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Points of departure: The Transformation of historic furniture into a modern vernacular

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POINTS OF DEPARTURE:
THE TRANSFORMATION OF HISTORIC FURNITURE INTO A MODERN VERNACULAR

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CHAPTER I

INTRODUCTION

My furniture is not about the tortured, personal experiences of my soul, nor is it an abstract wonder of twentieth-century conceptual art; I try to create beautiful functional furniture that has its roots in the great history of furniture. I created three pieces of furniture, each using a specific historical piece as a point of departure. These pieces, as you will see, are not mere antique reproductions, but a translation of antique designs into a more contemporary aesthetic.

In the early twentieth century, after the alleged excesses of Victorian design, furniture designers, like painters and sculptors, sought to make an abrupt break with their past. Inspired by the mechanized world of the Industrial revolution, designers created furniture stripped of ornament and plush upholstery. The furniture they designed more closely resembled the clean lined machines that were used to construct it rather than resembling any familiar antique. The invention of tubular steel enabled designers such as Marcel Breuer[1] and Mies van der Rohe[2] to create furniture that was stripped down to the austere essence of form, line and color. (Figure 1). Mies' Barcelona chair (1928) is a prime example of the fluid, mechanized

[1] Marcel Breuer is credited with developing the first piece of furniture using tubular steel. See Christopher Wilk, Marcel Breuer: Furniture and Interiors (New York: Museum of Modern Art, 1981),10.

[2] Ludwig Mies Van der Rohe: Furniture and Furniture Drawings (New York: Museum of Modern Art, 1977), 47-49.

style that was embraced in the early twentieth century. Even though they might have been inspired by the earlier bent wood furniture of Michael Thonet[3], this new furniture did not resemble any historical, ornate Victorian forms. (Figure 2). It was based upon geometry and the celebration of technology. The fact that the steel was exposed and chromed on this furniture demonstrates how important it was to the designer to imbue this work with an ahistorical look and give it a technological feeling.

Even as twentieth-century furniture design experienced a return to such natural materials such as wood and fiber as in the Danish Modern furniture of the 1940s and 1950s[4], the designs continued to incorporate the modern obsession with clean form, clear line and non-distractive color, with few references to furniture history. There is nothing wrong with this, but the people who bought these pieces soon discovered that they did not integrate very well with Grandma's sofa and Great Aunt Mary's dining room set and they were left with the choice of either having a hodgepodge design scheme in their home, or throwing out everything old. Also, much of twentieth-century furniture seemed to lack the warmth and comfort of older styles.

Finally, in the 1980s, furniture designers were influenced by the Post Modern architecture movement, and dared to return to the classical designs of the past for their inspiration. Studio furniture maker Richard Scott Newman said that furniture had been trying to be modern for so long that, finally, basing furniture upon antique designs was so different that it seemed unique and fresh.[5]

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[3]Christopher Wilk, Thonet: 150 Years of Furniture (Woodbury, NY: Barron's Educational Series, 1980).

[4] Esbjrn Hiort, Modern Danish Furniture, trans. Eve M. Wendt (New York: Architectural Book Publishing Co., 1956).

[5] Ron Netsky, "Richard Newman," Upstate Magazine, 8 January 1984, 9.

Also, like Post Modern architecture, this furniture provided the reassurances of nostalgia and a sense of being a part of the great continuum of history. People discovered they liked furniture with ornament that distracted and delighted the eye, and enjoyed a return to the plush comfort of overstuffed upholstery.

This is not to say that this new furniture gained nothing by its explorations of the essence of form in the earlier part of the century. The new craft movement might be about rediscovering its past, but it applied the lessons learned from early twentieth-century design. Even though a table might feature some type of funky ornament, it does not disguise the overall form and harmony of the basic design. Today, ornament does not fight against the overall design of good furniture, but rather complements it.

In the past, furniture makers were not necessarily the trained artists that they are today. While today's craftsperson might study at a leading art institution, yesterday's cabinet maker inherited the furniture business and the patterns of the previous generation. Perhaps the next generation of woodworkers would embellish upon a finial or pronounce the curve of a cabriole leg a little more emphatically, but they basically did not make radical breaks with their past and their teachers. A woodworker who was a rugged individualist soon found himself out of business.

Between American Colonial styles such as American Queen Anne (c.1725 - 1760) and Chippendale (c.1755 -1790), there were transition periods as new ideas that originated in Europe slowly crossed the Atlantic and were disseminated to cabinetmakers. Sometimes this would take ten or twenty years. Back then, people lived life at a slower pace and were hesitant to make radical breaks with their ancestors. New ideas were introduced through the

use of style books and cabinet maker guides.

Even at the beginning of the Industrial Revolution in the nineteenth century, people did not optimistically embrace the possibilities of the newly mechanized world; instead, they resisted it. Picturesque, nostalgic styles such as the Gothic Revival (1830 - 1875) and the Renaissance Revival (1860 - 1880) provided the consumer with an escape back to a time when life was not so hectic. It gave him the comforts of the idyllic past. An example can be seen in a Renaissance Revival dining room suite decorated with themes from the hunt. (Figure 3). Carvings of bunnies nibbling fruit, stags and festoons of wild game that decorated the furniture might lead one to believe that the head of the household provided food for his family by hunting. To afford such furniture, he was more likely the wealthy proprietor of the local textile mill[6].

Perhaps in the late twentieth century we seek to escape our own technological nightmares by surrounding ourselves with furnishings reminiscient of a more optimistic past. Personally, as a designer and builder of furniture, I not only admire the implicit, comforting messages of antique furniture, but also the complexities and curvilinear forms found within its designs.

When the <u>New American Furniture: The Second Generation of Studio Furnituremakers</u> show opened at the Museum of Fine Arts, Boston in 1989, I was already considering possible thesis topics. The fact that the various artists in the show were asked to base their designs upon antiques seemed truistic. I asked myself, wasn't this how all pieces were designed? I think that with

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[6] Katherine C. Grier, <u>Culture & Comfort: People, Parlors and Upholstery, 1850-1930</u> (Amherst, MA: University of Massachussetts Press, 1988),12.

my background in furniture conservation, some antique antecedent would always pop into my head whenever I was trying to design something new and different. With me, the past is unavoidable.

What was so special about the Boston show was that the curator, Edward S. Cooke, Jr., asked the artists to respond to a specific antique from the museum's collection. This parameter intrigued me. By basing a piece upon a specific historical example of furniture, I could best compare and contrast antique technology and design development with what I have learned in my training as an artist. I began to examine photographs of antique furniture that really caught my eye. I expounded upon them and envisioned a new piece using newly discovered materials and modern approaches to construction the antique cabinet makers never would have dreamt of.

CHAPTER II

THE RECAMIER

After my thesis was conceived and approved, the idea of making a small window seat intrigued me. Unfortunately, almost every antique example I could find reminded me of something that would be more easily translated into a marketable Ethan Allen product, rather than the unique expression I sought. Encouraged by my professors to develop a design that was asymmetrical, I realized that virtually every couch is frontally symmetrical.

I found a photograph of a French empire couch called a *méridienne.* (Figure 4) This couch was made by Jacob-Désmalter in 1806 in Paris. A similar piece of Napoleonic furniture is probably most familiar today via the French nineteenth-century painting Portrait of Madame Récamier by Jacques Louis David[7]. (Figure 5). This painting depicts the Parisian socialite Juliette Récamier clothed in Grecian costume reclining on a couch in a setting that is starkly classical. Napoleon's conquests and further explorations into the ancient worlds of Egypt and Greece had created a desire by the French people for items imbued with the look of classical antiquity. Napoleon further encouraged the development of the style by making Percier and Fontaine the royal designers to encourage the use of this style with its convenient imperial overtones. *Récamiers,* as they later came to be known due to the fame of the

[7] Jacques Louis David, Portrait of Madame Récamier, c.1800, oil on canvas, Musée du Louvre, Paris.

portrait and the woman, evoked an era of ancient Rome in which citizens reclined as they ate. In nineteenth-century Paris, it was probably used by women to swoon upon after dinner as they struggled to digest a heavy meal under their tightly corseted abdomens.

I realized that this furniture form had many asymmetrical possibilities. Some have one arm, others have two, often of two different heights. Even though my design was based upon the méridienne I saw, I wanted to alter many things. I found the french curves of the arms too fancy for my liking and chose to incorporate two arcs of a circle to envelop the sitter. I also did not like the stubby, block-like feet found on the original. They seemed an afterthought. In addition, with those feet the seat height would probably seem too low for our modern standards. I imbued the rest of the design with a crisp geometry, reflecting pure forms such as cones, rectangles and graceful uninterrupted curves.

After spending the summer examining new materials developed for the furniture trade, I decided to feature a product by Braewood called reconstituted veneer. Although the particular type I decided to use looked like dyed bird's eye maple, it was actually composed of poplar. Where actual bird's eye maple veneer will cost up to $6.50 per square foot, reconstituted veneer was only $1.65. Manufactured in Italy, poplar is ground up, dyed and pressed into molds. This process yields a similar effect as the metal working technique of *mokumé*,[8] where the wood fiber is repeatedly pressed and sliced eventually forming craters of more intense tone that give the overall pocketed effect of bird's eye maple.

[8] See Tim McCreight, The Complete Metalsmith: An Illustrated Handbook (Worcester, MA: Davis Publications, 1982), 23, for a description of the mokumé process.

Another advantage to reconstituted veneer was that it was dyed throughout the entire thickness of veneer. Often, when solid wood veneer is dyed, the color only slightly penetrates the surface. This creates a technical problem for additional sanding. I chose the lilac color because I wanted to reinforce the fact that this was no ordinary material. This product comes not only in a number of different colors, but also in a variety of wood and textile designs.

To construct the curved arms I used the new technology of the vacuum press. In the past, curved surfaces were veneered with a hot iron and hide glue, or veneered with heavy sand bags to yield a constant pressure. The vacuum press enables the craftsman to, in effect, shrink wrap the curved piece in place until the glue sets. First, I constructed a framework and then a corresponding mold. Daily, I glued layers of bending ply and veneer.

In the meantime, I turned the feet using the machine lathe in order to get a crisp, uniform cone. The rest of the seat is made like a bench using mortise and tenon construction. After the inside of the arms were upholstered, they were atached to the sides of the seat using bolts and t-nuts. The fact that the arms are bolted makes them removable from the rest of the frame should repairs or reupholstery be required in the future.

The techniques I used in the upholstery are also modern. Instead of using the tied springs, horsehair and cotton batting used in the past, I used zig-zag springs, foam and Dacron. Nor did I use a hammer and upholstery tacks to attach the muslin and fabric to the frame, but a pnuematic staple gun. The technology to do a one shot fastener enables the upholsterer to get a good tight cushion with little of the struggle experienced with a mouthful of upholstery tacks and banging of the finger with a hammer.

I had difficulty in conceiving a cushion for the seat. At first, I thought a welted box cushion would be appropriate, but after it was sewn, the transition between the upholstery on the arms to that on the seat was too abrupt. It fought against the clean, graceful lines of the rest of the piece. Eventually, I decided upon a continuous cushion with a soft edge, stapled into the frame of the récamier, which gave a more seamless look.

The constructed récamier (figure 6) has two arms that curve inward, embracing the sitter. The arms are crowned with an upholstered bolster, capped on either end by bleached maple rounded disks. The tight skin formed by the reconstituted veneer is visible on the outside of the curved arms and across the front and back stretcher. The tops of the bleached legs that blend the transition between the arms and the seat pop out with a rounded rectangular solid. The width of the récamier tapers slightly from the tall side to the shorter side allowing for a slight change in scale. The overall effect of the piece is a graceful, curvaceous form resting delicately upon its maple points.

I think I could have improved upon the design of the récamier if I had added a curved undercarriage to the end view. This view seems static and not as pleasantly curved as the rest of the piece.

Upon further reflection, the récamier is a beautiful, graceful piece, well within the boundaries of my thesis, but the ideology behind it is somewhat dry and technical. It is really a celebration of modern materials and techniques and not much more. I have not seen many purple couches in my lifetime, but I wanted my next piece to make more of a statement about the antique upon which it was based.

CHAPTER III

CHAIN SAW LOUIS

I don't know if it was the car accident I was in on the first day of Winter Quarter, or the impending doom of the Persian Gulf War, but I had violent thoughts during the conception of my next piece. I examined thoroughly the relationship a designer could have with the past. One could use the past for a point of departure in a reverent fashion, as I did with the récamier, or one could be irreverent. The idea of irreverence and even humor was really beginning to appeal to me at the start of a difficult quarter. With reflection I realized that there are many shades to humor : there is sarcasm, irony and slapstick. I was struggling with personal reactive emotions in my environment and I knew that my next piece had to somehow be cathartic.

Chain saws have appealed to me ever since I was an undergraduate at Smith College. From 1983, I remember a story about a disgruntled youth who murdered his entire family with a chain saw. This was so horrific and incomprehensible that my friends and I found ourselves making sophmoric jokes about it. Some of us even took to wearing Echo chain saw tee shirts and hats emblazoned with the Stihl logo. I even had my father show me how to use the gas powered chain saw at home. Never once did I think that someday in the future I would use a chain saw to create art.

Antique French furniture has a special appeal to me since it is probably the finest furniture ever made in the Western World. French furniture first

started to make its mark in the world around 1660 when the monarch Louis XIV set about to create a French art. The French system of cabinet makers utilized guilds that were specialized to do various tasks. The guilds included the *ébéniste,* a maker of veneered furniture, a *menusier,* a maker of solid wood furniture, a *fondeur,* a maker of bronze mounts, a *ciseleur,* a maker of bronze chasing, a *vernisseur* or a lacquerer, a *marqueteur,* a maker of marquetry panels, and a *doreur,* a gilder.[9] It was illegal to do a task not included in your guild description. The challenge to today's woodworker is to tackle this massive collective effort in the manufacture of a piece and not spend the rest of your life making only one chair. Progress made by machines would provide the answer.

I knew that to approach an ornately carved and gilt encrusted piece of the Louis XIV or XV type in one ten week period would require my taking some shortcuts. The raw power of the chain saw helped me to realize my goal. It would provide an excellent textural translation. Since the fast cutting ability of a chain saw would save me weeks of labor, I decided to base my piece upon the most ornate piece of French furniture I could find.

Upon close examination of Louis XIV and XV furniture I found a lot of restraint in designs rather than the goofy exuberance I was expecting. I began to clearly see a decorative heirarchy that pervaded the pieces and gave them a sense of harmony and order. I finally settled upon a gilt carved console that graced the cover of a book. (Figure 7).

A console or *piéd-de-table* was actually the support for the table, which would be a precious slab of marble, porphyry, alabaster or some other

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[9] Christopher Payne, ed., Sotheby's Concise Encyclopedia of Furniture (New York: Harper & Row, Publishers, 1989),

material. These supports were considered secondary in importance to the top and were frequently updated in style. Supports were of carved wood made by menusiers. An architectural piece of furniture, these *consoles d'applique* were fastened directly to the wall. They were placed either facing the fireplace or between windows under a pier glass. The side of the console that was attached to the wall was left plain, but the remaining three sides were lavishly decorated.[10] The fact that these tables had the additional support of the wall meant that the console could be really sculptural without having to worry too much about function.

The console d'applique reached its epitome under the Louis XV style (1735-1765). The carvings on these supports were of a frequently fanciful character incorporating the rocaille work so characteristic of works from this Rococo period. Abstract, curving shells and other naturalistic ornament were caught up in a swirling movement that was frequently asymmetrical. In the center of the stretcher connecting the legs was the *nut*, an area where the menuisier would create an item of interest such as a*cassolette,* a carving of birds and flowers, or an *agrafe.*

I let my sketches of consoles d'applique exaggerate the asymmetrical curves, festoons and bouquets of flowers I saw in the original. Finally, I was ready to begin.

To fully document the creation of the piece, a photography student, Donna Oefinger, videotaped me[11] . I thought it would be helpful to the audience at my thesis show to see the abstract blocky form the console began

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[10] Pierre Verlet, French Royal Furniture, trans. Michael Bullock (New York: Clarkson N. Potter, Inc., Publisher, 1963), 37.

[11] Donna Oefinger, Chain Saw Louis: The Motion Picture (Rochester, NY: FDM Productions, 1990).

as, and the processes I used to carve it into its final form. The videotape also enabled me to personally explain the creation of the support. In addition, I thought the sounds of the chain saw would provide an appropriate background noise to the viewer's observation of my piece.

In order to hone my chain saw skills, I worked on a vocabulary of different chain saw textures to serve as a visual short hand for the more time consuming hand carving processes. I studied the organic nature that characterizes much of Rococo furniture decorations and those peculiar to the original console and adapted them to the chain saw. I found this process similar to that used by landscape painters, who come up with their own code to approximate trees, rocks and grasses in their canvases. They do not paint each leaf on a tree or every blade of grass, but summarize them in a convincing fashion. I was using a chain saw instead of paint.

I decided to experiment with a practice leg. It was a good thing I did, for I discovered my original plan of assembling the entire support in block form and chain sawing it in its entirety would not be feasible: The leg moved and vibrated too much even when it was not attached to the apron. I decided to carve my work in pieces and assemble it only for the final touches.

The apron and legs of the console (figure 8) were stack laminated of white ash and were roughly bandsawn to shape. The bandsaw was also used as a carving instrument to nibble away at the interior of curves that would be difficult to reach with a chain saw. I then carved the legs with the chain saw using a variety of textures. The scrollwork on the feet was further enhanced with the use of a die grinder. As a final decoration on the legs I slashed the legs with the chain saw to imitate the laurel leaf motif found crawling down furniture legs of the period.

After the legs were finished, I glued up the support in its entirety. As I treated the surface of the apron with the chain saw, I sought to make a smooth transition between the horizontal, undulating surface of the apron and the vertical cabriolet legs.

Around this time I made a decision not to erase the guidelines I made with my purple magic marker. The original purpose of these lines was to clearly demarcate the areas to be saved and those to be carved away. The dust that electrostatically clung to my face shield made clear vision difficult, and I used a magic marker rather than a pencil because it was clearly visible. The magic marker became an additional design element to my handiwork, futher helping to set up a defined heirarchy of decorative elements. From a distance, the marker lines are the first elements visible, encouraging the observer to approach the piece for further inspection.

Finally, I carved the stretcher between the legs and added the final touches to the agrafes located in the nut and in the center of the apron. The piece was nearly finished, but I needed a table top.

Initially, I scoured the Rochester area for a sizable piece of slate for the top where I could crumble the edges to echo the rough texture of the chain sawn support. That search ended fruitlessly. I considered real marble, but that was prohibitively expensive. I thought about using concrete, leaving the rebar exposed to imbue the console with a deconstructivist feeling, but it was not appropriate to the spirit of my piece.

Finally, I decided to faux finish the top to look like marble. I took a piece of chipboard and chain sawed the perimeter of my apron on it. Then I ran an ogee curve router bit around it to give the top a classic slab of marble look. Then I painted it.

The piece is succesful on a design level because every surface undulates in a curve. The console was the perfect French furniture form to use because of its rococo movement. The chain saw texture remains interesting throughout the piece because I was careful to vary the chops and nibbles. As a final step I even crosshatched the background of the apron in an approximation of the *lozenge* pattern, although I think it more closely resembles an Easter ham or pineapple.

On another dimension, Chain Saw Louis could be even more profound. It was suggested to me that the fact that it is hacked with a chain saw could be a political statement on the state of furniture design or craftsmanship in the late twentieth century. Close examination of the piece reveals that this piece is not a random hack job, but an homage to its antique precedents. The fact that the piece appears unfinished (it actually has a sealer coat of flat lacquer) makes it more digestible to our design sensibilities. I believe if the piece was gilt, the gold would be all that an observer would be able to see, and would not be encouraged by our twentieth century biases to examine the piece much further.

The installation of the console also contributed to its abstract, conceptual interpretation. I sketched a background flat with a paintbrush in order to reinforce the piece's history as an integral, architectural piece of furniture. This gave the console an environment in which to be hung. I also did this because I was not permitted to drill holes into the walls of the gallery. If the background sketch was to remind the viewer of the original context of the console table in a French period room, the addition of a lavender switch plate in the lower left hand corner was intended to remind the viewer that this piece was made strictly in the twentieth century.

CHAPTER IV

LAS VEGAS LOUIS

During the construction of Chain Saw Louis, I was designing my third piece. I was showing a film on Pop Art when an idea came to me. We in the twentieth century have a false perception that Louis furniture is tacky. This conception probably owes more to the nouveau riche people who tend to collect this type of furniture, rather than to any careful, analytical observation of actual pieces. As I mentioned previously, when I was looking for a tacky French piece, I could not find it, for I understood its vocabulary. I thought of creating a piece to question this false perception and sought twentieth-century equivalents of poor taste. I believe Las Vegas epitomizes a great deal of that which is considered poor taste in our society.

The Post Modern architect, Robert Venturi, used the signboard philosophy of Las Vegas as a foundation for the conception of his buildings.[12] He felt that a false front could economically abbreviate the historical reference he was seeking to make in his architecture. It also contributed to the light-hearted spirit behind his works. I decided to also use a signboard approximation and create a *console de milieu* from the Louis XIV period (1660-1700) upon which to base my work. (Figure 9). The baroque, symmetrical forms characteristic of this period would work in my abstraction.

[12] Venturi, Rauch and Scott Brown: A Generation of Architecture (Urbana-Champaign, IL: The Museum, c.1984), 9,10.

Louis XIV pieces show curves and movement like Louis XV, but they still retain a squarish cross section that would be perfect for my plans.

I wanted Las Vegas Louis to light up like a Christmas tree! Instead of gilding the piece, I would translate the piece into a symbolic twentieth century object, a Las Vegas billboard. I decided the lights used on such signs, light emitting diodes (LEDs), would be an appropriate translation of gilding and carving.

There are many reasons why LEDs are used in signs: They have a long bulb life; they also have a good brightness; they do not take too much power to light; and they are relatively easy to wire. I chose to use red LED's because they are the brightest[13] .

The decision to use electronics in this piece forced me to do more preplanning in the design stage than I had ever done. Not only did I have to plan for the usual requirements of function and aesthetics, but I also had to accommodate 672 LEDs, their corresponding resistors and nearly two miles of twisted wire. This meant that the inside of this console would have to be hollow. Thus, every table component was comprised of two pieces, with the centers hollowed out to form a channel where the wires would run. I also made a provision in the event that something might go wrong with the wiring in the future, necessitating the piece be taken apart: I joined the parts with mechanical fastners. Using hardware as joinery reinforced the console's conception as a billboard representing Louis furniture.

I based Las Vegas Louis (Figure 10) upon a *console de milieu* from the Church of Saint-Jacques in Rheims, France. A console de milieu is free

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[13] Conversations with Donald Buss, Technician of Electrical Engineering, interviews by the author, January 1991-January 1992. Rochester Institute of Technology.

standing, as opposed to a console d'applique, which is fastened to the wall. All four sides of a console de milieu are decorated. As with the récamier, I streamlined the original to its elemental geometry, reducing the plastic ornament into a two dimensional billboard silhouette. For example, located at the center of the cross stretchers on the original console is a cassolette, or urn, that would frequently contain pot pourri to freshen the room. I abstracted this focal point into a paper doll cut out to reinforce the signboard mentality of the piece. Since red LEDs would provide the glitz and glamour, I decided to dye the piece yellow to remind the observer that these pieces were ordinarily gilt. The wood I used was maple because it was easily bleached and dyed.

Originally for the top I really wanted to inlay marbelized plastic laminate into a *piétra dura* pattern, for I think little in our society is considered more tasteless than Formica used in furniture. Piétra dura is an Italian technique of inlaying different kinds of stone into an elaborate pattern to serve as a table top. In my table, I chose to duplicate what I will call a sampler top: an arrangement of squares of different marbles. Unfortunately, the wiring of the table took so long I ran out of time and ended up marbelizing the pattern with paint.

It was not necessary for me to line the inside of the console with metal or conduit because LEDs use both low amperage and low voltage[14]. For example, a small incandescent light bulb uses 30-40 milliamps, while an LED uses only 8. Thus, five to ten times more power is needed to illumine a light

[14] The difference between amperage and voltage has often confused me. A useful anology is to assume electricity is your water meter at home. Volts are a measure of the amount of water pressure flowing through your pipes, the potential outflow. Amperes are the gallons of water that have actually flowed through the pipes. Power = (volts) (amps) = watts. In other words, watts are a total measurement of electricity, functioning like a water meter.

bulb. A small light bulb needs 12-28 volts to light, but an LED only 1.4 volts. I wanted the lights on Las Vegas Louis to flash and ordinary light bulbs would have drawn too much power and become hot with use.

The power source that converted 115 volts from the outlet into the 5 volts needed to drive the LEDs was placed in a metal box to safeguard people from electric shock. The power source was protected with a fuse to prevent an electrical fire. The power source was also grounded for safety.

The table was divided into four quadrants to divide the circuitry. It was simplest to make four sets of shift registers to get the effect I wanted, rather than to use only one register. The effect I was seeking was for the LEDs to start flashing at the bottom of the legs of the table and progress upward, ending in the middle of the aprons. (Figure 11 and Appendix C). The central stretcher would flash simultaneously with the legs. This meant that, at any given time, up to 4 LEDs could be on per circuit, a total of 16 LEDs. As it happened, the division of the table into four circuits helped us to trouble shoot, because it was possible to concentrate on one section of the table at a time to see how the LEDs were working.

This is how the table worked. (Refer to the circuit diagram in Appendix A.) Pressing the button under the table apron closed the switch and created a pulse in the one shot multivibrator. This pulse is simultaneously sent to the four circuits. Each circuit has eight 8-bit shift registers. The pulse is shifted in a serial fashion and fed through LEDs 1 through 8. Pin 13 sends the pulse to the next bit register, which in turn shifts through all of its eight positions sending the pulse on to the next bit register, etc. Finally at the last bit register, number 8, output #64 is sent back into the one shot multivibrator and starts the sequence over again.

A delay was built in after the last LED (#58) on the circuit because we used only 58 out of 64 possible outputs. This gave the human eye a break or pause to realize that the sequence was to begin again at the bottom of the leg. The timing of all the pulses was controlled by a 555 timer chip which generated a clock of 200-300 cycles, so there would be 3 pulses per second. The power source, the clock, the bits and wires are located under the top of the table.

Each position on a bit register had an amplifier to magnify the pulse so it could drive 4 LEDs at the same time. Each LED had a 430 ohm (Ω) resistor soldered to the lead wire to limit the current so we could use a 5 volt power supply. Without the resistor, the diode would burn out. The 430 Ω resistor limited the current to 8 milliamps.

Each LED had both its own lead and ground wire. If all the LEDs shared a common ground, that wire would have been 20 gauge, instead of the much thinner 30 gauge wire we used. The thicker wire would have been stiff and unwieldy to loop and bend itself through all the channels inside the table. Also, each LED would have to have been soldered in position as we were assembling the table, which would have been difficult. In addition, each LED having its own ground wire enabled the repair of broken LEDs. This way we could switch wires to share the ground with a neighboring LED if a line was shorted out.

Using two wires also meant that we did not have to have the LEDs' exact position figured out in advance. With 672 LEDs, this greatly eased assembly, even though we had to put in extra effort to twist nearly two miles of wire. We were able to solder all the lights to their resistors and wires in advance in assembly line fashion.

If I had known that Las Vegas Louis was going to take all this work from the outset, I certainly would have never built it. Many a late night in the studio, untangling a mass of wires almost made me throw up my hands and quit. It was my sheer stubborness and the cooperation of my friends that saw this project to its fruition.

Las Vegas Louis turned out to be not so tacky after all. Maybe this was due to the lack of the plastic laminate top I had originally planned. Perhaps my true feelings about the beauty of antique French furniture pervaded the piece. The flashing LEDs imbue the console with a mystical feeling. The progression of the lights across the table tend to twinkle rather than dazzle like a bill board. All the technology used to make this console illuminate is concealed within the table[15]. Perhaps this quieter mode is closer to the point. Louis XIV furniture is not so tacky after all.

[15] To further examine the technology that went into the circuitry of Las Vegas Louis, refer to Appendices A - I.

CHAPTER V
CONCLUSION

I am encouraged by the present trends in furniture to rediscover the designs and craftsmanship of the past and integrate them with modern attitudes. The Post Modern movement in architecture and furniture in the late twentieth century was among the first to look to the past for inspiration and adapt it for modern use. Classicism is their foundation. Some classical furniture artists, such as Richard Newman and Rick Wrigley, showcase the intricate techniques used in antique designs in their new furniture. They are modernizing and using these traditional processes before they are lost forever.

While I believe that the rediscovery and adaptation of old techniques is important, I tried to focus also on the translation into my work of the spirit behind antique furniture. The récamier explored the use of modern materials and techniques in its construction. Additionally, the finished work retains the classical mood of the French Empire.

Chain Saw Louis was a textural translation of a Louis XIV console. From a distance it appears to be a traditionally carved piece. Close examination reveals the rough texture of a chain saw. It is a modern approach to use a chain saw to create a piece of furniture. More than that, the movement and spirit of the original is somehow retained by the abstract carvings found in the new piece.

Las Vegas Louis translated the richly carved and gilded ornament of its precedent via a modern technology generally not used in furniture, that of electronics. The stately progression of flashing LEDs lends a spiritual, mysterious quality to a piece that was trying to be tasteless.

My attempt to translate specific examples of historic furniture into a modern veracular has made me aware of more than antique designs and techniques. I have also realized that antiques have an aura or spirit that greatly enhances a new piece. When these assets of historic furniture are combined with twentieth-century design practices, the result is satisfying. I believe I shall try to explore these qualities in my future work.

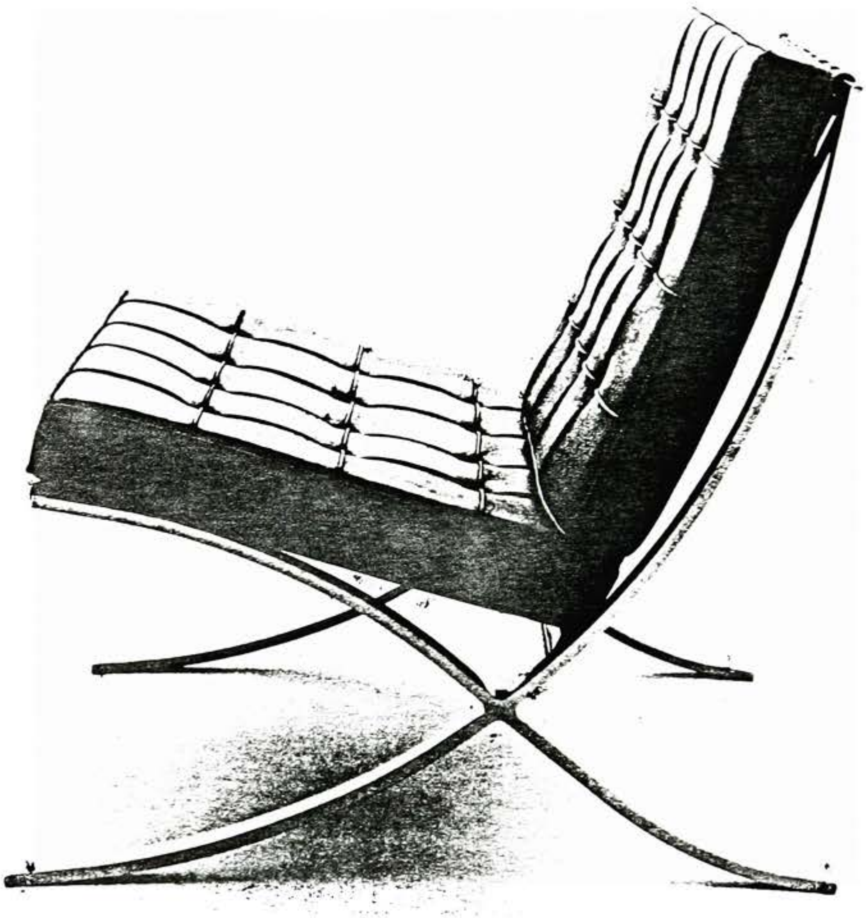


Figure 1. Ludwig Mies van der Rohe, Barcelona Chair, 1928, chrome plated steel, 29.5" x 29.5" x 30"h. Reprinted from Ludwig Mies van der Rohe: Furniture and Furniture Drawings, Museum of Modern Art (New York, 1977), 49.

Figure 2. Michael Thonet, Side chair for the Café Daum, 1849, laminated mahogany veneers. Collection Gebrüder Thonet AG. Reprinted from Christopher Wilk, Thonet: 150 Years of Furniture, Barron's Educational Series (Woodbury, NY, 1980), 19.

Figure 3. Sideboard, c.1860, oak, Margaret Woodbury Strong Museum, Rochester, NY. Reprinted from Oscar P. Fitzgerald, Three Centuries of American Furniture, Grammercy Publishing Company (New York, 1982), Figure XI-1.

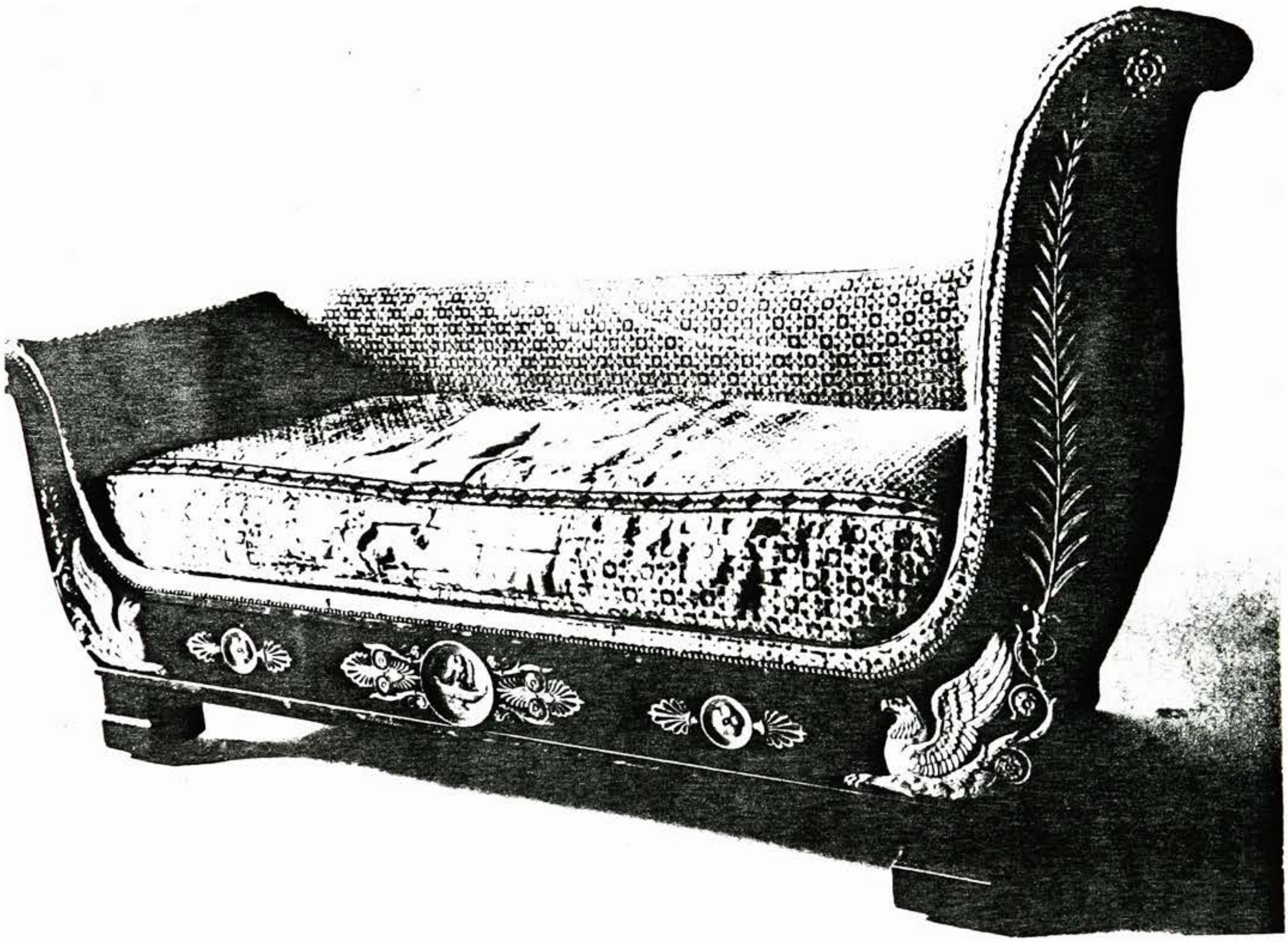


Figure 4. Jacob-Désmalter, Méridienne, 1806, mahogany and gilded bronze, 64" x 54" x 36"h, Fontainebleau. Reprinted from Serge Grandjean, Empire Furniture 1800 to 1825, Taplinger Publishing Co. (New York, 1966), illustration no. 36.

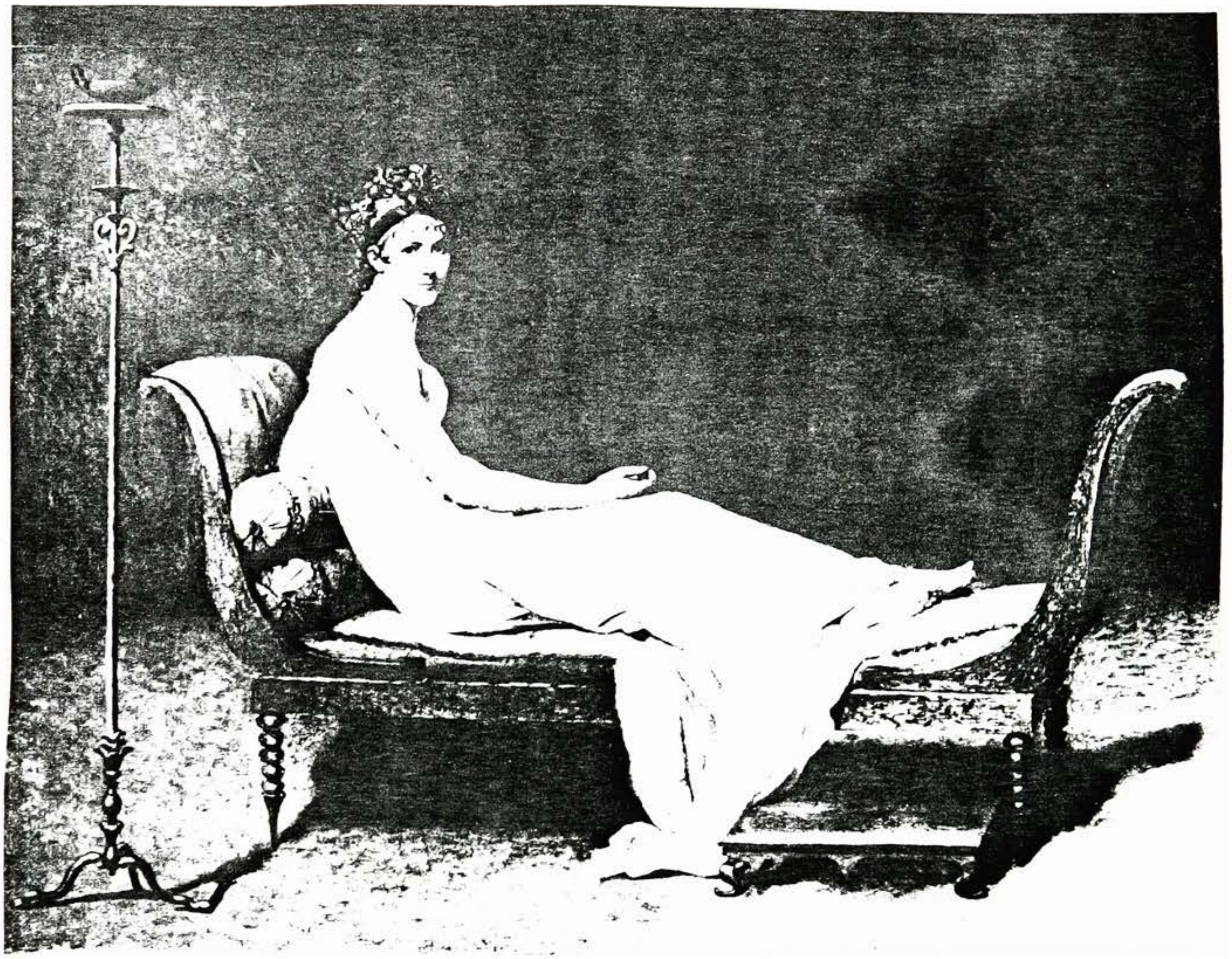


Figure 5. Jacques Louis David, Portrait of Madame Récamier, c. 1800, oil on canvas, 97.5" x 70", Musée du Louvre, Paris. Reprinted from Anita Brookner, Jacques Louis David, Harper & Row, Publishers (New York, 1980), illustration no. 71.

Figure 6. Stacey Smith, Récamier, 1990, reconstituted veneer, maple, 61" x 22" x 34.5"h, Collection of Larry and Dorothea Smith, Irvington, NY. Photograph by Hussey Photographic Arts.

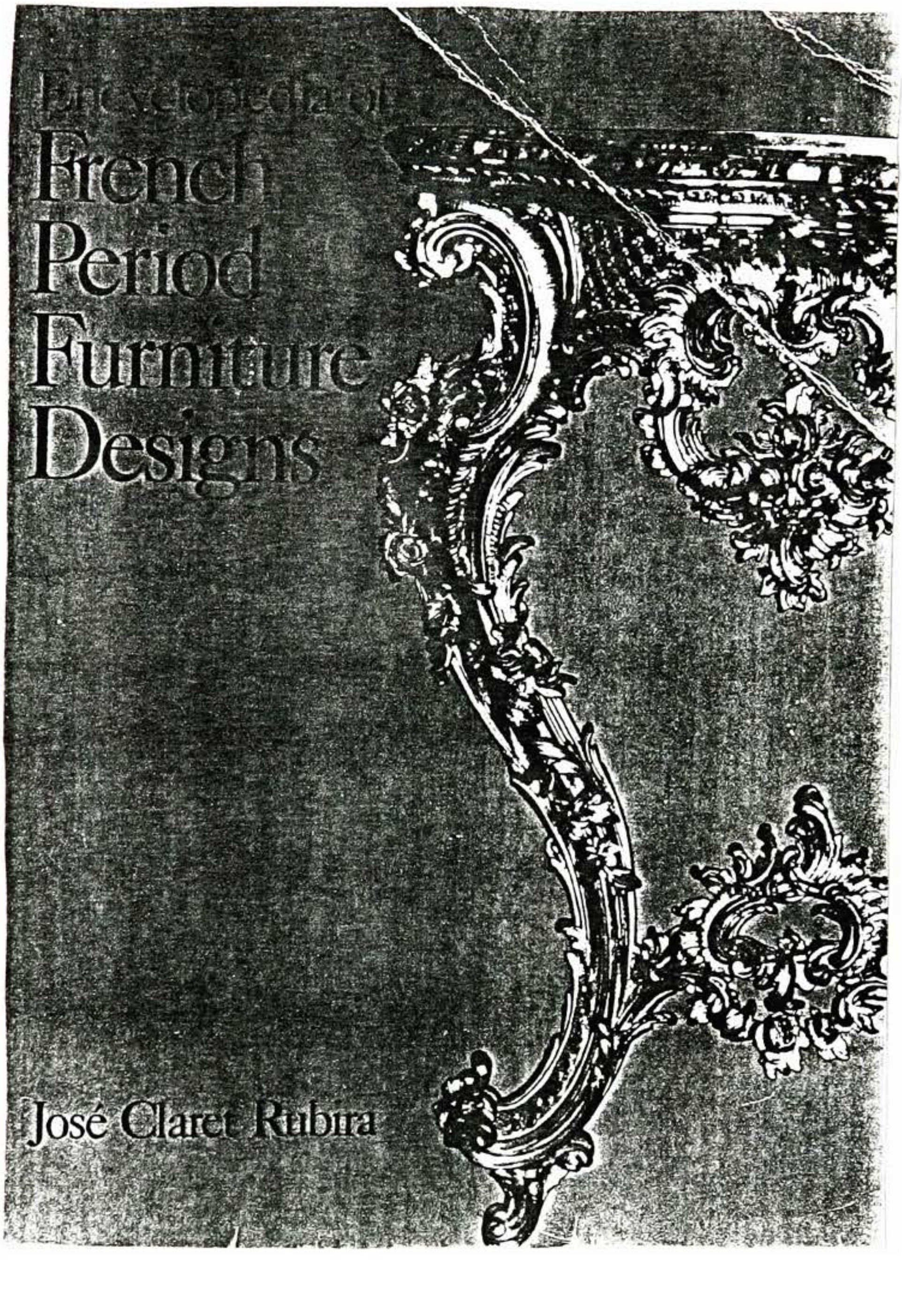


Figure 7. Console d'applique. Reprinted from José Claret Rubira, Encyclopedia of French Furniture Designs, Sterling Publishing Co. (New York, 1983), cover. Repeated attempts to get the exact specifications of the console from the publisher failed.

Figure 8. Stacey Smith, Chain Saw Louis, 1991, white ash, marbelized chip board, magic marker, 38" x 16" x 37"h, Collection of the artist. Photograph by Hussey Photographic Arts.

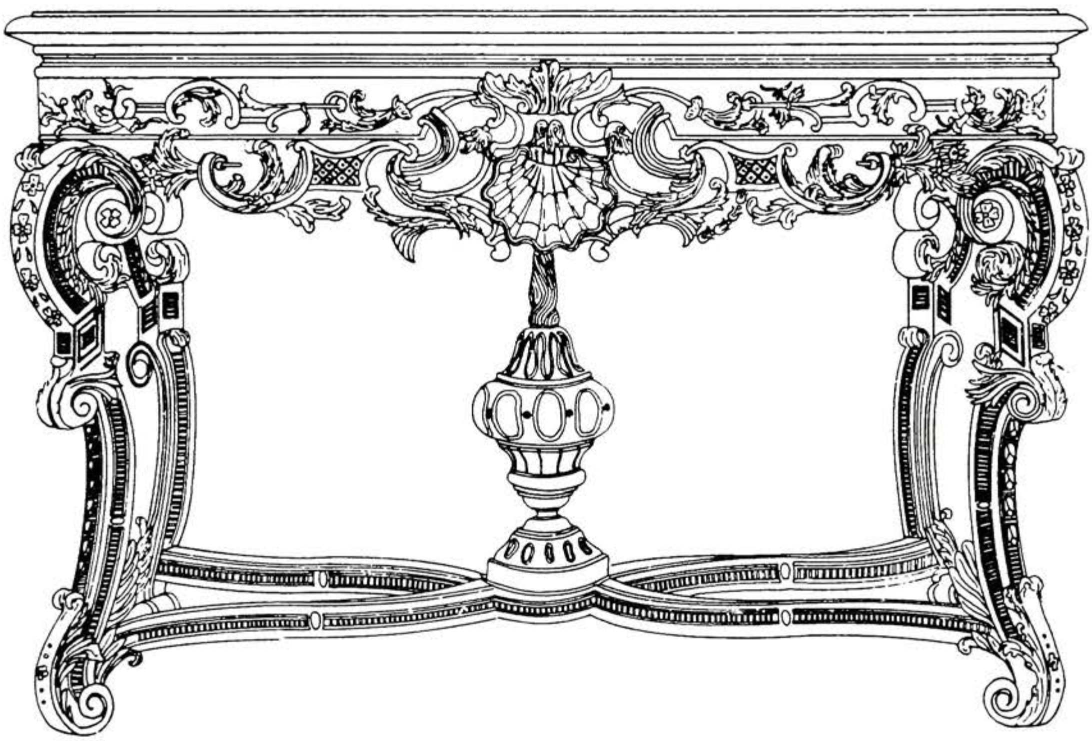


Figure 9. Consolé de milieu, Louis XIV, Church of Saint-Jaques, Rheims. Reprinted from José Claret Rubira, Encyclopedia of French Furniture Designs, Sterling Publishing Co. (New York, 1983), plate 79.

Figure 10. Stacey Smith, Las Vegas Louis, 1991, maple, marbelized chip board, 46" x 24" x 34"h, Collection of the artist. Photograph by Hussey Photographic Arts.

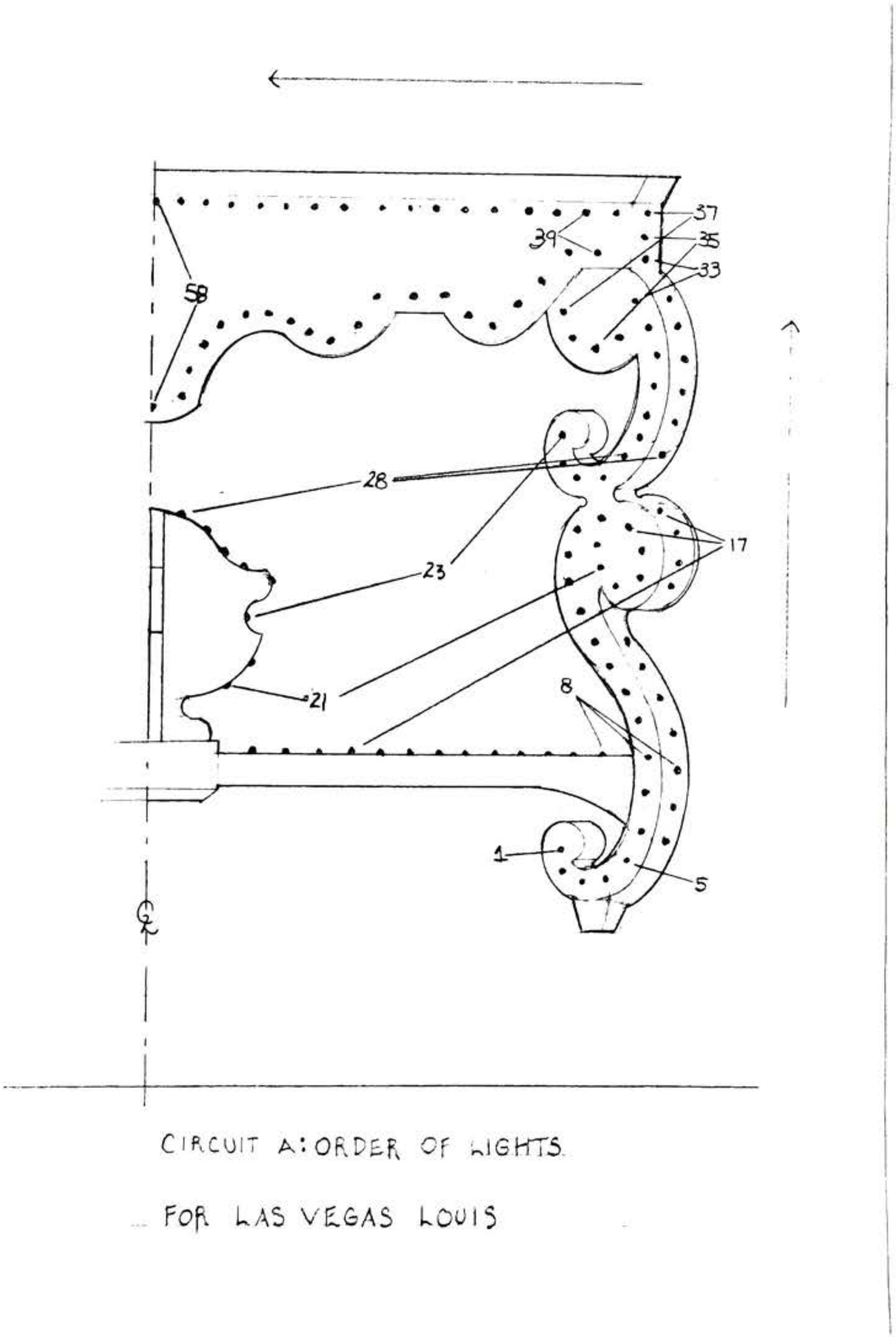


Figure 11. Stacey Smith, Order of Lights for Las Vegas Louis, 1991, pencil on vellum.

GLOSSARY

agrafe. An asymmetrical, decorative element located in the center of the cross stretchers of a Louis XV side-table.

cassolette. A perfume urn located in the center of the cross stretchers of a side-table. Made of wood or ceramic.

ciseleur. A maker of bronze chasing.

console d'applique. A side-table that is directly fastened to the wall.

console de milieu. A free standing side-table.

doreur. One who gilds.

ébéniste. A maker of veneered furniture.

fondeur. A maker of bronze mounts.

lozenge pattern. A cross-hatched decoration frequently located on the aprons of Louis XIV and Louis XV tables.

marqueteur. A maker of marquetry panels.

menusier. A maker of solid wood furniture.

méridienne. A couch with a back where the two ends (sides) are of different heights.

mokumé. Japanese metal working technique where metal is formed and rolled to simulate wood grain.

nut. An area of ornamentation located in the center of the cross stretchers of a table. Often a focal point.

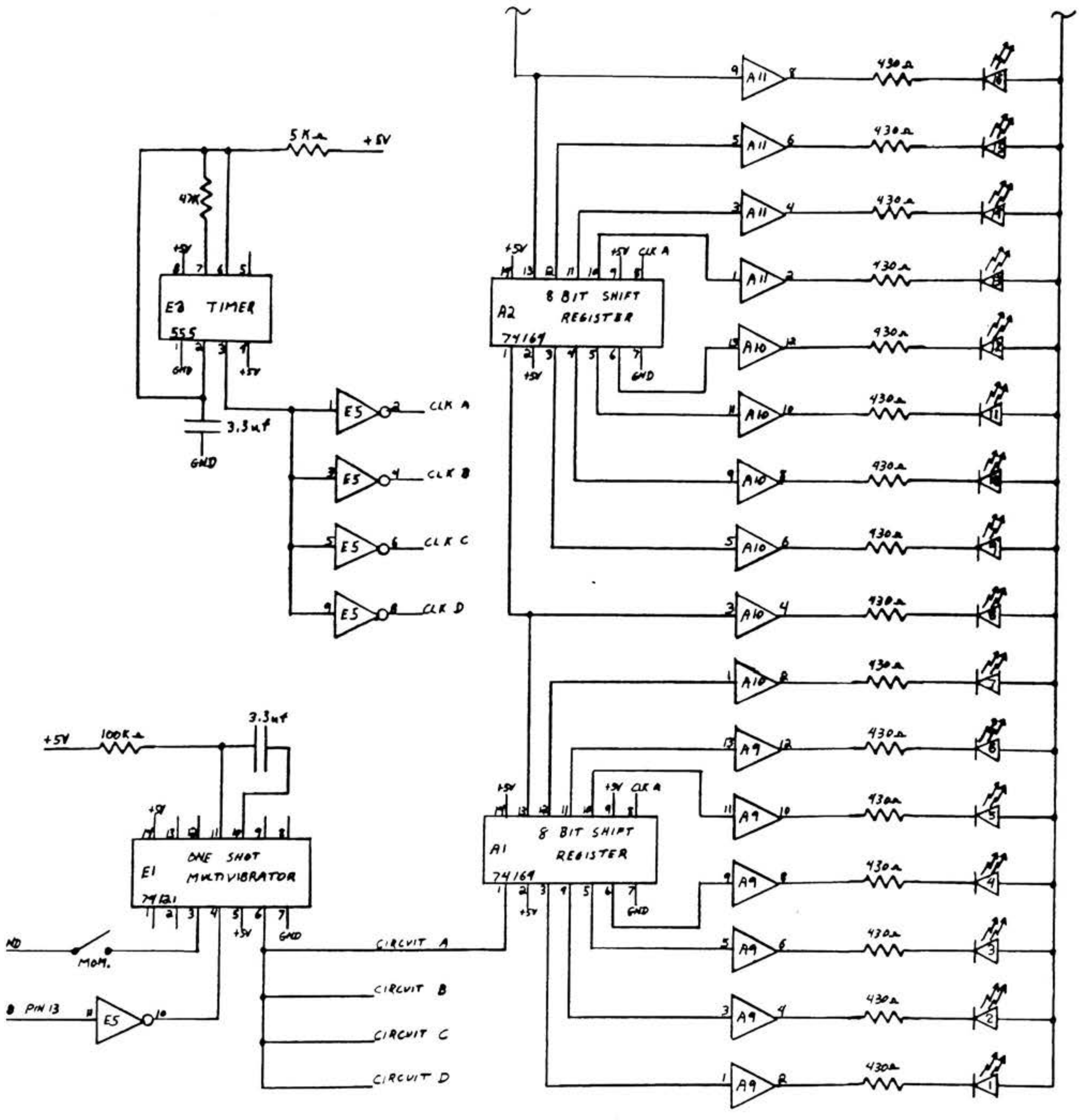
piéd-de-table. Technically, the carved wood understructure of a side-table which supports the top, usually made of marble.

piétra dura. An inlaid, decorative surface made with a variety of semiprecious stones perfected in Italy c.1600. Usually found in table tops.

récamier. A backless couch in which the sitter can recline as on a day bed.

rocaille. Form of Rococo decoration using abstractions of shells and rocks in its design.

vernisseur. One who lacquers.



APPENDIX A:
SCHEMATIC DIAGRAM FOR LAS VEGAS LOUIS
Drawing by Donald Buss.

WIRING LIST

FROM	TO	FROM	TO	FROM	TO
A1 - 3	A9 - 1	A9 - 2	LED # 1	A1 - 13	A2 - 1
4	3	4	2	A2 - 13	A3 - 1
5	5	6	3	A3 - 13	A4 - 1
6	9	8	4	A4 - 13	A5 - 1
10	11	10	5	A5 - 13	A6 - 1
11	13	12	6	A6 - 13	A7 - 1
12	A10 - 1	A10 - 2	7	A7 - 13	A8 - 1
13	3	4	8	A8 - 13	E5 - 11
A2 - 3	5	6	9		
4	9	8	10	A1 - 8	A2 - 8
5	11	10	11	A1 - 8	A3 - 8
6	13	12	12	A1 - 8	A4 - 8
10	A11 - 1	A11 - 2	13	A2 - 8	A5 - 8
11	3	4	14	A3 - 8	A6 - 8
12	5	6	15	A4 - 8	A7 - 8
13	9	8	16	A2 - 8	A8 - 8
A3 - 3	11	10	17		
4	13	12	18	E1 - 3	SWITCH - MOM. - 1
5	A12 - 1	A12 - 2	19	E1 - 7	SWITCH - MOM - 2
6	3	4	20	E1 - 4	E5 - 10
10	5	6	21	E1 - 6	A1 - 1
11	9	8	22	E1 - 10	E2 - 3
12	11	10	23	E1 - 11	E2 - 12
13	13	12	24	E1 - 11	E2 - 1
A4 - 3	A13 - 1	A13 - 2	25	E1 - 14	E2 - 14
4	3	4	26	E3 - 4	E3 - 8
5	5	6	27	E3 - 2	E3 - 6
6	9	8	28	E3 - 2	E4 - 3
10	11	10	29	E3 - 1	E4 - 12
11	13	12	30	E3 - 7	E4 - 2
12	A14 - 1	A14 - 2	31	E3 - 8	E4 - 13
13	3	4	32	E3 - 7	E4 - 1
A5 - 3	5	6	33	E3 - 2	E4 - 14
4	9	8	34	E3 - 3	E5 - 1
5	11	10	35	E3 - 3	E5 - 3
6	13	12	36	E3 - 3	E5 - 5
10	A15 - 1	A15 - 2	37	E3 - 3	E5 - 9
11	3	4	38	E1 - 6	B1 - 1
12	5	6	39	E1 - 6	C1 - 1
13	9	8	40	E1 - 6	D1 - 1

APPENDIX B:
WIRING LIST FOR LAS VEGAS LOUIS
Listed by Donald Buss

WIRING LIST

FROM	TO	FROM	TO	FROM	TO
A6 - 3	A15 - 11	A15 - 10	LED# 41	E5 - 2	A1 - 8
4	- 13	12	42	E5 - 4	B1 - 8
5	A16 - 1	A16 - 2	43	E5 - 6	C1 - 8
6	3	4	44	E5 - 8	D1 - 8
10	5	6	45		
11	9	8	46	A1 - 14	A1 - 2
12	11	10	47	A1 - 14	A1 - 9
13	13	12	48	A2 - 14	A2 - 2
A7 - 3	A17 - 1	A17 - 2	49	A2 - 14	A2 - 9
4	3	4	50	A3 - 14	A3 - 2
5	5	6	51	A3 - 14	A3 - 9
6	9	8	52	A4 - 14	A4 - 2
10	11	10	53	A4 - 14	A4 - 9
11	13	12	54	A5 - 14	A5 - 2
12	A18 - 1	A18 - 2	55	A5 - 14	A5 - 9
13	3	4	56	A6 - 14	A6 - 2
A8 - 3	5	6	57	A6 - 14	A6 - 9
4	9	8	58	A7 - 14	A7 - 2
				A7 - 14	A7 - 9
				A8 - 14	A8 - 2
				A8 - 14	A8 - 9

NOTES: #1 ALL SOCKETS ARE 16 PINS — ALL CHIPS ARE 14 PINS THEREFORE PINS 8, 9 ARE UNUSED AND PINS 10-16 ARE USED AS PINS 8-14

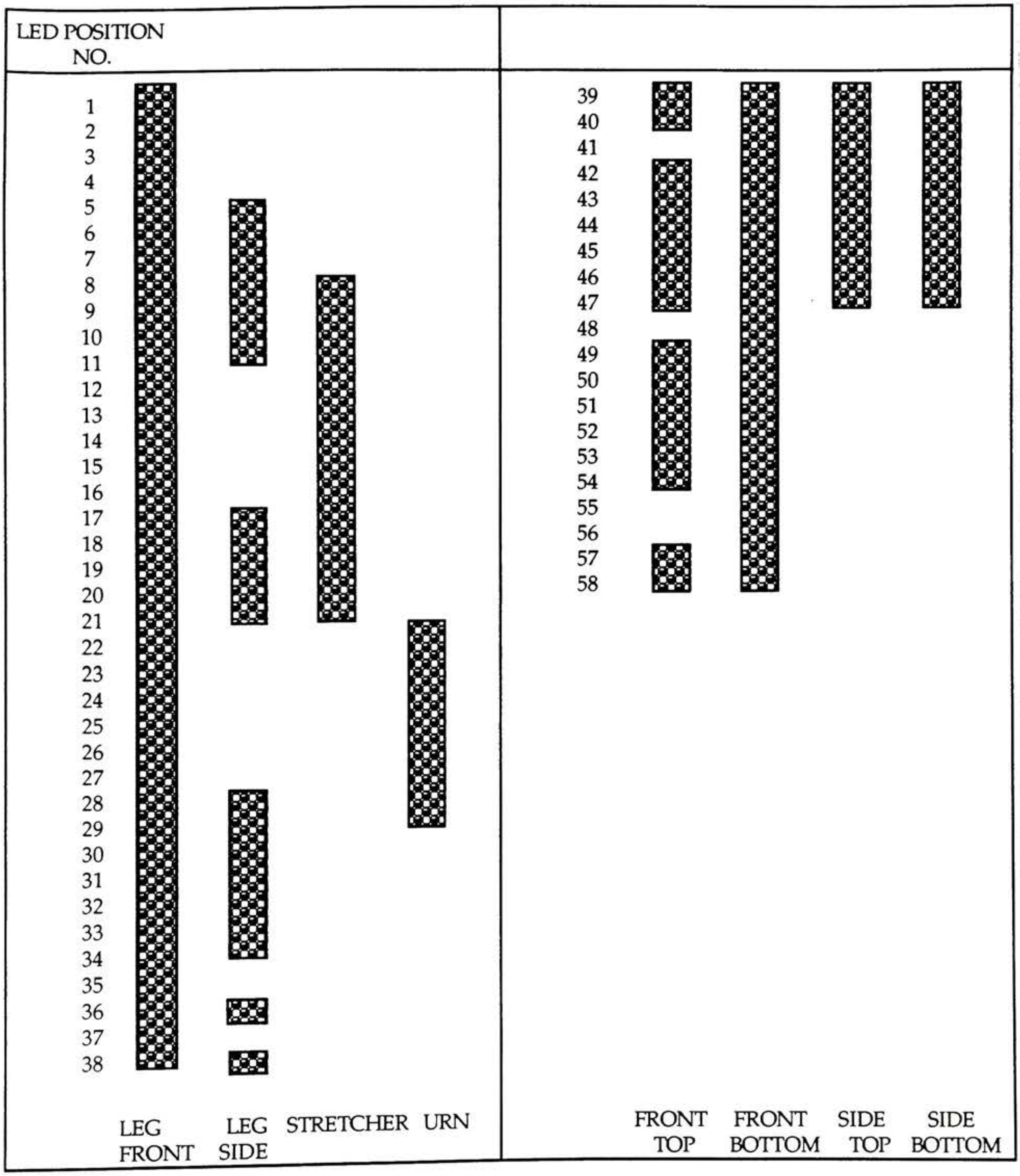
#2 ALL "A" CONNECTIONS ARE REPEATED ON B, C, D SECTIONS

#3 ALL CHIPS (EXCEPT E2, E3, E4) PIN A7 IS GND.
(E3 PIN 4, 8 → +5V PIN 1 → GND) PIN A14 IS +5V

#4 ATTACH A 430 Ω 1/4 W RESISTOR TO ALL LEDS.

#5 CHIPS

A1 → A8	74164	E1	74121	
B1 → B8	↓	E2	PIN 1 + 14	100K Ω
C1 → C8	↓	E2	PIN 3 + 12	3.3 uf
D1 → D8	↓	E3	72555	
A9 - A18	7407	E4	PIN 1 + 14	47K Ω
B9 - B18	↓	E4	PIN 2 + 13	5K Ω
C9 - C18	↓	E4	PIN 3 + 12	3.3 uf
D9 - D18	↓	E5	7404	



APPENDIX C:
SEQUENCE OF LED'S IN LAS VEGAS LOUIS

National Semiconductor

54LS164/DM54LS164/DM74LS164 8-Bit Serial In/Parallel Out Shift Registers

General Description

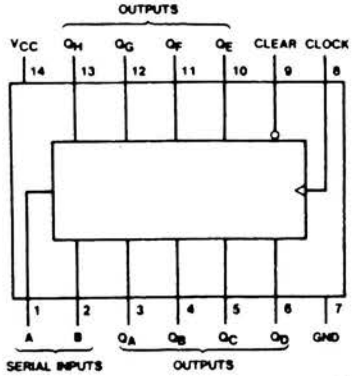
These 8-bit shift registers feature gated serial inputs and an asynchronous clear. A low logic level at either input inhibits entry of the new data, and resets the first flip-flop to the low level at the next clock pulse, thus providing complete control over incoming data. A high logic level on either input enables the other input, which will then determine the state of the first flip-flop. Data at the serial inputs may be changed while the clock is high or low, but only information meeting the setup and hold time requirements will be entered. Clocking occurs on the low-to-high level transition of the clock input. All inputs are diode-clamped to minimize transmission-line effects.

Features

- Gated (enable/disable) serial inputs
- Fully buffered clock and serial inputs
- Asynchronous clear
- Typical clock frequency 36 MHz
- Typical power dissipation 80 mW
- Alternate Military/Aerospace device (54LS164) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagram

Dual-In-Line Package



TL/F/6396-1

Order Number 54LS164DMQB, 54LS164FMQB, 54LS164LMQB, DM54LS164J, DM54LS164W, DM74LS164M or DM74LS164N
See NS Package Number E20A, J14A, M14A, N14A or W14B

Function Table

Inputs				Outputs			
Clear	Clock	A	B	Q_A	Q_B	...	Q_H
L	X	X	X	L	L	...	L
H	L	X	X	Q_{A0}	Q_{B0}	...	Q_{H0}
H	↑	H	H	H	Q_{An}	...	Q_{Gn}
H	↑	L	X	L	Q_{An}	...	Q_{Gn}
H	↑	X	L	L	Q_{An}	...	Q_{Gn}

H = High Level (steady state), L = Low Level (steady state)

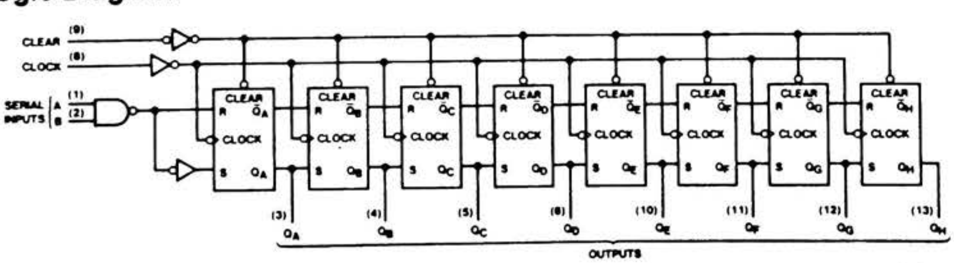
X = Don't Care (any input, including transitions)

↑ = Transition from low to high level

Q_{A0}, Q_{B0}, Q_{H0} = The level of Q_A, Q_B, or Q_H, respectively, before the indicated steady-state input conditions were established.

Q_{An}, Q_{Gn} = The level of Q_A or Q_G before the most recent ↑ transition of the clock; indicates a one-bit shift.

Logic Diagram



TL/F/6396-2

APPENDIX D:
8-BIT SERIAL IN/PARALLEL OUT SHIFT REGISTERS
Reprinted from National Semiconductor Logic Databook, National Semiconductor Corp., Santa Clara, CA, 1989, 2-188 - 2-190.

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54LS and 54LS	−55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" tables will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter		DM54LS164 Min	DM54LS164 Nom	DM54LS164 Max	DM74LS164 Min	DM74LS164 Nom	DM74LS164 Max	Units
V_{CC}	Supply Voltage		4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage		2			2			V
V_{IL}	Low Level Input Voltage				0.7			0.8	V
I_{OH}	High Level Output Current				−0.4			−0.4	mA
I_{OL}	Low Level Output Current				4			8	mA
f_{CLK}	Clock Frequency (Note 4)		0		25	0		25	MHz
t_W	Pulse Width (Note 4)	Clock	20			20			ns
		Clear	20			20			ns
t_{SU}	Data Setup Time (Note 4)		17			17			ns
t_H	Data Hold Time (Note 4)		5			5			ns
t_{REL}	Clear Release Time (Note 4)		30			30			ns
T_A	Free Air Operating Temperature		−55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max, V_{IL} = Max, V_{IH} = Min	DM54	2.5	3.4		V
			DM74	2.7	3.4		
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, V_{IL} = Max, V_{IH} = Min	DM54		0.25	0.4	V
			DM74		0.35	0.5	
		I_{OL} = 4 mA, V_{CC} = Min	DM74		0.25	0.4	
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 7V				0.1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V				20	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V				−0.4	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	DM54	−20		−100	mA
			DM74	−20		−100	
I_{CC}	Supply Current	V_{CC} = Max (Note 3)			16	27	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

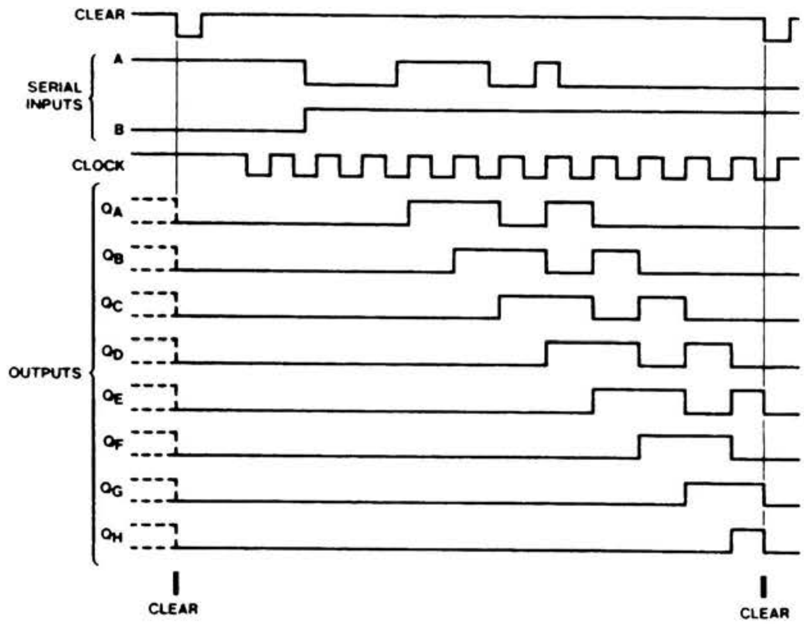
Note 3: I_{CC} is measured with all outputs open, the SERIAL input grounded, the CLOCK input at 2.4V, and a momentary ground, then 4.5V, applied to the CLEAR input.

Note 4: T_A = 25°C and V_{CC} = 5V.

Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	R_L = 2 kΩ				Units
			C_L = 15 pF		C_L = 50 pF		
			Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency		25				MHz
t_{PLH}	Propagation Delay Time Low to High Level Output	Clock to Output		27		30	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clock to Output		32		40	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clear to Output		36		45	ns

Timing Diagram



TL/F/6396-3

National Semiconductor

5404/DM5404/DM7404
Hex Inverting Gates

General Description

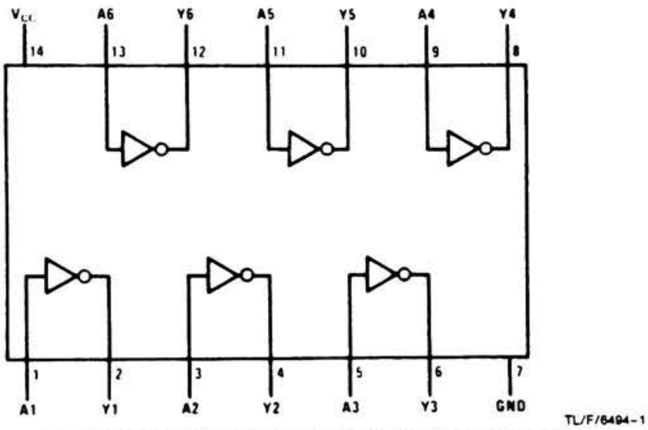
This device contains six independent gates each of which performs the logic INVERT function.

Features

- Alternate Military/Aerospace device (5404) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagram

Dual-In-Line Package



Order Number 5404DMQB, 5404FMQB, DM5404J, DM5404W, DM7404M or DM7404N
See NS Package Number J14A, M14A, N14A or W14B

Function Table

$Y = \overline{A}$

Inputs	Output
A	Y
L	H
H	L

H = High Logic Level
L = Low Logic Level

APPENDIX E:
HEX INVERTING GATES
Reprinted from National Semiconductor Logic Databook, National Semiconductor Corp., Santa Clara, CA, 1989, 4-11 - 4-12.

Ab

If Mi ... quired, plea ... ctor Sales Offi ... ions.

Sup	7V
Inpu	5.5V
Ope	
D	+125°C
D	+70°C
Stc	−150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Re ... itions

Sym		DM5404			DM7404			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}		4.5	5	5.5	4.75	5	5.25	V
V_{IH}		2			2			V
V_{IL}				0.8			0.8	V
I_{OH}				−0.4			−0.4	mA
I_{OL}				16			16	mA
T_A		−55		125	0		70	°C

El

over ... ge (unless otherwise noted)

Sym		nditions		Min	Typ (Note 1)	Max	Units
V_I		I_I = −12 mA				−1.5	V
V_{OH}		Min, I_{OH} = ... Max		2.4	3.4		V
V_{OL}	V	Min, I_{OL} = Max ... Min			0.2	0.4	V
I_I	V_C	Max, V_I = 5.5V				1	mA
I_{IH}		Max, V_I = 2.4V				40	μA
I_{IL}		Max, V_I = 0.4V				−1.6	mA
I_{OS}		Max	DM54	−20		−55	mA
		)	DM74	−18		−55	
I_{CCH}		Max			6	12	mA
I_{CCL}		Max			18	33	mA

Sw

5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

S	Conditions	Min	Max	Units
t_P	C_L = 15 pF R_L = 400Ω		22	ns
t_P			15	ns

Note

Note

National Semiconductor

DM5407/DM7407 Hex Buffers with High Voltage Open-Collector Outputs

General Description

This device contains six independent gates each of which performs a buffer function. The open-collector outputs require external pull-up resistors for proper logical operation.

Pull-Up Resistor Equations

$$R_{MAX} = \frac{V_O\,(\text{Min}) - V_{OH}}{N_1\,(I_{OH}) + N_2\,(I_{IH})}$$

$$R_{MIN} = \frac{V_O\,(\text{Max}) - V_{OL}}{I_{OL} - N_3\,(I_{IL})}$$

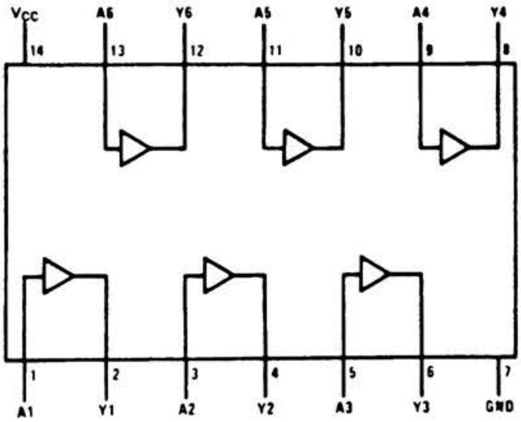
Where: $N_1\,(I_{OH})$ = total maximum output high current for all outputs tied to pull-up resistor

$N_2\,(I_{IH})$ = total maximum input high current for all inputs tied to pull-up resistor

$N_3\,(I_{IL})$ = total maximum input low current for all inputs tied to pull-up resistor

Connection Diagram

Dual-In-Line Package



TL/F/6497-1

Order Number DM5407J, DM5407W, DM7407M or DM7407N
See NS Package Number J14A, M14A, N14A or W14B

Function Table

Y = A

Input	Output
A	Y
L	L
H	H

H = High Logic Level
L = Low Logic Level

APPENDIX F:
HEX BUFFERS WITH HIGH VOLTAGE OPEN-COLLECTOR OUTPUTS
Reprinted from National Semiconductor Logic Databook, National Semiconductor Corp., Santa Clara, CA, 1989, 4-17 - 4-18.

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Output Voltage	30V
Operating Free Air Temperature Range	
DM54	−55°C to +125°C
DM74	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter	DM5407			DM7407			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage	2			2			V
V_{IL}	Low Level Input Voltage			0.8			0.8	V
V_{OH}	High Level Output Voltage			30			30	V
I_{OL}	Low Level Output Current			30			40	mA
T_A	Free Air Operating Temperature	−55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −12 mA			−1.5	V
I_{CEX}	High Level Output Current	V_{CC} = Min, V_O = 30V V_{IH} = Min			250	μA
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max V_{IL} = Max			0.7	V
		I_{OL} = 16 mA, V_{CC} = Min			0.4	
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 5.5V			1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.4V			40	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V			−1.6	mA
I_{CCH}	Supply Current with Outputs High	V_{CC} = Max		29	41	mA
I_{CCL}	Supply Current with Outputs Low	V_{CC} = Max		21	30	mA

Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	Conditions	Min	Max	Units
t_{PLH}	Propagation Delay Time Low to High Level Output	C_L = 15 pF R_L = 110Ω		10	ns
t_{PHL}	Propagation Delay Time High to Low Level Output			30	ns

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

National Semiconductor

54121/DM54121/DM74121 One-Shot with Clear and Complementary Outputs

General Description

The DM54/74121 is a monostable multivibrator featuring both positive and negative edge triggering with complementary outputs. An internal 2kΩ timing resistor is provided for design convenience minimizing component count and layout problems. This device can be used with a single external capacitor. Inputs (A) are active-low trigger transition inputs and input (B) is an active-high transition Schmitt-trigger input that allows jitter-free triggering from inputs with transition rates as slow as 1 volt/second. A high immunity to V_{CC} noise of typically 1.5V is also provided by internal circuitry at the input stage.

To obtain optimum and trouble free operation please read operating rules and NSC one-shot application notes carefully and observe recommendations.

Features

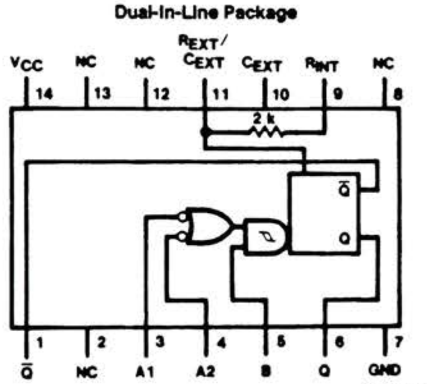
- Triggered from active-high transition or active-low transition inputs
- Variable pulse width from 30 ns to 28 seconds
- Jitter free Schmitt-trigger input
- Excellent noise immunity typically 1.2V
- Stable pulse width up to 90% duty cycle
- TTL, DTL compatible
- Compensated for V_{CC} and temperature variations
- Input clamp diodes
- Alternate Military/Aerospace device (54121) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Functional Description

The basic output pulse width is determined by selection of an internal resistor R_{INT} or an external resistor (R_X) and capacitor (C_X). Once triggered the output pulse width is independent of further transitions of the inputs and is a function of the timing components. Pulse width can vary from a few nano-seconds to 28 seconds by choosing appropriate R_X and C_X combinations. There are three trigger inputs from the device, two negative edge-triggering (A) inputs, one positive edge Schmitt-triggering (B) input.

Connection Diagram

Dual-In-Line Package



TL/F/6538-1

Order Number 54121DMQB, 54121FMQB, DM54121J, DM54121W or DM74121N
See NS Package Number J14A, N14A or W14B

Function Table

Inputs			Outputs	
A1	A2	B	Q	Q̄
L	X	H	L	H
X	L	H	L	H
X	X	L	L	H
H	H	X	L	H
H	↓	H	⊓	⊔
↓	H	H	⊓	⊔
↓	↓	H	⊓	⊔
L	X	↑	⊓	⊔
X	L	↑	⊓	⊔

H = High Logic Level
L = Low Logic Level
X = Can Be Either Low or High
↑ = Positive Going Transition
↓ = Negative Going Transition
⊓ = A Positive Pulse
⊔ = A Negative Pulse

APPENDIX G:
ONE SHOT WITH CLEAR AND COMPLEMENTARY OUTPUTS
Reprinted from National Semiconductor Logic Databook, National Semiconductor Corp., Santa Clara, CA, 1989, 4-116 - 4-119.

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
DM54	−55°C to +125°C
DM74	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter		DM54121			DM74121			Units
			Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage		4.5	5	5.5	4.75	5	5.25	V
V_{T+}	Positive-Going Input Threshold Voltage at the A Input (V_{CC} = Min)			1.4	2		1.4	2	V
V_{T-}	Negative-Going Input Threshold Voltage at the A Input (V_{CC} = Min)		0.8	1.4		0.8	1.4		V
V_{T+}	Positive-Going Input Threshold Voltage at the B Input (V_{CC} = Min)			1.5	2		1.5	2	V
V_{T-}	Negative-Going Input Threshold Voltage at the B Input (V_{CC} = Min)		0.8	1.3		0.8	1.3		V
I_{OH}	High Level Output Current				−0.4			−0.4	mA
I_{OL}	Low Level Output Current				16			16	mA
t_W	Input Pulse Width (Note 1)		40			40			ns
dV/dt	Rate of Rise or Fall of Schmidt Input (B) (Note 1)				1			1	V/s
dV/dt	Rate of Rise or Fall of Logic Input (A) (Note 1)				1			1	V/μs
R_{EXT}	External Timing Resistor (Note 1)		1.4		30	1.4		40	kΩ
C_{EXT}	External Timing Capacitance (Note 1)		0		1000	0		1000	μF
DC	Duty Cycle (Note 1)	R_T = 2 kΩ			67			67	%
		R_T = R_{EXT} (Max)			90			90	
T_A	Free Air Operating Temperature		−55		125	0		70	°C

Note 1: T_A = 25°C and V_{CC} = 5V.

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −12 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max, V_{IL} = Max, V_{IH} = Min		2.4	3.4		V
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, V_{IH} = Min, V_{IL} = Max			0.2	0.4	V
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 5.5V				1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.4V	A1, A2			40	μA
			B			80	
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V	A1, A2			−1.6	mA
			B			−3.2	
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	DM54	−20		−55	mA
			DM74	−18		−55	
I_{CC}	Supply Current	V_{CC} = Max	Quiescent		13	25	mA
			Triggered		23	40	

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.

Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Outout Load)

Symbol	Parameter	From (Input) To (Output)	Conditions	Min	Max	Units
t_{PLH}	Propagation Delay Time Low to High Level Output	A1, A2 to Q	C_{EXT} = 80 pF R_{INT} to V_{CC} C_L = 15 pF R_L = 400Ω		70	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	B to Q			55	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	A1, A2 to $\overline{Q}$			80	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	B to $\overline{Q}$			65	ns
$t_{W(OUT)}$	Output Pulse Width Using the Internal Timing Resistor	A1, A2 or B to Q, $\overline{Q}$	C_{EXT} = 80 pF R_{INT} to V_{CC} R_L = 400Ω C_L = 15 pF	70	150	ns
$t_{W(OUT)}$	Output Pulse Width Using Zero Timing Capacitance	A1, A2 to Q, $\overline{Q}$	C_{EXT} = 0 pF R_{INT} to V_{CC} R_L = 400Ω C_L = 15 pF		50	ns
$t_{W(OUT)}$	Output Pulse Width Using External Timing Resistor	A1, A2 to Q, $\overline{Q}$	C_{EXT} = 100 pF R_{INT} = 10 kΩ R_L = 400Ω C_L = 15 pF	600	800	ns
		A1, A2 to Q, $\overline{Q}$	C_{EXT} = 1 μF R_{INT} = 10 kΩ R_L = 400Ω C_L = 15 pF	6	8	ms

Operating Rules

1. To use the internal 2 kΩ timing resistor, connect the R_{INT} pin to V_{CC}.
2. An external resistor (R_X) or the internal resistor (2 kΩ) and an external capacitor (C_X) are required for proper operation. The value of C_X may vary from 0 to any necessary value. For small time constants use high-quality mica, glass, polypropylene, polycarbonate, or polystyrene capacitors. For large time constants use solid tantalum or special aluminum capacitors. If the timing capacitors have leakages approaching 100 nA or if stray capacitance from either terminal to ground is greater than 50 pF the timing equations may not represent the pulse width the device generates.
3. The pulse width is essentially determined by external timing components R_X and C_X. For C_X < 1000 pF see *Figure 1* design curves on T_W as function of timing components value. For C_X > 1000 pF the output is defined as:

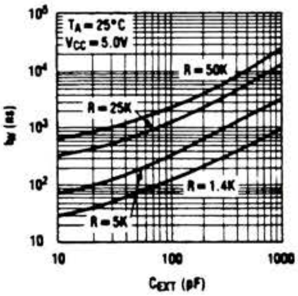
   $t_W = K R_X C_X$

   where [R_X is in Kilo-ohm]

   [C_X is in pico Farad]

   [T_W is in nano second]

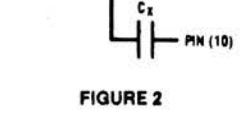
   [$K \approx 0.7$]



TL/F/6538-2

FIGURE 1

4. If C_X is an electrolytic capacitor a switching diode is often required for standard TTL one-shots to prevent high inverse leakage current *(Figure 2)*.

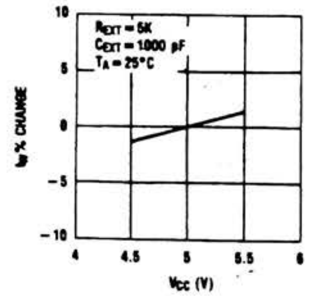


TL/F/6538-3

FIGURE 2

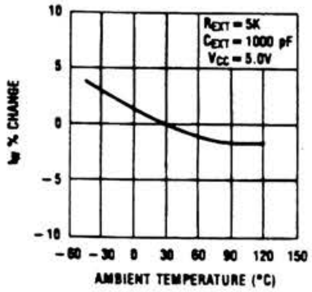
Operating Rules (Continued)

5. Output pulse width versus V_{CC} and operation temperatures: *Figure 3* depicts the relationship between pulse width variation versus V_{CC}. *Figure 4* depicts pulse width variation versus ambient temperature.



TL/F/6538-4

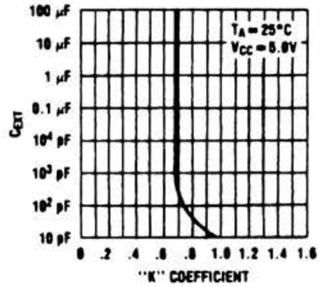
FIGURE 3



TL/F/6538-5

FIGURE 4

6. The "K" coefficient is not a constant, but varies as a function of the timing capacitor C_X. *Figure 5* details this characteristic.



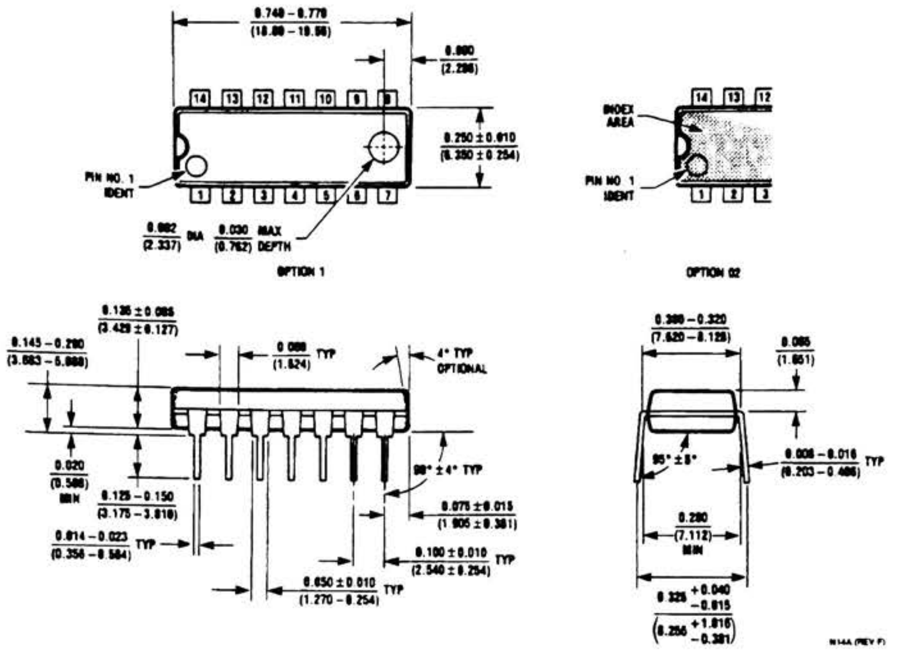
TL/F/6538-6

FIGURE 5

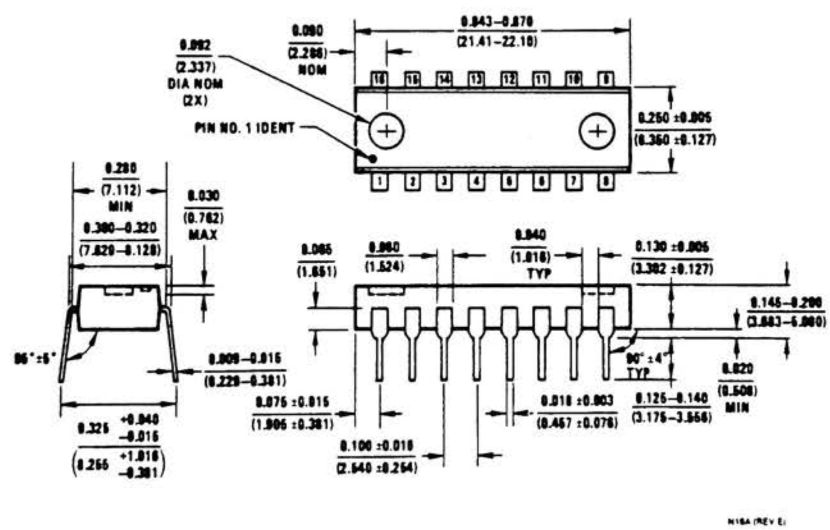
7. Under any operating condition C_X and R_X must be kept as close to the one-shot device pins as possible to minimize stray capacitance, to reduce noise pick-up, and to reduce I × R and Ldi/dt voltage developed along their connecting paths. If the lead length from C_X to pins (10) and (11) is greater than 3 cm, for example, the output pulse width might be quite different from values predicted from the appropriate equations. A non-inductive and low capacitive path is necessary to ensure complete discharge of C_X in each cycle of its operation so that the output pulse width will be accurate.
8. V_{CC} and ground wiring should conform to good high-frequency standards and practices so that switching transients on the V_{CC} and ground return leads do not cause interaction between one-shots. A 0.01 µF to 0.10 µF bypass capacitor (disk ceramic or monolithic type) from V_{CC} to ground is necessary on each device. Furthermore, the bypass capacitor should be located as close to the V_{CC}-pin as space permits.

For further detailed device characteristics and output performance please refer to the NSC one-shot application note, AN-366.

14 Lead Molded Dual-In-Line Package (N)
NS Package Number N14A



16 Lead Molded Dual-In-Line Package (N)
NS Package Number N16A



APPENDIX H:
LEAD MOLDED DUAL-IN-LINE PACKAGE
Reprinted from <u>National Semiconductor Logic Databook</u>, National Semiconductor Corp., Santa Clara, CA, 1989, 6-9.

LM555/LM555C Timer

General Description

The LM555 is a highly stable device for generating accurate time delays or oscillation. Additional terminals are provided for triggering or resetting if desired. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For astable operation as an oscillator, the free running frequency and duty cycle are accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on falling waveforms, and the output circuit can source or sink up to 200 mA or drive TTL circuits.

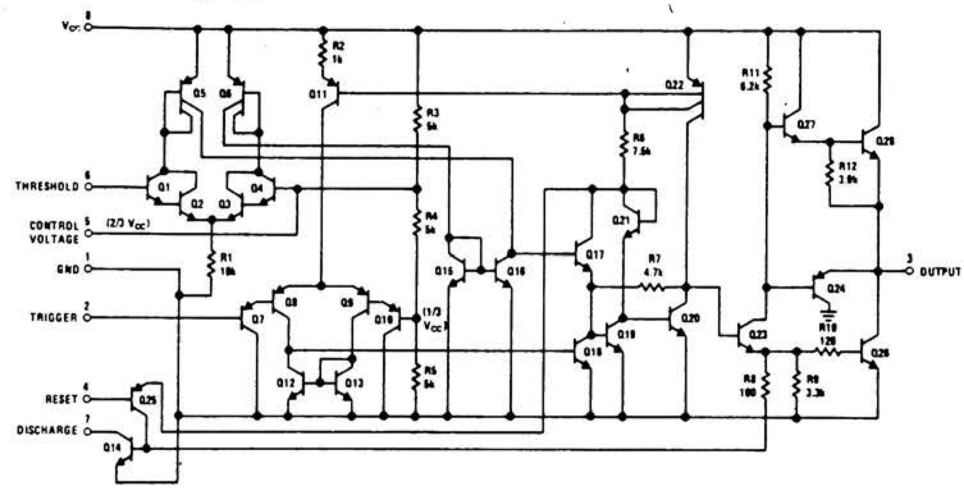
Features

- Direct replacement for SE555/NE555
- Timing from microseconds through hours
- Operates in both astable and monostable modes
- Adjustable duty cycle
- Output can source or sink 200 mA
- Output and supply TTL compatible
- Temperature stability better than 0.005% per °C
- Normally on and normally off output

Applications

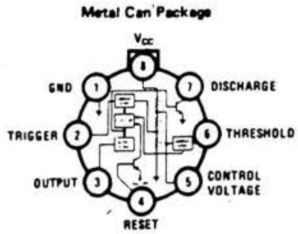
- Precision timing
- Pulse generation
- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Linear ramp generator

Schematic Diagram



Connection Diagrams

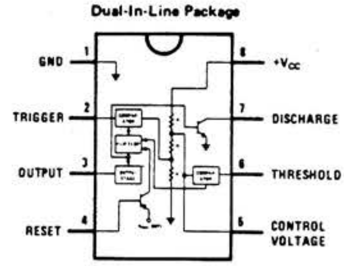
Metal Can Package



TOP VIEW

Order Number LM555H, LM555CH
See NS Package H08C

Dual-In-Line Package



TOP VIEW

Order Number LM555CN
See NS Package N08B
Order Number LM555J or LM555CJ
See NS Package J08A

APPENDIX I:
LM555/LM555C TIMER

Reprinted from National Semiconductor Logic Databook, National Semiconductor Corp., Santa Clara, CA, 1989, 9-33 - 9-38.

Absolute Maximum Ratings

Supply Voltage	+18V
Power Dissipation (Note 1)	600 mW
Operating Temperature Ranges	
LM555C	0°C to +70°C
LM555	−55°C to +125°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 10 seconds)	300°C

Electrical Characteristics (T_A = 25°C, V_{CC} = +5V to +15V, unless otherwise specified)

PARAMETER	CONDITIONS	LIMITS						UNITS
		LM555			LM555C			
		MIN	TYP	MAX	MIN	TYP	MAX	
Supply Voltage		4.5		18	4.5		16	V
Supply Current	V_{CC} = 5V, R_L = ∞		3	5		3	6	mA
	V_{CC} = 15V, R_L = ∞ (Low State) (Note 2)		10	12		10	15	mA
Timing Error, Monostable								
Initial Accuracy			0.5			1		%
Drift with Temperature	R_A, R_B = 1k to 100 k, C = 0.1µF, (Note 3)		30			50		ppm/°C
Accuracy over Temperature			1.5			1.5		%
Drift with Supply			0.05			0.1		%/V
Timing Error, Astable								
Initial Accuracy			1.5			2.25		%
Drift with Temperature			90			150		ppm/°C
Accuracy over Temperature			2.5			3.0		%
Drift with Supply			0.15			0.30		%/V
Threshold Voltage			0.667			0.667		x V_{CC}
Trigger Voltage	V_{CC} = 15V	4.8	5	5.2		5		V
	V_{CC} = 5V	1.45	1.67	1.9		1.67		V
Trigger Current			0.01	0.5		0.5	0.9	µA
Reset Voltage		0.4	0.5	1	0.4	0.5	1	V
Reset Current			0.1	0.4		0.1	0.4	mA
Threshold Current	(Note 4)		0.1	0.25		0.1	0.25	µA
Control Voltage Level	V_{CC} = 15V	9.6	10	10.4	9	10	11	V
	V_{CC} = 5V	2.9	3.33	3.8	2.6	3.33	4	V
Pin 7 Leakage Output High			1	100		1	100	nA
Pin 7 Sat (Note 5)								
Output Low	V_{CC} = 15V, I_7 = 15 mA		150			180	[illegible]	mV
Output Low	V_{CC} = 4.5V, I_7 = 4.5 mA		70	100		80	200	mV
Output Voltage Drop (Low)	V_{CC} = 15V							
	I_{SINK} = 10 mA		0.1	0.15		0.1	0.25	V
	I_{SINK} = 50 mA		0.4	0.5		0.4	0.75	V
	I_{SINK} = 100 mA		2	2.2		2	2.5	V
	I_{SINK} = 200 mA		2.5			2.5		V
	V_{CC} = 5V							
	I_{SINK} = 8 mA		0.1	0.25				V
	I_{SINK} = 5 mA					0.25	0.35	V
Output Voltage Drop (High)	I_{SOURCE} = 200 mA, V_{CC} = 15V		12.5			12.5		V
	I_{SOURCE} = 100 mA, V_{CC} = 15V	13	13.3		12.75	13.3		V
	V_{CC} = 5V	3	3.3		2.75	3.3		V
Rise Time of Output			100			100		ns
Fall Time of Output			100			100		ns

Note 1: For operating at elevated temperatures the device must be derated based on a +150°C maximum junction temperature and a thermal resistance of +45°C/W junction to case for TO-5 and +150°C/W junction to ambient for both packages.

Note 2: Supply current when output high typically 1 mA less at V_{CC} = 5V.

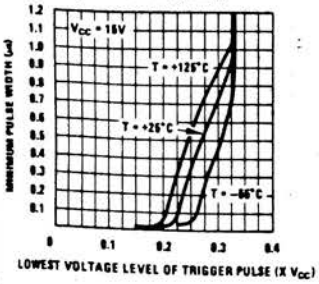
Note 3: Tested at V_{CC} = 5V and V_{CC} = 15V.

Note 4: This will determine the maximum value of $R_A + R_B$ for 15V operation. The maximum total ($R_A + R_B$) is 20 MΩ.

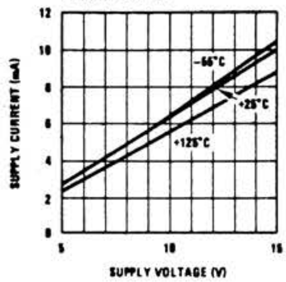
Note 5: No protection against excessive pin 7 current is necessary providing the package dissipation rating will not be exceeded.

Typical Performance Characteristics

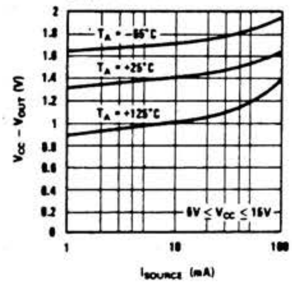
Minimum Pulse Width Required for Triggering



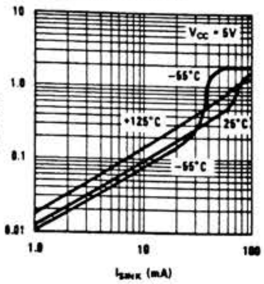
Supply Current vs Supply Voltage



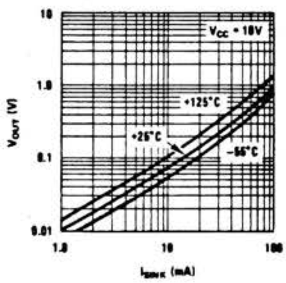
High Output Voltage vs Output Source Current



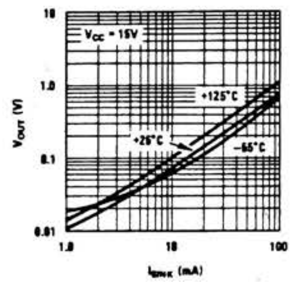
Low Output Voltage vs Output Sink Current



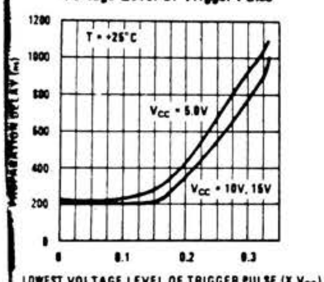
Low Output Voltage vs Output Sink Current



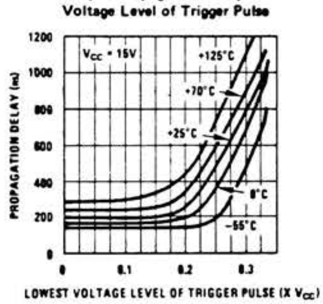
Low Output Voltage vs Output Sink Current



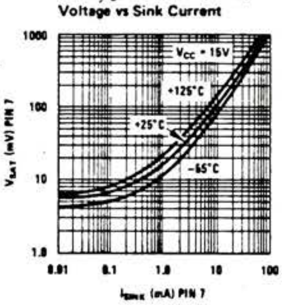
Output Propagation Delay vs Voltage Level of Trigger Pulse



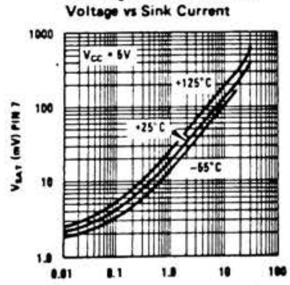
Output Propagation Delay vs Voltage Level of Trigger Pulse



Discharge Transistor (Pin 7) Voltage vs Sink Current



Discharge Transistor (Pin 7) Voltage vs Sink Current



Applications Information

MONOSTABLE OPERATION

In this mode of operation, the timer functions as a one-shot (*Figure 1*). The external capacitor is initially held discharged by a transistor inside the timer. Upon application of a negative trigger pulse of less than 1/3 V_{CC} to pin 2, the flip-flop is set which both releases the short circuit across the capacitor and drives the output high.

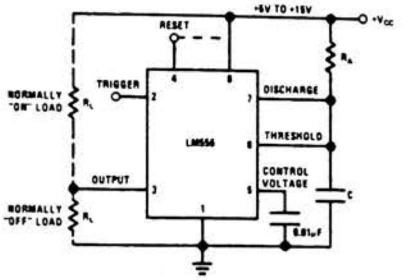


FIGURE 1. Monostable

The voltage across the capacitor then increases exponentially for a period of $t = 1.1\ R_A C$, at the end of which time the voltage equals 2/3 V_{CC}. The comparator then resets the flip-flop which in turn discharges the capacitor and drives the output to its low state. *Figure 2* shows the waveforms generated in this mode of operation. Since the charge and the threshold level of the comparator are both directly proportional to supply voltage, the timing internal is independent of supply.

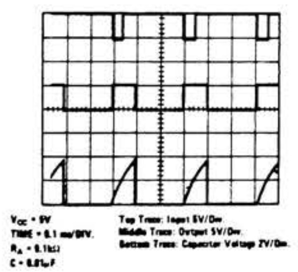


FIGURE 2. Monostable Waveforms

During the timing cycle when the output is high, the further application of a trigger pulse will not effect the circuit. However the circuit can be reset during this time by the application of a negative pulse to the reset terminal (pin 4). The output will then remain in the low state until a trigger pulse is again applied.

When the reset function is not in use, it is recommended that it be connected to V_{CC} to avoid any possibility of false triggering.

Figure 3 is a nomograph for easy determination of R, C values for various time delays.

NOTE: In monostable operation, the trigger should be driven high before the end of timing cycle.

ASTABLE OPERATION

If the circuit is connected as shown in *Figure 4* (pins 2 and 6 connected) it will trigger itself and free run as a multivibrator. The external capacitor charges through $R_A + R_B$ and discharges through R_B. Thus the duty cycle may be precisely set by the ratio of these two resistors.

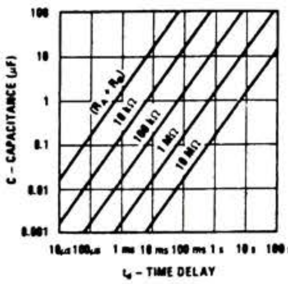


FIGURE 3. Time Delay

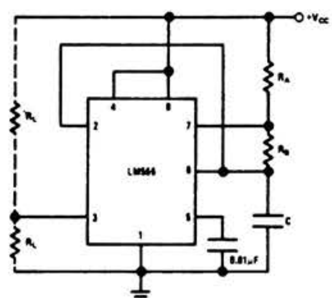


FIGURE 4. Astable

In this mode of operation, the capacitor charges and discharges between 1/3 V_{CC} and 2/3 V_{CC}. As in the triggered mode, the charge and discharge times, and therefore the frequency are independent of the supply voltage.

Figure 5 shows the waveforms generated in this mode of operation.

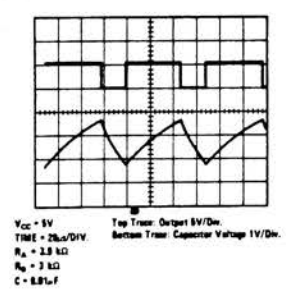


FIGURE 5. Astable Waveforms

The charge time (output high) is given by:

$$t_1 = 0.693\ (R_A + R_B)\ C$$

And the discharge time (output low) by:

$$t_2 = 0.693\ (R_B)\ C$$

Thus the total period is:

$$T = t_1 + t_2 = 0.693\ (R_A + 2R_B)\ C$$

Applications Information (Continued)

The frequency of oscillation is:

$$f = \frac{1}{T} = \frac{1.44}{(R_A + 2R_B)\,C}$$

Figure 6 may be used for quick determination of these RC values.

The duty cycle is: $$D = \frac{R_B}{R_A + 2R_B}$$

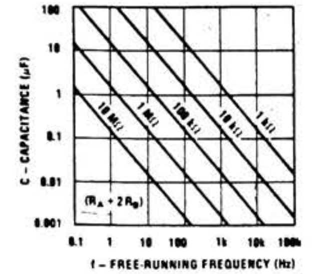


FIGURE 6. Free Running Frequency

FREQUENCY DIVIDER

The monostable circuit of *Figure 1* can be used as a frequency divider by adjusting the length of the timing cycle. *Figure 7* shows the waveforms generated in a divide by three circuit.

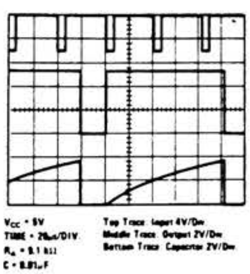


FIGURE 7. Frequency Divider

PULSE WIDTH MODULATOR

When the timer is connected in the monostable mode and triggered with a continuous pulse train, the output pulse width can be modulated by a signal applied to pin 5. *Figure 8* shows the circuit, and in *Figure 9* are some waveform examples.

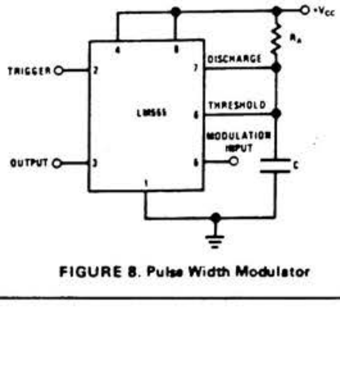


FIGURE 8. Pulse Width Modulator

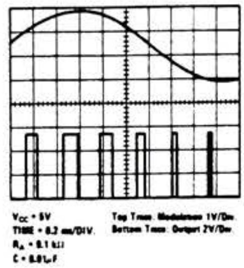


FIGURE 9. Pulse Width Modulator

PULSE POSITION MODULATOR

This application uses the timer connected for astable operation, as in *Figure 10*, with a modulating signal again applied to the control voltage terminal. The pulse position varies with the modulating signal, since the threshold voltage and hence the time delay is varied. *Figure 11* shows the waveforms generated for a triangle wave modulation signal.

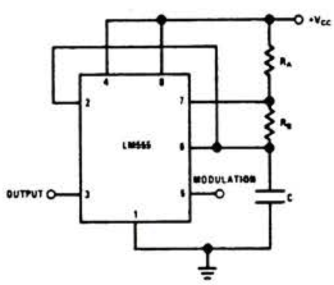


FIGURE 10. Pulse Position Modulator

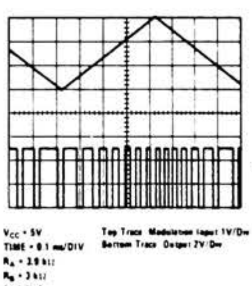


FIGURE 11. Pulse Position Modulator

LINEAR RAMP

When the pullup resistor, R_A, in the monostable circuit is replaced by a constant current source, a linear ramp is

Applications Information (Continued)

generated. *Figure 12* shows a circuit configuration that will perform this function.

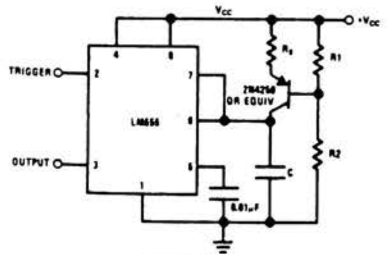


FIGURE 12.

Figure 13 shows waveforms generated by the linear ramp.

The time interval is given by:

$$T = \frac{2/3\ V_{CC}\ R_E\ (R_1 + R_2)\ C}{R_1\ V_{CC} - V_{BE}\ (R_1 + R_2)}$$

$$V_{BE} \simeq 0.6V$$

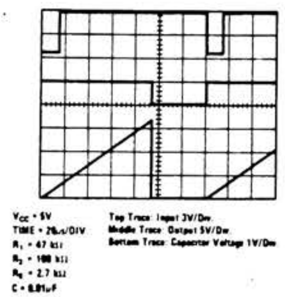


FIGURE 13. Linear Ramp

50% DUTY CYCLE OSCILLATOR

For a 50% duty cycle, the resistors R_A and R_B may be connected as in *Figure 14*. The time period for the output high is the same as previous, $t_1 = 0.693\ R_A\ C$. For the output low it is $t_2 =$

$$[(R_A\ R_B)/(R_A + R_B)]\ \ C\ln \left[\frac{R_B - 2R_A}{2R_B - R_A}\right]$$

Thus the frequency of oscillation is $f = \dfrac{1}{t_1 + t_2}$

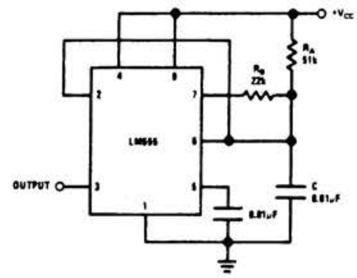


FIGURE 14. 50% Duty Cycle Oscillator

Note that this circuit will not oscillate if R_B is greater than 1/2 R_A because the junction of R_A and R_B cannot bring pin 2 down to 1/3 V_{CC} and trigger the lower comparator.

ADDITIONAL INFORMATION

Adequate power supply bypassing is necessary to protect associated circuitry. Minimum recommended is 0.1μF in parallel with 1μF electrolytic.

Lower comparator storage time can be as long as 10μs when pin 2 is driven fully to ground for triggering. This limits the monostable pulse width to 10μs minimum.

Delay time reset to output is 0.47μs typical. Minimum reset pulse width must be 0.3μs, typical.

Pin 7 current switches within 30 ns of the output (pin 3) voltage.

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