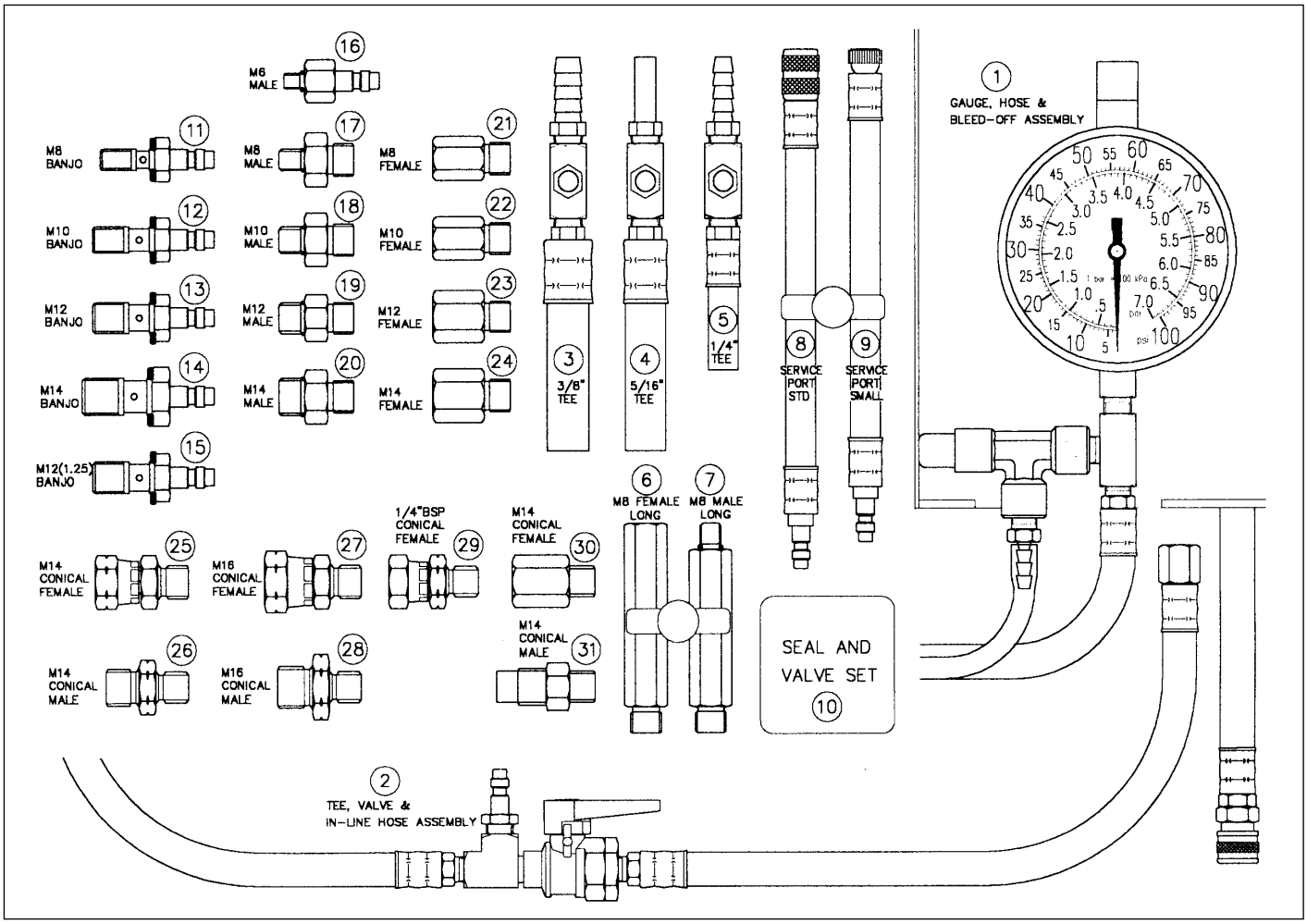
SEALEY Professional TOOLS
AUTO SERVICE LINE

VS210

FUEL INJECTION SYSTEM PRESSURE TEST KIT

1. TOOL PARTS & CONTENT LIST



STANDARD PARTS LIST

Item	Part Number	Description
1	VS210/01	Gauge, Hose & Bleed-Off Assembly
2	VS210/02	In-Line Tee/Flow Control Valve & Hose Assembly
In-Line TEE Adaptors		
3	VS210/03	In-Line 3/8" - Tee
4	VS210/04	In-Line 5/16" - Tee
5	VS210/05	In-Line 1/4" - Tee
Long Reach Thread Adaptors		
6	VS210/06	M8 Thread (long) - Female
7	VS210/07	M8 Thread (long) - Male
Test Port Adaptors		
8	VS210/08	Flexible Test Port - STD
9	VS210/09	Flexible Test Port - Small
10	VS210/10	Seal & Valve Set
In-Line Banjo Bolt Adaptors		
11	VS210/11	M8 In-Line - Banjo Bolt
12	VS210/12	M10 In-Line - Banjo Bolt
13	VS210/13	M12 In-Line - Banjo Bolt
14	VS210/14	M14 In-Line - Banjo Bolt
15	VS210/15	M12 In-Line (1.25) - Banjo Bolt
Male Thread Adaptors		
16	VS210/16	M6 Thread - Male
17	VS210/17	M8 Thread - Male
18	VS210/18	M10 Thread - Male
19	VS210/19	M12 Thread - Male
20	VS210/20	M14 Thread - Male
Female Thread Adaptors		
21	VS210/21	M8 Thread - Female
22	VS210/22	M10 Thread - Female
23	VS210/23	M12 Thread - Female
24	VS210/24	M14 Thread - Female
Conical Thread Adaptors		
25	VS210/25	M14 Conical - Female
26	VS210/26	M14 Conical - Male
27	VS210/27	M16 Conical - Female
28	VS210/28	M16 Conical - Male
29	VS210/29	1/4" BSP Conical - Female
30	VS210/30	M14 Conical (long) - Female
31	VS210/31	M14 Conical (long) - Male
--	VS210/84	Case + Insert

2. INTRODUCTION & APPLICATION

2.1. INTRODUCTION

The VS210 Fuel Injection System Pressure Test Kit provides the professional automotive technician with a fast and accurate way to test and identify system faults on both mechanical (CIS) and electronic (EFi) injection systems on a large range of vehicles worldwide.

The kit includes a comprehensive range of adaptors to effect 'In-Line' system connections, including 'Tee', 'Banjo Bolt', flexible 'Test Port' and Threaded adaptors to allow fitting onto the many and various fuel injection systems likely to be encountered.

The Gauge and Hose Assembly features a precision quality dual scale pressure gauge designed for accuracy, even in the lower pressure ranges to cover some SPi systems, an extra-long connection hose for improved practical use and long see-thru bleed hose for relieving fuel system pressure away from the vehicle.
Both male and female coupler connections are 'Valved' for safety and to minimise the risk of fuel spray and spillage.

2.2. APPLICATION

A wide range of petrol fuel injection systems including:-

Bosch: K, KE, KE3, L, LE2, LE3, LH. Jetronic.
Bosch Motronic: M1.3, M1.7, M2.5, M3.1, ML4.1, MA3.0, A2.2 SPi.
Bendix-Fenix: EFi.
Chrysler: SM.
Daihatsu: EFi.
Fiat: SPi, Weber 1AW.
Ford: EEC1V, EFi, Weber CFi.
GM: Multec SPi, EFi, Simtec EFi.
Hyundai: EFi.
Honda: PGM-Fi.
Isuzu: 1-Tec.
Kia: EFi.
Lucas: L Hotwire, P Digital.
Magnet Marelli: EFi, G5/G6 Mono.
Mazda: EGi.
Mitsubishi: ECi, MPi.
Nissan: EFi, ECCS.
Renault: R Electronic.
Renix: MPi.
Rover: SPi, PGM-Fi, M.E.M.S.
Subaru: MPFi, SPFi.
Suzuki: E.
Toyota: EFi, TCCS.
VW: Digijet, Digifant, VAG MPi.
Weber-Marelli: 1AW, CFi.

3. SAFETY INSTRUCTIONS

FUEL SAFETY.

❒ **WARNING! Ensure Health and Safety, local authority, and general workshop practice regulations are adhered to when working with fuel injection systems and petrol in general.**
❒ **WARNING! Petrol fumes and battery gases are explosive, DO NOT smoke or allow an open flame or sparks in the work area.**

FUEL LEAKS.

✓ Keep a dry chemical (class B) fire extinguisher near to the work area.
✓ Avoid fire hazard by using caution when disconnecting fuel lines and installing adaptors, as some spillage is inevitable.
✓ When connecting, or disconnecting from a fuel system, relieve pressure from system and wrap a cloth around the fuel line fitting to absorb any fuel leakage. Constantly check gauge and adaptor connections for leaks. If you see leakage turn off the ignition or disable the fuel pump, relieve fuel pressure if necessary and correct leaks before continuing.
✓ When using ‘tee’ adaptors, secure hose with hose clamps to ensure leak-free connections.
✓ Check all adaptor sealing washers and 'O' rings are in good condition before use.
✓ When connecting hose coupler to Test Port, Tee and In-Line Banjo Bolt Adaptors ensure coupler is correctly seated onto adaptor.
✗ DO NOT let fuel spill onto a hot engine.
✗ DO NOT allow fuel to remain in the adaptors or hoses after use. To clear any fuel trapped in the gauge/hose assembly after use, hold gauge vertical with hose coupler end in suitable fuel container. Depress coupler valve stem and at the same time, depress pressure relief button situated under the gauge.
❒ **WARNING! Wipe up fuel spills immediately.**

GENERAL

❒ **WARNING! Exhaust gas contains deadly poisonous gases. Test area must well ventilated - route exhaust gas outdoors.**
✓ Maintain tools in good and clean condition for best and safest performance.
✓ If required, ensure the vehicle to be worked on is adequately supported with axle stands, ramps and chocks.
✓ Before performing a test with the engine running (unless the manufacturer's manual states otherwise), set the parking brake and place the gear selector in neutral or park, and block the drive wheels.
✓ Before repairing the fuel system, turn off the ignition switch and disconnect the battery per manufacturer's procedure. Never disconnect the battery while the engine is running.
✓ Wear approved safety goggles. A full range of personal safety equipment is available from your Sealey dealer.
✓ Wear suitable clothing to avoid snagging. Do not wear jewellery and tie back long hair.
✓ Keep yourself, clothing and test equipment away from all moving or hot engine parts.
✗ DO NOT use tools if damaged.
✗ DO NOT use the components from this kit on diesel fuel systems.
✓ Account for all tools being used and do not leave them in or near the engine.
✓ **IMPORTANT:** Always refer to the vehicle manufacturer’s service instructions, or proprietary manual to establish the current procedure and data. These instructions for use are provided as a guide only.

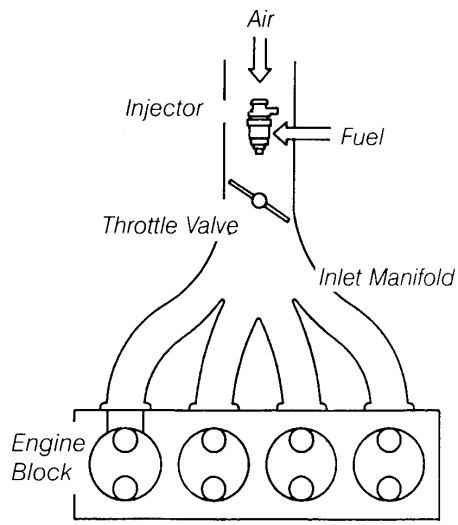
4. THE FUEL INJECTION SYSTEM

4.1. FUEL INJECTION SYSTEMS - BASICS

Petrol fuel injection systems can be Mechanical - CIS (eg. Bosch K-Jetronic) or Electronic - EFi (eg. Ford EEC 1V).
Systems can be: Single-point fuel injection (Throttle Body Injection TBi or Central Fuel Injection CFi) or Multi-point fuel injection (Port Fuel Injection PFi). Single point systems inject fuel from a position on the intake manifold above the throttle plate, a single injector supplying all cylinders (fig.1).
Multi-point systems have individual injector for each cylinder, injecting at a point on the intake manifold near the intake valve. These injectors are mounted on and feed fuel via a 'fuel rail' (fuel distribution rail), Fig.2.

On both single point and multi-point systems, the fuel line comprises 'the supply', which supplies fuel to the injector(s) and 'the return', which returns excess fuel to the tank. The fuel pressure regulator is fitted between the supply and the return sides and maintains constant system pressure.

fig 1



4.2. FUEL PRESSURE DIAGNOSIS

The Fuel Injection System Pressure Test Kit is used to identify system faults via system pressure readings and fuel delivery rate.

Faults such as:

- *Blocked lines*
- *Blocked filters*
- *Reduced output from pump*
- *Faulty regulator*

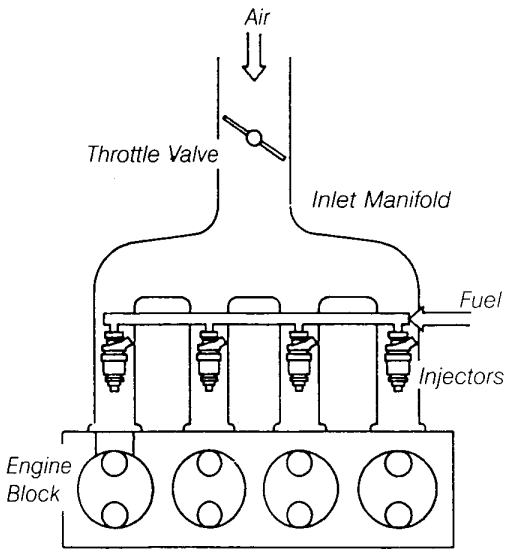
Fuel pressure is affected by the condition of the fuel pipes and components that make up the supply and return sides of the system. Lower than normal pressure is usually due to a faulty supply side component. Higher than normal pressure is usually caused by a faulty return side component.
A fault in the fuel pressure regulator could result in higher or lower pressure, since it divides the supply from the return side.

4.3. LOWER THAN NORMAL PRESSURE

Normally attributed to faults such as clogged filter, restriction (kink or bend) in supply line, defective fuel pump, defective pressure regulator or low pressure in tank caused by improper venting.

A low pressure condition on most systems can be isolated by pinching off the return line and checking the fuel pressure. If the fuel pressure increases, the pressure regulator may be faulty, if the fuel pressure does not increase, carry out tests for blockages in the supply pipes and filters. If no blockages are found check the fuel pump output.

fig 2



4.4. HIGHER THAN NORMAL PRESSURE

Usually attributed to faults such as defective fuel pressure regulator, restriction (bend or kink) in return line or excessive tank pressure caused by a poor vent system.
Isolate the area of restriction by disconnecting the fuel return pipe starting from the pressure regulator (only after relieving system pressure). Both outlets from the disconnection must be routed to a fuel container.
Operate the fuel system and if the pressure is at the specified level when the regulator is functioning normally, then the restriction is between the disconnected return pipe and the tank.
If the pressure remains high the regulator may be defective.

4.5. MAINTAINING SYSTEM PRESSURE

Most fuel injection systems will maintain the fuel pressure after the engine has been switched off to ensure fuel for easier starting. If this pressure leaks the vehicle may be hard to start.

5. OPERATING INSTRUCTIONS

WARNING! Ensure you have read, understood and apply the safety instruction in section 3. before using tools.

5.1. SYSTEM TEST CONNECTION POINTS

The pressure gauge assembly of the Fuel Injection System Test Kit is connected to the fuel system, either in the fuel supply line or via a test port, whilst still allowing the engine to run and normal fuel flow to occur.
All pressure tests should be made at idle engine speed on the **supply** side of the system. On multi-point systems supply pressure may be tested at a special test port, often located on the fuel rail.
Testing can require disconnection of the fuel supply line, at a suitable point, and the installation of special adaptors to provide the means of attaching the pressure gauge and hose assemblies in-line, Fig. 3.

If no specifications are available, connect the pressure gauge to the **supply line** as close as possible to the fuel rail, or on some systems it may be possible to connect between the fuel rail and the regulator.

Follow the manufacturer's instructions regarding the connection location point. For example:
a) On Bosch K-Jetronic mechanical systems, connection is normally made in-line between the fuel distributor and the warm-up regulator (fig.4).
b) Single point injection system see fig 4A.

5.2. RELIEVING SYSTEM FUEL PRESSURE

WARNING! - Always adhere to manufacturer's procedures for relieving system pressure.

Fuel injection systems are pressurised, typically up to 3.5 bar on electronic systems.
Before disconnecting the fuel lines to connect adaptors and pressure gauge to fuel system, this fuel system pressure must be relieved, to prevent fuel spraying when a joint is disconnected.

Switch off ignition, loosen the fuel tank cap to relieve tank pressure, then re-tighten.

To relieve fuel pressure, it is necessary to prevent the fuel pump operating, whilst still allowing both injection and ignition systems to operate.
For example, the procedure may simply require the fuel pump relay, fuse or electrical connection to be disconnected, the engine run until it stalls, and then cranked over a number of times after it has stalled.
However, on some electronic fuel injection systems removing the fuel pump fuse disables both the fuel pump and the injector. Refer to manufacturer's procedure.

IMPORTANT: DO NOT assume that pressure in the fuel system has been relieved. If you 'open' the system in this condition fuel will spray out uncontrollably.
When disconnecting wrap a cloth around the fuel line fitting to absorb any fuel leakage.

fig 3

Arrows indicate the Multi-point injection system Test Connection Points.

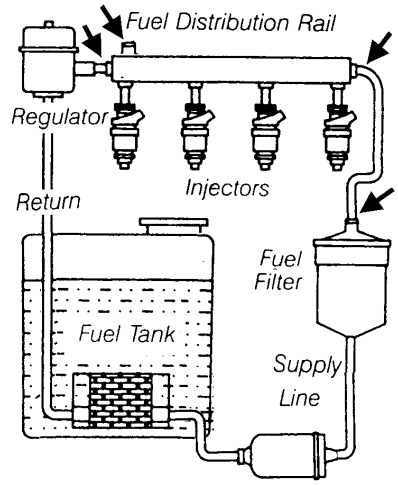


fig 4

Arrows indicate the K-Jetronic injection system Connection Points.

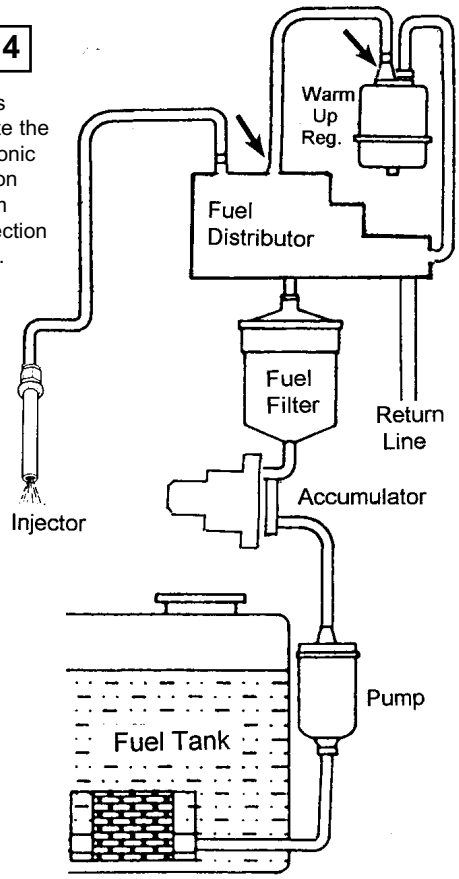
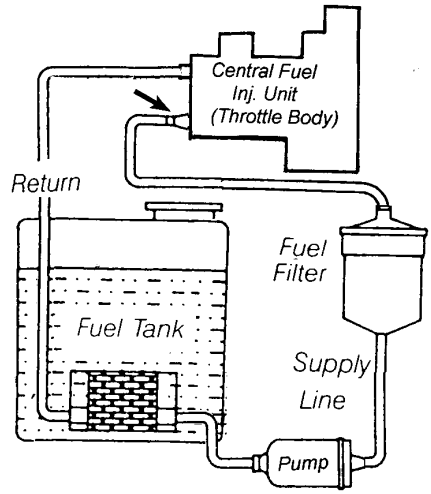


fig 4A

Arrow indicates the Single Point injection system Connection Points.



5.3. SELECTING ADAPTORS - CONNECTING TO THE FUEL SYSTEM.

Vehicle, engine and fuel system combinations vary and change over time and specific adaptor applications are difficult to detail.

The objective of the adaptor range is to provide the technician with the means of connecting the pressure gauge assembly onto a suitable place on the **'supply'** side of the fuel system, (normally between the fuel filter and fuel rail), in order to carry out system pressure tests/diagnosis.

The VS210 Kit provides a wide selection and combination of adaptors allowing connections to be made onto all known major systems. In addition the range of adaptors has been designed to provide variations and alternative methods of achieving entry into the fuel system, such as the In-Line Banjo Bolt Adaptors.

A guide to selection and use of the various types of adaptors is detailed as follows:

When the pressure gauge assembly has been connected to the system, air must be bled from it using the bleed-off relief valve/hose situated directly under the gauge.

5.4. TEST PORT CONNECTIONS

System examples: Bosch EFi/Motronic, Lucas EFi, Ford EEC1V, Chrysler SM

For **'Std' Test Ports** . . . . .use VS210/08
For **'Small' Test Ports** . . . .use VS210/09

Some F.I. systems have Test Ports -
a male fitting with internal schader type valve, very often located on the fuel rail.
These probably provide the most straightforward pressure test connection
to a fuel injection system
Two sizes of Test Port connection are commonly found -
'Standard' - of the type on **GM systems**.
'Small' - often found on **Ford systems**.

Test Port Adaptors VS210/08 or VS210/09 will screw onto the test port and provide the valved coupler to connect the pressure gauge/hose directly onto the system (fig 5).

Sealey Test Port Adaptors are 'Flexible' to aid connection in 'difficult to access' applications and 'Valved' at coupler end to minimise connection spray/fuel spillage.

See the following diagrams in figure 6 showing typical test port connections.

fig 5

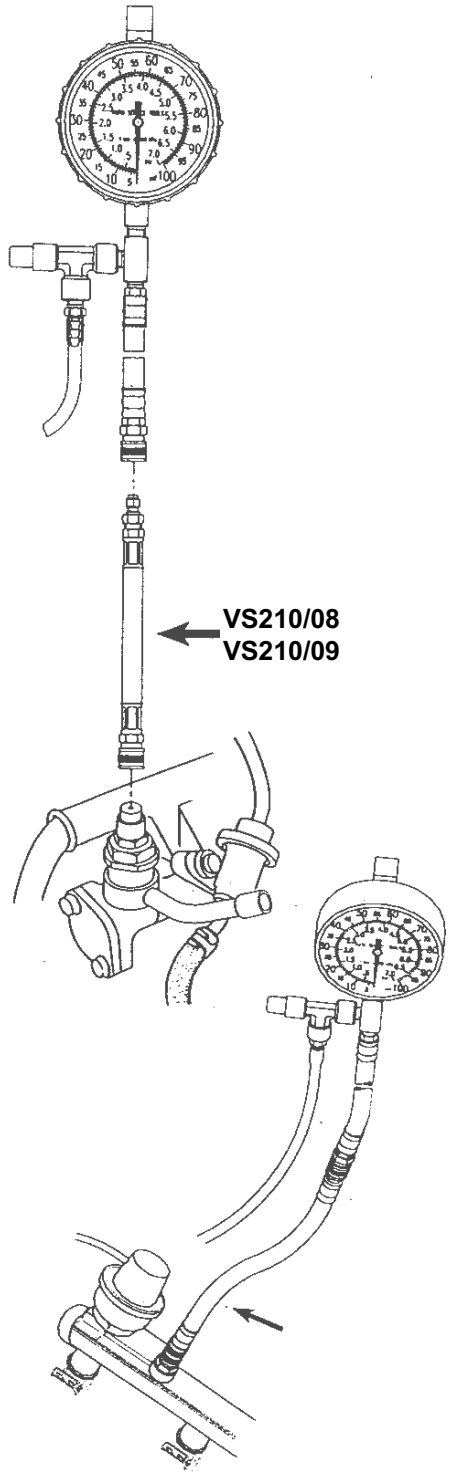


Figure 6. Typical test point connections

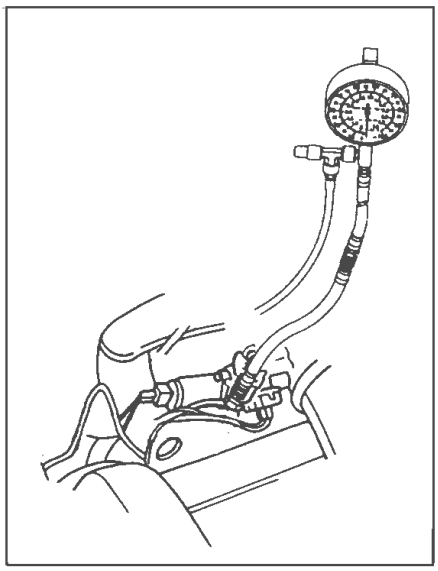


Fig. 6.1. Ford Mondeo *Test port adaptor on Schrader valve in fuel rail*

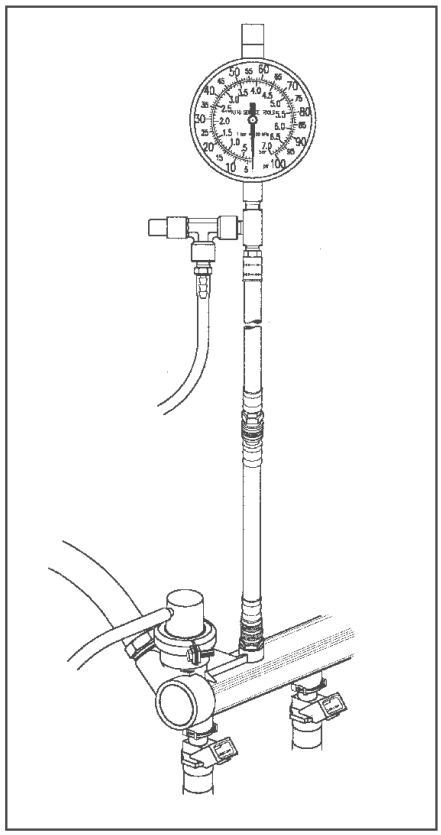


Fig. 6.2. Vauxhall/Opel 16v. Eco-Tec *Test Port Adaptor on fuel rail*

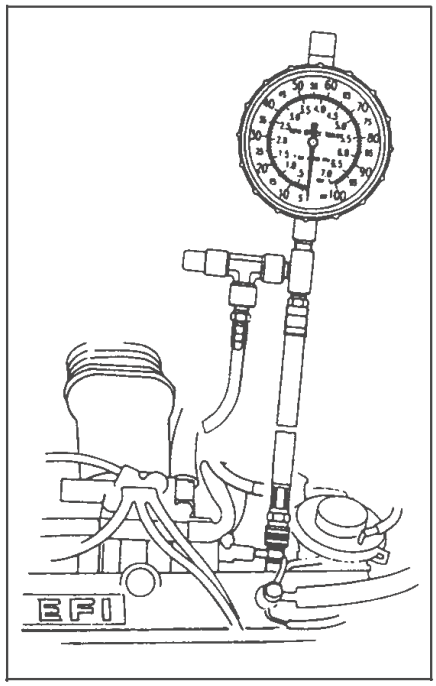


Fig. 6.3. Toyota *Test Port Adaptor*

Fig. 7.Typical In-Line Tee connectors

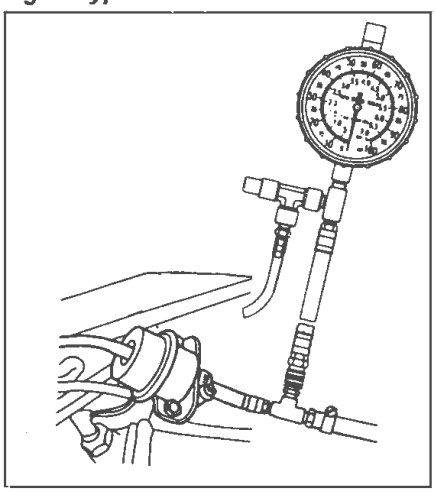


Fig. 7.1. BMW 535i *Tee hose adaptor in fuel line to regulator*

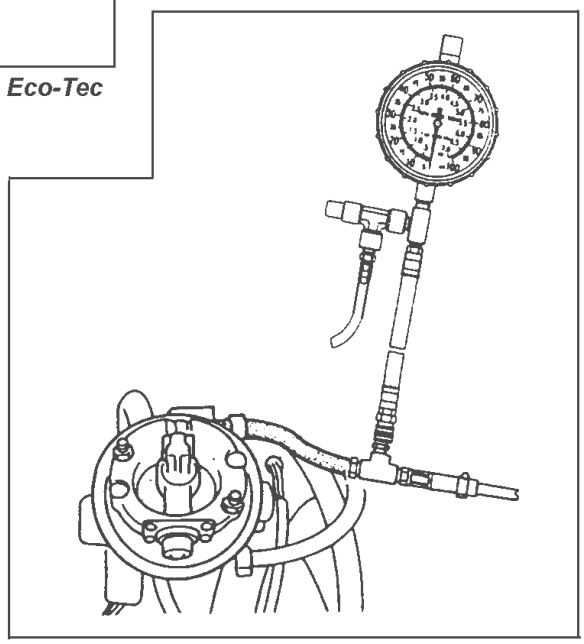


Fig. 7.3. Vauxhall-Opel Astra *Tee adaptor in fuel line to CFI unit*

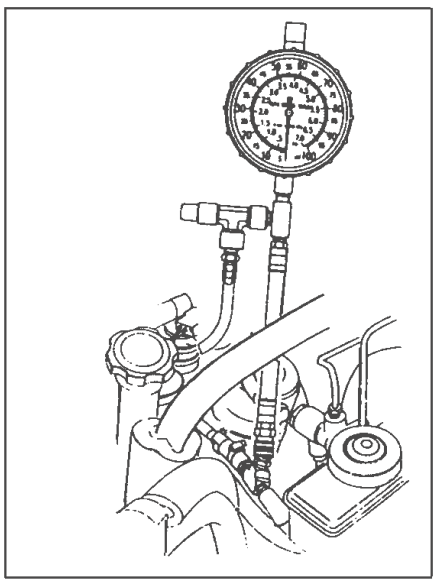


Fig. 7.2. Mazda *Tee hose adaptor*

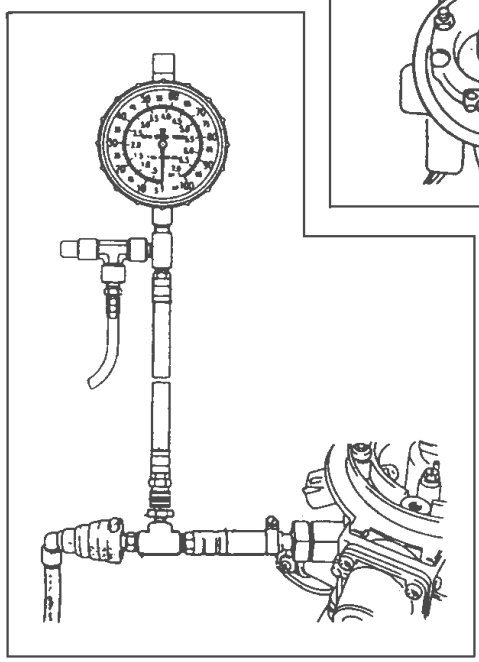


Fig. 8. Ford/Escort/Orion *Push-in tee hose inserted at push-in fitting on CFI unit*

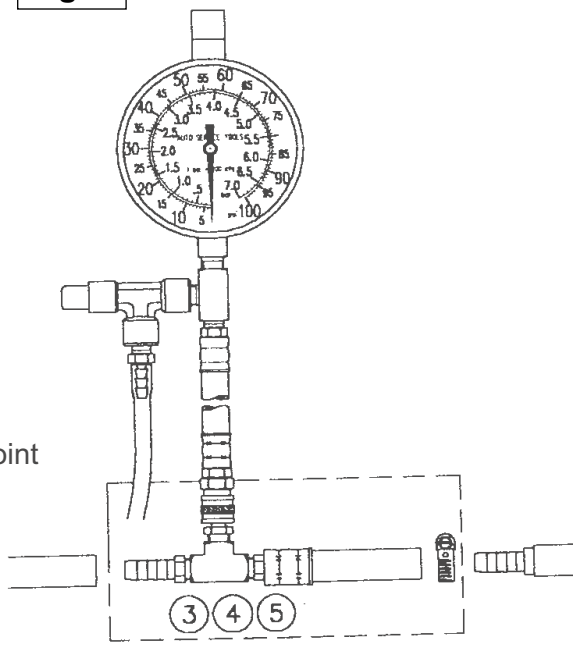
5.5. IN-LINE TEE CONNECTIONS

System examples:

5.5.1. Bosch EFi, Nissan EFi/ECCS, Renix, Subaru MPFi, Toyota EFi/TCCS, VW Digijet, Ford CFi, Weber 1AW

For **3/8" I.D. Fuel Lines** . . . . . .use VS210/03
For **5/16" I.D. Fuel Lines** . . . . . .use VS210/04
For **1/4" I.D. Fuel Lines** . . . . . .use VS210/05

fig 9



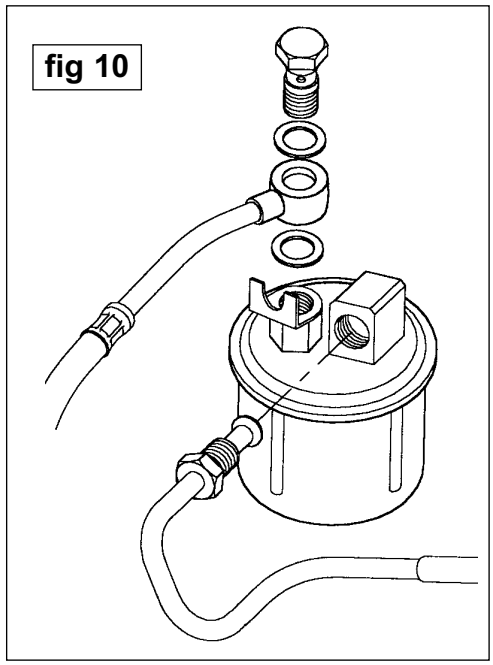
This type of connection is normally identifiable as the system supply fuel line is connected to the fuel rail/throttle body as a push on flexible hose onto a male barb hose fitting and secured in place with a hose clamp.
Releasing the hose clamp and disconnecting the hose at this point allows the appropriate Tee Adaptor VS210/03, VS210/04 or VS210/05, according to the inner diameter of the system supply line, to be placed in-line (fig 9).
The 'tee' then provides a valved coupler connection for the pressure gauge/hose assembly to be attached. Typical In-Line Tee connections are shown in fig 7.

IMPORTANT: **When installing an In-Line Tee Adaptor both the rail connection and the hose end connection MUST BE secured with hose clamps (eg. the original system clamp and a clamp from the Seal/Valve Set, item 10, in the Kit)**

5.5.2. Ford / Land Rover Freelander Applications:

In addition to using VS210/04 In-Line Tee Adaptor for 5/16" I.D. supply line connections, this adaptor is also use for in-line connection to systems with straight coupler style quick release connectors (fig 8).

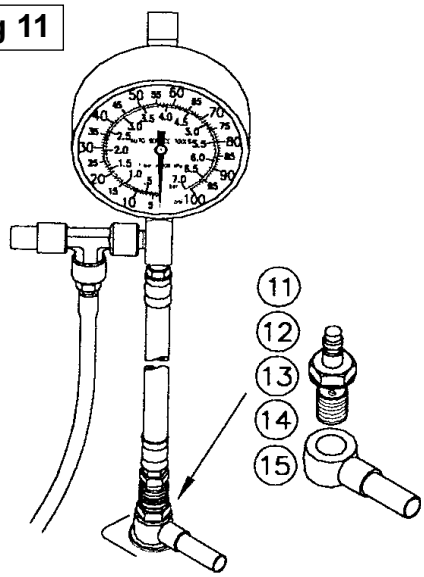
fig 10



In-Line Banjo Bolt connections
For **M8 Banjo Connections** . . . . . .use VS210/11
For **M10 Banjo Connections** . . . . . .use VS210/12
For **M12 Banjo Connections** . . . . . .use VS210/13
For **M14 Banjo Connections** . . . . . .use VS210/14
For **M12 Banjo Connections**
1.25 PGM-Fi systems . . . . . .use VS210/15

Banjo connections are commonly found on supply lines both at the fuel rail and at the fuel filter (fig 10).
These comprise a special retaining bolt which passes through a 'banjo' fitting with the fuel line fixed to the 'banjo'.
Sealey In-Line Banjo Bolt Adaptors are used to provide connection to the F. I. system by being substituted for the actual system banjo bolt. This then gives a valved coupler connection for the pressure gauge/hose assembly to be attached (fig 11).

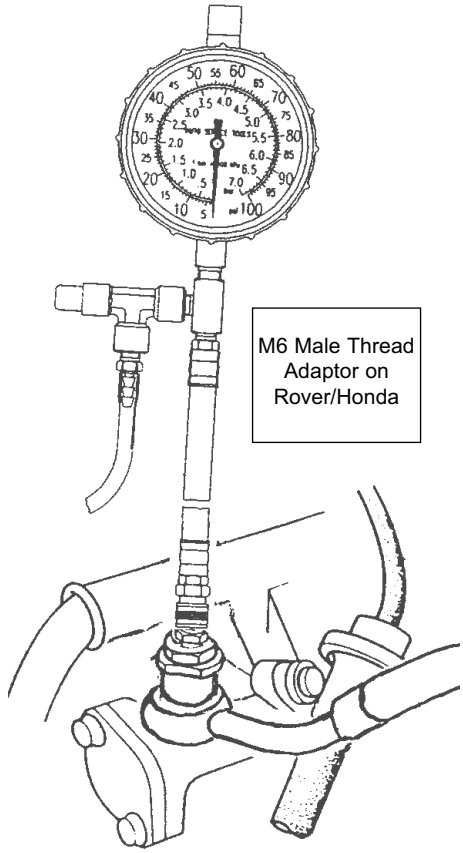
fig 11



IMPORTANT: **When making this connection, ensure sealing washers are in place at top and bottom of the "banjo". Fibre seal washers are provided in the Kit.**

5.6. THREADED CONNECTIONS - STANDARD

	MALE	FEMALE
For **M6 Threads** . . . . . .use	VS210/16	(Honda PGM-Fi)
For **M8 Threads** . . . . . .use	VS210/17,	VS210/21
For **M10 Threads** . . . . . .use	VS210/18,	VS210/22
For **M12 Threads** . . . . . .use	VS210/19	VS210/23
For **M14 Threads** . . . . . .use	VS210/20	VS210/24
For **M8 Threads Long Reach** . . . . . .use	VS210/06	VS210/07



Many systems have threaded supply line connections and therefore the Kit provides a comprehensive range of Threaded Adaptors (also see Threaded connections - conical seating).

When connecting onto the system using threaded adaptors the valved coupler connection required to attach the pressure gauge/hose to the system is provided by VS210/02 Tee/Flow Control Valve and Hose Assembly.

All the Threaded Adaptors detailed above, have a M12 male thread opposite the male or female thread size listed. Therefore when the supply line is disconnected and the appropriate size male and female Thread Adaptor fitted, two male M12 threads will be showing.

VS210/02 Tee/Valve & Hose Assembly has female M12 swivel connections on each hose end. These are screwed onto the M12 male threads which will be showing from the Threaded Adaptors used and therefore completes the in-line test connection onto the system (fig 12) and (fig 15).

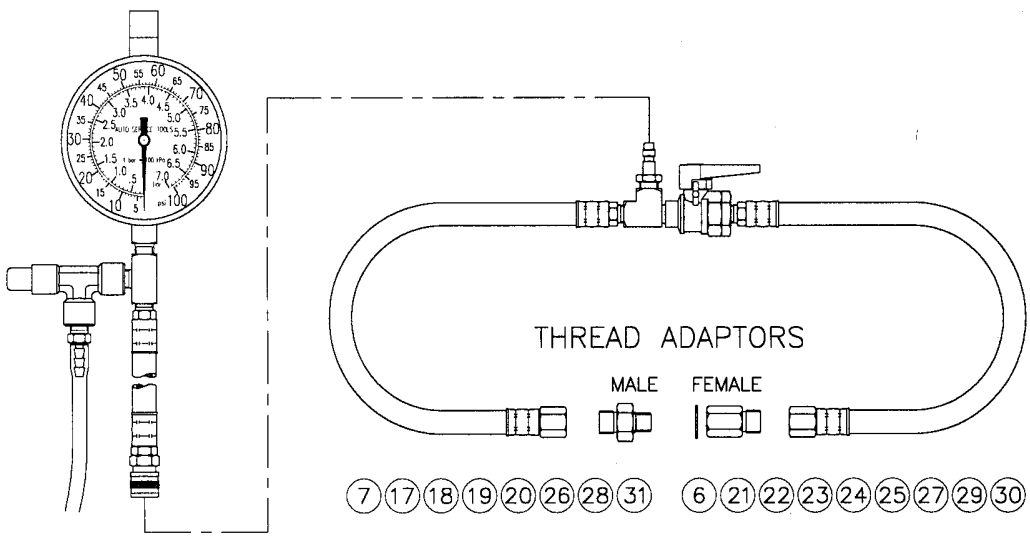
NOTE: The M12 swivel connection to the M12 adaptor thread is a cone seating. Tighten using two spanners holding the Threaded Adaptor firmly with one whilst tightening the swivel with the other.

CAUTION:
Ensure all connections are tightened fully and do not leak.
Ensure the Adaptor 'O' rIngs fully seal at the system connection points.

IMPORTANT: When connecting the VS210/02 always ensure that the Flow Control Valve is positioned after the pressure gauge take-off tee following the direction of flow.

For normal in-line system pressure testing the Flow Control Valve on AST3087/2 must be in the fully open position. - Also see Connecting to CIS (K-Jetronic) Systems.

fig 12



5.7. THREADED CONNECTIONS - BANJO WHEN IN-LINE FLOW CONTROL VALVE IS REQUIRED.

The range of Threaded Adaptors can also be used to place VS210/02 Tee/Valve & Hose Assembly in-line when the connection to a system banjo fitting is necessary and a Flow Control Valve is required, eg. on CIS(K-Jetronic) systems.

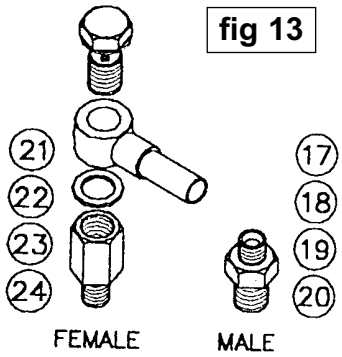


fig 13

Disconnect the banjo fitting and leaving the bolt through the banjo (with top and bottom seals in place), screw on to the banjo bolt the appropriate size of female threaded adaptor. Ensure the female adaptor threads fully up to the bottom seal, and tighten.
Screw into threaded hole which has been left by removing the banjo fitting, the appropriate size male threaded adaptor, (fig 13). Two male M12 threads will now be showing, allowing VS210/02 Tee/Valve & Hose Assembly to be connected and used to attach pressure gauge/hose to system.

5.8. CONNECTING TO CIS (K-JETRONIC) MECHANICAL SYSTEMS

Test connection to K-Jetronic systems is effected by fitting VS210/02 Tee/Valve & Hose Assembly in the fuel line between the fuel distributor and warm-up regulator using threaded adaptors (fig 14). In addition to providing the valved coupler connection for attaching the pressure gauge/hose, VS210/02 has a Flow Control Valve which is required when carrying out tests on this system. The tests require the valve to be **closed** when checking Main System Pressure and Fuel Pump Check Valve tests and **open** for Control and Residual Pressure examination.

IMPORTANT:
Always ensure that manufacturer's test procedures are understood and strictly adhered to, particularly those requiring the Flow Control Valve to be closed.

fig 14

Volkswagen Golf - Tee/Flow Control Valve and Hose fitted between fuel distributor and warm-up regulator

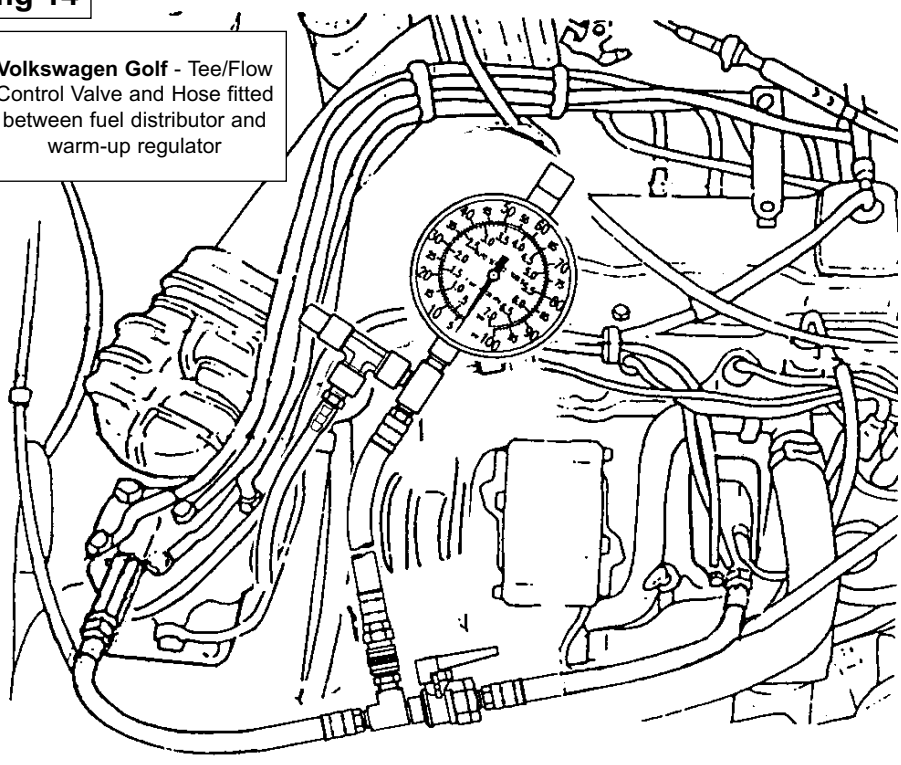
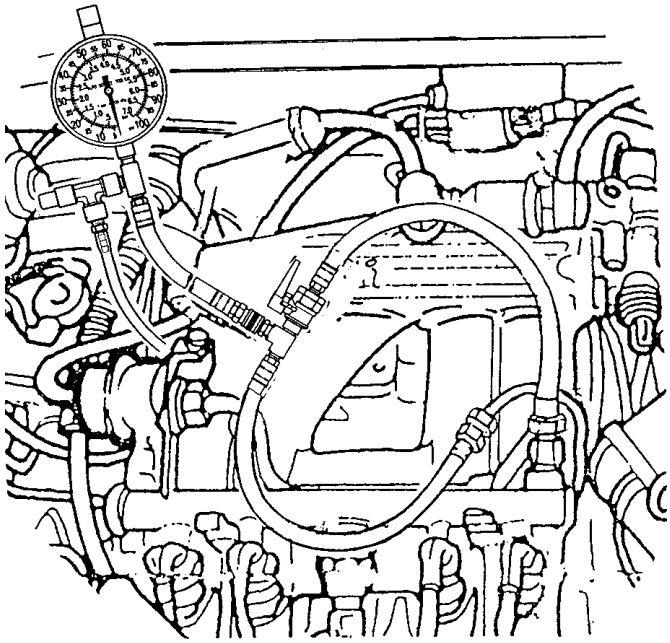
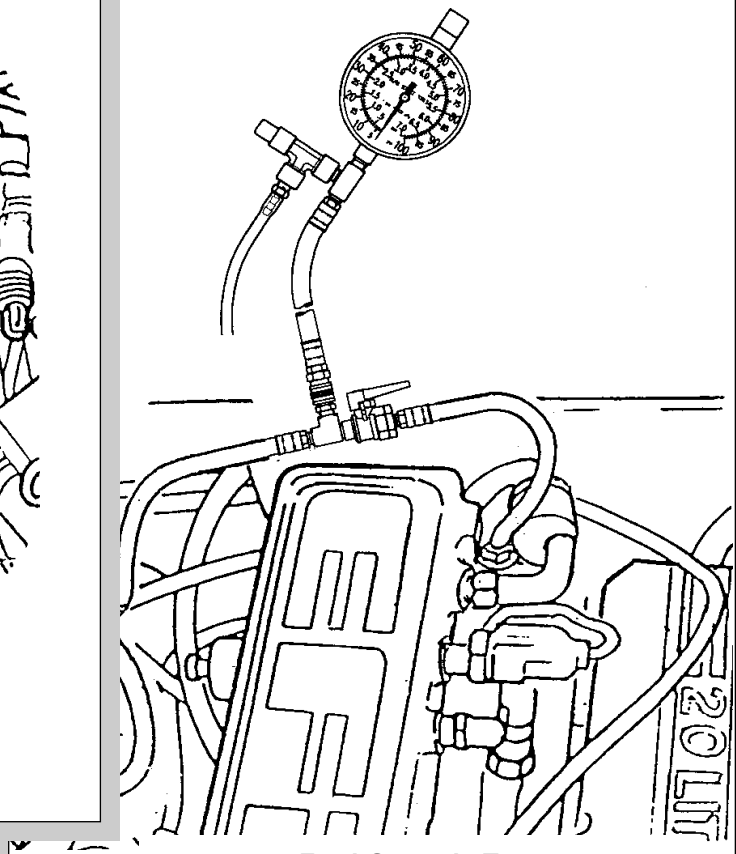


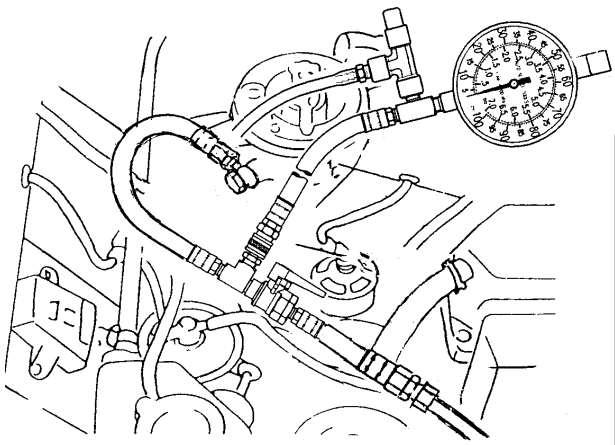
Figure 15. Typical in-line connections using VS210/02 tee/valve and hose assembly with threaded adaptors



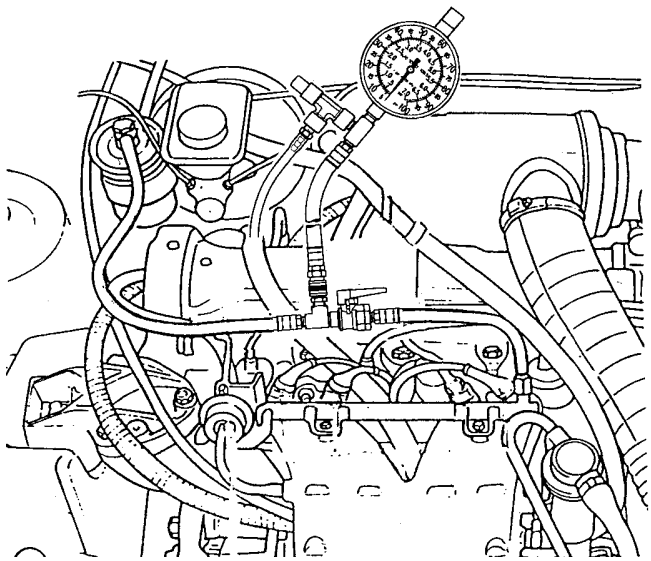
Rover 216 Tee,
valve and hose fitted in fuel line to fuel rail.



Ford Granada Tee,
valve and hose in fuel line at fuel rail



Ford Fiesta/Escort Tee,
valve and hose in fuel line to CFI unit.



Peugeot 205, 309, 405 Tee,
valve and hose between filter and fuel rail

THREADED CONNECTIONS - CONICAL SEATING

	MALE	FEMALE
For **M14 Conical**	.use VS210/25,	VS210/26 + VS210/29
For **M16 Conical**	.use VS210/27,	VS210/28 + VS210/29
For **1/4"BSP Conical**	.use VS210/25 +/26,	VS210/29
For **M14 Conical Long Reach (MEMS system)**	.use VS210/31,	VS210/30

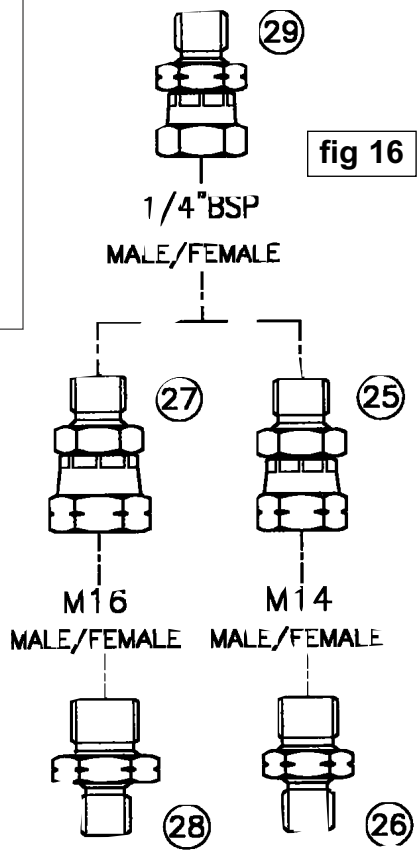


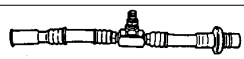
fig 16

NOTE: The M14, M16 and 1/4" BSP adaptors are used 'in combination' to achieve the male/female conical seating connections to the systems in order to provide the two M12 male threads required to connect VS210/02 Tee/Valve & Hose Assembly in-line, - see figure 16.

This range of threaded adaptors is used in exactly the same way as the 'standard' threaded adaptors described earlier - to make the connection onto the F.I. system lines with conical seatings. They then provide two M12 male threads onto which VS210/02 Tee/Valve & Hose Assembly is fitted. These adaptors however do not seal onto 'O' rings, as with the 'standard' adaptors, but directly onto the conical seatings of certain system fuel line connections.

NOTE: When testing is completed, use fuel pressure relief valve attached to gauge to relieve pressure prior to disconnecting the test equipment to re-make the system. Always ensure the drain-off hose directs fuel away from the vehicle and into a suitable container.

ADDITIONAL ADAPTORS AVAILABLE

In-Line Tee Adaptor	Ford Spring Lock Fitting		VS2101
In-Line Tee Adaptor	Ford Spring Lock Fitting (Cosworth)		VS2102
M12 Adaptor - Female	Range Rover/Discovery (Fuel Rail Connection)		VS2103
M12 Adaptor - Male	Range Rover/Discovery (Fuel Rail Connection)		VS2104
FOR ALTERNATIVE CONNECTION METHODS			
M8 Banjo M10 Banjo M12 Banjo M14 Banjo	Use in place of Male Threaded Adaptors for In-Line connection of VS210/02 Tee/Valve & Hose Assembly -Use in conjunction with In-Line Banjo Bolt Adaptors.		VS2105 VS2106 VS2107 VS2108

NOTE: *It is our policy to continually improve products and as such we reserve the right to alter data, specifications and component parts without prior notice.*

IMPORTANT: No liability is accepted for incorrect use of this equipment. **WARRANTY:** Guarantee is 12 months from purchase date, proof of which will be required for any claim. **INFORMATION:** Call us for a copy of our latest catalogue on 01284 757525 and leave your full name and address including your postcode.

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