P7100 Timing vs. Plunger Lift

Static Timing BTDC in degrees	49 state 160/175hp (a) mm	inches	CPL 1863 160 hp mm	inches	CPL 1968 CA auto 160hp mm	inches	CPL 2022 2174 180 hp (b) mm	inches	CPL 2175 2023 215 hp mm	inches
9.5	5.15	0.203	NA	NA	NA	NA	NA	NA	NA	NA
10	5.25	0.207	NA	NA	NA	NA	NA	NA	NA	NA
10.5	5.35	0.211	NA	NA	NA	NA	NA	NA	NA	NA
11	5.45	0.215	NA	NA	4	0.157	4	0.157	NA	NA
11.5	5.55	0.219	4	0.157	4.05	0.159	4.05	0.159	4.7	0.185
12	5.65	0.222	4.1	0.161	4.15	0.163	4.15	0.163	4.8	0.189
12.5	5.7	0.224	4.2	0.165	4.2	0.165	4.29	0.169	4.89	0.193
13	5.8	0.228	4.3	0.169	4.28	0.169	4.37	0.172	4.98	0.196
13.5	5.9	0.232	4.4	0.173	4.36	0.172	4.45	0.175	5.07	0.200
14	6	0.236	4.5	0.177	4.44	0.175	4.53	0.178	5.16	0.203
14.5	6.1	0.240	4.6	0.181	4.52	0.178	4.61	0.181	5.25	0.207
15	6.2	0.244	4.7	0.185	4.7	0.185	4.7	0.185	5.35	0.211
15.5	6.3	0.248	4.8	0.189	4.8	0.189	4.8	0.189	5.45	0.215
16	6.4	0.252	4.9	0.193	4.9	0.193	4.9	0.193	5.54	0.218
16.5	6.5	0.256	5	0.197	5	0.197	5	0.197	5.64	0.222
17	6.6	0.260	5.1	0.201	5.1	0.201	5.1	0.201	5.73	0.226
17.5	6.7	0.264	5.2	0.205	5.2	0.205	5.2	0.205	5.82	0.229
18	6.8	0.268	5.3	0.209	5.3	0.209	5.3	0.209	5.91	0.233
18.5	6.9	0.272	5.4	0.213	5.4	0.213	5.4	0.213	6.01	0.237
19	7	0.276	5.5	0.217	5.5	0.217	5.5	0.217	6.1	0.240
19.5	7.1	0.280	5.6	0.220	5.6	0.220	5.6	0.220	6.19	0.244
20	7.2	0.283	5.7	0.224	5.7	0.224	5.7	0.224	6.29	0.248
20.5	7.3	0.287	5.8	0.228	5.8	0.228	5.8	0.228	6.38	0.251
21	7.4	0.291	5.9	0.232	5.9	0.232	5.9	0.232	6.47	0.255
21.5	7.5	0.295	6	0.236	6	0.236	6	0.236	6.56	0.258
22	7.6	0.299	6.1	0.240	6.1	0.240	6.1	0.240	6.66	0.262
22.5	7.7	0.303	6.2	0.244	6.2	0.244	6.2	0.244	6.75	0.266
23	7.8	0.307	6.3	0.248	6.3	0.248	6.3	0.248	6.84	0.269
23.5	7.9	0.311	6.4	0.252	6.4	0.252	6.4	0.252	6.94	0.273
24	8	0.315	6.5	0.256	6.5	0.256	6.5	0.256	7.03	0.277
24.5	8.1	0.319	6.6	0.260	6.6	0.260	6.6	0.260	7.12	0.280
25	8.2	0.323	6.7	0.264	6.7	0.264	6.7	0.264	7.21	0.284
25.5	8.3	0.327	6.8	0.268	6.8	0.268	6.8	0.268	7.31	0.288
26	8.4	0.331	6.9	0.272	6.9	0.272	6.9	0.272	7.4	0.291
26.5	8.5	0.335	7	0.276	7	0.276	7	0.276	7.49	0.295
27	8.6	0.339	7.1	0.280	7.1	0.280	7.1	0.280	7.59	0.299
27.5	8.7	0.343	7.2	0.283	7.2	0.283	7.2	0.283	7.68	0.302
28	8.8	0.346	7.3	0.287	7.3	0.287	7.3	0.287	7.77	0.306
28.5	8.9	0.350	7.4	0.291	7.4	0.291	7.4	0.291	7.86	0.309
29	9	0.354	7.5	0.295	7.5	0.295	7.5	0.295	7.96	0.313
29.5	9.1	0.358	7.6	0.299	7.6	0.299	7.6	0.299	8.05	0.317
30	9.2	0.362	7.7	0.303	7.7	0.303	7.7	0.303	8.14	0.320
30.5	9.3	0.366	7.8	0.307	7.8	0.307	7.8	0.307	8.24	0.324
31	9.4	0.370	7.9	0.311	7.9	0.311	7.9	0.311	8.33	0.328
31.5	9.5	0.374	8	0.315	8	0.315	8	0.315	8.42	0.331
32	9.6	0.378	8.1	0.319	8.1	0.319	8.1	0.319	8.51	0.335

32.5	9.7	0.382	8.2	0.323	8.2	0.323	8.2	0.323	8.61	0.339
33	9.8	0.386	8.3	0.327	8.3	0.327	8.3	0.327	8.7	0.343
33.5	9.9	0.390	8.4	0.331	8.4	0.331	8.4	0.331	8.79	0.346
34	10	0.394	8.5	0.335	8.5	0.335	8.5	0.335	8.89	0.350
34.5	10.1	0.398	8.6	0.339	8.6	0.339	8.6	0.339	8.98	0.354
35	10.2	0.402	8.7	0.343	8.7	0.343	8.7	0.343	9.07	0.357
35.5	10.3	0.406	8.8	0.346	8.8	0.346	8.8	0.346	9.16	0.361
36	10.4	0.409	8.9	0.350	8.9	0.350	8.9	0.350	9.26	0.365
36.5	10.5	0.413	9	0.354	9	0.354	9	0.354	9.35	0.368
37	10.6	0.417	9.1	0.358	9.1	0.358	9.1	0.358	9.44	0.372
37.5	10.7	0.421	9.2	0.362	9.2	0.362	9.2	0.362	9.54	0.376
38	10.8	0.425	9.3	0.366	9.3	0.366	9.3	0.366	9.63	0.379
38.5	10.9	0.429	9.4	0.370	9.4	0.370	9.4	0.370	9.72	0.383
39	11	0.433	9.5	0.374	9.5	0.374	9.5	0.374	9.81	0.386
39.5	11.1	0.437	9.6	0.378	9.6	0.378	9.6	0.378	9.91	0.390
40	11.2	0.441	9.7	0.382	9.7	0.382	9.7	0.382	10	0.394

(a) **49 state** CPL's include: **1549, 1550, 1815, 1816, 1959** for 175 and 160 hp engines with manual and auto transmissions.
(b) CPL group **2022, 2174**

Additional information regarding non-Ram application CPL's can be found at:
http://dodgeram.org/tech/dsl/FAQ/timing.htm

Your specific engine CPL number can be found on the metal nameplate found on the drivers side of the timing housing. Using this CPL number, determine which column to use above.

Torque settings to know:

Pump nut - 165 ftlbs
Delivery Valve Holder - 85 ftlbs (pre-torque to 30 ftlbs)

Instructions for setting the timing

1. Thoroughly clean the engine and fuel system before attempting to remove any parts. Pay special attention to the fuel injection pump. Use compressed air to remove any water remaining on the fuel pump after the cleaning process.
Caution: Do not allow any dirt, debris, or paint chips to enter the fuel system while it is open. If any foreign material of any type is allowed into the pump, lines, or injectors during this process, it could result in an injection pump or fuel injector malfunction.

Locate TDC on cylinder #1.

2. Remove the rubber access plug located in the rear flange of the engine on the exhaust manifold side.
Tip: Removing #1 cylinder valve cover and barring the engine clockwise until- the exhaust valve starts to close will make locating engine TDC faster as described later in step 4.
3. Insert the barring tool through the access hole and into the flywheel housing.

4. While holding tension on the timing pin (toward front of engine), slowly, rotate the engine with the barring tool. Hold a slight rearward (pushing) pressure on the barring tool and rotate the tool counterclockwise until the timing pin drops into the machined hole in the back of the camshaft gear.

5. When the pin aligns to the gear, the engine is now at the TDC position (compression stroke) at cylinder #1. Place a paint mark on the damper to indicate TDC (use speed sensor as a reference to locate this mark). This mark will come in handy if you decide to adjust your timing again in the future. Remove the pin to prevent damage when barring the engine in later steps.

NOTE : THE PIN IS LOCATED ABOVE THE POWER STEERING PUMP, BELOW AND TO THE INSIDE OF THE FUEL INJECTION PUMP, ON THE REAR OF THE CAM GEAR HOUSING.

Check injection Pump Timing:

6. Remove #1 fuel injection line from the fuel pump (line closest to the front of the truck). Caution: Do not bend the fuel line. Bending the line will cause line or injector failure.

7. With the engine at TDC, loosen but do not remove, the front #1 delivery valve holder using the special DV socket.

Note: There is an external O-ring on the holder to help prevent debris from getting into the pump. This may create a slight resistance as the holder is unscrewed.

8. Remove the delivery valve holder by carefully tipping the holder outboard with one hand while using your other hand to hold the spring, fill piece, and any shims from slipping out of the holder. Place these as an assembly on a clean surface out of the way.

9. Using a magnet, remove the two piece delivery valve assembly from the pump. Place these pieces on the clean surface with the delivery valve holder.

10. Install the dial indicator adapter, in place of the #1 delivery valve holder and tighten finger tight. Then install the dial indicator and snug down the hold down screw.

11. Using the engine barring tool, Miller P/N 7471B, rotate the engine in the direction opposite normal direction of engine rotation (counterclockwise from front of engine) 1/4 turn or until you see the dial indicator reading stop dropping (you can also turn the engine over using a bolt on the harmonic balancer). This is the inner base circle of the injection pump cam. Zero the indicator and note the reading on the small inner dial.

CAUTION: Be sure the timing pin is disengaged before rotating the engine to avoid damage to the timing pin.

12. Rotate the engine clockwise slowly to TDC. Note the pump lift setting on the dial indicator. Look up this pump lift amount on the table above to determine where you timing is currently set.

Adjust Injection Pump Timing

13. If a change in injection timing is required, remove the oil filler tube and adapter elbow from the front of the gear housing.

14. Loosen the shaft nut (use the barring tool to keep the engine from rotating).
CAUTION: Do not drop the input shaft nut and washer, they may drop down inside the timing gear cover, requiring significant disassembly of the engine on order to recover them.
15. Slowly rotate the engine clockwise until reaching the required lift setting on the dial indicator. The injection pump should rotate with the engine since the pump gear is still locked to the injection pump shaft.
16. With the injection pump at the correct plunger lift setting, use the supplied gear puller to pull the injection pump gear off the taper of the injection pump input shaft (lubricate the bolt in the gear puller - neverseize works well). Leave the gear puller installed.
17. Rotate the engine 20 to 30 degrees counterclockwise, then rotate the engine back clockwise to TDC. This removes backlash from the geartrain.
18. Clean the ever living crap out of the pump shaft. Brake cleaner works well, followed by compressed air. The pump shaft and pump gear mating surfaces need to be perfectly clean and dry before tightening the gear back down.
19. Using the gear puller, rotate the pump gear counterclockwise by hand while pushing the gear onto the pump shaft. This will remove backlash between the injection pump and camshaft gears.
20. It is best to replace the lock washer at this point, however not absolutely mandatory. Hand tighten the input shaft nut and remove the gear puller.
21. Torque the shaft nut to 15 lb. ft. to seat the shaft taper. Then hold the engine from rotating (use the barring tool) and torque the nut to 165 lb. ft.
22. Repeat Steps 11 and 12 to verify that the final timing setting is correct. If the setting is not correct, repeat steps 13 thru 21.
23. Remove the dial indicator and adapter from the injection pump.

CAUTION: The following installation and torquing procedure must be followed exactly. Improper installation of the delivery valve will result in damage or leaks.
24. Install the delivery valve assembly on top of the sealing washer.
NOTE: The two pieces of the delivery valve must be assembled just as they were removed.
25. Lubricate the threads and clamping surface of the delivery valve holder with a few drops of engine oil. Do not lubricate the copper delivery valve washer or its seating area.
26. Install the delivery valve holder assembly taking care not to displace the delivery valve spring, fill piece, or any shims.
27. Pre-torque the holder to 30 lb. ft. Next, in one motion, torque the holder to 85 LB. FT.
28. Install remaining engine components removed during the timing process. Leave the injector side of the #1 high pressure fuel lines loose to facilitate 'bleeding' the air out of the system.

CAUTION: The pressure of the fuel in the line is sufficient to penetrate the skin and cause serious bodily harm.
29. Crank the engine until fuel is observed at the #1 injector. Tighten the high pressure line at the injector. Start the engine and check for leaks.