

Cross

Cross is the hardest to teach in CFOP, there aren't specific "cases", and it is mostly intuitive. The thing that helps me the most, is looking at reconstructions of good solves from good solvers. A lot of cross solving is taking your knowledge, and implementing it into your solves which is hard to do. Here are some general tips.

1. Solve cross on bottom, this allows for better look ahead to first pair.

2. 3 - move insert

If you cannot insert an edge, assuming it goes in the DF spot, with F2, off set it to the right with a U', and do R' U R. This is super fast, and is convenient.

3. If you can't solve the cross directly matching to the side colour, you can solve the cross relative to other pieces. Know your colour scheme, this also can be handy later when learning 4x4. For example, when solving cross on bottom, you can solve all the edges a D2, or D, or D' away. Learning to solve the cross relative to the other pieces, is extremely important to know, and applies to tip 4 and 5.

4. X Cross

X cross is a technique that solves the first pair while doing cross. It is not a necessary component but can make a difference of many seconds. This is usually done when you find yourself an easier scramble, with a corner correctly oriented and attached to a cross piece. Usually, an x cross is made when an offset cross is made, with a corner attached to one of the edges, and the corresponding edge to the corner is solved. It's hard to explain, you can search it up on YouTube.

One last tip, try to look ahead to your first F2L pair. Try solving the whole cross in one look, blind. If you can solve the cross blind, you will not have to focus on it, and can focus on, for example, a first pair, while doing the cross.

F2L

F2L is a very important part of a CFOP solve, if not the most important. It makes up for 50% of the solve, and 62% including the cross. F2L is improved through experience and look ahead, and it is helpful to know certain algs for certain cases.

1. Look ahead.

Look ahead is the process of focusing on what is happening next, and looking **ahead** of what you are doing at the moment, as the name suggests. Look ahead is separated into 2 parts. How to look ahead, and where to look.

a) Muscle Memory

By looking ahead, you have to focus your eyes not on the pair you are solving, but the next pair that you will solve. This requires you to have muscle memory handle the case that is physically being solved. To develop this muscle memory habit, try doing F2L cases with your eyes closed. This forces your eyes not to concentrate on the pair, and forces your hands to solve it without looking at the piece. This way, your eyes can be used for looking at other upcoming pairs, which is the next step in this process. When you feel confident doing F2L pairs with your eyes closed, you may feel the urge to go ahead and do every F2L pair extremely fast, then taking another 3 seconds to find the next pair to do, then stopping another 3 seconds. **This is not the route to take.** Remember, we are trying to reinforce **looking ahead**, not **completely ignoring lookahead and spamming moves**. This is where solvers usually mess up with learning lookahead, because they think it is faster to do an F2L pair extremely fast, now that they can do it blind, and have no lookahead into what is **next**. Only what is happening in the **now**. Reasons why spamming turns are bad will be explained later in detail in section b. Now continuing with after you have mastered doing it blind, open your eyes, but do all F2L pairs **extremely slow**. Do you get bored, feeling like you could turn faster? Do your eyes feel bored looking at the same place? Now, do a drill, this one is going to be harder. Do 2 F2L pairs **in a row, no stopping in between, not even a bit**. It does not at all matter how fast you turn, **but do not stop in between**. I suggest a metronome to force yourself not to stop. To do this, while doing

an F2L from muscle memory, find other pieces that make other F2L pairs, and track them. These concepts are explained in section b.

b) Tracking and where to Look

Now you might be wondering, where do I look to find pieces for a different F2L pair? There are 2 steps to this, inserting into the back slot, and focusing on the opposite side of the cube. Inserting into the back slot means to insert an F2L pair into one of the back 2 slots, as opposed to the one in the front slots. This allows for you to see more of the cube. Think about this, is it required to look at a solved part of a cube? Does it provide any new information about where pieces are? No. Once a pair is solved, it is useless to you, as it does not provide any information about where pieces are. So if you insert into the front slot on your first F2L pair, you will have 1 empty F2L slot in the front, and 2 empty slots in the back of the cube. The back of the cube is harder to see, therefore harder to look ahead to. This also reduces rotations of the cube, which should be avoided as much as possible, and will be explained in the second part of this F2L guide. Inserting into the back may be tricky at first, but it is an essential point. Next, when inserting into the back slot, allow your muscle memory to take over to solve and insert the back pair, this was a skill introduced in section a. Now, this is the real 'looking ahead' part. Look on the 2 empty sides that are facing you, try to find 2 pieces that will make the next pair. Try doing this, transitioning from the first F2L pair to the second, **without stopping your turning**. It does not matter, slower is better for lookahead. The reason why slower turning is better than faster turning, is because a skill called **tracking**. Tracking is the process of tracking the movement of a piece. Tracking is extremely important for look ahead, let's use the example before to help explain. When you solve the first F2L pair, you turn the layers, therefore moving pieces around. When you are solving a pair, you are most likely moving other pieces, other than the pair itself. These pieces other than the ones being solved may become part of the next F2L pair that you lookahead to. By turning fast, you are destroying the chance for your eyes to track moving pieces, as your eyes and mind can only move so quick, so for F2L, it is actually better to turn slower. Once you average around 10 seconds, it may be time to speed up your turning by a bit. But for now, just turn slower altogether. When I mean slow, I don't really mean slow, but efficient. Turning slow by itself is nothing, if you are not using the slow speed to your advantage by looking ahead. So do not turn slow for the sake of me saying "turn slow". Do it to your benefit. Slowly, increase the number of slots you do in a row, without stopping **at all**, not

even a second if stopping. Again, I recommend using a metronome. If anything, I suggest setting the metronome to 1 turn per second to start off with, or 1 beat per minute (bpm). Remember, it does not matter how slow you go, but the consistency of your turning. This practice method should eliminate most of your pauses during F2L in a solve. So now, by combining slow turning, tracking, muscle memory, and smooth, non-stop turning, you should have grasped the concept of look ahead.

2. Algorithms and Efficiency

So now, you may have effortless turning with no pauses, but you use **way** too many moves to solve an F2L pair. Algorithms can be learned to solve individual cases more efficiently. You can check out J perm's guide [here](#):

<https://drive.google.com/file/d/1nzAXYUWZJ6H2wIOXaHdWXep3W57tArbR/view>

The algorithms here are very efficient and flow well, meaning that they have the best combination of move count and finger tricks. To use the F2L guide the most efficiently, have a look at the F2L cases that may take you the longest, and find it on the PDF. Drill the algorithms until they are locked in on your memory. Soon enough you will have them memorized. Be sure to keep the F2L pairs flowing smoothly as always. A trick I use now, is to speed up my turning right in the middle of the algorithm, and slow down my turning as I finish up the pair and am moving on to the next one. This makes sure I have the best efficiency for turn speed, and still have good lookahead. By doing this, this maximizes the turn speed for when your muscle memory can remember the algorithm and secures the time it takes for your eyes to track the next pair.

This is all I have got to say about Cross and F2L. I hope this guide helps everyone who is reading. This guide is written for Sub 20-30 looking to improve their Cross and F2L for 3x3. Thanks to everyone for reading my guide.

Brian, Sub-14 (3LLL) Single / Aof 5 / Aof 12 - 7.92 / 11.76 / 12.87