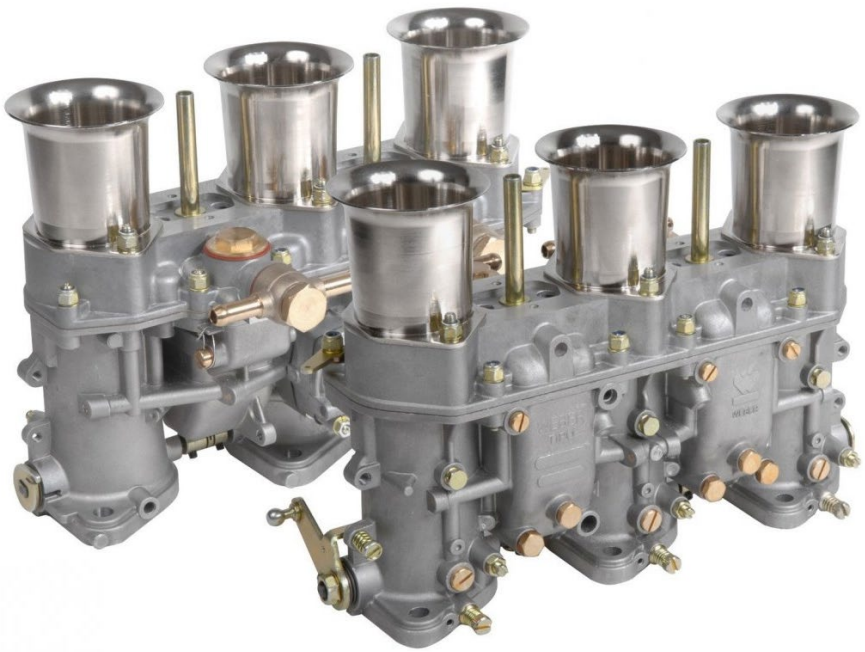
2CV SECONDARY CHOKE BUTTERFLY ADJUSTMENT

Revision 5



Graeme Dennes

2CV SECONDARY CHOKE BUTTERFLY ADJUSTMENT

Revision 5

By Graeme Dennes

Introduction. The writer has identified what is the most-likely procedure used by Citroen to set the secondary choke butterfly adjustment screw. The reasons behind Citroen's procedure, the reasons why Citroen stated the adjustment screw should never be altered and the reasons why we need to adjust it today are fully explained. This revision has made a small change to the clearance setting of the adjustment screw.

Um, what adjustment screw??? Um…, why?? Have you experienced high engine idle speeds which the idle speed adjustment couldn't correct it? Have you experienced rougher idling which the idle mixture adjustment couldn't correct? When driving your 2CV, have you experienced frustrating engine performance issues which you haven't been able to resolve? If so, the following information may be of assistance.

Background. The Citroen "All A Vehicles" Repair Manual 8161 of October 1983 states the Solex 26/35 CSIC dual-choke carburettor was fitted to the 2CV from July 1978 onwards in two versions. The earlier version with 21mm and 24mm chokes with tag reference *197* was fitted up to July 1980. The later version with 18mm and 26mm chokes (the rocket model!) with tag reference *225* was fitted from July 1980 onwards. This article is written around the later version carburettor fitted to a 1987 2CV but it should apply in principle to the earlier version.

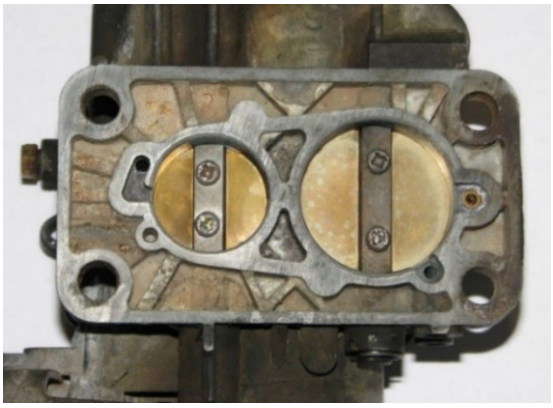


Photo 1

Photo 1 shows the underneath of the carburettor with the throttle at the idle position. The barely open (smaller) butterfly on the left controls the quantity of air/fuel mixture delivered by the (smaller) primary choke, while the larger butterfly on the right controls the quantity of mixture delivered by the larger secondary choke, the source of the 2CV's unbridled power! Um, unbridled *what…??*

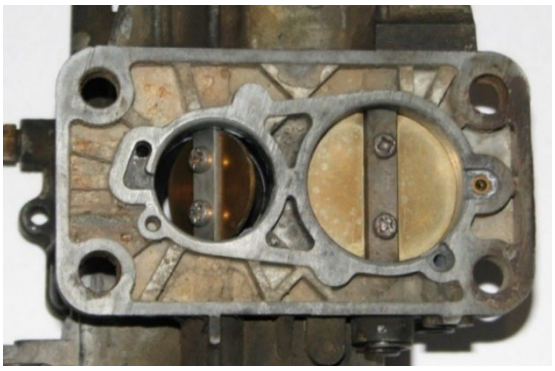


Photo 2

Photo 2 shows the butterflies as they appear with a partially open throttle. The primary choke butterfly on the left is around half open, while the secondary choke butterfly on the right is (still) closed. In fact, the secondary butterfly remains closed until around half throttle, after which it starts to open. Both butterflies reach maximum opening at full throttle.

The idling issue. Should the engine idle speed be too high, it's returned to normal by turning the idle speed adjustment screw anti-clockwise. Sometimes after doing this, the idle smoothness is not at its best, so the idle mixture is adjusted by turning the idle mixture adjustment screw out a little to correct it. Perhaps these actions have been performed several times before…

The driving issue… When driving, if the secondary choke butterfly is even the *slightest* amount open, it can impact the engine smoothness across the lower throttle ranges because the primary and secondary butterflies are no longer synchronised as Citroen requires. This may produce performance issues when driving but the underlying cause has never be found!

Let's analyse this a little further. Let's presume the 2CV is correctly set up except that the secondary choke butterfly is being held *ever so slightly* open at idle by the secondary choke butterfly adjustment screw. As a result, a *small* amount of extra air will be entering the engine via the secondary butterfly, adding to the air already entering via the primary butterfly. This slightly increases the total air flow into the engine and raises the idle speed a little. At the same time, the resulting depression in the *larger* secondary choke from the *small* air flow will not normally be sufficient to draw in fuel from the secondary choke fuel system so the extra air produces a leaning of the net mixture reaching the cylinders, creating a rougher idle. (Higher idle speed, rougher idle.) We adjust the idle speed adjustment screw to bring the idle speed back to the correct setting. (Correct idle speed, rougher idle.) Then the idle mixture adjustment screw is opened a little to correct the net air/fuel mixture, sufficient to result in a smooth idle. Ah, that's better. (Correct idle speed, smooth idle.) Unfortunately, we have just been tricked into believing everything will now be fine, but while ever the secondary butterfly is **not** closing off the secondary choke at idle as intended, the puzzling performance problems *will* remain!

The final symptom. The problem may worsen to where the idle speed adjustment screw has been unscrewed to the limit of its threads, yet the idle speed is still too high. It may worsen to where the idle mixture adjustment screw has been unscrewed to the end of its travel without achieving a smooth idle. Either or both screws have run out of adjustment and the engine idling is way short of ideal! *Something is very wrong. Not happy Jan!*

Well, Baldrick, what's your cunning plan? We need to ensure the secondary choke butterfly is fully closing off the secondary choke at idle. To do this, the carburettor has to be removed from the vehicle to view the butterfly. The secondary choke butterfly closing position is set by the **secondary choke butterfly adjustment screw** and it will be stopping the butterfly from closing off the choke at idle, causing the problems experienced. While the carburettor is removed, it's also an opportunity to clean and inspect it.

Photo 3 below shows the secondary choke butterfly adjustment screw in the centre of the photo. Note the small spring clip fitted to it to ensure it does not move. The throttle is being held in the fully open position.

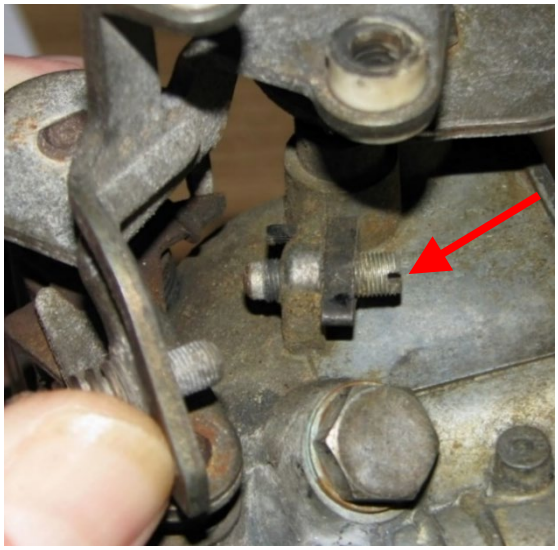


Photo 3

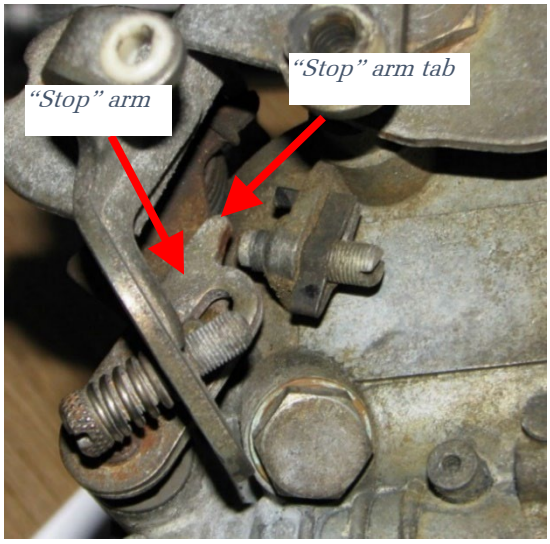


Photo 4

Photo 4 shows the "stop" arm which is attached to the secondary choke butterfly shaft. It's the partially hidden, slotted, elongated metal fitting positioned behind the idle speed adjustment screw and spring at the lower left. For clarity, the butterfly adjustment screw has been unscrewed several turns so its tip is well clear of the tab on the end of the "stop" arm.

Citroen requires that the **secondary choke butterfly adjustment screw** is never altered over the life of the vehicle. In fact, it states in the Citroen Repair Manual regarding the adjustment of the 2CV 26/35 CSIC carburettor with metal tag reference number 197:

Do not tamper with the butterfly stop screw of the second choke.

As a deterrent to any inquiring minds, a moulded plastic anti-tamper cap was permanently fitted over the adjustment screw as a reminder that it's not (intended to be) adjustable.

Seems odd. Why was an *adjustment* screw not meant to be adjusted? Ah, keep reading!

Background. The secondary choke butterfly adjustment screw acts as a limit stop for the butterfly's closing position. It does this when the tab on the "stop" arm of the secondary butterfly shaft makes contact with the tip of the adjustment screw at idle, preventing further rotation of the "stop" arm, the butterfly shaft and the butterfly, exactly as Citroen requires.

The question. When at *idle*, the tab on the "stop" arm makes contact with the secondary butterfly adjustment screw tip, the secondary butterfly just touches the walls of the secondary choke and the secondary butterfly fully closes off the secondary choke. Yes, these three actions *must* occur simultaneously! As there's no setup procedure known to the writer, and as the secondary butterfly adjustment screw is the only adjustment provided, how did Citroen set up the butterfly adjustment screw so that all three actions occur together?

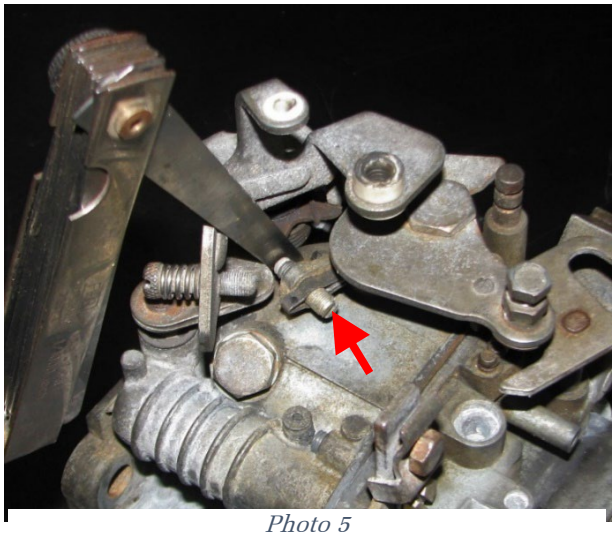


Photo 5

Recent analysis by the writer identifies how! See Photo 5 on left. At idle, the secondary butterfly adjustment screw (arrowed) is adjusted with a feeler gauge to provide a clearance of **0.2mm** between the tip of the secondary butterfly adjustment screw and the tab on the "stop" arm. That's it! All done! Ship it out!

What…?? All done? Yes. From that moment, the spring-loaded secondary choke butterfly will always close off the secondary choke at idle as Citroen requires. A perfect outcome! Here's how it happens.

The secret. Having just set up the **0.2mm** clearance, the "stop" arm tab will *not* be making contact with the tip of the butterfly adjustment screw at idle. That's the secret! Now here's the magic. In the future, every time the throttle is released to the idle position, when the secondary butterfly closes off the secondary choke, the *brass* butterfly will experience ever-so-slight "scraping" wear on its perimeter as it is honed to a new shape profile against the secondary choke wall at the points of contact with the choke wall. During the butterfly scraping wear period, whenever the throttle returns to idle, the butterfly will continue to close off the secondary choke as Citroen requires.

The scraping wear on the secondary choke butterfly will automatically continue in this manner until such time as the **0.2mm** clearance set above has been **reduced to zero** because of the continuing wear of the butterfly, at which moment the "stop" arm tab will (once again) make contact with the tip of the adjustment screw at idle. Job done!

The Magic. From that moment on, when at idle, the "stop" arm tab will be in contact with the tip of the adjustment screw, the secondary butterfly will be just touching the choke wall, the butterfly will be sitting perfectly in its final, long-term resting position in the choke, fully closing it off, and the scraping wear on the butterfly will permanently cease, exactly as Citroen requires. What's more, all this is achieved *automatically*. **That's the magic!**

In summary, setting the small clearance at idle between the "stop" arm tab and the tip of the adjustment screw allows the secondary butterfly to automatically wear and bed itself into its new long-term resting position in the secondary choke where the choke is once again fully closed off at idle, preventing the unwanted air entry which weakens the mixture and causes the idling and performance problems!

In the writer's view, this is almost certainly how Citroen/Solex set up the secondary butterfly adjustment screw. (The clearance setting used by Citroen/Solex is not known, but for new carburettors, it's likely to be no more than 0.1mm.)

A question? Why did Citroen state in the Citroen Repair Manual: *Do not tamper with the butterfly stop screw of the second choke?* The answer? Should the butterfly adjustment screw be altered, it will destroy the critical relationships set up between the secondary butterfly closing position in the choke (to ensure the secondary choke remains closed off at idle) and the adjustment screw (to prevent further wear of the butterfly). If the screw is turned clockwise, the secondary butterfly will no longer close off the secondary choke at idle. If the screw is turned anti-clockwise, the wear on the butterfly will resume. Yes, Citroen had good reasons for making that statement in the repair manual. We also now understand **why it's imperative** we should comply with that statement.

And now to today. Over the past 30+ years of vehicle use, the shaft of the secondary butterfly and the body of the carburettor will have suffered wear. When the carburettor is in its idle position with the "stop" arm tab resting against the tip of the butterfly adjustment screw, the wear may show up as a slight looseness in the butterfly shaft which allows the shaft to be shifted ever-so-slightly away from its intended position in the carburettor body. This in turn will cause the butterfly to be shifted ever-so-slightly away from its intended position in the secondary choke such that it no longer properly closes off the secondary choke, allowing a *small* amount of extra air to enter the engine at idle. Yes, that's the problem at hand and it's caused by wear in the carburettor!

And the solution is? The secondary butterfly adjustment screw *has* to be readjusted (sorry Monsieur André!) to allow the secondary butterfly to find a (new) position in the secondary choke where it can once again close off the secondary choke at idle as we require, while at the same time accommodating the carburettor wear. We achieve this by repeating Citroen's setup procedure!

Ok. Let's do it! In the absence of any known formal procedure from Citroen and to bring any black-magic secret knowledge out into the open, the writer prepared the following procedure to adjust the secondary choke butterfly adjustment screw, very likely in the same manner used by Citroen.

1. Remove the carburettor from the engine and place on a clean work bench.
2. Thoroughly clean all the surfaces, fixtures, fittings and moving linkages, ensuring all moving parts, including the butterflies and shafts, are fully free to move without binding.
3. Ensure the machined metal faces on the bottom of the carburettor are all at the same level and machine-flat! Run a straight edge and torch over the areas. Also ensure both surfaces of the thick spacer block are absolutely dead flat, else it will likely crack when tightened.
4. Check the idle mixture adjustment screw and ensure its tip is not damaged.
5. Remove the carburettor top cover. If the gasket is damaged, replace it. Ensure the float valve is operating correctly. Ensure the floats and float hinge are in good condition, the hinge is not too loose and the float heights are correct. Remove any dirt and water in the fuel bowls and confirm the floats are free to move without binding on the side walls. Then refit the top cover. You don't want air leaks here.

6. If the secondary choke butterfly adjustment screw is fitted with an anti-tamper cap, remove the cap to expose the slotted screw head. In Photos 3 and 4, the cap has been removed.
7. With the throttle fully closed, turn the secondary butterfly adjustment screw anti-clockwise five turns so its tip is **well clear** of the "stop" arm tab, as per Photo 4.
8. With the carburettor throttle held in the fully open position, ie with both choke butterflies fully open, release it, allowing the secondary butterfly to "snap" back into its closed position, ensuring the tip of the butterfly adjustment screw remains **well clear** of the "stop" arm tab. Repeat this several times to allow the secondary butterfly to find a **new** resting position in the secondary choke so it can (once again) close off the choke.
9. With the carburettor in the idle position, adjust the secondary choke butterfly adjustment screw until a **0.2mm** feeler gauge just fits nicely between the tab on the "stop" arm and the tip of the adjustment screw per Photo 5. It should be a smooth sliding fit, not a tight fit or a loose fit. "Snap" the throttle by hand a few more times, then recheck the clearance. Snap some more and recheck. And again. Setting the **0.2mm** clearance while the secondary butterfly is properly closing off the secondary choke ***is the most important part of the entire procedure.***
10. From this moment on in the life of your 2CV, and in compliance with Citroen's statement: **Don't alter the butterfly adjustment screw. (**Well, not for *another* thirty years!) **Don't let anyone else alter it either!** (Keep ya cotton-pickin' fingers off it!).
11. Return the carburettor to the car, fitting a new gasket to each side of the thick spacer block. Ensure the spacer block is correctly orientated. Ensure the carburettor mounting nuts are done up tightly to form an **airtight** seal with the inlet manifold so air cannot enter around the base of the carburettor and cause a leaning effect on the fuel mixture.
12. Run the engine for five minutes. Set the idle speed and idle mixture adjustments.
13. Take the car for a one hour run to *thoroughly,* yes, *thoroughly,* warm up the engine.
14. While the engine is hot, recheck/adjust the butterfly adjustment clearance, then adjust the idle speed and idle mixture. Use a tachometer to set the idle speed to 800-850 RPM.
15. Put a drop of Loctite onto the threads of the butterfly adjustment screw to lock it in place.
16. Once the engine is *cold*, slightly break and then retighten the four carburettor mounting nuts.

That completes the procedure. Over the coming months of driving, the secondary butterfly will **automatically** undergo the ever-so-slight *but necessary* scraping wear to allow itself to bed into its **new position** in the secondary choke. Nothing further has to be done by the owner except drive the car!

As already noted, the scraping wear on the butterfly will continue until the "stop" arm tab finally comes to rest against the tip of the adjustment screw at idle. **From that moment on**, when at idle, the "stop" arm tab will be in contact with the butterfly adjustment screw tip, the scraping wear on the secondary butterfly will cease and the butterfly will continue to seal off the secondary choke, just as Citroen requires, and all this is achieved through setting the small **0.2mm** clearance!

Conclusion. The above procedure should allow the secondary choke butterfly to properly close off the secondary choke at idle while also accommodating any wear in the carburettor body, the secondary butterfly shaft and the secondary butterfly.

Finally, should it be found that the carburettor has suffered too much wear for this procedure to successfully correct the performance problems, the carburettor will need to be professionally rebuilt and this procedure repeated using a suggested clearance figure of 0.1mm, which will be closer to the figure used by Citroen/Solex when the carburettor was new.

LIST OF ARTICLES BY THE WRITER

The articles written by the writer, listed below, may be freely downloaded from either of the following club websites by clicking on the adjacent links and locating the articles. Both websites maintain the latest revisions of the articles. Before using the articles, please ensure the latest revisions are being used, as the articles are updated on an as-required basis by the writer and given new revision numbers.

Citroen Classic Owners' Club of Australia: Technical Articles

Citroen Car Club of Victoria: Tech Tips

1. 2CV 40-Litre Fuel Tank
2. 2CV API GL-4 Gearbox Oil
3. 2CV Battery Charging Circuit
4. 2CV Battery Problems Solved
5. 2CV Brake Saga
6. 2CV Buyer's Questions
7. 2CV Carburettor Cover Screws
8. 2CV Carburettor Jets and Adjustments
9. 2CV Engine Problems
10. 2CV Fuel Filter
11. 2CV Fuel Gauge and Battery Meter
12. 2CV Gearbox Output Hubs
13. 2CV Gearbox Unwinding Debacle
14. 2CV Hard Luck Stories
15. 2CV Headlights Improvement
16. 2CV Ignition Coil
17. 2CV Knife Edges Replacement
18. 2CV Low Oil Pressure Beeper and Lights On Beeper
19. 2CV Maintenance - Part 1 of 2
20. 2CV Maintenance - Part 2 of 2
21. 2CV Oil Breather
22. 2CV Oils and Maintenance Advice From Burton
23. 2CV Points Ignition Reinstallation
24. 2CV Roof Rack
25. 2CV Secondary Choke Butterfly Adjustment
26. 2CV Spare Parts to Carry
27. 2CV Valve Clearance Adjustment
28. 2CV Workshop
29. Better Fuel Hose Clamps – **applies to all vehicles**
30. Better UHF CB Car Radio Performance – **applies to all vehicles**
31. Ignition Coil Ballast Resistors – **applies to all vehicles**

FINAL STATEMENT

My acknowledgement and grateful appreciation is given to the web sites
from which photos/drawings/diagrams have been sourced.

If material copyrighted by others has been inadvertently used in this document without permission, then upon receiving advice, the writer will remove the material immediately.

This article may be updated in the future and assigned a new revision number.

Before using the information in this article, ensure the latest revision is being used.

If you have questions about the information in this article, if you find errors or incorrect statements, if you have suggestions for improvement, or should you wish to republish this article in your club magazine, please - contact the writer at: gdennes@gmail.com