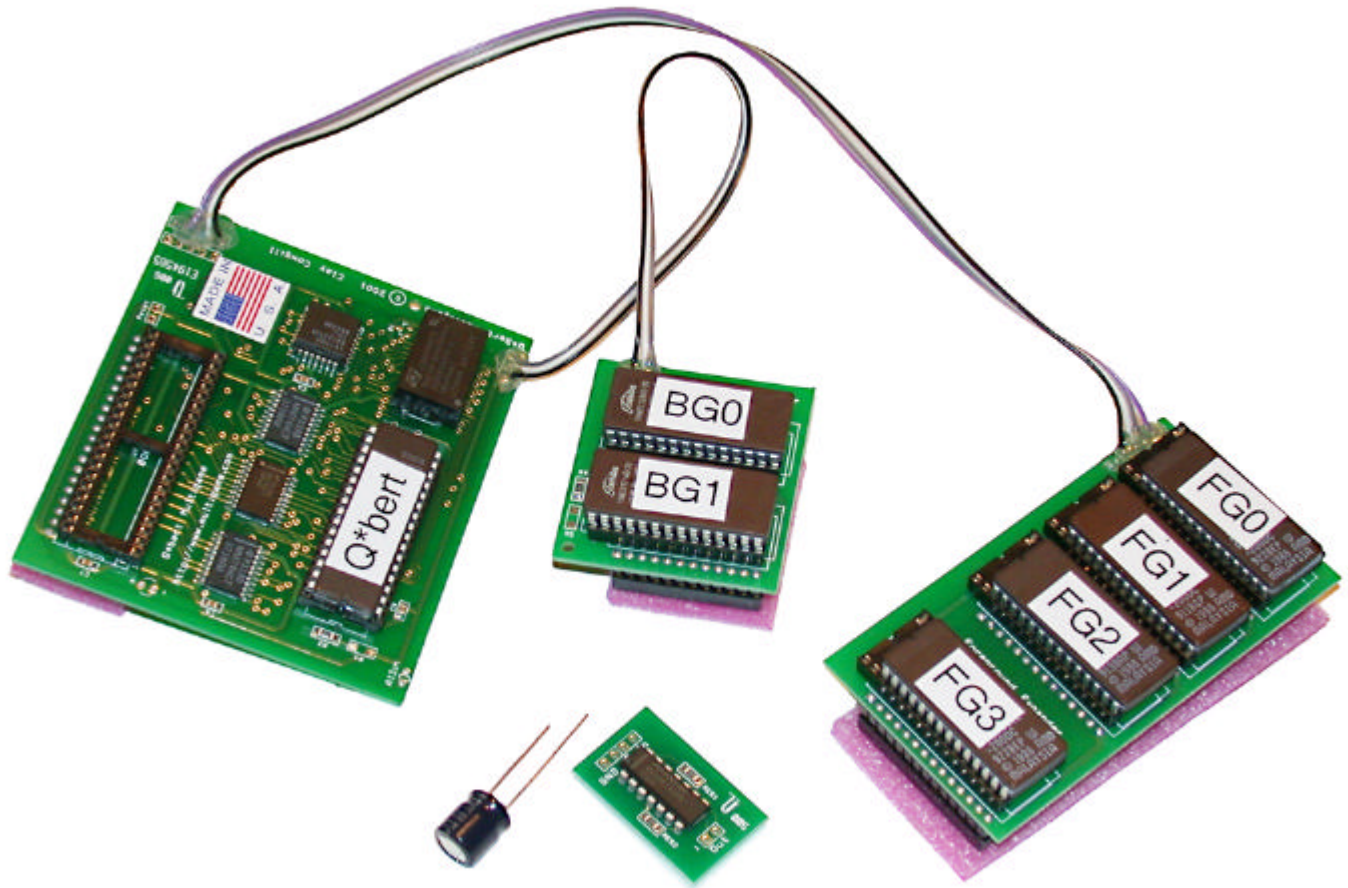


Q*bert

MULTIGAME



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Notice Regarding this Upgrade

Warning!

Although this upgrade has been tested and the techniques used will not directly cause harm to your video game, if you do something wrong you can very seriously damage the game electronics!

To perform this upgrade you should:

- Be familiar with safe handling procedures for electronic components.
- Be able to remove socketed IC's (chips) without causing damage.
- Understand IC (chip) pin numbering.
- Have some experience soldering with electronic components.
- Be willing/able to follow directions.
- Have a low-wattage (~15-20W) soldering iron. (The "blue" Radioshack iron is fine.)
- Have some fine solder (.31" diameter or so—Radioshack has this too.)
- Have access to miscellaneous tools—screwdrivers, wire cutters, etc.
- Have some minor supplies—hot glue gun and glue, tape, maybe some styrofoam...
- Have access to more complete supplies (wire, connectors, tools, wood, metal, etc.) if you're installing the JAMMA adapter and/or for customizing controls if you wish to run all games from a single control panel.
- Although not required, some steps go much easier with a Multi-meter or continuity tester.

Arcade games are rugged equipment, but anytime you start messing around with something (particularly something electronic that's 20 years old) you accept a certain amount of risk that you may break something.

This kit carries with it no guaranty of compatibility to your particular game. Although this kit has been tested with numerous Gottlieb arcade games and CPU boards, there's a possibility that some of them are different. If you carefully follow these instructions, you should do fine and everything should work. I'll try to help walk you through any problems you have, but if this looks like it's above your confidence level please recruit someone locally to install the kit for you!

Please read these instructions completely through before starting. If at any point your PCB looks significantly different than what you see in here, contact support@multigame.com before continuing!

This upgrade should ONLY be used on a genuine Q*Bert game circuit board. Experienced users will be able to make it work with other Gottlieb 8088 System CPU boards, but this will not be covered in the manual.

Introduction:

The Q*Bert Multigame consists of a daughtercard and two smaller satellite boards that plug into your Q*Bert boardset. A smaller "Reset Adapter" and a capacitor are also provided to complete the hardware system.

Once the Q*Bert Multigame is installed in your boardset you will have an on-screen menu built into your game which you can select any of the three Q*Bert games available for the 8088 processor based system (Q*Bert, Faster Harder More Challenging Q*Bert, and Q*Bert's Qubes).

These instructions describe how to install the kit into a working Q*Bert arcade game and how to operate the Multigame. All operations are fully reversible. Please read all these instructions thoroughly before starting the conversion.

Games included with the Q*Bert Multigame	Description
Q*Bert	The original US release of Q*Bert, circa 1982 by Gottlieb
FHMC Q*Bert	Faster, Harder, More Challenging Q*Bert. A follow-on to the original Q*Bert this version was never released in arcades, but the original ROMs were acquired from ex-Gottlieb people.
Q*Bert's Qubes	A sequel to Q*Bert, this time turning colored cubes in a manner similar to Rubic's Cube crossed with Tic-Tac-Toe. An enjoyable addition to the Q*Bert family.
Q*Blaster	A new shoot-'em up programmed for the original Gottlieb 8088 system board. This isn't quite finished yet, but will be included with the kit when it is, and available as a ROM upgrade for existing owners. Written in 'C' and assembler.
Q*Bert Multigame Menu	Your one-stop shop for all of the above. Written in 'C' and assembler.

Notes:

- 1) Game scores and settings are stored in the Non-volatile SRAM chip on the Multigame. The battery life of this chip is expected to be about 10 years. After that time, the battery on top of the chip will need to be replaced. However, the battery will not leak and cause damage like the old battery on the Q*Bert main board.
- 2) Q*Bert has a rather poorly behaved power-on-reset system on the main board. These are getting worse over time as the components in the circuit age. This can cause corruption of high-score table data when turning the game off and on some machines. To be safe, switch to the menu system before turning the game off when you're done using it.

The Kit:

The Q*Bert Multigame kit consists of the following pieces:

- This manual
- The Q*Bert Multigame boards (three daughterboards connected by cables)
- The Reset Adapter (one small circuit board)
- A 1000uF Capacitor (used to help stabilize the reset circuit on the main board)

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Preparing the CPU board:

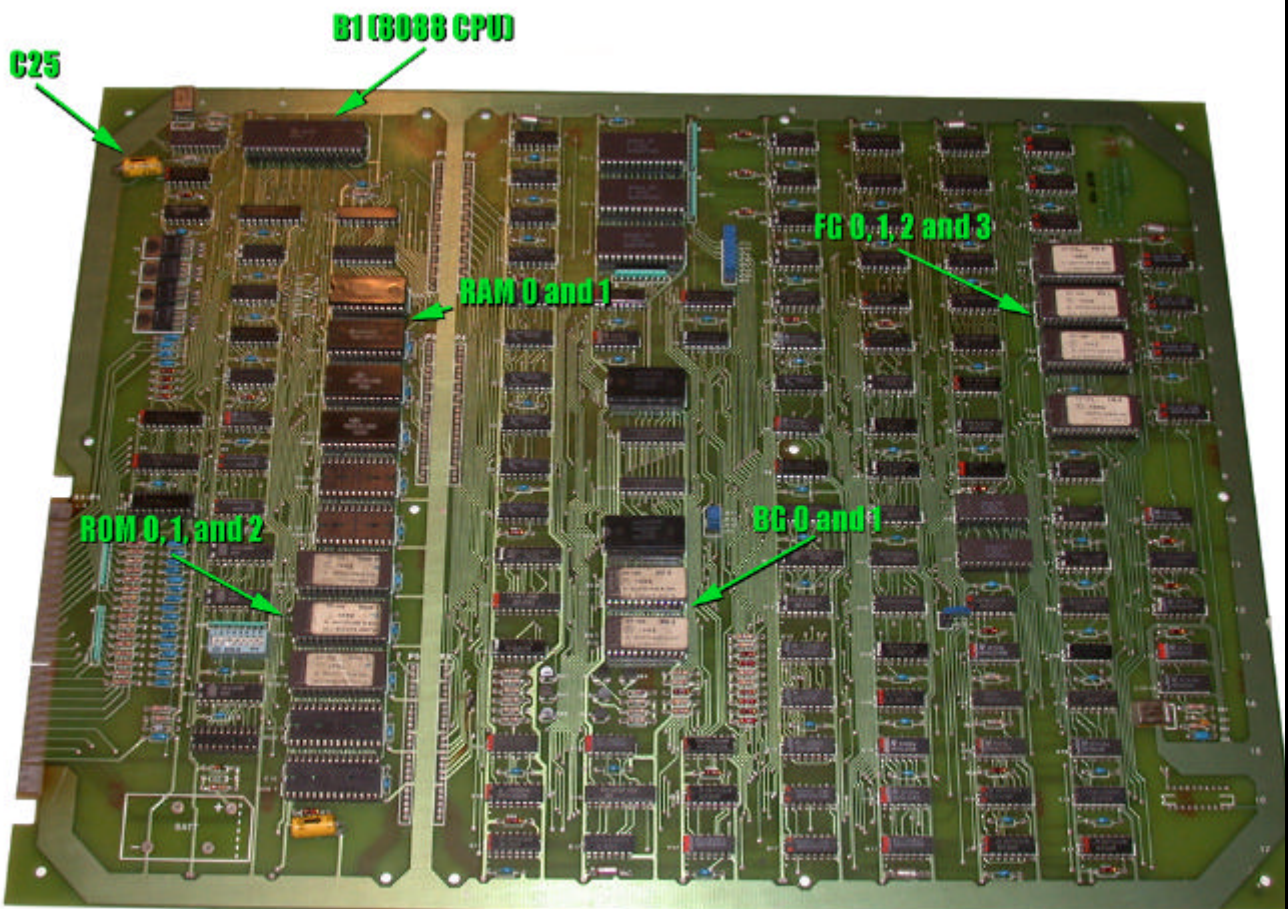
Start with the machine turned off and unplugged from the wall. Open your game to gain access to the game circuit boards. It is possible to install the Multigame without needing to remove all the circuit boards from inside the game cabinet. If you do elect to take anything out for easier access, **make SURE you mark or somehow identify where the cables need to re-connect to the board!**

The Gottlieb 8088 System consists of one main CPU board and a separate Sound board, typically mounted on the back door of the Q*Bert cabinet. The main CPU board is where the Multigame kit installs.

Locate the main circuit board in your Q*Bert Machine. It will be mounted on the back door in the upright cabinet. For the installation of the Multigame kit you may want to remove the board from the back door and perform the upgrade at a table, although that is not strictly required if you're careful.

The main CPU board should look like the one on the following page. If it does not, it's possible that you have a 'bootleg' CPU board, or the board is not actually for Q*Bert (possibly another Gottlieb game). If the CPU board looks significantly different than the picture, do not install the Multigame as damage to the Multigame or main CPU board could result.

Gottlieb CPU board (shown with important locations noted)



To protect any components from harm, touch the metal plate that the boards are mounted to with a bare finger. (This will place you and the game boards at the same “ground” potential.)

The Multigame kit replaces numerous chips on the Q*Bert main board. To install the Multigame you will need to remove a total of 12 chips from the main board. Be careful removing the chips-- Q*Bert boards tend to have problems with corrosion which can lead to chip sockets being damaged when the chips are pulled. If you mangle a socket you will need to desolder and replace it-- so do yourself a favor and work slowly and gently to avoid extra work later! Begin by locating and removing the following chips:

- Location B1 - the 8088 microprocessor. Carefully remove the 8088 from its socket and place it on some anti-static material. (Some aluminum foil is fine.) The CPU will be used on the Multigame daughtercard. (Be sure you didn't bend any pins on the chip. If you did, carefully bend them back.)
- Locations C5 and C6 (RAM0 and RAM1). Carefully remove these two chips and set them aside. They will not be required once the kit is installed.

- Locations C11-12, C12-13, C13-14 (ROM0, ROM1, and ROM2). Carefully remove these three chips and set them aside. They will not be required once the kit is installed.
- Locations E11-12 and E13 (BG0 and BG1). Carefully remove these two chips and set them aside. The "BG" daughtercard will connect to these sockets.
- Locations K4, K5, K6, and K7-8 (FG0, FG1, FG2, and FG3). Carefully remove these four chips and set them aside. The "FG" daughtercard will connect to these sockets.

Removing the original CPU board Battery:

If your CPU board still has the original “box” battery in the lower left-hand corner it is **HIGHLY** recommend that you de-solder and discard it. The Multigame has its own battery-backup, so the one on the main CPU is not needed. The original battery is very prone to leakage which will damage or destroy the PCB in time. Do yourself a favor and get rid of it!

Installing the 8088:

You need to the an 8088 CPU into the 40-pin socket on the Q*Bert Multigame. You can use the 8088 you removed from socket B1 on the game board, or any other known-good 8088.

Locate the notch on the end of the 8088 chip and match it up to the notch at the end of the 40-pin socket on the Q*Bert Multigame daughtercard. Gently press the 8088 into the socket on the daughtercard. Be careful to get all the pins in the socket and not to bend any pins out.

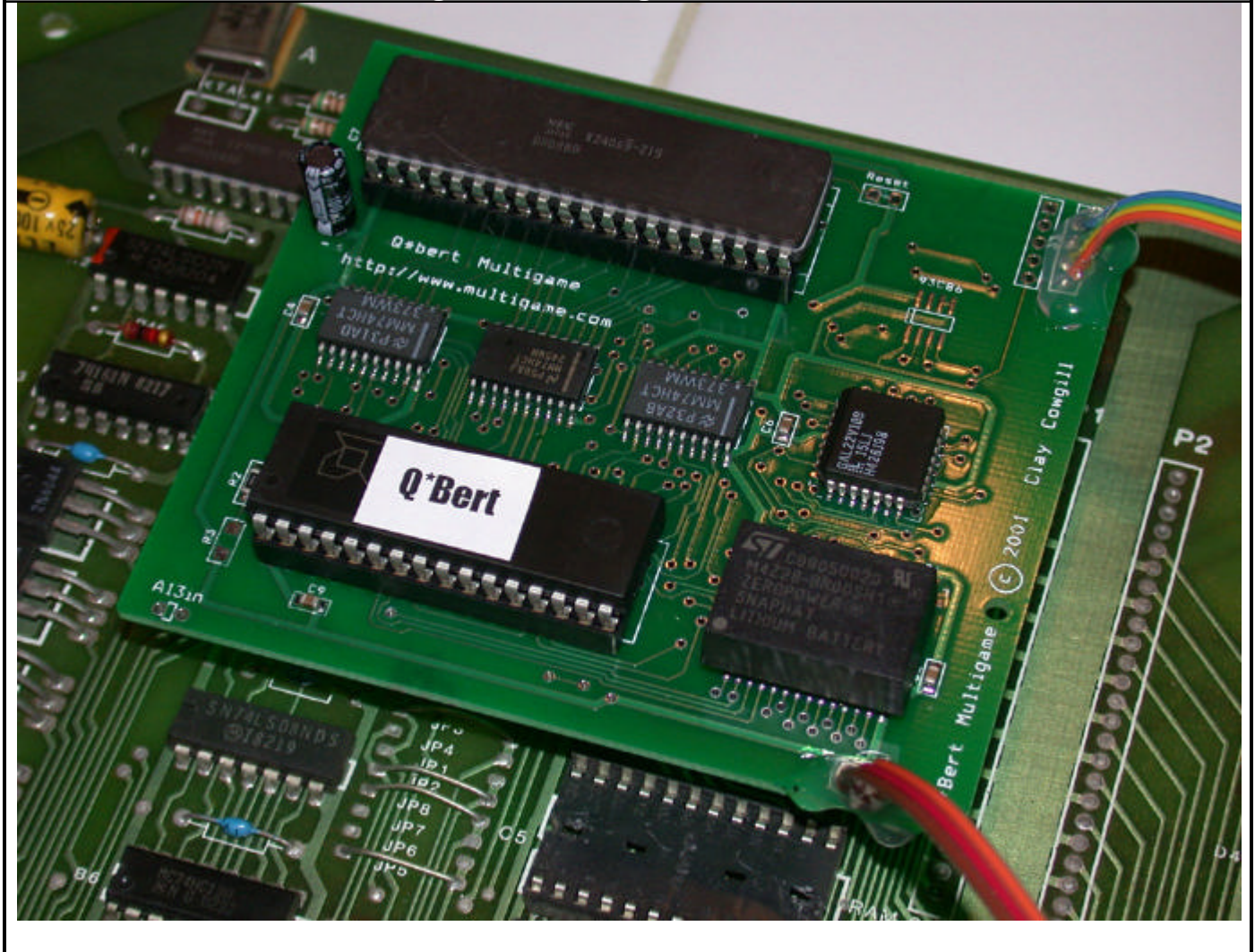
Install the Q*Bert Multigame boards:

You're not ready to install the Multigame boards onto your game board. Remove the protective foam from the 40-pin header on the largest daughterboard from the Multigame kit. Orient the daughterboard such that it does **not** hang off the edge of the board (the two smaller daughterboards should naturally rest close to the "BG" and "FG" sockets.

Gently press the 40-pin header into the socket on the game board. The connection should hold the daughterboard in place in the socket.

You should have something like shown on the following page now:

Multigame CPU Daughtercard Installed

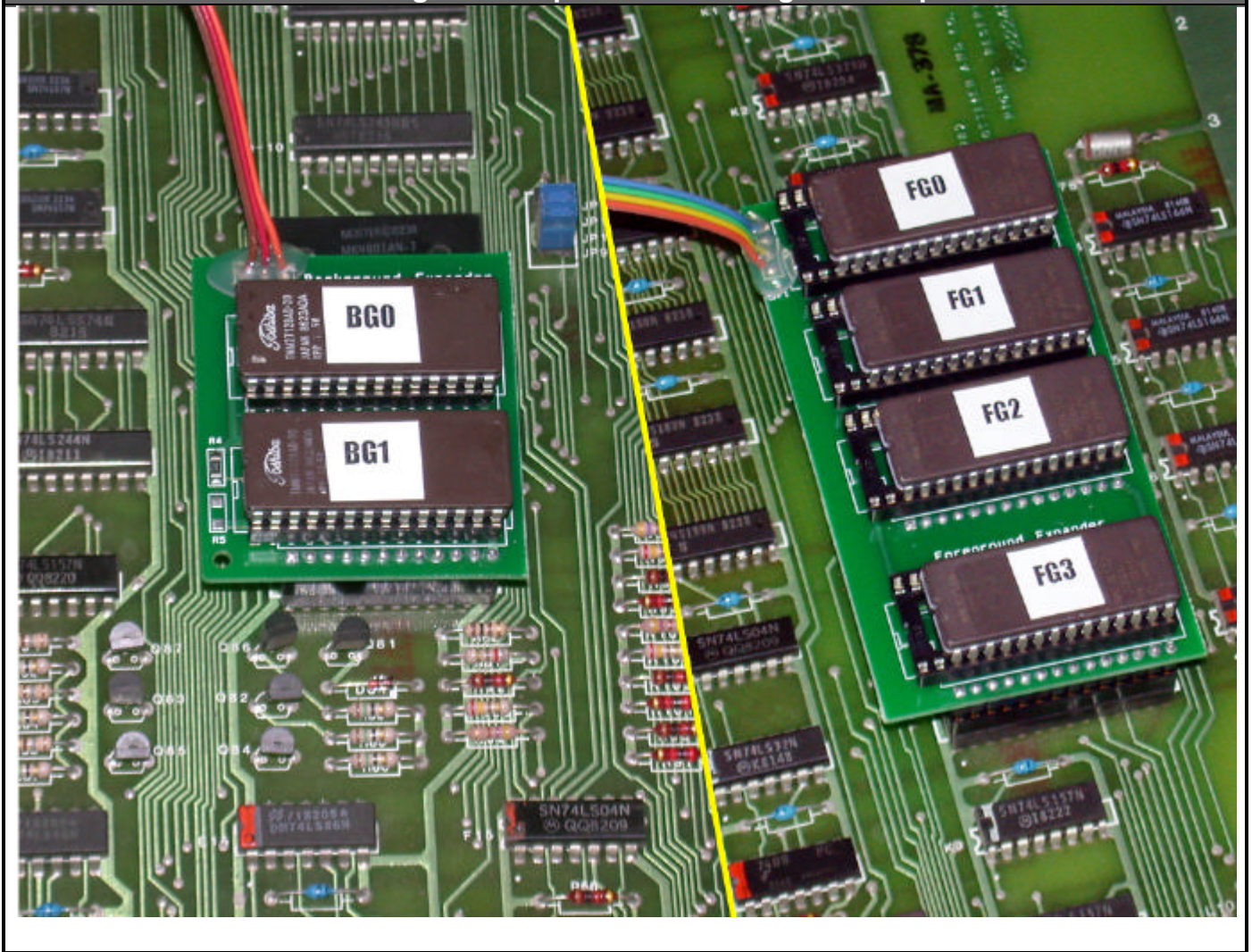


Next, remove the protective foam from the header of the "BG" ("Background Expander") daughterboard. Gently press both connectors into the empty sockets at E11-12 and E13. Be sure that all the pins line up to the sockets and that none are bent out of place or that the daughtercard is 'off by one' in any direction.

The final daughterboard is the "FG" ("Foreground Expander") board. Remove the protective foam from the four headers on the daughtercard and align the pins of the daughtercard to the empty sockets at K4 through K7-8. Once you're certain that all the pins line up and that none are bent out or damaged, gently press down on the daughterboard to seat it into position.

Check the picture on the following page for an example of the proper installation.

Installed Background Expander and Foreground Expanders



Congratulations!

You have now successfully installed the daughtercards into your machine! If you removed any of the PCB's or cables from the original boards, now is the time to put everything back together, double check your work, and triple check the power connection to the CPU Expansion daughtercard.

Quick test:

At this point, you can replace the main board in your cabinet, cross your fingers, and apply power.

Right about now you're either oooh-ing and aaaaahhh-ing at the Q*Bert Multigame Menu (or one of the other games), or you're starting to panic.

- If you get the menu on the screen you're good to go—proceed with the “Quick Test OK!” section.
- If you're not seeing the menu, turn everything off and start with the “Quick Test Not OK!” section.

Quick test, Not OK!

The kits are fully tested prior to shipment, so a "DOA" is unlikely. Check for bent pins, missing connections (you *did* plug the board in, didn't you?), improper seating on the daughterboards, etc. If a recheck of all work still doesn't yield a working board, you will need to examine the sockets on the main board carefully. To be 100% certain they're not failing, you can desolder all the sockets that the Multigame plugs into and directly solder the sockets that are attached to the Multigame daughtercards to the main PCB. If that *still* doesn't work, start checking that your power supply is still OK and begin to suspect damage to the 8088 or game board as a result of the installation. Further troubleshooting will be required and should be performed by a technician.

Quick test OK!

If you got something on the screen the kit install so-far has been successful! Good job. The next steps will install a 1000uF capacitor on the main Q*Bert PCB to help clean up the reset pulses the main PCB generates and the 'reset adapter' board to allow you to just to the menu by pushing P1 and P2 start simultaneously.

Adding the 'try to fix the shitty reset on the mainboard' capacitor:

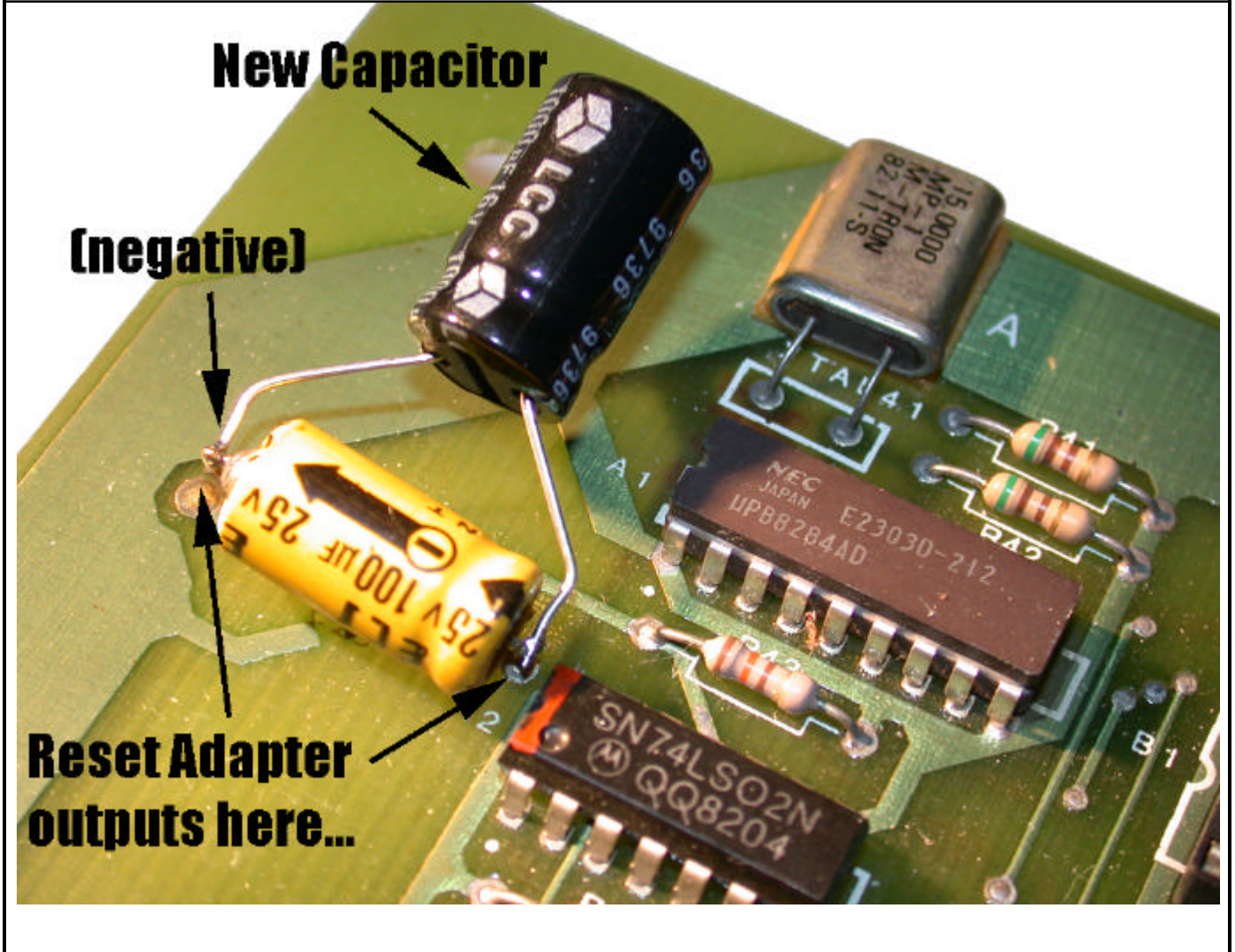
Looking at the main PCB such that the edge-connector is on the left, the upper left corner of the board (closest to the 8088 processor) has a large (usually yellow) capacitor labeled "C25" on the PCB. This capacitor is responsible for setting the time that the board stays in reset when powering up (or resetting). Due to a less-than-robust design of the main board, memory corruption during power on/off was a problem on the Gottlieb 8088 boards. (Q*Bert's Qubes goes to great lengths to try to avoid this by keeping multiple copies of high-score data, etc.) Software can try to minimize the effect, but the problem is largely a hardware one.

Unless the reset behavior of the main board is 'cleaned up', the Multigame can erroneously boot to the wrong game, lose high-scores, and generally act flaky when you turn it on or call the menu.

To help reduce this problem, the included 1000uF capacitor will be added to the reset circuit to allow the board a longer period of time to stabilize before resuming normal operation after a power-up or reset. Locate C25 and note which direction the "-" (negative) side is. Solder the 1000uF cap in parallel with C25 making sure that the "-" (negative) lead of the 1000uF cap goes in the same direction as C25. This will dramatically reduce the risk of lost high-scores or improper settings in the Multigame.

See the following page for the recommended connection points for the capacitor.

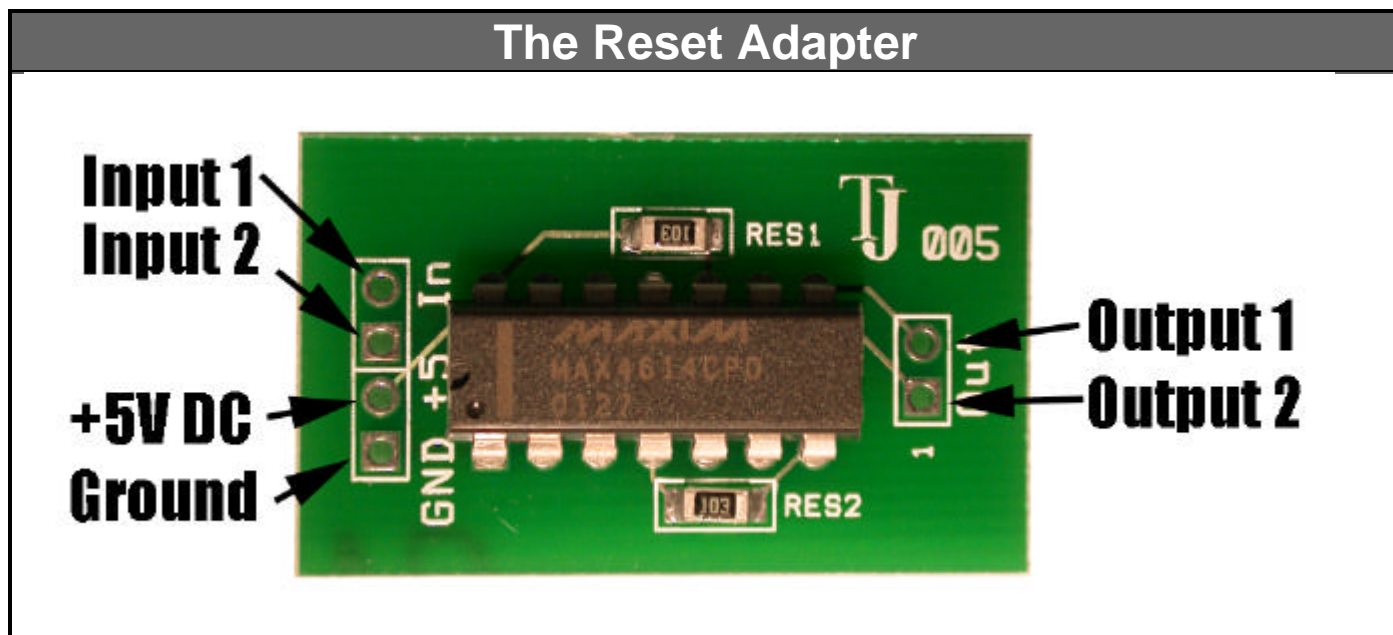
Extra 1000uF Capacitor and Reset Adapter Connections



Installing the Reset adapter.

The reset adapter lets you close any two switches to reset your machine. Depending on the setting of the Multigame menu that will either restart the 'default' game, or call the menu system. Any two switches on the machine could be used, but most people will find the P1 and P2 start buttons to be convenient.

The reset adapter needs to be supplied with +5V and Ground. The connections on the reset adapter are:



+5V and GND need to be connected to +5V and Ground on the Q*Bert main board. This can be easily accomplished by soldering a wire from the +5V connection of the reset adapter to the +5V trace near the old battery on the top side of the Q*Bert main board. Connect the GND of the reset adapter the ground trace near the old battery on the Q*Bert main board. (Alternatively you could connect +5V to pin 14 of chip A2 and GND to pin 7 of A2-- whichever is easier for you.)

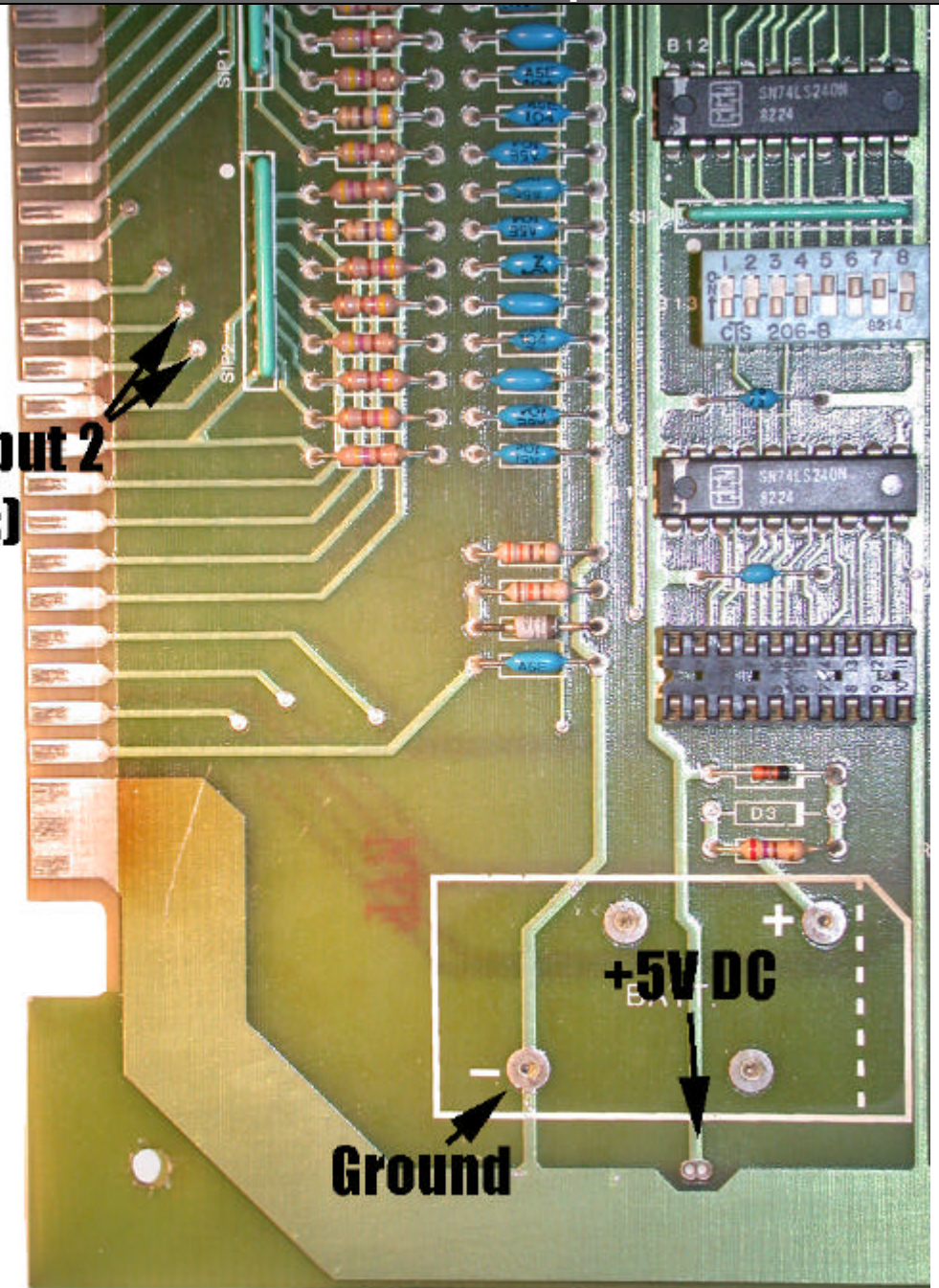
The two Input lines on the reset adapter need to connect to switches on the game cabinet. You could connect both of them to a single switch (like the P2 coin switch for example), but most people will prefer to connect one to the Player 1 start button and one to the Player 2 start button. To do this, connect a wire from one of the Inputs on the reset adapter to pin 16 of the edge connector (the 15th pin from the *bottom*) and the other Input on the reset adapter to pin 17 of the edge connector (the 14th pin from the *bottom*). (A picture's worth 1000 words... See the example on the next page.)

Finally, the Outputs of the reset adapter will be connected to the 1000uF capacitor you added to the reset circuit earlier. Solder a wire from each output to either pin of the 1000uF capacitor.

Once installed this way, pressing both the P1 and P2 start buttons simultaneously will result in the reset circuit on the main board activating which will restart the machine (running the menu code) and (hopefully!) not corrupting the battery backed-up memory.

Connections for the Reset Adapter

**Input 1 and Input 2
(Start Buttons)**



Using the Multigame:

Reconnect anything in your machine that you've disconnected earlier and plug the power back in. Turn the machine on. You should hear Q*Bert's standard "I'm Turned On" greeting. The screen should be showing the menu system. If not, press the P1 and P2 start buttons simultaneously and then release them. If you still don't get the menu, go back and recheck your work according to the previous section.

With the menu system running, you will see the Q*Bert Multigame logo and some 'bouncing' text showing the selected game.

While the Multigame menu is running one row of text instructions will alternate on the screen to remind you of the button functions. In summary:

- Pressing the Player 1 Start button will start the current menu choice.
- Moving the joystick will select games from the menu.
- Pressing the Player 2 Start button will set the current choice as the 'default' game.

If you press the Player 1 Start button, the game that is displayed on the screen will start. You can press P1 and P2 simultaneously (as long as you have the reset adapter installed) to get back to the menu.

If you press the Player 2 Start button, the game that is displayed on the screen will toggle as the "default" game.

If a "default" game is set, when the machine is turned on or reset the default game will run, not the menu system. To get back to the menu system, close the 'service' switch and reset (or power cycle) the machine. (You'll see a message that the default game has been cleared.) Open the service switch again and the menu will run as before.

Care and feeding of the Multigame:

In general, the games from the Multigame will work virtually identically to a dedicated machine. One difference is in Q*Bert's Qubes. Normally Qubes would run on a later version of the Gottlieb 8088 board. The newer board appears to have one more sprite than the old Q*Bert board. You'll notice this by Q*Bert's 'speech bubble' occasionally missing the bottom right piece when you lose a life.

Although the capacitor modification and reset adapter will solve most problems with the on-board high score memory becoming corrupted (and thus resetting your high score tables), the best way to prevent problems is to switch to the menu system before turning the machine off. (The menu doesn't really care if its RAM gets scribbled on.) These problems may be more pronounced (or less) depending on the condition of your power supply—a noisy main power supply can cause multiple resets as the machine powers on which can lead to the processor going 'berserk' and scribbling on RAM.

Rapidly turning the power to the machine on and off is also officially 'just asking for it' as far as getting your high-scores scribbled on. When you turn the machine off or on, be sure to give it 5-10 seconds in between power cycles to fully discharge the power supply capacitors before turning it back on.

Miscellaneous Menu Features:

There are a few features of the menu that don't fit well into any real category, so I'll just list them here:

- The menu will usually start with the last game/function you selected as the default choice. (If you ran FHMC Q*Bert the last time you used the menu, FHMC Q*Bert will be the current selection the next time the menu starts.)
- There is a screen saver that kicks in after a few minutes—it will fly some sprites around the screen in pretty patterns while nagging you to move the joystick to go back to the menu.
- Each game has its own high-score and settings memory—if something does glitch during power on or off it should only clobber the currently selected game. (Hence why it's a good idea to switch to the menu before turning the machine off.)

Troubleshooting:

Make sure there's nothing silly wrong like the machine's unplugged, one of the power-interlock switches is off, etc. If that all checks out OK, go back and check that all the daughtercards are plugged in properly, nothing has any bent pins, and no cards are loose or flopping around. If that all looks good, fire up the machine and check your power supply voltages and the voltages on the daughtercards (the "CPU Expansion" and "Background Expander" and "Foreground Expander"). Power should be +5VDC within about 10% and should be relatively free of power supply ripple.

If you're getting good power and you're sure everything is installed correctly, be suspicious of the connectors on the CPU board and of the sockets on the Main board.

Often times the battery on the original Q*Bert CPU board will leak and cause corrosion to the sockets—the original EPROMs may have still been making contact, but when you removed them and installed the daughtercards it's possible that there is corrosion preventing good electrical contact. You may need to replace any sockets if they've been bent or too corroded over the years.

When all else fails, the board will need have full troubleshooting done by someone familiar with electronics (and preferably video games). Although unlikely, it is possible that something will decide to just die simply from moving things around. You should try re-seating socketed chips and connectors, and look for cold solder joints on all connectors and IC's. There are numerous resources on the World Wide Web for help in trouble-shooting games.

- All kits are 100% tested prior to shipment, so a "bad" board is fairly unlikely. The single greatest point of failure will be sockets/connectors.
- Double check your solder connections on the main CPU board for the reset capacitor and Reset Adapter. A tiny splash of solder onto the traces or pins of an IC can cause problems if it shorts to a neighboring signal.

- Sometimes handling the Q*Bert boards can cause problems—you may need to clean the card-edge connector that the main harness plugs into. A pencil eraser or **very** fine sandpaper (#000 or better) can be used to ‘shine up’ the card edge.
- If double checking the installation doesn’t fix any problems you can backtrack and remove the kit and try your original game ROMs back in the boardset. If a problem persists with the board at that point, you should refer to one of the Game PCB Troubleshooting references on the World Wide Web, or the original service/operators manual. (Or contact a professional for repairs.)
- If you’re still stuck contact me at: support@multigame.com and I’ll try to help debug the installation. Unfortunately, due to time and space constraints I can not accept any boards for repair or installation.

Tips:

- Remember that if a "default" game is set, when the machine is turned on or reset the default game will run, not the menu system.
- To get back to the menu system when a default game is set, close the 'service' switch and reset (or power cycle) the machine. (You'll see a message that the default game has been cleared.) Open the service switch again and the menu will run as before.
- Switch to the menu before turning off the game if possible to help prevent corrupting any high-score information when turning the machine off.
- Don’t flick the power switch off and on repeatedly. Why you’d want to do this, I have no idea, but in case you were thinking about trying it... Don’t. It might lose you high-scores and at a minimum you’ll look like a bit of a dope doing it.

That’s all!

I hope you enjoy the Q*Bert Multigame. Please check out <http://www.multigame.com> for other Multigame kits/PCB’s/JAMMA adapters and developments!

Credits:

- JROK – JROK made numerous tweaks to Qubes to get it to behave better on stock Q*Bert hardware. He also provided the framework for the C compiler and skeleton code which the menu system (and Q*Blaster) was started from. JROK's the man. Check out his website at <http://www.jrok.com>
- Al Kossow – arcade game preservationist and historian, Al's the man behind <http://www.spies.com/arcade> which is where the Q*Bert pinouts I used during development came from.
- The Original Gottlieb Crew – back when the US had multiple arcade game companies, people like Jeff Lee, Warren Davis, and David Thiel were creating games like Q*Bert without multi-million dollar budgets, producers, or CGI intermissions. Jeff Lee's "The History of Q*Bert" page is a worthwhile read at <http://users.aol.com/JPMLee/qbert.htm>

I hope you enjoy the Multigame!

-Clay