



COMMANDER   **16**



Kit Assembly Guide

Commander X16 Kit Assembly Guide

Thanks so much for buying a Commander X16 kit! We really appreciate it and hope you find the assembly process as rewarding as writing your first program in BASIC! This guide walks through assembling the Commander X16 kit part-by-part. Every step includes component identification tips and checkpoints to ensure a successful build.

Parts may be installed in any order desired, but it is easiest to install the shortest parts first, and then gradually move on to the tallest part. Our directions diverge from this rule to install the ICs last. Generally, this is the safest route, but feel free to follow each section in the order which makes sense for your comfort level at soldering.

Before You Start!

Be sure to reference the online interactive BOM tool here: [Commander X16 BOM](#). It will greatly aid in locating components on the PCB and help keep track of what has been installed. It will also allow you to familiarize yourself with the parts in the kit and verify that everything is present.

Kit Information

The Commander X16 Kit has two varieties, the Full Kit and the Basic Kit. The Full Kit contains all the parts needed to complete the motherboard. You will still need a power supply, and keyboard, etc. Most standard or micro ATX cases as well as most ATX power supplies will work with the system. Likewise, most PS/2 keyboards and mice will work fine. Except for cases, we do have all these [items for sale in our store](#) including a branded Commander X16 Keyboard.

The Basic Kit includes a smaller subset of parts, including all the pre-programmed ICs and a few other parts which we were able to buy in bulk for a better price. There are also some discontinued parts which we were able to source and include in this kit. The balance of the needed parts are listed in the spreadsheet linked below:

Commander X16 Basic Kit Required Parts List - Mouser Electronics.xlsx

You may also opt to reduce the cost further by eliminating parts you may not want to use. For example, the IEC Serial port for use with Commodore Peripherals is rather expensive. You could eliminate it from the parts list if you don't plan to use it. If you have any parts on-hand or want to use a supplier other than Mouser that is fine, the spreadsheet has everything needed to complete the motherboard along with the Basic Kit.

Please note, both kits only come with 512K of the possible 2MB of RAM and no user-port 65C22 chip along with its protection diodes. Most of the software for the X16 will run within 512KB, and the user

port is optional. We offer an upgrade kit with these missing chips, but they are not included with either the Full or Basic kit.

Electro-Static Device Precaution

Most ICs in this kit are static sensitive. Be careful when handling them and use as much precaution as possible. A proper static mat with a wrist-strap is not too expensive, but it is unlikely that most DIY solder-stations will include one. That said, I would recommend discharging yourself if possible.

Touching bare metal on a wall-outlet grounded chassis, like your PC case, will help to reduce any static you may have built up. In general, handle the ICs as little as possible. Also take a break soldering between pins if some take a while. It will reduce the potential for heat damage. Handle the ICs with their body, and not their legs.

Diodes are also static sensitive. Take similar precautions when installing them on the board.

Soldering Basics

Soldering is often referred to as an art, and not a science. In reality; it just takes some practice. This is not meant to be a beginner kit, but most of the soldering required is very straightforward. Don't be in a hurry, even those with more experience should still expect to spend five or more hours to assemble this board. Don't be afraid if it takes you significantly longer than that, it is far better to be thorough than fast. We would expect that a beginner could finish a kit over a weekend including plenty of breaks and time for review.

There are many methods and tips regarding how to solder, and this is where it is more art than science. For example, when placing an axial component, you could leave the pins straight and tack a leg while holding the part in place from the other side. This will likely result in burning your finger as the part heats up, so Kapton tape may also be useful here. Another method would be to slightly splay the legs on the bottom of the board to hold the part in place while soldering. Some even bend the component legs flush to the board and solder. Such as this tutorial video: [Soldering Crash Course: Basic Techniques, Tips and Advice!](#)

This is where your preference will come into play, and it is beyond the scope of this document to explain the full process. There are many other videos and tutorials online which will help you and there is some expectation that you are familiar with soldering in this assembly guide.

In addition to the kit and all the parts, you will need at a minimum, a soldering iron, solder and wire cutters. Make sure your iron is rated properly for the solder you plan to use. Wire cutters are used to trim excess pin leads after soldering. You should clean the board with 95% or greater isopropyl

rubbing alcohol when soldering is complete. Cotton swabs and lint-free towels work well for this. Old flux residue may be corrosive or conductive. It's best to remove it.

It may also be nice to have some additional tools like component benders, needle-nose pliers, tweezers, magnification, solder-braid, or even a desktop PCB vice to hold and easily rotate the PCB. We leave these choices up to you, in general, no specialized tools beyond what a standard through hole soldering kit would need are required.

Part Installation Basics

This kit includes several types of components which require different methods of installation. Axial components are parts such as resistors which have a lead on either side of the axis of the package. Radial components are parts such as electrolytic capacitors which have their legs on one side. Some parts, such as the IC sockets, and pin headers, will insert directly into the PCB with no additional effort.

The ICs themselves have their legs slightly angled outward, which means they must be bent inward to install into the PCB or an IC socket. The best method is to use an IC leg straightener tool to align the pins. (Pictured here.)



The alternate method is to pick the IC up by its body and gently press the legs of each side evenly against a flat static-free surface. The legs need to be bent to approximately 90 degrees on each side. Try to ensure you keep the pressure even so that the legs are bent the same amount and proceed slowly so you don't overbend them. It can take a little practice, but this method is not too difficult once you get the hang of it.

The axial components will also require their legs to be pre-bent to a 90-degree angle on either side. However, you cannot just bend the legs at the body and install the parts. Most of the radial parts will need to be bent slightly further out down the lead to make sure they align with the holes properly.

An axial leg bender tool is handy for this use. (Pictured here.) Many different widths are needed for the Commander X16, and this will ensure the parts are aligned properly when bending the legs. Center the part on the bender to ensure that all the parts line up, if you are concerned about the aesthetics.



If you do not have an axial part bender, the best alternative method would be to simply bend the pins by finger. Bend them from the ends into a U shape and take care not to commit to a bend in the lead yet, just leave it

arched. Arch it enough to allow you to push the component through the PCB. Then start pushing the part towards the PCB attempting to center it between the holes as you go. You can either just push the part in at this point or use needle-nose pliers to bend each side gently now that you have the correct spacing. Pushing it in will not show a bend like on the pin, but you can center the parts in this manner.

We [sell the tools pictured](#) if you would like to purchase them, or you can also [3D print](#) them yourself. We highly recommend doing so if you are able, they will make assembly far easier.

Other components, like radial capacitors, can have their leads splayed out much like an axial part, and other parts like the transistor on the board can take advantage of this too. However, some parts like the pin headers, or IC sockets may need to be held by hand, or with Kapton tape to hold them in place until at least one leg is soldered.

The Full kit has parts grouped in bags with the components marked. A few are loose in the packaging, so be sure to closely examine the part number to make sure you have the correct one.

Some parts are also polarity sensitive, and they will be called out in the installation steps below.

SECTION 1 — Resistors (R1–R26) – Not Polarity Sensitive

Resistors are the easiest components to install and make a perfect starting point. Only install one value group at a time to make sure you don't get them mixed up. If you have any doubt about a value, use this handy online resistor color calculator to help: [Resistor Color Code Calculator](#)

Make sure the resistors are completely flat and aligned to your liking against the PCB before soldering. While not critical, it can be annoying to go back and reseat parts if you decide you don't like the result.

The orientation of resistors is not critical.

Value Groups:

100Ω (R1–R3, R25–R26) — 5 pcs

150Ω (R4–R5) — 2 pcs

470Ω (R6) — 1 pc

1K (R7–R10) — 4 pcs

1.5K (R11–R12) — 2 pcs

4.7K (R13–R15) — 3 pcs

10K (R16–R22) — 7 pcs

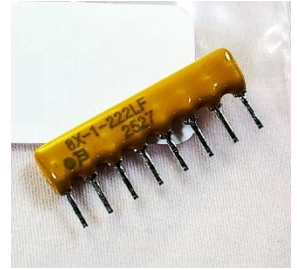
15K (R23–R24) — 2 pcs

Checkpoint

- All values in correct locations?
- Any cold solder joints?
- Any solder bridges?
- Are parts seated as desired?

SECTION 2 — Resistor Networks (RN1–RN10) - Polarity Sensitive Parts

Resistor networks are not static-sensitive, but their installation direction does matter. The X16 PCB has a silkscreen marking for pin one orientation for each part. The pad of pin one is square and has a small square silkscreen around it. It is part of a larger silkscreen rectangle around the whole footprint, but it should be clear from the PCB and the online BOM tool where pin one is located.



Each resistor network has a dot marking pin one. (Pictured above.) Generally, the side with text will have the left-most pin marked. Just be sure to match this with this square on the board.

How to Install Resistor Networks

- Look for the dot marking pin 1
- Match pin 1 to the PCB's pin 1 indicator
- Insert flat and align vertically & solder one pin to anchor part to PCB
- Check alignment, adjust if needed and solder remaining pins

Install in Groups

- **RN1:** 330Ω, 8-pin
- **RN2–RN3:** 4.7K, 5-pin
- **RN4–RN5:** 4.7K, 6-pin
- **RN6:** 2.2K, 8-pin
- **RN7–RN10:** 100Ω, 8-pin

Checkpoint

- All values in correct locations?
- Any cold solder joints?
- Any solder bridges?
- Are parts seated as desired?

SECTION 3 — Diodes & LEDs (D1–D18, D30–D34) – Polarity & Static Sensitive Parts

Diodes, including LEDs, are semi-conductor devices and are static sensitive. In general, you should discharge yourself and take similar precautions when handling as you would ICs. They are also polarity sensitive, so the direction of installation does matter for these parts.

The kit mostly consists of axial diodes, which have a band marking on their cathode, or negative end. The PCB also shows a line in the silkscreen for each diode indicating the cathode end. Be sure to align the marking on the diode to the marking on the PCB.

Axial Diode Installation

- Locate the band marking on the diode
- Bend the part to match the pin alignment
- Align the diode to the band marking on the PCB
- Insert flush to the board & solder one pin to anchor part to PCB
- Check alignment, adjust if needed and solder remaining pin

LEDs usually have a flat side, which is meant to mark the side closest to the shorter leg. This side is the cathode, and the longer leg is the anode. The PCB has a flat marking facing left on the PCB which is the cathode marking. Both diodes should be oriented such that their flat side/short leg aligns with the flat marking on the PCB.

LED Installation

- Locate the flat side of the LED
- Orient the flat side of the LED to match the flat marking on the PCB
- Insert flat and align vertically & solder one pin to anchor part to PCB
- Check alignment, adjust if needed and solder remaining pins

Install in Groups

- **D1–D14:** 1N4148
- **D17–D18, D30–D34:** TVS diodes
- **D15–D16:** LEDs

Checkpoint

- All bands aligned properly to the silkscreen?
- All LEDs face the correct direction?
- Any cold solder joints?
- Any solder bridges?
- Are parts seated as desired?

SECTION 4 — Ferrite Beads & Fuses (FB1–FB5, F1–F3) - Not Polarity Sensitive

The ferrite beads are axial components which install like resistors. When installing, make sure they are completely flat and aligned to your liking against the PCB before soldering. While not critical, it can be annoying to go back and reseat parts if you decide you don't like the result.

The fuses are a radial part, and you may want to install them near the end of the process. They are in the same section as the ferrite bead as they are both passive power-related passive components, but the fuses are one of the taller parts.

The orientation of ferrite beads and fuses is not critical.

Install in Groups

- **FB1–FB5:** Ferrite beads
- **F1–F3:** Resettable fuses (RUEF250-AP)

Checkpoint

- All bands aligned properly to the silkscreen?
- All LEDs face the correct direction?
- Any cold solder joints?
- Any solder bridges?

SECTION 5 — Capacitors (C1–C57) - Polarity Sensitive

This section is marked as polarity sensitive, but only the electrolytic capacitors, C49–C57, have a polarity marking. The first section are the ceramic and film capacitors which may be installed in either direction. All parts are radial, so they should be installed accordingly. We broke the list up to where the smaller component count parts are installed first. This will make inspection easier and prevent the accidental installation of a part in the wrong location.

Ceramic/Film Capacitors (Non-polarized) – Install in Groups

- **C39–C40:** 3300pF film
- **C41–C42:** 9pF
- **C43–C44:** 1000pF film
- **C45–C48:** 1 μ F film
- **C1–C38:** 0.1 μ F



Electrolytic capacitors are polarized and installation direction is important. There is a band on one side of the capacitor marking the negative lead on the part. (Pictured here.) The PCB has a circular silkscreen marking with one side filled in. The open side of the silkscreen has a + or positive marking near the pin. The negative band on the capacitor should be facing the filled-in side of the silkscreen and not the positive side. On this kit, all electrolytic capacitors will have their negative leads facing the front of the PCB, and their positive leads facing the rear.

Electrolytic Capacitors (Polarized)

- Locate the stripe on the electrolytic capacitor, this is the negative lead
- The PCB marks the negative side with a filled half-circle, positive is open and has a +
- Orient negative capacitor marking towards front of PCB/Negative PCB marking
- Insert flat and align vertically & solder one pin to anchor part to PCB
- Check alignment, adjust if needed and solder remaining pins

Install in Groups

- **C49:** 47 μ F
- **C50:** 10 μ F
- **C51–C52:** 100 μ F
- **C53–C57:** 220 μ F

Checkpoint

- All values in correct locations?
- Are all electrolytic capacitors aligned properly?
- Any cold solder joints?
- Any solder bridges?
- Are parts seated as desired?

SECTION 6 — IC DIP Sockets - Polarity Sensitive

IC sockets are used to make removal and installation of ICs simple. Some ICs are socketed to prevent too much heat on the pins, or to allow for easy upgrade or replacement. We opted not to socket all ICs on the original release or the Full Kit. Instead, we socketed high-value components as well as upgradeable parts. If you have the Basic Kit, you could install no sockets or socket the whole board if you like. The choice is yours, but we would recommend socketing the YM sound chip and DAC as well as the CPU & System ROM at a bare minimum.

DIP sockets, as well as DIP ICs are polarized, or have a proper orientation. If you read the text on top of the IC, the pin in the lower-left hand will usually have a mark or an indentation indicating where pin 1 is located. Most DIP ICs will also have a notch on the top of the IC indicating the location of pin 1. The DIP sockets are also marked with a notch on one of the short ends of the socket. This indicates the location closest to Pin 1.

The PCB silkscreen also shows the notch, so it should be easy to match the orientation of the socket to the board.

Note: The online BOM tool does not show the location of the IC sockets, it only shows the IC which fits into the location. U8 is the ATTINY861 but U8 is technically two parts, the DIP socket, and the IC itself. The final step of the assembly should be to socket the remaining ICs once you have completed/verified assembly and cleaned the PCB.

DIP Sockets (Polarized)

- Locate the notch on the IC Socket, align this with the notch on the PCB silkscreen
- Insert flat and solder one pin to anchor part to PCB
- Check alignment, adjust if needed and solder remaining pins

Install in Groups

- **U26–U28:** 40-pin
- **U1–U6:** 32-pin
- **U7:** 24-pin
- **U8, U25, U29:** 20-pin
- **U10, TVS1, TVS2:** 16-pin

Checkpoint

- All sockets in correct locations?
- Any cold solder joints?
- Any solder bridges?
- Are parts seated as desired?

SECTION 7 — Mechanical Parts (B1, SW1–SW3, RL1)

Buttons SW1-SW3 have no polarity, so they may be installed in either direction. Just make sure they are seated flush before soldering. As always, solder one pin first, then verify seating before proceeding.

The relay is designed to only be installed in one direction. Place it flush against the board, and repeat the process of soldering one pin, checking, and then proceeding.

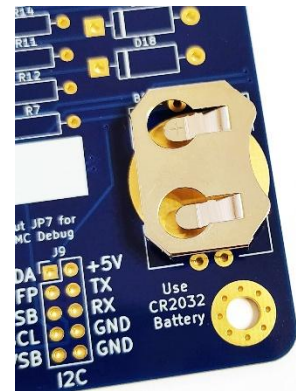
Lastly, the battery holder does have a polarity of sorts. The connector is designed to press the negative side of the battery against the PCB, while two tabs in the connector are designed to touch the positive side of the battery. They should be oriented so that the tabs are angled from the top to the left. If the connector is reversed, the tabs will interfere with battery insertion from the right side of the board.

Install in Groups

- **SW1–SW3:** FSM4JAH switches
- **RL1:** EC2-5NU relay
- **B1:** Battery holder

Checkpoint:

- Any cold solder joints?
- Any solder bridges?
- Are parts seated as desired?



SECTION 8 — Connectors & Headers (CO1–CO6, EXP1–EXP4, J1–J12)

This section contains all the external connectors from the motherboard. It also contains all of the pin headers needed for the whole board. For the Full Kit, we used bulk pins and pre-broke them to length. They may need a little clean-up if desired. If you bought the Basic Kit, we have added all of the pin headers needed to the parts list. You could also use standard pin-headers and break them yourself to save a little cost.

Pin headers can be a little tricky to install so be sure to only solder one pin and verify their vertical alignment before proceeding.

Each of the connectors below only install one way, except for the expansion ports. Make sure each connector is fully seated to the board, solder one pin and then inspect to make sure it is flush to the board. The SNES connectors should be installed so that the lip of the connector is just hanging off the edge of the PCB. You may need to slightly bend the connectors into place. One connector is oriented left, and the other right. They will only plug in one-way.

Their polarity of the EXP ports is not important; they have no marking for pin 1. The optional angled connector for EXP1 should be installed facing the left. You will also need to remove the breakaway piece of the PCB in the upper-left hand corner but do so after soldering the connector in-place. It will help keep it aligned properly.

Install in Groups

- **CO1:** DIN-6
- **CO2–CO3:** SNES connectors
- **CO4:** Audio jack
- **CO5:** 1734021-4 Mouse/Keyboard
- **CO6:** 44206-0007 ATX Power
- **EXP1–EXP4:** Expansion connectors
- **J1–J12:** All headers (1×2, 1×3, 1×4, 2×3, 2×5, 2×12, 2×13)

Checkpoint

- Any cold solder joints?
- Any solder bridges? Especially on the EXP connectors?
- Make sure the soldering is strong, most of these connections are mechanical.

SECTION 9 – Crystals and Transistor – Static Sensitive

This section is short, but it is important to take your time. The Q1 transistor needs to be aligned to the silkscreen on the PCB with the flat face pointing towards the front of the board. When inserting, do not force the transistor flush to the board. It should be standing approximately 7-10mm from the surface. If the legs make it all the way through, you have it aligned fine. Solder an outer leg and level the part out. Complete the last two legs.



X2 & X3 install much like an IC and the packages likewise have a mark in their lower left-hand corner when you are reading the text on the part normally. In addition, the package of these crystals have 3 rounded, and one-pointed corner. The pointed corner should be oriented to the silkscreen marking which is also in the lower left-hand corner.

X1 is a little trickier to install. While it has no polarity requirement, it is a small and fiddly part. The best method is to slightly spread the legs of the component so that you can push them through the PCB. You do not want to push it down all the way, you need some slack to bend the part flush to board. Push the part horizontally to the board, facing left. Solder one pin as usual and make sure you have the part aligned correctly. It is easy to cross or twist pins on installation, so look closely before finalizing soldering. Do not add too much solder as it could bridge the case of the package to a pin.

Install in Groups

- **Q1:** 2N3904 transistor
- **X2:** 3.579545MHz Sound Crystal
- **X3:** 16MHz System Crystal
- **X1:** 32.768KHz RTC Crystal

Checkpoint:

- Any cold solder joints?
- Any solder bridges?
- Are parts seated properly and in the correct location?

SECTION 10 — Non-socketed ICs – Polarity and Static Sensitive Parts

This section will likely take the most time to complete, as it will be important to handle the ICs properly and ensure that each part is placed in its proper location. The online BOM will be very helpful here as it will allow you to easily identify the location of all ICs.

As discussed in the IC socket section, each IC will have pin 1 notated in its lower left-hand corner. There is usually a notch at the top of the IC as well. Pin 1 on the IC needs to be oriented such that it is facing the notch on the motherboard silkscreen. All ICs on the board are oriented so that pin 1 and the notches are facing the rear of the board.

The beginning of the document has a section called part installation section which discusses how to bend IC legs to a 90-degree installation for installation into the PCB. If you haven't read that section, we recommend reviewing it now. Most ICs will need to have their pins bent inward to install on the board.

It is best to seat the ICs flush to the board and solder one pin on each side of the IC. Ensure it is properly seated and that all of the pins are sticking through the PCB evenly. Once you have confirmed this step, solder the remaining pins. You should only need to spend about 5 seconds on each pin. If you find you are taking too long, take breaks between soldering pins to allow the package to cool down.

Note: Most of the logic on the board is ACT, but U23 is an HCT IC. It is the first-listed so it does not get confused with the two ACT chips with the same designation. This part is timing-critical, so please be sure to pay attention to the part numbers when installing the ICs.

Install in Groups

- **U23:** 74HCT138
- **U9:** MCP7940N
- **U11, U19:** TL074
- **U12:** 74ACT08
- **U13–U14:** 74ACT20
- **U15:** 74ACT04
- **U16:** 74ACT00
- **U17:** 74ACT163
- **U18:** 74ACT74
- **U20, U30:** 74ACT138
- **U21–U22:** 74ACT02
- **U24:** 74ACT139
- **U25, U29:** 74ACT273
- **TVS3:** SP720APP
- **U31:** SN7406

Final Checkpoint

- All IC notches aligned to the PCB silkscreen?
- All ICs in their proper locations?
- Are all ICs properly seated?
- Any solder bridges, or cold-solder joints?

SECTION 11 — Socketed ICs

The final section of the kit, it is finally time to install the socketed ICs. At this point, all of the soldering should be complete. If you have not already done so, we highly recommend inspecting the entire board carefully. Ensure all polarities are correct, all parts are installed in their correct locations, and most importantly, make sure there are no solder bridges on the board. There are a lot of points where a bridge might occur, so take your time to carefully inspect the board before proceeding. You may also want to take this opportunity to clean the board carefully.

The ICs will need to be bent to a 90-degree angle as done with the soldered ICs. On the surface, it would appear easy to install the ICs into their socket, but you might easily bend a pin if you aren't careful. The best approach is to slightly insert either the left or right side of an IC into the socket first. Don't seat the pins yet, just make sure they are all in the socket properly. Once this is done, rock the chip towards the other side and make sure they are all sitting in their proper locations. Once you are certain the pins are aligned correctly, press evenly downward on the board. You should have it flat on your workspace for this step, it will take a little force to insert them fully.

If a leg is misaligned, it may go outside of the socket, or worse, bend-under the chip and not actually insert. It is difficult to isolate issues such as this, so take your time when inserting the chips into the sockets.

Install in Groups

- **U1:** SST39SF040 - Pre-Programmed System ROM
- **U2:** AS6C1008 - System RAM
- **U3:** AS6C4008 – 512KB Expansion RAM
- **U7:** YM2151 or YM2164 Yamaha Sound IC
- **U8:** ATtiny861A – Preprogrammed System Micro-Controller
- **U10:** YM3012 – Yamaha Sound DAC
- **U26:** W65C02 CPU – 65C816 is also allowed
- **U27:** W65C22 VIA – System peripheral controller

Final Checkpoint

- All IC notches aligned?
- Are all of the pins correctly seated in the socket?
- Everything fully pressed flush into place?

Power Up Checklist

You should now have a fully constructed and populated board. You can only turn it on for the first time once, so this is the last chance to inspect your work. Check the entire PCB to ensure that all parts are installed in their proper location. Make sure all parts which have a polarity are installed correctly. Lastly, really check the board, top and bottom, for any solder bridges. It is a very large board with a lot of solder points, so the potential for an accidental bridge is very high.

You will need a VGA monitor and an ATX power supply at a minimum for a power on test. All you need to do is plug the power supply and VGA cable into the system. Once the power supply is turned on, simply press the power button on the Commander X16, and you should see the boot screen with a blue background.

You may then add a mouse, keyboard and some amplified speakers and begin testing. The SD card included has a ton of software, so put the system through its paces and be sure to exercise the video and sound to make sure everything is working properly.

Don't mount your system in a case until you do a bench test first, it will make it easier to troubleshoot issues if any should occur.

Now that your system is tested and working, install it in your case much like any other ATX motherboard and prepare for a great time! Thanks so much again for buying a Commander X16 Kit! We hope the machine brings you years of enjoyment!

Troubleshooting Section

Unfortunately, most failures will likely result in no video being displayed. This section is going to be brief because comprehensive troubleshooting steps would be a whole other document. If you power your system on for the first time after following all of the instructions in the document, then you may be able to try a few things.

- Carefully check for bent pins on the socketed chips, this is a very common issue.
- Check carefully for bridges, it is probably the second most common issue.
- Insert the provided SD card, do you see the activity LED flash at boot? If so, the system is operating, but something is preventing video. Some VGA monitors may not sync properly with the Commander X16 video signal, or there may be some other issue with the PCB soldering, cold-joint, etc.
- Using your multi-meter, check for shorts on the board between the power pins and the ground.
- You get video but cannot type. Check that U8 is seated properly and that the keyboard/mouse connector is soldered correctly. It is also possible you are using a keyboard which is not compatible with the Commander X16, try a different keyboard. You could have a similar issue with the mouse, so try a different one there too.
- No audio? There are two sources, the VERA and the Yamaha. If neither is working, make sure you use an amplifier for the output, it is line-level. Alternatively, you will need to check the audio path in the schematic and be sure that the relay is installed properly along with Q1. The relay should click on startup.
- If you get VERA audio but no YM audio, check the pins carefully on U10 and U7. You may also need to inspect the soldering around U11 and its related capacitors. We are testing all of the sound chips before sending them, be very careful to check the whole section if you're still not getting sound.