Golden Tee Fore!
Portable Build Instruction Guide

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1. Foreword

After building a portable Golden Tee Fore!, I decided to attempt to document the process after the fact in hopes it may be of benefit to others. When I started out, I had a few questions about converting the video out of the board to a TV. I knew what was needed to convert the low resolution CGA output of the GT to TV, but wanted to take advantage of the GT's ability to output medium resolution EGA. I thought a quick search on the newsgroups, or web would tell me what I needed to know. I was amazed to find only a few people asking about this, and no real answers that I could find at that time. Hopefully, this document will address the conversion issues and more.

More over, this document should only be used as a rough guide; it is only the path that this cabinet was built by. In nearly every step of the way, there were many options that would have worked as well or better, but changing one item may impact other procedures or required parts. You may find better, cheaper, or what have you, methods for completing your project.

Now, a little disclaimer: A project like this requires knowledge and/or skill with power tools, soldering, and electricity. Don't attempt anything that you are uncomfortable with, or operate equipment you are not appropriately trained to operate. Use information in this document at your own risk.

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2. Material list:

1 - GT Fore! Complete control panel
> **Trackball, trackball wiring harness, buttons, and original hinge**
> **[Ebay, Gatorcade.com, local operator]**

6 - Cherry .187 micro switches.
> **[Gatorcade.com, http://therealbobroberts.net/, competitiveproducts.com]**

12+ - DQ .187 spades
> **[http://therealbobroberts.net/]**

1 – Jamma harness
> **[http://therealbobroberts.net/]**

1 – GT Fore! motherboard, hard drive, compatible power supply, and IDE cable
> **[Ebay, Gatorcade.com, local operator]**

1 – Power bypass cable – if using a green board
> **[Gatorcade.com]**

1 – Video converter (JROK CGA converter for low res, or Averkey 300 for med res)
> **[Ebay, Gatorcade.com – carries JROK and now a Med res convertor – unknown type]**

1 – Radio Shack Rear-Panel Audio/Video/S-Video Extend-A-Jack model #15-1997
> **[RadioShack]**

1 – Autosound line level converter speaker level in/ line out #60-410
> **[mcminone.com]**

1 – 80mm 12v fan and guard
> **[mcminone.com]**

1 - RCA A/V cable 12 ft
> **[monoprice.com]**

1 - S-video cable 12 ft
> **[monoprice.com]**

2 - 2'x4' 5/8" MDF
> **[Any lumberyard]**

Sanding sealer
> **[Any hardware store]**

1 - Hammertone paint
> **[Ace Hardware]**

1 – Control panel clasp
> **[From original GT cabinet, or order #16-0510 competitiveproducts.com]**

4 – 8-32 2" machine bolts and nuts and washers for 80mm fan
4 – rubber or plastic feet.
Misc #6 ½ screws
Misc #6 washers
Misc #6 ¾" screws
Wire ties
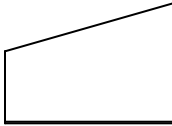**A foot or two of stranded wire.**

3. Cabinet.

Bottom = 28" wide by 12" deep

Front = 29 1/4"wide by 6 3/8" high

Sides = 12" deep by 6 7/8" high in front and 9 7/8" high in the back.

Back = 29 1/4" by 10" measured at the peak of the angle cut. *See below.

* Side view of back panel

    To make the back panel, the saw blade is tilted at the same angle as the sides in order to have the control panel set flush on panels when closed. To get the angle correct, simply cut the sides first, and place one of the sides against the saw blade and adjust. The back panel should be cut last, since all other cuts are made with the blade at a normal 90-degree angle. See Figure 3.1.

    These cuts can be made on a table saw or hand held circular saw. It is just as easy to use a circular saw. Just use a couple of clamps and another straight board to make a fence to guide the saw.

    A rectangle was cut from the back panel to allow the power supply to just slide though to be flush with the back of the cabinet. To make the cut, the cabinet was setup and the power supply put into position, and then traced the outline. A hole was drilled in each corner to allow a saw blade to enter. I didn't have quick access to a jigsaw, so I used a sawzall – a bit overkill but with a steady hand can be done. Even the blade from a hacksaw would work, although it will be slow going. Cut inside the trace to leave just a bit of extra material. Then you can finish it after assembly by hand fitting the power supply into the opening using a sanding block, file, or etc. to get the perfect fit.

A biscuit joiner was used to cut slots and the cabinet was assembled using biscuits and glue. If a biscuit joiner is not available or you are unfamiliar with operating one, it could be assembled with drywall screws. I would recommend pre-drilling and counter sinking the holes and assemble with a bit of wood glue on the joining surfaces. After assembly, the screws can be covered by a bit of wood putty and sanded for a smooth finish.

At this point you can also use a 3" hole saw and drill the hole for the 80mm cooling fan. It is ideal to position the fan such that it blows over the graphics card and hard drive if possible. The graphics card generates enormous amounts of heat, but with the 80mm fan it runs cool to the touch.

A hole a little larger then the diameter of the Radio Shack Extend-A-Jack cord, was drilled in the back panel about an inch from the top. Then a saw was used to make two cuts down to the drilled hole, to create an opening for the Radio Shack Extend-A-Jack cord to exit the cabinet.

Figure 3.2 shows the back view of the fan, power supply, A/V cord hole, and the control panel clasp.

Figure 3.3 shows the positioning of the fan in relation to the hard drive and video card.

After assembly and allowing the glue to dry, an orbital sander was used to smooth the joints to a perfect finish. A sanding block would also work, but require much more time. The finishing touch would be to 'break' the edges using a sanding block to round off all the outside edges. The MDF will 'take' paint much better, and you will use much less paint if you apply a couple coats of sanding sealer. I highly recommend using the sanding sealer. The sealer dries quickly, and can usually be top coated in about half an hour.

I used, and recommend Hammertone paint. The real Hammertone paint, not the stuff made by the rust…something company unless you have days or weeks to wait for it to dry. I was able to obtain the real Hammertone paint at an Ace Hardware store. Although they didn't carry the color I wanted, they special ordered it. This paint can also be ordered online and shipped UPS thru several online vendors. The Hammertone paint looks great, is extremely tough, and hides most surface flaws because of the texture.

Attach the control panel with appropriate sized washers and screws; making sure the length of the screw will not penetrate thru the front panel. The original control panel hinge allows for adjustment some adjustment, and I set the control panel back about as far is it would allow so the control panel covered as much as the cabinet as possible.

Place the power supply into place and secure it with appropriate sized screws.

To install the fan, select a drill bit that can slide easy in and out of the fans four bolt holes. Hold the fan on the outside back panel and position it in the center of the 3" hole that was cut previously. Put the drill bit thru one of the fans four bolt holes and drill it though the back panel. Remove the fan and re-drill the hole using a drill bit slightly larger then the diameter of the 8-32 bolt you will use to secure the fan. Place the fan back onto the back panel and place the 8-32 bolt thru the fan and panel. Place the smaller bit back into the drill and drill another hole. Remove the fan, and drill the hole again with the larger bit. Secure the fan on to the back panel again and secure it with two 8-32 bolts. Take the smaller bit and drill the other two holes. Remove the fan and drill these two holes with the larger bit. Place two 8-32 bolts thru the fan guard and back panel. Slide the fan onto the bolts protruding thru the inside of the cabinet. Put the last two bolts in and secure with washers and nuts. Don't over tighten the nuts because this can break off the corners of the plastic fan. A little Loctite on the threads here will help prevent the vibration from loosening the nuts.

Now would also be the time to install a small chain to hold the control panel open when in the upright position. Figure 3.1 shows the chain. Simply secure with chain with the appropriate sized screws, in a position that allows the control panel to stay open but not so far that it will tip the whole cabinet forward.

   Install the control panel clasp on the back panel, and the hook on the control panel. Each type of clasp will require slightly different installation. Just make sure it locks down tight and secure. I also selected to put four plastic feet on the bottom of the cabinet to protect the surfaces that the cabinet might be placed on. Most any hardware store will have a variety of rubber or plastic feet to choose from. Install them as necessary.
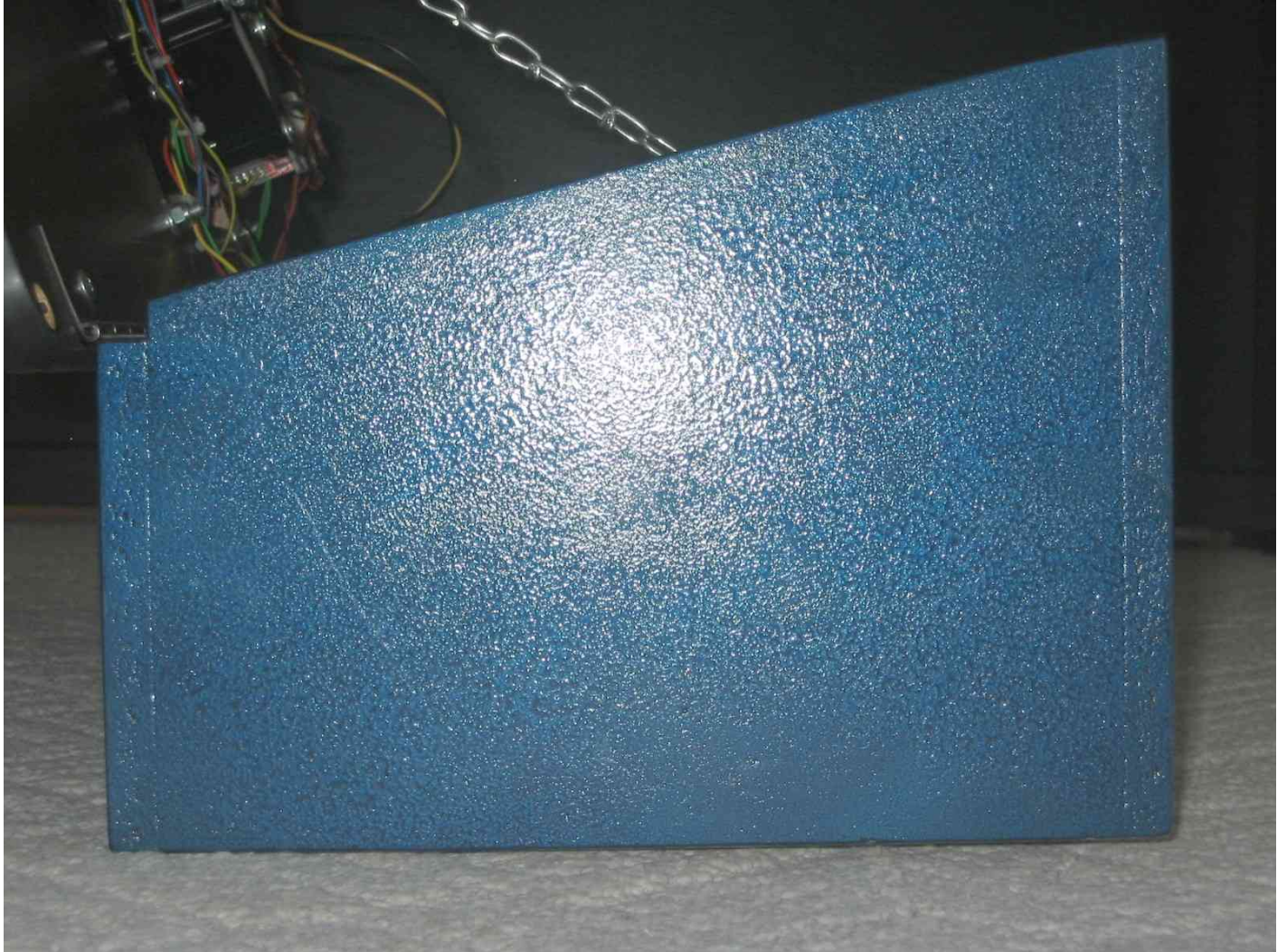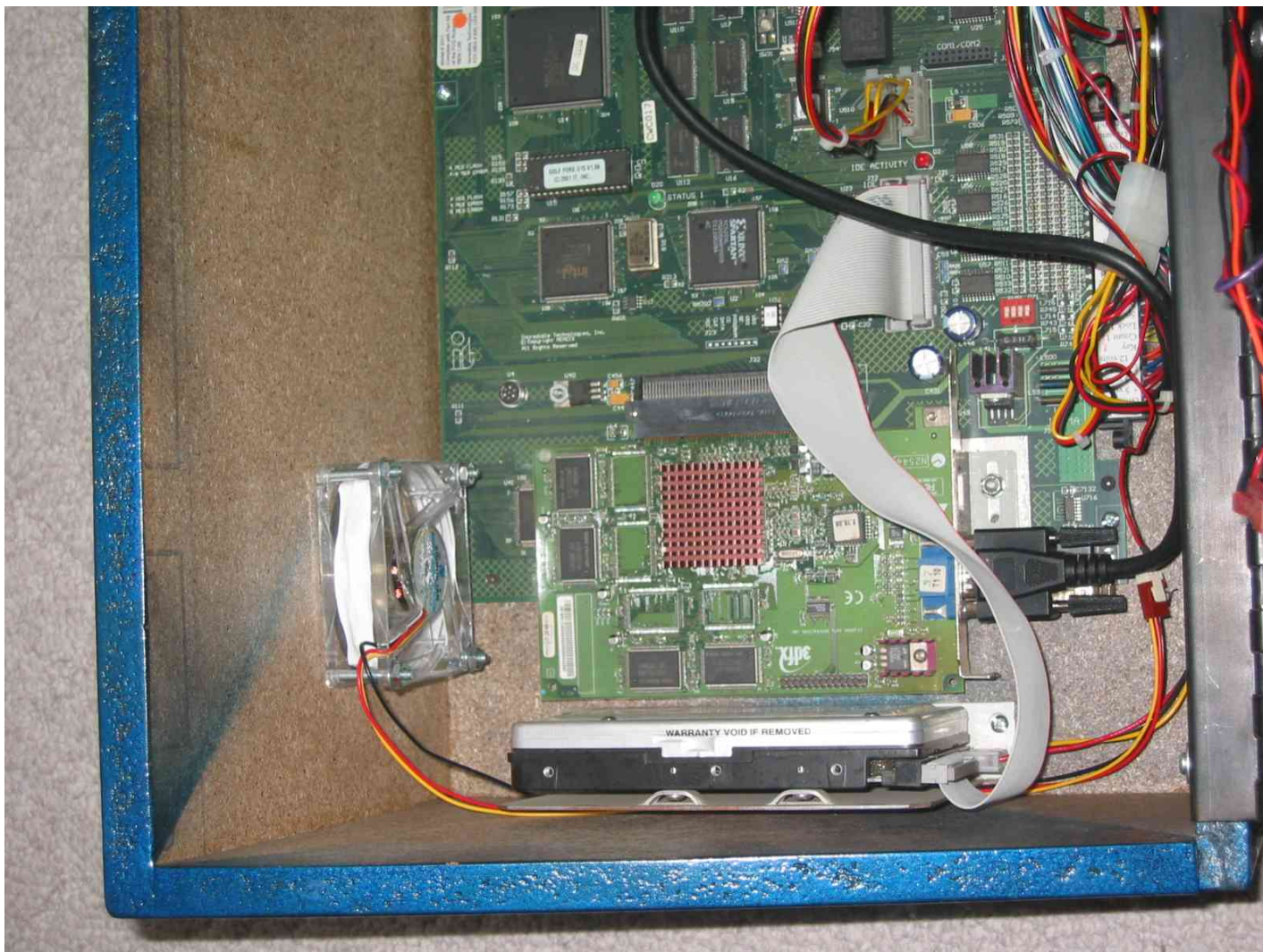

Figure 3.1

Figure 3.2

Figure 3.3

4. Wiring.

Take the Jamma harness and group the wires we want together and wire tie them. Take the video wires (V GREEN [N], C SYNC[P], V RED [12], V BLUE [13], and V GND [14]), separate them from the rest of the harness. Give them a slight twist and wire tie them all together starting about 4" to 6" from the connector, and from then on every foot or so. Repeat the same procedure for the sound wires (SPL- [L], SPL+ [10], and GND [B]), the test button wires (TEST [15], and GND [2]), the control panel wires (1P START [17], 1P LEFT [20], 1P RIGHT [21], 1P PUSH1 [22], 1P PUSH2 [23], GND [27], and GND [28]), and also pull GND [1] from the main harness, it will be used to provide the ground for the trackball later. The rest of the main harness wires should be bundled and wired tied, and the end of this bundle should be wrapped in electrical tape. The unused wires were not cut off so that in the future, the Jamma harness could be used in a different game or could be modified if needed. The 5V, -5V, and 12V wires from the Jamma harness are not needed because the motherboard will receive power directly from the power supply thru the power bypass cable if your using a GT green board or from the 20 pin ATX connector if using a red GT board. See figure 4.1. The differences between the green and red GT boards are covered in more detail in section 6.

The following is optional. I wired the video wires (V GREEN [N], C SYNC[P], V RED [12], V BLUE [13], and V GND [14]), into two .156 molex connectors (one six pin and one three pin molex) just as they would be in a full cabinet. See figures 4.2, 4.3, and 4.4. I don't currently plan on using them, but would allow to quickly connect the cabinet up to an arcade monitor. If you're planning on using the Jrok converter, you will need to use the video wires to connect to that device. If you are using the Jrok converter follow the directions provided with that unit.

Take the sound wires and solder and insolate them as per the directions provided with the speaker to line level converter. Use caution here, if you feed the TV speaker level you can ruin the TV. The speaker to line level converter has both a left and right channel but the GT board is mono. Connect both of the converters Left and Right positive to the SPL+ [10] wire and connect both of the converters Left and Right negative to the SPL- [L] wire. Also connect the GND [B] to the converters GND wire.

Take control panel wires (1P START [17], BACKSPIN [20], FLY-BY [21], LEFT [22], RIGHT [23], GND [27], and GND [28]) and crimp on .187 DQ's on the ends of each except the two GND wires. Connect the wires with the DQ's on them to the appropriate micro switches on the control panel.

Take one of the ground wires and an extra piece of stranded wire and crimp on one .187 QD to both wires. Attach this DQ to either the BACKSPIN or START button micro switch. Place another DQ on the other wire and connect it to the other micro switch. Do the same for the FLY-BY, LEFT, and RIGHT micro switches.

Connect the lone GND [1] wire to the green ground wire coming from the trackball. This can be done with any connector type you prefer.

Take the test button wires (TEST [15], and GND [2]) and place .187 QD's on each and connect them to a .187 micro switch. Mount this switch inside the cabinet using appropriate wood screws. This switch will allow you enter the adjustments menu for the game.

For this project the SERVICE [R], COIN2 [T], COIN COUNT [8], COIN1 [16], VOL DOWN [Ab], and VOL UP [24] were not used. Volume will be adjusted in the operator menu and TV volume controls.

This completes the Jamma wiring.

SOLDER SIDE			COMPONENT SIDE
GND	A	1	GND
GND	B	2	GND
5V	C	3	5V
5V	D	4	5V
-5V	E	5	-5V
12V	F	6	12V
KEY --------	H	7	------- KEY
	J	8	COIN COUNT
	K	9	
SPL-	L	10	SPL+
	M	11	
V GREEN	N	12	V RED
C SYNC	P	13	V BLUE
SERVICE	R	14	V GND
	S	15	TEST
COIN2	T	16	COIN1
	U	17	1P START
	V	18	
	W	19	
	X	20	BACKSPIN
	Y	21	FLY-BY
	Z	22	LEFT
	Aa	23	RIGHT
VOL DOWN	Ab	24	VOL UP
	Ac	25	
	Ad	26	
GND	Ae	27	GND
GND	Af	28	GND

Figure 4.1

NC
NC
V GND
V BLUE
V GREEN
V RED

Figure 4.2

C SYNC
C SYNC
NC

Figure 4.3

Figure 4.4

< NO CONNECTION

< HOT

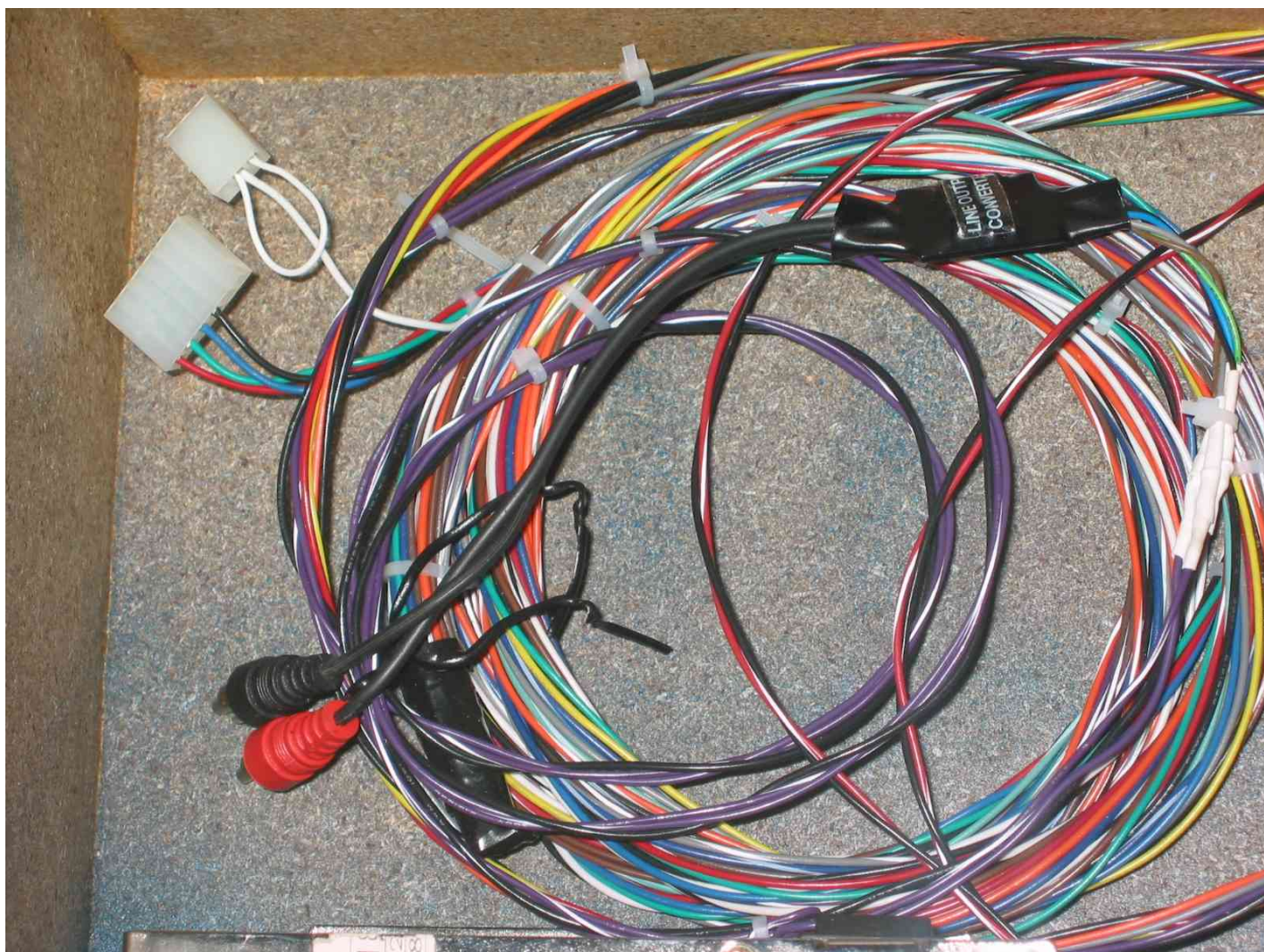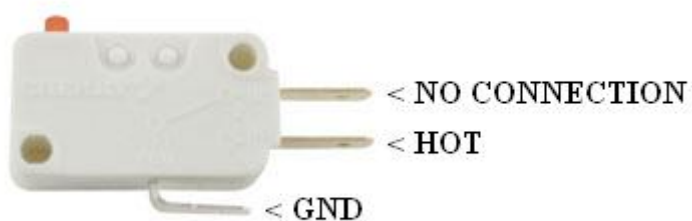< GND

5. Video

This section will cover the video conversion if you intent to run medium resolution (EGA). The low resolution (CGA) was partly covered in the prior wiring section.

You will need an Averkey300 video converter to run medium resolution. I have tried many of the Averkey Media products including the Imicro and the Averkey3. The Averkey300 is the only unit that I know will work. Both the Imicro and the Averkey3 partially worked, but they both dropped about 20% of the right hand part of the picture, which resulted in not being able to see the club selection and wind direction and speed. Even with the left/right controls the right 20% was being dropped.

Make sure the motherboard dipswitch is set for medium resolution. This will be a 4-pin dipswitch labeled SW5. Pin 1 should be set to OFF for medium resolution. Remove the short original VGA cable that connects the GT motherboard to the video card. Connect a VGA cable to the GT video card and the other end to the Averkey300 video in VGA connector. Connect the Radio Shack Extend-A-Jack S-video cable to the Averkey300 S-video out. Plug the Averkey300 transformer into the 110V plug on the power supply and the other end into the power in of the Averkey300. See figure 5.1.

On the TV I'm using I cannot display the entire picture even with the Averkey300. But I can center the picture to display the information on the left and right side of the picture to be totally playable. You may find that you also may have to use the Averkey300 controls also to adjust the picture to your liking.   I assume this is do to this TV being older and very cheap. It would probably look perfect on a newer 16:9 capable TV.
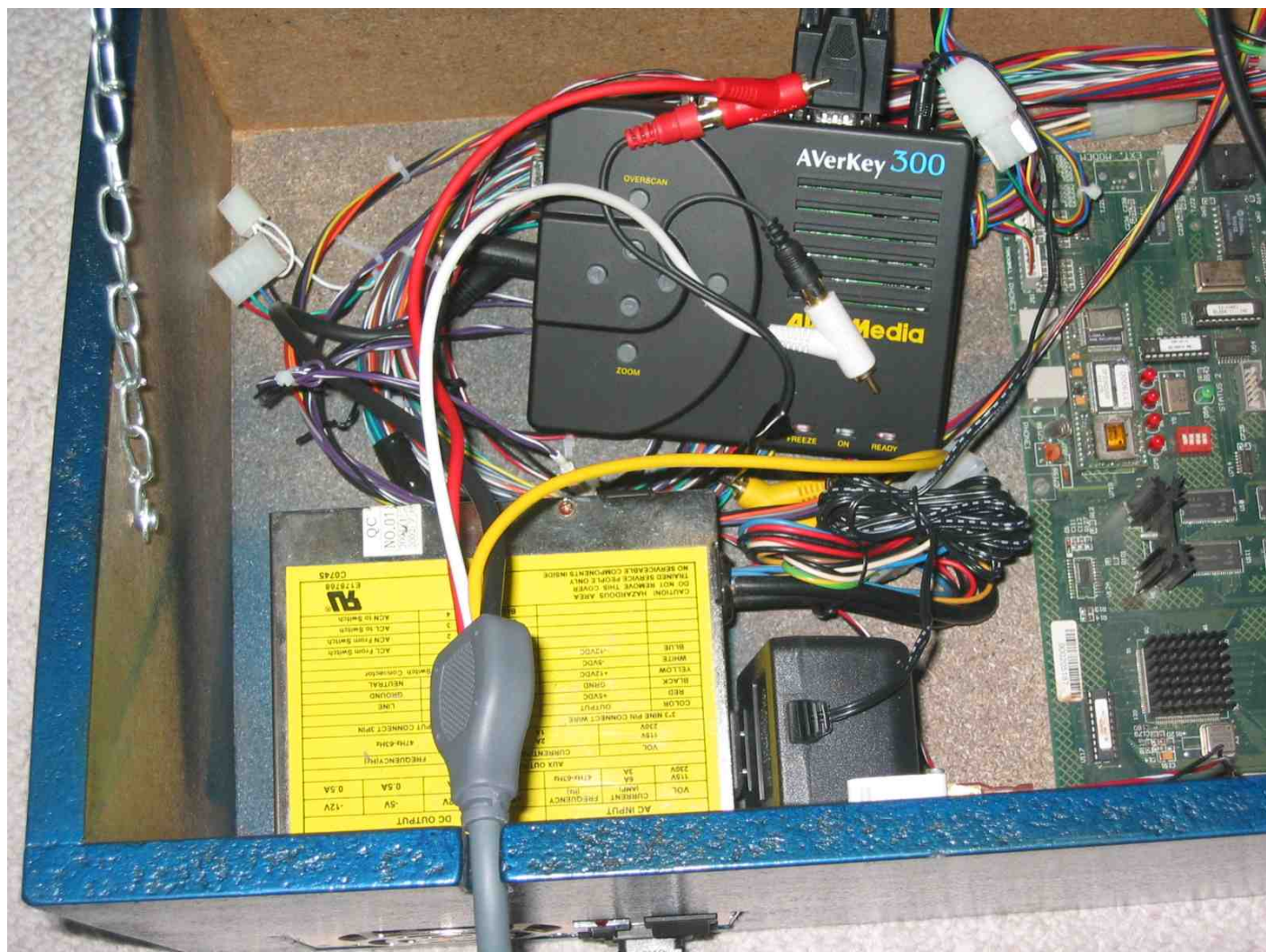
Figure 5.1

6. Finishing up

Make sure nothing is connected to the power supply. Power up the power supply and using a voltmeter check the +5 volt line. Adjust the knob on the power supply until the 5 volt line measures 5.1 volts. This should get you close enough for the game to boot. Don't trust that the power supply you have is set to 5 volts, measure it first. You can damage the GT board if the power is not between +5v and +5.15v. Then turn off the power supply.

Connect your 80mm fan to a connector from the power supply.

Put the hard drive into the cabinet and secure it using appropriate screws. Connect the IDE cable from the motherboard to the hard drive and also plug in the power connector from the power supply to the hard drive.

Put the Jamma connector on the GT motherboard and slide the motherboard into the cabinet. It is much easier to put the Jamma connector on first because there is not much room in the cabinet to put it on after the board is installed. Secure the motherboard with the appropriate screws.

Connect the trackball with the trackball harness to the "trackball 1" port on the GT motherboard.

Connect the power supply to the GT motherboard with the power bypass cable if using a green GT board. If you are using a red GT board you will directly connect the 20 pin ATX connector to the red board at J5. The power requirements for the green board are 15 amps of +5v and 3 amps of +12v. The red GT board requires a 250 watt ATX power supply to provide 14 amps of +3v, 25 amps of +5v, and 10 amps of +12v.

Connect the two RCA jacks from the speaker to line level converter to the Radio Shack Extend-A-Jack left and right audio in ports.

Connect a S-video cable from the TV S-video in port to the Radio Shack Extend-A-Jack S-video out port, and connect a RCA audio cable from the Radio Shack Extend-A-Jack left and right out ports to the TV audio left and right in ports.

If your TV does not have a S-video in port, you can use the RCA video port on the Averkey300 and the TV instead of the S-video.

See figures 6.1 and 6.2.

Now you should be able to turn on the power supply and TV and turn the TV to the A/V channel and watch it boot up.

Follow the procedures in your GT manual to make adjustments to your game using the operator mode.

Figure 6.1

Figure 6.2