D-Jet System Tester

User Manual

020322

1. Overview.

While the ECU and all other original D-Jet equipment remains installed and unmodified in the car, the D-Jet System Tester (DST) is taking input from each fuel injector and temperature sensor using a customized DST cable assembly as indicated in Fig-1. Injector activity and various test results are continuously displayed by the DST.

The DST cable assembly and a built-in DST generator allows for testing of all D-Jet components while the engine is stopped, as-long-as the distributer cable adapter is NOT connected to the engine distributor. Testing can also be performed while the engine is running, as-long-as the generator is turned OFF and the adapter remains connected to the engine distributer.

When a separate (optional) MPS System Test Adaptor (STA) is inserted between the ECU and the MPS, additional fuel-mixture related test results can be obtained during Stopped Engine Test (SE-Test) as well as Running Engine Test (RE-Test) sessions.

To minimize the risk of flooding the engine with gasoline during a SE-Test session, it is strongly recommended the 12-volt power to the DST and the STA modules is supplied via the fuel pump relay as indicted in Fig-1. This fuel-pump relay power hook-up scheme is also helpful verifying the ECU is correctly controlling when the fuel-pump should run or be stopped.

Fig-1 D-Jet System Test configuration

for Stopped Engine (SE) & Running Engine (RE) test modes

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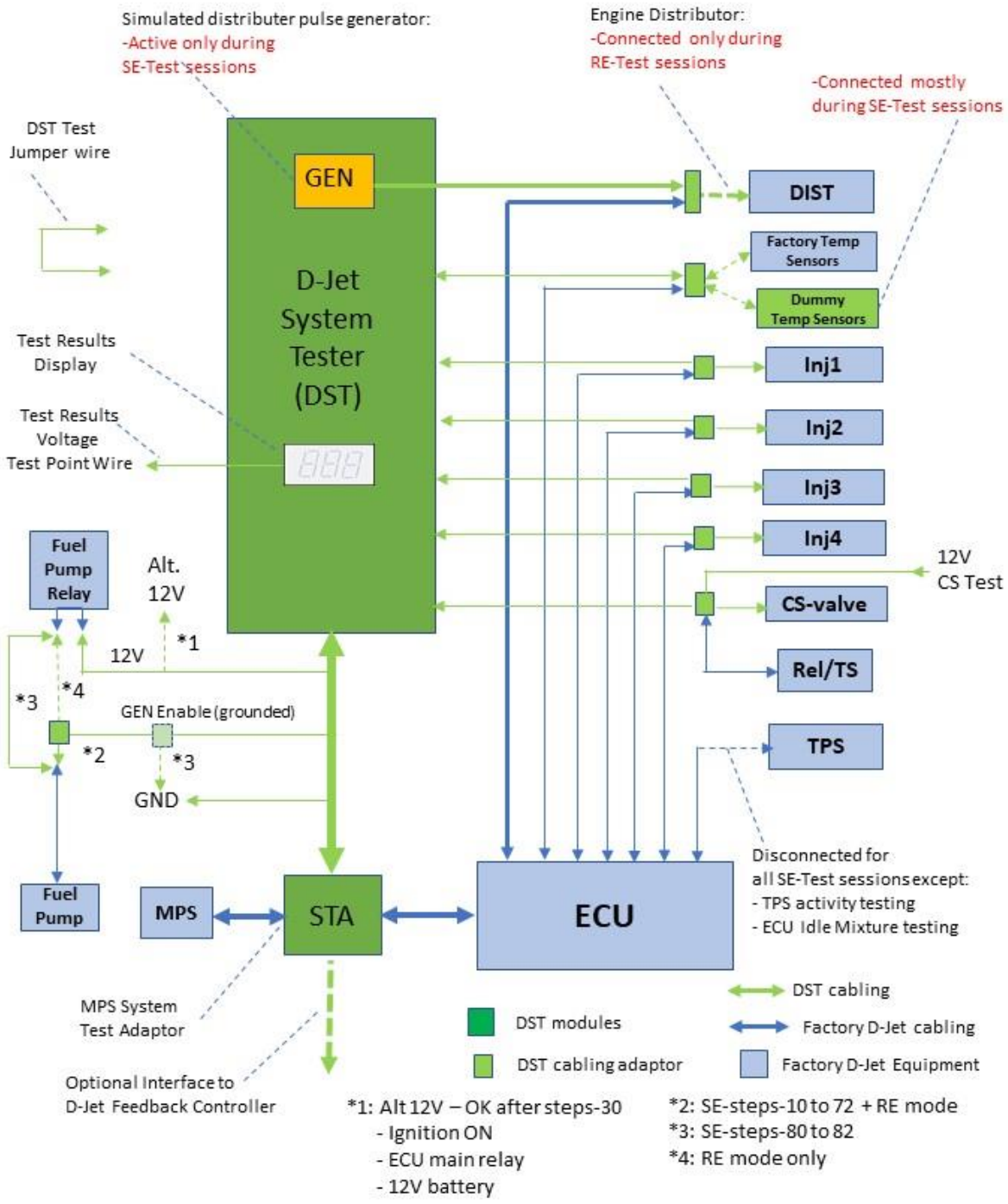

2. D-Jet System Tester.

Fig-2 Top view of DST

Test Value:

Displays current

(a) Injector activity rate (variates with simulated/actual RPM value)
(b) D-Jet base value
(c) simulated/real RPM values

as selected via front Test Value slide switch. An 8.00 display value corresponds to 50% Injector open (duty-cycle) value or an 8000 RPM value.

Fig-3 Front view of DST

Gen: Red LED illuminated when generator is on. Generator is turned on/off via left-side slide switch.

I1-I6: Red LED illuminated only while injector is activated by ECU. Appears to be continuously on at higher RPM values – more intensely as RPM values increase.

CS: Red LED illuminated while the Cold Start injector is active (during running engine startup testing only).

Test Value: Select which test value to be displayed on top of DST.

- *InjS*: Injector activity sense-values for individual injector - selected via left-side rotary switch.
- *DJB*: Display 2 x D-Jet Base Value – only when the MPS-STA is installed as part of the test setup. D-Jet Base Value is an internal ECU generated signal that is adjusted when changes are detected in:
  (a) the TPS idle-switch position
  (b) the ECU Idle Mixture setting
  (c) Engine-Speed Density signal - generated by the ECU as RPM values are changing.
- *RPM*: Displays current RPM/1000 values – controlled via the right-side RPM pot-meter and high/low slide-switch setting during SE-Test sessions – or displaying real RPM values during running engine testing.

Man DTP: Toggle switch allowing for manual control of Distributer Trigger Pulse (DTP) values during SE-Test sessions – when the generator is turned off. Switching

to one side triggers injectors 1+3 while switching to the other side triggers injectors 2+4.

Repeated switching to same side does not repeatedly activate same injector- pair. The manual DTP switching must alternate to activate all 4 injectors. Activating the Man DTP toggle switch during active SE-Test or RE-Test sessions will inhibit activation of injectors 1+3 or 2+4.

Fig-4 Left Side of DST

Gen: Turns the built-in DTP generator on or off.

Rotary Switch: used to select which InjS signal value to display – including:

- Injector (1-6) activity value. I5 and I6 only valid for 6-cylinder D-Jet equipped cars.
- The DTP-a and DTP-b selections will display duty-cycle of the selected (a/b) DTP (Distributer Trigger Pulse). Displayed value will be close to 8.00 (corresponding to 50% duty-cycle) for both (a/b) positions during SE-Test sessions – disregarding changes in RPM values. Expect values in the 7.xx range during RE-Test sessions as the physical distributer switches are both non-active (closed) for a very short time interval.

Fig-5 Right Side of DST

RPM Slide Switch: Selects High/Low RPM range for built-in generator.

RPM Potentiometer: controls the RPM rate of the DST generator when enabled and testing in RE-Test mode:

- RPM-High range: 1500 > 8000
- RPM-Low range: 500 > 2700

Fig-6 Back Side of DST

Water Temp slide switch:

- ***Act** position*: ECU is connected directly to the engine water temperature sensor, causing the ECU to increase/decrease injector activation time in accordance with actual coolant temperature of the engine under test.
- ***Ho**t position*: causes the DST to modify the water temperature sensor signal to simulate a hot engine condition (200 F range) – assuming the actual engine is cold (60/70 F range).

  NOTE: slide switch setting is active in SE-Test and in RE-Test modes. Select *Act* position when attempting to start engine in RE-Test mode.

Air Temp slide switch:

- ***Act** position*: ECU is connected directly to the air intake temperature sensor, causing the ECU to increase/decrease injector activation time in accordance with actual engine intake air temperature.
- ***Cold** position*: causes the DST to disconnect the air temperature sensor signal to simulate super-cold environment air condition (0-10 F range). The ECU will increase the Injector open time accordingly.

  NOTE: slide switch setting is active in SE-Test and in RE-Test modes. Select *Act* position when attempting to start engine in RE-Test mode.

Engine Sensor I/F: A DB15 type receptacle used to connect the DST to all D-Jet injector, temperature, and distributer components.

MPS I/F: A 6-position MINI CT receptacle used to connect the DST to:
- 12-volt power
- Ground
- GEN Enable (when grounded)
- Optional MPS System Test Adaptor (STA) module

3. MPS System Test Adaptor.

Fig-7 Front of MPS STA

MPS Load: Slide switch used to select three different simulated MPS (engine vacuum level) load conditions. The three switch positions are intended to be used during SE-Test sessions to select reproduceable engine load scenarios for the MPS and resulting ECU reaction to specific vacuum levels. Leave switch at position *Act* (actual) during any RE-Test session.

***Act** position*: During an ongoing SE-Test session (engine stopped), the MPS vacuum level is normally assumed to be zero. However, if a hand vacuum pump is connected to the MPS it can be used to simulate multiple vacuum (engine load) conditions during such SE-Test session.

Light position: Intended to create a low engine (light cruise) load condition – corresponding to approximately 10-inch Hg vacuum (assuming the actual MPS vacuum remains at the zero Hg level).

***Heavy** position:* Intended to create a high engine (accelerating) load condition – corresponding to approximately 4-inch Hg vacuum (assuming the actual MPS vacuum remains at the zero Hg level).

DJ-base: This slide switch can be used to enable a D-Jet base offset a STA built-in adjustment feature, allowing the engine to run richer or leaner than the current (perhaps somewhat out of calibration) D-Jet engine installation would otherwise result in.

- ***ADJ** position*: Enables the current trim-pot meter (located next to the slide switch) to be active.
- **ORIG** position: Disables the current DJ-base offset setting (engine reverts to original unmodified fuel-mixture controls).

ADJ: Trim-pot access. Turn clockwise to increase the ECU DJ-base signal value - causing a leaner fuel mixture baseline. Turn counter-clockwise to decrease the ECU DJ-base signal value - causing a richer fuel mixture baseline.

DFC-ctl: Red LED illuminated when the optional D-Jet Feedback Controller (DFC) is installed and enabled from inside the car cabin. Any fuel-mixture feedback controls generated via the optional DFC will only be active if the DJ-base slide switch remains in the **ADJ** position. Refer to http: www.phoenixkr.com for further details of the optional DFC.

Fig-8 Left Side MPS STA

DFC: A 8-pin MINI DIN receptacle used to connect the STA to the optional DFC.

DST: A 6-position MINI CT receptacle used to connect the STA to:

- 12-volt power
- Ground
- Optional DST (D-Jet System Test) module.

Fig-9 Right Side of MPS STA

ECU: A 4-position MINI CT receptacle used to connect the STA to the ECU.

MPS: A 5-position MINI CT receptacle used to connect the STA to the MPS – plus an optional RPM signal indicator connection (e.g 2.6 Volt ~ 2600 RPM).

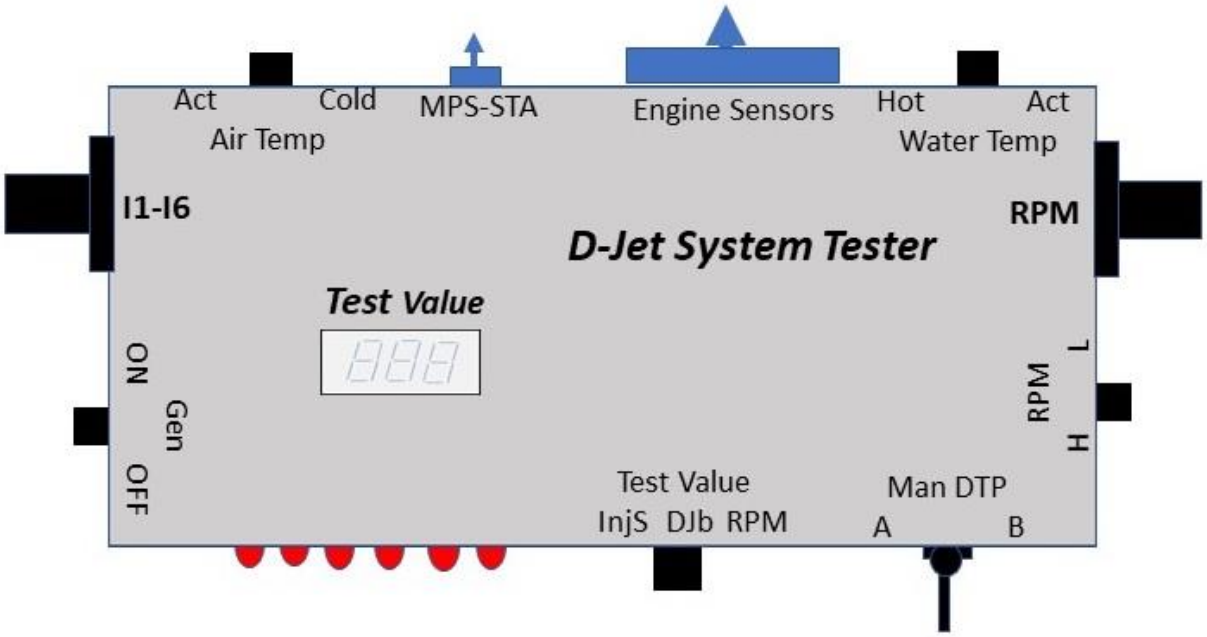

Fig-10 DST Overview

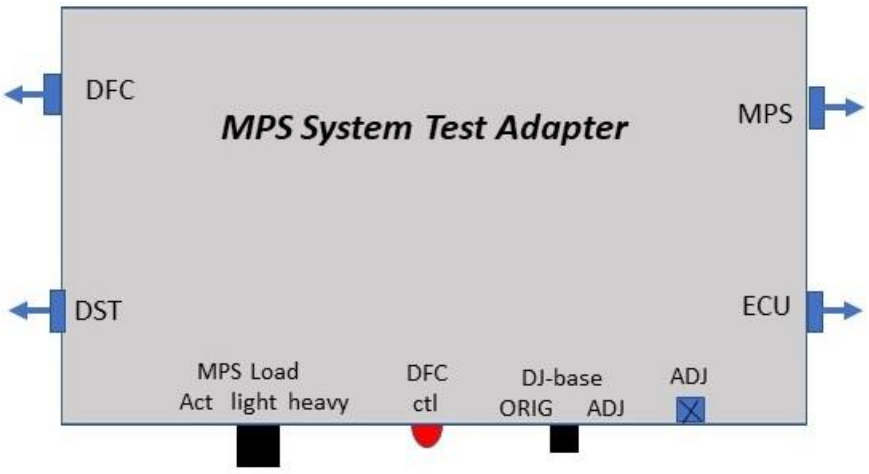

Fig-11 MPS-STA Overview

4. Stopped Engine Test Procedures.

Test Series	Testing description	Fault isolations
	A} Manual Injector activity testing.	
Steps-10	DST hookup and test configuration settings.	
Steps-20	Testing manual ECU Injector driver triggering.	Fault-isol-20: One or more DST LEDs not illuminated.
Steps-21	Testing Fuel Pump relay activation (I1+I3 and I2+I4 illuminated correctly)	Fault-isol-21: Fuel Pump relay not activated and no Test Value display.
Steps-22	Testing engine D-Jet Injector activation (I1+I3 and I2+I4 illuminated, and Fuel-Pump relay activated)	Fault-isol-22: Injectors 1+3 and 2+4 not activated (not heard, not felt), although DST-LEDs are indicating the ECU injector drivers and the ECU-to-injector D-Jet connecters are working OK.
	B] Injector duty-cycle testing	
Steps-30	Validate correct DST and Generator operations.	
Steps-31	Validate the Temp Sensor wiring and ECU response to simulated (abrupt hot/cold) temperature changes. Applying fixed dummy temperature sensors makes this test independent of actual environment and engine temperature conditions.	
Steps-32	Testing Injector fuel-delivery variations for RPM pot-meter Min/Max variations (500-2700 RPM).	
Steps-33	Testing Injector fuel-delivery variations for simulated idle L/H (500-1500 RPM) variations.	
Steps-34	Testing Injector fuel delivery variations for simulated driving L/H (1700-5000) RPM) variations.	
Steps-35	Testing fuel delivery variation due to ECU Speed Correction feature.	Fault-isol-35: The ECU Speed Correction (SC) is not increasing injector open-time as RPM is increasing from idle to driving (3000-4000) RPM levels.
Steps-36	Testing Injector fuel-delivery variations by simulated MPS vacuum signal changes. Requires the MPS-STA module is installed between the MPS and the ECU.	
Steps-37	Testing Injector fuel-delivery variations by D-Jet base (Djb) value changes.	
	C] MPS testing	
Steps-40	Testing the MPS and injector duty-cycle response to changes in actual MPS vacuum changes supplied to the MPS. Requires use of a hand-activated vacuum pump with associated vacuum gauge.	Fault-isol-40: The MPS, the ECU, or the ECU-to-MPS wiring is likely to be faulty.
Steps-41	Optional test procedure to obtain MPS and injector duty-cycle response to variating vacuum levels.	

	D] Factory Temperature sensor testing.	
Steps-50	Testing ECU responses to simulated (abrupt hot/cold) temperature changes of factory air & water temperature sensors.	
Steps-51	Testing the factory air & water temperature sensors response to actual temperature changes.	
	E] TPS and Idle mixture testing.	
Steps-60	Testing the Throttle Position Switch is signaling the ECU, and the ECU is responding correctly, as throttle is opened rapidly (car accelerating).	
Steps-61	Verifies the ECU is adjusting Djb level as the throttle idle-switch is closing – to a level previously set via the ECU idle-control knob.	Fault-isol-61: Test internal TPS switch operations.
Steps-62	Testing the full range of the ECU idle-mixture control knob. Requires access to the ECU idle-mixture control knob which is located next to the air coolant-fins of the ECU.	Fault-isol-62: Test TPS to ECU connections.
	F] Cold Start wiring testing.	
Steps-70	Test the CS associated wiring.	
Steps-71	Test the CS valve itself and the wiring is OK.	
Steps-72	Test activation of the car starter motor will also activate the CS valve.	
	G] Fuel Pump and Injector delivery testing.	
Steps-80	Testing Fuel Pump	
Steps-81	Testing Injector fuel spray.	
Steps-82	Testing Cold Start valve fuel spray.	

a) Manual Injector activity testing.

Verifies the ECU injector drivers, injector cabling, and associated distributer pulse signals are working correctly.

NOTE1: Most of the DST test results are obtained via the DST harness-adapters inserted between the D-Jet components and factory D-Jet harness as shown in Fig1. However, when the test activities are indicating the factory D-Jet harness is at-fault, specific fault-isolation steps *will require the 24-pin ECU connector to be disconnected from the ECU* to “ohm-out” the suspected D-Jet harness wire(s).

A single or two D-jet wires can easily be “ohmed” from the 24-pin connector when using the DST supplied Test Shunt Wire to interconnect the two suspected D-Jet wiring – or connect a single sensor-wire to ground.

Starting Switch Settings	Position	Note
DST - Test Value	InjS	
DST - Gen	OFF	
DST - RPM	L	
DST – Air Temp	Act	
DST – Water Temp	Hot	
DST – I1-I6-DTP Rotary	I1	
STA – MPS Load	Act	
STA – DJ-base	ORIG	

Table-1 – DST connections

Steps-10: DST hookup and test configuration settings.

- Connect as indicated in Fig-1:
  - the DIST and the TPS are disconnected.
  - the12V DST power supply is connected to the Fuel Pump (FP) relay.
  - the DST Generator Enable wire is grounded via the FP.
  - *NOTE: If FP mistakenly were also to be connected to the FP relay during testing (and hereby cause the PF to start running), the DST generator Enable signal will “go-high” and the DST Generator will stop operating. This will prevent the DST operations to cause the engine to be flooded by gasoline as the injectors may be activated during DST testing.*
- Connect dummy Temp Sensors instead of Factory Temp sensors to the DST harness (makes subsequent DST test results temperature independent).
- Set DST switches as indicated in Table-1
- Disconnect 12V power to distributer (or ignition controller, coil, other - prevents ignition to overheat)
- Turn on car ignition switch – DO NOT attempt to start engine
- Observe (hear) FP relay go on – then off). Continue to steps-20 even if relay **is not** activated.

Steps-20: Testing **manual ECU Injector driver triggering**.

- Alternate between *Man-DTP* switch positions A and B multiple times to observe I1+I3 or I2+I4 LEDs being illuminated. DST Test Value display may also be illuminated shortly.
  GOTO fault-isol-20 if one, multiple, or all LED(s) not illuminated as stated above.
  Otherwise continue to steps-21.

Steps-21: Testing **Fuel Pump relay activation** (I1+I3 and I2+I4 illuminated correctly)

- Observe DST Test Value display being illuminated, and the FP relay being activated momentary, as the *Man-DTP* switch is moved from one side to another.
  GOTO fault-isol-21 if FP relay is not activated momentary, and/or Test Value display not illuminated.
  Otherwise continue to steps-22.

Steps-22: Testing **engine D-Jet Injector activation** (I1+I3 and I2+I4 illuminated, and Fuel-Pump relay activated)

- Observe (hear/feel) injectors I1+I3 and I2+I4 being activated as toggle switch is moved from one side to another.
  GOTO fault-isol-22 if one or more injectors are not activated.
  Otherwise **continue to steps-30**.

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Fault-isol-20: One or more DST LEDs not illuminated. *May require access to the ECU 24-pin connector.*

A: Change the DST 12 Volt supply wire from the FP relay (ref Fig-1) to the 12 Volt battery terminal (or other permanent 12V supply). Observe the DST display being illuminated permanently. Double check the Test Value switch is in the InjS position.

B: Move the DTP rotary switch between positions A & B to verify the ECU is causing the DST display for each DTP position to alternate between 0V and 11V, as the DTP toggle is moved back and forth.

If “opposite alteration” cannot be observed check for possible failures:

- Disconnect D-Jet distributor connector from DST harness.
- Shortly connect a grounded test probe to outer pin of the three pin distributor connector - one at-a-time.
- Between each short-circuit action, verify that the ECU is “alternating” the voltage level of the two pins between 7V and 0V (in opposite manner) – but only when the “high” (7V) side is short-circuited to ground.
- If such “alternating” voltage changes cannot be verified, the D-Jet distributer wiring, or the ECU is likely to at fault. Turn off car ignition switch, disconnect the 24-pin ECU connecter, and “ohm-out” wiring (ECU pins 21,22,12 to distributor connector). Repair and restart testing if failures are detected.
- If the distributor wiring is verified to be OK, the ECU is likely at be at fault. Check the 12V is supplied to the ECU (pins 16 & 24 of 24-pin ECU connector), before replacing or attempting to repair of the ECU.

C: (Distributer trigger *alteration observed -, but injector LED activity still missing*)

If one or more LEDs are still not illuminated as stated in steps-20, turn off car ignition switch, disconnect 24-pin ECU connecter and “ohm-out” wiring (ECU pins 3,4,5,6 to each injector D-Jet connector. Verify other side of each D-Jet connector is grounded). Possible failures:

- D-Jet wiring or connector problems. Repair and restart testing.
- Internal ECU driver failure. Repair or replace ECU.

D: (Injector wiring OK – LED illumination still missing)

Possible failures:

- DST harness or internal DTP/LED failure.
- Assuming it is just the DST LED(s) that has failed - optionally continue testing at steps 21+22 to verify Fuel-Pump relay and actual Injector activations.

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Fault-isol-21: Fuel Pump relay not activated and no Test Value display.

NOTE: I1+I3 and I2+I4 LEDs illuminated indicating the ECU is triggered by the *Man-DTP* switch movements and Injector drivers appear to be working OK. The Fuel-Pump relay should therefore also be activated each time the *Man-DTP* switch is moved from side-to-side.

A: Change the DST 12 Volt supply wire from the FP relay (ref Fig-1) to the 12 Volt battery terminal (or other permanent 12V supply). Observe the DST display being illuminated permanently.

B: Switch the front DST Test Value slide switch to the middle (DJB) position to observe the Test Value being in the 4-6V range – indicating the ECU is powered.

C: Use voltmeter to verify if the Fuel-Pump relay is activated from the ECU as the DTP switch is moved side-to-side. To activate the relay the ECU must pull-down one end of the relay-coil to 0-volt, as the other side of the relay-coil if supplied 12V from the D-Jet Mail-Relay when ignition switch is on.

- If the relay coil is activated (one side 12V and the other side 0V) the ECU is working OK. Repair relay-connector or replace relay. Restart testing at steps-10.
- If the relay coil **is not** activated (both side 12V):
  - turn off car ignition switch.
  - disconnect 24-pin ECU connecter and “ohm-out” Fuel-Pump relay wiring (ECU pins 19 to relay pull-down connecter).
  - if wiring is OK, the ECU is considered faulty - repair or replace ECU.
  - Otherwise (wiring faulty), repair relay wiring. Restart testing at steps-10.

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Fault-isol-22: Injectors 1+3 and 2+4 not activated (not heard, not felt), although DST-LEDs are indicating the ECU injector drivers and the ECU-to-injector D-Jet connecters are working OK.

A: Disconnect each of the DST harness adaptor from of the injector itself and verify the I1+I3 and I2+I4 LEDs are still illuminated when the DTP toggle switch move side to side. If not - restart testing at steps-10.

B: Use voltmeter to test if the injector activation pulse is reaching the DST adaptor connector previously inserted into the injector itself. If not - the DST adapter is faulty. Stop further testing using the DST.

C: Use ohmmeter to verify the other side if the DST injector adapter is grounded. If not, disconnect the D-Jet injector connector and verify the original D-Jet connection to ground is OK.

- If original D-Jet ground is not verified OK, repair D-Jet harness and restart testing at steps-10
- If the DST adapter grounding test is not verified to be OK – stop further testing using the DST.

NOTE: All wiring to the injector is now tested to be OK. The injector(s) still not heard/felt to be activated are considered to be faulty:

D: Use ohmmeter to verify the coil inside the failing injector(s) is close to 2.5 ohms. If not replace faulty injector and restart testing at steps-10.

- If the injector coil is verified to be OK, the injector is likely to be stuck in an open or closed position. **GOTO steps-80** to test and fault isolate injectors.

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b) Injector duty-cycle testing

Verifies the ECU injector activity (duty-cycle) signals **in accordance with** simulated **temperature, RPM, ECU Speed Correction, and MPS engine load** (vacuum signal) **changes.**

Steps-30: Validate correct **DST and Generator operations**.

- If test steps 10 and 20 has not yet been executed successfully GOTO steps-10 to verify injector activation is working as expected.
- Double-check the DST is connected as shown in Figure-1 (still using dummy Temp Sensors). Also verify the DST switches are set as indicated in Table-1 (**warning**: important the FP **is not** connected to the Fuel-Pump relay).
- Turn on the DST Gen switch to the ON position and cycle the Man-DTP toggle switch between positions A & B a few times – then leave switch in middle position.
- Verify the DST Test Value display is turned on as the Puel Pump relay is activated and the I1, I2, I3, I4 LEDs starts blinking. Also verify all four injectors starts clicking. If LEDs are not blinking and injectors are not clicking the DST is considered faulty – assuming steps-10 and 20 was just executed successfully.
- Move the Test Value slide switch to the RPM (right) position and verify the display changes from (approx.) 0.5 to 2.7 (indicating simulated 500 to 2700 RPM values) - as the RPM pot-meter is moved from Min to Max positions. Also verify the injector clicking sound is increasing along with the increasing RPM.
- Switch the RPM H/L slide switch to the H (high) position and verify the display changes from 1.4 to 8.0+ (indicating simulated 1400 to 8000+ RPM values) as the RPM pot-meter is moved from Min to Max positions. Also verify the injector clicking sound is increasing along with the increasing RPM.
- Move the Test Value slide switch to the InjS position and alternate the I1-I6-DTP rotary switch between positions DTP-A and DTP-B.

- Verify the Test Value display is almost constant (indicating 8.0 +0/- 0.2) for both DTP A/B positions as the simulated RPM values are changed between Min to Max values.
- The lower RPM values (typically -0.2) displayed at lower RPM values is due to the built-in DST 2.2 sec R/C circuitry used to average-out the RPM display values.
  If the 7.8 to 8.0 (+/- 0.1) RPM display values are not observed – the DST is out of calibration - or likely to be faulty.

  NOTE: The 8.0 display value is indicating the simulated distributor pulse duty-cycle is exactly 50%. One DTP signal value must be high while the other side is switched low (shortened to ground) to activate the injector drivers.

- If the injector LEDs and the Test Value display cannot be verified as stated above, the DST module and/or harness must be considered faulty (assuming test steps-10 and steps-20 was executed successfully).
  Otherwise, DST and harness is OK - GOTP steps-31.

Steps-31: Validate the **Temp Sensor wiring and ECU response** **to simulated (abrupt hot/cold) temperature changes.** Applying fixed dummy temperature sensors makes this test independent of actual environment and engine temperature conditions. *May require access to the ECU 24-pin connector.*

- Verify the dummy Air Temp sensor and dummy Water Temp sensor is connected to the DST harness.
- Move the Air and the Water Temp slide switches to the Act positions (simulated ~ 65-70 F temperature range).
- Move the DST Test Value slide switch to the InjS position and the I1-I6-DTP rotary position to I1 (DST generator still turned on).
- Move the RPM H/L slide switch to the H position and turn the RPM pot-meter between min and max positions. Observe how the Display value is increasing when the RPM pot-meter is moved towards the Max position and vice-versa.
- If the Test Value display does not variate as the RPM pot-meter is moved between min to max, the MPS, the ECU, or the ECU-to-MPS wiring may be faulty. GOTO Fault-isol-40 to fault-isolate.

- **Disconnect the dummy Water Temp sensor** from the DST harness and attempt to adjust the RPM pot-meter **to a position where the Test Value display shows 8.0** (50% injector I1 saturation).
- If a display value of 8.0 cannot be obtained, the MPS or the ECU is likely to be faulty. GOTO Fault-isol-40 to fault-isolate.
- **Connect the dummy Water Temp** sensor to the DST and observe the Test Value **display drops from 8.0 to 4.9 (+/- 0.2).** Water Temp slide switch still at Act position).
- **If no display change** observed when the dummy **Water Temp sensor is inserted**, the **Water TempD-Jet harness or the ECU may be faulty**. Use universal test meter to ohm-out D-Jet harness before replacing or repairing ECU. Then restart testing at steps-10.
- **Move the Air Temp slide switch to the Cold position** and observe the Test Value **display increase to 5.3 (+/- 02).**
- **Move the Water Temp slide switch to the Hot position** and observe the Test Value **display decrease to 4.4 (+/- 02).**
- **If no display changes** observed when the **Air Temp slide switch is moved to the Cold position**, or when **the Water Temp slide switch is moved to the Hot position**, the **Air Temp D-Jet harness or the ECU is likely to be faulty**. Use universal test meter to ohm-out D-Jet harness before replacing/repairing ECU. Then restart testing at steps-10.
- **If significantly different Test Values are observed** (than values stated in above test steps) **the ECU is likely to be faulty**. **Minor deviations are to be expected** as different ECU models are “calibrated” differently to match actual engine models.
- **Otherwise,** move the **Air Temp** slide switch **to the Act position**, and the **Water Temp** slide switch **to the Hot position**. Then GOTO Steps-32 to continue testing (dummy Air & Temp sensors remain connected to the DST harness).

Steps-32: Testing Injector **fuel-delivery variations for RPM pot-meter Min/Max** variations (500-2700 RPM). Requires Air and Water Temp switches to be set as stared above. Move the Test Value slide switch to the InjS (left) position and switch the RPM H/L slide **switch to the L (low) position**.

- Alternate the I1-I6-DTP rotary switch between I1 to I4 and verify the display for each injector **variates between 0.4 (+/- 0.1) to more than 2.5** - as the RPM **pot-meter is turned between Min to Max positions**.
- If the injector display values does not variate (at all) as the RPM values are changed between Min and Max for all four injector (I1-I4) test settings, the MPS, the ECU, or the ECU-to-MPS wiring may be faulty. GOTO Fault-isol-40 to fault-isolate.
- If the injector display values for injectors I1+I3 are significantly different from for injectors I2+I4 values, the ECU driver circuitry for I1+I3 or I2+I4 could be at fault. The injector pair showing the lowest test values is likely to be the failing (weak) injector driver of the ECU.
- If only one of the injector display values are lower than the other three injector values, the injector itself, the ECU-to-injector wiring, or the DST harness could be at fault. If one injector test value is higher than the other three the injector itself or the grounding for the injector D-jet connector could be at fault.

Steps-33: Testing Injector **fuel-delivery variations for simulated idle L/H (500-1500 RPM) variations.**

- Move the Test Value slide switch to the InjS (left) position and set the I1-I6-DTP switch to I1.
- Move the **RPM pot-meter to Min** and switch the **RPM H/L slide switch between H and L positions**.
- Verify the test value display **increases from 0.3 (+/- .1) to more than 1.0** when altering between H and L RPM positions (pot-meter still at Min).
- If the H display value is not more that 1.0 (typical 1.1 to 1.3) the ECU appears to have trouble triggering the injector drivers at these slightly increased RPM values (500 at low, 1500 at high). Optionally repeat test for I2, I3, I4 positions.

Steps-34: Testing Injector **fuel delivery variations for simulated driving L/H (1700-5000) RPM) variations.**

- Move the Test Value slide switch to the RPM (right) position and set the I1-I6-DTP switch to I1.
- Move the RPM H/L slide switch to the H position and **adjust the RPM pot-meter to show 5.0 (5000 RPM)** at the display.
- Switch back to the InjS Test Value position (RPM left at 5000), **verify** *the Water Temp is at the Hot position, and the Air Temp is at the Act position.*
- Switch the **RPM H/L slide switch between H and L** positions and verify the test Value display (for I1) **changes between 1.6 (+/- .2) and more that 5.2** when altering between H and L RPM settings. Optionally repeat for I2, I3, I4.
- If the InjS test values are not changing with the L to H RPM-range changes, as stated the ECU appears to have trouble triggering the injector drivers at these higher (1700 at low - 5000 at high) RPM values.

.

Steps-35: Testing **fuel delivery variation due to ECU Speed Correction** feature.

- Repeat steps-34 and **insert the High/Low (5000/1700) RPM** and the **High/Low InjS values** into the lower part of Table S-35. Specifically, change the "1" values in the spread-sheet table to show the RPM and InjS low/high values obtained while repeating steps-34.
- Observe the spread-sheet calculated ratio(H/L) values, and SC-incr(%) value being added to the table (NOTE: could requires Windows-Word and Windows Excel installation at your PC).

`	low-RPM	high-RPM	ratio(H/L)	SC-incr(%)
simulated RPM -- sample-range:				
RPM-DST	1700	5000	2.94	
INJS-DST	1500	5400	3.60	22
`	low-RPM	high-RPM	ratio(H/L)	
simulated RPM -- your-range:				
RPM-DST	1	1	1.00	
INJS-DST	1	1	1.00	0

Table s-35-sample & your test results

- Verify the **ratio-increase of the InjS** (i.e. fuel delivery per time unit) **is higher than the ratio-increase for the RPM**. This is due to the Speed Correction (SC) function of the ECU (Rennlist Speed Correction link).
- The SC-ECU circuitry is designed to increase the injector open (duty-cycle) time as the engine RPM is increased. This SC increase is applied beyond the per-second increase the change in RPM is contributing with. If such additional SC increase is not verifiable the ECU is likely to be at fault.
  NOTE: The **results** obtained from the steps-35 activity is likely to deviate somewhat from the sample test results shown at the top of table s-35. This is due to the slightly different ECU, MPS, and D-Jet temp-sensors that comes with each D-Jet engine installations. The importance of this test is to verify the **Speed Correction (SC) feature** of the ECU is functional and is increasing the injector open duty-cycle – as **expected to be in the range of 10% to 25%** for this (1700 to 5000) RPM range.
- **OPTIONAL:** A **more precise SC-percent increase** value can be obtained if executing steps-35 while **using a more precise universal volt-meter** connected to the Test Results Voltage Test-Point Wire – part of the DST engine harness (Ref Fig1). The more precise InjS test results is likely to produce a lower and more realistic **SC-incr(%) values (10%-15%)** when entered into table s-35.

- If the increased SC values cannot be verified as stated above, the ECU is likely to be faulty. Execute Fault-isol-35 steps to find out which parts of the ECU circuitry is likely at fault.

- Otherwise, the ECU SC functionality is OK - GOTO steps-36 to verify MPS vacuum impact on Injector duty-cycle.

==========

Fault-isol-35: The ECU Speed Correction (SC) is not increasing injector open-time as RPM is increasing from idle to driving (3000-4000) RPM levels.
A: Move the RPM H/L slide switch to the H position and move the Test Value slide-switch to the Djb (middle) position. Also verify the Water Temp is at the Hot position and the Air Temp is at the Act position.
B: Use the RPM pot-meter to change the simulated RPM from Min-RPM (approx. 1700) toward the Max-RPM. Observe how the Djb value is decreasing from approximately 5.0 at the Min-RPM

position to a lower value (approximately 10% lower that the starting (5.0) value) - as the RPM pot-meter is about half-way towards the Max-RPM (3500-4000) position. Thereafter the Djb value will increase somewhat (2-3%) as at the RPM value is reaching the Max (8000) RPM level.
C: If the decreasing (and slightly increasing) Djb values can be observed as described, the ECU circuitry of the ECU controlling the SC injector open-time is working OK (the lower Djb values should result in increased injector open times).
D: Otherwise, (assuming the steps-35 test results are still failing) the ECU circuitry controlling the injector open-time (with diminishing Djb values) must be considered at fault. Repair or replace ECU.
==========

Steps-36: Testing **Injector fuel-delivery variations by simulated MPS vacuum signal changes**. Requires the MPS-STA module is installed between the MPS and the ECU.

- Move the Test Value slide switch to the RPM (right) position and set the I1-I6-DTP switch to I1.
- Move the RPM H/L slide switch to the H position and **adjust the RPM pot-meter to show 5.0 (5000 RPM)** at the display.
- Switch back to the InjS Test Value position (RPM left at 5000), **verify** *the* ***Water Temp is at the Hot*** *position, and the* ***Air Temp is at the Act*** *position.*
- Move the **STA-MPS Load slide switch between the Act, light, and** heavy positions and make a note of the InjS Test Value results for each of the three MPS load positions.
- The three MPS vacuum signal values (for actual MPS vacuum equal to zero inch Hg) should result in three different InjS test values close to the following sample test results:
  - **Act** (0" Hg): **InjS = 5.4 +/- 0.2**
  - **light** (approx. 10" simulated Hg): **InjS = 3.4 +/- 0.2** (63% of 0" Hg load)
  - **heavy** (approx. 4" simulated Hg): **InjS = 4.3 +/- 0.2** (80% of 0" Hg load)

- All three **InjS test values may deviate slightly** (higher or lower) than the sample test-reference values shown above. Such deviations are to be expected as the **"built-in" Djb voltage level** of each ECU will always be **slightly different due to component tolerances**. Furthermore, **different ECU model-numbers** (280-000-009/-017/-034) **are likely to have slightly different "tuning-resistor"**

values (R205 // R206) installed to match different car-engine (B20E and B20F) models where the "matching" ECU is installed.

- If the two InjS test values (for light and heavy MPS load) does not result in a similar percentage load result (ref: 63% and 80%), the ECU circuit that is processing the variating MPS vacuum signal levels is likely to be at fault.
- If similar MPS load signal test results are obtained the ECU is considered OK. GOTO steps-40 to test the actual MPS.

Steps-37: Testing **Injector fuel-delivery variations by D-Jet base (Djb) value changes.** Djb changes can be induced by following events (requires the MPS-STA module is installed between the MPS and the ECU):

NOTES:

A: The **engine Speed Correction (SC)** signal is permanently passed onto the Djb circuit and hereby directly causing the Injector duty-cycle to increase as the engine RPM is increasing. **The Djb adjustments caused by the SC feature can be verified when executing step B of fault-isol-35.**

B: Current ECU **idle-mixture adjustment** setting is passed onto the Djb circuit – when the throttle ECU idle-switch is closed.

C: Current MPS-STA **DJ-base (trim-pot) adjustments** setting is passed onto the Djb circuit – when the STA DJ-base switch is moved to the ADJ position. **This is the method used** below for steps-37 **to verify Djb variations is immediately resulting in increased or decreased Injector duty-cycle.**

D: Current **DFC feedback control** value is passed onto the Djb circuit – when the optional DFC module is connected to the MPS-STA, and the DFC-feedback feature is enabled by the driver (will cause the STA ctl LED to be illuminated). The DFC feedback control will be disabled when the STA DJ-base switch is moved to the ORIG position.

E: Any adjustments made to the Djb value will result in a reverse (near-linear) change of the Injector open (duty-cycle) timing. A negative going (X-percent) change in Djb value will result in a corresponding positive going (X-percent) change in Injector duty-cycle and vice-versa.

- Verify the **Water Temp is at the Hot position**, and the **Air Temp is at the Act position**. DST generator still running.
- Move the Test Value switch to the RPM position, move the RPM H/L slide switch to the H position, and **adjust the RPM pot-meter to show 3.0 (3000 RPM)** at the display.

- Move the Test Value switch to the Djb (middle) position (RPM left at 3000) and take a note of the Test Value display – **call it Djb-ORIG** (should be **in the 4.5 +/- 0.5 range**).
- Move the Test Value switch to the InjS (left) position and Take a note of the Test Value display – **call it InjS-ORIG** (should be **in the 3.0 +/- 0.5 range**).
- Move the Test Value switch to the Djb (middle) position, move the MPS-STA DJ-base **switch to the ADJ position**, and **use the ADJ trim-pot to adjust** the Djb (**Test Value**) level to be **equal to the Djb-ORIG value** as initially noted above.
- Move the Test Value switch to the InjS position and verify the **InjS display** is showing a value **very close to the InjS-ORIG value** as initially noted above.
- Move the Test Value switch to the Djb (middle) position and use the ADJ trim-pot to **adjust the Djb value to a level 0.5 above** the initial Djb-ORIG value – take a note and call it Djb-adj1. Then switch back to display the new InjS value – call it InjS-adj1. **Verify an approximate 10% increase of the Djb value** (to Djb-adj1 level) resulted in an approximately 10% decrease of the InjS value (to the InjS-adj1 level).
- Repeat the above step, but **this time decrease the initial Djb-ORIG** level with a similar (0.5 ~ 10%) level. Then verify the **InjS level is now increased** with approximately the same 10% amount.
- **If** the above described **test-steps cannot be verified**, the ECU (or the DST + MPS-STA) must be considered faulty. **Repair / replace as needed**.
- Use the DJ-base trim-pot to adjust the Djb level back to the original noted Djb-ORIG level and switch the MPS-STA DJ-base switch to the ORIG position.

c) MPS Testing.

Steps-40 Testing the **MPS and injector duty-cycle response to changes in actual MPS vacuum changes** supplied to the MPS. Requires use of a hand-activated vacuum pump with associated vacuum gauge.

- Move the Test Value slide switch to the RPM (right) position and set the I1-I6-DTP switch to I1.
- Move the RPM H/L slide switch to the H position and **adjust the RPM pot-meter to show 5.0 (5000 RPM)** at the display.
- Switch back to the InjS Test Value position (RPM left at 5000), **verify *the Water Temp is at the Hot*** *position, and the* ***Air Temp is at the Act*** *position.*

- Move the **MPS Load slide switch to the light position** and **double-check** the InjS value is close to the "light-load" test Value obtained when performing the steps-36 (InjS = 3.4 +/- 0.2).
- **Move the MPS Load slide switch to the Act position** (o" Hg). Then use the hand-activated vacuum pump to **apply 10 inch vacuum** to the MPS.
- Verify the 10 inch vacuum is steady, or not dropping more than 10% for every 10 seconds. Make sure to apply hose-clamps at the MPS and the pump ends of the hose to eliminate possible false vacuum leaks.
- If vacuum loss is occurring (assuming internally to the MPS), and it is exceeding the max 10 percent drop-limit, the MPS is considered un-useable for popper D-jet engine controls and should be repaired (or replaced).
- Otherwise**, verify** the InjS test value is close to the value just double-checked above (**InjS = 3.4 +/- 0.2**) – when the simulated 10 inch Hg load value was selected.
- Release all vacuum - then use hand-pump to **apply 4 inch vacuum** to the MPS. **Verify** the InjS test value is close to the value obtained when executing steps-36 (**InjS = 4.3 +/- 0.2**) – as the simulated light (4 inch Hg) load value was selected.
- If the obtained InjS test value (for real 10 inch and 4 inch Hg vacuum) is not close (+/- 0.4) to the simulated (10 and 4 inch) test results, the **MPS diaphragm could be faulty** – or not be suitable for the type of ECU and engine model in use. GOTO Fault-isol-40 to conduct further testing of MPS coils and MPS-to-ECU wiring.
- Otherwise, continue to (optional) steps-41 for more detailed MPS vacuum testing - or GOTO to steps-50 if the real-vacuum test results match the simulated test results.

==========

Fault-isol-40: The MPS, the ECU, or the ECU-to-MPS wiring is likely to be faulty. *May require access to the ECU 24-pin connector.*

- Disconnect the MPS-to-DST harness connector (or D-jet connector if DST-STA not in use) and use universal test meter to ohm-out the primary and the secondary coils of the MPS. Expected results should be close to:
  - Primary (outer pins 7 & 15): 90 ohm (80-120 ohm variations)

- Secondary (middle two pins 8 & 10) : 360 ohm (300-400 ohm variations)
- Primary to secondary coils: no connection
- Primary to MPS body: no connection
- Secondary to MPS body: no connection.

- Connect the MPS directly to the D-Jet harness.
- Turn off car ignition switch and disconnect the 24-pin connector to the ECU.
- Repeat the Primary (pins 7 & 15) resistance measurement via the 24-pin ECU connector.
- Repeat the Secondary (pins 8 & 10) resistance measurement via the 24-pin ECU connector.
- If the measurements from the 24-pin ECU connector does not match the exact measurements made directly at the MPS (within a few ohms), the D-Jet herness (or associated connectors) are faulty. Repair harness and GOTO steps-10 to redo all testing.
- If MPS and D-Jet (ECU-to-MPS) harness resistance measurements are matching and within tolerances, the ECU internal circuitry associated with eh MPS operations may be failing or out-of-acceptable operational parameters.

==========

Steps-41: Optional test **procedure to obtain MPS and injector duty-cycle response to variating vacuum levels**.

- If STA is in use, reconnect the MPS to the DST harness adaptor and move the STA-MPS Load switch to the Act (o" Hg) position.
- Move the Test Value slide switch to the RPM (right) position and set the I1-I6-DTP switch to I1.
- Move the RPM H/L slide switch to the H position and **adjust the RPM pot-meter to show 2.0 (2000 RPM)** at the display.
- Switch back to the InjS Test Value position (RPM left at 2000), **verify *the Water Temp change to the Act*** *position, and the* ***Air Temp is at the Act*** *position.*
- Use hand-pump to apply actual vacuum to the MPS in steps (possibly 2 inch per step) and make a note of the InjS test value at each step.
- Insert the InjS test results in a "InjS-per vacuum" table and connect the test points to reveal the resulting MPS-vacuum response curve (possibly using the Microsoft Xcel spreadsheet).
- If the resulting MPS-vacuum results curve is similar to the sample response curve shown as Fig-41a (approx. 50% decrease in InjS value for 0-16 inch Hg) the tested MPS can be considered OK.

OPTIONAL: A **more exact MPS-response curve** may be obtained if executing steps-41 while **using a more precise universal volt-meter** connected to the Test Results Voltage Test-Point Wire – part of the DST engine harness (Ref Fig1).

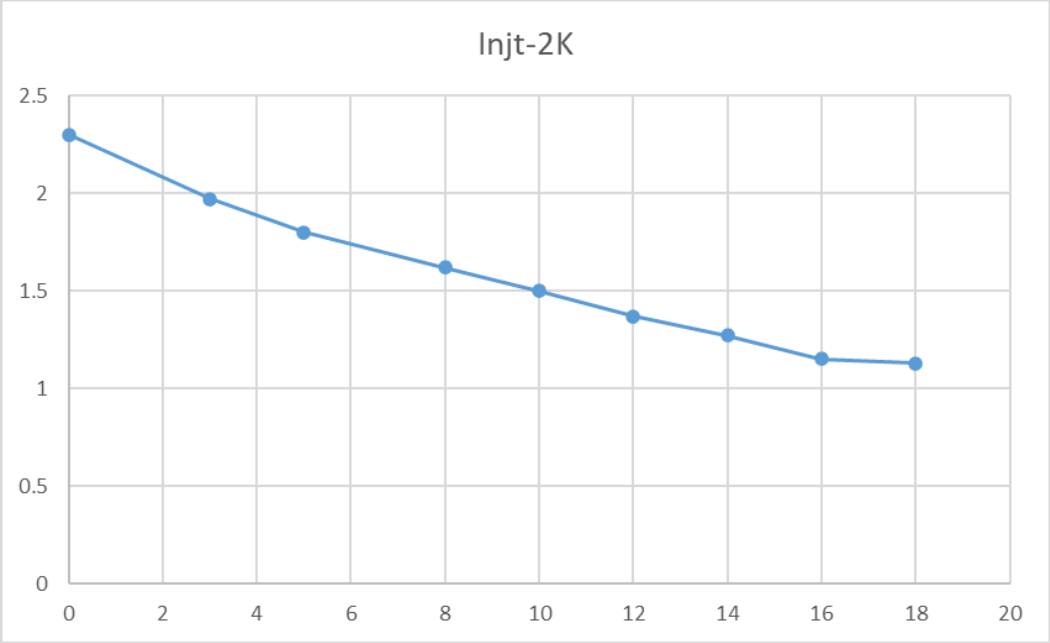

Fig-41a: Injector activity for MPS model 0-280-100-035 produced by D-Jet System Tester at 2000 RPM for 0-18 inch Hg vacuum. Injector delivery reduced approximately (1.2/2.3)*100 ~ 50% as vacuum is increased from 0 to 16 inch Hg.

d) Factory Temperature sensor testing.

Steps-50: : Testing **ECU responses to simulated (abrupt hot/cold) temperature changes** of factory air & water temperature sensors.

This test is similar to steps-31 – except for using the factory D-Jet temperature sensors. **Should only be executed under cold engine (within air environment) conditions** and an environment **air temperature falling within the 50-75 F range**.

- Disconnect the dummy air & water constant temperature (resistor) sensors and connect the DST harness-adaptor connectors to the factory D-Jet temperature sensors.

- Move the Air and the Water Temp slide switches to the Act (actual temperature) positions.
- Move the **RPM H/L slide switch to the H** position, move the **DST Test Value slide switch to the InjS** position, and move the **I1-I6-DTP rotary position to I1** (DST generator still turned on).
- **Disconnect the factory Water Temp sensor** from the DST adaptor and attempt to adjust the RPM pot-meter **to a position where the Test Value display shows 8.0** (50% injector I1 saturation).
- If a display value of 8.0 cannot be obtained, the MPS or the ECU is likely to be faulty. GOTO Fault-isol-40 to fault-isolate.
- **Connect the factory Water Temp** sensor to the DST adaptor and observe the Test Value **display drops from 8.0 to 4.9 (+/- 0.4).** Water Temp slide switch still at Act position).
- **If no display change** observed when the factory **Water Temp sensor is connected**, the **Water Temp sensor is likely to be faulty**. GOTO steps-51 for more detailed factory temp-sensor testing.
- **Move the Air Temp slide switch to the Cold position** and observe the Test Value **display increase to 5.3 (+/- 04).**
- **Move the Water Temp slide switch to the Hot position** and observe the Test Value **display decrease to 4.4 (+/- 04).**
- **If no display changes** observed when the **Air Temp slide switch is moved to the Cold position**, or when **the Water Temp slide switch is moved to the Hot position**, the corresponding **temperature sensor is likely to be faulty**. GOTO steps-51 for more detailed temp-sensor testing.
- **If significantly different Test Values are observed** (than values stated in above test steps – and steps-31 testing was completed OK) one or both temp sensors are likely to be out of calibration**. Some deviations are to be expected** as different ECU models are "calibrated" differently to match actual engine models.
- **If testing is performed** at engine & air **temperatures lower or higher** than the originally simulated 65 to 70 F range **the expected result changes** (8.0 -> 4.9 -> 5.3 -> 4.4) will also deviate somewhat. However, a similar pattern of InjS value changes ((8.0 -> 4.9) a 39% drop --> (4.9->5.3) an 8% increase --> (5.3->4.4) a 17% drop) should still be evident.

- If the relative InjS test value changes are not observed GOTO steps-51 for more detailed temp sensor testing.
- **Otherwise**, the Air & Water temp sensors, associated D-Jet harness, and the ECU is considered OK.

Steps-51: Testing the **factory air & water temperature sensors response to actual temperature changes**.

- Disconnect the DST adaptor from the factory Air Temp sensor and use ohm-meter to measure the resistance of the AT sensor while mounted in the car.
- Make a lookup in the Fig-51a Ohm/Temp curve to determine the acceptable air temperature range for the ohm value just measured.
- If the actual air environment temperature where the car is located is not falling withing the acceptable (Fig-51a) range, the factory Air Temps sensor must be considered defect or out-of-spec.
- Disconnect the DST adaptor from the factory Water Temp sensor and use ohm-meter to measure the resistance of the WT sensor while mounted in the engine.
- Make a lookup in the Fig-51b Ohm/Temp curve to determine the acceptable water/coolant temperature range for the ohm value just measured.
- If the actual engine coolant temperature is not falling withing the acceptable (Fig-51b) (cold engine) range, the factory Water Temps sensor must be considered defect or out-of-spec.
- If a reliable engine coolant temperature measurement is not achievable, the air environment temperature may be applied (assuming the engine has not been running for many hours).

- Optionally, remove the air and water temp sensors from the car and perform a step-by-step measurement of the resistance for each temp sensor when submerged into water heated/cooled to the 10-to-40 C (50-to-104 F) temperature range.
- If the resulting ohm/temp curves for the two sensors dies not fall within the Fig-51a&b ranges, the failing temp sensor should be replaced.

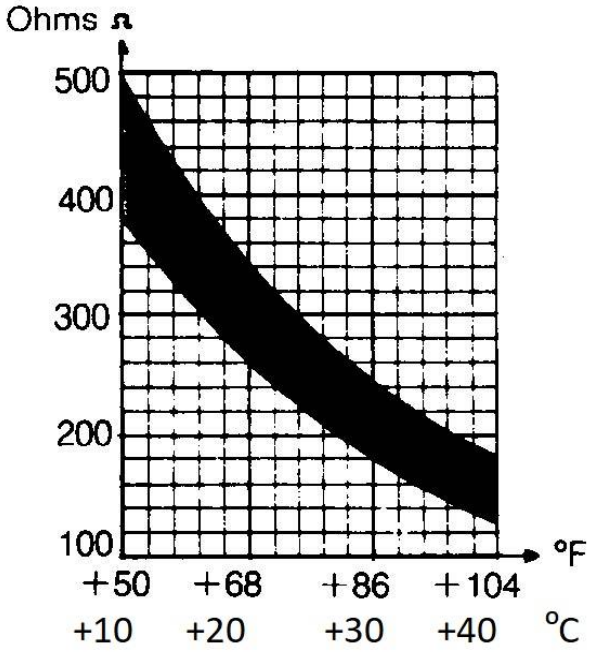

Fig-51a -- Air Temp

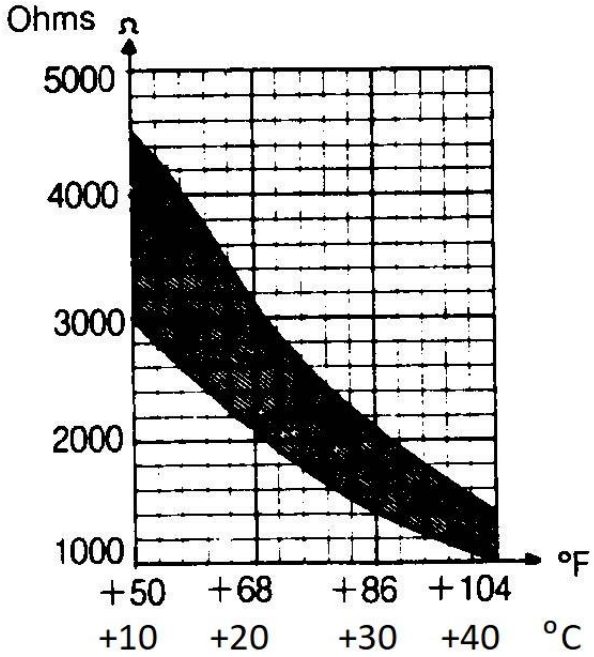

Fig-51b -- Water Temp

e) TPS and Idle mixture testing.

Steps-60: Testing the Throttle Position Switch is signaling the ECU, and the ECU is responding correctly, as throttle is opened rapidly (car accelerating).

- Turn the DST **Generator OFF** and verify the Air and the Water Temp slide switches are both at the Act positions. Observe the DST display is off, and **no Injector LEDs illuminated**. Car ignition switch still on!
- **Connect the TPS** to the D-Jet harness.
- **Move the Man DTP** slide switch between the A & B positions few times and verify the DST display is turned on monetary. Also **verify the 1+3 or the 2+4 Injector indicator LEDs are illuminated** as the switch is moved between the A and the B positions.

- While the Man DTP switch remains in the neutral position, **move the throttle from the idle/closed position slowly** to the max-open position.
- **Observe how the 1+3 or the 2+4 Injector indicator LEDs** (depending on last Man DTP A/B position) are illuminated multiple times as the throttle is moved to the fully opened position. **Injector activation clicking should also be audible.**
- If no LEDs activated (and no injector clicking) the TPS may be faulty, the TPS to ECU wiring may be failing, or the ECU is faulty. **GOTO Fault-isol-62** to isolate problem and repair.
- **Move the throttle back to the closed position** and verify **no Injector indicator LEDs** are illuminated (no clicking heard) when moving towards the closed throttle position.
- If LEDs are activated (and injectors **are** clicking) the TPS may be faulty **GOTO Fault-isol-61** to isolate problem and repair.
- **Optionally**, **move the Man DTP** switch to the opposite (A or B) position to **activate the other injector pair** (the 1+3 or the 2+4). Then **repeat the throttle open and close test steps** as described above. Same observations for the other injector/LED pair should be evident (multiple times injector/LED activation – but only when opening the throttle).
- **Switch the DST Generator on** and activate it with a few Man DTP movements. The **DST display should go on**, the Injector **indicator LEDs should start blinking**, and the injectors should start clicking.
- Switch the RPM H/L to the H (high) position, the Test Value switch to the RPM position, and use the RPM pot-meter to adjust the **RPM level to 3.0 (3000)** RPM.
- Switch the Test Value to the InjS position and **move the throttle back and forth** between closed and fully open positions a few times (3-4 seconds interval).
- Observe how the **InjS value** initially is steady (in the 3.5 to 4.0 range) as the throttle is closed but **increases in value (+0.3 to +0.4) as the throttle is moving towards the fully open** position. Then returning to the starting InjS value as the throttle is moved back to the closed position.
- If the increased InjS values (additional enrichment) is not observed as the throttle is opening, the ECU is likely at fault -- assuming LED and injectors

clicking vas observed as described in above steps where the DTS Generator was not running. Repair or replace ECU if no InjS values increases observed.

- Otherwise, GOTO steps-61 for D-Jet idle-mixture testing.

Steps-61: Verifies the ECU is adjusting Djb level as the throttle idle-switch is closing – to a level previously set via the ECU idle-control knob.

- **Verify the TPS is connected** to the D-Jet harness and the Air Temp slide switch is at the Act positions and the Water Temp switch is in the Hot position.
- **Turn the DST Generator ON**. If the Injector indicator LEDs are not illuminated (and injectors not clicking) activate the Man DTP switch a few times to start the generator.
- Move the Test Value switch to the RPM position and **adjust the RMP level to 1500 RPM** – the RPM H/L switch must be at the L position.
- Move the Test Value switch to the Djb position, **open the throttle** a little away from the closed position and make a note of the Djb display value – **call it Djb-run1**. It is expected to be within the 5.0 +/- 0.5 value range.
- Close the throttle and attempt to determine if the Djb display value is now different (higher or lower) – **call it Djb-idle1**.
- If the **Djb display value did not change**, there are several possible reasons:

  A: the **TPS has not been adjusted to close the Idle-switch** when the throttle is closing. Disconnect the D-jet TPS connector and attempt to adjust the TPS position to close idle switch when throttle is closing. Use the DST test jumper wires to connect ohm-meter between TPS pins 12/14 and 17 to verify if the TPS idle switch is functioning. If idle-switch will not close **GOTO Fault-isol-61** for repair or replacement of TPS.

  B: The **TPS connector or D-jet wiring to the ECU is failing**. **GOTO Fault-isol-62** for D-jet wiring repair.

  C: The idle-adjustment of the **ECU is adjusted** to a position that results in an idle mixture (Djb-idle1) that is **identical to the running (Djb-run1) mixture**

value. GOTO steps-62 to conduct a full range test of the ECU idle-mixture controls.

D: The **ECU is failing to detect TPS idle-mixture switch** open/close signal changes. Repair or replace ECU.

- If the **Djb display did change** (Djb-run1 different from Djb-idle1), the TPS and ECU response to idle-switch/throttle closure is working OK. GOTO steps-62 for full-range testing of ECU's idle-control adjustments.

Steps-62: Testing the full range of the ECU idle-mixture control knob. ***Requires access to the ECU idle-mixture control knob*** which is located next to the air coolant-fins of the ECU.

- **Verify the TPS is connected** to the D-Jet harness and the Air Temp slide switch is at the Act positions and the Water Temp switch is in the Hot position.
- **Verify the DST generator is still running**, and the RPM is at simulated 1500 RPM.
- Move the Test Value switch to the Djb position, **open the throttle a little** away from the closed position and make a note of **the Djb display value** remains **close to the Djb-run1** value observed when executing steps-61.
- Close the throttle and **adjust the ECU idle-control knob** between full-lefty and full-right positions.
- Make a note of the Djb values at the full-left position (**call it Djb-left**) and the full-right position (**call it Djb-right**).
- Verify the **Djb-left value is higher** (most lean idle mixture) **than the Djb-run1** value, and the **Djb-right value is lower** (most rich idle mixture) **than the Djb-run1 value**. The Djb-idle1 value obtained during the steps-61 execution, should also be in between the two Djb-left/right values.
- The **difference between the Djb-left** (typical 5.4+) and the **Djb-right** (typical 4.5-) values is **expected to be greater than 1.0.**
- With the TPS idle-switch (and throttle) still closed, adjust the Djb-idle value to the initial Djb-idle1 value obtained during the steps-61 execution. **This will leave any previously idle-mixture setting** for the running engine **unchanged** as steps-62 activities are finished.

- If Djb-left and Djb-right values are observed to be quite different from detailed above, the ECU's idle-mixture control circuitry (or idle control pot-meter) is likely to be faulty.

Fault-isol-61: Test internal TPS switch operations.

First **testing proper Idle-Switch connection.**

- Disconnect the TPS from the D-Jet harness.
- Use DST supplied jumper test wire to connect ohm-meter between TPS pins 12/14 (intended ground connection) and 17 (the idle switch connection).
- If not measuring less than a few ohms when throttle is closed, attempt to adjust the TPS position to obtain idle-switch closure when throttle is closed.
- If the pin 12/14 to pin 17 cannot be verified to short-circuit with a closed throttle, the TPS must be considered faculty. **Repair (new TPS PCB) or replace TPS.**
- **Otherwise,** fasten the TPS at position where the idle-switch closure can be detected and subsequently be registered by the ECU.

Now **testing TPS opening (car-acceleration) alternating on-off connections**.

- Use DST supplied jumper test wire to connect ohm-meter between TPS pins 12/14 (intended ground connection) and TPS pin 9.
- When slowly opening the throttle the pin 12/14 to pin 9 connection should indicate multiple on-off alterations as the throttle is move towards the full-open position. When moving the throttle back to the closed position the 12/14 to 9 conditions should remain off.
- Same multiple on-off observations when opening the throttle, and the all-off condition when closing the throttle, should be observed when connecting ohm-mater between pins 12/14 and 20.
- If the above on-off & all-off connections cannot be verified when executing the two above steps, the TPS must be considered faulty. **Repair (new TPS PCB) or replace TPS.**
- **Otherwise,** reconnect the TPS to the D-Jet harness and return to previous test activity.

Additional TPS operations & repair information.

https://jetronic.org/index.php/en/d-jetronic/58-throttleswitch

https://www.sw-em.com/bosch_d-jetronic_injection.htm#TPS

Fault-isol-62: Test TPS to ECU connections. *May require access to the ECU 24-pin connector.*

- If the TPS internal switch operations have not already been tested, execute Fault-isol-61 before continuing.
- Turn off car ignition switch and disconnect the 24-pin connecter from the ECU.
- Use the DST supplied Test Jumper wire to interconnect the TPS D-jet harness connector pin 12/14 with pins 9, 20, and 17.
- For each of the three connections made, use ohm-meter at the 24-pin ECU conner to verify the D-jet TPS wiring is OK (only a few ohms should be observed). Also, verify each of the three connections is isolated from car ground. If not – repair D-jet harness.
- Reconnect the 24-pin connector and restart DST test activities.

f) Cold Start wiring testing.

Steps-70: Test the CS associated wiring.

- Disconnect the CS D-jet connector and remove the DST CS adaptor.
- Use ohmmeter to **verify one side of the D-jet connector pin is connected directly to ground**. This should be correct for cars with a CS-relay as well as cars with the Thermal Switch (TS).
- If a direct ground connection cannot be verified on either side of the CS D-jet connector the following failures are possible:
    - the D-jet wiring (or connector) may be faulty.
    - the TS may be hot (greater than 35 C / 95 F).
    - the TS itself may be faulty.
- **Verify the other side of the D-jet connector pin is not directly grounded**. Cars with the TS should indicate a resistance value several ohms “above ground” (resistance of TS G-connection in parallel with starter relay – approximately ?? ohms). Cars with the CS relay should indicate an open connection. Repair and re-test if failures are observed.
- Use ohmmeter to **verify the resistance the CS valve itself**. It should be **close to 4 ohms**.

Steps-71: Test the CS valve itself and the wiring is OK.

- Re-insert the DST CS adapter into the CS valve and connect the D-jet connector to the DST CS adaptor. If the 12V CS-test wire (an open wire, part of the DST CS adaptor) is not connected to the side of the CS D-jet connector pin that was

verified as “not-directly-grounded” – the CS D-jet wiring or the DST CS adaptor wiring somehow has been reversed. Disconnect and reconnect the D-jet connector reversely to the DST adaptor before proceeding.

- Verify the car ignition switch and DST 12V power lead (via the FP relay) are both off.
- Use a universal test probe-wire to **connect (very shortly) the battery plus to the 12V CS-test connection** of the DST CS adaptor.
- **Verify the CS LED indicator of the DST is illuminated shortly**, **and the CS valve is activated** (audible click and/or small vibration).
- If the CS LED indicator **did not blink** the CS D-jet or TS ground wiring is still likely to be faulty -- despite the D-jet and TS grounding was verified to be OK during the steps-70 test activities. If a small click was also heard from the car starter relay (or starter motor engaging shortly), the DST adaptor to the **D-jet CS connection may still be reversed**.
- If the **CS valve was not clicking/vibrating** the **CS valve** itself **is likely to be at faulty**.
- If successful (CS LED blinked and CS valve clicked) the **steps-71 testing can be repeated multiple times**. With correct CS D-jet and DST CS adaptor connections **the TS will not be heated each time** the test is repeated.

Steps-72: Test **activation of the car starter motor will also activate the CS valve**.

- Verify test configuration as follows:
  - the FP **is not conceded** to the FP relay (via the DST Gen alarm adaptor). **FP must NOT run during this test!**
  - The DST Gen Alarm disable wire is connected to the FP and only the DST 12V supply is connected to the FP relay.
  - The DST distributor adaptor is not connected to the distributor.
  - the DST Generator is switched on, the RPM H/L is set to low, and the RPM pot-meter is at Min (500 RPM) position.
- **Turn on the car ignition switch**, verify the FP relay is turned on, and the **the DST generator is running** (injector LED’s blinking injectors clicking).
- Carefully watch the DST CS LED while shortly engaging the car starter motor.
- **If the CS LED does not illuminate during the starter motor activation** the **following failures are likely**:

- the starter motor wiring to the TS (or the ECU starter-solenoid wiring - for cars without a TS) is failing.
- the TS is not grounding – or it is too hot (greater than 35 C / 95F).
- for cars without the TS - the ECU is not engaging the CS relay (ECU or CS relay failing -- or the ECU is sensing the engine is already hot).
- The TS has opened the W-to-ground connection after previous continues test attempts to verify CS valve activation.

- If the DST CS **LED was blinking** the **CS valve activation during** (cold) **starter motor activation is OK**.
- **Repeating the steps-72 testing will cause the TS to be heated** each time the test is executed. The TS will eventually disconnect the W-to-ground connection.

g) Fuel Pump and Injector delivery testing.

WARNING: The steps-80, steps-81, and steps-82 are the only three Stopped Engine tests where the Fuel Pump will be running while the DST generator is also active and generating injector pulses. It is therefore impotent to follow instructions carefully to avoid fulling the engine intake and cylinders with gasoline while executing any of the following test.

Steps-80: Testing Fuel Pump.

- Turn off the car ignition switch. Verify the DST distributer adaptor is still disconnected from the car distributer (required for all stopped engine testing).
- **Disconnect all DST injector adaptors** from the D-jet injectors (thus preventing any subsequent injector activation and potential engine flooding).
- **Disconnect the GEN Enable adaptor from the FP** and **instead connect the GEN Enable (spade pin) connection directly to ground** (using universal test probe wire).
- If the DST 12V supply wire is still connected to the FP relay, disconnect, and **reconnect the 12V line to alternate 12V supply** as indicated in Fig-1.
- **Connect the FP directly to the FP relay**.
- Move the DST Gen switch to the off position, the RPM switch to the L position, and turn the RPM pot-meter to the min (500 RPM) position.

- **Insert a fuel pressure meter into the fuel supply hose** connected between the D-jet fuel pressure regulator and the D-jet fuel injector supply fuel-line / pipe.
- **Turn the car ignition switch on**.
- Move the DST Gen switch to the on position and move the Man DTP toggle switch a few times between the A & B positions to active the DST generator.
- **Observe the DST injector LEDs start blinking (slowly)** and the FP relay is turned on. It may also be possible to **hear that the FP is now running**.
- Verify the fuel pressure meter is now indicating a fuel pressure close to the **reconnected D-jet fuel pressure (28-30 PSI)**.
- **If no or low fuel pressure** is observed:
    - verify the voltage of the FP relay connection to the FP is in the range of 12V-10V. If not check the battery voltage and the FP to battery wiring – including related fuse connections.
    - If FP relay voltage is OK – but identical to the battery voltage, the Fuel Pump may not be pumping correctly. Turn the car ignition switch off and ohm-out the connections to the FP, the FP itself, and the grounding wire at the other side of the FP.
    - If all FP related wiring and the FP itself appears to be OK, the FP is likely to be failing.
- If the measured **fuel pressure is not close the recommended 28-30 PSI** level, attempt to **adjust the pressure** to recommended level via the D-jet fuel pressure regulator.
- If fuel pressure is now OK, turn the car ignition switch off and GOTO steps-81 for optional testing of Injector fuel spray.

Steps-81: Testing Injector fuel spray. This test **requires the injectors are removed** from the engine header. DO NOT attempt these test-steps unless new injector sealing shims are available when it is time to reinsert the injectors after the steps-81 testing is testing is completed.

A: Injector fuel amount test.

- Verify the **car ignition switch is off** and the DST Generator switch is I the off position. Also verify the RPM settings is till set at 500 RPM as specified in the above steps-80 testing.

- **Remove all injectors from the car header** and **attach a short transparent hose** line to each injector as described in the following R. Kwass link to catch the subsequent injected gasoline:

  https://www.sw-em.com/bosch_d-jetronic_injection.htm#Fuel_Injectors

- Verify the DST Gen Enable and 12V power wiring is till connected as specified in above steps-80 testing. Also **verify the injectors are still dis-connected from the DST injector adaptors.**
- Turn the **car ignition switch on**.
- Move the DST Gen switch to the on position and move the Man DTP toggle switch a few times between the A & B positions to **active the DST generator**.
- **Observe the DST injector LEDs start blinking (slowly)** and the FP relay is turned on. It may also be possible to **hear that the FP is now running**.
- **Observe that the none of the injectors are leaking gasoline** into the attached hose as the PF keeps running and the fuel pleasure remains nominal.
- If one or more injectors are leaking fuel, stop all father testing until the leaking injector(s) can be replaced.
- **Turn off the DST Generator** and observe the Fuel pressure is approaching zero as the FP is no longer running.
- Now **attach each injector to the DST injector adaptors**.
- Move the DST Gen switch back to the on position and move the Man DTP toggle switch a few times between the A & B positions to **active the DST generator.**
- **Observe how each injector is now squirting gasoline** into the attached transparent hose as the FP is now running and the fuel pressure is building. Be carefully to **turn off the DST Generator before any hose line is ¾ filled** with gasoline.
- Optionally increase the simulated (500) RPM value to observe how each injector is now filling the hose line at an increasing rate as the injector open frequency is increasing.
- **Stop** the DST Generator **before** any injector **hoses** are more than **¾ full**.
  Warning: gasoline vapor pressure may increase if the hose-to injector fitting is too tight – possibly risking the hose is popping off the injector.
- Thurn the **car ignition switch off and examine** (measure) if **each injector hose is filled with the same amount of gasoline**. If not the injector with less or

more amount of fuel is likely to be faulty. (The failing injector may be slow to open or clow to close for each activation cycle).

B: Injector spray pattern test

- **Move the DST Gen switch to the OFF position** and verify each injector is still be fitted with a transparent hose.
- **Disconnect the FP from the FP relay** and **reconnect the FP to any of the Alt 12V positions** indicated din Fig-1. The FP may start running if the 12V is still on with the car ignition switch off.
- Turn the **car ignition switch on**. **Verify the FP is running**, the DST display is on, the **injector LEDs are not blinking**, and **none of the injectors are squirting/leaking gasoline** into the attached hose.
- **Move the Man DTP slide switch** between the A & B positions a few times and **observe the 1+3 or the 2+4 injector LEDs are illuminated** shortly for each toggle switch move.
- Also **verify injectors 1+3 or 2+4 are squirting a little amount of fuel** into the attached hose for each toggle switch move.
- Carefully **remove (and empty) the hose attached to a single injector** - replacing it with a well absorbing piece of cloth (could be an old towel).
    - Now **move the Man DTP toggle switch to another position** while holding the absorbent cloth some distance from the now exposed injector nozzle.
    - **Observe how the exposed injector spray is well distributed** and not dripping or leaking after the injector was activated.
    - **Reconnect the hose** to the tested injector after completing the stray test.
- **Repeat the above step(s) until all injector spray pattern has been tested** and examined.
- Turn the **car ignition switch of**f and re-connect the FP to the FP relay (FP should no longer be running).
- Clean or replace the injectors observed with a bad spray pattern. Repeat steps-81 testing if any injector repairs/replacement were made.

Steps-82: Testing Cold Start valve fuel spray.

- Verify the **car ignition switch is off**, the DST Generator switch is in off position, and the **FP is connected to the FP relay**.
- **Remove all hoses** connected to the injectors (if any) and **reinsert all injectors into the car header** – preferably using new injector sealing shims.
- **Disconnect all DST injector adaptors** from the D-jet injectors (thus preventing any subsequent injector activation and potential engine flooding).
- Verify the **DST CS adaptor is connected** between the start valve and the D-jet CS wiring harness.
- **Remove the Cold Start valve** from the car intake manifold and **place the start valve** (with hose and CS adaptor) **into a** suitable (preferably transparent) not too deep **can.**
- **Connect a universal test probe** wire **to the 12V CS test connector** (part of the DST CS adapter).
- Turn the **car ignition on** and move the DST **Generator switch to the on** position.
- **Toggle the Man DTP switch** a few times to activate the DST generator (RPM still at 500). The **FP relay should be activated**, and the **FP should start running**.
- The **DST injector LEDs wills start blinking** (slowly) – but no fuel will be injected into the car intake **as all wiring to the injectors remains disconnected**.
- Shortly **connect the DST 12V CS test wire** (using the universal test probe) **to the car 12V battery.**
- Observe the **DST CS LED become illuminated** shortly and the **CS valve squirting a little amount of fuel** into the can where the CS valve is now positioned. Repeat the manual CS activation a couple of times to **observe proper CS fuel release each time**. Also verify the CS valve is not leaking or dripping after each activation.
- **If no fuel is released or the CS valve is leaking/dripping** afterwards, the CS valve must be considered faulty. **Clean, repair, or replace as needed**. Then repeat all steps-82 testing.
- **Otherwise**, turn the car ignition switch off and remount the CS valve at the car intake manifold.
- Reconnect all injectors to the DST injector adaptors.

5. Running Engine Test Procedures.

Yet to be developed!