SEGA®/Gremlin®

Data Bus

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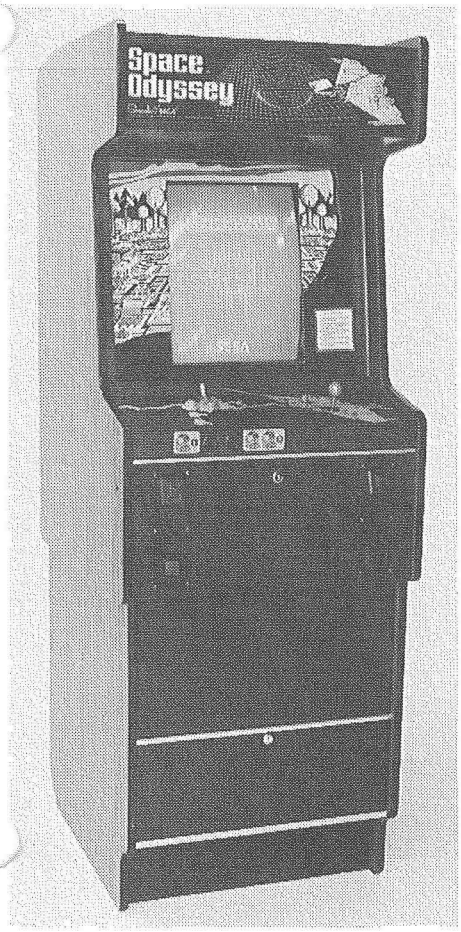
SEGA/Gremlin Introduces Space Odyssey/Space Fury

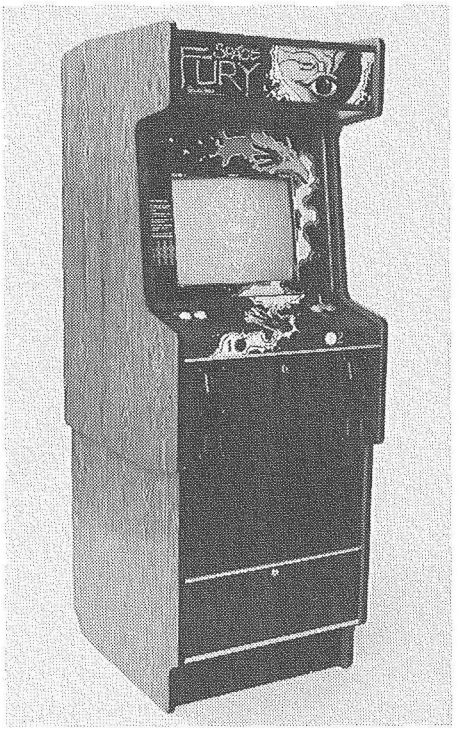
At the recent distributor's conference at La Costa, California, SEGA/Gremlin introduced two new exciting games. Space Odyssey and Space Fury are the newest sensations from SEGA/Gremlin. Each game is very exciting and innovative and is sure to bring in high profits.



Space Odyssey

Space Odyssey is a very fast moving game that has seven sectors. The game has vertical and horizontal game play. As players proceed through the sectors they must fire at oncoming aliens to gain points. In the vertical game play the player must avoid the black hole which will hold the ship in temporary suspension for a short period of time. The player also has laser and bombing capacity which adds to the game action considerably. Space Odyssey also contains a background generator board that produces intricate and colorful displays behind the game action on the screen. The board acts as a self-contained color display system that generates a pre-programmed pattern on the screen.

Space Fury is a unique, technological advancement in the video game industry. It features a new color X-Y monitor. The first of its kind. For those of you wishing a more in-depth look at the color X-Y monitor system, refer to the new Color X-Y Monitor Manual. Space Fury also contains a special thrust feature to speed the player's ship around the playing field to avoid enemy aliens. Your game play is constantly monitored by the Commander of the enemy fleet. He lets you know how you are doing and rates your game skill at the conclusion of the game. As the game continues, enemy alien fleets become more and more difficult to destroy. The game action is fast and furious as players attempt to



Space Fury

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tech—tips

THE G-80 SYSTEM

This issue's Technical Tips on troubleshooting the G-80 system are provided by Heibat Seyfnarimani and John Hawley. As Customer Service Technicians, they have found these tips very helpful in their own board repair procedures.

Test equipment needed for troubleshooting the system are:

1. Multimeter
2. Logic probe
3. Oscilloscope (30-50 MHZ)
4. Extender Board

Points to Remember

All boards are interchangeable in their positions in the card cage. Power **must** be switched off before removal or installation of boards. Any problem encountered will fall in either the monitor, card cage, power supply, or harness (including the control panel). It is therefore important to know how to isolate the problem down to one area.

Power Supply

Voltages should be checked at the card cage when making adjustments; this compensates for voltage losses in the lines. It is extremely important that all voltages are correct before the commencement of any troubleshooting; the power supply will be covered more fully later.

Monitor

If the screen is completely black this may indicate that the filament voltage is missing. This is a 100 VAC and should be checked at the secondary of the isolation transformer. Because the monitor only displays signals that have been fed to it, isolating problems to this area is made easier. If colors are missing, just check for the color inputs; this is also the case for sync and video problems.

Harness & Control Panel

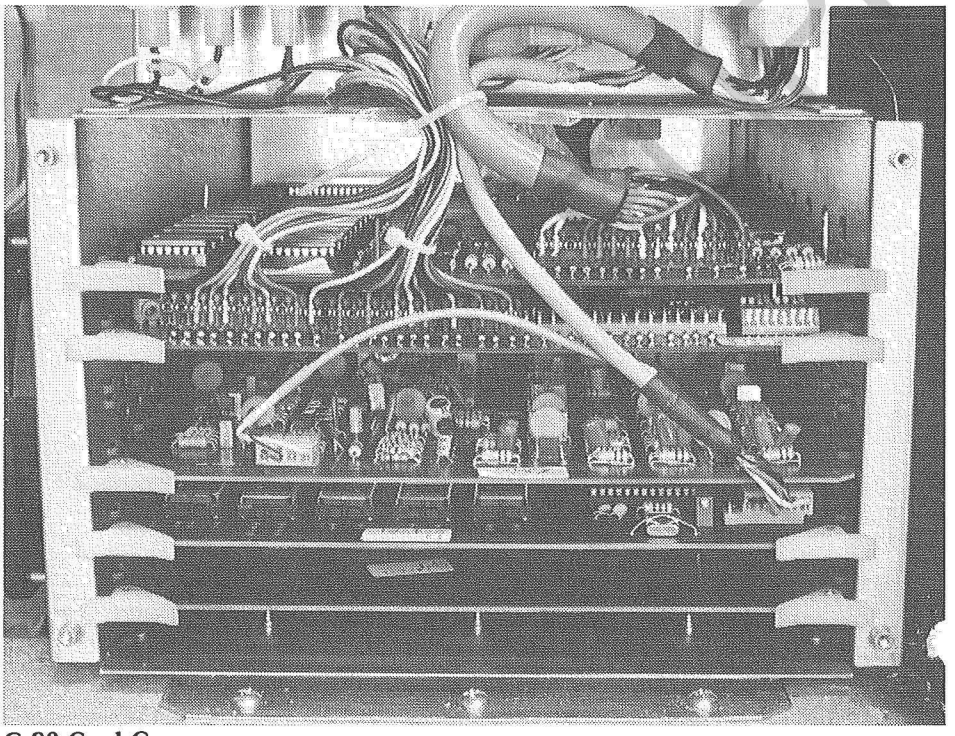
Often problems will be found in these areas. They can be excluded by doing continuity checks and by comparing the harness positions to the wiring diagrams in the manual. If all the forementioned areas seem to be in proper working order, the card cage should be looked upon as the trouble area. The card cage itself can then be broken down into five seperate sections.

Self Test

This is activated by depressing the red button located on the CPU board. If the CPU board is working properly the self test will usually isolate the problem down to the board level. If there is no activity on the screen when the self test is activated there is usually a problem on the CPU board.

Steps for troubleshooing the CPU:

1) Check for the clock pulse at Pin 6 of the Z80A (U22). If this is not present check timing at U10, U18, U19, Q7, and the crystal.
2) Check for the reset signal at Pin 26 of U22; this is normally high. If for any reason this signal is not high then U22 will not reset. If Pin 26 is low momentarily short Pins 25 & 26.



G-80 Card Cage

tech—tips

If the game resumes normal play there is a problem in the reset circuitry. The input to U23, Pins 2 and 3 should be low in order to get a high out on Pin 1. If either one is high the corresponding circuit should be traced back.

3) Check U21 (address bus controller) and scratch pad rams U26 thru U29 for activity on all inputs and outputs.
4) If there is a problem in credit/coin handling, power-up sequence, player 1 or 2 recognition or CPU initialization U25 should be suspected. U25 also contains the self test information.
5) If there is any trouble in the player controls, RP3 (resistor pack) and U5 should be looked at. The inputs of U5 are normally held high by RP3; when a player control is activated, the input is grounded. Problems occur here either in component failure or the grounding of a player control wire.
6) Coin problems usually occur either in the micro switches or from failure of U6, U8, U9, U39, U16 or U7. Coin problems should be found by tracing input low on coin up through the discrete components through to Pin 16 on the CPU. Pin 16 is usually high but goes low on coin up.

Video Board

There are two types of video boards in circulation. One with a VIC chip and the other contains a VIC board. The technician should be aware that the board can not be substituted for the chip until a number of modifications have been performed on the video board. This information is available from Gremlin Customer Service.

Troubleshooting the Video Board

1) The self-test is important when fault finding on the video board. Not only can it isolate the problem to the board, it will also give discrete RAM failure information.
2) When it is suspected that one or more RAMs have failed they may be checked by putting your scope or logic probe on output Pin 14. 4 to 5 volt high/low activity should be noted. All good outputs will be identical. Grounded or high outputs on a RAM will mean that this RAM is bad and should be replaced with another 4015 or 4027 RAM of the same family.
3) If the self-test shows known-good U31, U27, U25 RAMs to be bad, U38 74LS283 should be substituted with a 74S283.
4) If a bad signal is common to all RAMs suspect either U39, U40 and U41 or U37 and U58 as being bad.
5) U59 may cause U58's address lines to be held either high or low. Disabling Pin 8 of U59 will enable the address lines.
6) Whenever there is any type of problem apparent on the screen, the video board should be suspected first. If a color problem is present red, green, and blue signals should be checked at Pin 15, 13, and 11. If any signal is missing, that circuit must be traced back giving particular attention to U7, U8, U9 and U11. If all colors are missing suspect U9 (the color RAM).
7) If any problem on the screen is sync oriented, U3, U4 and U5 (timer) should be suspected. Pin 15 of U58 (VIC chip) may also be bad.
8) If snow is present on the screen or the picture is shakey, suspect U52 (PROM) U60, and U53.

EPROM Board

The self-test is a good indicator of the condition of the EPROMs. It must be noted that the test is not 100% accurate and it is possible to have a bad EPROM even though they are shown good by the test. If there is a bad EPROM that the self-test hasn't picked up, the best way to find the bad PROM is by lifting the EPROMs one at a time. When the bad EPROM is lifted from the circuit the self-test will be able to continue. If you do not get any results by doing this suspect U26, U28 and U27.

Sound Board

If there is no sound at all, first check the speaker, the audio amplifier (power supply) and harness; if they are good, the problem is the sound board or speech board. Check U7 and Q4 on the sound board; check U12 and U11 on the speech board. When one particular sound is missing, that part of the circuit should be checked.

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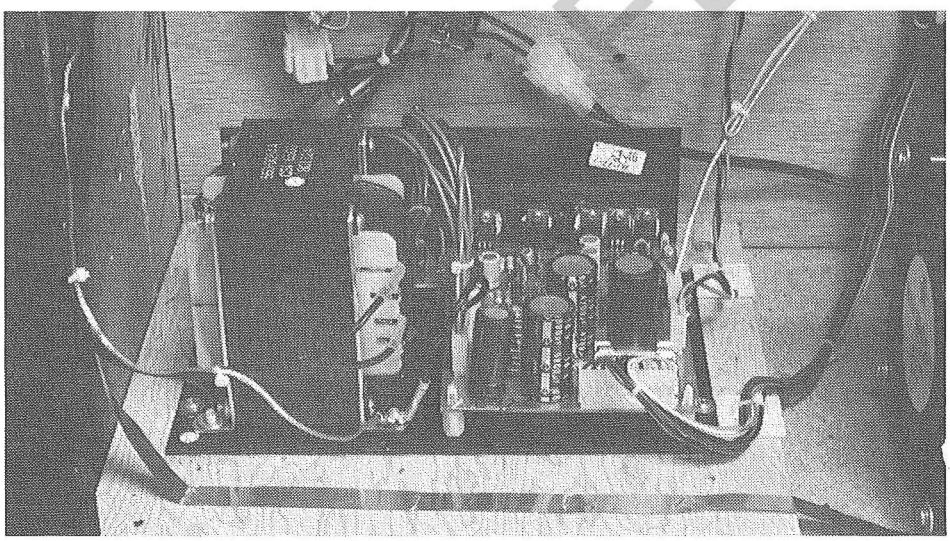
the ROM line

Power Supplies

As part of our continuing series of basic elements of a computer, this month, we'll look at the remaining element-the power supply. Specifically, we'll examine two kinds of power supplies-the linear and switching regulator types. You may want to refer to schematics as you read this article. For the linear power supply, see drawing #800-0128 in the Astro-Blaster manual. The switching regulator schematic is #601-0158 in the Space Odyssey manual. We'll look at a linear supply first. Basically, this type of power supply consists of a step-down transformer, a diode bridge, filter capacitors and voltage regulation circuitry. The transformer simply converts 100 VAC to a number of smaller secondary voltages. These voltages can then be rectified to DC and filtered. Finally, voltage regulation is provided in a number of ways, commonly with 3-terminal IC regulators. These devises regulate an input voltage to a stable output level. Or the 800-0128 schematic, the -5 and -12 voltages are provided by 3-terminal type regulators, U4 and U5. For higher current levels, regulation can be provided by power transistors, as shown on the schematic, above IC U1. The 723 IC is another kind of voltage regulator IC that is adjustable through a range of output voltages. In the configuration shown here, it is providing a higher current, #5 voltage output. This voltage can be varied slightly with pot R5. Additionally, voltage regulation is performed by an op-amp in the configuration shown at U2. Here, the op-amp and transister circuits are regulating the input voltage to supply an accurate #12 DC source.

These are the basic elements of a linear power supply and are commonly used in computer game power supplies. The second power supply design is the switching regulator type. this supply operates by alternating a current through an inductor and filter capacitor. The result is that the AC line voltage is regulated to a low DC voltage (for example, +5) at a high current. The switching action causes current to increase in the inductor and then decrease. As it falls, it is switched to the filter capacitor. Looking at the schematic, you'll see the 110 VAC input applied to D1, a diode bridge. The DC output is then applied to the primary of the transformer T1. Q1 causes the high primary voltage to switch on and off. T1's secondary generates a low voltage as the primary is switched. The secondary current flows into the inductor L1 and, when the current is cut off by Q1's action, the current level at the inductor falls. This decrease is sensed by D3, which then switches to pass the current to filter capacitors C9 and C10. The output, then, is +5 volts at a higher current level. A feedback signal is developed from the +5 source and applied to IC1. this IC generates pulses that switch Q2 on and off, which activates transformer T2. The output of T2 then triggers the on/off activity of Q1. The feedback signal is necessary to ensure a well-regulated +5 volt output. Transformer T3 is used to provide voltage for the IC and its associated components. We have now looked briefly at the basic elements of a computer. Hopefully, you'll be encouraged to dig deeper into the subject and keep informed of the new circuits and developments in computers. Watch this column for more on the theory of video game computers.



Power Supply

service notes

This column is intended to keep you informed on service notes you may have missed about our games. They are important items and only repeated here for further emphasis.

VIC Replacement Board

In some G-80 games a VIC replacement board (pt.#800-0212) may be used in place of the VIC chip. This board is located on the G-80 video board.

The VIC replacement board is, in part, the equivalent circuit of the VIC chip. It is a relatively simple circuit consisting of a number of counters and multiplexers for generating video timing and addressing video RAM.

On those video boards using the VIC replacement board, there are a few changes that have been made to the video board. Video boards using a VIC chip are slightly different.

These changes are:

1) 6 330 ohm resisters are added to the lines entering pins 5, 6, 7, 10, 11, & 12 of U24.
2) The 74LS74 IC at position U45 is replaced with a 74S74 ICs.
3) The 74LS175 ICs at positions U42 and U43 are replaced with 74S175 ICs.
4) The 74LS163 IC at position U53 is replaced with a 74S163 IC.
5) The 220 pf 16V capacitor at position C10 is removed.
6) To simplify future troubleshooting, wherever an IC is replaced add a socket.

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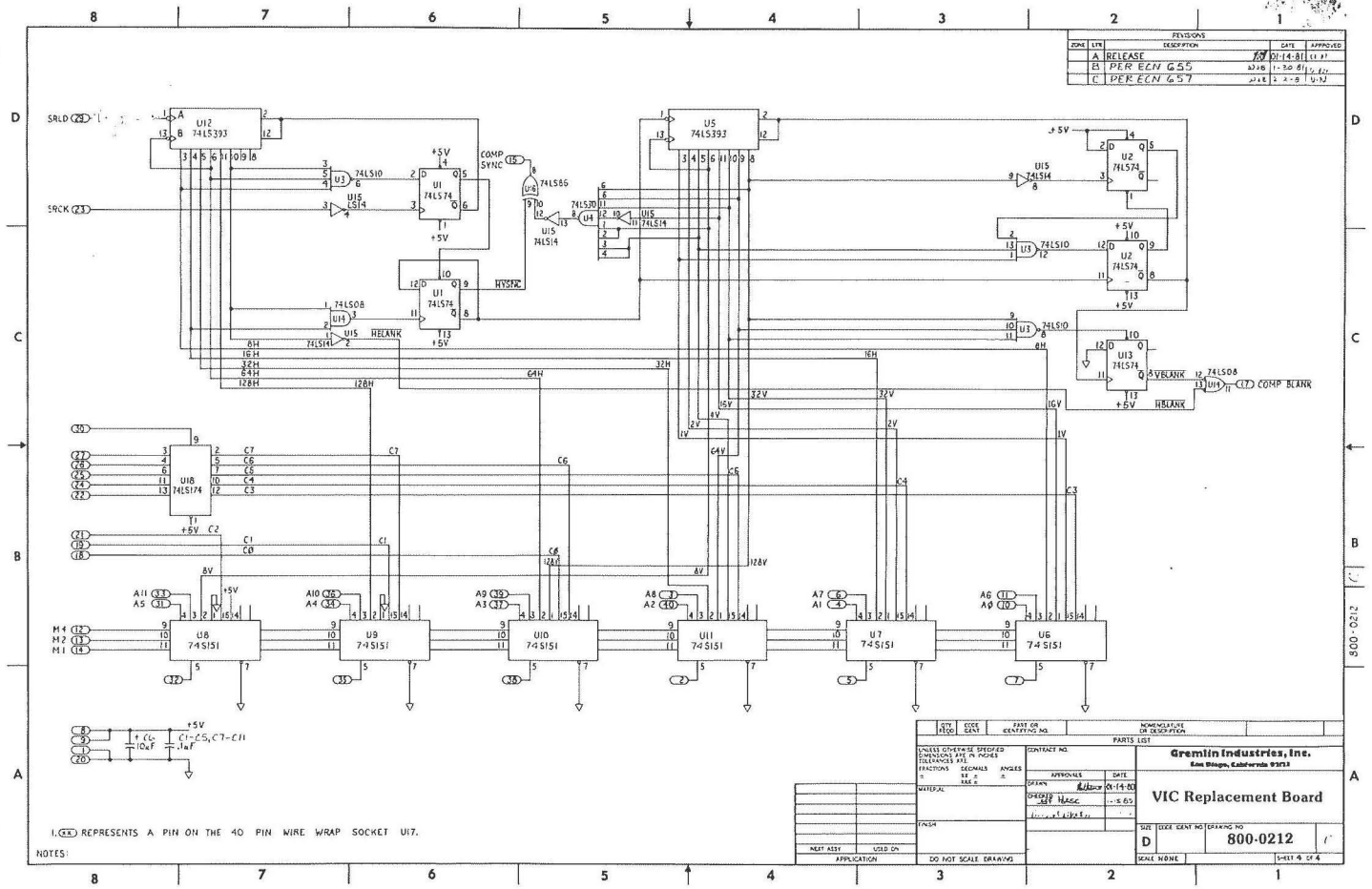


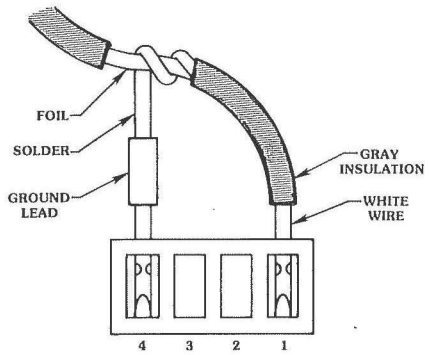
service notes

Audio Interference Modification

It has been found that in some areas where there is a number of outside communication systems, audio interference may occur in the Astro Blaster games. If you are experiencing this problem in some areas the following procedure will eliminate this interference.

Turn off the game and locate the 4-pin power amp input connector on the power supply. Strip off approximately ½ inch of the gray insulation from the connector lead.

Volume Control Connector on Power Supply



Be careful not to strip away the foil underneath. Make a small jumper 2 or 3 inches long. Strip one end and attach a small crimp pin to the other. Connect the stripped end of the jumper by wrapping it around the exposed foil. Insert the other end of the jumper in slot 4 of the 4-pin connector, then plug it back on the power supply. For best results refer to the diagram below.

If you have any questions regarding any of these notes, need schematics or manuals, please contact SEGA/Gremlin Customer Service, (800)854-1098.

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tech—tips

Speech Board

If all speech is missing, suspect U14, U9 or U2. When only portions are missing suspect the EPROMs. "Garbled" speech usually indicate U2 is bad.

Power Supply

Many problems can be traced down to the power supply. Common problems are bad voltages or poorly adjusted ones. Often a short in one of the boards will cause the power supply to blow. This board may be found by removing all the boards and replacing them one at a time until the power supply goes bad, which will indicate the failed board. When one component fails in a circuit a cascade effect will usually take out one or more associated components, i.e. +5 if Q5 goes it will usally take Q1 and U1 with it.

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Space Odyssey/ Space Fury

destroy alien scouts, cruisers, destroyers, and warships.

Both games are sure to attract players. Each game is very challenging and stimulating. Space Fury and Space Odyssey are also equipped with the special self-test feature, similar to Astro Blaster. Astro Blaster, Space Fury, and Space Odyssey are the forerunners of the G-80 system. The commonalities in this system will make future games easier and easier to troubleshoot.

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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.

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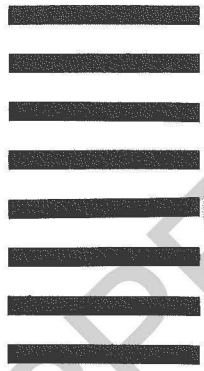

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Tape This Edge