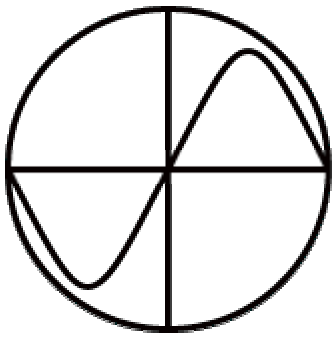

synthesis technology

MOTM-700 Dual Voltage-Controlled Router
Assembly Instructions & Owner's Manual

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MOTM-700 PARTS LIST

Please carefully check that all parts are in your kit. If you have a suspected shortage, please call or email. If you get free extra stuff, keep it for next time.

❒ **Capacitor** bag, containing the following 24 parts:

5ea 10mfd, 25V or 50V Electrolytic	C1, C19, C22, C23, C24
6ea 100pf (marked 101) ceramic axial	C7, C8, C11, C12, C13, C14
13ea 0.1mfd (marked 104) ceramic axial	C2 – C6, C9, C10, C15 – C18, C20, C21

❒ **Resistor** bag, containing the following 26 parts:

6ea 510 ohm (green, brown, brown)	R19 – R24
4ea 68K 5% (blue, gray, orange)	R10, R11, R15, R16
4ea 4K7 5% (yellow, violet, red)	R1, R3, R4, R6
2ea 330 ohm 5% (orange, orange, brown)	R2, R5
2ea 390 ohm 5% (orange, white, brown)	R17, R18
2ea 1K 5% (brown, black, red)	R8, R13
2ea 4M7 5% (yellow, violet, green)	R7, R12
2ea 100K 5% (brown, black, yellow)	R9, R14
2ea 47K 5% (yellow, violet, orange)	R25, R26

❒ **IC** bag, containing the following 12 parts:

4ea 2N3904 NPN TO-92 transistor	Q1, Q2, Q3, Q4
2ea LM311 comparator	U1, U2
1ea 74HC86 quad CMOS exclusive-OR gate	U3
1ea DG213DJ quad CMOS switch	U4
1ea LM78L05 +5V regulator, TO-92	U5
1ea LM78L12 +12V regulator, TO-92	U6
1ea SSM2404P quad audio switch	U7
1ea LM79L12 –12V regulator, TO-92	U8

❒ **Misc** #1 bag, containing the following 9 parts:

2ea Axial ferrite beads (plain, gray things)	L1, L2
1ea MTA-156 power connector	JP1
2ea SPDT (ON-ON) toggle switch	S1, S2
2ea Red LED, panel mount	D1, D2
2ea Green LED, panel mount	D3, D4

MOTM-700 PARTS LIST (cont)

❒ **Knobs**, 2ea, ALCO PKES90B1/4

❒ **Jacks**, 8ea Switchcraft 112A

❒ **Pots**, containing the following:

2ea 100K cermet Spectrol 149 VR1, VR2

❒ **Front panel**

❒ **Mounting bracket**

❒ **Wire** bag, containing the following 15 wires:

6ea RG-174 coax, 4 1/2 inches
1ea 3-wire set 22ga, 4 1/2 inches (white/orange/gray)
1ea 3-wire set 22ga, 7 inches (red, white, black)
2ea 2-wire set, 22ga, 7 inches (white/orange)
4ea 2-wire set, 22ga, 3 ½ inches (red/black)
1ea Power Cable, 20”

❒ **Hardware** bag, containing:

4ea #8-32 x 3/8 black screws (for mounting module to rack)
4ea #6-32 x 1/2 zinc screws (for attaching pc board to bracket)
4ea 1/4 inch aluminum spacers
6ea #6 KEPS nuts (2 for attaching bracket to front panel, 4 for pc board)
8ea small tie-wraps
8ea small heat-shrink tubing

❒ **Organic Solder**
❒ **No-clean Solder**
❒ **PC Board**, MOTM-700

GENERAL INFORMATION

Thank you for purchasing the MOTM-700 Dual VC Router. If you have any issues concerning the building or use of the kit, please contact us at (888) 818-MOTM [6686] or by email: synth1@airmail.net

This kit should take the average builder between 2 and 3 hours. However, please remember this is NOT a speed contest, it is an accuracy contest. There is no rule that you have to complete the entire kit in one session (as long as you wash the flux off!).

Successful kit-building relies on having the proper tools. Here is a list of what you will need to build your MOTM-700.

* Soldering iron, 50W max power
* Needle-nose or chain-nose pliers
* Diagonal cutters
* Allen key set for securing the knobs
* Lead bending tool (optional, but makes the job go much faster)
* DVM or oscilloscope (to check the output)

For more information of tools used and suggestions, see the MOTM FAQ and Tutorial pages at www.synthtech.com

HOW TO FOLLOW THE DIRECTIONS

Please read the entire instruction before proceeding. There may be valuable information at the end of the instruction. Each instruction has a check box ❒ next to it. After you complete the instruction, check the box. This way you can keep track of where you are in the process.

VERIFY THE PARTS LIST

❒ Verify that all of the parts are in the kit as shown on the parts list.

A WORD ON SOLDERING

There are 2 very different types of solder used in the kit. Most of the soldering uses 'Organic Flux' solder. ***This is strictly for use on the pc board, and is NOT to be used on the front panel wiring!***

In order for solder to 'stick' to the copper, a chemical called 'flux' is embedded in the solder. The flux leaves a residue on the pc board that should be cleaned with warm water. DO NOT USE SOAP OR OTHER CLEANSERS. Most of the parts in the kits are 'waterproof', and can be washed in the sink. The flux is OSHA approved for flushing down the drain, so don't worry about that! A soft brush is used to gently scrub the board. We recommend a 'fingernail brush', which is about 1" x 2" and can be found for about $1.

The other type of solder is called 'No Clean Flux', because as the name implies it does not require washing. This solder is used on wiring the pots, switches, jacks, etc. This solder is harder to use on the pc board, because even when melted it is not very fluid (about the consistency of toothpaste). We will use it VERY SPARINGLY on the pc board.

OK, let's get started on the board!

PART #1: SOLDERING THE RESISTORS

Since there are more resistors than anything else, we will start here. If you do not know the resistor color code, refer to the parts list. Resistors are not polarity sensitive, but the board will be easier to debug (and look nicer) if you point the first color band in the same direction for all the parts. The color code is also in the README FIRST document that every customer gets with their first order.

❒ Find the **RESISTOR** bag.

❒ Find the MOTM-700 blank pc board. There is a copy (larger than actual size) of the silkscreen which shows where the parts go at the end of this document. It will be useful if you locate the part on the print first, put the part in the board, then 'check off' the silkscreen. All parts are inserted from the side of the board with the white silkscreen (the "top" side).

❒ We will stuff the resistors by value to make things easier. The resistors (and other long-leaded parts) are inserted on 0.4 inch spacing. The important thing is to be sure that the part is sitting all the way down on the board. Push the leads in the holes, push the part on the board, and then bend the leads on the bottom outwards to a 45 degree angle (roughly!). This is called 'cinching the leads': keeps the part from falling out! From the bottom of the board, solder (with the organic flux), applying heat to the pad for about a half second first, then applying just enough solder to make a small, flat puddle.

The rule of soldering: don't use too much, you can always add more! Cut the leads flush with the top of the solder.

NOTE: you will need to save 2 of the resistor leads after you cut them!

Locate the 100K resistors and solder into R9 & R14.

❒ Locate the 68K resistors and solder into R10, R11, R15, & R16.

❒ Locate the 4K7 (4.7K) resistors and solder into R1, R3, R4, & R6.

❒ Locate the 330 ohm resistors and solder into R2 & R5.

❒ Locate the 390 ohm resistors and solder into R17 & R18.

❒ Locate the 1K resistors and solder into R8 & R13.

❒ Locate the 4M7 (4.7M) resistors and solder into R7 & R12.

❒ Locate the 510 ohm resistors and solder into R19 to R24.

❒ Locate the 47K resistors and solder into R25 & R26.

That should be all of the resistors! And guess what: you are about 1/3 of the way done!

PART #2: BOARD WASH #1

❒ Verify all the resistors are in the correct position.

❒ Verify all the resistors are flat on the board. Correct if needed. Check solder joints.

❒ Wash the board in warm water, gently scrubbing *both* sides.

❒ Shake the board a couple of time, blot dry with an old towel (the leads will frazzle the good towel). Let dry about 15 minutes.

PART #3: CAPACITORS

❒ Locate the **CAPACITOR** bag.

❒ Locate the 100pf ceramic axial caps. They are marked 101. Solder into C7, C8, C11, C12, C13, & C14.

❒ Locate the 0.1mfd axial ceramic caps, marked 104. Solder into C2 – C6, C9, C10, C15 – C18, C20, & C21.

❒ Locate the 10mfd electrolytics. Note that there is a stripe on the NEGATIVE terminal. The pc board has a + on the POSITIVE terminal. Carefully stick the capacitors into C1, C19, C22, C23 & C24 with the stripe ***away*** from the + pad on the board.

❒ Wash the board again, gently scrubbing both sides. Use ONLY warm water!

PART #4: MISC and IC STUFF

Almost done with the parts on the pc board! This will finish up the soldering with the organic flux.

❒ Locate the **MISC #1** bag and the **IC** bag.

❒ Locate the ferrite beads. They are axial parts, gray colored with no markings. These are non-polar, and are soldered into L1 and L2.

❒ Locate the MTA-156 power connector. Solder into JP1. Note that the connector has a 'locking tab' on one side. This side is the "inside" facing relative to the pc board. Note the silkscreen symbol for JP1 has a line on one side, indicating this is the side where the locking tab goes.

❒ Locate the LM311 comparators. Solder into U1 & U2. Note that Pin #1 is the square pad. Pin #1 is the pin near the very small 'dimple' in the top of the part. All of the ICs point "to the bottom" on the pc board.

❒ Locate the 74HC86. Solder into U3.

❒ Locate the DG213DJ. Solder into U4.

❒ Locate the SSM2404. Solder into U7.

❒ Locate the 4 2N3904 NPN transistors. Look closely, they are marked on the "flat side" of the part. ***DO NOT GET THESE CONFUSED WITH THE 3 VOLTAGE REGULATORS!*** Note the hole pattern on the pc board has the middle lead slightly forward. Insert the 3 leads, with the bottom of the part about 1/8" from the pc board. DO NOT try to push the transistor all the way down on the board! Solder in Q1, Q2, Q3, & Q4. Note they all "face to the right".

❒ Locate the LM78L05. Look closely, it is marked on the "flat side" of the part. Note the hole pattern on the pc board has the middle lead slightly forward. Insert the 3 leads, with the bottom of the part about 1/8" from the pc board. DO NOT try to push the part all the way down on the board! Solder in U5.

❒ Locate the LM79L12. Solder into U8.

❒ Locate the LM78L12. Solder into U6.

PART #5: WASH THE BOARD AGAIN

❒ Verify all the parts are in the correct locations. Make sure all the ICs are pointing the same way.

❒ Inspect the solder joints. Any solder shorts? Too much solder? Missing joints?

❒ Wash the board under warm water. Scrub gently. Dry.

THIS IS A GOOD STOPPING PLACE TO REST OR PUT THE KIT AWAY UNTIL LATER.

You are now finished with the Organic flux solder. All soldering past this point is using the No-Clean solder. You do not have to wash the board anymore.

PART #6: FINISHING THE PCB

You will now solder in the remains parts on the pcb in preparation for wiring to the front panel. USE THE NO-CLEAN SOLDER. BE CAREFUL!

❒ Locate the 2 Spectrol pots. **IMPORTANT**: in order for the pc board to properly align into the front panel, each pot must be ***absolutely flat*** on the pc board, with the shafts pointing away from the pc board.. Solder the pots into VR1 & VR2.

❒ Locate the **WIRE** bag. Note that the pre-stripped wires all have a short end and a longer end. THE SHORT END GOES IN THE PC BOARD.

❒ Locate the 6 pieces of RG-174 black coax cable. Again, note that one end has longer wires stripped than the other. The short ends will go in the pc board in positions J3 - J8. Look at the pc board. Notice that in positions J3 – J8, there is a large hole pad (lower pad) and a smaller pad (top hole). The braided wire is soldered into the larger hole. The smaller, inner conductor goes in the top hole.

Note there is a row of 'plain' holes along the bottom, under J3 - 8. These holes are for threading the small white tie-wraps for holding the coax against the pc board. The holes are designed so that coax exits the pads directly underneath. The coax then lies between the 2 holes. The tie wrap enters the left hole from the top, comes out the right hole from the bottom, and is then secured so that the coax is tightly held against the top of the pc board. Note that the tie wraps must thread from the top, or there may not be sufficient room between the pc board and the mounting bracket. The excess tie wrap is cut off. See the illustration pages.

❒ Solder, then tie-wrap the 6 short coax cables J3 – J8. Trim the excess tie-wrap. NOTE: because of the way the coax is made, chances are more of the braid will go in the hole than the inner conductor. This is normal, unlike all the other parts and wires. The secret is to get the coax firmly soldered and tied down. You may find it easier to tie-wrap first, then solder.

❒ Find the 4 red/black twisted pairs. These are for the 4 LEDs. They go into the holes marked D1, D2, D3, and D4. The RED wire goes into the '1' hole, the BLACK into the '2' hole. Solder the 4 wires.

❒ Find the 2 long orange/white twisted pairs. They go into J1 and J2 (near the center of the pc board). This one is easy! The ORANGE wire goes into the ORG hole, and the white wire goes into the WHT hole.

❒ Find the long red/white/black twisted wire. This goes into S1. The RED wire goes into '1', the BLACK wire into '2', and the WHITE wire into '3"

❒ Find the short orange/white/gray twisted wire. This goes into S2. ORANGE into '1', GRAY into '2', and WHITE into '3'.

The MOTM-700 should now look like an alien spider.

YOU ARE NOW FINISHED WITH THE PC BOARD WORK! BREAK TIME.

PART #7: FRONT PANEL PREPERATION

You will now attach components to the front panel. It is HIGHLY recommended that you use a set of hollow shaft nut drivers, NOT PLIERS, to tighten the nuts. This prevents scratching. NOTE: all references to part orientation is from the REAR of the panel.

❒ Locate the 8 Switchcraft jacks. Notice that from the rear, there is a beveled corner. This corner is ALWAYS CONNECTED TO GROUND, USUALLY WITH THE BRAIDED CONDUCTOR. Each jack has a flat washer, a lockwasher, and a ½" hex nut. Remove the nuts and washers from each jack. Place aside. Keep the lockwasher on the jacks.

❒ Insert the 8 jacks/lockwashers, with the beveled corner in the ***upper right*** corner, into the 8 holes. Place the flat washer on the jack, then the hex nut. Hold the jack with one hand on the backside, keeping it 'square'. Tighten the hex nut with a nut driver. NOTE: when tight, not much of the exposed threads of the jack are exposed.

❒ Insert the 4 LEDs into the panel. Note there are 2 colors, RED and GREEN. The RED LEDs go into the A<>X and C<>Y holes. The LEDs are 'pressed in' the holes all the way until the lip touches the panel. NOTE: one lead is longer, this is the

ANODE. Try to press in the LEDs so that the ANODE lead is to the left (when facing the front of the panel).

❒ Insert the 2 switches into the MODE holes. CAUTION: DO NOT OVERTIGHTEN! Notice that there are 3 lugs, which we will refer to as 'top', middle', and 'bottom'. Depending on the switch manufacturer, the lugs may be marked '1 2 3' or 'ON" and 'ON' with the center lug blank. Therefore, the instructions will simply refer to them as top, middle, and bottom as viewed from the rear of the panel.

You are now ready to attach the pc board to the bracket, and then wire up to the panel.

PART #8: ATTACH PC BOARD TO BRACKET/PANEL

❒ In the **HARDWARE** bag, locate 4 #6-32 x 3/8 screws, 6 #6 KEPS nuts, and 4 spacers.

❒ Locate the mounting bracket. The pc board attaches to the bracket, with the 4 screws threading from the top of the board, through the spacers, through the bracket, and then out the bottom of the bracket. The #6 KEPS nut attaches on the bottom of the bracket. Note the bracket has 2 long mounting flanges with a hole in each. These attach to the 2 threaded studs sticking out of the rear of the panel. The 4 pots each stick in it's panel hole when the bracket is screwed down on the 2 threaded posts.

Attach the pc board to the bracket. The flanges will point upwards when the pc board is sitting on the bracket. Note that the bracket holes for the pc board are actually oblong. This is to allow adjustment for the pc board to firmly press up against the back of the panel. As a start, set the 4 screws ALL THE WAY TO THE LEFT of the oblong holes. ***Loosely*** tighten the 4 KEPS nuts on the bottom.

❒ THIS IS A VERY IMPORTANT STEP, SO PAY ATTENTION AND READ ALL OF IT BEFORE PROCEEDING!

Note that each of the 2 pots on the pc board have 2 hex nuts and a flat washer. Remove the first hex nut and the washer. Set aside.

What you will do now is adjust the remaining hex nuts so that when the bracket is all the way down on the panel's threaded studs, all the pot hex nuts touch the rear of the panel.

Screw (by hand) each hex nut on the pots so that it is all the way on (touching the face of the pot). Now, pick up the pc board/bracket assembly and carefully slide it over the 2 threaded studs, making sure the pots are aligned in the holes. Use 2 #6 KEPS nuts and tighten the bracket to the panel.

❒ Loosen the 4 KEPS nuts on the bottom of the bracket. Slide the pcb ALL THE WAY TO THE RIGHT AS FAR AS IT WILL GO, so that the 2 pot nuts are all pressing against the panel. By hand, put hex nuts on the outside threads of VR1 and VR2 to keep the pc board in place. Now, tighten the 4 KEPS nuts on the bracket. The pcb and bracket should be secure, with no gaps visible between the panel and the pot nuts. You may need to loosen the nuts on the pots, so that they are touching the back of the panel. Again, make sure each pot's nut is touching the back of the panel (no gaps!). There will be a gap from the edge of the *pc board* to the panel.

❒ Remove the hex nuts on VR1 & VR2. For the pots, first put on the flat washer, Then the hex nut. Tighten with a ½" nut driver.

PART #9: FINISH WIRING TO THE PANEL

❒ Now you will solder the coax wires to the jacks. You will solder the bottom row of jacks first, then the top row. Note that from the rear, the jack lugs are referred to as 'LEFT', 'TOP', and 'BEVEL'. The left lug is the signal from the outside plug, the top lug is the switched signal, that is disconnected when a plug is inserted, and the bevel is ALWAYS ground.

❒ Solder the IO Y (J8) coax on the jack. The braid goes to the BEVEL, the inner wire goes to the LEFT lug.

❒ Solder the IO D (J7) coax on the jack. You may find it convenient to first route the coax in-between the IO X and IO Y jacks first.

❒ Solder the IO C (J6) coax on the jack.

❒ Now for the top row coax. Solder IO X (J5) on the jack.

❒ Solder IO B (J4) coax on the jack.

❒ Solder IO A (J3) coax on the jack.

❒ Leaving the 2 CV input jacks for the time being: you will now solder the leads onto the LEDS. The pcb is designed so the D1/D4 leads and the D2/D3 leads will "cross-over" each other. Note again (very important!) that the LEDs have a long lead (ANODE) and a slightly shorter one. The LED leads are too long, so, first cut only the ANODE lead off about half-way of red LED D1, which is in A<>X hole (note that this procedure is repeated 3 times, so only D1 is presented in detail). Next, find a short piece of heat-shrink tubing and place it over the RED wire (you may want to un-twist the wire 1 time). Solder the RED wire to the clipped ANODE lead. The way I like to do it is to make a small 'J' hook bend in the LED lead and the wire, and hook them together and then solder. Do the same for the other (CATHODE) led: clip shorter, place heat-shrink tubing over the wire, and solder. Lastly, use a heat-shrink gun to shrink the tubing over the solder joints: slide the tubing all the way towards

the LED base until it touches.

❒ Repeat the above procedure for the other 3 LEDs. Remember: RED wire to the ANODE!! D2 is the RED LED in the C<>Y hole, D3 is the GREEN LED in the D<>Y holes, and D4 is the GREEN LED in the B<>X hole.

❒ You will next attach the wires to S2 (2nd MODE switch). The WHITE wire goes to the top or '1' lug, the GRAY wire to the center or '2' lug, and the ORANGE to the bottom or '3' lug.

❒ Next (this thing has a zillion wires!!) solder the wires to S1 (1st MODE switch). Again, the WHITE wire goes to top/'1', the BLACK wire to center/'2', and the RED wire to bottom/'3' lug.

❒ You will now solder to the 2 CV input jacks. If you were reading closely, you have saved a couple of scrap resistor lead wires. These wires are soldered from the BEVELED lug to the TOP lug in the 2 CV IN jacks. This is provide a default CV of 0 volts to the comparators when no jack is inserted. For each CV IN jack, solder the resistor lead across the 2 lugs (it's not that far!).

❒ The end is near! Solder the orange/white pair J1 to the top CV IN jack. The WHITE wire goes to the left (input) lug, and the ORANGE wire goes to the TOP lug (which is really tied to ground by the jumper wire).

❒ Solder the other orange/white wire (J2) to the bottom CV IN jack: WHITE to the left and ORANGE to the top.

❒ Find the 2 remaining tie-wraps. Attach 1 tie-wrap to a "bundle" consisting of the 2 orange/white wires and the white/red/black wire from S1. Attach the tie-wrap about 1 inch off the surface of the board, around the 3 wires. Cinch tight and clip off the excess.

❒ Use the last tie-wrap to "bundle up" the wires in D2, D3, and S2.

❒ Rotate all of the front panel pots fully counter-clockwise. Locate the **KNOBS**. Notice each knob has a thin white line on it. Place the knob on the pot shaft, align the white line to the '0' tick mark and tighten the hex screw. The silver part of the knob has a protective clear plastic overlay that can be removed if desired. Gently rub with your fingernail and it will peel off.

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CONGRATULATIONS! YOU HAVE FINISHED BUILDING THE MOTM-700!

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All that's left to do is test it! But before we do, please read the following Theory of Operation.

ELECTRICAL THEORY OF OPERATION

Since the MOTM-700 contains 2 identical sections, this discussion is for the "top" switch. This switch has 2 signals: A, B, X. The are labeled IO A, IO B, and IO X because the are bi-directional. IO (short for in/out) means that the switch can be thought of as having either 2 inputs and 1 output OR 1 input and 2 outputs. This is summarized below.

VIEWPOINT #1

IO A – input
IO B – input
IO X – output

VIEWPOINT #2

IO A – output
IO B – output
IO X – input

It cannot be stressed enough that BOTH ways of thinking are important in finding uses for the MOTM-700 in your studio.

The "switch" portion is an electrical emulation of a standard SPDT (single-pole, double-throw) switch. The switch has a 'common terminal' that is connected to one of 2 other terminals. If you are a witty and clever reader, you will instantly see from the above chart that IO X (and in the other switch, IO Y) is indeed the "common" terminal.

The MOTM-700 actually has 2 SPDT switches in parallel: one for AUDIO and one for VOLTAGE. We will get to this later.

Let's turn our attention to the first page of the schematic (we will look at the top half, because the bottom half is identical). Since this is a VC (voltage-controlled) device, the first thing we need is a comparator to determine if the input CV is above or below our switch-point. U1 is a LM311 comparator. It compares the voltages on it's + and – pins. The – pin is connected to the incoming CV. R9 and C7 form a 'trash filter' that keeps out junk like strong local AM radios and excessive noise. The + input is connected to a voltage divider made from R10, VR1, and R11. The values are chosen so that the adjustment range is –5V to +5V. Resistor R7 provides hysteresis for slowly changing input waveforms (like an

envelope). Note that the comparator is powered from +12V and –12V. Resistor R8 is used to convert the output to +5V.

Now U1 is set up to output +5V or ground if the input is lower or higher than the setpoint. Since the analog switches we are using are closed when the control input is +5V, we need both "logic signals" for OPEN/CLOSE. Therefore, we use an old digital trick: XOR gate U3 is used as an inverter (why don't we use just a plain old 74HC04 inverter chip? Because that's boring.) The signals S1A and S1B are now at opposite polarity. These are used for 2 purposes: to drive LED indicators D1 and D4, and to switch our signals around.

Turning now to page 2: there are 2 separate CMOS switch chips, connected in parallel, that are used to switch the signals. U7 is a SSM2404, which is a specialized IC that really is not a switch at all, but cross-faded VCAs (voltage-controlled amplifiers). This is what is used to switch the AUDIO. For switching VOLTAGES (selected by "regular" SPDT switch S1), a different chip is used. This is U4: a Harris Semiconductor DG213DJ. This is a military version of the 'industry standard' 4066 switch. However, this being MOTM, we wanted the performance of the DG213DJ. It has lower ON resistance, much faster switching times (90ns) and most importantly, something called *low charge-injection*. Without boring the casual reader, this reduces DC offsets and "zipper noise" when the switch opens & closes.

Usually, MOTM modules run off of +15V and –15V. However, the SSM2404 has a maximum supply voltage specification of +12V and –12V. Therefore, 2 3-terminal regulators U6 and U8 are used to convert the +15V & -15V to the +12V and –12V. In addition, regulator U5 outputs +5V for the LEDs and the 74HC86.

PRELIMINARY CHECK-OUT

Since the CV IN jacks are switched to ground without a plug inserted, the MOTM-700 can quickly be checked out without applying a CV. Power up the unit (a MOTM-900 or other MOTM supply is preferred). Set the 2 SWITCH pots to –2V. Both RED LEDs should be OFF, and the 2 GREEN LEDS should be ON. Why?

Because, the switch threshold is set to –2V, and ground is applied to the CV IN. Since ground is *higher* than –2V, the switch is in the B<>X and D<>Y connections. Now, adjust the pots to +2V. As you rotate the knob clockwise, the LEDs should "flip" very near the 0V tick mark. This means the input CV is below the SWITCH setting, and A<>X and C<>Y are now active.

Now verify the switching operation. The easiest way is to use 2 audio sources. Plug one in IO A, and the other into IO B. Place the MODE switch to AUDIO. Plug the output IO X into an amplifier. By rotating the knob back and forth through 0V switchpoint, you should hear the 2 audio sources switch in and out. Now flip the MODE switch to VOLTAGE, and repeat the test. Note that in the VOLTAGE mode, you may hear "pops" and "clicks". This is just a quick test to verify operation. ***You should ALWAYS switch audio with the MODE switch in the AUDIO position.***

TROUBLESHOOTING

If your MOTM-700 does not work, please verify ALL of the following before contacting us. The following reference directions assume that you are looking at the pc board with the panel to the right and the power connector to the left.

- ❒ All of the IC are pointing the same way: all notches are 'down'.
- ❒ C1, C19, C22, C23 & C24 stripes are all pointing upwards.
- ❒ With a DVM, check to see that pin 7 of U1 (and pin 7 of U2) switch from +5V to ground as you rotate the SWITCH pots through the 0V tick mark. Make sure pins 3 and 6 of U3 are the opposite from pin 7 of U1 and U2 (ie if pin 7 of the LM311 is +5V, pin 3 or pin 6 should be very close to ground).
- ❒ Transistors Q1 to Q4's and the 3 voltage regulators' flat sides are all facing to the right.
- ❒ The braided wire on the coax goes to the beveled side of the jacks.
- ❒ The board has all the right parts in all the right places.
- ❒ No solder shorts or missing joints.

If you still can not get the module to perform correctly, please contact us by phone/fax at (888)818-MOTM or by email to synth1@airmail.net

USE OF THE MOTM-700 Dual VC Router

The MOTM-700 has 100's of uses, limited only by your imagination! Once you start using it, more and more ideas will come together. The 2 sections of the module are totally independent: you can patch IO X into IO D without worry.

The broad range of applications is based on the fact that the CV IN can come from just about anything, including audio! Here is just a short list of thing that can be used to control the '700:

a) Output from a MOTM-800 Envelope Generator. The signals switch during attack and release.
b) Output from a voltage-output foot controller pedal. Many music stores carry them. They operate from an internal 9V battery and usually output 0V when the pedal is up and +6V when the pedal is down. This is not a problem, since the LM311's are powered from +12V and –12V. You can therefore switch signals with pedal up/down, very useful in live performances.
c) Output from a LFO. This will cause the signals to "ping-pong" back and forth. The 'duty-cycle' (how long A<>X versus B<>X is active) can be set by the SWITCH pot.

d) Output from the MOTM-100 “Slow Random” or S/H OUT jack. The SWITCH setting now can set a *voltage-controlled probability* to add randomness in your patches!
e) Output from a MIDI-CV converter. Switch signals “on the beat” with your sequencer program. Use the keyboard and you have a programmable “switch point”, just like a “split point”. Playing above the note produces 1 effect, and above another.
f) You can create some interesting timbres if you switch at audio rates.

From a ‘system’ standpoint, here are some things you can do, based on the above list:

1) switch between 2 “stomp boxes”.
2) switch between 2 drum machines with your sequencer program.
3) use the two sections together to create interesting results. You can feed the same CV into both CV IN jacks, and by setting 2 different SWITCH settings cause sequential switching to occur.
4) switch between 2 control voltages to modulate filters, VCOs or VCAs. Use 2 MOTM-800s: set one for short attack/release and another one for longer times. Use a foot pedal to switch between envelopes. Or a LFO!

Again, the more you use it, the more different ideas you will discover Have fun!

Thank you for purchasing the MOTM-700 kit.

SPECIFICATIONS
MOTM-700 DUAL VC ROUTER

AUDIO MODE

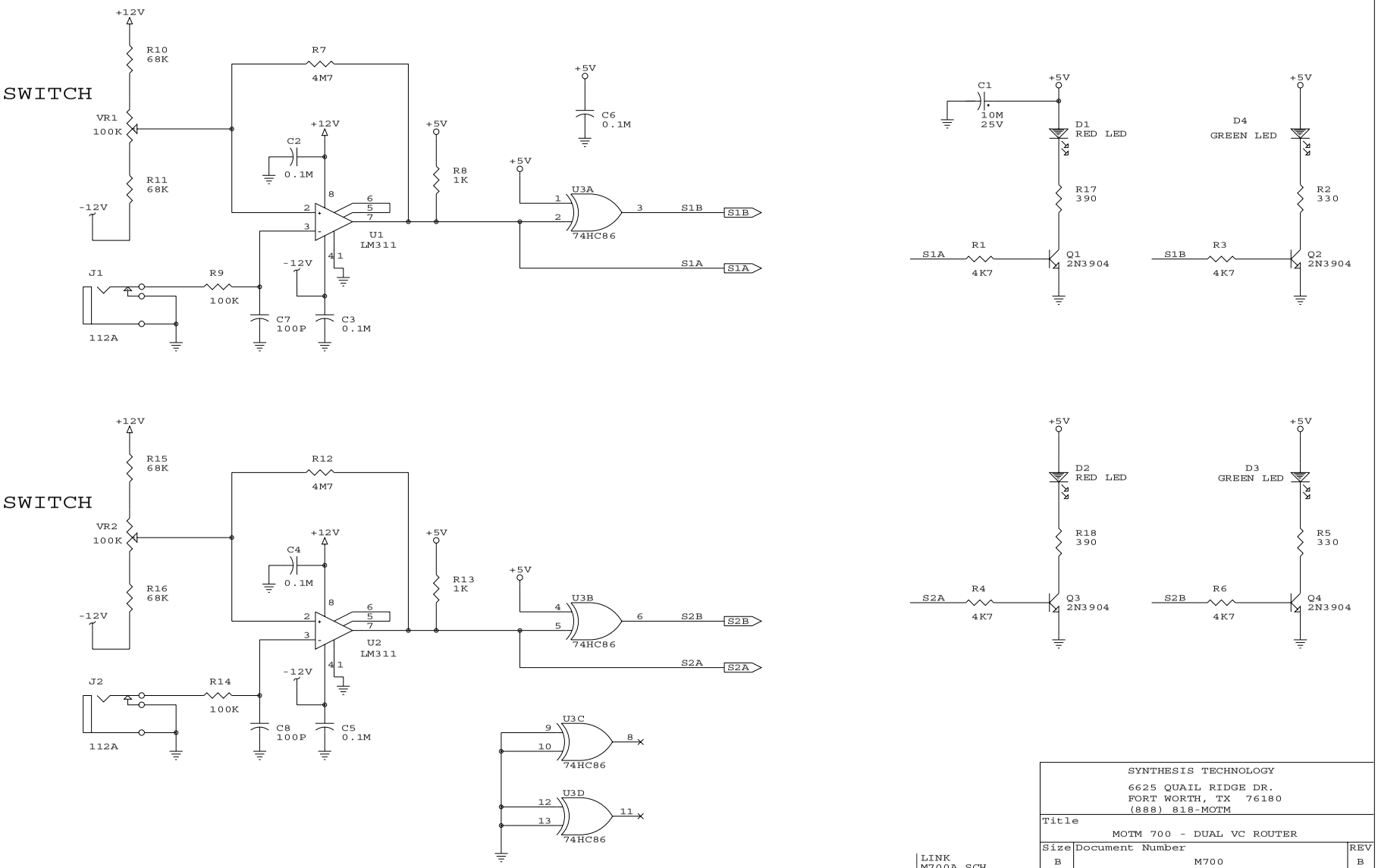
Voltage levels	-11.8V to +11.8V (23.6v pk-pk)
Insertion resistance	1100 ohms, max.
Switching time	20ms, max..
THD+N @1Khz, Vin = 2Vrms	0.003%, max.
OFF isolation @ 1Khz	-100dB, typ.
Crosstalk @ 1Khz	-94dB, typ.

VOLTAGE MODE

Voltage levels	-11.8V to +11.8V (23.6v pk-pk)
Insertion resistance	1100 ohms, max.
Switching time	150ns, max.
THD+N @1Khz, Vin = 2Vrms	0.05%, max.
OFF isolation @ 1Khz	-90dB, typ.
Crosstalk @ 1Khz	-95dB, typ.

GENERAL

Power Supply	-15VDC @ 20 ma +15VDC @ 20 ma
Size	2U x 5U 3.47" x 8.72" 88.1mm x 221.5mm
Depth behind panel	4.375inches 111.1mm



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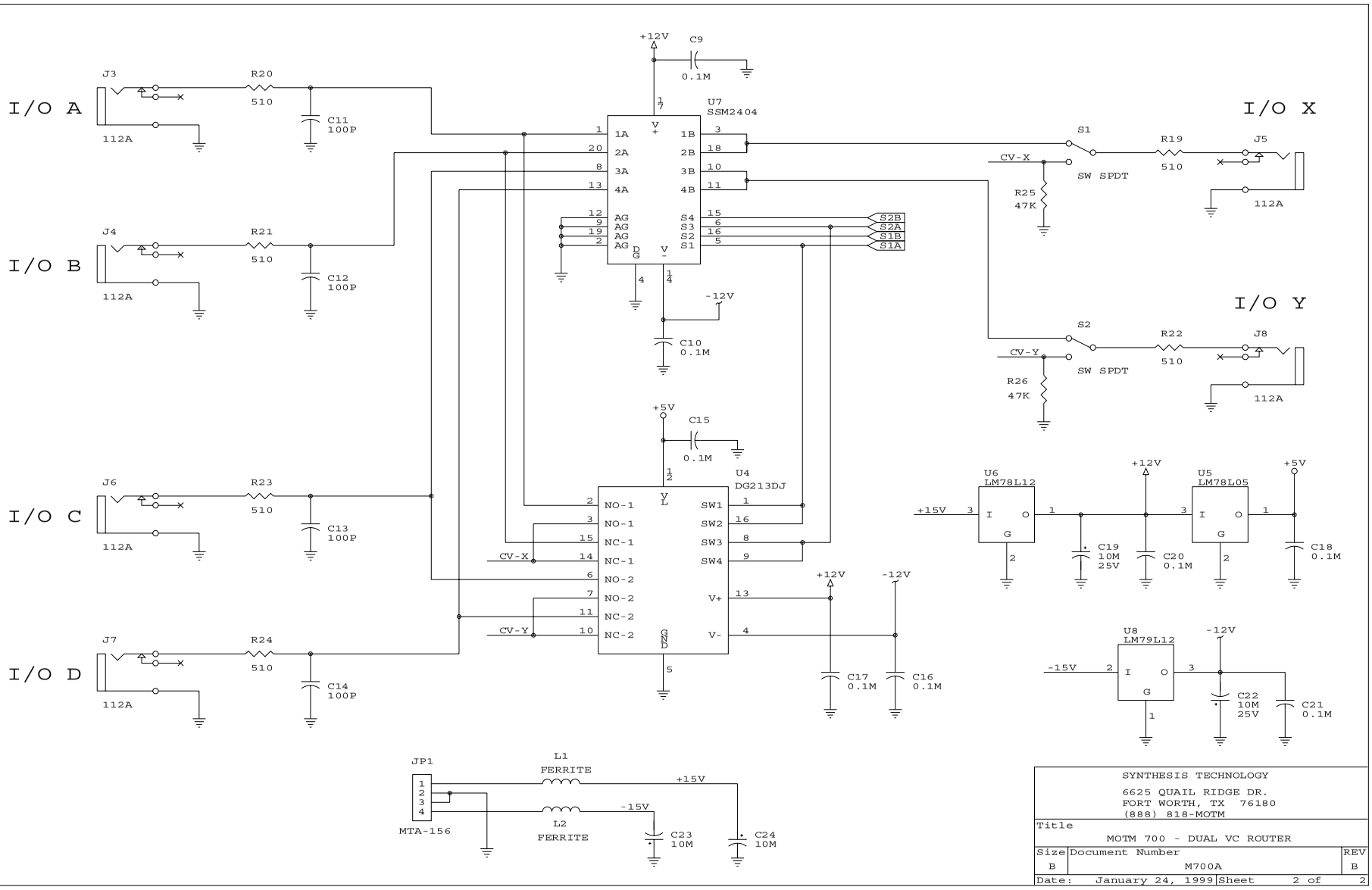

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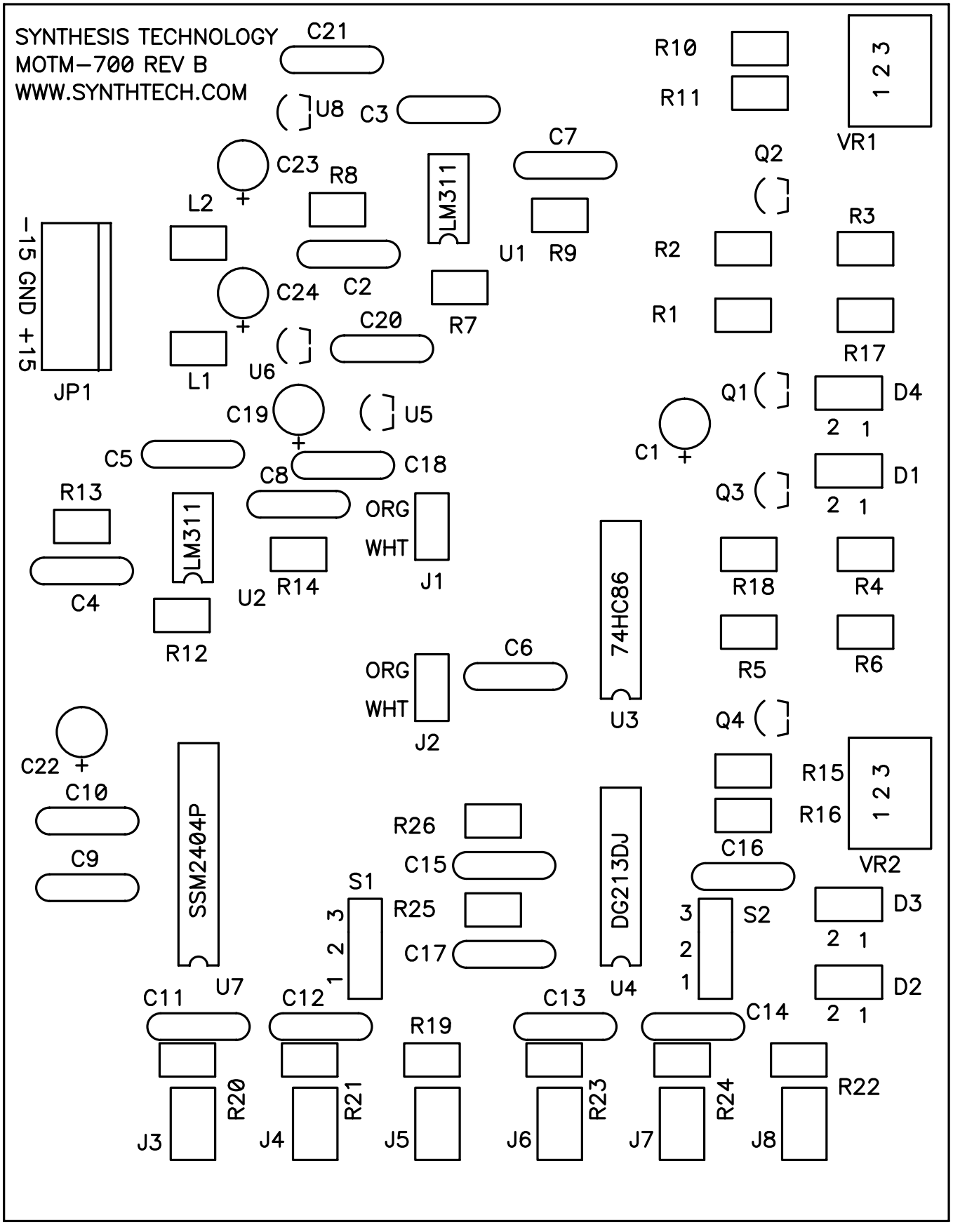
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C21
U8
C3
C23
L2
R8
LM311
C7
U1
R9
Q2
R10
R11
VR1
1 2 3
R3
R2
R1
R17
-15 GND +15
JP1
C24
C2
R7
C20
U6
L1
C19
U5
Q1
D4
2 1
C1
C5
C8
C18
Q3
D1
2 1
R13
LM311
ORG
WHT
J1
74HC86
R18
R4
C4
U2
R14
R12
C6
ORG
WHT
J2
U3
R5
R6
Q4
C22
C10
C9
SSM2404P
R26
C15
S1
1 2 3
R25
C17
DG213DJ
R15
R16
VR2
C16
D3
2 1
S2
3
2
1
U7
U4
C11
C12
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C14
D2
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R19
R20
R21
R23
R24
R22
J3
J4
J5
J6
J7
J8