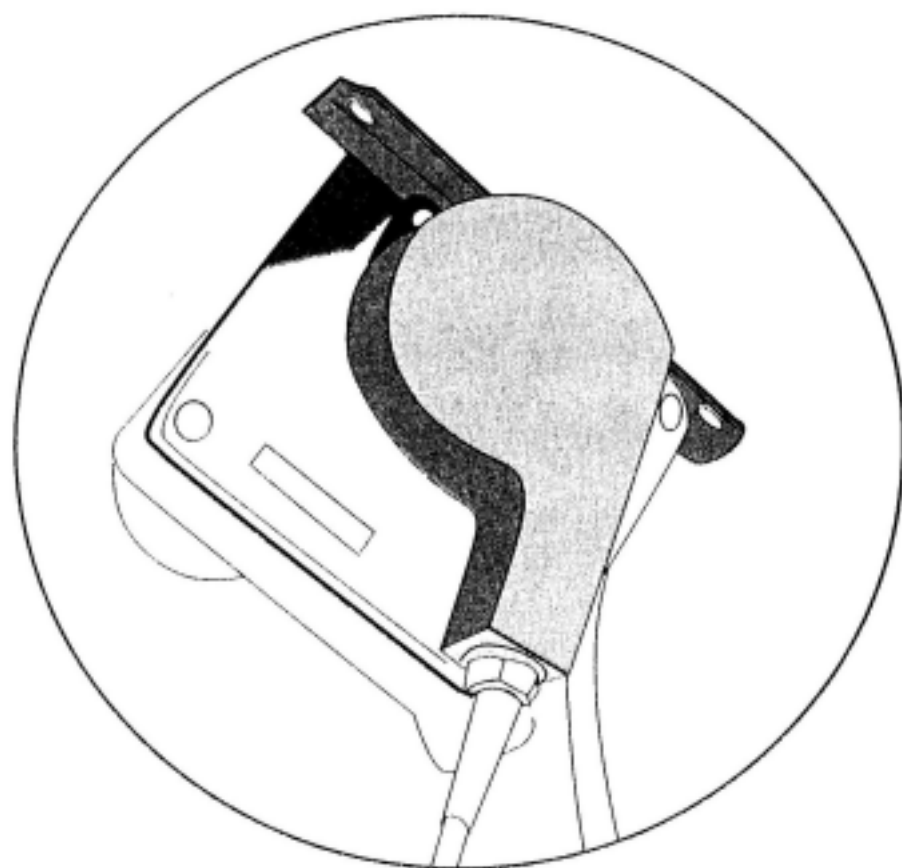


INSTALLATION MANUAL

ELECTRIC OPERATED
CRUISE CONTROL

AP 500

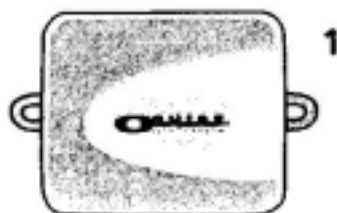


1

PARTS LIST:

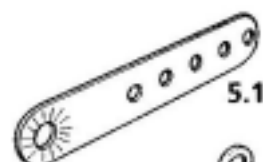
ITEM	PART NO	QTY	DESCRIPTION
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1	A10-2086930	1	ELECTRONIC MODULE
2	A80-3987110	1	ACTUATOR
3	190-5058030	1	WIRING HARNESS

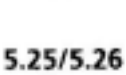
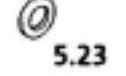
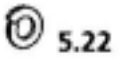
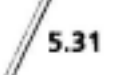
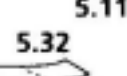
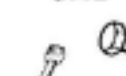
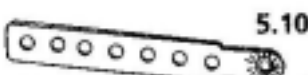
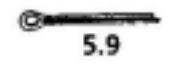


5	A90-9188090	1	HARDWARE KIT AP500
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5.1	1	CARBURETTOR SHAFT ADAPTER
5.2	3	TERMINAL CLAMP
5.3	1	CABLE WIRE CLAMP
5.4	1	LOCK WASHER M8
5.5	1	ROTATING BOLT
5.6	1	SELF LOCKING M4 NUT
5.7	1	WASHER M4
5.8	2	NYLON WASHER M5
5.9	1	SPLIT PIN
5.10	1	CABLE BRACKET
5.11	1	BRACKET "U" SLOT
5.12	1	SPRING WASHER M6
5.13	1	NUT M6
5.14	1	MACHINE SCREW M6x12
5.18	3	MACHINE SCREW M6x15
5.19	1	MACHINE SCREW M6x12
5.20	2	TAPPING SCREW BLACK
5.21	3	NUT M6
5.22	3	SPRING WASHER M6
5.23	2	FLAT WASHER M6
5.24	1	LOCK WASHER M6
5.25	1	CABLE WIRE CLAMP
5.26	1	ALLEN SCREW M4x6
5.27	1	END CLAMP
5.28	1	ALLEN SCREW M4x4
5.29	1	ALLEN SPANNER M2
5.31	10	WIRE TIE
5.32	1	DOUBLE TAPE
5.33	2	SCREW 8x1/2



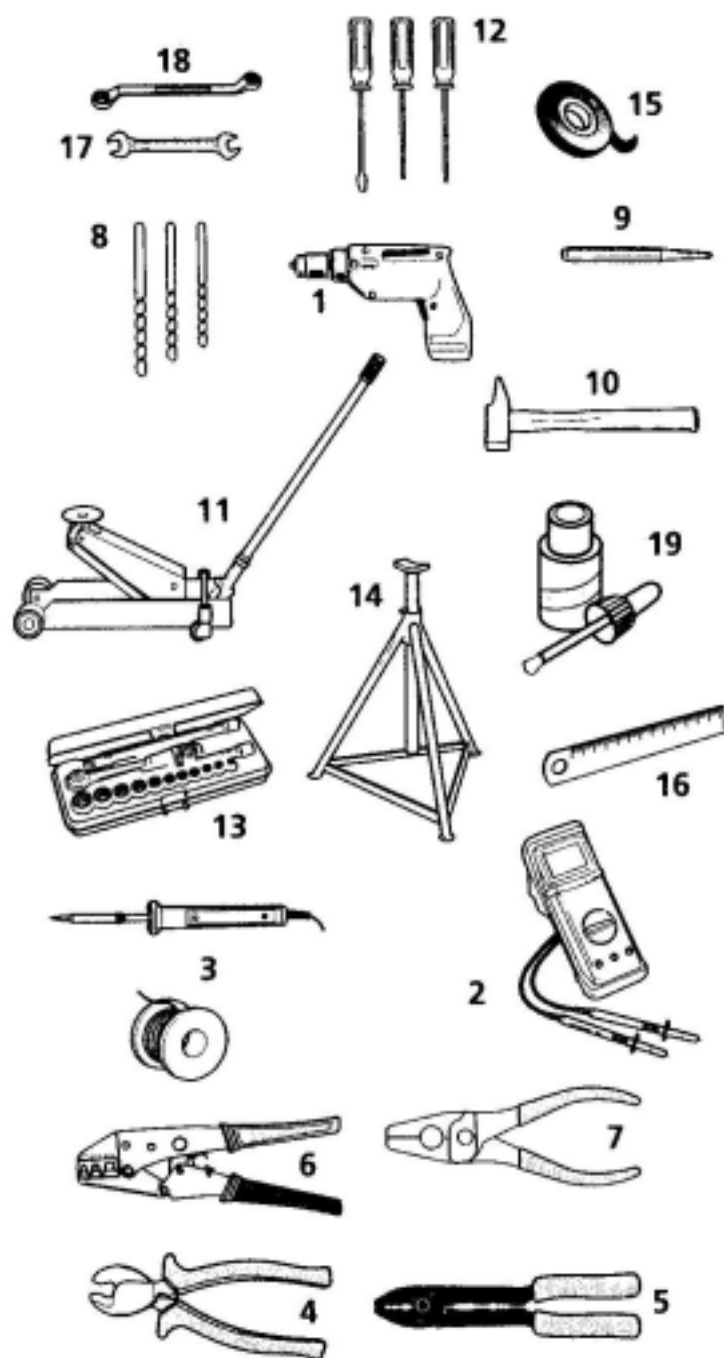
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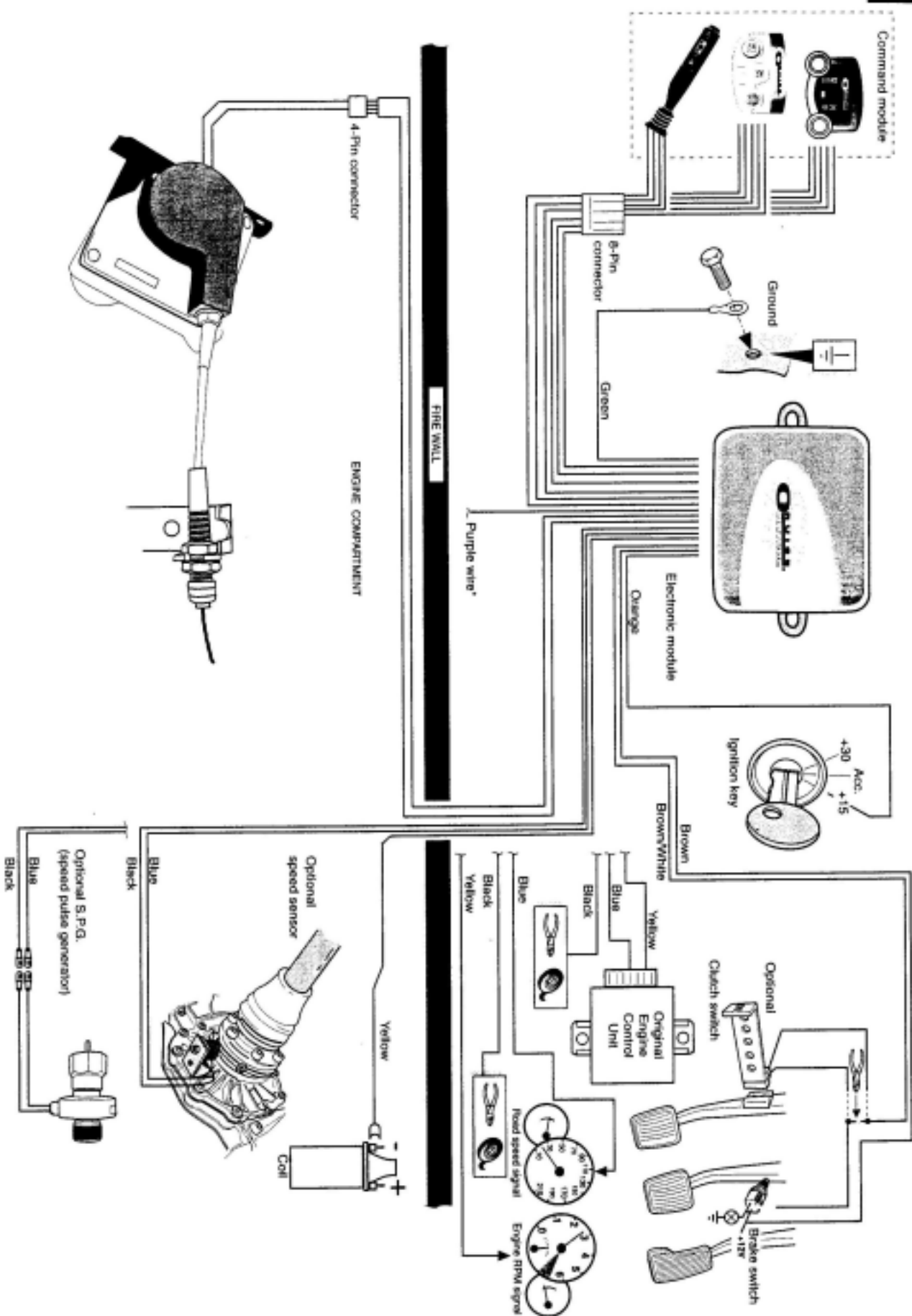
2

TOOLS REQUIRED:

The following is a list of tools required to properly install the cruise control. While this unit may be installed without some of the tools listed, it is recommended that the installer has all these tools available. It is strongly recommended soldering the connections to be sure of a reliable connection.



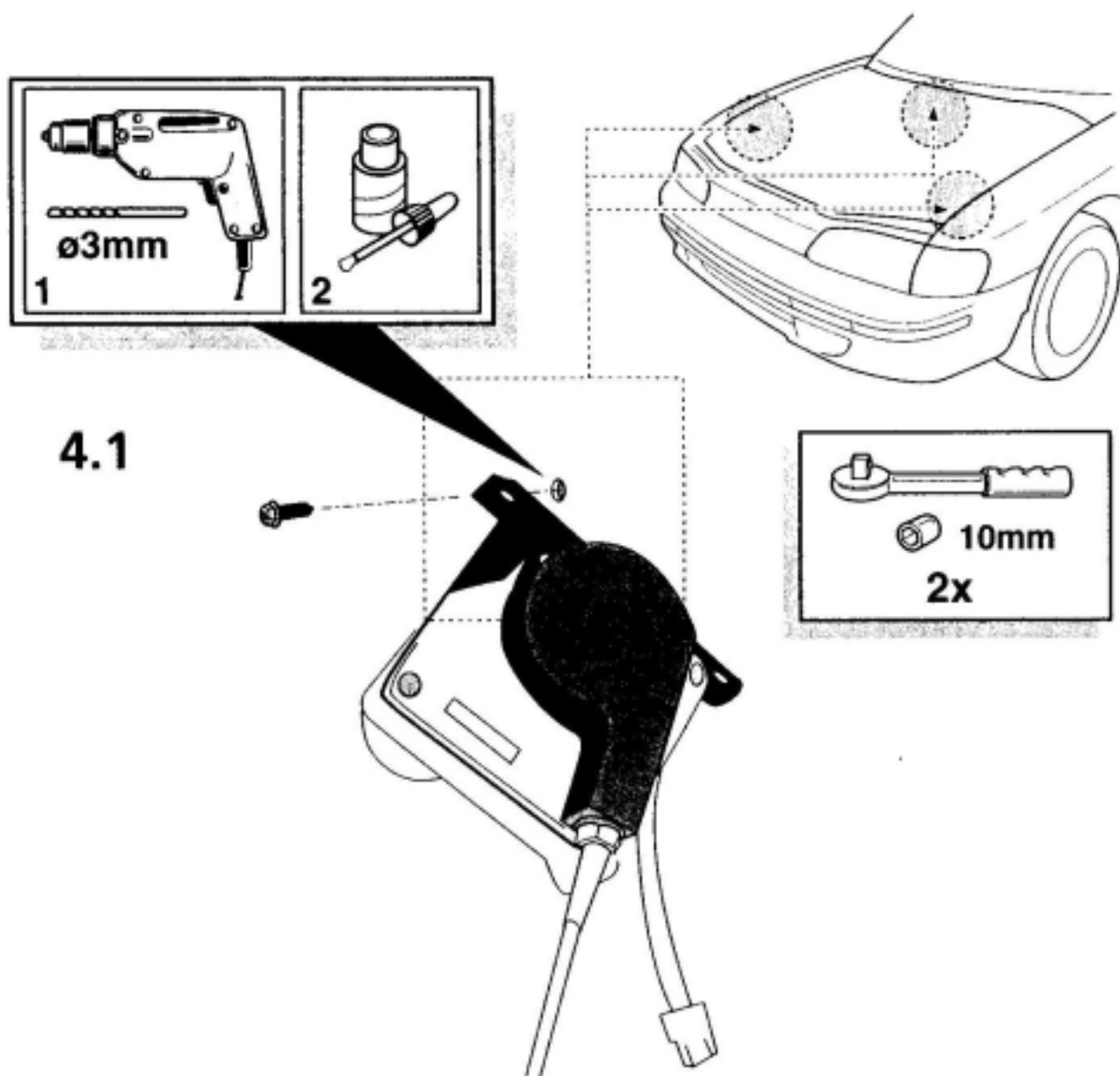
- 1 Electric drill
- 2 Volt meter
- 3 Soldering iron + solder
- 4 Wire cutters
- 5 Strippers
- 6 Crimping tool
- 7 Pair of pliers
- 8 Drill bits
- 9 Center punch
- 10 Hammer
- 11 Floor jack
- 12 Screw driver set
- 13 Socket set
- 14 Axle stands
- 15 Insulation tape
- 16 Measure
- 17 Spanner set
- 18 Ring spanner set
- 19 Wax sealant



4A

ACTUATOR

The actuator needs to be mounted in the engine compartment on the firewall or side skirt (fig.4.1). It is important to mount the actuator away from excessive heat and at least 300mm away from any high-tension leads such as the distributor, coil, ignition wires, or alternator. The actuator cable should reach the throttle linkage without requiring a bend tighter than a diameter of 300mm and away from hot or rotating surfaces.



4B

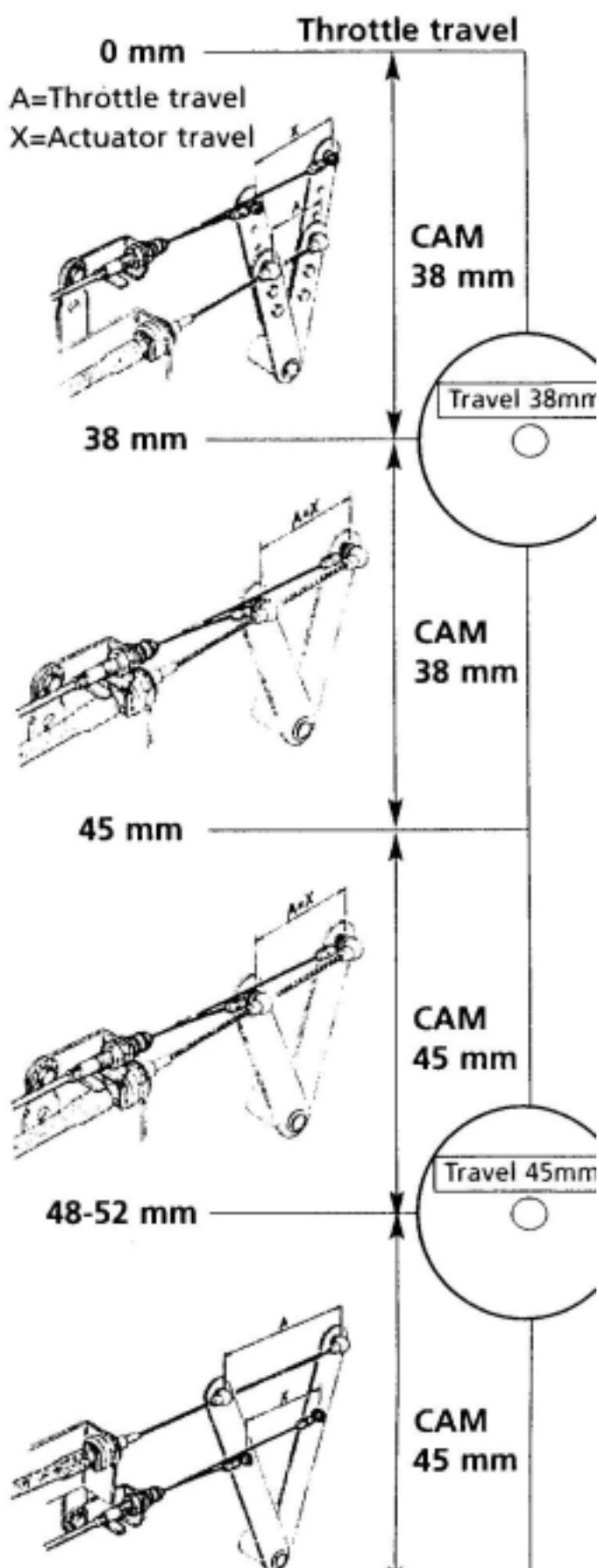
VARIABLE ACTUATOR CABLE TRAVEL

The AP500 actuator cable can be adjusted of different cable travel lengths. The two lengths are 38mm or 45mm. The travel you require will be dependant upon the travel of the vehicle throttle cable or the accelerator pedal. The length of the actuator cable travel can be adjusted by reversing the cam on the actuator. (see changing cable travel) To determine the required length of actuator cable travel you should measure the travel of the vehicle throttle cable or pedal between rest and full throttle.

Make sure you mount the correct CAM to avoid damage the original vehicles throttle cable, throttle pedal or the cruise control actuator cable.

Changing the cable travel

The cruise control actuator cable is set at 38mm travel as default. To alter the travel of the cruise control throttle cable you can adjust the cam on the actuator. Remove the plastic actuator cable cover on the servo. Remove the actuator cable from the cam. Undo the M6 nut that holds the actuator cam in place. Mount the cam with the 45mm cam marking face up. The actuator cable travel length is stamped on both sides of the cam for easy identification.



5

THROTTLE LINKAGE:



Caution:

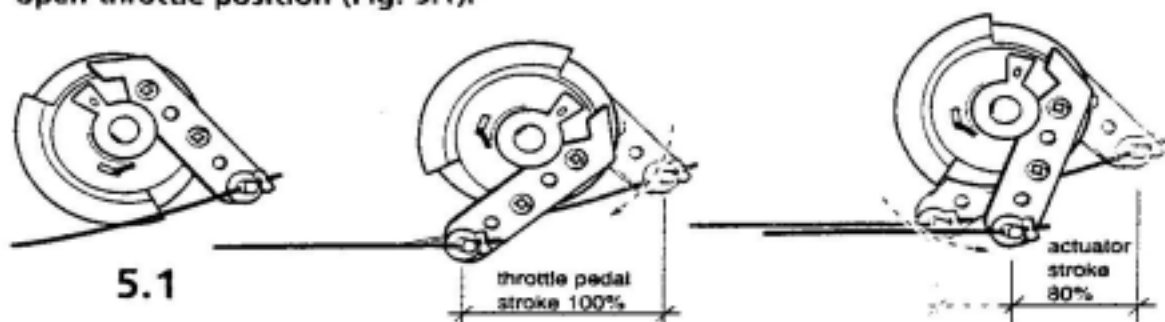
Your cruise control is designed with numerous safety features, but none of these can prevent a tangled or jammed throttle linkage. Double check the throttle by hand and by pressing the throttle pedal to make sure the throttle operates smoothly and will not jam in an open throttle condition.

Determine the most suitable throttle linkage for your vehicle and a suitable place to mount the actuator cable and cable bracket. To make a secure and reliable throttle linkage, the cruise control kit is supplied with a Rotating Bolt (item 5.5) and with a Cable Wire Clamp (Item 5.25) to make the throttle linkage attachment. The Rotating Bolt can be mounted on the supplied bracket directly to the throttle. The Cable Wire Clamp has been developed to make the connection directly to the throttle cable.



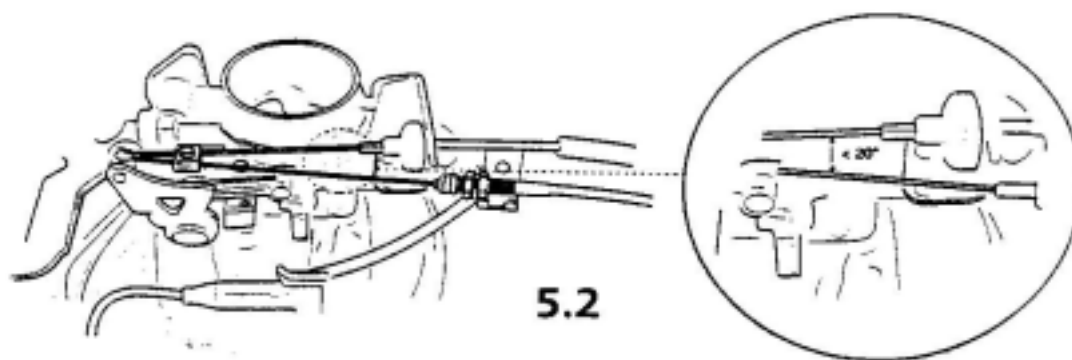
Caution:

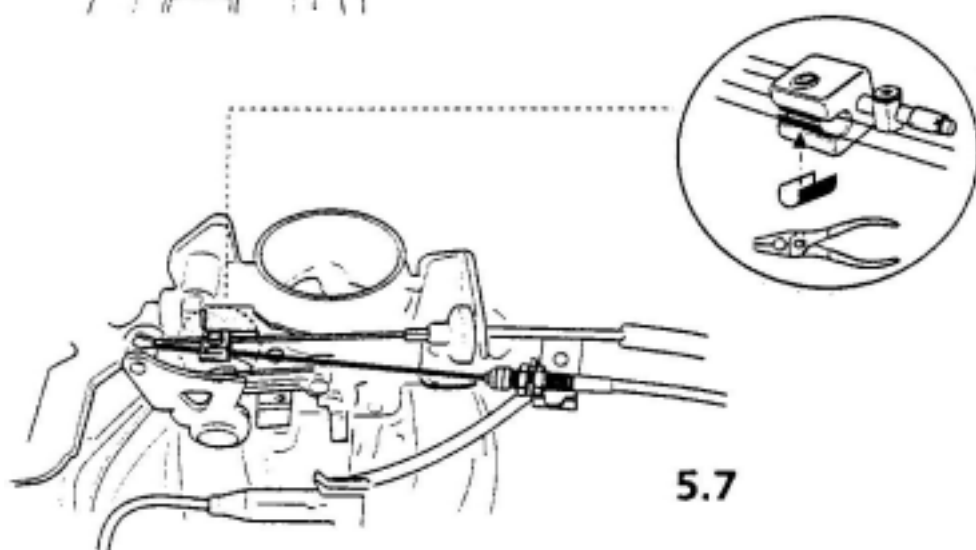
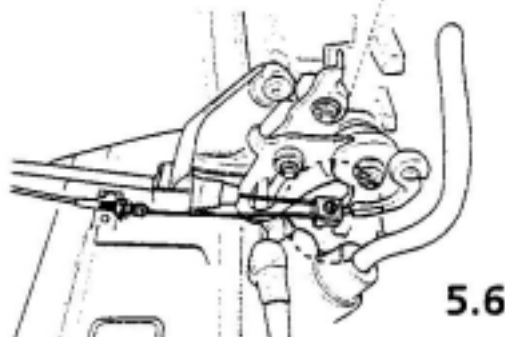
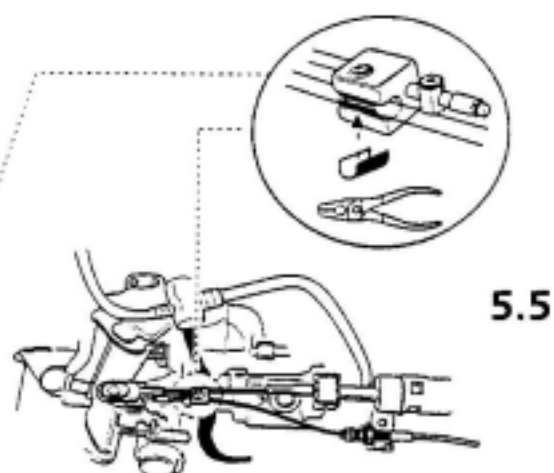
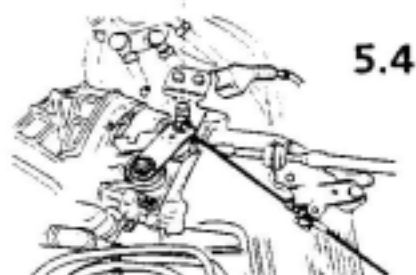
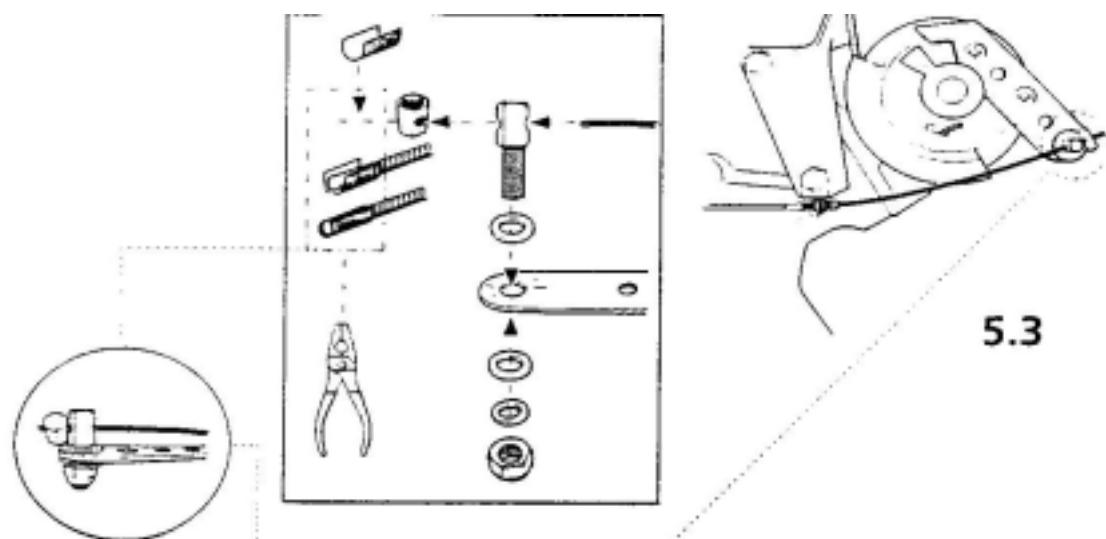
The travel of the throttle pedal must be longer than the actuator. Before making the connection, check the travel of the throttle cable from closed to open throttle position (Fig. 5.1).



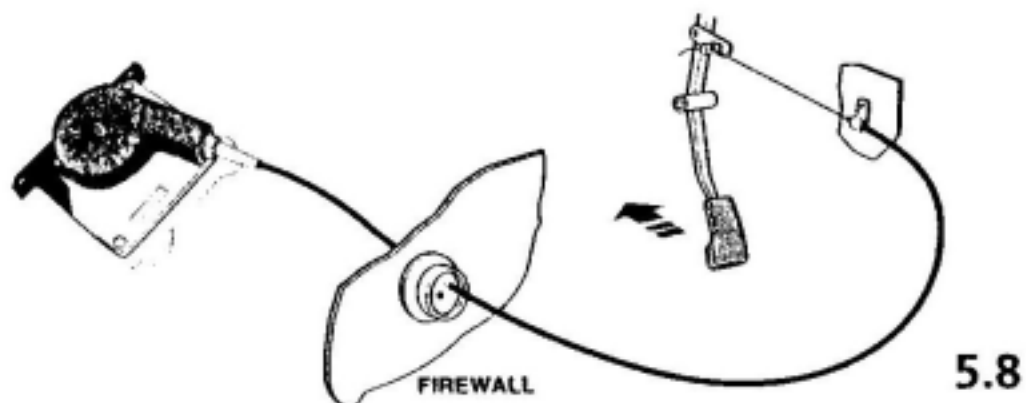
The actuator cable has a travel of * 38/45mm. The cable wire clamp has a length of 10mm, which must be included in checking a combined distance of *48/55mm free path along the vehicle throttle cable. It is important that the travel of the cable is at least *48/55mm when the Cable Wire Clamp is used. The Actuator Cable should pull in a straight line or the angle from the attachment point must be less than 20 degrees (Fig. 5.2).

**Depending the position of the cam of the actuator.
(see variable actuator cable travel section)*





Some modern vehicles do not have a throttle cable. With these vehicles a connection directly to the throttle pedal is required. The best location for the actuator should still be the engine compartment. The actuator cable should route from the engine bay via the bulkhead into the passenger compartment. An overview of the attachment is shown in Fig. 5.8.



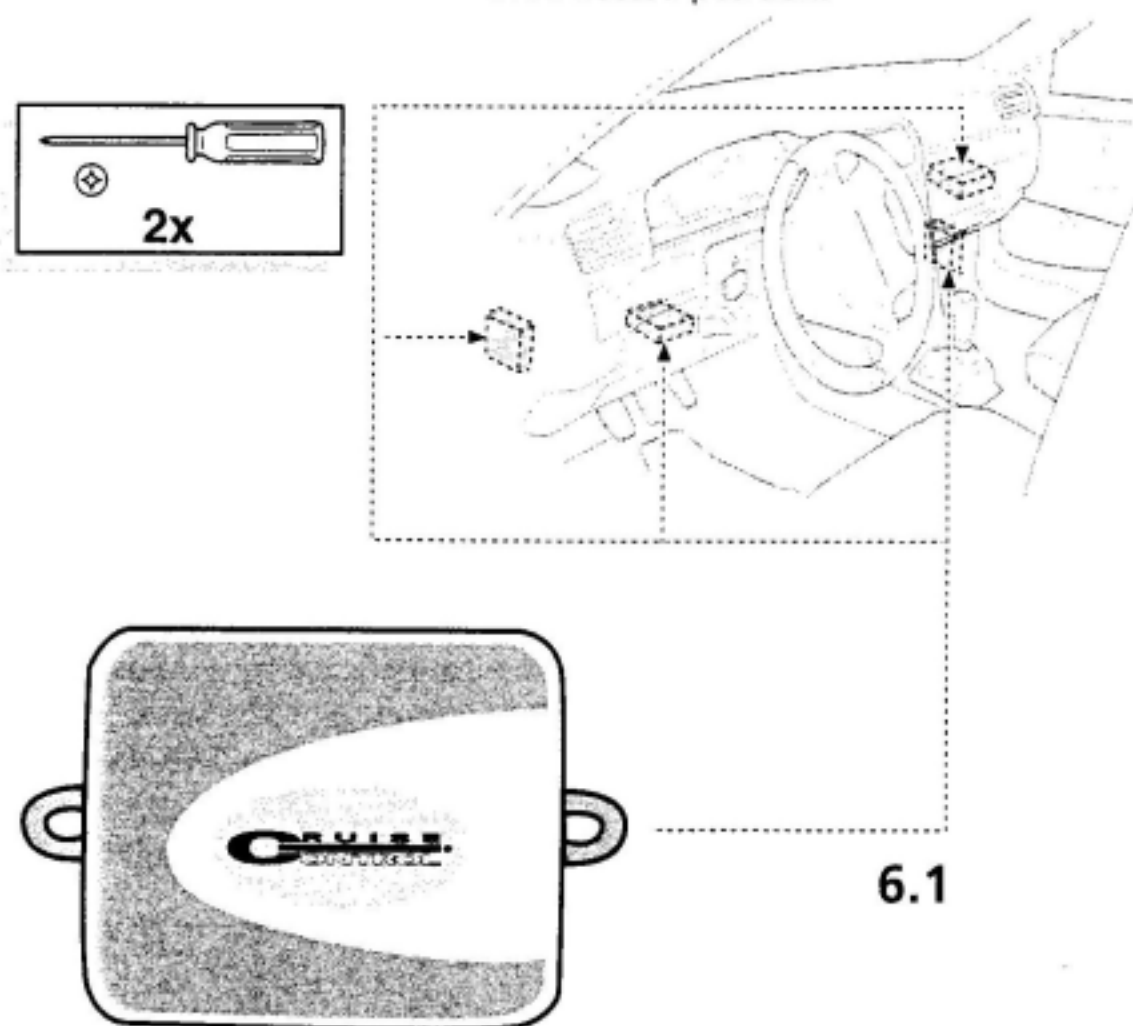
6

ELECTRONIC MODULE:

The electronic module should always be mounted in the passenger compartment of the car with the 4mm sheet metal screws or with the supplied double-sided tape. Avoid places with excessive heat, dampness and high-tension leads. The most common mounting locations are under the dashboard on the driver's side, behind the glove compartment or the drivers- or passenger-side kick panels (Fig.6.1). Do not mount the electronic module in the engine compartment. For mounting, mark holes, center punch and drill two 3mm holes. **Always check the other side for clearance before drilling.**

Temporarily install the electronic module in the selected position.

DO NOT firmly screw the electronic module down unless you have easy access to the electronic module. Once the installation has been finished, the electronic module can be screwed down in the selected position.



The other Brown wire needs to be connected to the wire that supplies voltage to the brake lights when the brake pedal is depressed. This wire will read ground through the brake light bulbs when the brake pedal is not depressed and 12 volts when the brake pedal is depressed. Possible locations for this wire are the sill harnesses to the rear of the vehicle.

Note:

The two BROWN wires are reversible. However as a safety feature, if the connections are not made securely and correctly the cruise will not work.

Purple wire

The PURPLE wire can be connected in 3 different ways

1. Hand Brake on lamp. The PURPLE wire can be connected to the hand brake switch. Locate the hand brake switch and use a voltmeter to locate the wire which goes to ground when the hand brake is applied.

Connect the PURPLE wire to this wire.

2. Neutral or Park lamp (automatic vehicles only). The PURPLE wire can be connected to Neutral or Park switch. Locate the switch which detects when the vehicle is in neutral or park, use a voltmeter to locate the wire which goes to ground when the vehicle is in neutral or park.

Connect the PURPLE wire to this wire.

3. O.E Clutch switch. The PURPLE wire can be connected to an O.E clutch switch. Locate the O.E clutch switch, using a voltmeter test to see which wire goes to ground when the clutch pedal is depressed. Connect the PURPLE wire to this wire. **CHECK THIS CONNECTION CAREFULLY AS AN INCORRECT CONNECTION COULD RESULT IN ENGINE DAMAGE.**

The cruise control will dis-engage or will not engage when the PURPLE wire is taken to ground.

Note: The cruise control will function as normal if the PURPLE wire is not connected. If no connection is required cut and tape the PURPLE wire.

Yellow and Blue wire (Speed Sensor Connection)

There are two types of speed signals that can be used for the cruise control installation.

1. Road speed signal: This type of signal indicates the vehicles true road speed. This type of signal should always be used on a vehicle with an automatic gearbox, it can also be used on vehicles with a manual gearbox but will require over rev protection.

2. Engine RPM signal: This type of signal indicates the engines RPM. The speed of the vehicle is related to the rpm of the engine as long as the vehicle stays in the same gear. This type of signal can be used on vehicles with a manual gearbox. In this case the no over-rev protection is then required.

The cruise control has two wires that can be used for speed sensing.

1. **Blue wire:** Road speed signals and Engine RPM signals with a voltage from 1.5 volt to 24 volts and a frequency between 6Hz and 8.5KHz. The Blue wire should be used for all speed signals either road speed or engine speed that operate between the above parameters.
2. **Yellow wire:** Engine RPM signals only, with a voltage from 6 volt to 250 volts and a frequency between 6Hz and 488Hz. The Yellow wire should only be used for engine RPM speed sensing signals, where the voltage is greater than 20 volts. For all other applications the Yellow wire should be used when over rev protection is required and the engine RPM signal is between 6 and 250 volts.

Engine Over-rev Protection

If a Road speed signal is being used for speed sensing on a manual vehicle, over-rev protection must be included to prevent damage to the engine.

If the clutch is depressed when the cruise control is engaged, the cruise must automatically disengage otherwise damage to the engine could result.

There are two methods of providing engine over-rev protection:

1. When the Blue wire is being used for a Road speed signal, the Yellow wire can be connected to an engine RPM signal to provide the necessary engine protection. See section identifying a suitable speed pulse signal.
2. A clutch switch can be used if no suitable engine RPM signal can be found. (See optional extras) The clutch switch should be fitted to the clutch pedal so when the clutch pedal is depressed the cruise control will automatically disengage.

The best solution for speed sensing for the cruise control installation is dependent upon the vehicles gearbox.

Automatic Vehicles:

The Blue wire should be used and must be connected to a Road Speed signal, AN ENGINE RPM SIGNAL CANNOT BE USED. No over rev protection is required for automatic vehicles. See section identifying a suitable speed pulse signal. If no suitable speed signal can be found on the vehicle the optional magnet sensor kit or optional speed pulse generator can be installed. (See optional extras)

Manual Vehicles:

The best solution for manual gearbox vehicles is to use the Blue wire for a Road speed signal and use the Yellow wire for over rev protection using an engine RPM signal or the optional clutch switch. See section identifying a suitable speed pulse signal. If no suitable road speed signal can be found the optional magnet speed sensor kit or optional speed pulse generator kit can be fitted. If you cannot find a Road speed signal on the vehicle, the Blue wire can be used on engine RPM signals, or the Yellow wire can be used on the negative side of the ignition coil. With this solution no over rev protection is required as the cruise control is monitoring the engine RPM speed. When using an engine RPM signal the minimum engage speed of the cruise control will depend on the gear the vehicle is being driven in.

Identifying a suitable speed pulse signal.

There are several locations for finding a suitable speed signal for the cruise control. Below is a list of suitable speed signals, locations and how to identify the signal.

Road speed signals: will require over rev protection on manual vehicles.

Possible locations for a Road speed signal are:

- a. Engine ECU road speed signal 1.5 - 24 volts and a frequency between 6Hz and 8.5KHz.
- b. Electronic speedometer - rear of the instrument cluster, or loom to instrument cluster. 1.5 - 24 volts and a frequency between 6Hz and 8.5KHz.
- c. Gearbox speed sensor- mounted on the gearbox usually has 3 wires. 1.5 - 24 volts and a frequency between 6Hz and 8.5KHz.
- d. Car Radio - rear of radio if the car has an ISO connector the speed pulse will be in chamber 3 pin 1 or 5. 1.5 - 24 volts and a frequency between 6Hz and 8.5KHz.

Engine RPM speed signals

Possible locations for an Engine RPM signal.

- a. Engine ECU engine RPM signal. 1.5 - 24 volts
- b. Electronic rev counter (tachometer) - rear of instrument cluster or loom to instrument cluster. 1.5 - 24 volts and a frequency between 6Hz and 488Hz.
- c. W+ terminal of alternator - at the alternator you will find an extra terminal this will be the W+ terminal, on some vehicles this terminal is not used so a connection to the alternator is required. 6 - 250 volts and a frequency between 6Hz and 488Hz.
- d. Negative side of the ignition coil - the Yellow wire must be used for this type of connection. 6- 250 volts and a frequency between 6Hz and 488Hz.

Identify one of the speed signals listed above. Using a voltmeter, test the signal in the following way. Connect the Red voltmeter lead to the speed signal you have selected and the Black voltmeter lead to a good earth connection. Drive the vehicle at the minimum engage speed you require and measure the RMS voltage of the signal. Note that all digital voltmeters measure RMS voltage when set on the AC range.

7

WIRING HARNESS:

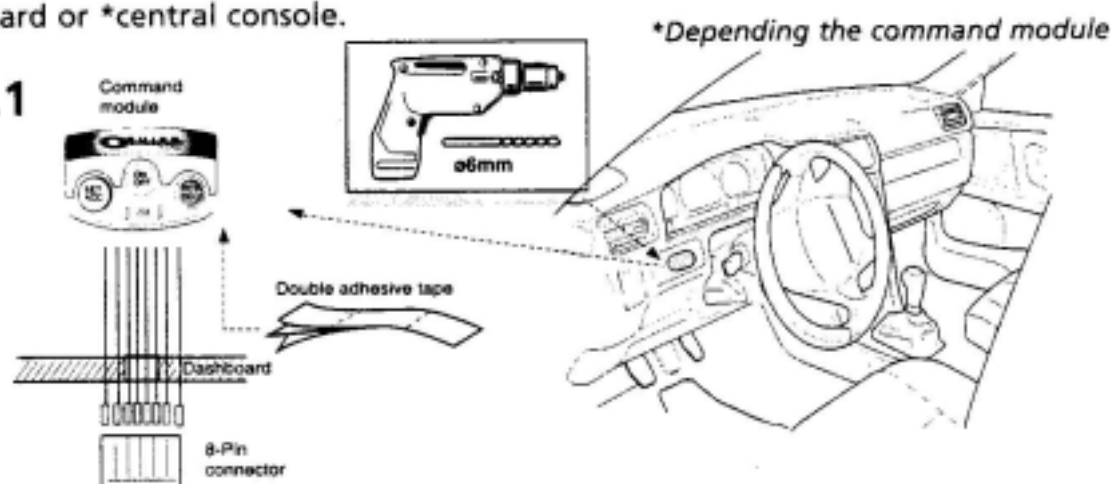
Once you have the location of the electronic module, it is possible to mount the wiring harness of the Cruise Control. To locate the wires where the connection should be made, use a voltmeter.

Command Module (Fig.7.1)

The Cruise Control has the option to use a number of different Command Modules. A range of command modules are available to offer the most convenient (operating) solution for each application.

The cruise control command module must be mounting in a location which guarantees safe operation in all circumstances. Suitable positions are on the *dash-board or *central console.

7.1



After selecting a suitable location for the command module, a hole of 6mm needs to be drilled near the command module. The wires of the command module can now be routed via the 6mm hole to the cruise control main harness. The terminals of the command module harness can be pushed into the connector housing and can be plugged in the 8-pin connector of the main harness.

IR command module: The IR command module is supplied with its own installation manual. This manual must be read before the installation is attempted.

There is also the option to use an O.E command module to operate the cruise control. (See 13 optional extras)



Caution:

Ensure that the driver does not have to insert his hand through the steering wheel to operate the command module.

Green/Red, Black, Pink/Red and Blue/Red Actuator wires

Route the four (GREEN/RED, BLACK, PINK/RED and BLUE/RED) actuator wires into the engine compartment through a hole in the fire-wall (original grommet) or via a drilled hole and grommet supplied in the kit. The four terminals can now be plugged into the connector of the actuator at the location with the corresponding wire colour.

Orange wire

Connect the ORANGE wire to a fused Ignition Switched Feed. This Ignition Switched Feed must have battery voltage (+12V) when the ignition key is in the ON position. Be sure that the ignition key is in the off position when making the connection to prevent blowing a fuse.

Note:

Check with a Voltmeter that the ignition switch feed you select supplies a full battery voltage. A suitable location is usually at the fuse box. It is not recommended to connect this orange wire to vehicle accessory (ACC) power wire. Make sure that the ignition key is in the off position before making the connection.

Green wire

Attach the GREEN wire to an existing vehicle ground or a bare metal ground on the chassis. Most common locations for a central vehicle ground would be at the left or right-side kick panels.

Brown wires

The BROWN wires are the wires to connect to the brake switch (Fig. 7.2).

If there are more than two wires coming from the brake switch, use a voltmeter to locate the two wires, which should be used.

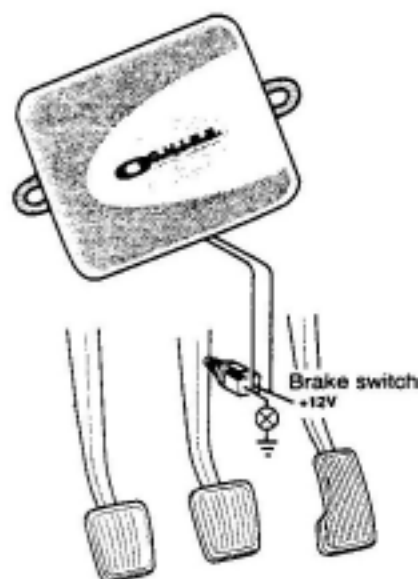
One of the two wires should be either a permanent feed or ignition switched feed.

The other wire should read the battery voltage (+12V) when the brake pedal is depressed and zero (0V) when released.

If you cannot find the correct signals at the brake switch, the vehicle may have a digital link brake switch. In this case you must connect the brown wires in the following way:

One of the Brown wires should be taken to an ignition switched feed, make sure the ignition feed only has voltage when the ignition is switched on.

7.2



8

DIAGNOSTIC MODE:

The Cruise Control has an integrated self-diagnostic mode. The self diagnostic mode includes three steps A, B and C to test all features and functions of the Cruise Control. Check over your installation one more time to verify all connections are secure. Be sure to engage the handbrake and place the gearbox in neutral or park if the car has an automatic gearbox.

To activate the diagnostic mode with buzzer operation, press and hold the SET key while turning the vehicle Ignition switch ON. The buzzer will beep as long as you hold the SET key down. Release the SET key and the buzzer will stop sounding. If the buzzer comes back ON again within one second, this indicates that one of the other control inputs is active when it should not be. By process of elimination, you can determine which control input is not functioning properly and repair the connection to that input.

Diagnostic mode A.

The diagnostic mode is provided to test the electrical connections to the cruise control module.

A diagnostic LED on the Electronic Module functions in this mode all of the time.

Since visual access to this Module is inconvenient once the module is mounted under the dash, a temporary diagnostic mode is provided that echoes the operation of the LED through the audio buzzer.

The LED and buzzer will activate whenever one of the following inputs is detected:

- Set Key
- Res Key
- Coast Key
- Brake Pedal
- Speed input when in Speed sensing mode
- Tach input when in Tach sensing mode
- Clutch Switch
- Neutral Safety Switch

Any switch (control) input that is active for more than 10 seconds is automatically locked out to prevent that input from over-riding the detection of another switch input.

Diagnostic mode B.

When the test of the features and functions in diagnostic mode a is completed successfully, the test of the Cruise Control can be continued with the diagnostic mode B. In this mode it is possible to test the functions of the actuator. Engage the handbrake and place the gearbox in neutral or park if the car has an automatic gearbox. To enter this diagnostic mode turn on the ignition and start the engine while you press and hold the SET/ACC button of the command module. Release the SET/ACC button when the engine runs. Turn on the Cruise Control by pressing the ON/OFF button. The LED of the Command Module will turn on. Tap at the SET/ACC button of the Command Module and the actuator should start to pull the throttle in and will increase the engine revs. Use the SET/ACC and RES/DEC buttons on the command module to adjust the throttle position. The actuator can release the throttle instantly by pressing the brake pedal or using the ON/OFF switch of the command module. Turn the ignition key off to exit the diagnostic mode.

Diagnostic mode C.

This third test is to check the speed input (when in speed sensing mode) or tach (RPM) input (when in tach (RPM) sensing mode). When driving the car on the road the speed signal can be checked by the LED of electronic module.

The LED will flash at a rate determined by the pulse frequency of the speed or tach (RPM) signal.

While driving around 50 KM/H, the LED should flash once per second. Turn the ignition key off, after the car is stopped, to exit the diagnostic mode.



Note:

The diagnostic mode can be used to test all features and functions of the cruise control. The cruise control uses an internally generated speed reference signal to test the actuator in the diagnostic mode B. Therefore, if you completed diagnostic mode B but your cruise control will not engage the most likely cause of the problem is the speed signal.

9

SAFETY FEATURES:

The cruise control is fitted with numerous safety features, which will disengage the cruise control in the following situations:

- 1 When depressing the brake pedal;
- 2 When pressing the OFF button of the command module
- 3 Over-revving engine.
- 4 When decelerating to 50% of the set speed
- 5 When accelerating to 150% of the set speed
- 6 When turning the ignition OFF.

The cruise control will disengage if the brake fuse blows, brake lights burn out, or any of the connections become disconnected.

For safe and economical operation NEVER operate any cruise control in congested traffic or on a wet slippery road.



SAFETY Note:

Should a situation ever arise where action 1 through to 5 above will not disengage the cruise you can always turn the ignition OFF (action 6).

If your vehicle has a steering lock, be sure it cannot be activated when the ignition key is in the ignition lock or the car is in gear.



WARNING:

The cruise control is designed with numerous safety features, but none of these can prevent a tangled or jammed linkage. Double-check it!

10

SETUP / LEARN MODE:

The setup and learn modes allow the user to adjust the major cruise control parameters so that the cruise control operation is optimized for each vehicle installation. The 3 basic modes tell the cruise control Electronic Module the pulse rate of the distance and speed sensor (PPM value), the throttle linkage free play (INIT count) and overall system sensitivity (GAIN factor).

The adjustment procedure for these 3 basic parameters is straightforward and can be accomplished while driving the vehicle. This allows the user to fine tune the parameters under actual driving conditions for accurate settings.

These settings can be accomplished without removing the Electronic Module from its mounting location to access special adjustment switches.

The adjustments are made electronically and the results of the settings are stored inside the Electronic Module.

10.1 SET-UP MODE ENTRY

To enter the SET-UP mode, turn the vehicle ignition switch OFF, then ON again. Within one minute, press and hold the BRAKE pedal while pressing the SET key 4 times in quick succession. The Electronic module will respond with 4 Hi Tone beeps. You must enter the SET-UP mode first before selecting one of the following adjustment modes:

10.2 Auto PPM and INIT Adjustment Mode

The AUTO PPM adjustment mode allows a single step mode to set the PPM, INIT and GAIN settings to simplify the initial adjustment procedure. This procedure may be followed by any of the manual adjustment modes at a later date to fine-tune the parameter settings.

To enter the AUTO PPM adjustment mode from any SETUP mode, press and hold the BRAKE pedal and press the RES key one time. The Electronic Module will respond with one LO Tone beep for each press of the RES key. Release the BRAKE pedal and the Electronic Module will respond with 1 HI Tone beep confirming the AUTO PPM setting mode. If you hear the incorrect number of HI tone beeps, repeat the BRAKE pedal and RES key sequence.

Drive the car at a speed of 70 Km/Hr. Press the SET key for DISTANCE (blue wire) sensor speed regulation or press the RES key for TACH (yellow wire) sensor speed regulation.

The cruise control will engage and immediately go to the Manual INIT adjustment mode as described in section 10.4 below. Press and hold the SET key to increase the INIT response by one count per Electronic Module beep. Press and hold the RES key to decrease the INIT response by one count per Electronic Module beep. To confirm the correct INIT response, press the BRAKE pedal to save the PPM, INIT and GAIN settings and exit the SETUP mode by pressing the BRAKE pedal while pressing the RES key 4 times. No further adjustments should be required.

10.3 Manual PPM Adjustment Mode

To enter the manual PPM setting mode from any SET-UP mode, press and hold the BRAKE pedal while pressing the RES key 2 times in quick succession. The Electronic Module will respond with one LO Tone beep for each press of the RES key. Release the BRAKE pedal and the Electronic Module will respond with 2 HI Tone beeps confirming the manual PPM setting mode. If you hear the incorrect number of HI tone beeps, repeat the BRAKE pedal and RES key sequence.

To set the PPM in this mode, drive the car at the minimum (35-40 km/h) engage speed and press the SET key for DISTANCE (blue wire) sensor speed regulation or press the RES key for TACH (yellow wire) sensor speed regulation. Changing the PPM setting will overwrite any previous INIT setting with the factory default values but will leave the GAIN setting unchanged. (Note: an alternative to manual PPM, INIT and GAIN settings can be accomplished with the AUTO PPM and INIT setting mode described in 10.2).

10.4 Manual INIT Adjustment Mode

To enter the manual INIT setting mode from any SET-UP mode, press and hold the BRAKE pedal while pressing the RES key 3 times in quick succession. The Electronic Module will respond with one LO Tone beep for each press of the RES key. Release the BRAKE pedal and the Electronic Module will respond with 3 HI Tone beeps confirming the manual INIT setting mode. If you hear the incorrect number of HI tone beeps, repeat the BRAKE pedal and RES key sequence.

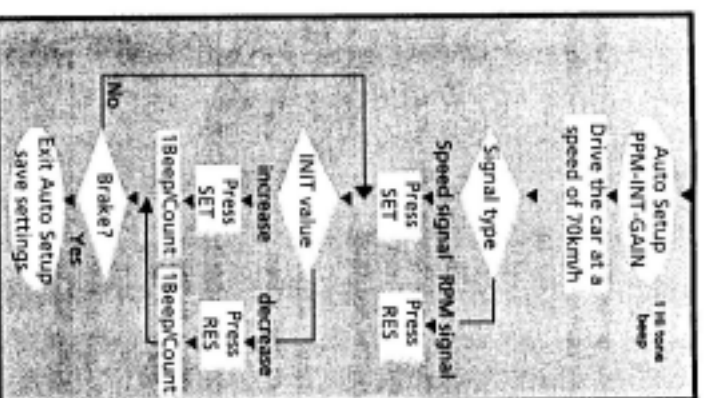
To set the INIT in this mode, drive the car at a convenient cruise control speed and press and hold the SET key until the cruise control throttle servo pulls the throttle pedal away from your foot. Disengage the cruise control with the BRAKE pedal and press the SET button again. The cruise control should take over with minimum drop or overshoot. Press and hold the SET key to increase the INIT amount by one count for each Electronic Module beep or press and hold the RES key to decrease the INIT amount by one count or each Electronic Module beep.

Normal operation

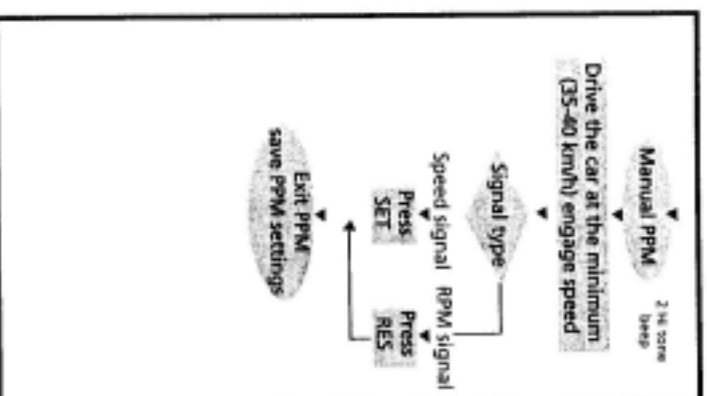
Ignition switch ON
Press the ON button of the cruise control
press and hold brake pedal
press SET key 4 times

SETUP MODE

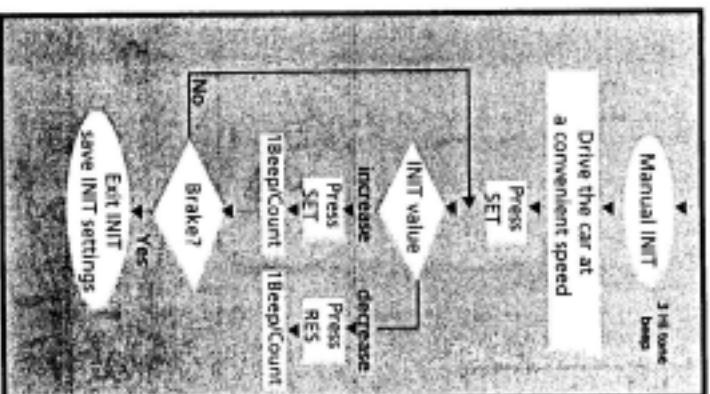
Press and hold brake pedal
press RES key 1 time
release the brake pedal



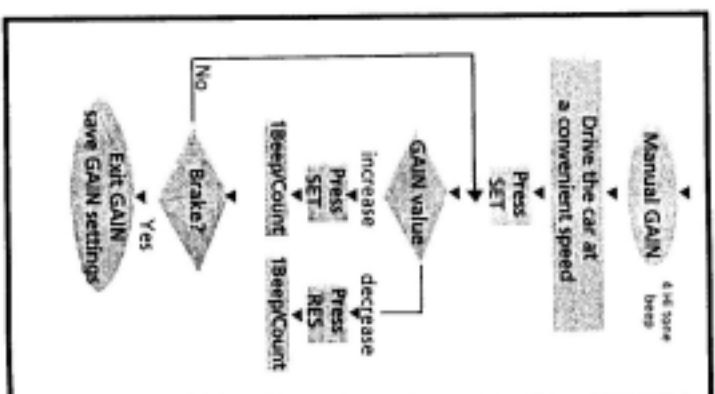
Press and hold brake pedal
press RES key 2 times
release the brake pedal



Press and hold brake pedal
press RES key 3 times
release the brake pedal



Press and hold brake pedal
press RES key 4 times
release the brake pedal



EXIT SETUP MODE: press and hold brake pedal, press SET key 4 times 1 Long HI Beep

NOTE: The normal TAP UP and TAP DOWN functions of the SET and RES key are disabled in this mode to allow these keys to be used as adjustment inputs.

Press the BRAKE pedal to disengage the cruise control and store the current INIT parameter inside the Electronic Module. When the INIT parameter is changed, the Electronic Module will calculate the most likely GAIN parameter for the cruise control module and change the value stored inside the Electronic Module. For most installations, no further adjustment is necessary. It is suggested that you exit the SET-UP mode and test the cruise control operation again (See Section 10.6). If GAIN adjustment seems necessary, perform steps 10.1 and 10.5 to adjust the cruise control system GAIN.

10.5 Manual GAIN Adjustment Mode

Low system gain is distinguished by sluggish throttle response when traveling up or down a hill. The result is excessive speed loss when climbing a hill or cresting the top. High system gain is distinguished by overactive adjustments and continuous surging. Normally the default gain calculated, after the INIT adjustment is made, will produce satisfactory cruise control performance. If adjustment is required, follow the procedure below:

To enter the manual GAIN setting mode from any SET-UP mode, press and hold the BRAKE pedal while pressing the RES key 4 times in quick succession. The Electronic Module will respond with one LO Tone beep for each press of the RES key. Release the BRAKE pedal and the Electronic Module will respond with 4 HI Tone beeps confirming the manual GAIN setting mode. If you hear the incorrect number of HI tone beeps, press the BRAKE pedal and RES key sequence.

To set the system GAIN in this mode, drive the car on a typical road at the most likely cruise control speed and press the SET key to engage the cruise control. Press the SET key again while engaged to increase the system GAIN by one count for each beep from the Electronic Module. Press the RES key while engaged to decrease the system GAIN by one count for each beep from the Electronic Module.

A very sensitive test for cruise control GAIN setting is to set the cruise control at a convenient cruise control speed then disengage the cruise control with the brake pedal. Let the vehicle slow down 25 to 30 km/h below the cruise speed and press the RES key to enable the resume function. Monitor the throttle response while the vehicle is accelerating back to the cruise speed.

Excessive throttle motion indicates the gain is too high. Excessive overshoot of the final set speed indicates the gain is too low. When the cruise control's response has been adjusted to a satisfactory level, press the brake pedal to save the GAIN settings. The electronic module will respond with 2 beeps to confirm the saved settings. Exit the SET-UP mode as described in section 10.6.

10.6 Exit SET-UP mode

To exit the SET-UP mode, press and hold the BRAKE pedal while pressing the SET key 4 times. The Electronic Module will respond with one long Hi Tone beep to confirm the SET-UP mode has been terminated.

KEYBOARD INITIALIZATION MODE OPERATION

The keyboard initialization mode is only required if you change the command module keyboard from the factory supplied unit or wish to restore the factory default values for the default ACCEL/SET or DECEL/SET constants.

Press the SET button on the command module to instruct the cruise control to operate in the ACCEL / SET mode. The Electronic module will respond with 2 hi tone beeps and exit the Keyboard Initialization mode.

Press the RES button on the command module to instruct the cruise control to operate in the DECEL / SET mode. The Electronic module will respond with 2 low tone beeps and exit the Keyboard Initialization mode.

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ROAD TEST:

Start your vehicle and turn the cruise control on using the command module ON/OFF button.

While driving at around 40KM/H (25MPH) press and release the SET/ACC button and you should feel the cruise control take over. The lowest speed that your cruise control will operate is the minimum engage speed, this should be around 40 KM/H (25 MPH). The cruise control should now engage smoothly and maintain a stable vehicle speed.

Sensitivity adjustments:

If the cruise control does not engage smoothly or if the cruise control gains or loses speed while cruising you can make adjustments to the sensitivity settings of the cruise control. If the cruise control engages too quickly, you can decrease the INIT count. If the cruise control engages too slow, you can increase the INIT count. When the cruise control is engaged and gains speed, acts erratically or seems too responsive, you can decrease the GAIN factor. If the cruise control loses speed or seems to be sluggish in response you can increase the GAIN factor.

All the sensitivity settings can be adjusted in SET UP MODE, please refer to the flowchart (fig. 10.1)



TROUBLE SHOOTING GUIDE

This section of the manual includes a list of potential problems and a list of recommended checks to perform to solve these problems.

The LED on the electronic module does not light when the command module buttons are pressed.

Check the 8-pin command module connector from the electronic module and make certain that it is connected correctly to the command module.

Check the colour code on the command module connector and make certain that you have inserted the terminals into the command module correctly. If these are inserted correctly then check the main electronic module power supply and earth connection. The Orange wire should have the battery voltage (+12V) when the ignition is switched on and the Green wire should have earth at all times.

The LED on the electronic module does not light when the brake is pressed.

Check that the LED on the electronic module lights up when the command module buttons are pressed. If not, check the main electronic module power supply and earth connection. The Orange wire should have the battery voltage (+12V) when the ignition is switched on and the Green wire earth at all times.

Use a Voltmeter to check the connections to the brake switch. One Brown wire from the electronic module should be connected to a brake light switch wire, which is either permanent feed, or an ignition switched feed. The other Brown wire should be connected between the brake light bulb and the brake light switch. You will therefore read earth through the brake light bulb when the brake pedal is not pressed and the battery voltage (+12V) when the brake pedal is pressed. The two Brown wires are interchangeable. Some brake light circuits will have an ignition switched feed, so test the wires with the ignition switch in the ON position.

For safety purposes, the Cruise Control will not work if you have a problem with the vehicles original brake light circuit. Therefore, test the brake lights and make certain they are operating correctly.

The LED does not flash with a TACH signal input

Incorrect TACH signal. Check the signal using either a voltmeter or an oscilloscope. Make certain that the peak voltage of the signal is between the limits of 6v to 250V and in the frequency range of 6Hz-488Hz.

Once you have checked that the TACH signal is correct, test the signal again at the cruise control electronic module. Place the Red voltmeter lead or oscilloscope lead on the Yellow wire of the electronic module connector and the other lead to earth. Make certain you have the same signal at the electronic module.

If not, check over your connections and check if the Yellow wire is damaged or broken. In-correct PPM SET-UP Setting. If Speed sensing is selected, then the cruise control will not work from a TACH input signal, set the PPM setup again, and make certain that the PPM setup mode is in the RPM signal setting.

The LED does not flash with a speed signal input

Incorrect Speed signal. Check the speed signal using either a voltmeter or an oscilloscope. Make certain that the peak voltage of the signal is between the limits of 1.5v to 24v and is in the frequency range 6Hz to 8.5KHz.

Once you have checked that the Speed signal is correct, test the signal again at the cruise control electronic module. Place the Red voltmeter lead or the oscilloscope lead on the Blue wire of the electronic module connector and the other lead to earth. Make certain you have the same signal at the electronic module. If not, check over your connections and check if the Blue wire is damaged or broken. In-correct PPM SET-UP Setting. If Speed sensing is selected, then the cruise control will not work from a SPEED input signal, set the PPM setup again, and make certain that the PPM setup mode is in the SPEED signal setting.

The Actuator does not pull the Throttle in Diagnostic Mode

Perform all other diagnostic mode tests to check that the problem is not either power supply or command module related.

Turn off the ignition and exit diagnostic mode. Leave the ignition off for a few seconds and then press and hold the SET/ACC button while you turn on the ignition to re-enter diagnostic mode.

Repeat the test and verify whether the actuator is still not working.

Check the actuator connectors to make certain the terminals have been inserted into the connector with the same wire colours.

Press the SET/ACC key on the command module and listen to the actuator.

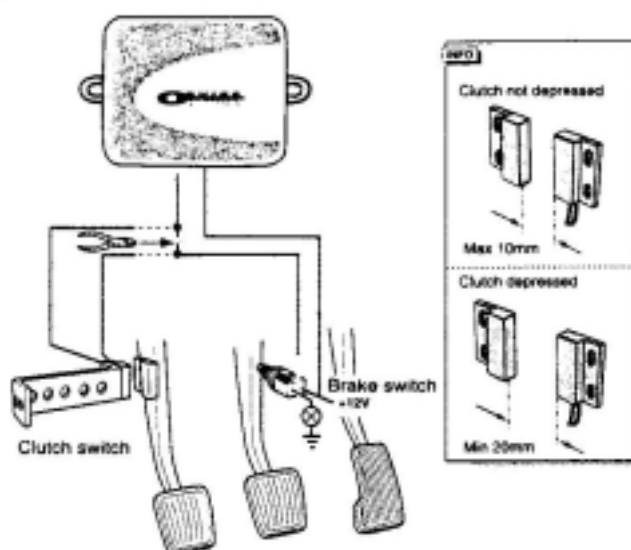
You should hear the motor in the actuator clicking as the button is pressed.

The cruise control does not function smoothly and tends to surge or hunt for the correct SET speed.

If the cruise control gains speed, acts erratically, or seems too responsive, then DECREASE the sensitivity by resetting the GAIN sensitivity set-up mode. If the cruise control loses speed or seems to be sluggish in responding, then INCREASE the sensitivity by resetting the GAIN sensitivity set-up mode.

AA170 Clutch switch kit

The Clutch Switch Kit can be used as an engine over-rev protection on cars with a manual gearbox. The cruise control will automatically disengage when the clutch is depressed and will prevent engine damage caused by over-revving. The magnet should be attached with double-sided tape, or cable tied to the clutch pedal. While the reed switch is attached to the chassis or pedal buffer, with the supplied self-tapping screws or with the double-side tape.



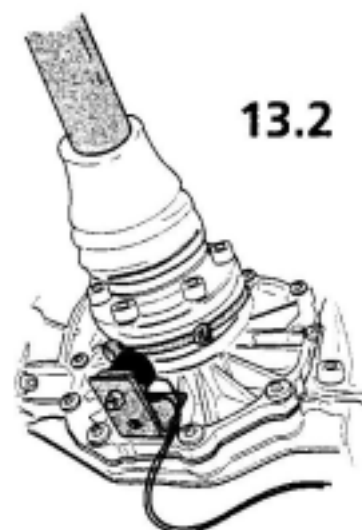
The two wires of the reed switch need to be connected to one of the two BROWN brake wires of the cruise control wiring harness (Fig.13.1). Cut one of these two brown wires and connect the clutch switch in series.

Speed sensor kit

The Speed Sensor kit generates the Speed Signal. The set has numerous installing possibilities. To mount the magnets, use the double-sided tape to stick the magnets to the drive shaft or universal joint. The cable tie is then used to fix the magnets to the drive shaft or universal joint.

Front wheel driven car (Fig. 13.2):

Block the wheels at the rear, ensure the gearbox is in neutral and use the hand brake. Lift the front end of the car until there is sufficient space for working and use axle stands for supporting the car. Fit the sensor on the bracket and determine a location to mount the bracket. This should be as close as possible to the gearbox as there is less movement of the shaft at this point. The inner universal joint of the shaft would be the best option. Use double-sided tape for sticking the 2 or 3 magnets to the shaft and once these are divided equally around the shaft use the cable tie to fix these to the shaft. The adjustment to the sensor should be made so there is gap of 3-5mm between the magnets and the speed sensor. Ensure that there is less than 5mm movement in a vertical direction of the shaft at this point.



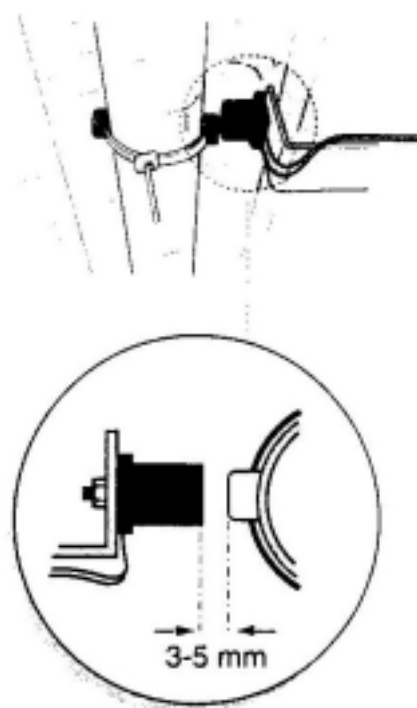
Rear wheel driven car (Fig. 13.3):

Block the wheels at the front and ensure the gearbox is in neutral. Lift the rear end of the car until there is sufficient space for working and use axle stands for supporting the car. Fit the sensor on the bracket and determine a location to mount the bracket.

This should be as close as possible to the gearbox as there is less movement of the shaft at this point.

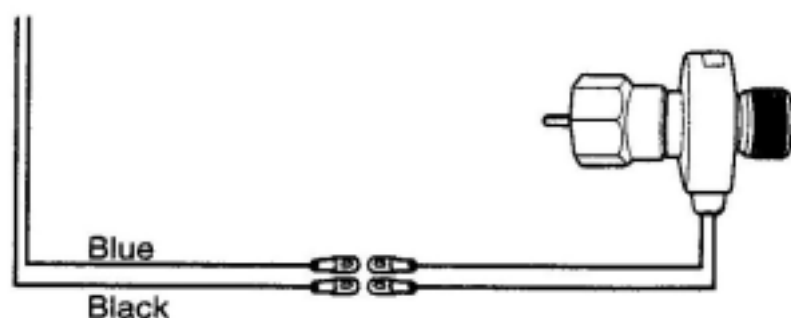
Use double-sided tape for sticking the 1 or 2 magnets to the shaft and once these are divided over the shaft use the cable tie to fix these to the shaft. The adjustment to the sensor should be made so there is gap of 3-5mm between the magnets and the speed sensor.

Ensure that there is less than 5mm movement in a vertical way of the shaft at this point.

**Speed Puls Generator (SPG) (Fig.13.4)**

The Speed Pulse Generator (SPG) can be used for generating a speed signal on cars with a screw-on type speedometer cable. Because the SPG is generating a speed signal, cars with manual transmission should always be fitted with an additional clutch protection to prevent over revving the engine when the clutch is pressed with an engaged cruise control.

The required protection should be made by using the clutch switch kit (AA170) or using the yellow wire as an over rev protection (see section identifying a suitable speed pulse).



13.4

O.E Command module

An O.E command module can be used on an AP300 and AP500 cruise control, for more information ask your dealer.