

GENERAL CONSUMER ELECTRONICS, INC

VECTREX TROUBLE-SHOOTING GUIDE

The following trouble-shooting guide assumes a general understanding of T.V. electronics and digital techniques. As with all Consumer repair, a complete explanation of the problem can prove invaluable in determining the problem.

Timely repairs can be accomplished with a "GCE" maintenance Test Cartridge (latest Revision), Vectrex Service Manual and this Trouble-Shooting Guide.

All repairs will require the removal of the rear cover! CAUTION, the retaining screws are fine-threaded metric (#.7) and are subject to easy cross-threading when replaced.

Most repairs will be PCBA replacement at first, but with a little experience, component level repairs can be made. Replacing components will require expert soldering techniques to insure correct operation.

REQUIRED TOOLS  
AND  
TEST EQUIPMENT

1. Test Cartridge (Latest Revision)
2. Maintenance Manual (VECTREX )
3. Start-Up Parts Kit (VECTREX )
4. Temperature Controlled Solder Station
5. General Hand Tools
6. Oscilloscope (2 CHAN.)
7. DVM/DMM
8. High Voltage Probe Meter
9. General T.V. Adjustment Tools

T E S T   C A R T R I D G E

P R O C E D U R E

## TEST CARTRIDGE DESCRIPTIONS

### TEST #1

Description: GCE Title Page  
(Fig. 1)

1. Insure the following events happen upon Power-up of unit with Test Cartridge in place.
  - A. VECTREX Announcement:
    1. Border lines parallel with each other & sides of tube.
    2. Printing complete and straight or with only slight slant.
  - B. Introductory Tune:
    1. Sounds are clear.

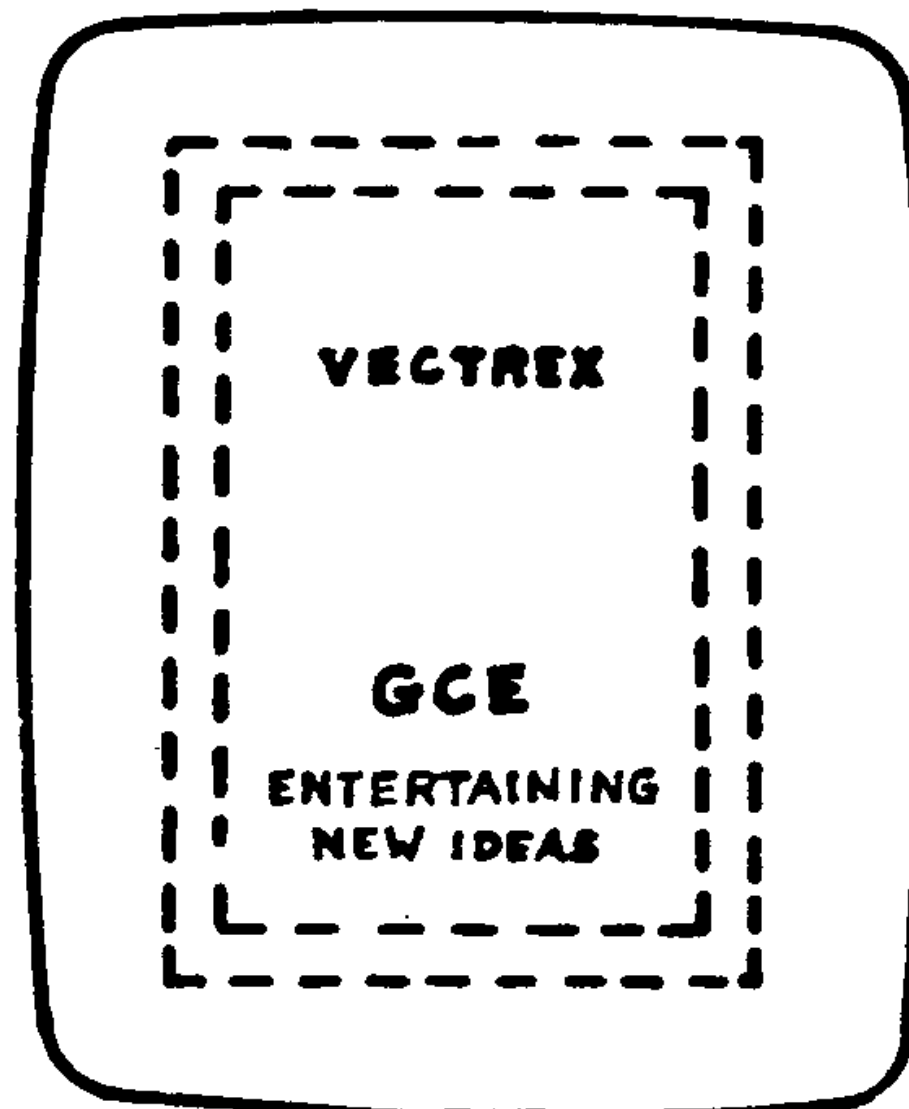


FIGURE 1

### TEST #2

Description: Cartridges Title Page  
(Fig. 2)

1. After 10 seconds, +/-5%, second title page will be displayed automatically. Also, any time you hit re-set with unit on and Test Cartridge in place, Test title page will be displayed.

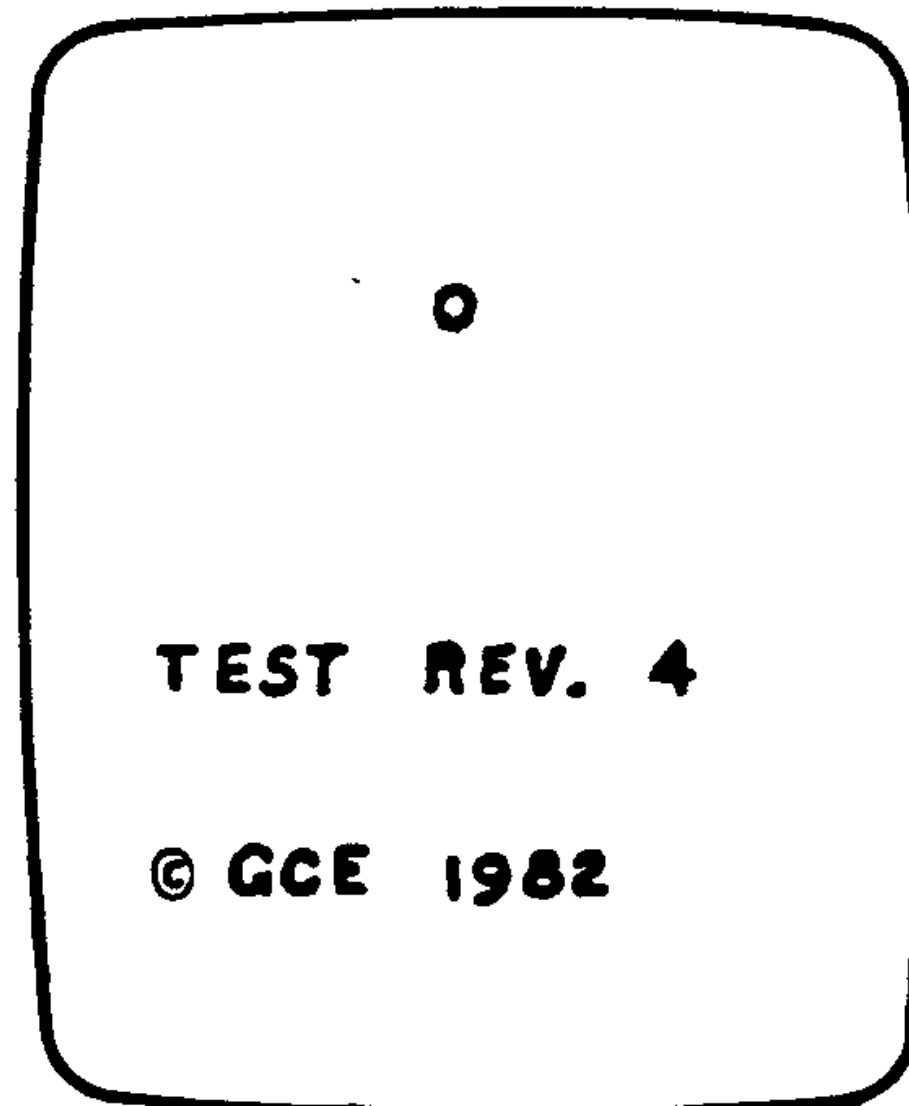


FIGURE-2 -

### TEST #3

Description: Linearity Pattern  
(Fig. 3)

1. After 5 seconds, this display will appear automatically.
2. The pattern is used to check the following:
  - A. Picture Geometrical Distortion
  - B. Vertical Size
  - C. Horizontal Size
  - D. Centering
3. Press Button #4 to move to the next test. Do not depress Button #3 or the controller test (#13) will be displayed and Button #1 and #3 or #4 must be depressed simultaneously to exit.

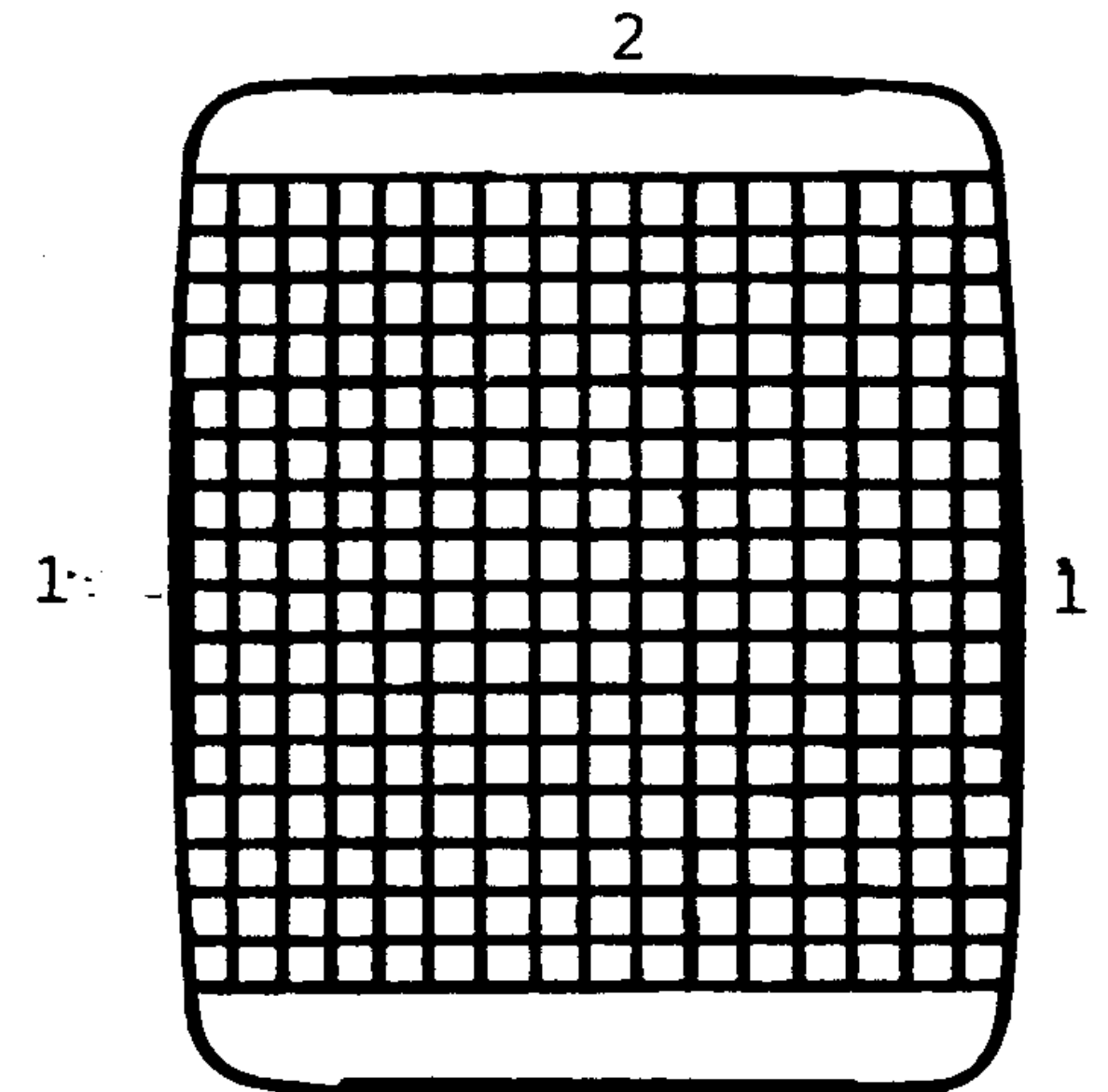
### TEST #4

Description: DAC Offset Adjustment  
(Fig. 4)

1. This test is used in conjunction with a DVM or scope to set the DAC offset pot R302. See test procedure in later section of this manual.
2. This test will display the statement, "ADJUST DAC OFF-SET", for a short time each 6 seconds. The adjustment R302 must only be done when these words are off the screen.
3. To move to another test when display is "on", hit controller Button #3 or Button #4 to move to Test #3 or Test #5 respectively. Reset maybe hit at anytime to return to title page.
4. Button #4 must be depressed to advance to the next test and Button #3 to return to the previous test.

Anytime Test #13, the Hand Controller Test is displayed, Button #1 and either Button #3 or #4 must be depressed to exit that Test.

1-HORIZ. SIZE  
LOCATION LINE  
2-VERT. SIZE  
LOCATION LINE



2  
FIGURE 3



FIGURE 4

TEST #5

Description: Integrator Offset  
(Fig. 5)

1. All lines must meet and be continuous.  
NOTE: Please use bottom display for checking.
2. Allowable Offset other than bottom displays can be 1/2 of a line offset. Refer below.



GOOD



UNACCEPTABLE

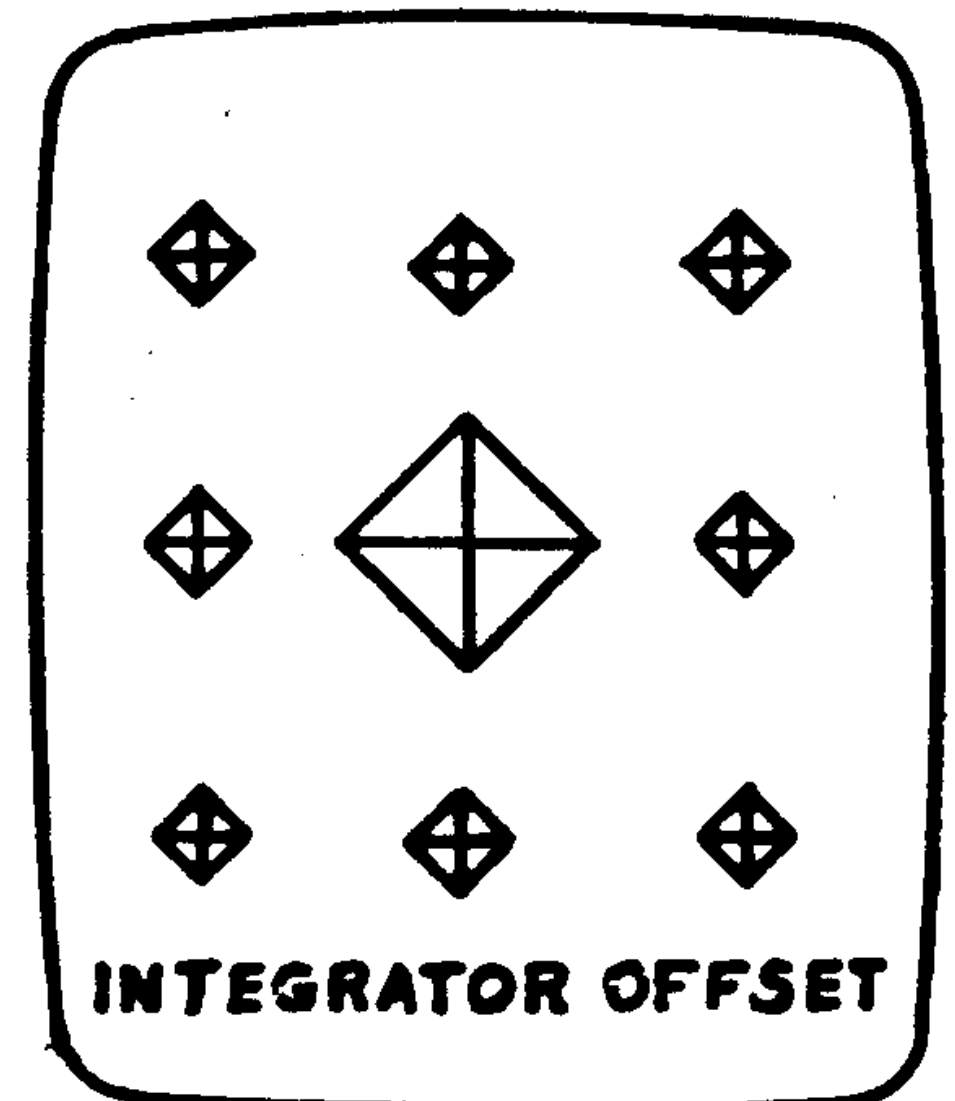


FIGURE 5

TEST #6

Description: Check Sum  
(Test Cartridge Rev. 4)  
(Fig. 6)

1. During performance of forming checksum, display #1 is near center of tube and is flashing. Display #2 comes later (5 sec.) and stays. To do another checksum, select an adjacent test then immediately return to test #6.

Please note the Checksum B796 is the Domestic Checksum. It will appear for the International Executive I or for the International Executive II in newer production.

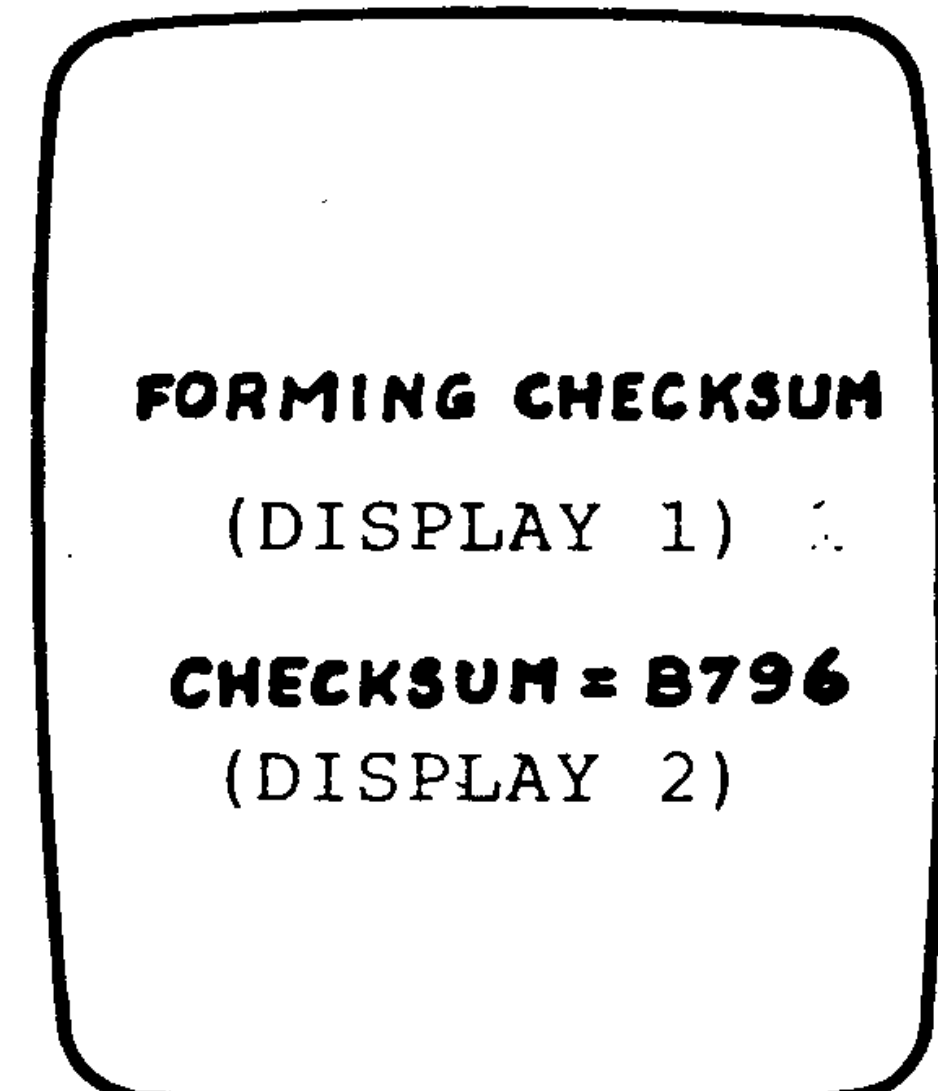


FIGURE 6

TEST #7

Description: Deflection Protect  
(Fig. 7)

1. When selected the words "Deflection Protect" will appear then the screen will be blank for 6 seconds, the display will start at half size and grow to full size. Insure pattern #2 does not start as a dot and grow; it should start at 1/2 full-size. NOTE: Intensity adjustment will effect display. Please refer to Test #9.

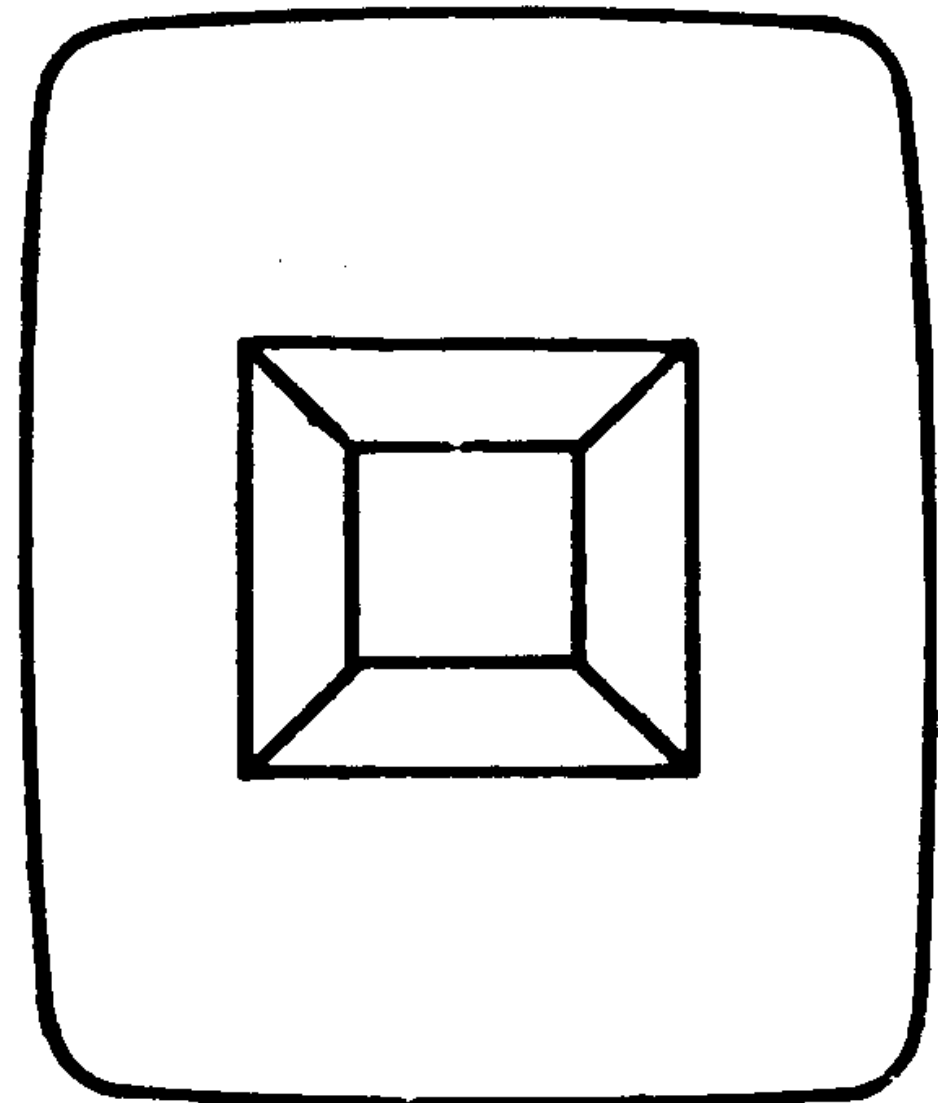


FIGURE 7

TEST #8

Description: Sound Test  
(Fig. 8)

1. Words "CHANNEL A" will appear on bottom of the screen, at the same time a tone going from low to high, smoothly and continuously will be audible.
2. Words, "CHANNEL B" will appear in the middle of the screen and the same audible tone will be heard.
3. "CHANNEL C" will be displayed at the top of the display with the same tone as in #1 and #2.
4. Words will next appear in the center of the display "NOISE ALL CHANNELS". There will be sound like static or "gun shot" for a short duration, then the screen will go blank for a few seconds. Two other sounds will be heard, which are CPU generated. This test runs over and over without Operator intervention.

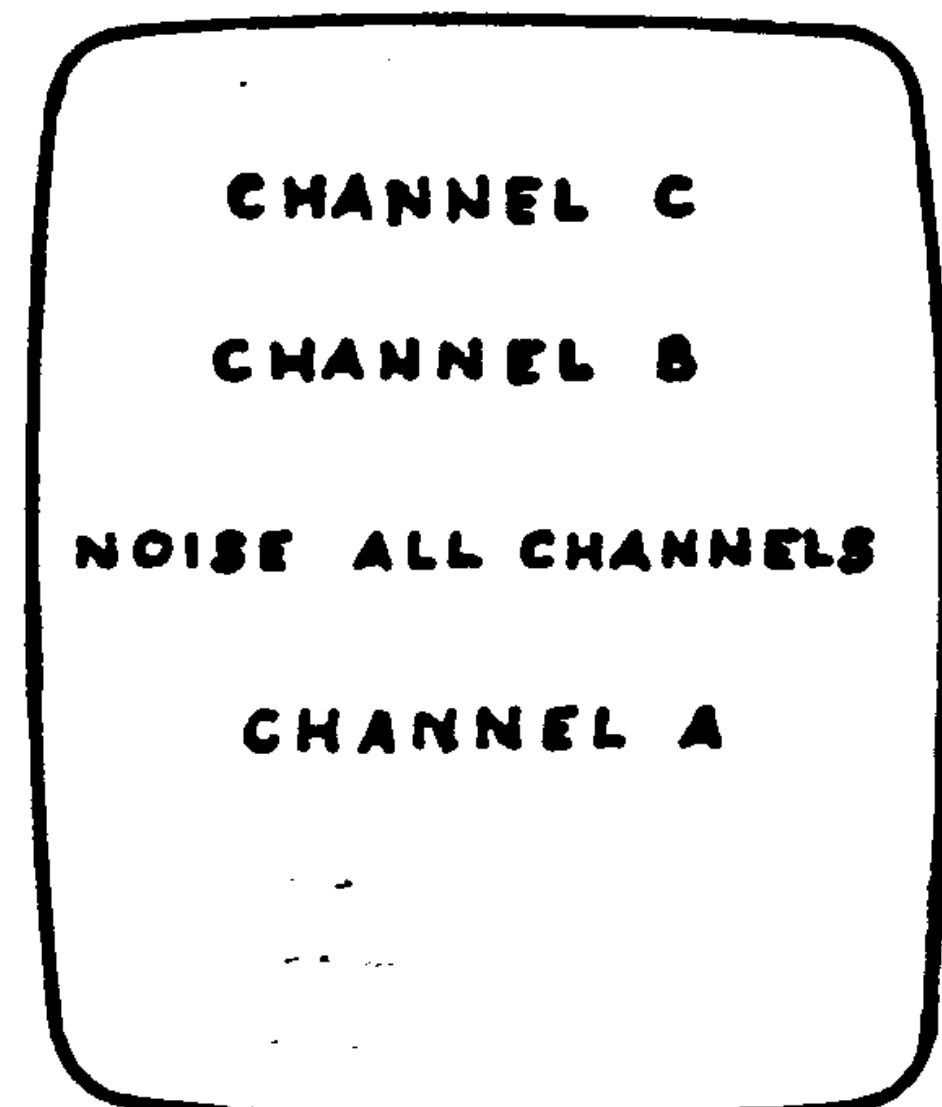


FIGURE 8



TEST #9

Description: Intensity Adjust  
(Fig 9)

1. The word "INTENSITY" will appear with 17 equally spaced lines running horizontally across the screen. The 2nd, 3rd, and 4th line from the top should not be seen, but the 5th line, just on top of the word, "INTENSITY" must be visible. Adjust brightness if necessary to meet the requirements above.

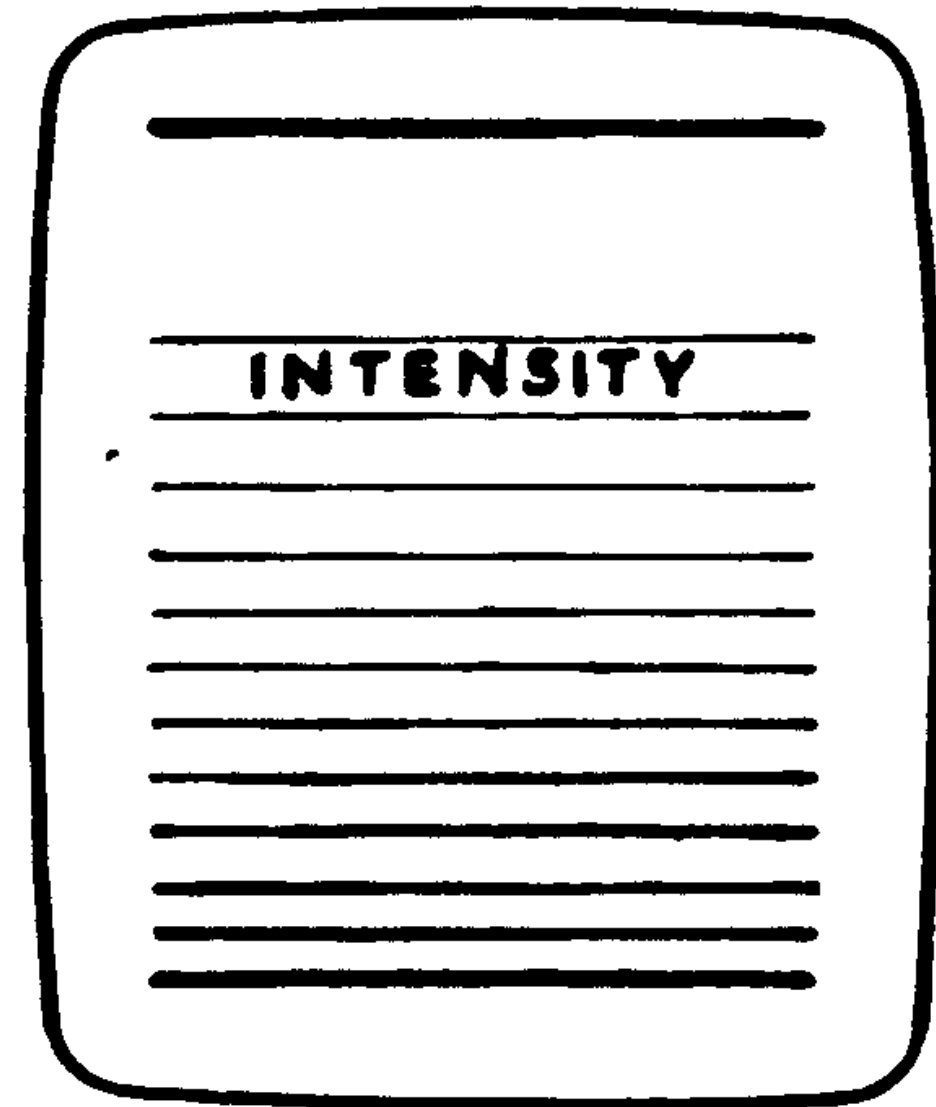


FIGURE 9

TEST #10

Description: Focus Test  
(Fig. 10)

1. The line packets in the center of the screen should be sharp with a well defined space between each line. Four (4) corner line packets should exhibit minimum unfocus.



FIGURE 10

TEST #11

Description: Distortion Test One  
(Fig. 11)

1. A boarder of triangles will appear on the screen with the work "DISTORTION" in the center. Check that all triangles are symmetrical in appearance.



FIGURE 11

TEST #12

Description: Distortion Test Two  
(Fig. 12)

1. The words "DISTORTION 2" will be displayed in the center of 16 progressively larger rectangles traced around it.

The spacing of each side must be the same for each succeeding rectangle and the overall pattern must be symmetrical.

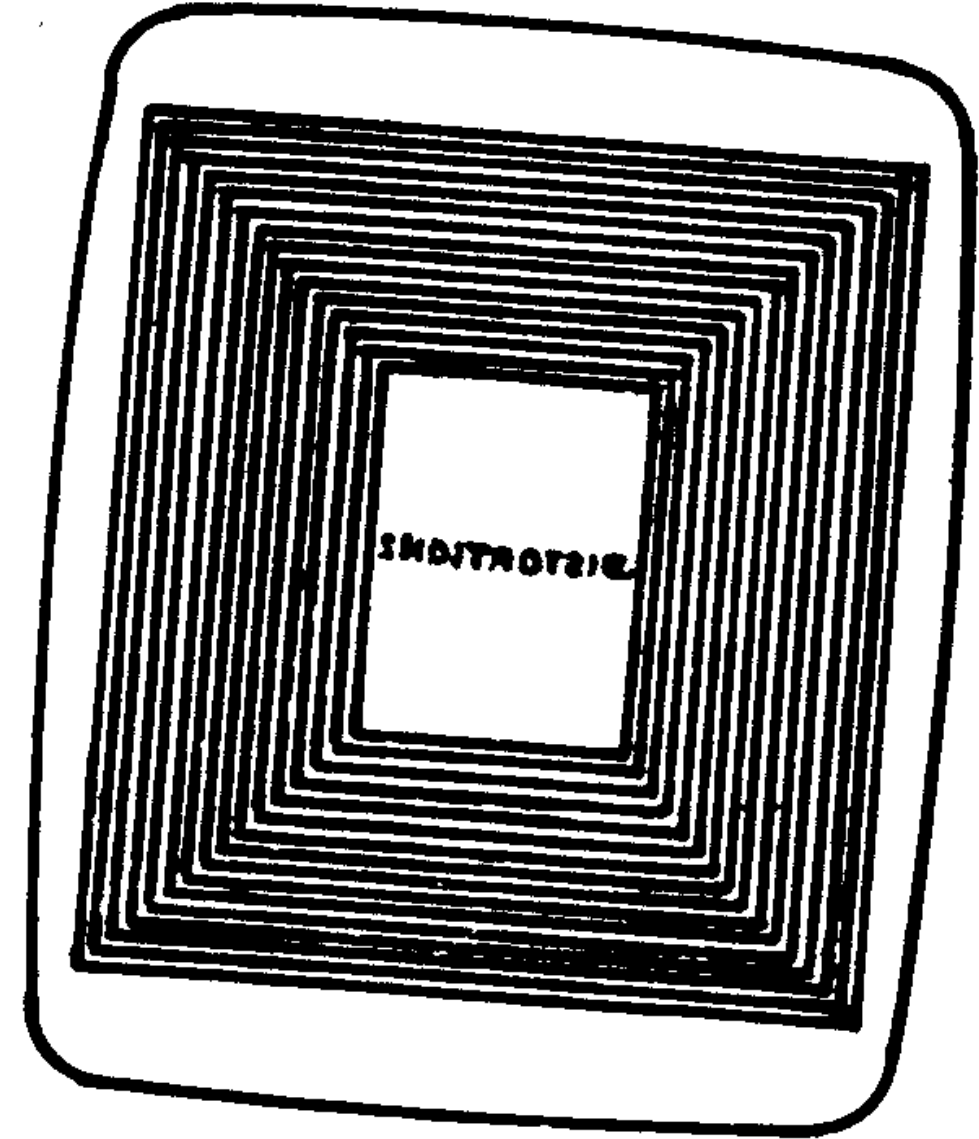
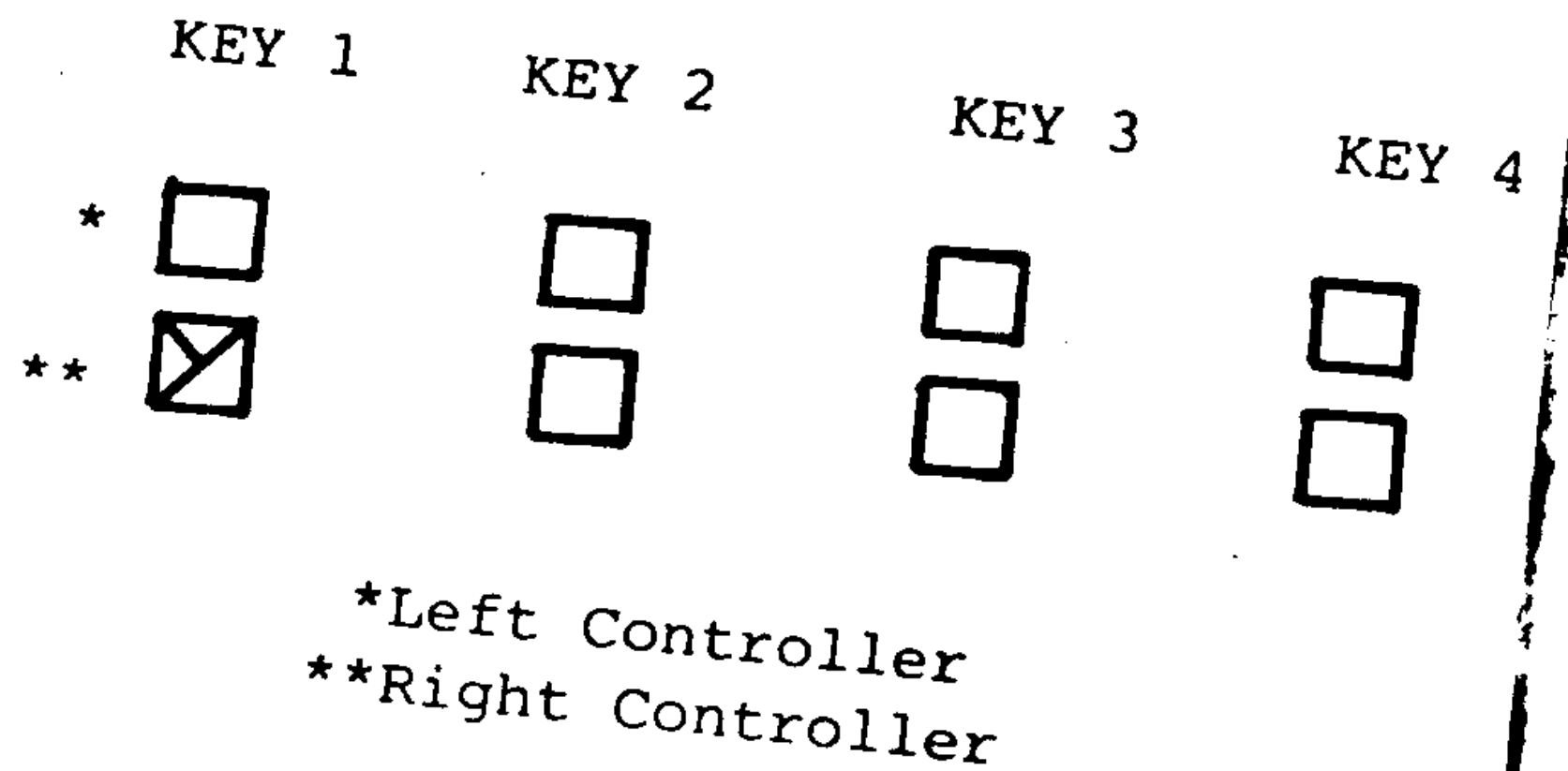


FIGURE 12

TEST #13

Description: Key panel Test  
(Fig. 13)

1. NOTE: When you have entered this last Test Pattern, you must hit "Reset" to change test, or hold down #1 key button and hit #3 key button to move back to Test #12 or #4 key button to jump to Test #3.
2. After testing controller in plug #1, the right controller port, move to plug #2, the left controller port and retest controller.
3. Press Buttons 1 thru 4 consecutively:  
The



\*Left Controller  
\*\*Right Controller

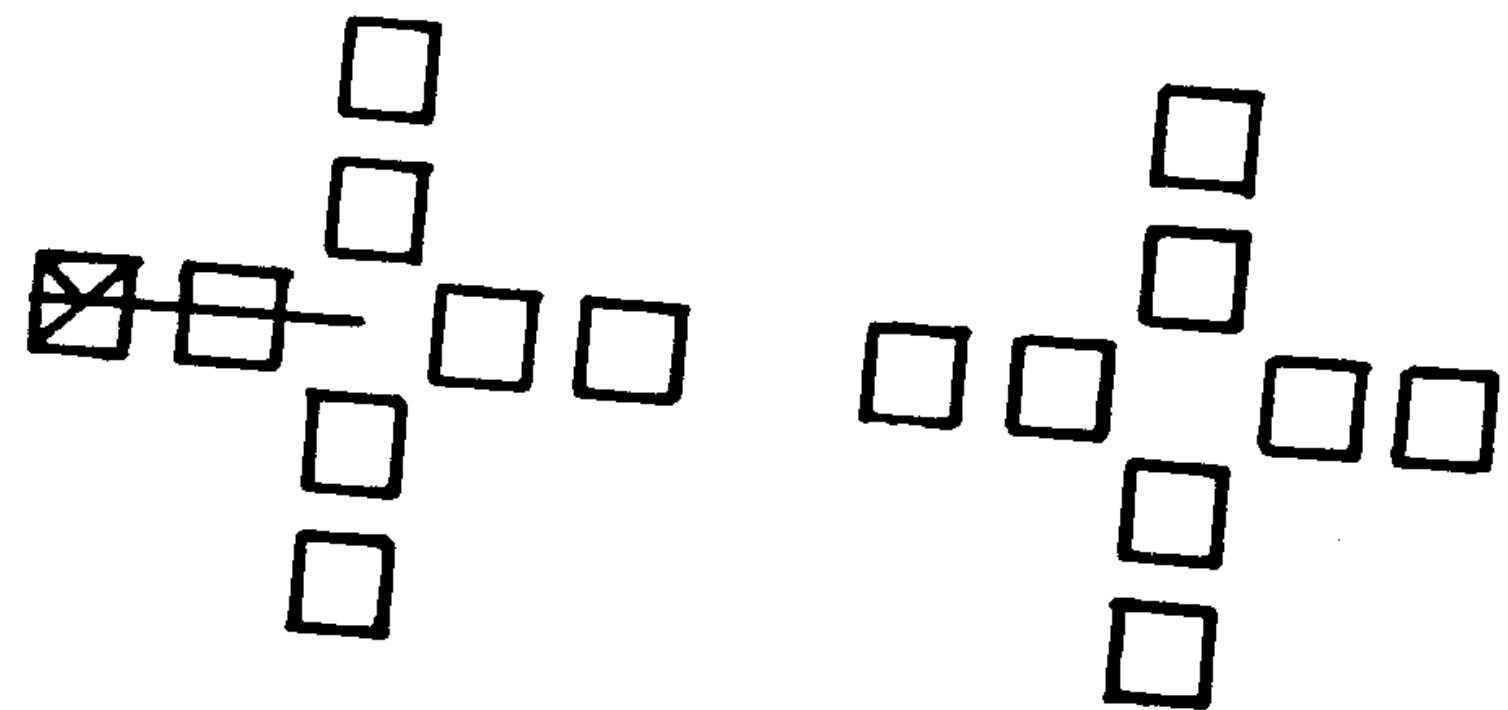


FIGURE 13

symbol must appear as each button is pushed in the appropriate square.

4. Displace the joystick 90 degrees to the right slowly. The symbol as above must appear first in the box closest to the center, then disappear and the outer box must indicate the symbol. There will be a line that extends from the center of the diagram in the direction the joystick is pushed. Check all four (4) directions and check that the appropriate box lights up.

Remove the hand control cord from right port and move it to the left port. Repeat the above test.

NOTE: If the left joystick is not plugged in, one of the inner boxes will light because of the LMEG pull-up resistor internal to the VECTREX. No boxes should light on either port for which a controller is plugged into when the joystick is at rest.

GCE  
TROUBLESHOOTING GUIDE  
VECTREX SYSTEM

NOTE: VECTREX Orientation is from  
the Rear Left to Right.

SYMPTON	TOOLS/EQ. NEEDED	TEST PROCEDURE	PROBABLE CAUSE
Unit will not Power up.	VOM Philips Scredriver	<ul style="list-style-type: none"> <li>- Measure resistance at A/C plug (set VOM to OHMS scale 1X) should read 10 to 21 OHM +/- 5%.</li> <li>- <u>CAUTION</u>: AC Switch SW301 is located on secondary side side of T101.</li> <li>- Remove rear cover - REF. Pg. 11, Service Manual HP3000.</li> <li>- Check Fuse F101.</li> <li>- Check SW301 - Turn unit onside (CAUTION: Damage can be done) and make a continuity check of the A/C switch.</li> </ul>	<p>T101 PRIMARY open or shorted.</p> <p>F101 Open. SW301 open or shorted</p>
<p>No Vector</p> <p>Intermittent Vector</p> <p>Intensity bad</p>	<p>VOM</p> <p>DMM/DVM</p> <p>Scope</p> <p>Shop Tools</p> <p>Test Cartridge</p>	<ul style="list-style-type: none"> <li>- Select Test #3.</li> <li>- Check for +/- 5 VDC and -13 VDC at connector J204 Left to Right -5, GND, +5, -13.</li> <li>- Measure AC input voltage to power supply PCB.</li> <li>- EP105 (center tap) to EP106 = 8.6 VAC.</li> <li>- EP105 (center tap) to EP104 = 8.6 VAC.</li> <li>- <u>CAUTION</u>: When replacing Power Supply wires, insure you check continuity on both sides of P/S PCB.</li> <li>- Check that there are no shorts between the +9 and -9 power supply to GND. (T503 (IN) - T401 (IN) ).</li> <li>- Remove T401 or T503 and check that there are no shorts to GND.</li> <li>- Check for short between heat sink (on Power Board) and IC401 heat sink.</li> </ul>	<p>D101 - D104 IC 101, 102 IC 207 T101 F101</p> <p>Q502 IC 401 T502</p>

GCE  
TROUBLESHOOTING GUIDE  
VECTREX SYSTEM

NOTE: VECTREX Orientation is from  
the Rear Left to Right.

SYMPTON	TOOLS/EQ. NEEDED	TEST PROCEDURE	PROBABLE CAUSE
<p>No Vector Intermittent Vector Intensity bad</p>	<p>VOM DMM/DVM Scope Shop Tools Test Cartridge</p>	<p>- Check Signal Waveform (X, Y, &amp; Z axis-See Attach. 1) (Red Blue Yellow) at J402 on Logic PCB. Refer to Page 15, WAVE FORMS "A". Also check these same signals at EP401-404 (Y,Y,) and EP506 on Power PCB same Waveforms as above. Connect scope: EXT. SYNC to PIN 9 of IC302, set scope CHAN. A to .2 volts/Div. and Time/Div. to 1ms.</p> <p>- Select TEST #4.</p> <p>- Check Signal Waveform at PIN 7 and PIN 8 of IC401 (no DC level is carried) Refer to Page 15, WAVEFORMS "B". Set Scope: Same as above except Volts/DIV. = .02 Time/DIV - 2 ms. NOTE: Waveform is seen only when "DAC OFFSET" is displayed.</p> <p>- Check supply voltage at CRT PCB PINS 2 (+40), 3 (+.3 mv), 5 (-29 to +3 brightness control) and 6 (+135), (All +/- 10%)</p> <p>- Check Z Axis Waveform at PIN 2 of CRT socket (EP505) Page 15.</p> <p>- Connect Scope: Ext.-SYNC. to PIN 9 of IC303.</p> <p>- SET Scope: Volts/Div. = 2 and Time/Div. - 1ms.</p>	<p>IC303 IC302 IC301 IC401 IC501</p> <p>IC 401</p> <p>No Z axis is applied. Intermittent or poor contact of CRT socket P501.</p> <p>Q503 Q505 Open Cable IC303 IC302</p>

GCE  
TROUBLESHOOTING GUIDE  
VECTREX SYSTEM

NOTE: VECTREX Orientation is from  
the Rear Left to Right.

SYMPTON	TOOLS/EQ. NEEDED	TEST PROCEDURE	PROBABLE CAUSE
<p>No sound, Abnormal sound on CHAN. A, B or C &amp; CPU.</p> <p>Weak sound, distorted sound, or noisy sound.</p>	<p>VOM, Scope Test Cartridge</p>	<p>SELECT TEST #8</p> <ul style="list-style-type: none"> <li>- Check for signal on IC 208 PINS 1, 4, and 5.</li> </ul> <p style="margin-left: 40px;">NOTE: Chan. A = PIN 5, Chan. B = PIN 4 and Chan. C = PIN 1.</p> <ul style="list-style-type: none"> <li>- Set Scope: VOLTS/Div. - .5V Time/Div. = 5 ms.</li> <li>- Check continuity between J302 on Logic PCB &amp; J302 on Power PCB.</li> </ul> <p style="margin-left: 40px;">NOTE: Black audio cable can not be inverted end for end, loss of audio will occur. Also insure, when you make continuity check you do not bend contacts inside connectors.</p> <ul style="list-style-type: none"> <li>- Check signal Waveform at PIN 8 of IC103 and PIN 1 of J103 (Speaker Cable), both should be the same.</li> </ul> <p style="margin-left: 40px;">NOTE: The Waveforms will be different for each sound.</p> <ul style="list-style-type: none"> <li>- Set Scope: Volts/Div. = .02; Time/Div. = 5 ms.</li> <li>- When checking volume control, place scope probe on PIN EP108 and turn volume control up to see same Waveforms as above, also check wave forms at J103 PIN 1.</li> </ul> <p style="margin-left: 40px;">NOTE: Check that audio cables are routed away from yoke and all IC areas when possible.</p>	<p>IC 208 IC 302 IC 207 R341 - R346 C-224 Volume Control Speaker Cable</p>



GCE  
TROUBLESHOOTING GUIDE  
VECTREX SYSTEM

NOTE: VECTREX Orientation is from  
the Rear Left to Right.

SYMPTON	TOOLS/EQ. NEEDED	TEST PROCEDURE	PROBABLE CAUSE
<p>Ripple in Picture Shaking or Flashing</p>	<p>VOM DMM/DVM Scope Test Cartridge</p>	<p>SELECT TEST #3</p> <ul style="list-style-type: none"> <li>- Check ripple on + and - 9VDC and 5 VDC power supplies at T503 (IN), should be less than .05V.</li> <li>- Set Scope: Volts/DIV. = .01 Time/DIV. 5 ms (AC)</li> <li>- Check AC voltage between GND and EP104 and EP106.              EP104 = 8.5 VAC +/- 10%              EP106 = 8.5 VAC +/- 10%</li> <li>- Set Scope: Volts/DIV. 1 Time/DIV. 5 ms              Internal SYNC.</li> <li>- Check Waveform at PIN 7 of T502, Refer to Page 15 of manual.</li> <li>- Check ripple Waveform at G1 (PIN 5) CRT. PCB.              (Maximum 400 mv).</li> <li>- Check output Waveform at PIN 10 and PIN 5 of IC401 -              These waveforms should be the same.</li> <li>- Set Scope: Volts/DIV. = .05 Time = Sync external</li> </ul>	<p>D101 - D104 C111 &amp; C110</p> <p>T101 C514, C515 IC401</p>
<p>Picture distortion Pincushioning, Barreling and keystoning.</p>	<p>Shop tools Test Cartridge</p>	<p>SELECT TEST #1</p> <ul style="list-style-type: none"> <li>- Loosen yoke clamp, push yoke tight against CRT bell. Orient yoke to correct axis; tighten clamp. If distortion is still not acceptable, inspect yoke magnets.</li> </ul>	<p>Yoke magnets missing Bad yoke winding</p>
<p>Abnormal sound &amp; picture while tapping.</p>	<p>Shop tools Meter</p>	<ul style="list-style-type: none"> <li>- Do visual inspection of unit taking careful note of all connectors, IC sockets and areas previously repaired.</li> </ul>	

GCE  
TROUBLESHOOTING GUIDE  
VECTREX SYSTEM

NOTE: VECTREX Orientation is from  
the Rear Left to Right.

SYMPTON	TOOLS/EQ. NEEDED	TEST PROCEDURE	PROBABLE CAUSE
Picture off-center Vertical size incorrect	Shop tools Scope	SELECT TEST #3 - Refer to Page 12 of manual - "Logic Board Adjustments". - Refer to Page 15 of manual - "Power Board Adjustments".	Adjustments incorrect IC305 IC303 IC301 IC401 Q301
Poor lettering Display, i.e., Tilt & size	Shop tools Scope DMM/DVM VOM Test Cartridge	SELECT TEST # 4 - Do DAC 0 Adjustment  - Do intergrator OFF - SET adjustment (Refer to page 15 of manual. - SELECT TEST #5	IC305 IC303 IC301 R 333 R 335
Picutre size changed and unstable when input voltage is normal	Scope DMM/DVM Test Cartridge	SELECT TEST #3 - Check voltage at PIN 5 and PIN 8 of IC501 PIN 5 = 5VDC     +/- 5% PIN 8 = 3VDC     +/- 5% - Check waveform at PIN 7 of T502 and base of Q502, these should be the same. - Disconnect C504, check waveform at PIN 3 of IC501, adjust R 525 and R 526 to conform to display on wave- forms section (Refer to Waveforms, C) Page 15. - Set Scope: Volts/DIV. = 1 Time/DIV. = .1 ms internal.	C501, C517 IC501 R 505 T 501 R 527 T 502



GCE  
TROUBLESHOOTING GUIDE  
VECTREX SYSTEM

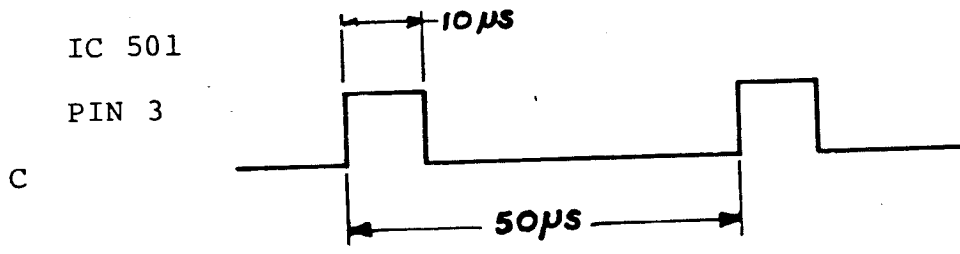
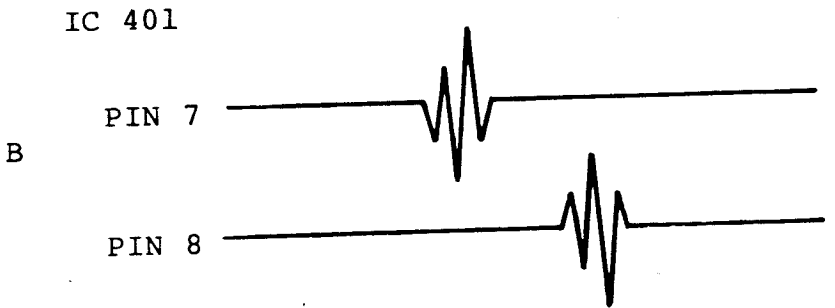
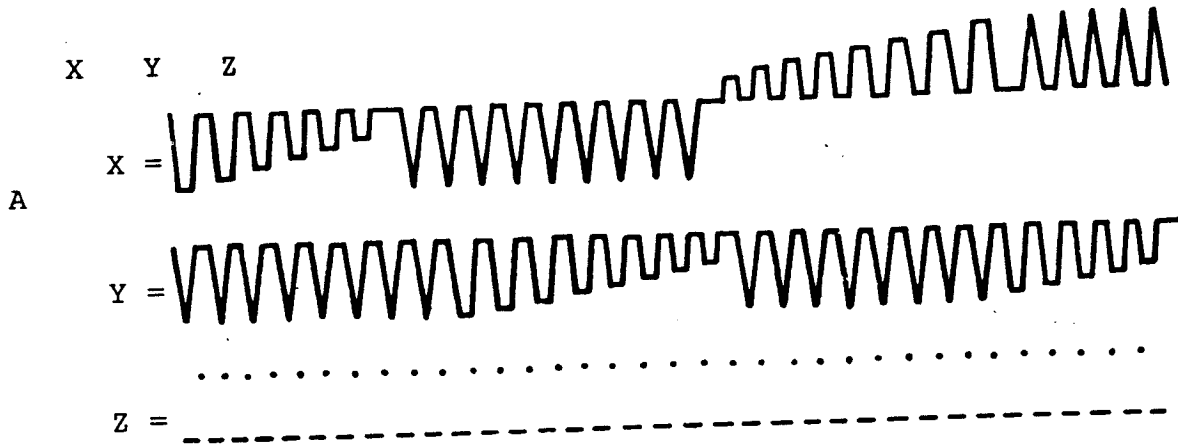
NOTE: VECTREX Orientation is from  
the Rear Left to Right.

SYMPTON	TOOLS/EQ. NEEDED	TEST PROCEDURE	PROBABLE CAUSE
Slanting of announcement and sub-title display.	Shop tools Test Cartridge	SELECT TEST #1 - Display of Title Page is tilted, replace IC302. - Printing inside Title Page is slanted, replace IC301.	IC302 IC301
Picture distortion - long and short of picture.	Scope DMM/DVM Test Cartridge	SELECT TEST #3 Check Signal waveform at J301 (X, Y) Compare these to Signal at R413 and R406 on Power PCB respectively (return to signal).	Q301 IC401 Mounting method of IC401.

ATTACHMENT 1

VECTREX™

WAVEFORMS



J301

