Compiled Weber DCOE Series Tuning Procedure for Single Carburetor manifolds

Purpose:

To provide a streamlined and easy to follow procedure for tuning a Weber DCOE on single carburetor manifolds. This procedure does NOT discuss theory behind the procedure. (For more information on the principles behind this procedure, see ref. 1)

References:

1. Weber DCOE White Pages by Keith Franck
2. Weber Tuning Manual
3. Weber "Lean Best Idle" Procedure for DCOE Series Carburetor

Tools and Materials required:

- Flathead Screwdriver
- Optical Gauge(Figure 3-a)
- Vernier caliper
- Wideband O2 Sensor with AFR Gauge
- Carburetor jet drill set (optional)

Preconditions:

- Engine timing, advance, and ignition must be functioning properly
- Fuel delivery must be stable and at the correct fuel pressure.
- Ensure your gas is of good quality
- If you intend to premix your gas with 2 stroke oil, ensure you are using the correct ratio for your engine before you begin tuning. Changes in this ratio later could affect the state of your tune.

- It is ideal to do all of your testing with the engine at NOT (Normal Operating Temperature), as this will provide the most universal state of tune.

Procedure:

1. Determine correct venturi size(This varies with driving style/purpose/engine type)
2. Determine correct carburetor barrel size with the following equation:

   Venturi size x 1.25
3. Setting fuel level
    a. Start the engine, and allow it to come up to NOT. The engine should ideally be on a level surface. NOTE: If the engine idles too poorly to sustain itself, steps 3-b and 3-c can be completed within 60 seconds of shutting the engine off.
    b. Rest the sleeve on the top surface of the well (Figure 3-b) and slowly push the acrylic rod down until the tip of the acrylic rod appears to become darker.
    c. Carefully remove the optical gauge, then measure the distance between the tip of the rod to the edge of the sleeve.
    d. The measured distance should be 25mm +/-1mm. If it is not, adjust fuel level IAW (In accordance with) ref. 2
4. Setting transition circuit
    a. Disable the main jet circuit by temporarily removing the emulsion tube assemblies.
    b. CAUTION: Exceeding ~10% throttle input at this point will stall the engine. Be careful driving the car in this state as the engine will lack power.
    c. Set each idle mixture screw to ~1 turn off their seat. This is to ensure that idle jets are chosen based on the base screw setting defined in ref. 3.

d. Drive the car at a steady speed on level ground. Do not change throttle position. Note the AFR after reading stabilizes.
e. Adjust idle jet size until ~12.5:1 AFR is achieved
f. Shift the car into high gear and slowly increase the engine rpm until the engine dies. The maximum rpm at which the transition circuit keeps the engine running while in high gear should be recorded as the "Transition RPM."

5. Setting Idle circuit
    a. Set idle mixture screws (IAW ref. 3) as follows(figure 5-a)
        i. Confirm throttle linkage allows the throttle lever to rest against the idle speed screw.
        ii. Adjust idle speed screw until it makes light contact with the throttle lever, then turn in an additional ½ turn.
        iii. Turn in each idle mixture screw until they are lightly seated. (CAUTION: Do not seat the mixture screws firmly. This could cause damage to the needle seat.) Then back each mixture screw off their seat 1 turn.
        iv. Loosen the 8mm wrench size nuts on the “air bleed” screws, turn in the air screws until
        they lightly seat, then tighten the nut.
        v. Turn in each idle mixture screw until the engine runs more roughly, then begin backing the screws out ¼ turn at a time.
        vi. Do this until the idle mixture screw does nothing or the engine runs worse.
        vii. Turn the screw back to the point where the engine sounded/ran best. Repeat for the other idle mixture screw
    b. Adjust idle AFR to by turning each idle screw ¼ turn at a time in/out from the setting found in step 3-a-7. Do this equally between each idle mixture screw until

AFR=12.5:1 (NOTE: Done correctly, the engine should shudder minimally on it's compliant mounts, indicating equal AFR on both cylinders.)

c. Set idle speed as follows:
    i. IAW Ref 2., Set idle speed to ~1000 RPM
    ii. Slowly raise engine speed by screwing in the idle speed screw. Continue increasing speed until a stumble is heard, OR until engine speed has increased by 300 RPM +/- 100 RPM.
    iii. Confirm the engine is running lean with the wide-band O2 sensor.
    iv. If there isn't a stumble: Lightly seat each idle mixture screw in turn, and confirm that the cylinder cuts out/misfires from a lack of fuel. If the engine does not stumble and the cylinder cuts out like it should then that idle speed setting is correct.
    v. If engine does not quickly return to idle upon release of throttle(Lazy Idle): Reduce the idle speed until these symptoms vanish.

6. Setting Main Jet circuit
    a. First, check to see if the main jet circuit is fully functioning just prior to transition rpm previously recorded(Step 2-f).
        i. Drive the car in high gear at the Transition RPM, suddenly go to wide open throttle (WOT), and hold it open for ~5 seconds.
        ii. At first, the car will lunge forward slightly because of the accelerator pump shot, but then if the engine continues to run (even if it obviously lugs) that indicates the main jet circuit is active.
    b. Determine the minimum size air corrector jet.
        i. Reduce the jet size

        (***Main jet size + 50*** can be used to determine a rough starting point)

until the engine stalls momentarily when the throttles are held open, while briskly cornering at about 15-30 mph on an uphill incline of at least a 5% grade. The cornering must be in the direction opposite that the air trumpets point out.

c. Go up in size 2-4 sizes for the Air corrector jet. This will be the correct AC Jet Size. (Ex: Minimum AC Jet Size =115, Ideal AC Jet Size= 125-135.)
d. Determine the Main Fuel Jet Size
    i. Determine which size fuel Jet maintains ~12.5:1 AFR throughout the RPM band at WOT (beyond the transition RPM.)
    ii. Pay particular attention to AFR at high RPM.
    iii. NOTE: The following thumb rule may help determine a rough fuel Jet Size:

    Venturi size * 4
e. Choosing Emulsion tubes:
    i. Emulsion tube size selection cannot by covered on a step by step basis.
    ii. Trial and error will help determine the correct emulsion tube for your particular application.
    iii. Generally, the goal is to maintain a 12.5:1 AFR throughout the RPM band at any throttle setting. Different emulsion tube designs can effect this differently.

7. Accelerator pump tuning
    a. The accelerator pump should provide enough fuel to prevent AFR from going lean at WOT in racing conditions
    b. This will lead to a rich AFR in anything but racing conditions, which is acceptable as long as it does not cause a bog upon opening throttles to WOT.

8. The ideal final state of your tune should be an engine that runs at or near 12.5:1 AFR in almost any condition.

Figures:

- 3-a

- 3-b.

- 5-a

DCOE Adjustment controls