Prof M's Strategy for Solving Mechanism Problems

Here are the steps I use to figure out a reasonable mechanism for a new reaction. I will work through the following example to show how each step is applied.

Example: In addition to expected product 1, product 2 is formed under the following reaction conditions. Please draw a reasonable arrow-pushing mechanism that illustrates how product 2 is formed.

1. Number all "heavy" atoms (C, O, Cl, N, etc).

2. Draw in hydrogens.

3. Inventory the bonds you need to break and the bonds you need to make.

<table>
<thead>
<tr>
<th>Break</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>C6-H</td>
<td>C6-C11</td>
</tr>
<tr>
<td>Cl1-H</td>
<td>Cl10-H</td>
</tr>
<tr>
<td>Cl10-C114</td>
<td></td>
</tr>
</tbody>
</table>

4. Consider the starting materials. What is nucleophilic? What is electrophilic? (or identify acids and bases)

5. Decide which bond you can break or make first. Check off your break/make table from step 3.

Lewis base + Lewis acid...
6. Repeat steps 4 and 5 until you get to product. If you come to a step where there are 2 possibilities about what to do, choose one and put a star next to that step. If you cannot then get to the product, return to that step and see where the other possibility takes you.

7. If you get stuck, try going backwards.

8. Confirm that the product you form is the right product.
Example of Following the Wrong Path (at first):

\[ \text{Cl}_3\text{Al} : \text{Cl} \rightarrow \text{Cl}_3\text{Al-Cl} \]

This is where I would re-evaluate the choices I made.
It seems like I'm doing a lot of extra bond breaking & making.
1st choice I made: Numbering atoms in my product. Maybe the carbon that ends up on \( \text{C}6 \) is not \( \text{C}10 \), but rather \( \text{C}11 \).
Start over w/ new numbering & see if you get a more reasonable mechanism.