DM0490

COMMON RAIL INJECTOR REPAIR - ADVANCE NOTE

SUBJECT: TEST EQUIPMENT AVAILABLE TO ORDER NOW

1. Introduction

Since the launch of the first Delphi Common Rail system in 2001, Delphi Diesel Aftermarket and its test equipment partner, Hartridge, have been working on the development of test equipment to enable the repair of the individual components within the system. With its high operating pressures and extremely precise machining, the repair of Common Rail systems has required a new approach in terms of both test equipment and workshop conditions.

Delphi successfully introduced Common Rail pump repair in 2004 and is now pleased to announce the launch of a repair programme for Common Rail injectors. With the simultaneous launch of test equipment, training, repair manuals, test plans, workshop standards and a repair parts programme, the Delphi network will have all the elements required for Common Rail injector repair.

2. Workshop Standards

Delphi Diesel Aftermarket has issued Service Policy documents (DT307/2 & DT367) that give details of the clean environment and cleaning equipment required to become an authorised Delphi Common Rail service centre. These standards must be met in order for a workshop to become an authorised Common Rail injector repair centre.

In addition to these existing standards, there are some further requirements for CR injector repair. Common Rail injector testing is extremely sensitive to heat fluctuation within the test bench and for this reason additional cooling equipment is required for the test bench. The recommended specification for this equipment is:

Water Temp:	Max 15 deg. C
Water Flow:	Min 10 l/min
Water Pressure:	Min 0.75 bar, Max 7 bar
Heat dissipation:	8kW (Min)

Due to the extreme temperatures and pressures involved in Common Rail injector repair, it is essential that the AVM2 test bench is audited at the recommended intervals. Particular attention should be paid to the areas of oil viscosity and metering unit calibration during this audit.

DELPHI Diesel Systems Ltd, Aftermarket Operations, Spartan Close, Warwick, CV34 6AG, UK.
Tel: [44] [0] 1926.472900 Fax: [44] [0] 1926.472901

It is also vital that the PC used to operate OCRES meets the minimum specification detailed below:

Pentium 400 MHz minimum
Windows 2000, XP
RS232 dedicated
Ethernet card (Minimum 10 Mb)
Network connection RJ45
128 MB memory
250 MB available on the hard drive
1 USB port dedicated
CD Rom drive
Ethernet cable: Category 5e Crossed Patch Lead, 5m

3. Test Equipment

The Delphi Common Rail injector solution is based around a combination of Delphi and Hartridge test equipment. The parts listed below are the requirements for authorised CR injector repair workshops. These parts are shown in three tables; the first shows those that were also required for CR pump repair, the second shows new generic requirements for injector repair and the third shows application-specific parts.

Existing Requirements for CR Pump Repair

Description	Part No.	Distributor	Availability / Launch
AVM2PC Test Stand (20HP)	various	Hartridge	Contact Hartridge distributor
CR base kit	HB378	Hartridge	Contact Hartridge distributor
Electronic Test Kit	YDB295 or YDT240	Delphi Diesel Aftermarket	Ave. 10 week lead time
OCRES interface box	YDT331*	Delphi Diesel Aftermarket	Available ex-stock
CR pump control unit	HF1130	Hartridge	Contact Hartridge distributor
Delphi CR pump kit	HF1132	Hartridge	Contact Hartridge distributor

* Please note that a software download from OCRES version 6 will be required prior to using YDT331 for CR injector testing. Please contact Service Operations for more information.

New Generic Requirements for CR Injector Repair

Description	Part No.	Distributor	Availability / Launch
AVM2 Software Upgrade (v36 or later)	HB374	Hartridge	Contact Hartridge distributor
All-Makes CR injector base kit	HK900	Hartridge	Contact Hartridge distributor
Pressurised backleak kit	HK901-P**	Hartridge	Contact Hartridge distributor
Cable kit – Delphi	HK904	Hartridge	Contact Hartridge distributor
Nosepiece adaptor kit	HK907	Hartridge	Contact Hartridge distributor

High pressure pipes kit	HK917	Hartridge	Contact Hartridge distributor
Rail/PCV assembly	HK950	Hartridge	Contact Hartridge distributor

** Hartridge will be offering an exchange scheme on the HK901-P for customers that have already purchased a HK901. Please contact Hartridge for more details.

Application-Specific Requirements for CR Injector Repair

Description	Applications Covered	Part No.	Distributor	Availability / Launch
Backleak adaptor	Citroen, Ford (2.0 TDCI), Jaguar, Suzuki	HK911	Hartridge	Contact Hartridge distributor
Clamp block kit	Citroen, Ford (1.8 TDCI), Hyundai, Kia, Nissan, Renault, Ssangyong, Suzuki	HK916	Hartridge	Contact Hartridge distributor
Clamp block kit	Ford (2.0 TDCI), Jaguar	HK920	Hartridge	Contact Hartridge distributor
Clamp spacer kit (7.5mm)	Ford (2.0 TDCI), Jaguar	HK929	Hartridge	Contact Hartridge distributor
Clamp spacer kit (7.65mm)	Ford (1.8 TDCI)	HK930	Hartridge	Contact Hartridge distributor
Clamp spacer kit (24.5mm)	Hyundai, Kia	HK931	Hartridge	Contact Hartridge distributor
Clamp spacer kit (51.0mm)	Ssangyong	HK932	Hartridge	Contact Hartridge distributor
Clamp spacer kit (56.6mm)	Citreon, Suzuki	HK933	Hartridge	Contact Hartridge distributor

4. Tooling

To facilitate the test and repair of CR injectors, a tool kit has been developed specifically for the dismantling and the re-assembly of the product. As with the Common Rail pump repair kit, the tools have been designed to be used in the Hartridge clean cabinet during the reassembly operations to ensure compliance with the cleanliness standards. The dismantling phase with these tools takes place outside of the clean cabinet.

This kit is Delphi part number YDT440 and contains the following tools:

YDT437	Main bracket
YDT438	Pipe cutter
YDT439	Cleaning bracket
YDT441	Label cutter
YDT442	Pipe cutter & spare wheels kit
YDT443	Snap ring pliers
YDT444	Snap ring assembly sleeve
YDT445	Nozzle protection cap
YDT446	Gland nut assembly sleeve
YDT447	Injector bracket

In addition a range of standard workshop tools will be required (see publication DDNX299) for details.

5. Reference Injectors

Due to the minute tolerances involved in generating the C2I code for CR injectors, it is essential that the target curve for each application is established on every test bench being used for injector repair. For this reason, workshops will need to purchase a new injector for each injector group that they will be repairing. The injector groups are shown in the appendix of this note. For example, prior to repairing a R02201Z, a workshop should test a new Ford Lynx injector on their test bench in order to establish the target curve for that injector group on that particular test bench.

6. Printer Requirements

When a Common Rail injector is repaired it will be necessary to allocate the injector a new C2I code. It is imperative that this code is then printed onto a label and the label is securely attached to the injector. As this label will have to withstand severe engine conditions, it is essential that workshops purchase the following specification of printer and adhesive tape:

- Printer: DYMO LabelManager PC
- Tape D1 in permanent polyester 12 mm width DYMO ref: 16959
- Tape D1 in permanent polyester 19 mm width DYMO ref: 16960

7. Test Plans

The test plans for Common Rail injectors will be distributed on the forthcoming version of OCRES (DDRX101 version 6 – see appendix for detail). These test plans will be restricted to those workshops that meet the test equipment and workshop standards requirements detailed on this note.

8. Technical Information and Training

Technical information for Common Rail injectors will be available on Direct Evolution – this will include all the relevant parts lists and EVD's along with the accompanying SI notes and Warranty notes.

A repair manual, DDNX299, giving details of all test and repair procedures will also be available and will be issued to all those who attend the CR injector repair training course that will be run at regular intervals from November 2006. It is essential that all workshops who plan to repair Delphi CR injectors attend the training course – please contact the Service Operations department for more details.

9. Repair Parts Programme

As part of the repair programme, Delphi will be launching a range of component parts for Common Rail injectors. These will include:

- Nozzle
- Control valve
- Adaptor Plate
- Spring
- Cap Nut

The repair parts programme will cover all the applications currently in the range. These include vehicles manufactured by Citroen, Ford, Hyundai, Kia, Nissan, Renault, Suzuki and Tata.

Full details of part numbers and pricing for the repair components will be communicated via a further MI note later in the year.

10. Distribution

Access to CR injector repair parts will be restricted to those workshops that have met the required standards and have been approved for CR injector repair capability.

For further information, please contact the Delphi Service Operations Department.

11. Pricing

The prices for the Delphi test equipment and tooling is shown below:

Description	Part No.	RRP	Discount Code
ETK light	YDT240		
OCRES interface box assembly	YDT331		
CR injector repair tool kit	YDT440		
OCRES**	DDRX101		

** Please note that this OCRES charge is the total per year for CR injector, CR pump & EUI. Therefore for existing CR pump & EUI subscribers, the fee is an additional £62.50 (RRP) p.a.

12. CRi-PC

Hartridge has developed a stand-alone all-makes Common Rail injector tester, the CRi-PC. Delphi will be integrating it's official test plans onto this equipment and authorising it for Delphi CR injector repair in mid-2007. Until this time, only workshops with the AVM2PC solution detailed in this note will be authorized by Delphi for CR injector repair.

13. To order

To order any of the Delphi parts detailed on this note please contact the Customer Services department quoting the Delphi part number and your order will be processed. The OCRES software must be ordered via the enclosed fax-back form.

Standard discounts off retail price apply.

If you require any further information then please contact your Area Sales Manager or Territory Manager.

APPENDIX

Test Plans on OCRES (version 6)

Injector Part Number	Vehicle Manufacturer / Engine
R00801Z R01101Z R01301Z R01302Z R01601Z R02201Z	Ford Lynx
R00001Z R00002Z R00101Z R00201Z R00202Z R00301Z R00401Z R00402Z R00403Z	Ford Puma 1
R00501Z R00502Z R00504Z R00601D R00701D R01001D R01101D	Ford Puma 2
R00901Z R01901Z R02301Z R02401Z R02501Z R02801D R02901D R03001D R03601D R03701D	Kia / Hyundai
R01201Z R01401Z R01501Z R01701Z R01801A R01801Z R02101Z R04001D R04101D	Renault / Nissan / Suzuki Jimny
R01001A R01001Z	Citroen / Suzuki Liana