

# ON TARGET

Gottlieb

TECHNICAL NEWSLETTER

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## TROUBLESHOOTING Q\*bert™

Foreground on the Gottlieb GG-III Video System is generated on a 16x16 pixel format. Foreground characters can be moved to any point on the CRT with each having its own priority scheme in relationship to the other foreground characters. The foreground characters consist of: The word "Q\*bert" on the instruction frame, all moving characters, the large letters for high-

est score on the high score table, Q\*berts balloon that appears when he collides with an enemy and the level number that is displayed between levels.

Background is generated on an 8x8 pixel format and is behind all foreground with the exception of a priority switch (when Q\*bert falls off behind the pyramid).

It is no secret that solid state hardware does sometimes become defective. It is for this reason that the accompanying table of symptom/possible causes can be helpful when troubleshooting the Gottlieb GG-III Logic Board. A note to remember: This list has been compiled to assist the technician in troubleshooting the Logic Board. The list of possible faults is not always definitive.

SYMPTOMS	POSSIBLE CAUSES
<b>FOREGROUND</b>	<b>POSSIBLE CAUSES</b>
NO FOREGROUND CHARACTERS ON SCREEN	D2, E1-2, E2-3, E4, G8, J10, J12, K11
FOREGROUND CHARACTERS DIVIDED HORIZ. AND STACKED ON TOP OF EACH OTHER	G17, H10, L12
TWO SEPARATE CHARACTERS APPEAR STACKED VERT.	E1-2, E2-3, E4
THE WORD "Q*BERT" IS SEPARATED INTO SECTIONS	SIP 71
THE WORD "Q*BERT" APPEARS AS HEX NUMBERS	J1, J2, K5
INCORRECT CHARACTERS APPEAR (I.E., SLICK IN PLACE OF Q*BERT)	E1-2, E2-3, E4, G4, J1, K1-K3
FOREGROUND CHARACTERS ARE BLURRY (DISTORTED) HORIZ. LINES THROUGH FOREGROUND CHARACTERS	F5
UNEVEN MOVEMENT OF CHARACTERS	K10, L7-8
RIGHT HALF OF CHARACTER APPEARS ON THE LEFT SIDE OF THE SAME CHARACTER	SIP 72, SIP 73, H3, H4
VERT. LINE ABOVE Q*BERT THAT BLANKS EVERYTHING ABOVE Q*BERT	F5
FOREGROUND DIVIDED VERT. (MIRROR IMAGE OF SELF)	H3
FOREGROUND FROZEN (NO MOVEMENT)	G17
INCORRECT FOREGROUND COLORS	E1-2
CHARACTERS APPEAR AS COLORED SQUARES	G13, G14, G15, H12, K5, K10, Q82-Q87
	K1-K6, K7-8, L4-5, L5-6, L6-7, L7-8
<b>BACKGROUND</b>	<b>POSSIBLE CAUSES</b>
NO BACKGROUND CHARACTERS ON SCREEN	D5, D10, E8, E10-11, E11-12, E13, G6, J7, J8, J12
INCORRECT LETTERS GENERATED ON THE SCREEN	E10-11
PURPLE SQUARE APPEARS AT BOTTOM OF LETTERS	L10
DISTORTED LETTERS ON TOP HALF OF THE SCREEN	D9
RANDOM LETTERS FLASHING RANDOMLY ON SCREEN	E11, E7, E8, E9-10, J8
BACKGROUND CHARACTERS ARE BLURRY (DISTORTED)	E10-11, E11-12, E13
JUMBLED BACKGROUND	E10-11, E11-12, E13
PYRAMID DIVIDED INTO SEVERAL VERT. SECTIONS	E10-11, E16
HORIZ. LINES DIVIDE CHARACTERS	G11
GREEN BACKGROUND WHEN Q*BERT IS SMASHED	G15
INCORRECT BACKGROUND COLORS	G13, G14, G15, Q82-Q87

The Intel 8088 microprocessor is a third generation microprocessor with an 8-bit data bus to memory and to I/O (Input/Output). The chip is a standard 40 pin dual inline package (see FIG. 1) and operates from a single +5VDC power source. The 8088 is extremely flexible in its application and is well suited for use in the GG-III System.

The processor has dual operating modes (minimum and maximum) which is allowed by dual function pins selected by a strapping pin. The GG-III System utilizes the minimum mode of operation. In this mode, these dual function pins transfer control signals directly to memory and I/O devices.

The high efficiency of the 8088 is conducive to combining a 16-bit internal bus with a pipeline architecture allowing instructions to be prefetched during spare bus cycles. Microprocessors execute a program by repeating the simplified cycle shown below:

1. Fetch the next instruction from memory.
2. Read the operand (if required by the instruction).
3. Execute the instruction.
4. Write the results (if required by the instruction).

These steps are usually performed serially by most microprocessors. The architecture of the 8088 however, allocates these steps to two separate processing units within the CPU. The execution unit executes instructions while the bus interface unit fetches instructions, reads operands and writes results. Both units work independently of each other and are able to overlap instruction fetch with execution. This means that the time required to fetch an instruction, during normal program sequence, disappears because the execution unit executes instructions that have already been fetched by the bus interface unit.

Below are listed several of the functions allowed by the minimum mode of the Intel 8088 microprocessor as applied to the GG-III System:

The NMI (Non-Maskable Interrupt), pin 17, will receive pulses 61 times a second. The pulse is generated when the CRT's vertical blanking time begins. During this blanking time the background register (E7) transfers data to the background buffer (E10-11) through DMA (Direct

Memory Access) for the next frame. The DT/R (Data Transmit/Receive), pin 27, controls the direction of data flow via the Data Transceivers (C4) DIR (Direction Control Input) pin. This allows data to flow from the A bus to the B bus or from the B bus to the A bus. The DEN (Data Enable), pin 26, allows or disables data flow by placing a voltage level on the  $\bar{G}$  (Enable Input), pin 19, on the Data Transceiver (C4) so that the bus is effectively isolated. The RD (Read Control), pin 32, manages the OE (Output Enable) of the program ROM's as well as enabling the output of the Background Character Register (E7) and the Input Port Select (B10). The IO/M (IO/Memory Control), pin 28, is utilized to differentiate between either program memory or I/O on the processors bus. The WR (Write Control), pin 29, controls the read/write function of the system RAM as well as clocking the Output Port Flip Flops (A8, A9, A10).

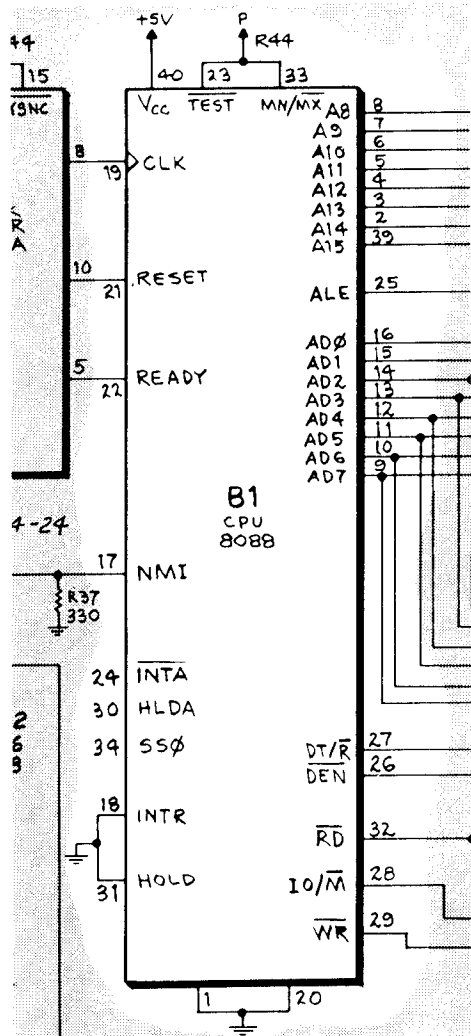


FIGURE 1.

This is a general pin function description that can be utilized when troubleshooting the GG-III System. The other pins on the microprocessor are all self explanatory on the illustration (see FIG.1).

The following page is a tear-off, postage paid, self-addressed questionnaire. We would sincerely appreciate your time in answering it

fully and returning it to Gottlieb. Your feedback on the questionnaire will aid Technical Marketing Services in improving

the services we now offer and help plan future assistance to operators and distributors. Thank you for your help.

TEAR OFF AT DOTTED LINE

# TECHNICAL MARKETING SURVEY

DEAR CUSTOMER,

WE NEED YOUR OPINION!

YOUR FEEDBACK IS IMPORTANT IN HELPING US TO CONTINUALLY IMPROVE OUR SERVICES. FOR THIS REASON, WE ASK THAT YOU ANSWER THIS BRIEF QUESTIONNAIRE AND DROP IT IN THE MAIL TODAY. NO POSTAGE IS REQUIRED.

THANK YOU IN ADVANCE FOR YOUR COMMENTS.

CORDIALLY,  
TECHNICAL MARKETING SERVICES

1. IN WHICH CITY DO YOU CURRENTLY RESIDE? \_\_\_\_\_

2. WHICH AREA OF THE AMUSEMENT INDUSTRY ARE YOU IN? (CIRCLE ALL THAT APPLY)

**OPERATOR                      DISTRIBUTOR                      MANUFACTURER                      ARCADE OWNER                      SERVICE PERSON**

3. HOW IMPORTANT WOULD EACH OF THESE AREAS BE TO YOU IN A TECHNICAL SEMINAR?

	NOT IMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT
a. <b>BASIC ELECTRONICS</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. <b>DIGITAL ELECTRONICS</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. <b>BASIC GOTTLIEB PINBALL TROUBLESHOOTING</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. <b>BASIC GOTTLIEB VIDEO TROUBLESHOOTING</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. HOW INTERESTED WOULD YOU BE IN ATTENDING A 3-5 DAY SCHOOL / SEMINAR (NOT FOR PROFIT) SPONSORED BY GOTTLIEB, AND DEALING WITH THE ABOVE FOUR AREAS? (CIRCLE ONE)

**NOT AT ALL                      SLIGHTLY INTERESTED                      INTERESTED                      MODERATELY INTERESTED                      VERY INTERESTED**

5. APPROXIMATELY HOW MANY GOTTLIEB PINBALL GAMES DO YOU OWN? \_\_\_\_\_ VIDEO GAMES? \_\_\_\_\_

6. APPROXIMATELY HOW MANY OF YOUR GOTTLIEB PINBALL GAMES ARE SYSTEM ONE (PRIOR TO SPIDERMAN)? \_\_\_\_\_

7. HOW OFTEN DO YOU USE THE GOTTLIEB "800" HOT LINE? (CIRCLE ONE)

**NEVER (NOT AT ALL)                      OCCASIONALLY                      SOME OF THE TIME                      FREQUENTLY                      ALWAYS (VERY OFTEN)**

8. HOW OFTEN HAS THE GOTTLIEB "800" HOT LINE HELPED YOU FIND YOUR PROBLEM? (CIRCLE ONE)

**NEVER (NOT AT ALL)                      OCCASIONALLY                      SOME OF THE TIME                      FREQUENTLY                      ALWAYS (VERY OFTEN)**

9. AT WHAT POINT IN TROUBLESHOOTING A GAME DO YOU CALL THE "800" HOT LINE? (CIRCLE ONE)

**BEFORE LOOKING FOR THE PROBLEM                      AFTER FINDING THE FAULT                      AFTER TALKING TO DISTRIBUTOR PERSONNEL                      AFTER TRYING TO FIX THE PROBLEM**

10. WHAT EQUIPMENT DO YOU USE FOR ON-LOCATION TROUBLESHOOTING? (CIRCLE ALL THAT APPLY)

**JUMPER WIRES      METER      LOGIC PROBE      OSCILLOSCOPE      SIGNATURE ANALYZER      FLUKE 9010A**

11. WHAT EQUIPMENT DO YOU USE FOR IN-HOUSE SHOP TROUBLESHOOTING? (CIRCLE ALL THAT APPLY)

**JUMPER WIRES      METER      LOGIC PROBE      OSCILLOSCOPE      SIGNATURE ANALYZER      FLUKE 9010A**

12. HOW OFTEN DO YOU MAKE USE OF THE INSTRUCTION MANUALS SUPPLIED WITH EACH GAME? (CIRCLE ONE)

**NEVER                      OCCASIONALLY                      SOMETIMES                      FREQUENTLY                      ALWAYS**

13. HOW OFTEN DO YOU MAKE USE OF THE SYSTEM 80 SERVICE MANUAL? (CIRCLE ONE)

**NEVER                      OCCASIONALLY                      SOMETIMES                      FREQUENTLY                      ALWAYS**

14. HOW OFTEN IS THE INFORMATION WRITTEN IN THE "ON TARGET" NEWSLETTER TOO BASIC? (CIRCLE ONE)

**NEVER                      OCCASIONALLY                      SOMETIMES                      FREQUENTLY                      ALWAYS**

15. HOW OFTEN IS THE INFORMATION WRITTEN IN THE "ON TARGET" NEWSLETTER TOO TECHNICAL? (CIRCLE ONE)

**NEVER                      OCCASIONALLY                      SOMETIMES                      FREQUENTLY                      ALWAYS**

16. HOW OFTEN WOULD YOU USE SIGNATURES IF WE SUPPLIED THEM ON OUR SCHEMATICS? (CIRCLE ONE)

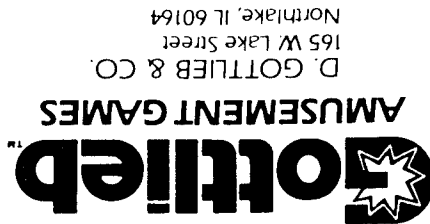
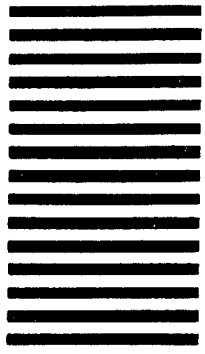
**NEVER                      OCCASIONALLY                      SOMETIMES                      FREQUENTLY                      ALWAYS**

17. WHAT WOULD YOU LIKE TO SEE ADDED TO OUR MANUALS?

\_\_\_\_\_

18. WHAT WOULD YOU LIKE TO SEE ADDED TO THE TECHNICAL SERVICES D. GOTTLIEB NOW OFFERS?

\_\_\_\_\_



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**FOLD HERE LAST**

Thank you for your cooperation in completing this questionnaire. To return, fold where indicated and mail. No return postage is required.

**FLASHBACK**

An attempt at replacing the flipper was made in May 1953 with GUYS AND DOLLS. Across the bottom of the playfield were five rollovers, between each rollover was a plastic "kicking post" which moved parallel to the rollovers. The six

posts were ganged together so that all moved when either flipper button was pressed, this approach did not allow for much aiming of shots. After a while the plastic kickers broke off. The device was never re-used.

**FIXIN' IT BY PHONE**

The Pinball/Video Service Hotlines are now the same.  
Call Toll Free:  
1-800-323-9121  
(ILLINOIS) 1-800-942-1620  
Call from 8:00AM to 4:30PM Central Standard Time, for any Gottlieb Pinball or Video game assistance.

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**FOLD HERE FIRST**



Gottlieb Amusement Games  
165 W. Lake Street  
Northlake IL 60164

MR FRED ABEL  
HOME DESIGN INC  
9609 BERKSHIRE CT S E  
OLYMPIA, WA 98503