SEGA/Gremlin

=Data Bus

Eliminator — The Show Stopper

ELIMINATOR by SEGA/Gremlin

This year's annual AMOA show recently ended in Chicago with SEGA/Gremlin's new **ELIMINATOR** attracting a lot of attention. An extremely clever and fascinating advertising sequence lured many of the show goers to take that step into the "Color X-Y Zone". Reflecting the sophistication and expertise of today's game players, **ELIMINATOR** challenges you on multiple levels of coordination, strategy and geometry (by using the reflexive borders to expand shot possibilities).

Utilizing the well-proven G-80 card cage system to ease troubleshooting, the self-test feature verifies CPU and Video RAMs, all game ROMs, system inputs, audio and more. And of course, the Color X-Y Monitor allows a "depth" and quality of visuals unattainable with a conventional raster-scan. Impressive memory capability shows in the intensity of game play. Cocktail table, upright, and 4-player stand-around versions are available. A winner at the show, a winner with technicians, **ELIMINATOR** is bound to attract attention and profits on locations as well.

Old hands in our business will remember the conceptual and economic success of MONACO GP. Driving games do appeal to all types of people, and though first created in 1978, MONACO to this day continues to enjoy great popularity across the country. SEGA/GREMLIN's new **TURBO**, taking advantage of the many advances in hard and software since then, offers versatility, driver challenge, and a range of background effects unmatched in the industry.

The aerodynamic **TURBO** cockpit is fully equipped with an LED instrument panel that maps acceleration, indicates the top five scores to beat, score of the last game played and measures record breaking speed. Additionally, the display monitors the number of cars passed, time left in the round, and the round number. That, and the variety of terrain and road hazards are made possible by what may be the largest memory in a video game to date, between 480 and 640K bits. The 2764 makes its debut in **TURBO.** All in all, **TURBO** is sure to bring out the "Grand Prix" driver in all of us.


TURBO by SEGA/Gremlin

tech — tips

COLOR X-Y MONITOR GENERAL DESCRIPTION

In previous issues, TECH TIPS has detailed some service techniques for power supplies, coin mechanisms, the G-80 card cage system and the carnival logic board. In this issue we begin a discussion of SEGA/GREMLIN's revolutionary new color x-y monitor, the unique element of and basis for SPACE FURY, ELIMINATOR and many future high technology, high profit video games.

To fully appreciate the singular advance and potential of the color x-y concept, it might be advantageous to review the monitor we're most familiar with, the raster-scan. As you may remember, the display in the raster scan results from the preset movement of an electron beam across the face of a phosphor screen. That is, the flow of electron begins at the top left, scans across to the right, resets (blanks) back to the left and down one line, repeating this operation until the entire screen has been scanned, (a typical video monitor might have 225 lines or more, depending on the resolution desired). To illustrate a simple display, (for example, a large " + " symbol), we determine first where, on the screen we want the symbol positioned; lets say the center, in this case. We then generate a video signal that represents our symbol, input that signal into our monitor, intensifying only that portion of the electron beam that corresponds to the " + "; a close up

would look like this:
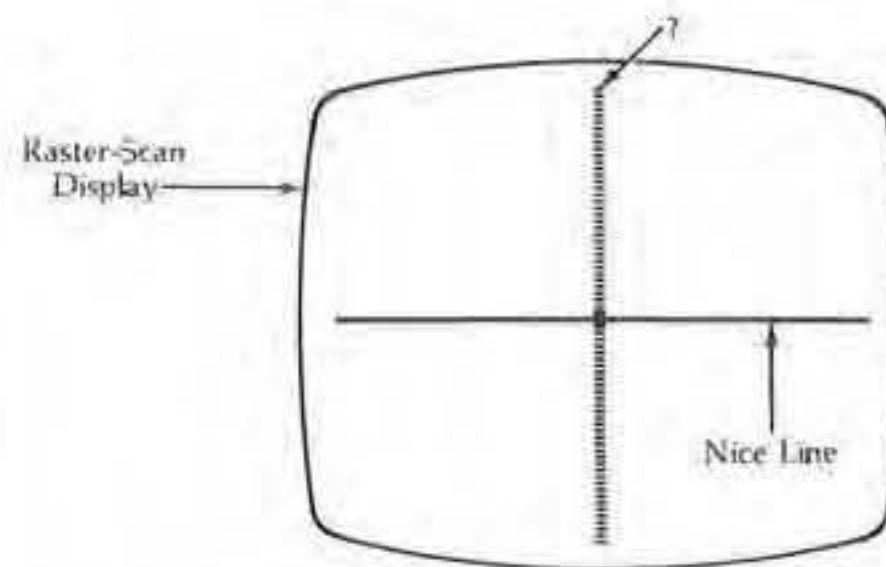
Notice how the vertical line is really more a column of stacked line segments? This is because the raster lines, running horizontally, are spaced slightly as the beam traces them and thus, as I mentioned earlier, the greater the line count, the greater the resolution. Notice also, our horizontal line is perfect; its one, solid, uninterrupted line, because the beam scans only the single raster. How would we go about eliminating the undesirable, segmented vertical component? The x-y monitor concept solves this problem nicely, with a complete absence of raster. Unlike the beam in a conventional monitor, the x-y color "guns" can be moved in any direction we choose. All we have to do is know where we want to move it, and then move it. Of course its necessary to tell the beam when to turn-on, or intensify, to "draw" the figure we want, how large, the colors to be used, what position the lines will take, and when to stop drawing. More about this later. For now, remember that we are directly commanding the x-y beam to create our lines by moving, and turning it on when needed; with the raster-scan, all we

had to do was turn the beam on at the proper times.

Important differences between the raster and x-y include the absence of horizontal and vertical oscillators/drive circuits, and the flyback pulse. A very high voltage is still necessary however, in the x-y monitor to "attract" the electron beam to the face of the CRT.

Let's now consider how it is that we actually control the electron beam. Within the CRT itself, an element called the CATHODE, when charged to a certain voltage, emits electrons, which are in turn shaped to form a thin ray, or beam. This beam is controlled by the use of two DEFLECTION COILS, one determining vertical position, one horizontal. When a current is run through either of the coils, an electro-magnetic field deflects the beam. The higher the current run through the coils, the stronger the magnetic field, and the further the deflection.

Considering the subject of beam movement, the "x-y" in x-y monitor refers to the designation of the horizontal "axis" of movement as the "x-axis," and the vertical, the "y-axis." Keeping that in mind, let's look further into the circuitry governing beam control.

The circuitry in block A of the accompanying schematic accepts two varying voltage levels from the G-80 boards, one horizontal, one vertical. These signals are called ANALOG because they represent all voltage levels between two predetermined points, (a sine-wave is an excellent example). Don't

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confuse these signals with a digital one. A digital signal switches between 0 volts, and typically, 5 volts. Digital does not drop to a negative level. As these analog voltages come in to block A, they activate the x and y power amplifiers shown in schematic Blocks B and F, respectively. These amplifiers drive the deflection coils, which in turn control the electron beam, as we mentioned earlier. To further expand our understanding of these operations, consider the following chart.

Now, in addition to an ability to control beam movement, recall that we need to intensify, or turn on the beam at specific times. The RGB, or RED, GREEN, and BLUE inputs are again, ANALOG signals that originate in the G-80 X-Y Control Board, enabling the three color "guns" through the circuits in Block C. An increase in the signal produces a corresponding increase in the color intensity. Turning all three guns full-on simultaneously, produces a white display.

Using what we know so far, lets apply it to an actual example of drawing something simple on the screen a white line for instance.
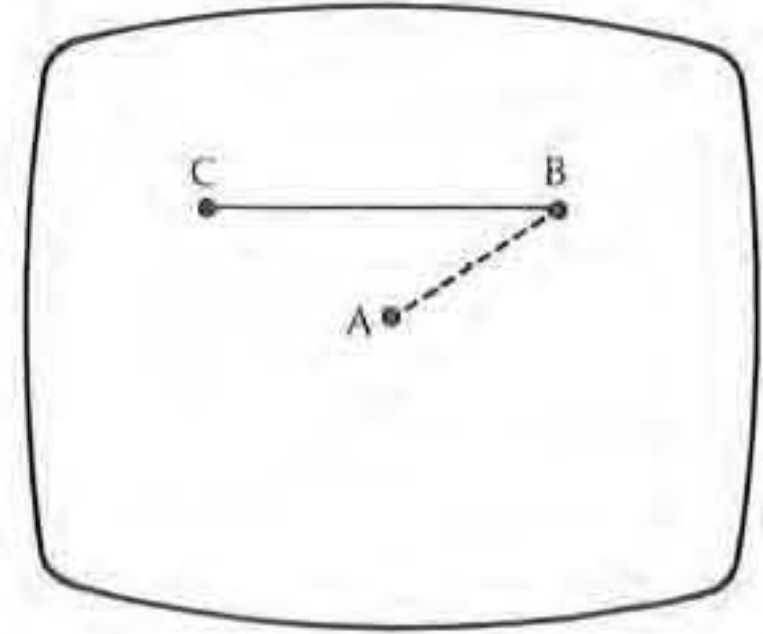
Point A, the center of the screen, is the starting point for our beam. In order to move our beam to point B, we have to apply a voltage to the monitor inputs that cause a 45 degree deflection. Two increasing positive signals (of equal amplitude) at the deflection coils will force our trace upward (x-axis) and to the right (y-axis). Please keep in mind these signals MUST be applied at the same time, as we don't want this line to appear on the screen, there are no RGB

| INPUT VOLTAGE		BEAM MOVEMENT
X-Amp	Positive	Right
(horizontal)	Negative	Left
Y-Amp	Positive	Up
(vertical)	Negative	Down

SCHEMATIC GO8-003
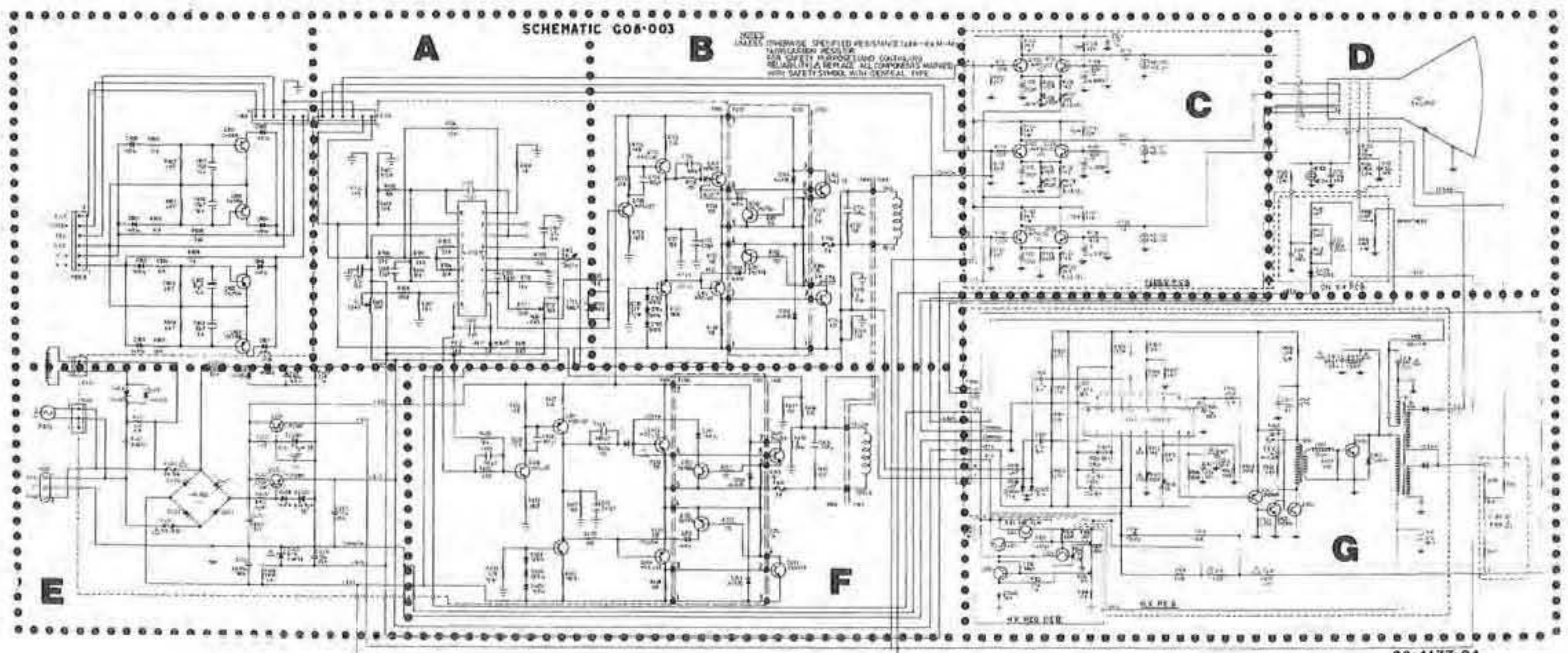
the ROM line

Continuing our ROM LINE series on integrated circuits, this issue we will expand on those devices covered previously, differentiate between TTL/LS and CMOS logic, discuss handling techniques and look at some common applications. As we mentioned last time, the most basic of digital ICs are the logic gates AND/NAND, OR/ NOR, EXCLUSIVE OR/ EXCLUSIVE NOR, the YES (or BUFFER) and the NOT (or INVERTER). These gates are often grouped together, several on a single chip, and comprise the more complex ICs.

TTL (or Transistor to Transistor Logic) at present has the widest application in the video games industry and is the most diversified IC family. Typically, a TTL device can be recognized by a 74 preface designation (i.e. 74154). LS (or Low-power Schottky) is functionally identical to TTL, but has superior speed, temperature parameters and consumes an average of 80% less power. An LS logic device is differentiated by an LS in its designator (i.e. 74LS131). Power supply requirements should be kept regulated within the 4.75 to 5.25 VDC range. Also keep in mind that digital is two state logic and inputs should never exceed supply (5.25 VDC) or fall below ground (0 VDC). A quick tip on troubleshooting digital — outputs found to be floating (held somewhere midway between 0-5 VDC) are always suspect. Now, on to some specific chips. . . .

The QUAD NAND gate, 7400/ 74LS00 is a 14-pin IC that has wide use both as a convenient packaging of 4 NAND gates on a single chip, and as a way to consolidate components for space considerations, (for example, on the SPACE TACTICS Logic board, IC 148 is configured as a single NAND and a single OR). Pictured below is an internal configuration of the 7400/74LS00, and our IC 148 arrangement.

IC 148
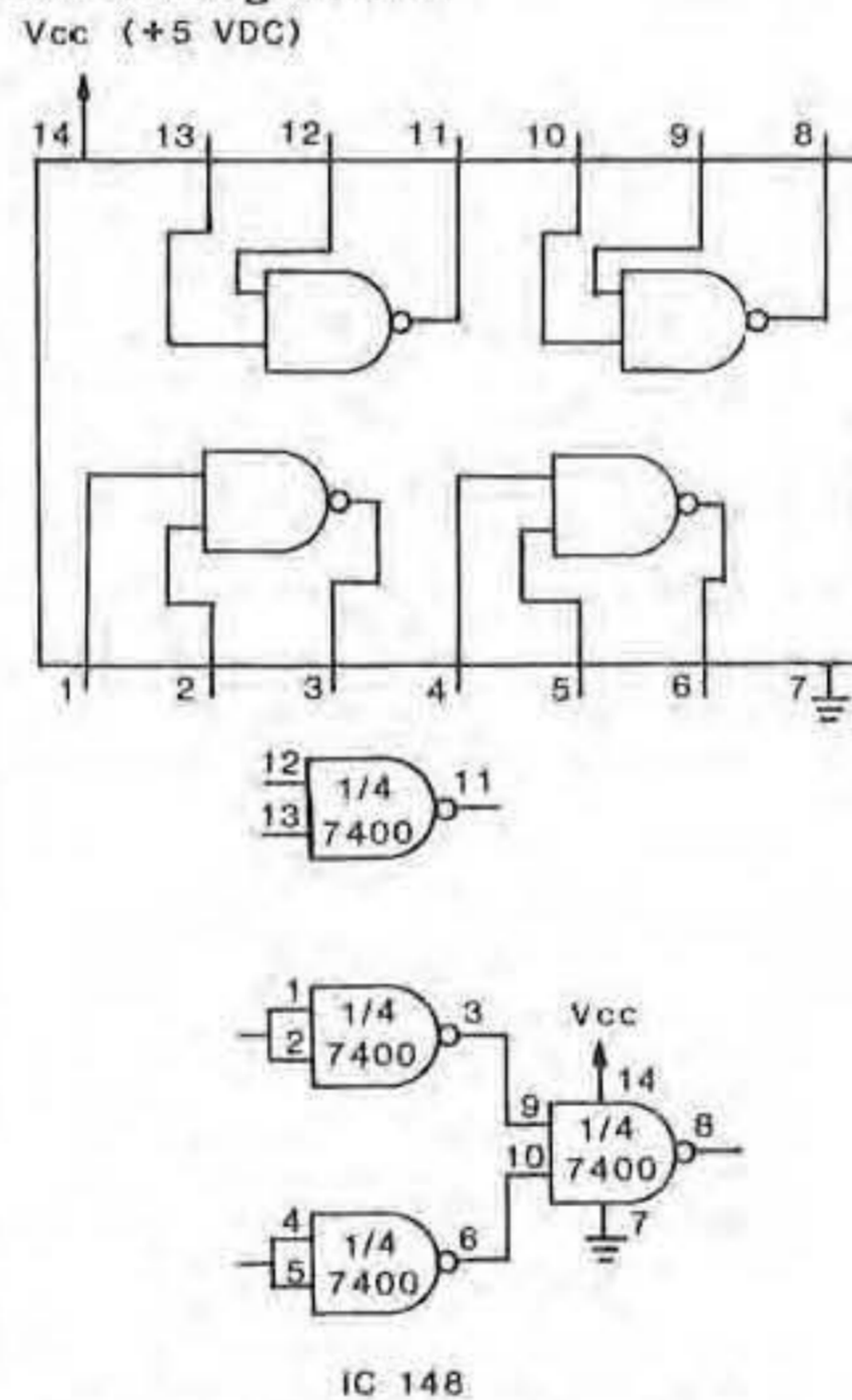
The 7410/74LS10 is a 14-pin, Triple 3-input NAND gate generally used for decoder or enable control functions:
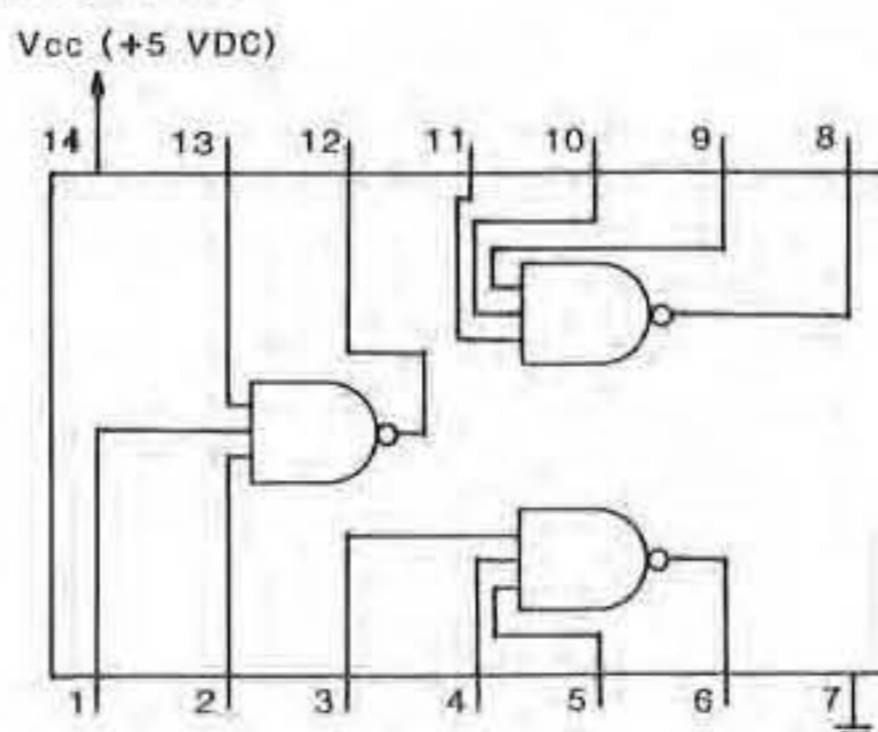
Having analyzed a few representative TTL devices and their applications let's turn now to a brief discussion of MOS/CMOS. MOS stands for Metal Oxide Silicon/or Semiconductor. By and large you will be concerned with Complimentary MOS or CMOS. These ICs can contain more functions per chip than TTL/LS and consume very little power operating over a supply range of +3 to 15 VDC. CMOS chips are multiple stratis devices (similar to other formats) with the unique addition of a silicon dioxide film separating the input port from the other junctions. It's this thin, glassy layer that enables the chip to impose very low loads on the input signal source, while at the same time standing as this chip-type's "Achilles Heel". Susceptibility to static damage requires careful handling techniques that include exclusive use of DC powered irons or well isolated, controlled output soldering stations, and storage **only** in conductive foam or pins down on aluminum foil. Ground differentials should be strictly observed.

In the next issue of the ROM LINE we'll undertake a discussion of Linear devices, some Memory theory and hardware, and continue a compilation of troubleshooting tips and techniques. In the meantime, please continue sending us your questions, comments and suggestions. High profits and low "down-time" to you all.

service notes

Frogger Cocktail

It has been noted in the past that cabinet interior installation of the volume control requires opening the locked table top, and obvious exterior installations tempt "inquisitive" fingers. To alleviate these problems, the volume control has been partially recessed under the edge of the cabinet on the side opposite the coin mechanism.

In your Frogger Cocktail Manual (P/N 420-5016) there is an error on the Gremlin Parts list insert. Item 4, the black table glass, is P/N 275-0077 and not P/N 275-0075. Please make this change on your parts lists.

In the advent that you may wish to increase the audio amplitude of your FROGGER video game, the following modification is recommended:

1. Remove the existing 100 ohm potentiometer from the volume control block and replace with a 10K ohm potentiometer (Gremlin P/N 475-0007).

2. Remove the 1K ohm resistor from R-42 to ground, and replace it with a 4.7K ohm resistor in parallel with R-42 (Gremlin P/N 471-0472).

3. Correct the manual's schematic No. 834-0085 to reflect the modification.

In your Frogger Manual (P/N 420-0647), there is an error on page 88, the Game Power Supply, Drawing No. 800-0128 REV. F, page 6 of 6. In Zone 2B, Q8 and its designation, TIP120, and Q9 and its designation, TIP 125, need to exchange positions, (i.e. Q8, TIP120 should be in the upper position). Q8 is the NPN device, Q9 is the PNP device.

Eliminator

An error in the ELIMINATOR Owner's Manual (Gremlin P/N 420-0603) has been found, and corrections to the schematics should be made as follows:

Drawing Number 700-0062; Sheet 8 Zone 1C & 2C, P4- pin assignments

(WAS)
Pin 5- BRN THRUST 1
Pin 8- RED FIRE 1
Pin 11- WHT THRUST 2
Pin 12- VIO FIRE 2
(IS)
Pin 5- RED FIRE 1
Pin 8- BRN THRUST 1
Pin 11- VIO FIRE 2
Pin 12- WHT THRUST 2
Drawing Number 800-3168; Zone 4C & 4D

(WAS)
Pin 5- BRN 17.00 [431.8]
Pin 8- RED 17.00 [431.8]
Pin 11- WHT 6.00 [152.4]
Pin 12- VIO 5.00 [127]
P4
(IS)
Pin 5- RED 17.00 [431.8]
Pin 8- BRN 17.00 [431.8]
Pin 11- VIO 5.00 [127]
Pin 12- WHT 6.00 [152.4]
P4

RMA Shipping Labels

Effective 10/15/81, you will find all RMA stock shipments from SEGA/Gremlin have included a green adhesive return mail label. In order to expedite our accounting and your parts stock exchange, please use these labels on the outside of the package when you return your defective parts. Sufficient time will be allotted for return f material requisitioned before the 15th; however, the use of these labels will be required in the near future. Thanks for your cooperation.

Board Service Trouble Report

As any technician will tell you, troubleshooting electronics that have been started by someone else, without knowing what's been done, complicates procedures tremendously. That is the reason we began supplying distributors with a Board Service Trouble Report back in July. Taking the time to fill out one of these short forms will save you in "turn-around" time and our technicians a grey hair or two. "Turn-around" time relates directly to profits, and that is good incentive to get some of these simple forms from your distributor if you don't already have them. So please, help us to help you, be specific in your descriptions and we'll all "profit" in the long run.

input port

Continuing our question and answer column, we would like to thank you for your interest and urge you to "keep those cards and letters coming." We do answer technical questions in this column, both written and those called in. If writing, please direct your questions to:

Editor — Data Bus
SEGA/Gremlin Customer Service
8401 Aero Drive
San Diego, California 92123-9990

Q: I've bought many Gremlin/ SEGA games in the past, and they do well in the arcade, but two or three times now, games right out of the crate were down. This doesn't do your reputation any good. Is there anything being done about it?

A. Yes. Quality control is an important part of any manufacturing business, and as you pointed out, can effect your reputation. We've made several changes in that area, among them being an organizational change that brings Quality Assurance out from under Production (and a possible conflict of interest). We have also increased our game "burn-in" period from the engineering standard 90 minutes to a full 36 hours and are attempting to identify those component brands that are least reliable. Product quality **IS** important to us, and I believe you will see a marked improvement in the future.

Q: Why does it take so long to get parts or repairs through my distributor? The last board I sent in, took 6 weeks to get back.

A: Allowing an average of 2-3 weeks for handling by your distributor and the postal service still leaves 3-4 weeks that your board was here "in house;" that is not a figure we're happy with, and you'll now find our "turn-around" time has been reduced to **one** week. In the last month, we have done a number of things to dramatically improve our department, and here are just three of those things: 1) The number of technicians employed in Customer Service Repair has doubled, including an additional supervisor; 2) all new test equipment has been acquired including 50 and 100 MHz 'scopes, logic probes; and 3) the establishment of a new and independent Customer Service parts stock to speed supply. We really intend to be the best in the business on service, and it will show.

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inputs present. However, once the beam is at point B, we can energize all three color guns (a white display, remember?), forcing the x-axis coil to go negative, (resulting in a trace to the left) while leaving the y-axis coil where it is. Here is what our signals looked like during this process:
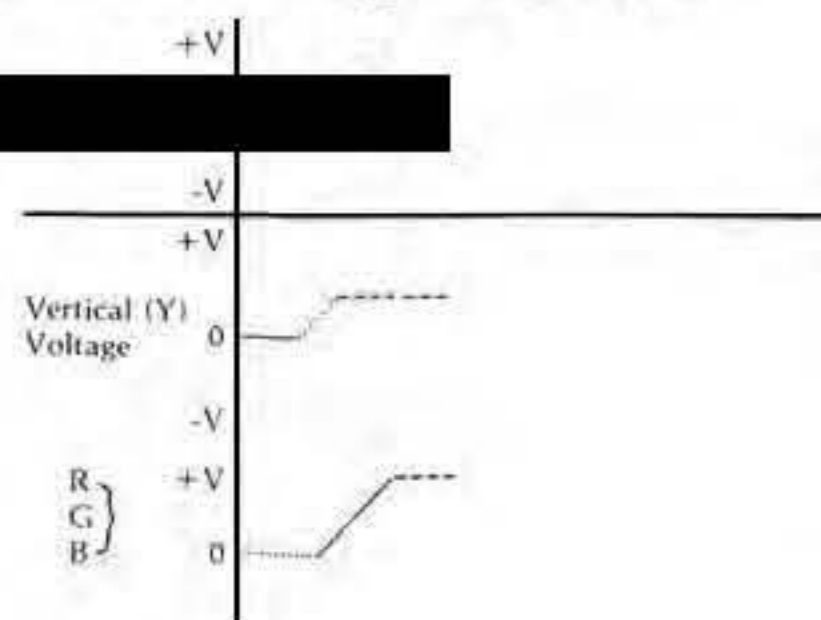
In our example, we made a very short line, considering we could have drawn one clear across the screen. In order to draw longer lines, in any direction, we simply increase the positive or negative voltage on the inputs.

The remaining circuits in the monitor are a power source (block E), the CRT and brightness adjustment (block D) and the high- voltage generator (block G).

Next issue, we will continue our discussion in more detail, outlining the G-80's role in generating the necessary video intelligence and de-cyphering the digital "language". We hope to better your understanding of this exciting new format and ease the problem solving experience.

WE WELCOME YOUR COMMENTS!

Your comments and suggestions will assist us in improving the usefulness of our publications. They are an integral part of preparing for revisions of manuals and parts catalogs.

If you have any technical questions about any SEGA/Gremlin game, are requesting additional publications, or have a suggestion about how we can make our publications more useful to you, drop us a line or use the handy form below.

Comments:

Fill in if you wish a reply:

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Address _____ ☐ Operator

City _____ State _____ Zip _____ ☐ Other _____

DB

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