CX 5200™ FIELD SERVICE MANUAL

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ATARI

ADVANCED VIDEO ENTERTAINMENT SYSTEM

MODEL 5200™

FIELD SERVICE MANUAL

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INTRODUCTION

The Atari Advanced Video Entertainment System (Model 5200) Field Service Manual is a reference guide for you, the service technician.

This Field Service Manual is organized in twelve sections:

- THEORY OF OPERATION – Overview of how the Model 5200 works and what its basic assemblies look like.
- SILKSCREENS AND SCHEMATICS – Electrical drawings and layouts of all of the Model 5200 printed circuit boards.
- 4 – PORT 5200 TESTING – Review of Diagnostic Tests available for diagnosing 4 – Port Model 5200 problems.
- 2 – PORT 5200 TESTING – Review of Diagnostic Tests available for diagnosing 2 – port Model 5200 problems.
- 4 – PORT 5200 DIAGNOSTIC FLOWCHART – Aids for troubleshooting the 4 – Port Model 5200.
- 2 – PORT 5200 DIAGNOSTIC FLOWCHART – Aids for troubleshooting the 2 – Port Model 5200.
- 4 – PORT 5200 SYMPTOM CHECKLIST – Failure information to assist the experienced technician arrive at a rapid diagnosis of 4 – Port Model 5200 problems.
- 2 – PORT 5200 SYMPTOM CHECKLLST – Failure information to assist the experienced technician arrive at a rapid diagnosis of 2 – Port Model 5200 problems.
- GAME CONTROLLERS – Overview of hand controller construction with electrical schematics and recommended test and repair procedures.
- TRAKBALL CONTROLLER – Overview of trakball construction with electrical schematics and recommended test and repair procedures.
- PARTS LLST – Detailed breakdown of all parts used in the 4 – Port and 2 – Port models.
- SERVICE BULLETINS – Section to be used to hold Field Change Orders, Upgrade Bulletins and Tech Tips.

This manual is designed for use by both the experienced and inexperienced service technician. The Diagnostic Flowcharts (Sections 4 and 4A) provide detailed procedures for technicians not completely familiar with the 5200 models. The Symptom Checklists (Sections 5 and 5A) provide a rapid reference for the more experienced technician.

SECTION 1

THEORY OF OPERATION

Overview

The ATARI Advanced Video Entertainment System (Model 5200) is an advanced microcomputer. It receives input from the game controllers, Read-Only-Memory (ROM) cartridges and other peripherals, and displays this input on a T.V. screen. A maximum of four players may play at one time.
The Model 5200 is composed of the console, switchbox and game controllers. The following paragraphs provide a general discussion of each of these items and their component parts. For a detailed discussion of the Game Controller see SECTION 6.

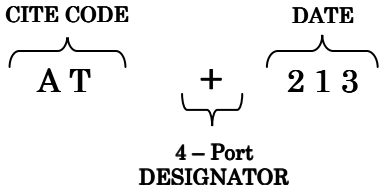
Model 5200 CONSOLE

The Model 5200 console is composed of an outer plastic case which houses the PC board and its RF Shield. Figure 1-1 shows the console and its parts.
There are currently three different PC Boards being used in Mode! 5200 consoles. Some models contain the original 4 – Port PC Board, number CA018087. Other consoles contain a 4 – Port universal PC Board, number CA020108. A third PC Board with only two player pots, number CA021374, is also available. Unless otherwise specified, the references in this manual pertain to the original 4 – Port PCB, number CA018087. The specific differences of the 4 – Port universal PCB and the 2 – port universal PCB are called out below.

Four-Port Universal PCB differences:

External

The ATARI serial number on the bottom of the unit will have a + as its third designator. For example:



Internal

1. The chip designators have been changed. All chips are designated A instead of U.
2. Two 74LS244 Ics (U4 and U15) were removed from the PC Board.
3. Two 74LS244 Ics (U14 and U28) were replaced with a 74LS125 (A14) and a 74LS51 (A15).
4. Provisional circuitry for future expansion has been added in order to accommodate the VCSTM cartridge adaptor.

Two-Port Universal PCB differences:

1. All of the 4 – Port universal board differences listed above are included on the 2 – Port universal PCB.
2. Ports 3 and 4 and their associated discrete components have been removed.
3. Ics A12 and A13 have been removed.
4. The automatic switchbox has been replaced with a manual switchbox and the RF cable has been replaced with the standard RF cable.
5. The power adaptor plugs directly into the rear of the console instead of plugging into the switchbox.

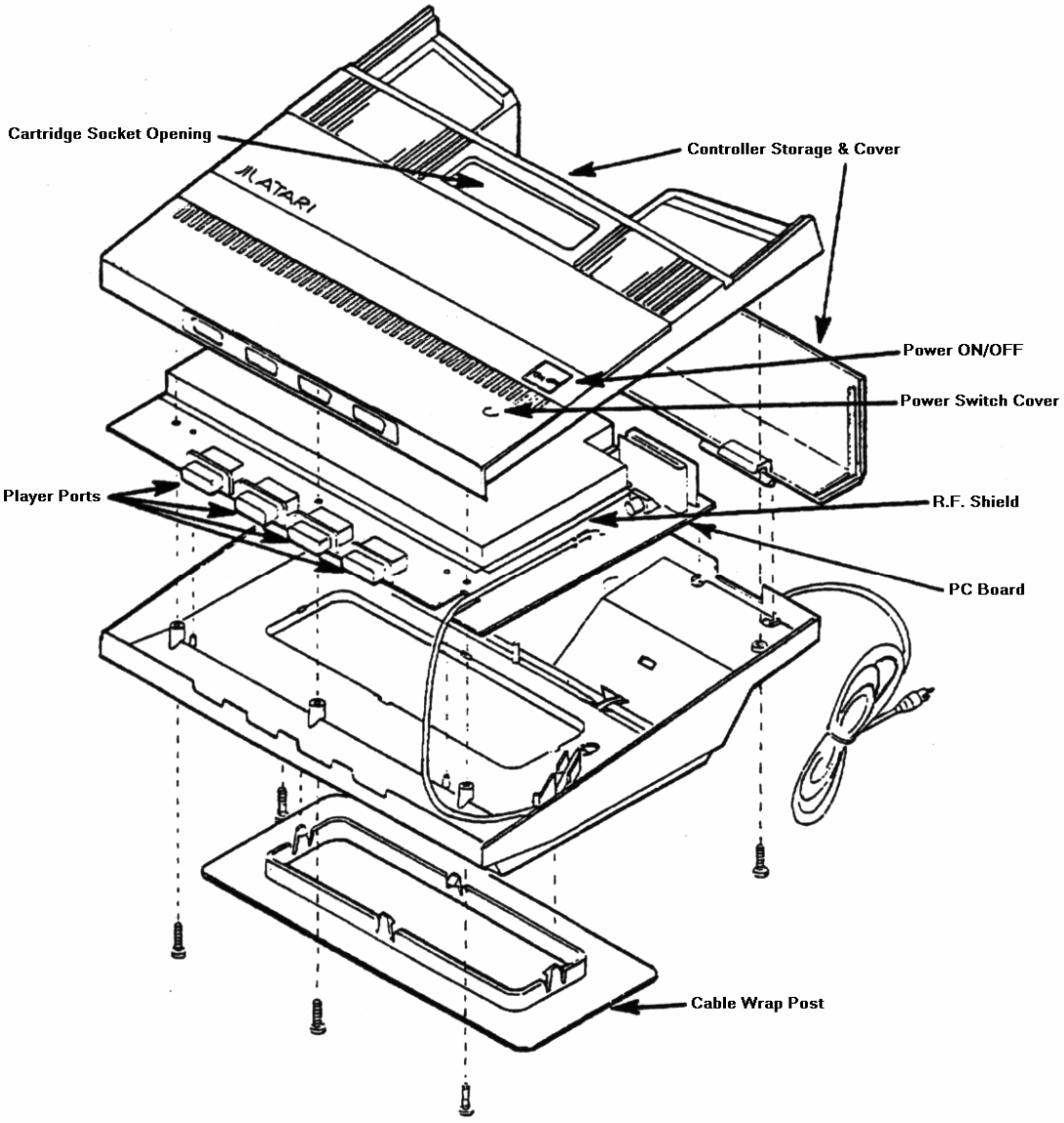


Figure 1-1. Model 5200 console (4 – Port)

Outer Case

The outer case consists of a bottom and a top plastic cover which are held together by five Phillips-head screws.

At the rear of the bottom plastic cover (Figure 1-2) is:

a) an opening for access to the channel 2-3 switch
b) a removable door which allows access for future development.

In the base is a cable wrap post for RF cable storage.

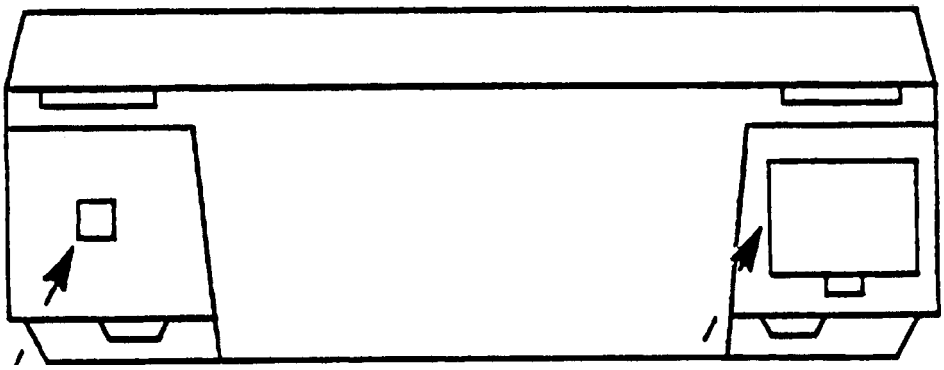


Figure 1-2. Channel 2-3 Switch and Future Development Access

The top plastic cover provides:

1) openings at the front for the four player ports
2) the power switch cover
3) the power ON/OFF switch
4) a storage area at the rear for two game controllers. The hinged cover for this area comes off as a separate piece when the top cover is disassembled.

RF Shield

An aluminium shield covers the PC Board and prevents the PC Board from generating interference on the T.V. screen.

PC Board

The console you are servicing may contain either the original PC Board Number CA01.8087 or the newer PC Boards Numbers CA020108 or CA021374. See Page 1-1 of this manual for an explanation of the three board's differences.

The PC Board consists of:

- 28 Integrated Circuit Chips on PC Board Number CA018087; 26 Integrated Circuit Chips on PC Board Number CA020108; 24 Integrated Circuit Chips on PC Board Number CA021374.
- a cartridge socket
- an RF module
- various discrete components

The major chips on the PC Board are:

Microprocessor Chip – MPU

The microprocessor (MPU) is the brain of the 5200. It makes the major decisions based on information from the ROM cartridge and the Random Access Memory. Figure 1-3 shows the pin assignments for the MPU.

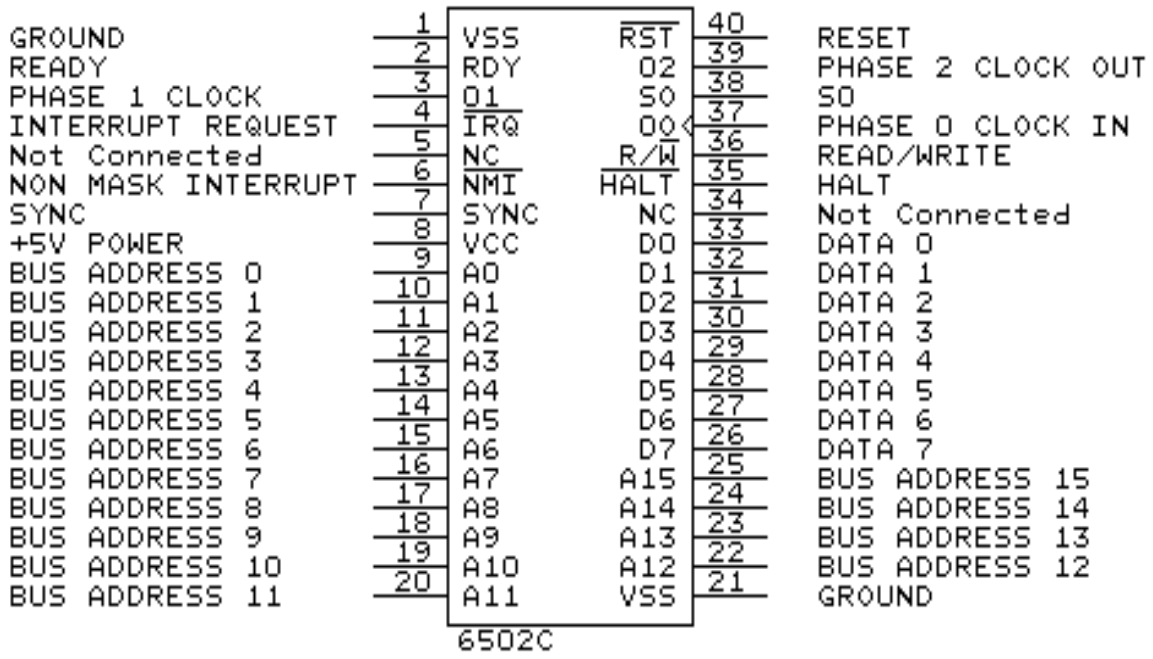


Figure 1-3. MPU Pin Assignments

Alphanumeric Television Interface Controller (ANTIC)

The primary function of the Alphanumeric Television Interface Controller (ANTIC) chip is to get data from memory, independent of the processor, for display on the video screen. Figure 1-4 shows the pin assignments for the ANTIC.

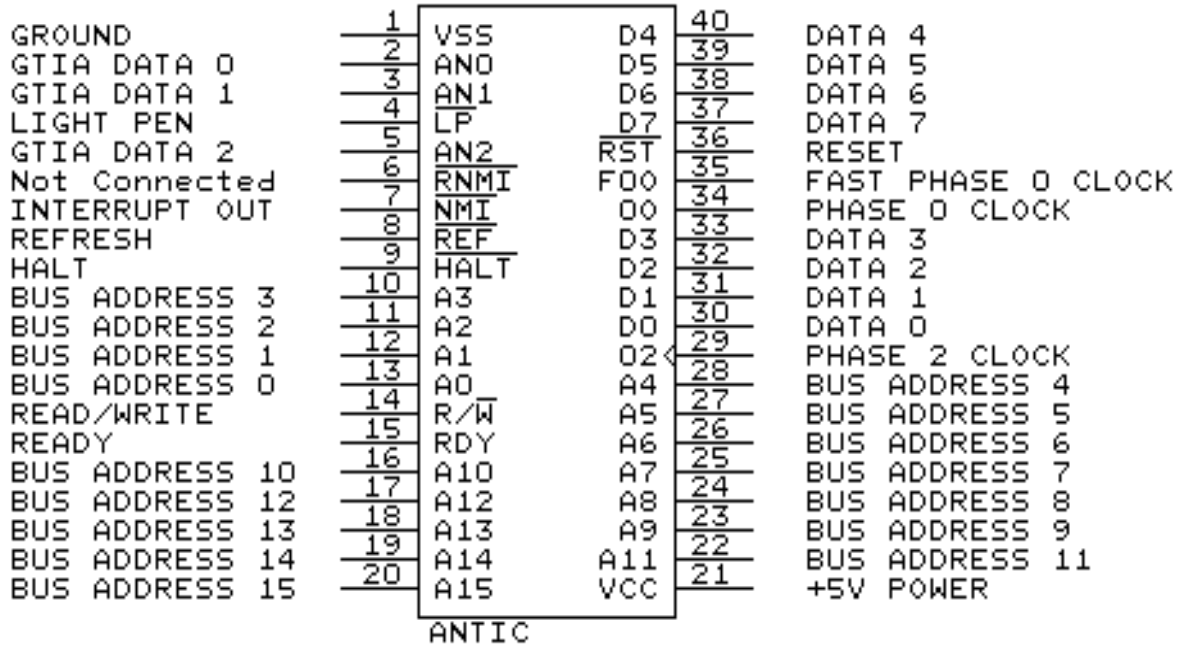


Figure 1-4. ANTIC Pin Assignments

Graphic Television Interface Adaptor (GTIA)

The Graphic Television Interface Adaptor (GTIA) chip retrieves graphics data from memory via the ANTIC DMA process. This data is routed to the GTI~ graphics registers. Figure 1-5 shows the pin assignments for the GTIA.

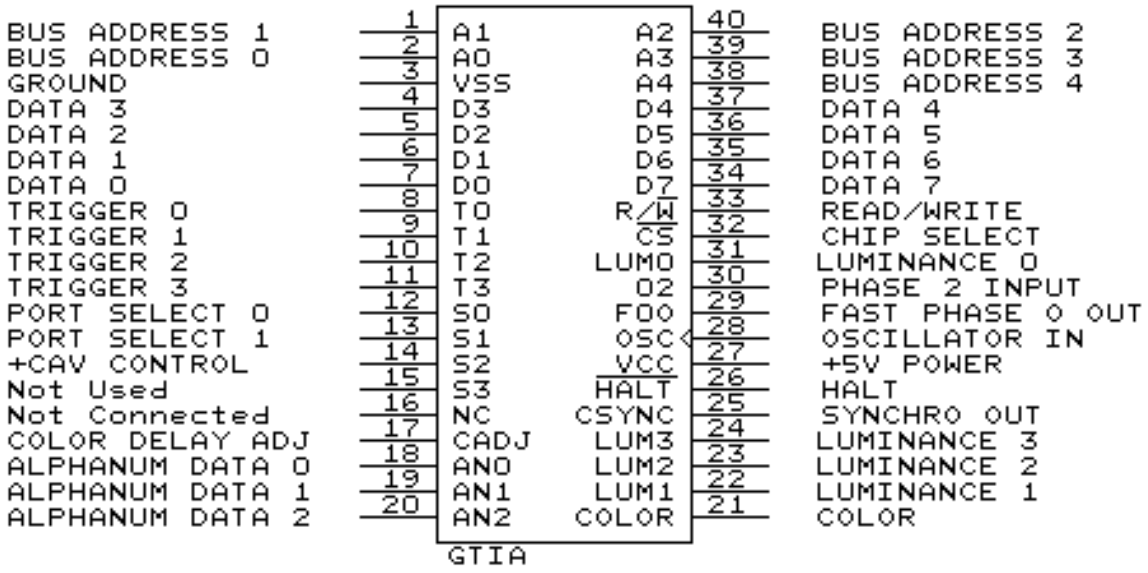


Figure 1-5. GTIA Pin Assignments

POT Keyboard Integrated Circuit (POKEY)

The Pot Keyboard Integrated Circuit (POKEY) chip provides the interface between the game ports and the microprocessor. It also contains four semi-independent audio channels, each with its own frequency, noise, and volume control. Figure 1-6 shows the pin assignments of the POKEY.

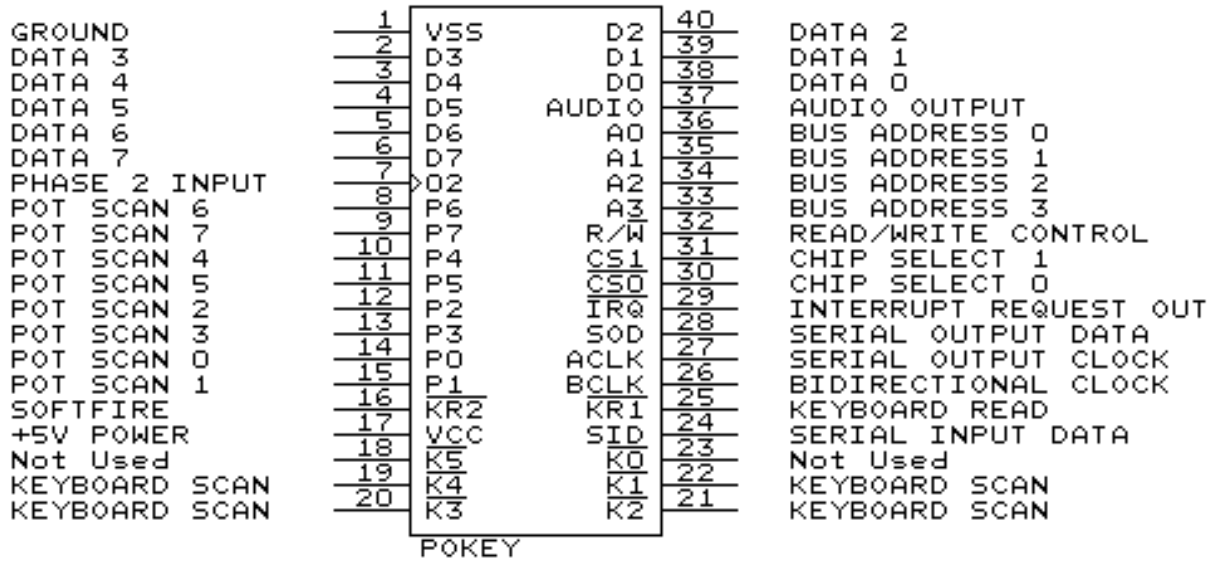


Figure 1-6. POKEY Pin Assignments

Switchbox

A switchbox is connected and mounted to the back of the television set. The switchbox that is used with the 4 – Port Models is different from other switchboxes manufactured by Atari and from the 2 – Port Mode1 5200. These differences include:

1) power for the Model 5200 supplied through the switchbox
2) two Select Switch functions. The two functions are:

   NORMAL – Allows the Model 5200 to automatically switch between the television and the game when the Model 5200 ON/OFF switch is pressed.
   STANDBY – Enables television viewing while the Model 5200 is turned on.

Game controller

The game controller supplied with the Model 5200 is composed of an analog joystick, a 12-key Keypad, two separate Fire Buttons on each side, and three Select Buttons. The game controller is discussed in detail in Section 6.

SUMMARY

The Model 5200 is an advanced microcomputer which receives input from the Game Controllers, Read-Only-Memory (ROM) cartridges, and other peripherals. The console PC Board is housed within an outer case and contains four major chips which allow for interaction between the game and the player. They are: the Microprocessor (MPU), the Alphanumeric Television Interface Controller (ANTIC), the Graphic Television Interface Adaptor (GTIA), and the POT Keyboard Integrated Circuit (POKEY).
The console, switchbox, and Game Controllers male up the Model 5200 System which is addressed in the remainder of this manual.

SECTION 2

SILKSCREENS AND SCHEMATICS

On the following pages are representative silkscreens and schematics for the Model 5200. Minor variations in design may be encountered depending on the production date of the unit, but these schematics provide all details required for an in-depth understanding of all Model 5200 units.

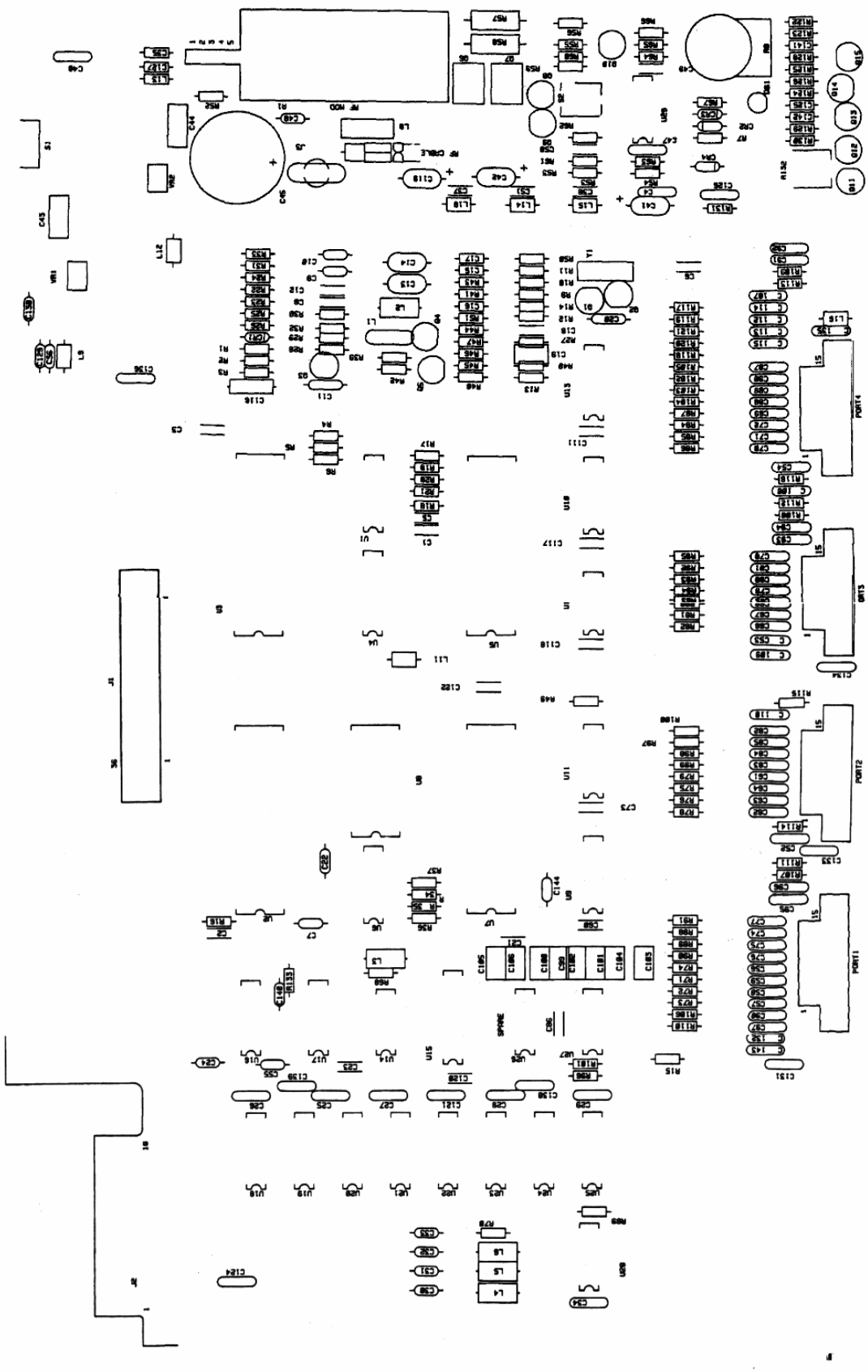


Figure 2 – 1. 4 – Port 5200 CA018087 Motherboard Silkscreen

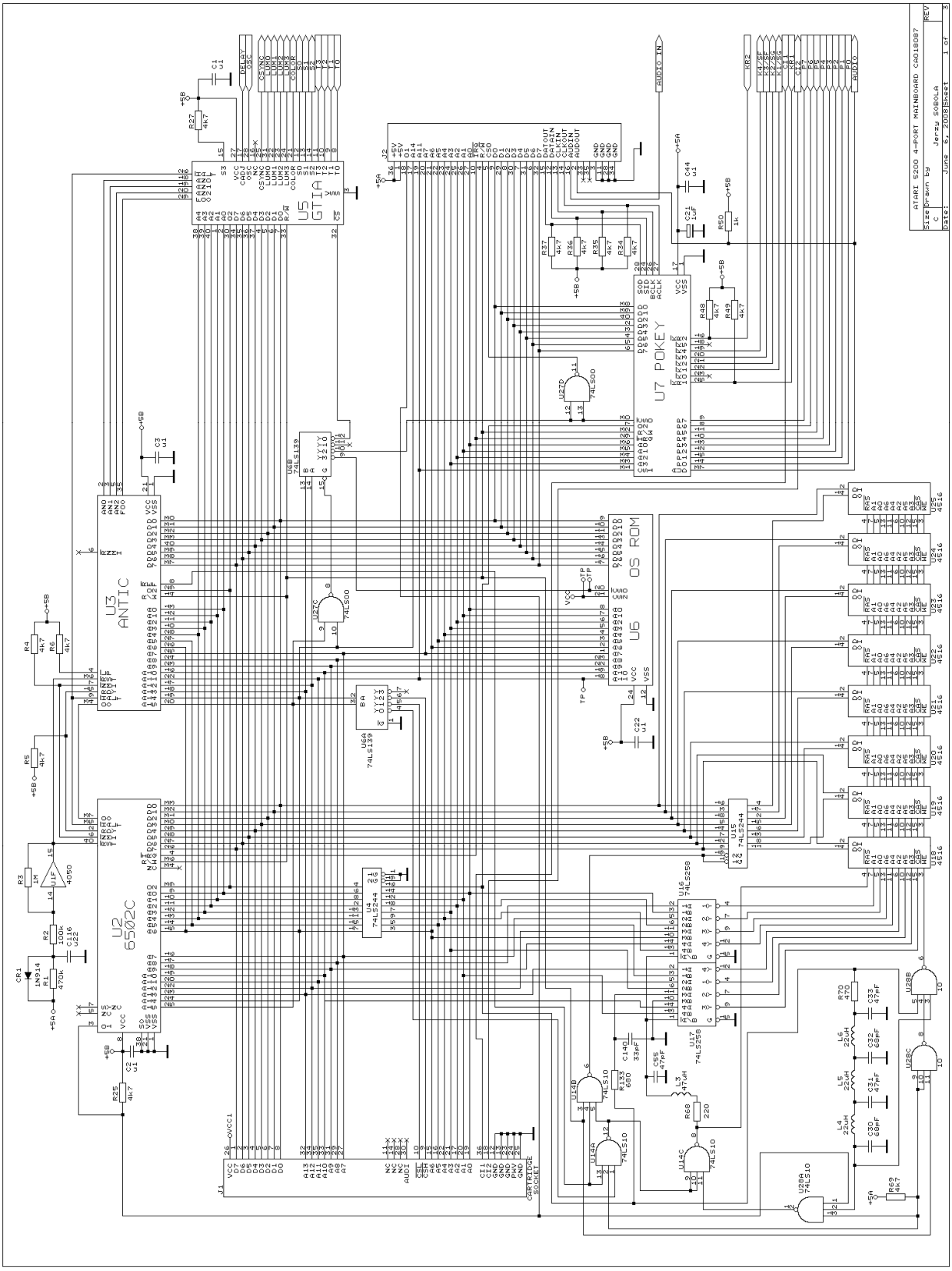


Figure 2 – 2. 4 – Port 5200 CA018087 Motherboard Schematic Part 1

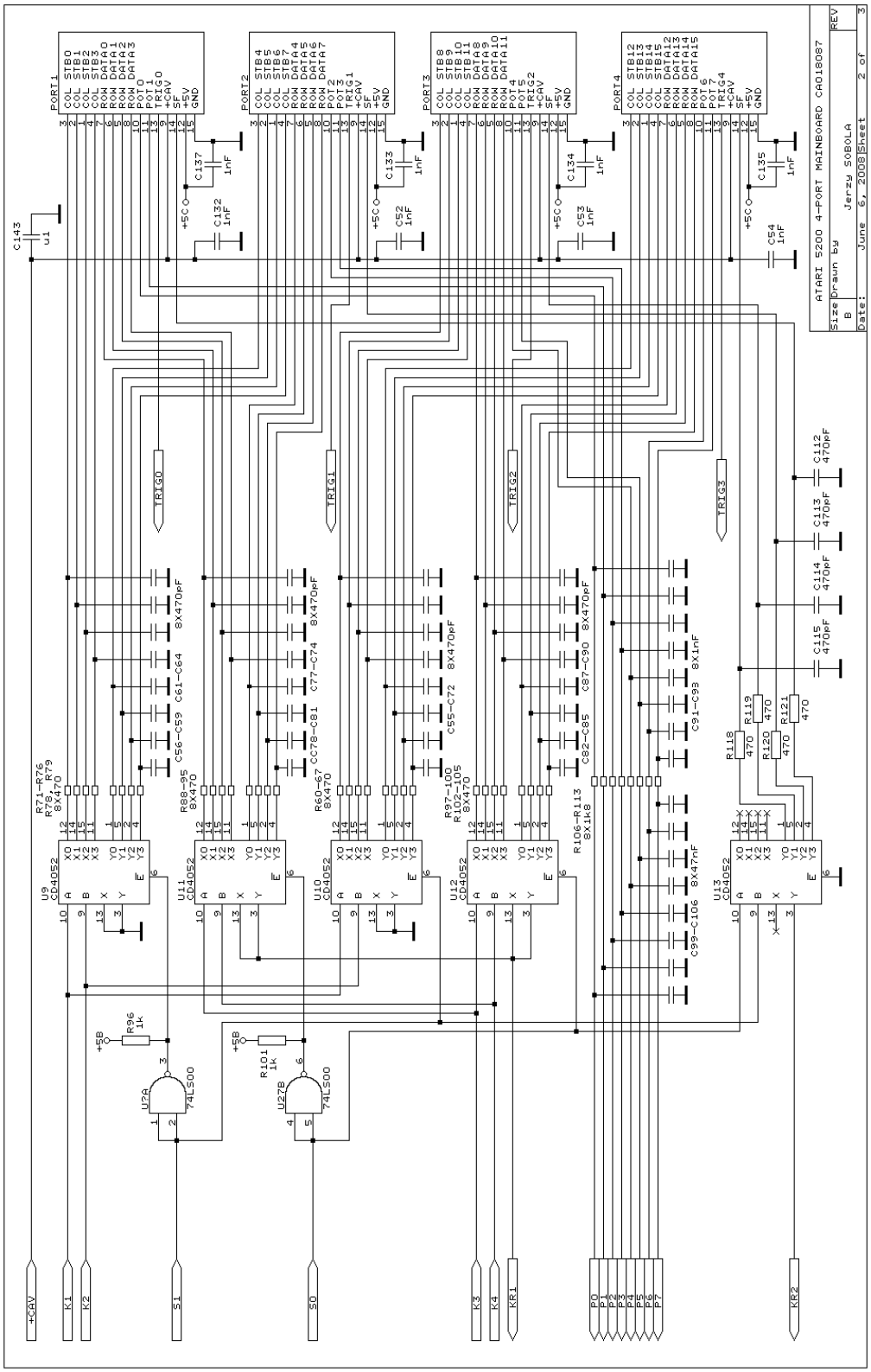


Figure 2 – 3. 4 – Port 5200 CA018087 Motherboard Schematic Part 3

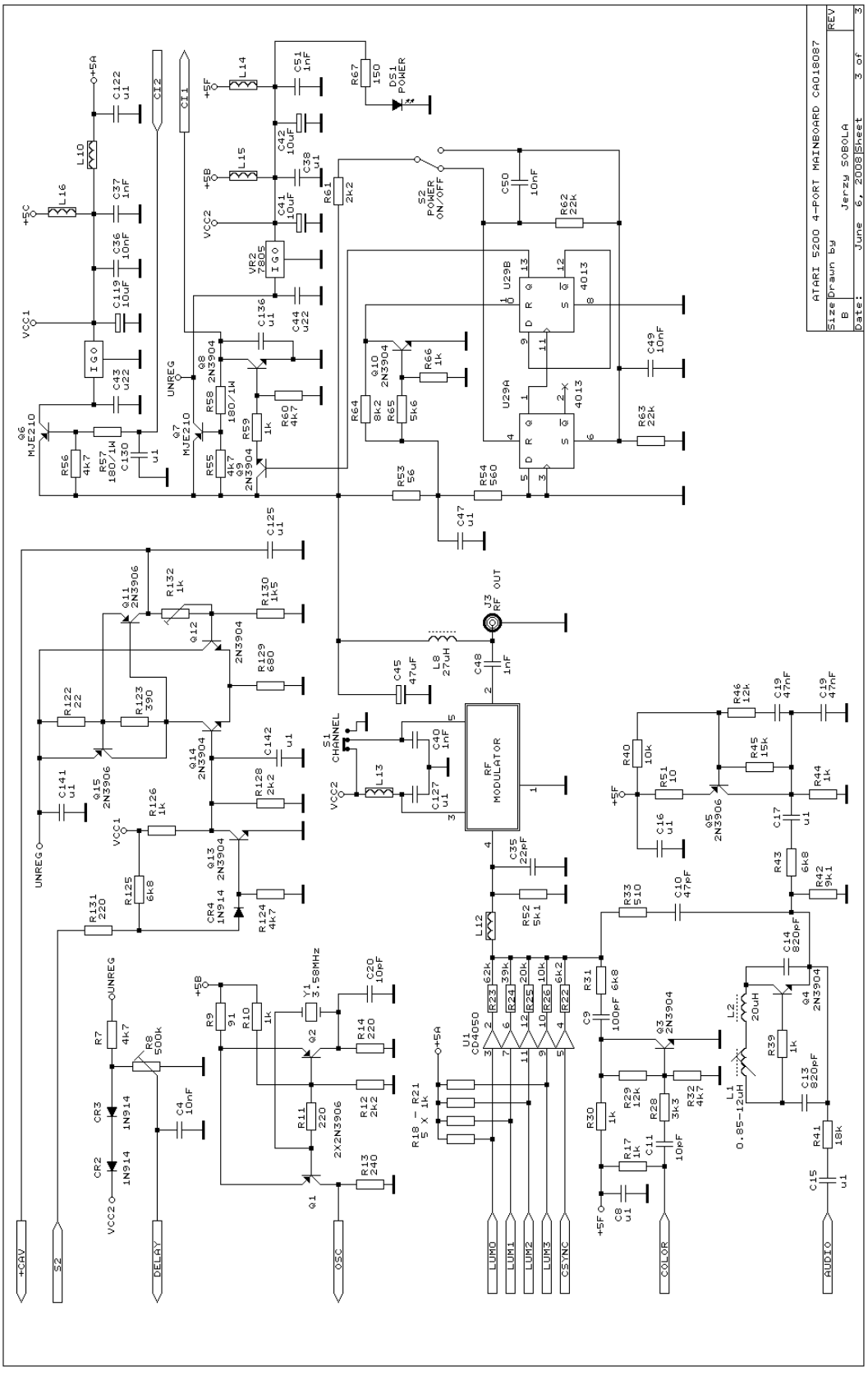


Figure 2 – 4. 4 – Port 5200 CA018087 Motherboard Schematic Part 3

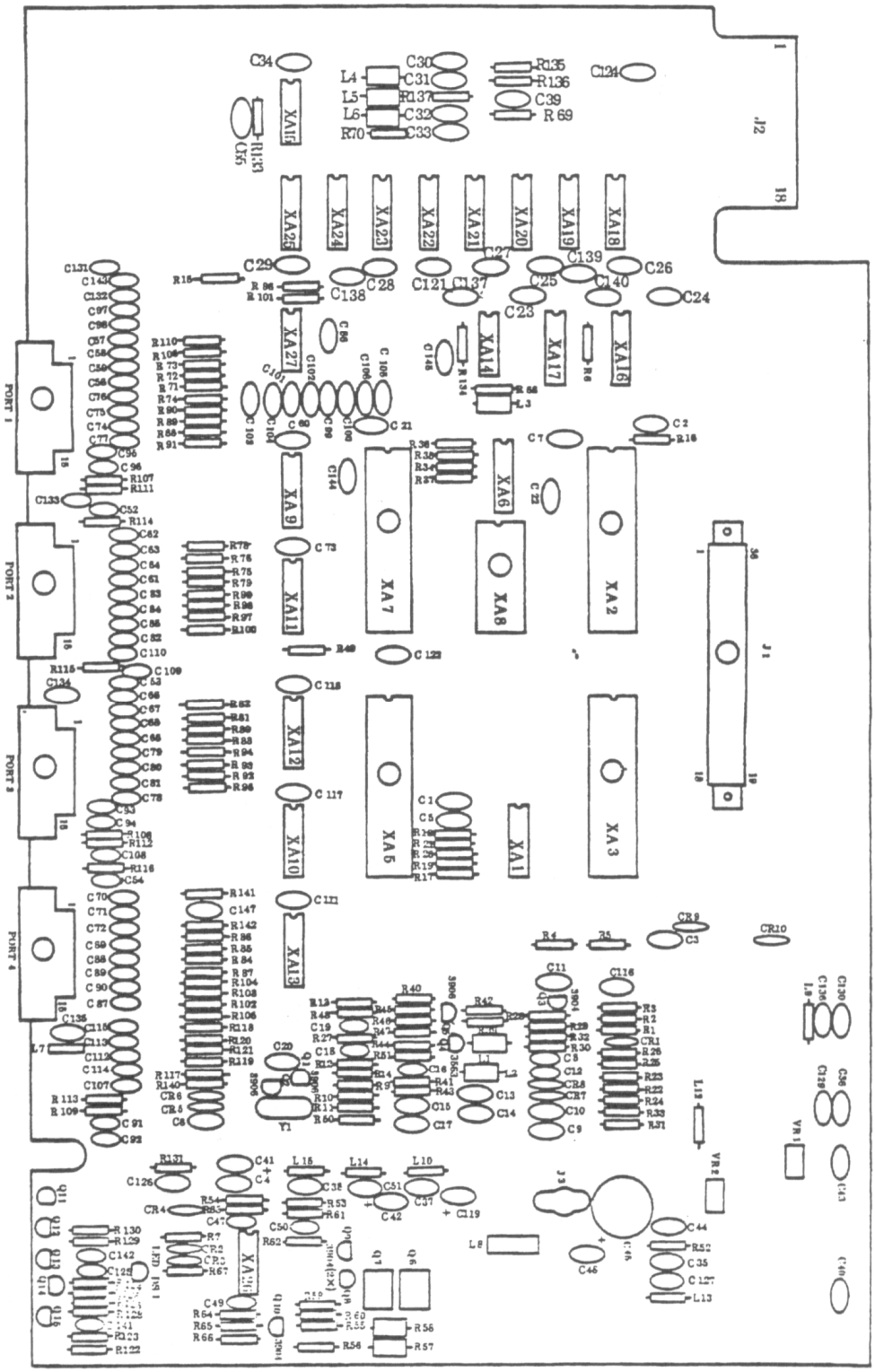


Figure 2 – 5. 4 – Port 5200 CA020108 Motherboard Silkscreen

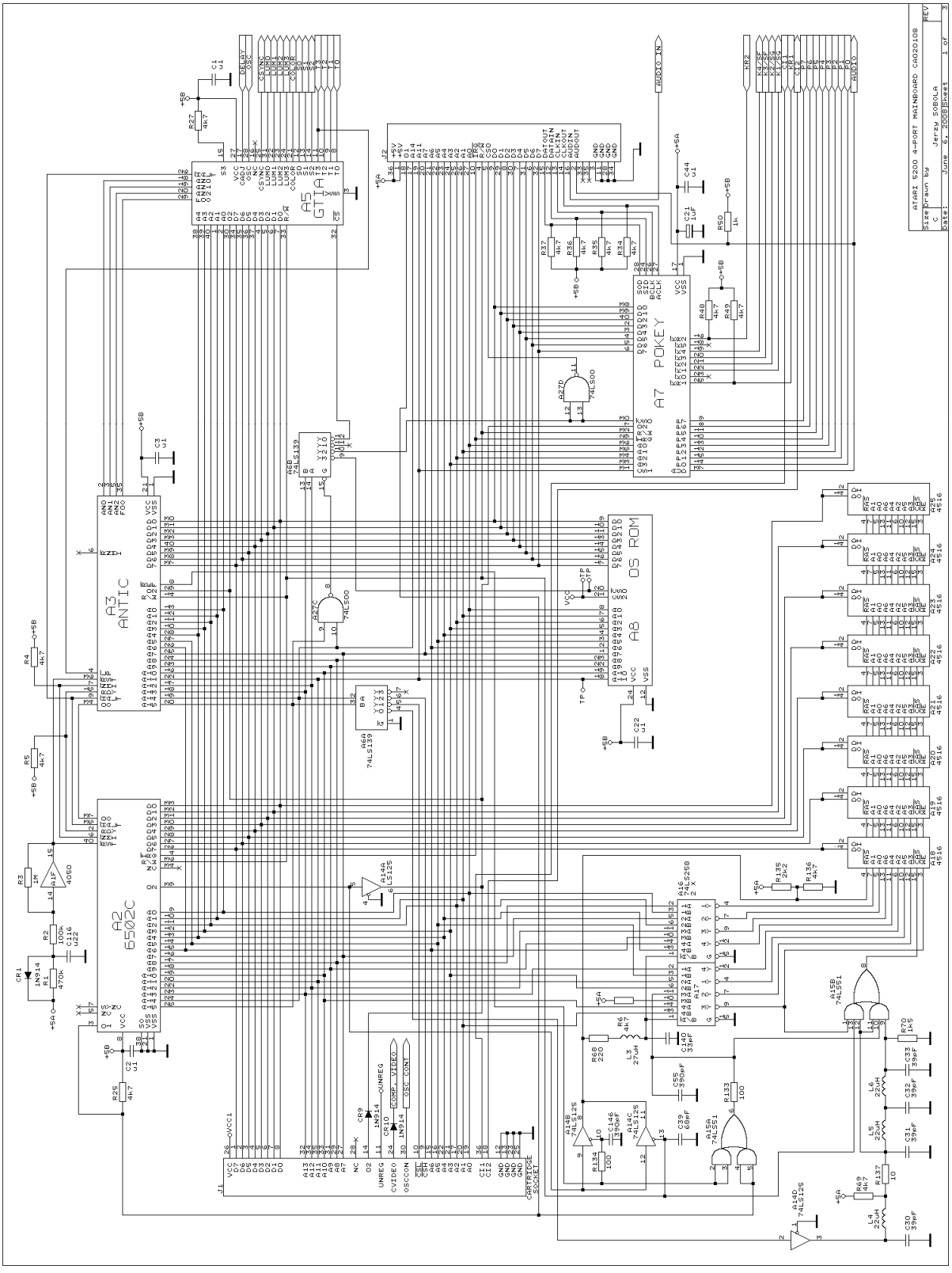


Figure 2 – 6. 4 – Port 5200 CA020108 Motherboard Schematic Part1

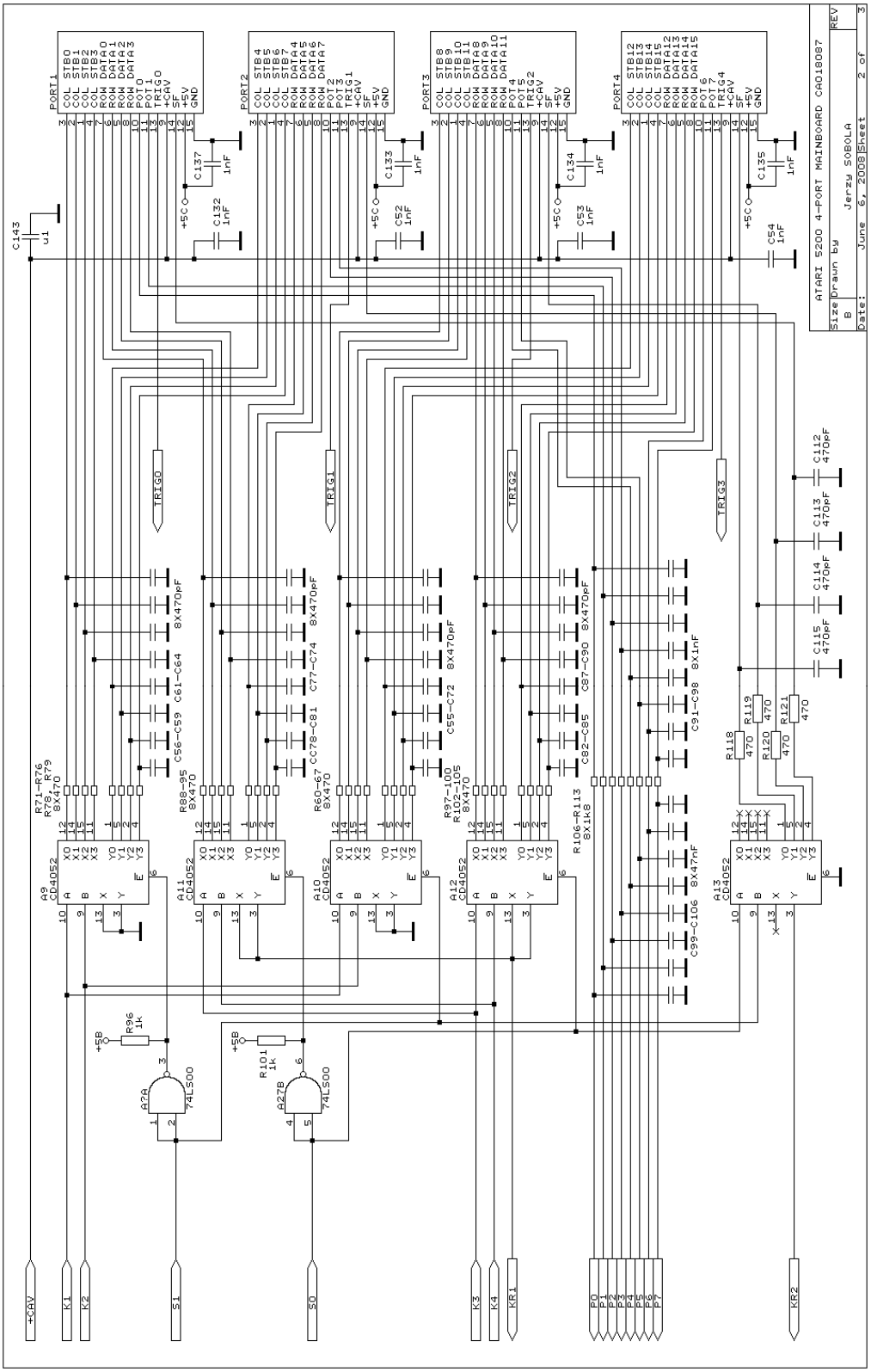


Figure 2 – 7. 4 – Port 5200 CA020108 Motherboard Schematic Part2

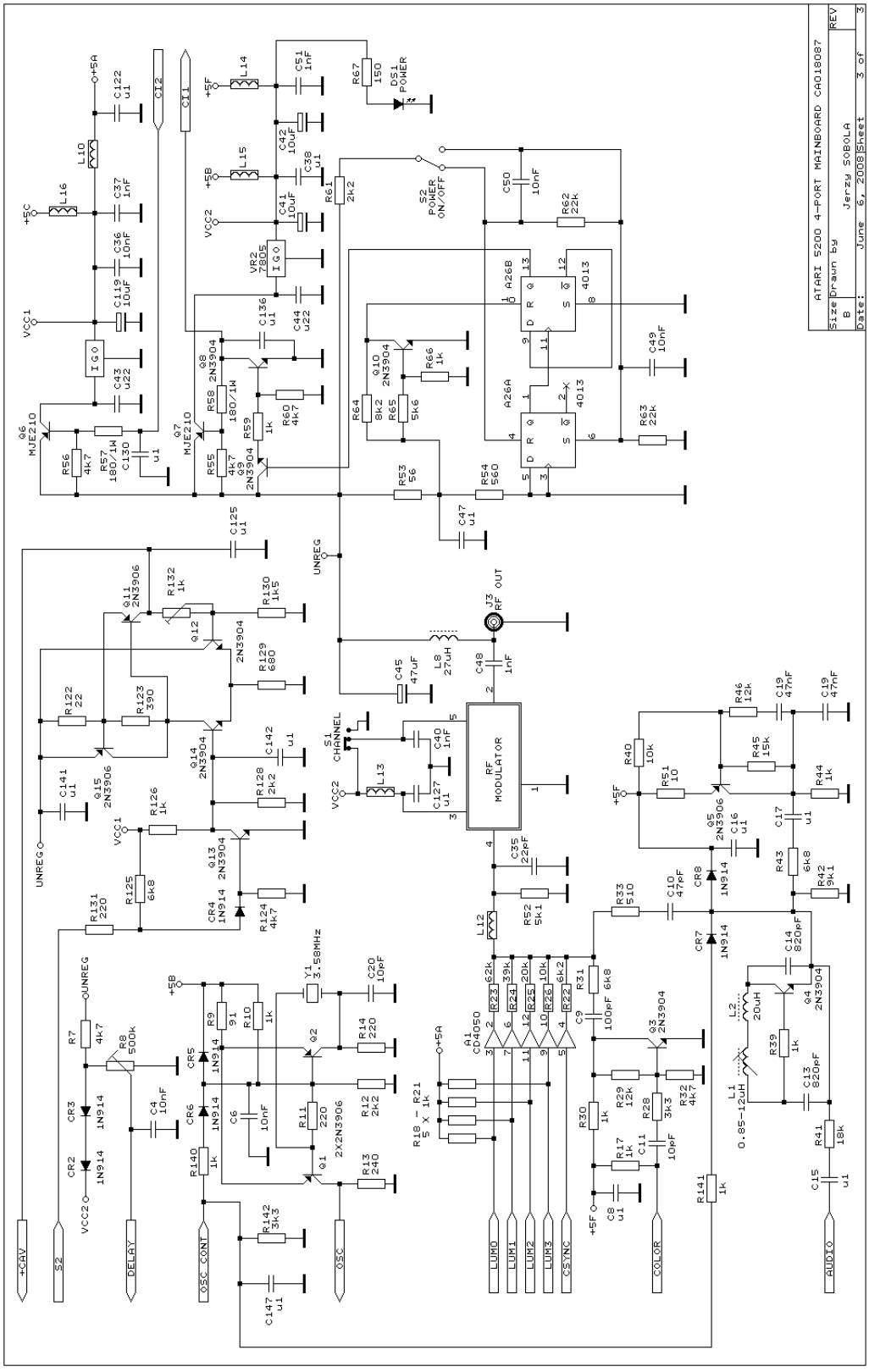


Figure 2 – 8. 4 – Port 5200 CA020108 Motherboard Schematic Part 3

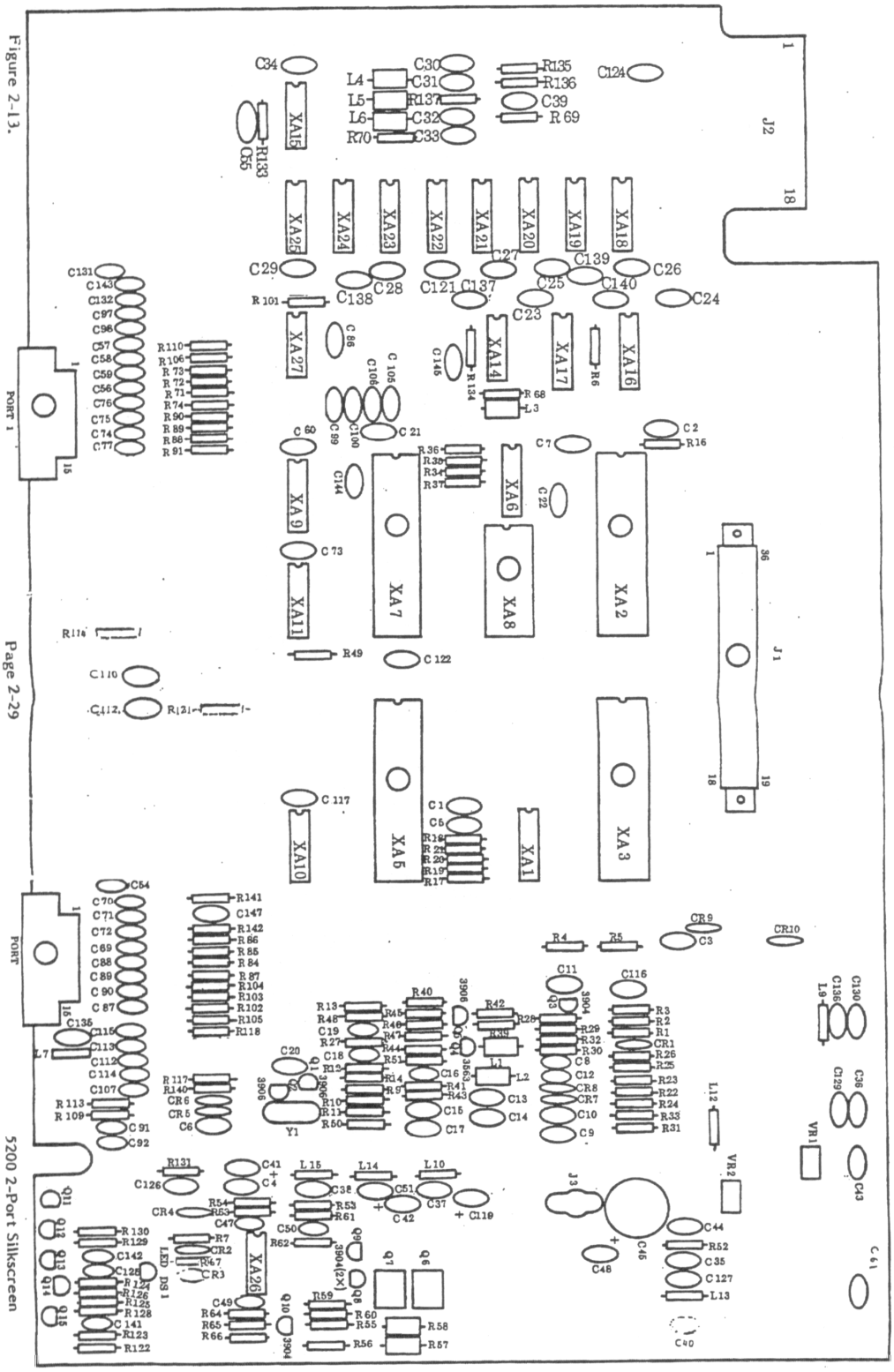


Figure 2 – 9. 2 – Port 5200 CA021374 Motherboard Silkscreen

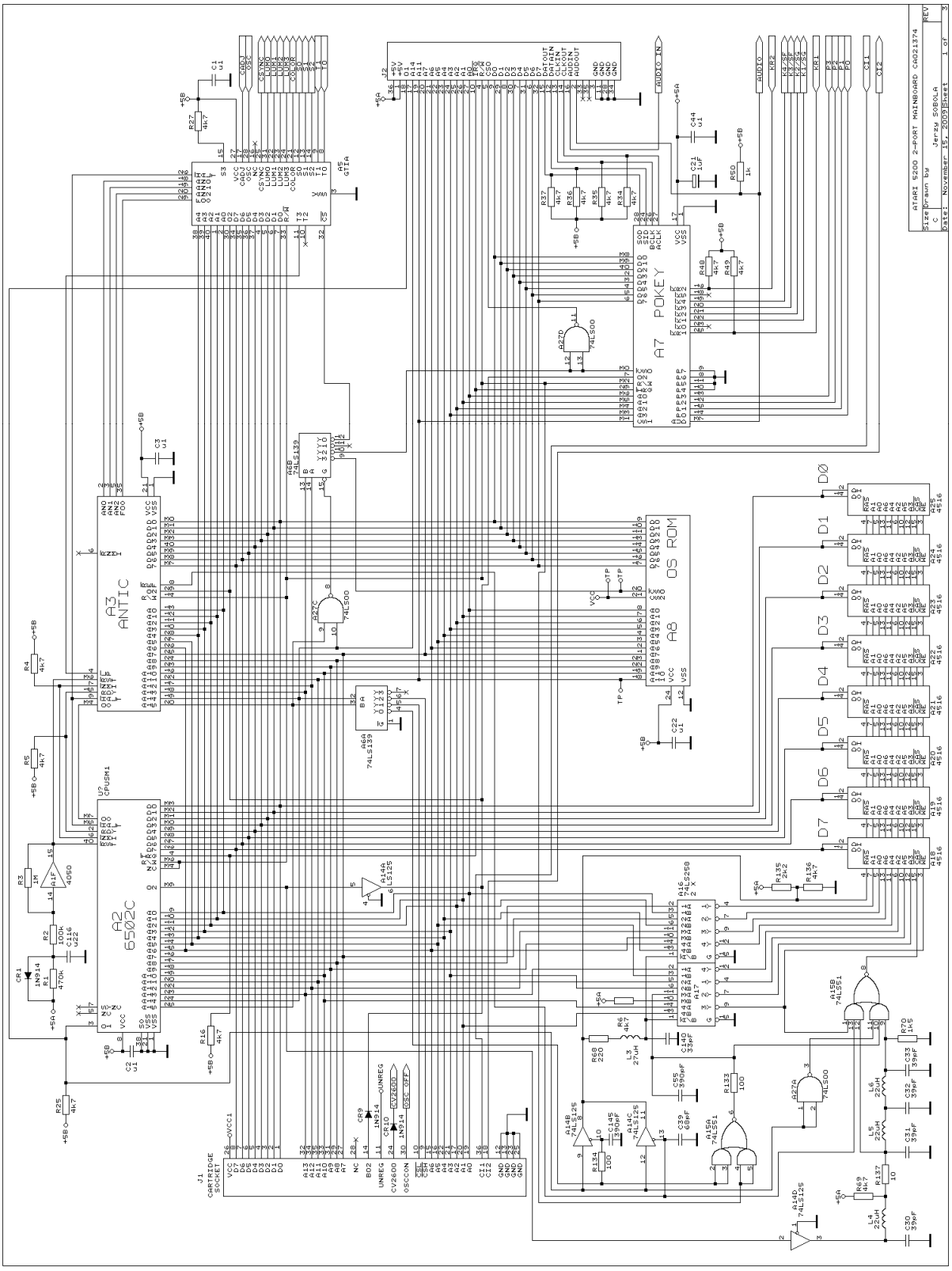


Figure 2 – 10. 2 – Port 5200 CA021374 Motherboard Schematic Part 1

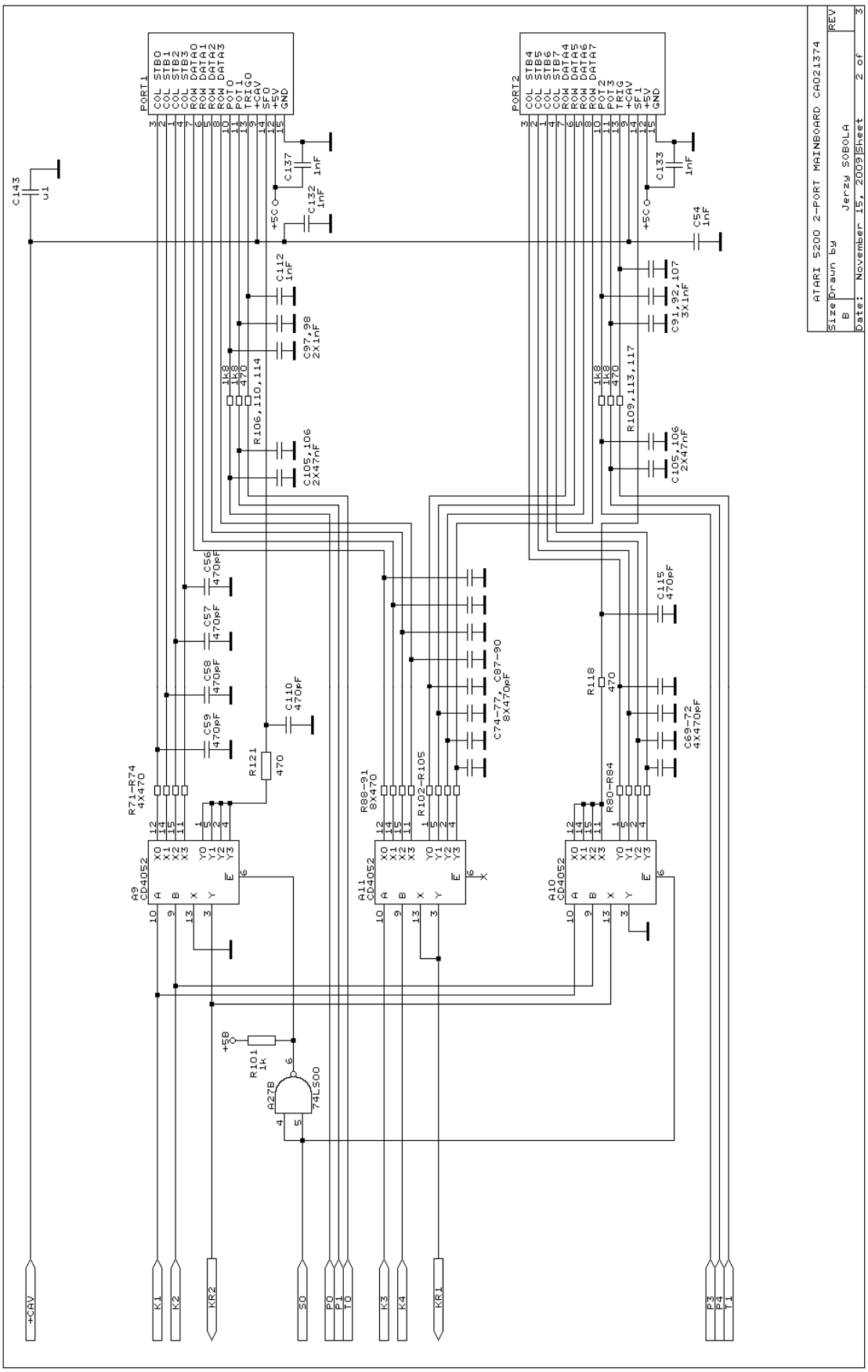


Figure 2 – 11. 2 – Port 5200 CA021374 Motherboard Schematic Part 2

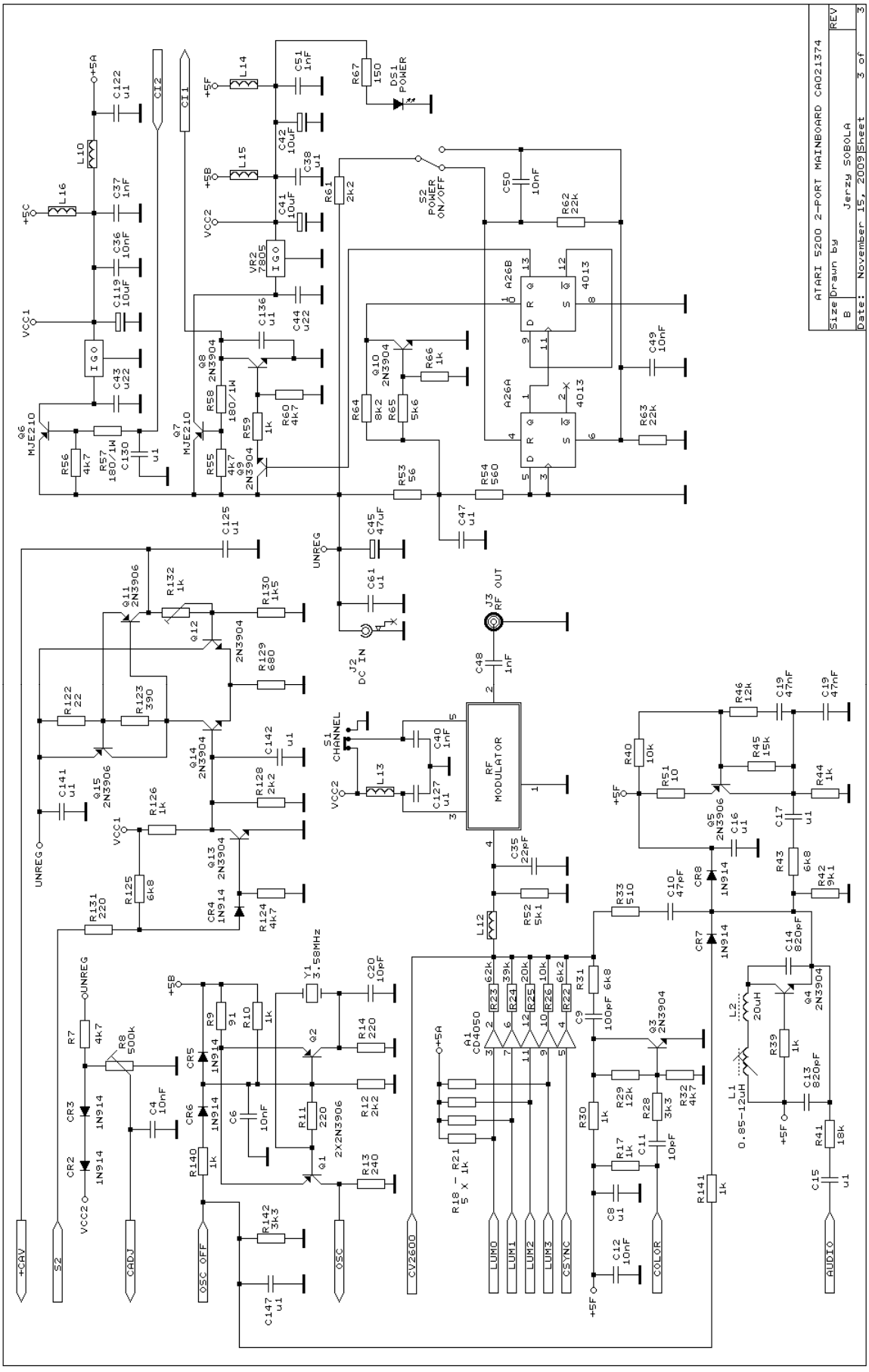
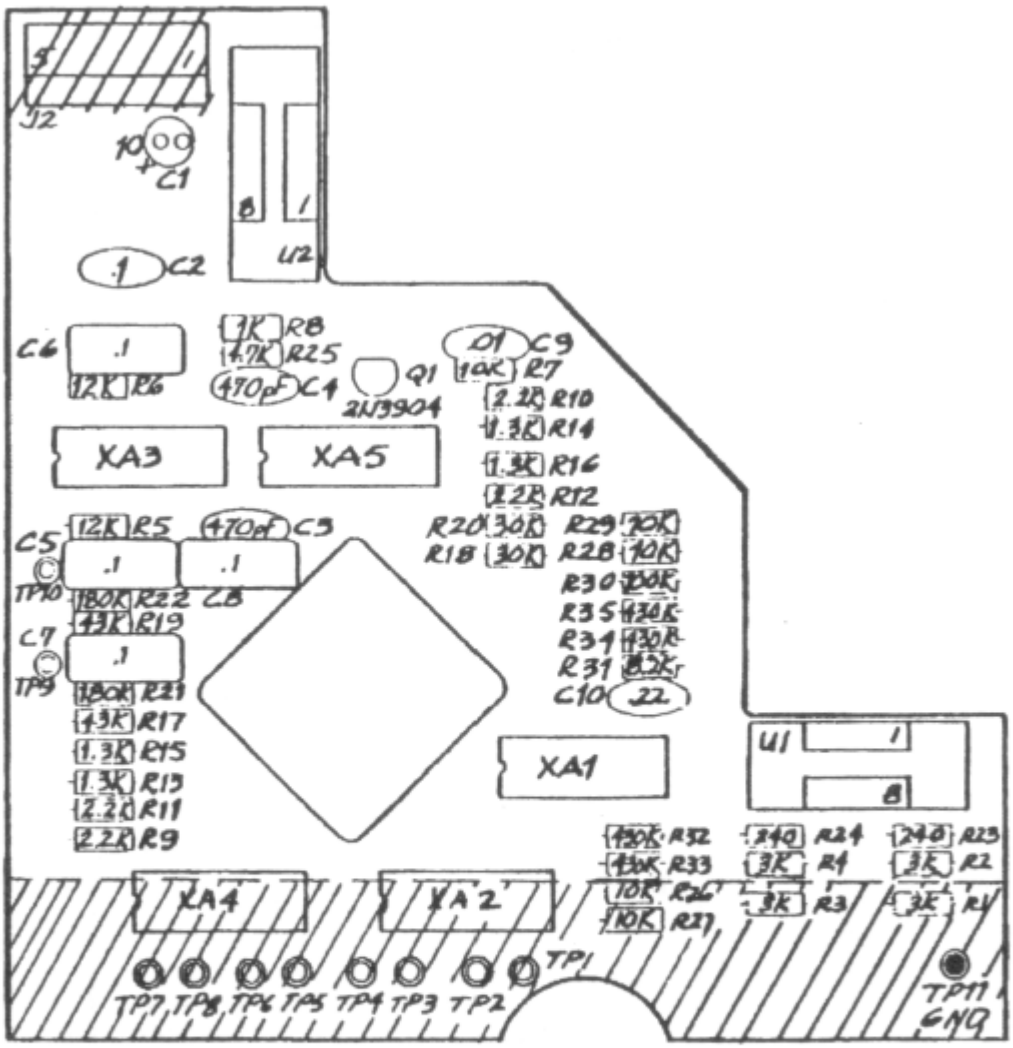


Figure 2 – 12. 2 – Port 5200 CA021374 Motherboard Schematic Part 3



Note: If sockets or components are replaced, trim leads in shaded areas as close to PC Board as possible.

Figure 2 – 13. Trakball Silkscreen

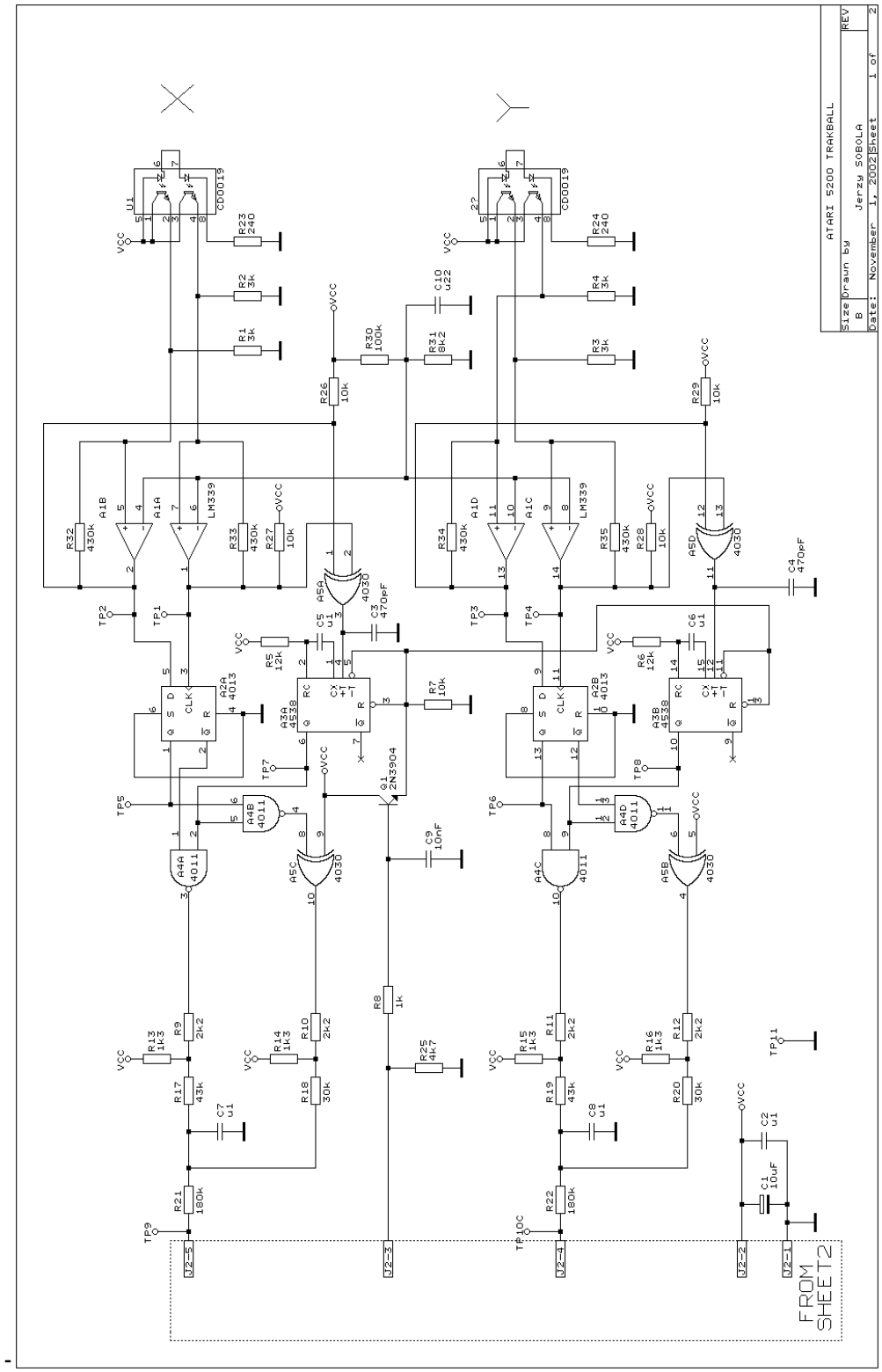


Figure 2 – 14. Trakball Schematic Part1

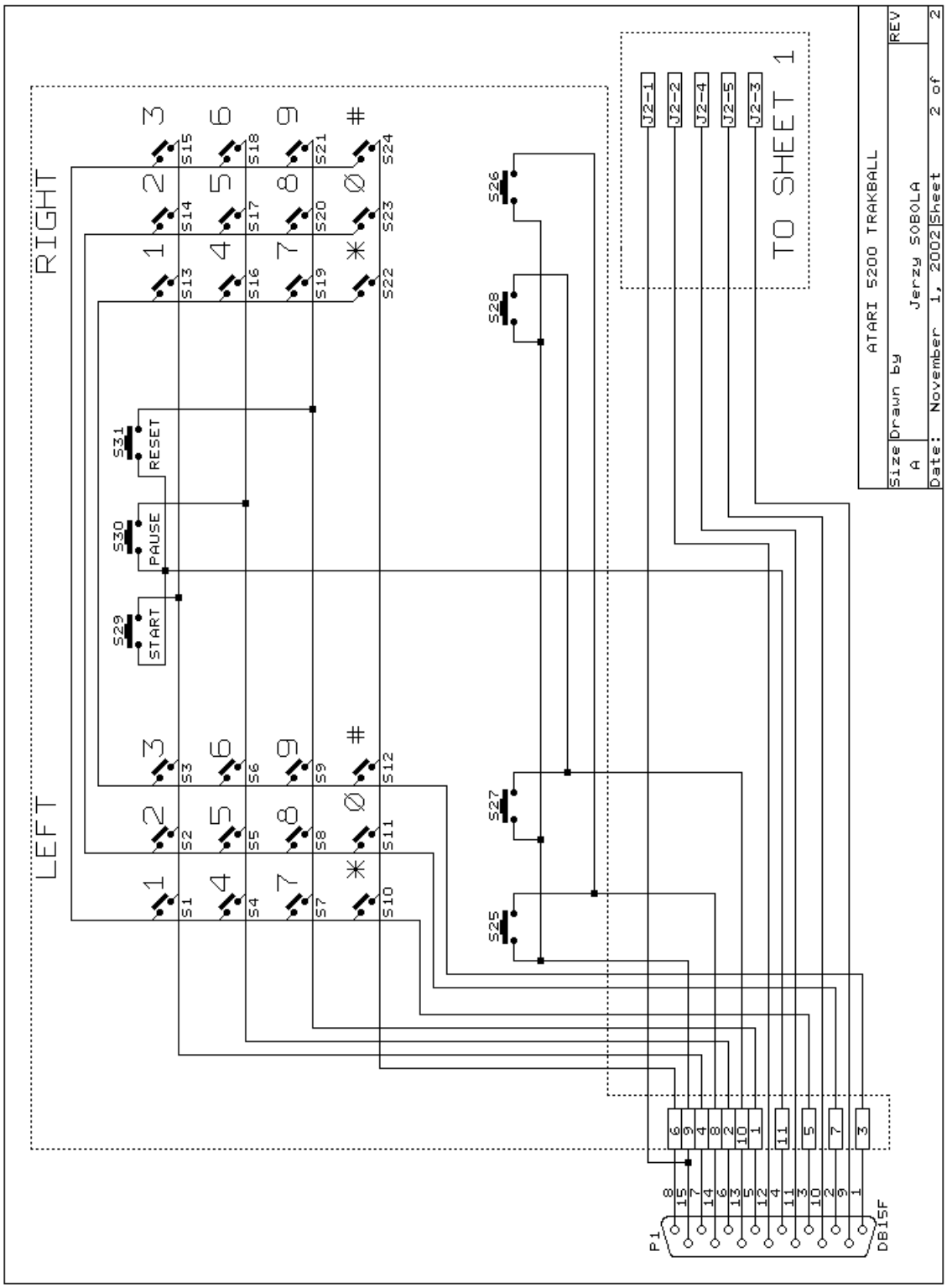


Figure 2 – 15. Trakball Schematic Part 2

SECTION 3

4 – Port MODEL 5200 TESTING

EQUIPMENT REQUIREMENTS

You require six basic pieces of equipment in order to analyze failures in the Model 5200. These items include:

- 15 MHz oscilloscope
- Diagnostic Cartridge (version 1.1)
- Model 5200 Port Board (Loop Back Board)
- CX5200 Field Service Manual
- colour T.V. set (properly adjusted)
- voltmeter

TESTING WITH THE DIAGNOSTIC CARTRIDGE (VERSION 1.1)

All tests are reviewed in this section. If applicable, a Flowchart Entry Point is given. If a failure occurs, go to the flowchart indicated and continue troubleshooting.

OVERVIEW OF TESTS

- The PAM Diagnostic Cartridge (Version 1) contains a variety of test routines to assist you in identifying the source of problems in the Model 5200. The test cartridge is used in conjunction with the equipment listed at the beginning of this section.

INITIALIZATION

To prepare the Model 5200 for testing, perform the following steps in the order given:

- Connect the switchbox to the VHF terminals) on the back of the T.V. Set. r Plug the power adaptor into the opening on the switchbox marked Power.
- Plug the RF cable from the console into the opening on the switchbox marked Game. Be sure the select switch on the switchbox is set to the NORMAL position.
- Plug the Model 5200 Port Board into the player ports. Insert the Diagnostic Cartridge (Version 1.0).
- Turn on the T.V. Set and the Model 5200.

The Model 5200 tests are run using the Port Board (Loop Back Board) which automatically cycles through all of the tests. If a test fails: turn the unit off, remove the Post Board, plug a game controller into Port 1, and turn the unit back on. You can select any of the tests manually by pressing the proper key followed by the start key.

NOTE: The Diagnostic Cartridge will cycle automatically only if the Port Board is inserted before the unit is turned on.

POWER-UP SCREEN

Figure 3-1 Power-Up Screen

The Power-up screen appears in a few seconds. It displays information about the inner workings of the unit. This screen shows:

- The type of TIA in the unit. NTSC appears if the GTIA is the proper one for that unit. If PAL appears, replace with a GTIA from your kit.
- The rev. of ROM in the unit. (Not important at this time.)

After the initial power-up, this screen does not automatically appear again.
One of the following indicates a failure.

- Solid Coloured (Black) Screen or Vertically Lined Screen
- Snowy Screen
- WARPED - Ragged Picture

Solid Coloured (Black) Screen or Vertically Lined Screen

If a solid coloured (Black) or vertically lined screen appears, the unit is suffering a catastrophic failure. This means that the unit is not functioning well enough to even put up a simple display.

Diagnostic Flowchart Entry Point: Pg. 47.

Snowy Screen

If, when turned on the unit displays no modulation on the screen, the failure is probably in the power circuitry. However, first check the following:

- Check that the select switch on the switchbox is set to the NORMAL position.
- Check the power adaptor using a standard voltmeter.

Diagnostic Flowchart Entry Point: Pg. 53.

Warped - Ragged Picture

In this failure, the power-up screen appears bent to one side with a ragged edge. The picture may roll or slide down and to the left of the screen. This means that the sync. signal broadcast by the GTIA is probably not functioning. Another possible cause is that the unit is not set on the same channel as the T.V. set. Check this before going to the flowcharts.

Diagnostic Flowchart Entry Point: Pg. 57.

Press the * or # key followed by the start key to print this menu on the screen:

Figure 3-2 Test Menu Screen

Options 9 and 0 are not used at this time.

The following pages show the tests as they appear with the Port Board plugged in.

If a test fails, go to the Flowchart Entry Point indicated for that test and begin troubleshooting.

COLORBARS TEST

- Purpose: To test the GTIA chip and associated colour circuitry for correct operation.
- Format: A screen of horizontal colour bars displays (see Figure 3-3). The screen should be steady and unchanging. A grey or blue horizontal reference line runs across the screen about three bars from its bottom. This reference line is thinner than the bars around it. R8 should be adjusted so the bars immediately above and below the reference line are within one shade of each other. Proper operation of the unit is indicated by being able to make this adjustment and by consistent colour within the entire span of each bar on the screen. Minor glitches on the edges of the colour bars are acceptable. Leave this test on for at Least ten seconds in order to catch any intermittent problems, such as a bar momentarily changing colours or blanking out.

Figure 3-3 Color Bars Screen

Diagnostic Flowchart Entry Point: Pg. 58.

GREYBARS TEST

- Purpose: To test the function of the luminescence lines (LM0, LM1, LM2) from the GTIA chip.
- Format: Eight horizontal grey bars are displayed, going from black at the top to white at the bottom in even steps (see Figure 3-2). The screen should be steady and unchanging. These lines may have minor glitches on their edges. A thin white line always appears just over the top (black) bar. No colour should appear anywhere on the screen. The areas above the top (black) bar and below the bottom (white) bar are of no importance to the test. This test should be left on for at least ten seconds to ensure that there is no "flashing" of any colour or shifting of the grey bars.

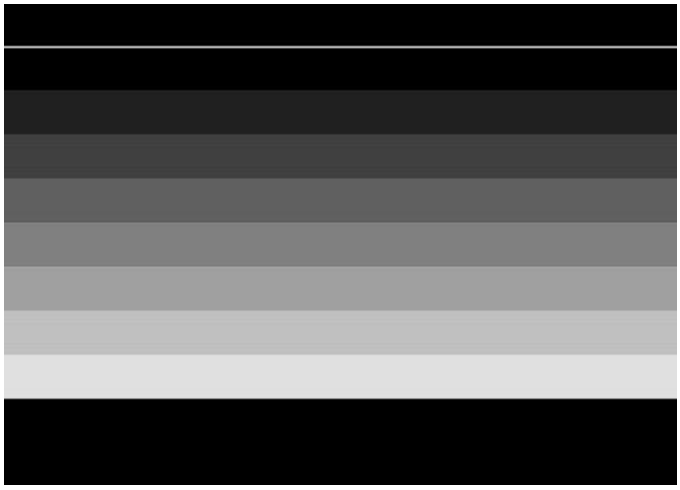


Figure 3-4. Greybars Screen

Diagnostic Flowchart Entry Point: Pg. 60.

ANYVIDEO SCREEN

- Purpose: To test the video generation of the GTIA and ANTIC chips.
- Format: The screen should have a black background with eight vertical bars. Half of the vertical bars should be narrow, and the other half much wider. A horizontal bar should appear across the top of the screen. From left to right, the shade of colour on the horizontal bar should change. On the right of the bar, two Vs should be displayed, right side up.

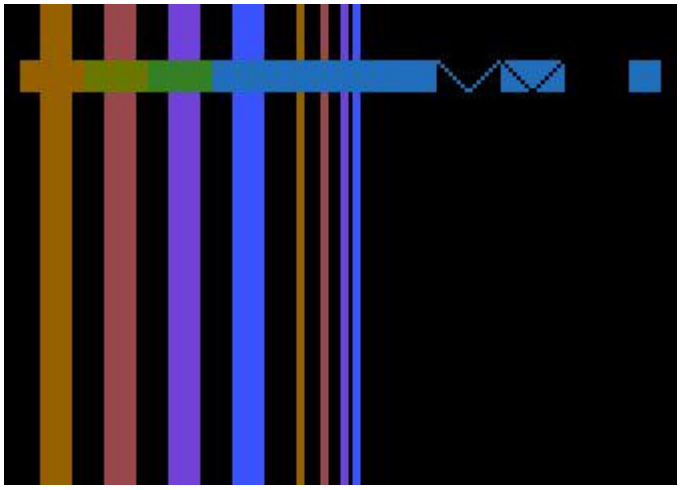


Figure 3-5. Anyvideo Test Screen

If the Any Video test fails, replace U3, U5.

POKEY ADJUST

- Purpose: To check the value of the pot line for the controller ports.
- Format: Adjust R132 to make the value in Port 1, HOR position read 112 ±1. All other values should read between 100 and 124.

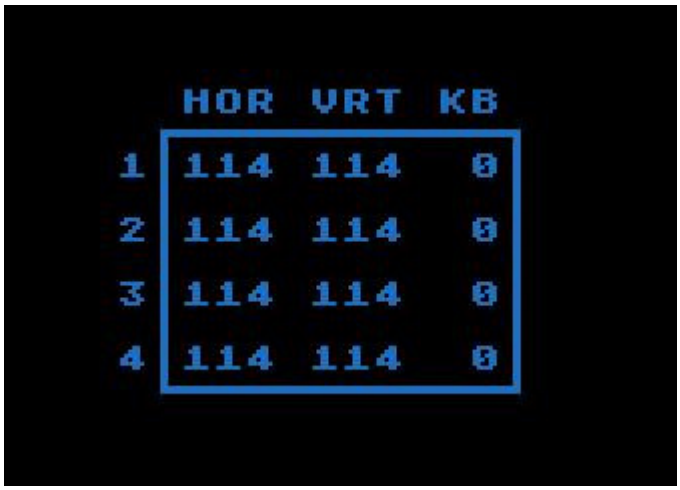


Figure 3-6. Pokey Adjust Screen.

Diagnostic Flowchart Entry Point: (Refer to Table 3-1, Diagnostic Error Codes).

NOTE: Figure 3-6 shows a sample Pokey Adjust screen. The values on your screen may differ from those shown in Figure 3-6.

POKEY SOFTFIRE TEST

1. Connect the oscilloscope to pin 16 of A7 (1V/div.; 10ms/div.).
2. Insert the controller into port 1.
3. Press key 5 followed by START.
4. Press the top fire button (softfire).
5. A 5V pp square wave signal should appear (Fig. 3-7). If it does not, proceed to the SOFTFIRE TROUBLESHOOTING FLOWCHART, page 64.
6. Unplug the controller from port and plug it into next port.
7. Repeat the fourth and fifth steps for port 2, 3 and 4.

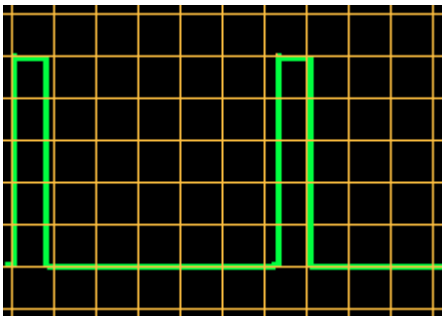


Fig. 3-7 Softfire signal.

ERROR SUMMARY

Errors during the RAM, PORT, and verify OS ROM Test are displayed on the matrix shown in Figure 3-5.

Figure 3-8. Error Summary Screen

Table 3-1 shows the defective component and/or the flowchart entry point which corresponds to the Failure Code number on the Error Summary.

Table 3-1 Diagnostic Error Codes

Failure Code	Failure	Reference Page #
0	RAM - Chip 1 - U25	RAM Test, Pg. 3-10
1	RAM - Chip 2 - U24	"
2	RAM - Chip 3 - U23	"
3	RAM - Chip 4 - U22	"
4	RAM - Chip 5 - U21	"
5	RAM - Chip 6 - U20	"
6	RAM - Chip 7 - U19	"
7	RAM - Chip 8 - U18	"
8	Port 1 - Data - Keyboard	Keyboard Troubleshooting, Pg. 4-21
9	Port 2 - Data - Keyboard	"
10	Port 3 - Data - Keyboard	"
11	Port 4 - Data - Keyboard	"
12	Trigger 0	Trigger Line Troubleshooting, Pg. 4-19
13	Trigger 1	"
14	Trigger 2	"
15	Trigger 3	"
16	Soft Fire 0	Softfire Troubleshooting, Pg. 4-20
17	Soft Fire 1	"
18	Soft Fire 2	"
19	Soft Fire 3	"
20	Serial Port 0	Not Used
21	Serial Port 1	Not Used
22	Pot Line 0	Pot Line Troubleshooting, Pgs. 4-17, 4-18
23	Pot Line 1	"
24	Pot Line 2	"
25	Pot Line 3	"
26	Pot Line 4	"
Z7	Pot Line 5	"
28	Pot Line 6	"
29	Pot Line 7	"
30	O.S. ROM - U8	Verify OS ROM, Pg. 3-10

RAM TEST

- Purpose: To test the 16K RAM chips for proper functioning.
- Format: This test takes approximately 10 seconds. At the end of this time period, if the test has failed, a Failure Code number appears on the screen to signify which chip is defective. Swap out the chip corresponding to the Diagnostic Error Code (Table 3-1). If this does not solve the problem, replace the chips U15, U16, U17, and U28 for PCB #CA018087. For PCB #CA020108, replace A14, A15, A16 and A17.

No Diagnostic Flowchart Entry Point

VERIFY OS ROM

- Purpose: To test the OS ROM (U8) for proper functioning.
- Format: If error code 30 appears on the Error Summary (Figure 3-7) the OS ROM chip is defective. Replace the defective chip and restart the test.

No Diagnostic Flowchart Entry Point

PORT TEST

- Purpose: This test checks the functions of the POKEY, GTIA and associated PORT circuitry.
- Format: The test is done internally with failures appearing on the Error Summary (Figure 3-7).

Diagnostic Flowchart Entry Point: (Refer to Table 3-1, Diagnostic Error Codes).

TONE TEST

- Purpose: To check the audio generation section of the POKEY (U7).
- Format: The screen prints at the bottom which register is being tested (Register 4,3,2,1). A series of eight tones will sound on each register. The first two tones may be inaudible but you can hear the speaker click.

Diagnostic Flowchart Entry Point: Pg. 71.

SECTION 3A

2 – PORT MODEL 5200 TESTING

EQUIPMENT REQUIREMENTS

- You require seven basic pieces of equipment in order to analyse failures in the Model 5200 2 – Port. These items include:
- 15 MHz oscilloscope
- Diagnostic Cartridge (version 1.0)
- 5200 Port Board (Loop Back Board)
- CX5200 Field Service Manual
- Colour T.V. set (properly adjusted)
- Volt-ohmmeter
- Known-good 5200 controller

TESTING WITH THE DIAGNOSTIC CARTRIDGE (VERSION 1.0)

All of the tests are reviewed in this section. If a test failure occurs, enter the diagnostic flowchart where indicated and continue troubleshooting.

OVERVIEW OF TESTS

The Diagnostic Cartridge (Version 1.0) contains a variety of test routines to assist you in identifying the source of problems in the 5200. The test cartridge is used in conjunction with the equipment Listed at the beginning of this section. The tests available in the cartridge are:

INITIALIZATION

To prepare the 5200 for testing, perform the following steps in the order given:

- Connect the switchbox to the VHF terminals) on the back of the T.V. set.
- Plug the power adaptor into the console.
- Plug the RF cable from the console into the opening on the switchbox marked GAME. Be sure the select switch on the switchbox is set to the GAME/COMPUTER position.
- Plug a game controller into port 1 of the 5200.
- Insert the Diagnostic Cartridge (Version 1.1).
- Turn on the T.V. (Select Channel 2 or 3) and the 5200.

POWER-UP SCREEN

Figure 3A-1 Power-Up Screen

The Power-up screen appears in a few seconds. It displays information about the inner workings of the unit. This screen shows:

- The type of TIA in the unit. NTSC appears if the GTIA is the proper one for that unit. If PAL appears, replace with a GTIA from your kit.
- The rev. of ROM in the unit. (Not important at this time.)

After the initial power-up, this screen does not automatically appear again.
One of the following indicates a failure.

- Solid Coloured (Black) Screen or Vertically Lined Screen
- Snowy Screen
- WARPED - Ragged Picture

Solid Coloured (Black) Screen or Vertically Lined Screen

If a solid coloured (Black) or vertically lined screen appears, the unit is suffering a catastrophic failure. This means that the unit is not functioning well enough to even put up a simple display.

Diagnostic Flowchart Entry Point: Pg. 73.

Snowy Screen

If, when turned on the unit displays no modulation on the screen, the failure is probably in the power circuitry. However, first check the following:

- Check that the select switch on the switchbox is set to the NORMAL position.
- Check the power adaptor using a standard voltmeter.

Diagnostic Flowchart Entry Point: Pg. 79.

Warped - Ragged Picture

In this failure, the power-up screen appears bent to one side with a ragged edge. The picture may roll or slide down and to the left of the screen. This means that the sync. signal broadcast by the GTIA is probably not functioning. Another possible cause is that the unit is not set on the same channel as the T.V. set. Check this before going to the flowcharts.

Diagnostic Flowchart Entry Point: Pg. 83.

Press the * or # key followed by the start key to print this menu on the screen:

Figure 3A-2 Test Menu Screen

Options 9 and 0 are not used at this time.

The following pages show the tests as they appear with the Port Board plugged in.

If a test fails, go to the Flowchart Entry Point indicated for that test and begin troubleshooting.

COLOUR BAR TEST

- Purpose: To test the GTIA chip and associated colour circuitry for correct operation.
- Format: A screen of horizontal colour bars displays (see Figure 3-1).. The screen should be steady and unchanging. A grey or blue horizontal reference line runs across the screen about three bars from its bottom. This reference line is thinner than the bars around it. R8 should be adjusted so the bars immediately above and below the reference line are within one shade of each other. Proper operation of the unit is indicated by being able to make this adjustment and by consistent colour within the entire span of each bar on the screen. Minor glitches on the edges of the colour bars are acceptable. Leave this test on for at Least ten seconds in order to catch any intermittent problems, such as a bar momentarily changing colours or blanking out.

Figure 3A-3 Color Bars Screen

Diagnostic Flowchart Entry Point: Pg. 84.

GREY BAR TEST

- Purpose: To test the function of the luminescence lines (LM0, LM1, LM2) from the GTIA chip.
- Format: Eight horizontal grey bars are displayed, going from black at the top to white at the bottom in even steps (see Figure 3A-4). The screen should be steady and unchanging. These lines may have minor glitches on their edges. A thin white line always appears just over the top (black) bar. No colour should appear anywhere on the screen. The areas above the top (black) bar and below the bottom (white) bar are of no importance to the test. This test should be left on for at least ten seconds to ensure that there is no "flashing" of any colour or shifting of the grey bars.

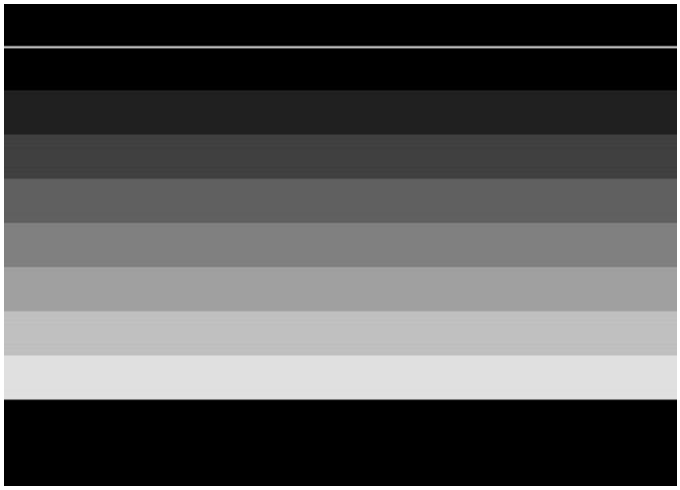


Figure 3A-4. Grey Bar Screen

Diagnostic Flowchart Entry Point: Pg. 86.

ANYVIDEO SCREEN

- Purpose: To test the video generation of the GTIA and ANTIC chips.
- Format: The screen should have a black background with eight vertical bars. Half of the vertical bars should be narrow, and the other half much wider. A horizontal bar should appear across the top of the screen. From left to right, the shade of colour on the horizontal bar should change. On the right of the bar, two Vs should be displayed, right side up.

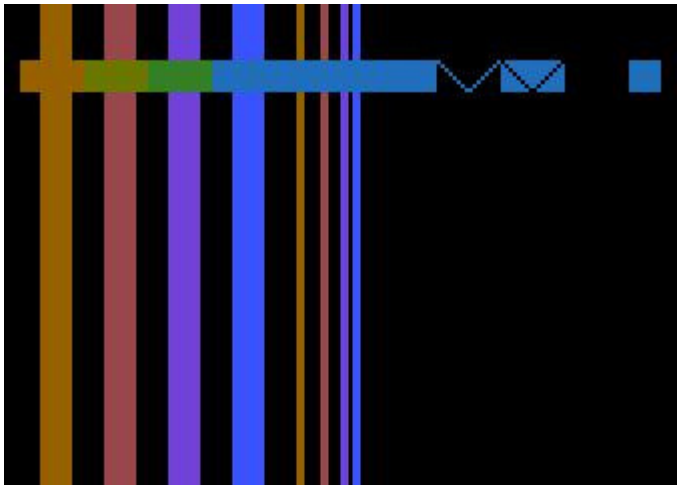


Figure 3A-5. Any Video Test Screen

If the Any Video test fails, replace A3, A5.

POKEY ADJUST TEST

- Purpose: To check the value of the pot line for the controller ports.
- Format: Adjust R132 to make the value in Port 1, HOR position read 112 ±1. All other values should read between 100 and 124.

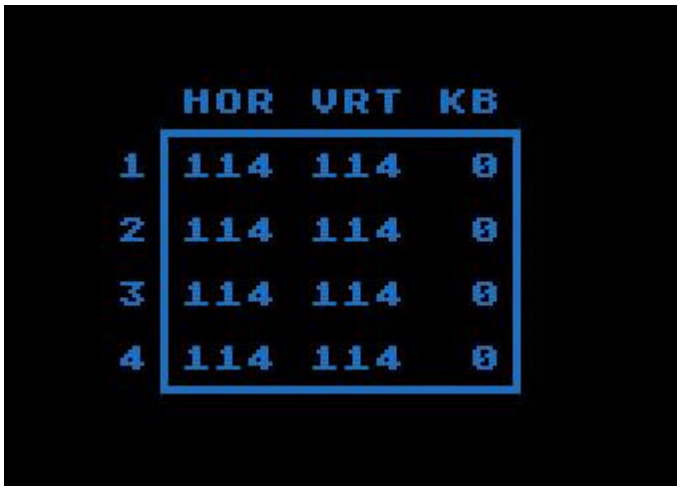


Figure 3A-6. Pokey Adjust Screen.

Diagnostic Flowchart Entry Point: (Refer to Table 3-1, Diagnostic Error Codes).

NOTE: Figure 3A-6 shows a sample Pokey Adjust screen. The values on your screen may differ from those shown in Figure 3A-6.

If the unit cannot be adjusted or if values are out of range, proceed to the Flowchart Entry Point: Pg. 90.

POKEY SOFTFIRE TEST

8. Connect the oscilloscope to pin 16 of A7 (1V/div.; 10ms/div.).
9. Insert the controller into port 1.
10. Press key 5 followed by START.
11. Press the top fire button (softfire).
12. A 5V pp square wave signal should appear(Fig. 3A-8). If it does not, proceed to the SOFTFIRE TROUBLESHOOTING FLOWCHART, page 89.
13. Unplug the controller from port 1 and plug it into port 2.
14. Repeat the fourth and fifth steps for port 2.

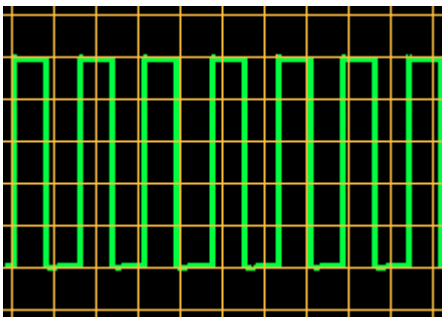


Fig. 3A-7 Softfire signal.

ERROR SUMMARY

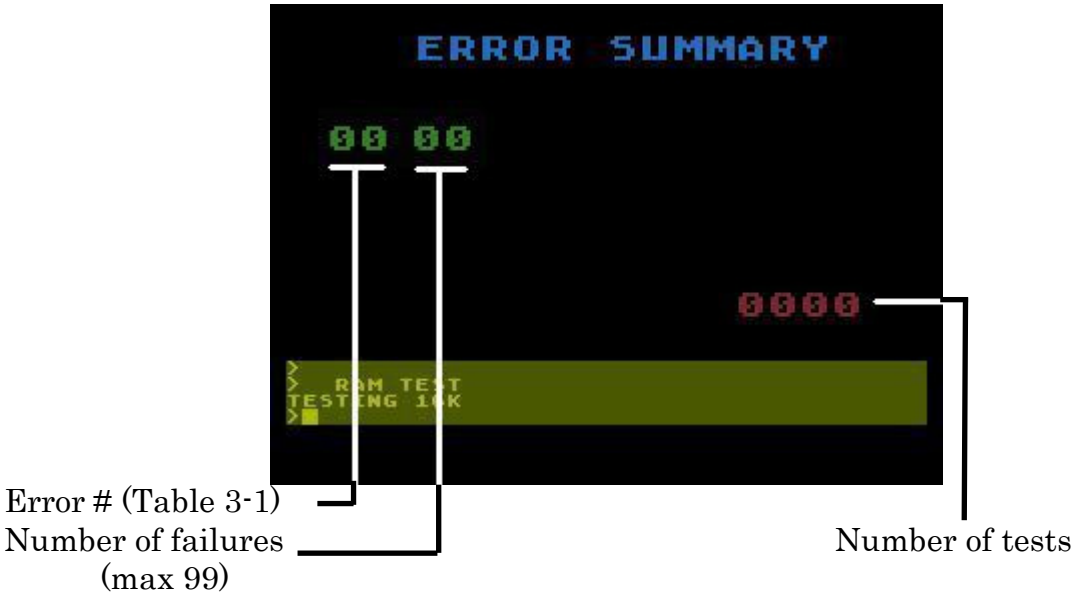


Figure 3A-8. Error Summary Screen

SECTION 4

4 – PORT 5200 DIAGNOSTIC FLOWCHART

The Diagnostic Flowchart is intended to be easy to use and the primary aid when troubleshooting the 4 – Port 5200. Follow the prompts in the order presented. When a question is asked, follow the line from the box that best applies to your unit's condition. When that line terminates with a letter inside a circle, locate the letter on a different page and continue the diagnosis. The flowchart leaves nothing to chance; it tells you when to perform a specific test and when to replace components.

SWAPOUT PROCEDURE

At many places in the diagnostic flowchart, a box tells you to "刼wapout" a component, a chip, or a number of chips in a particular order. The "刼wapout" instruction means that you should replace the indicated components (one at a time) with known-good components of the same type. The unit should then be tested with the new, known-good components) in place to see whether the 刼wapout solved the problem being checked. If the 刼wapout did not fix the problem, leave the new chip in and 刼wapout the next. Repeat this procedure for the rest of the components. Once the unit functions properly, reinstall the original IC's one by one to determine which are actually defective.

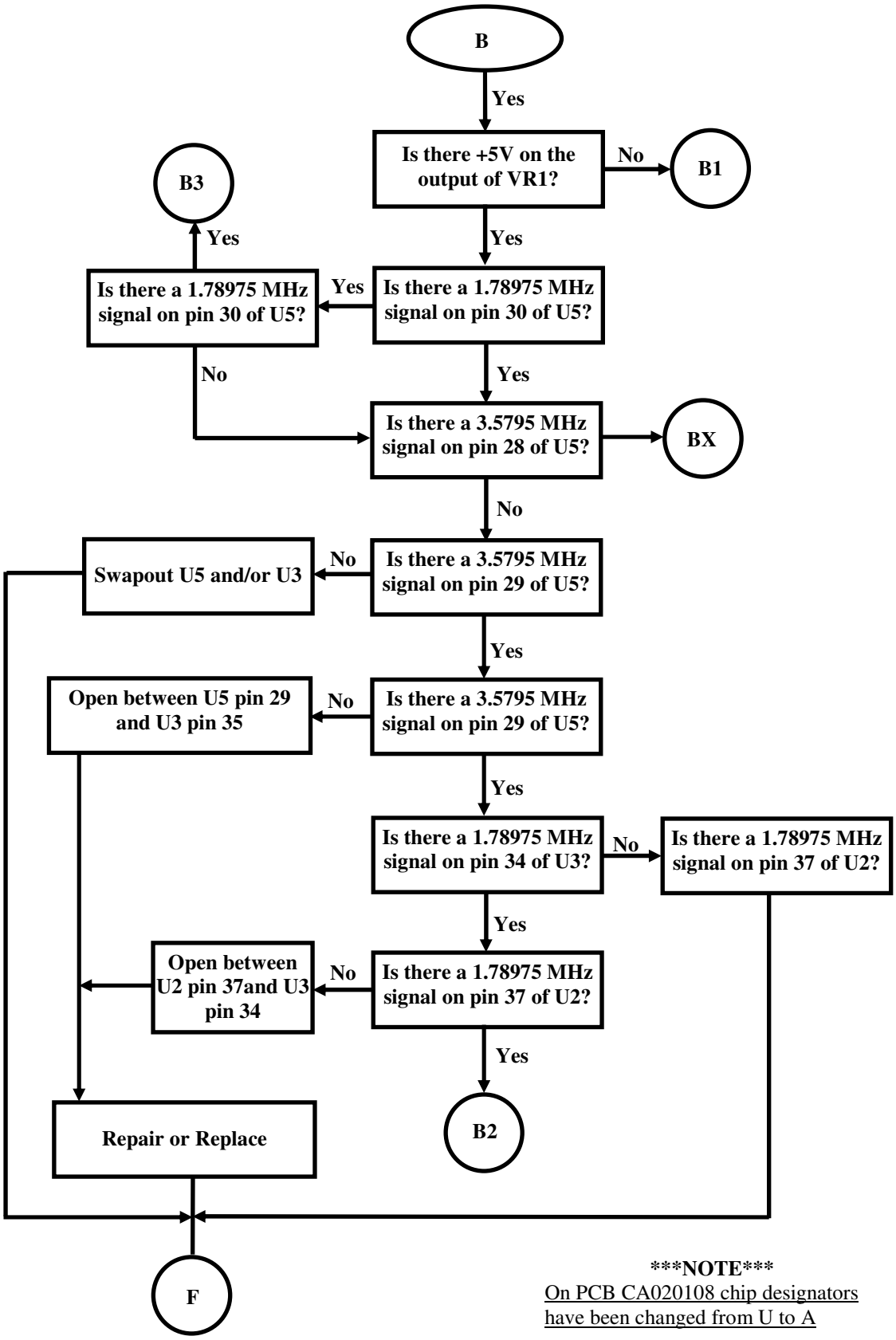
REPLACE IN ORDER

The "replace in order" instruction means that you should replace the components indicated in the order listed until the result called out in the previous block is obtained.

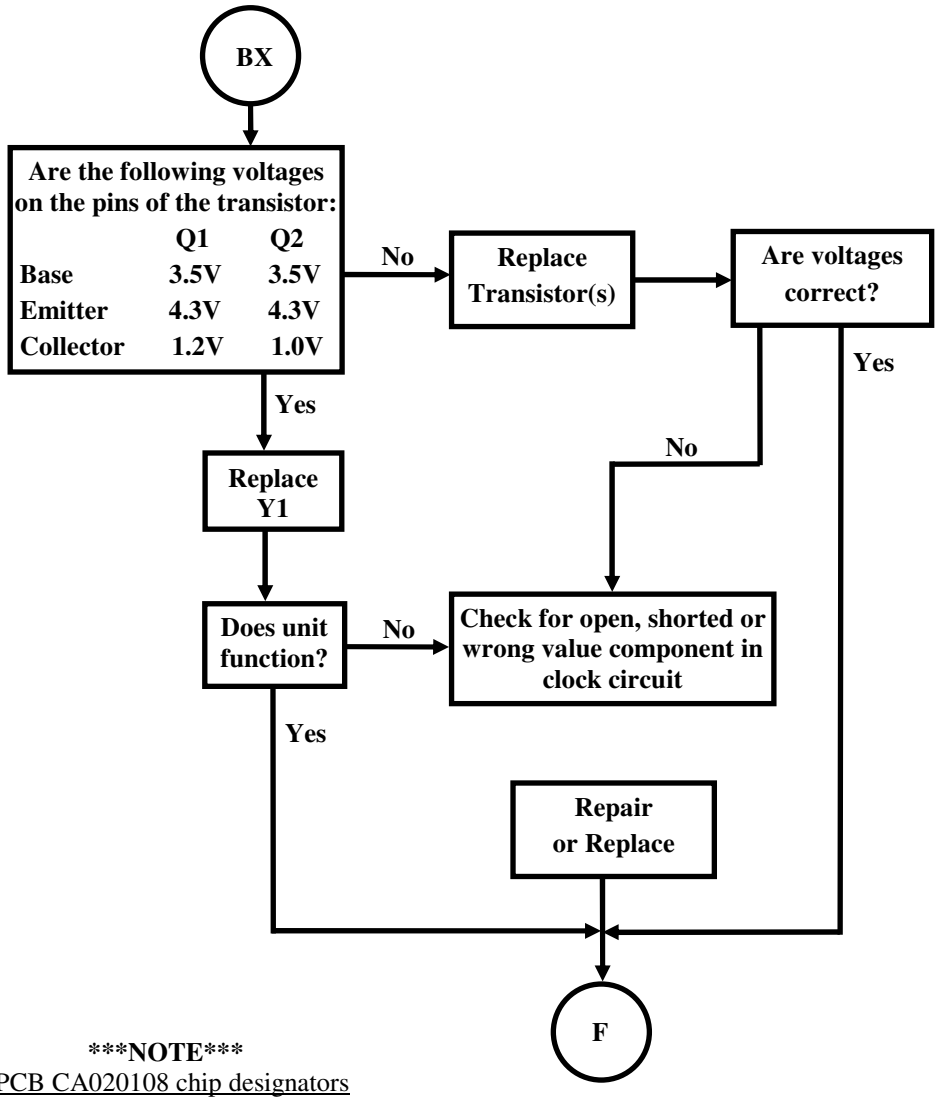
F – Some lines terminate with an F inside a circle. When this occurs, return to the beginning of the test sequence on page 32.

N – Some lines terminate with an N inside a circle. When this occurs, call your

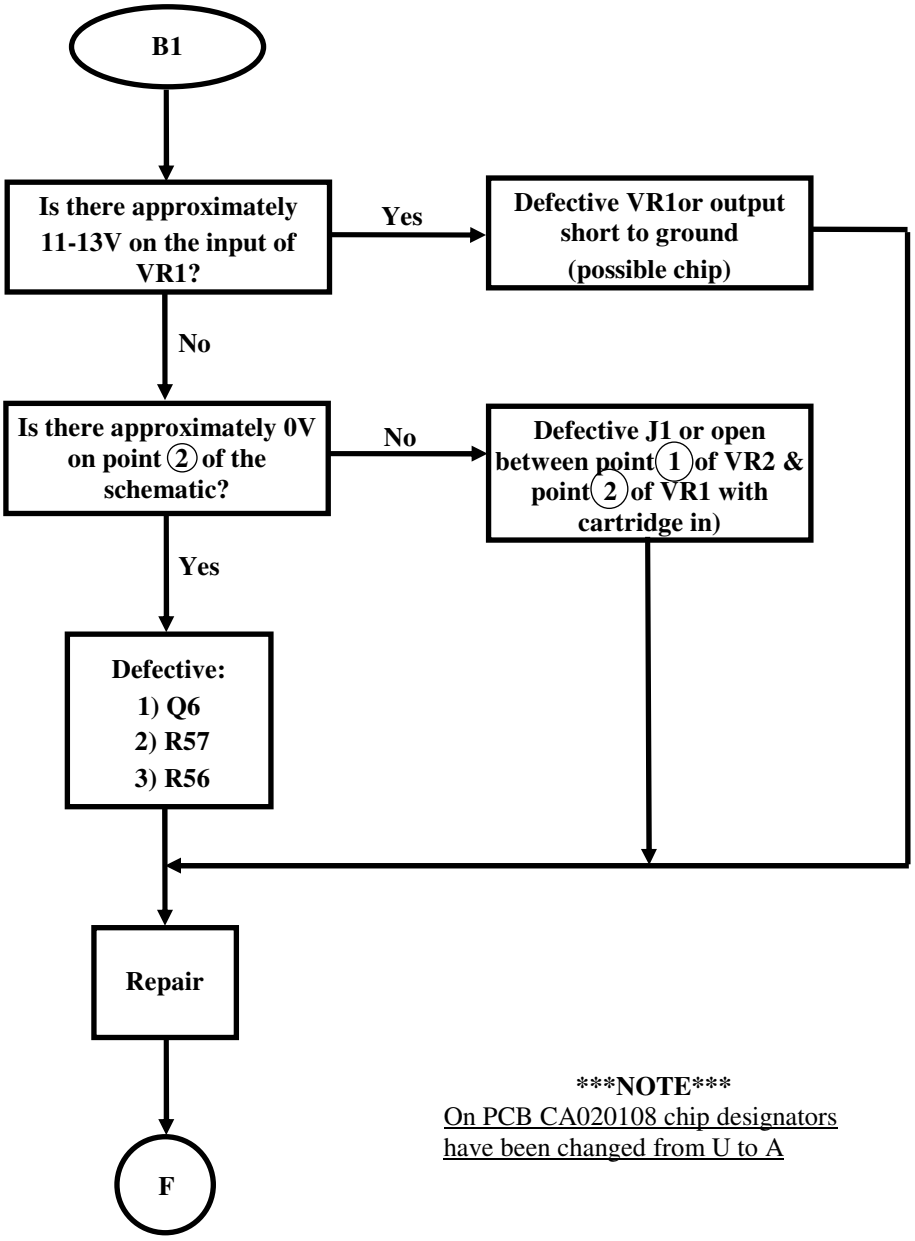
Atari Repair Hotline.
Inside California (800) 672-1466
Outside California (800) 538-1535 (300) 538-1536



NOTE
On PCB CA020108 chip designators have been changed from U to A

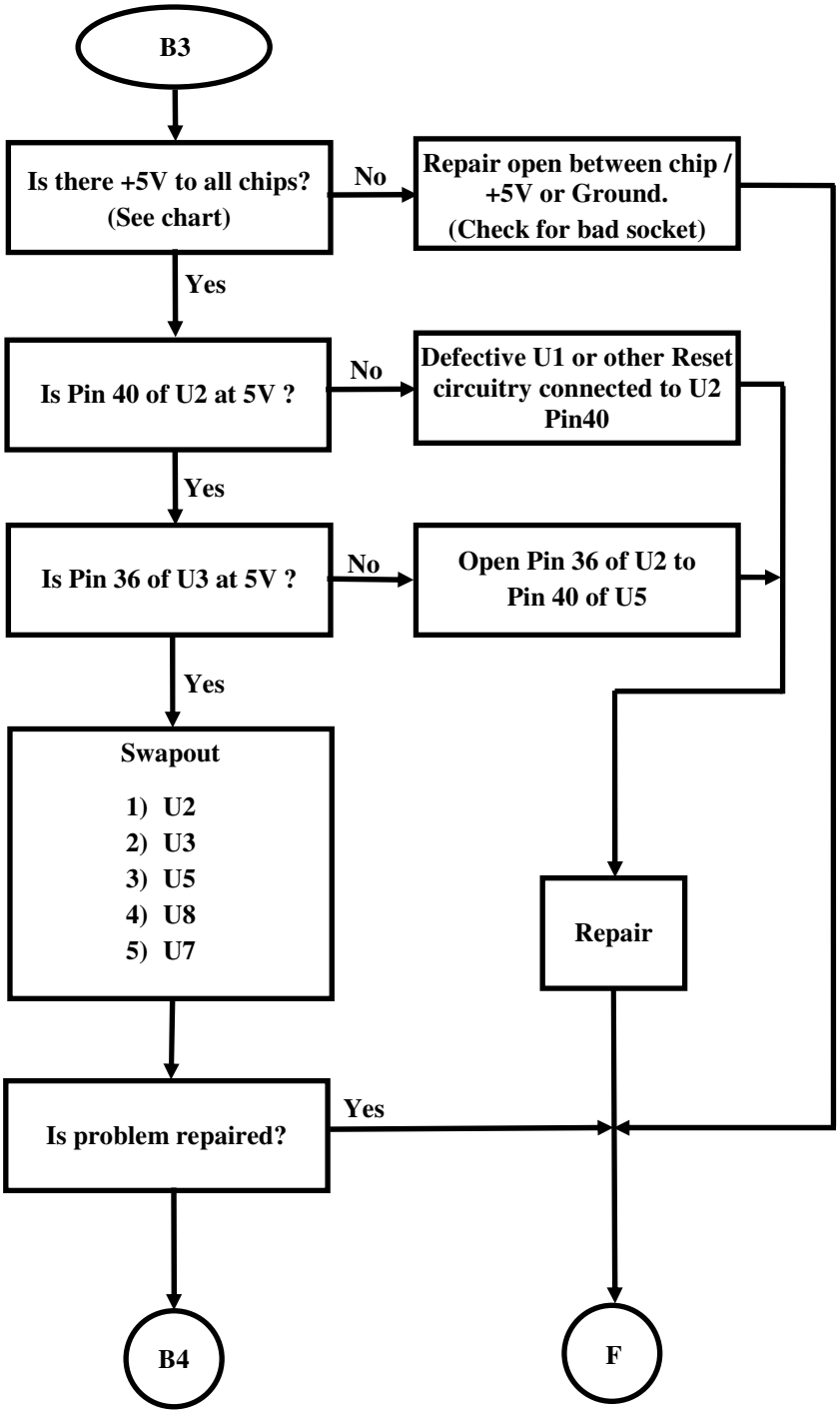


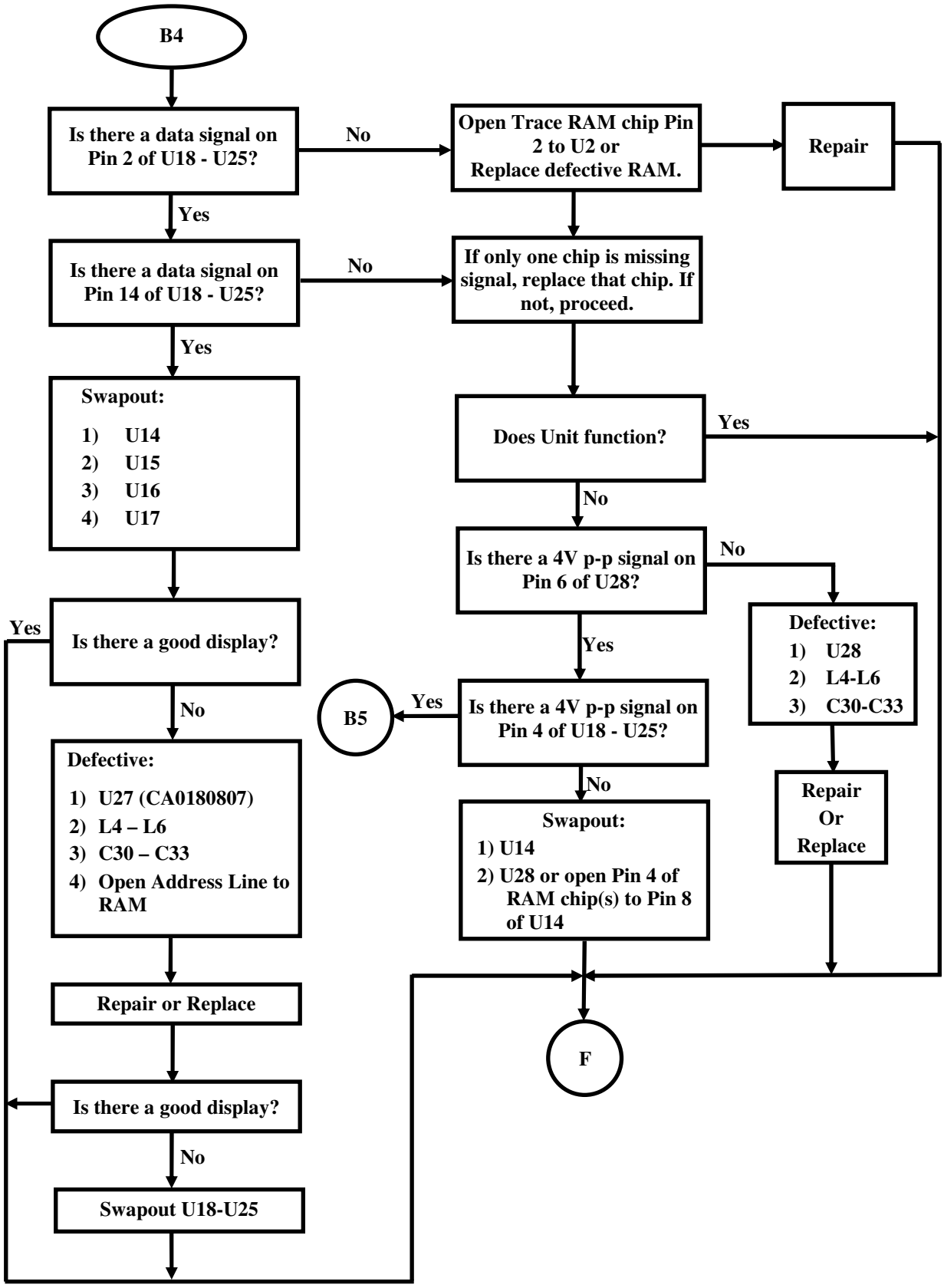
*****NOTE*****
On PCB CA020108 chip designators have been changed from U to A

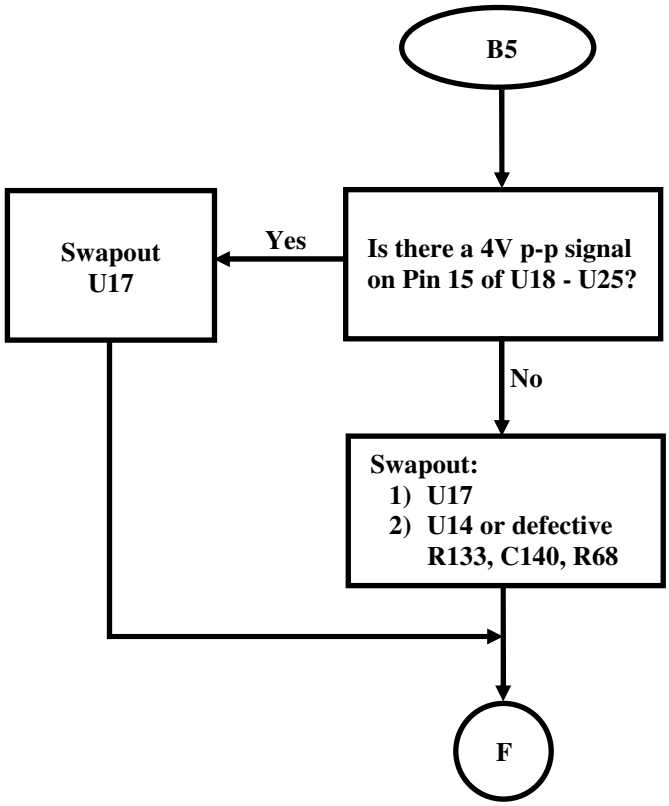


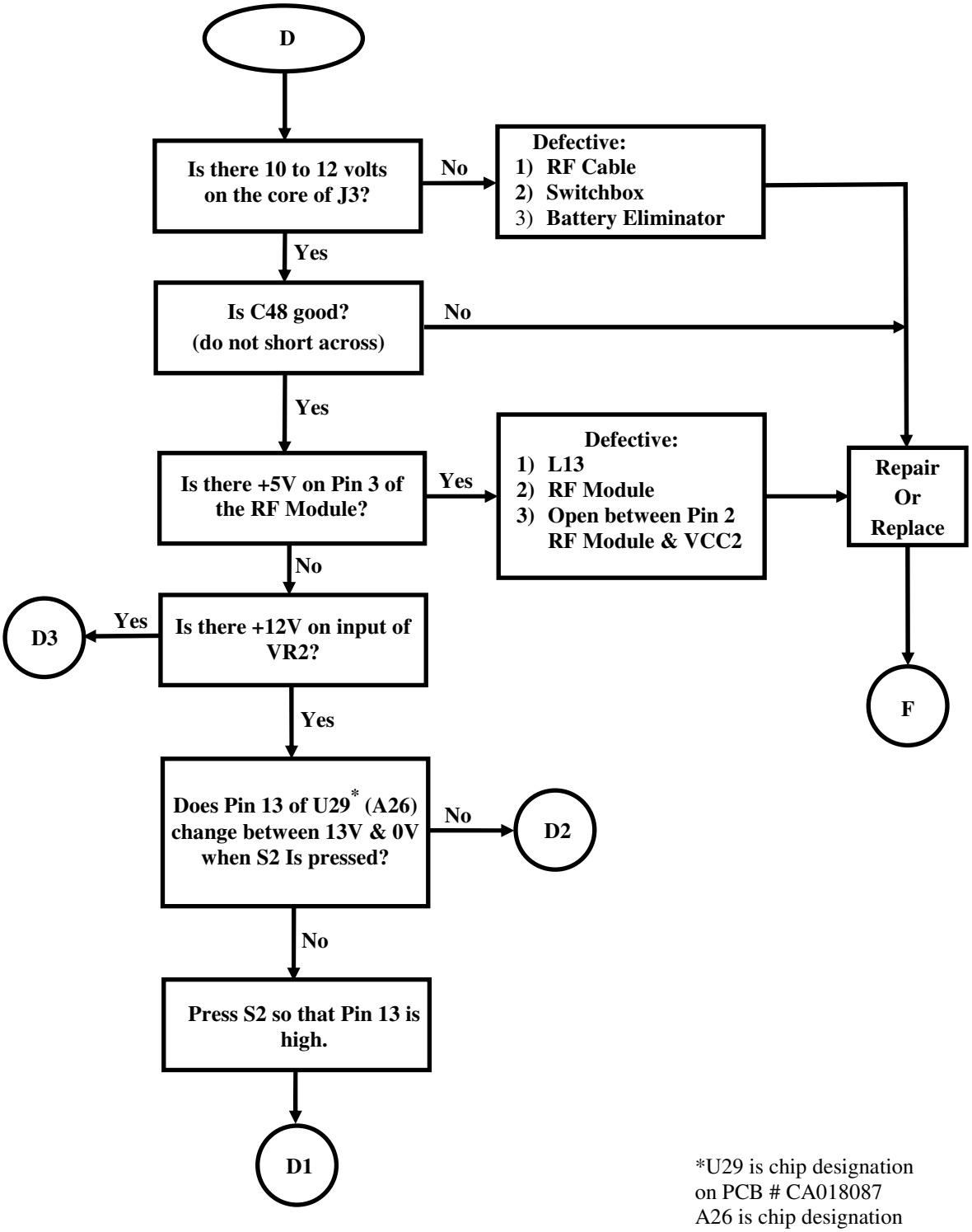
NOTE
On PCB CA020108 chip designators have been changed from U to A

PCB #		Pin #	
CA020108	CA018087	+5V	GND
A1	U1	1	8
A2	U2	8	1,21
A3	U3	21	1
	U4	20	10
A5	U5	27	3
A6	U6	16	8
A7	U7	17	1
A8	U8	24	12
A9	U9	16	8
A10	U10	16	8
A11	U11	16	8
A12	U12	16	8
A13	U13	16	8
A14	U14	14	7
	U15	20	10
A16	U16	16	8
A17	U17	16	8
A18	U18	8	16
A19	U19	8	16
A20	U20	8	16
A21	U21	8	16
A22	U22	8	16
A23	U23	8	16
A24	U24	8	16
A25	U25	8	16
	U26	Not used	
A27	U27	14	7
	U28	14	7
	U29	14	7
A15		14	7
A26		14	7



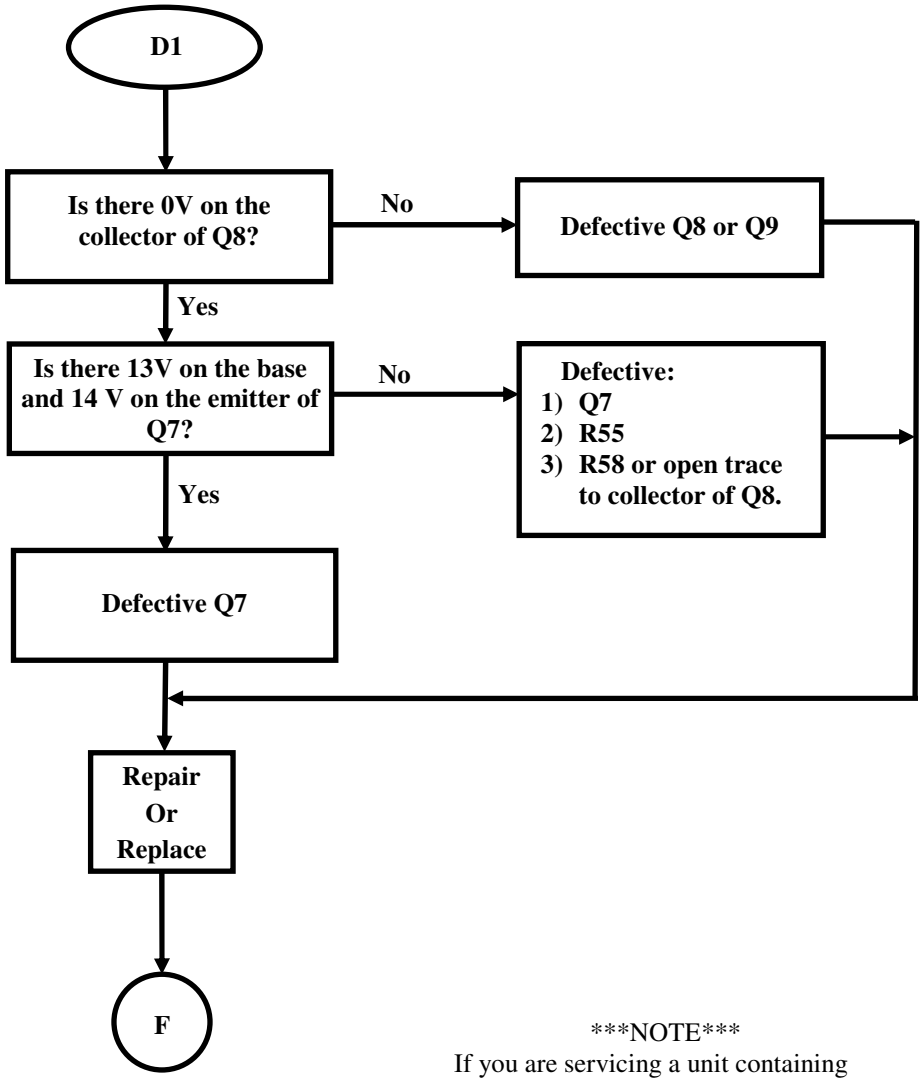

B4
Is there a data signal on Pin 2 of U18 - U25?
No
Open Trace RAM chip Pin 2 to U2 or Replace defective RAM.
Repair
Yes
Is there a data signal on Pin 14 of U18 - U25?
No
If only one chip is missing signal, replace that chip. If not, proceed.
Yes
Swapout:
1) U14
2) U15
3) U16
4) U17
Does Unit function?
Yes
No
Is there a 4V p-p signal on Pin 6 of U28?
No
Defective:
1) U28
2) L4-L6
3) C30-C33
Yes
Is there a good display?
Yes
Yes
B5
Is there a 4V p-p signal on Pin 4 of U18 - U25?
No
Repair Or Replace
No
Defective:
1) U27 (CA0180807)
2) L4 – L6
3) C30 – C33
4) Open Address Line to RAM
Swapout:
1) U14
2) U28 or open Pin 4 of RAM chip(s) to Pin 8 of U14
Repair or Replace
F
Is there a good display?
No
Swapout U18-U25


B5
Is there a 4V p-p signal on Pin 15 of U18 - U25?
Yes
Swapout U17
No
Swapout:
1) U17
2) U14 or defective R133, C140, R68
F

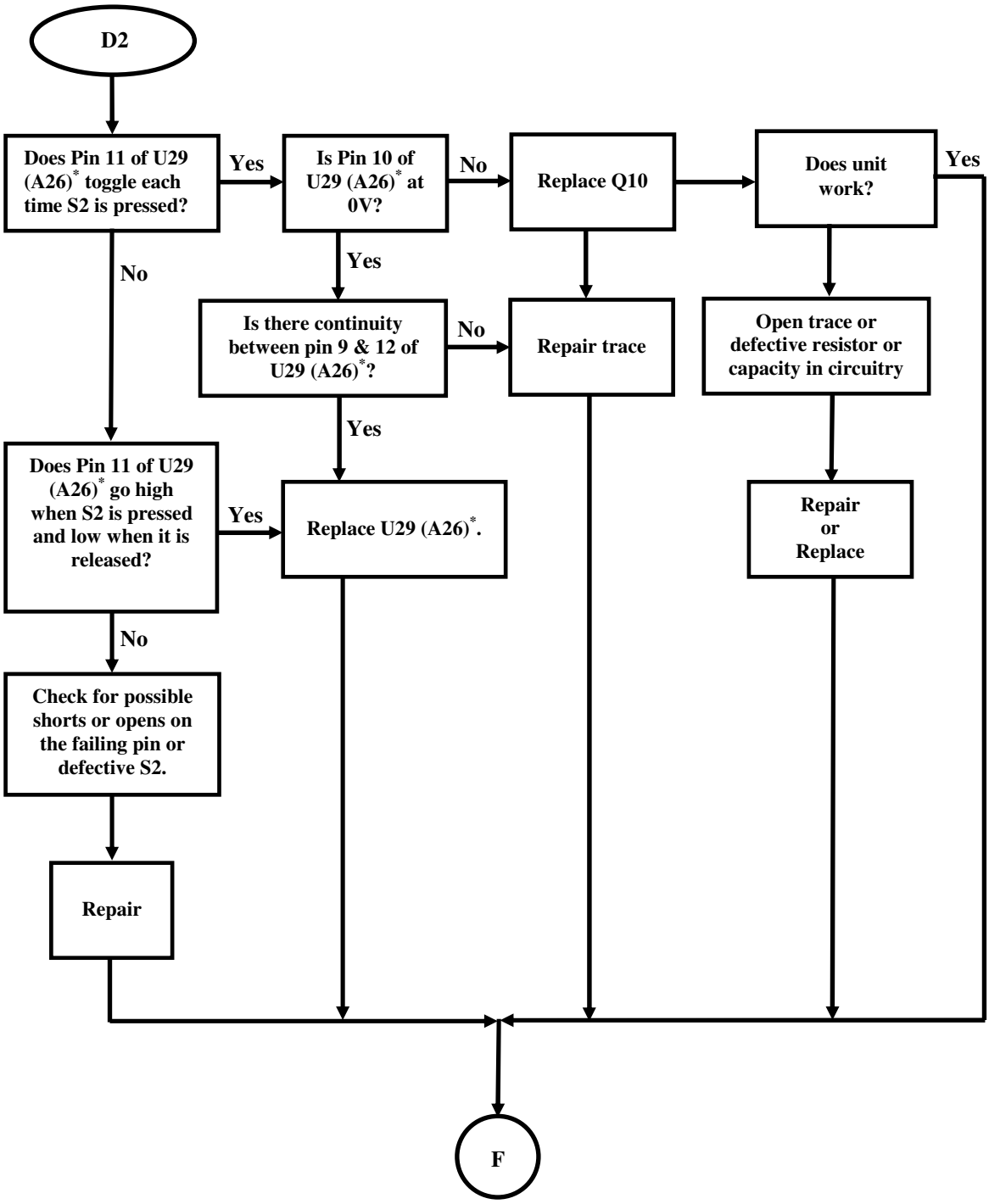


*U29 is chip designation on PCB # CA018087
A26 is chip designation on PCB # CA020108

NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

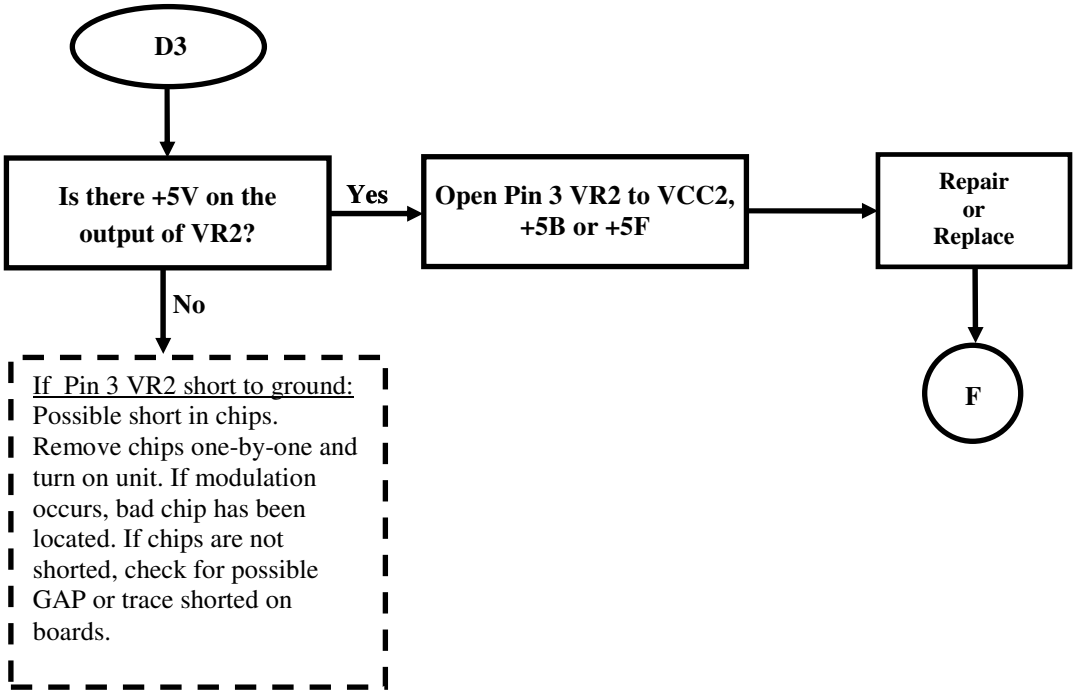


NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

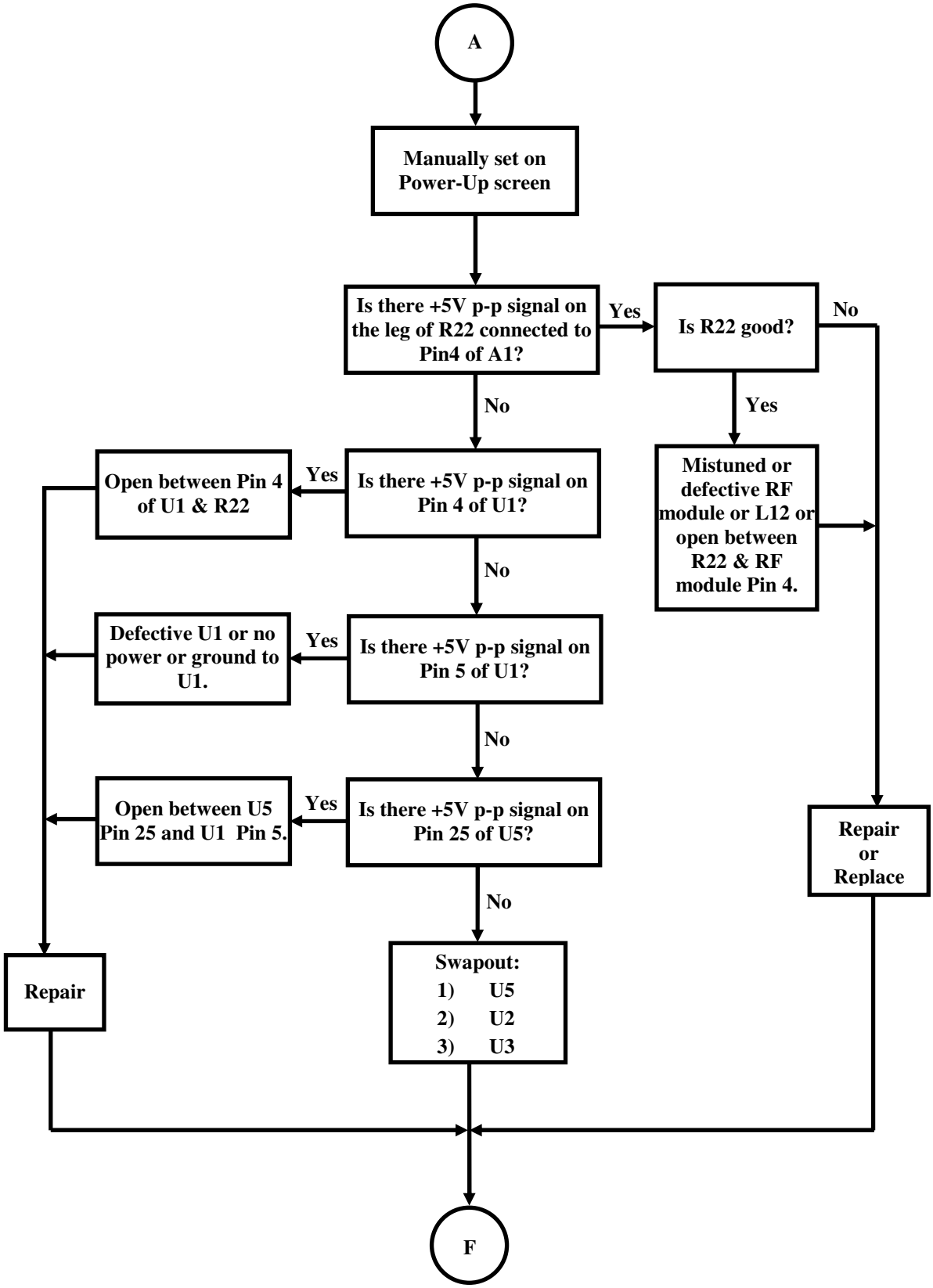


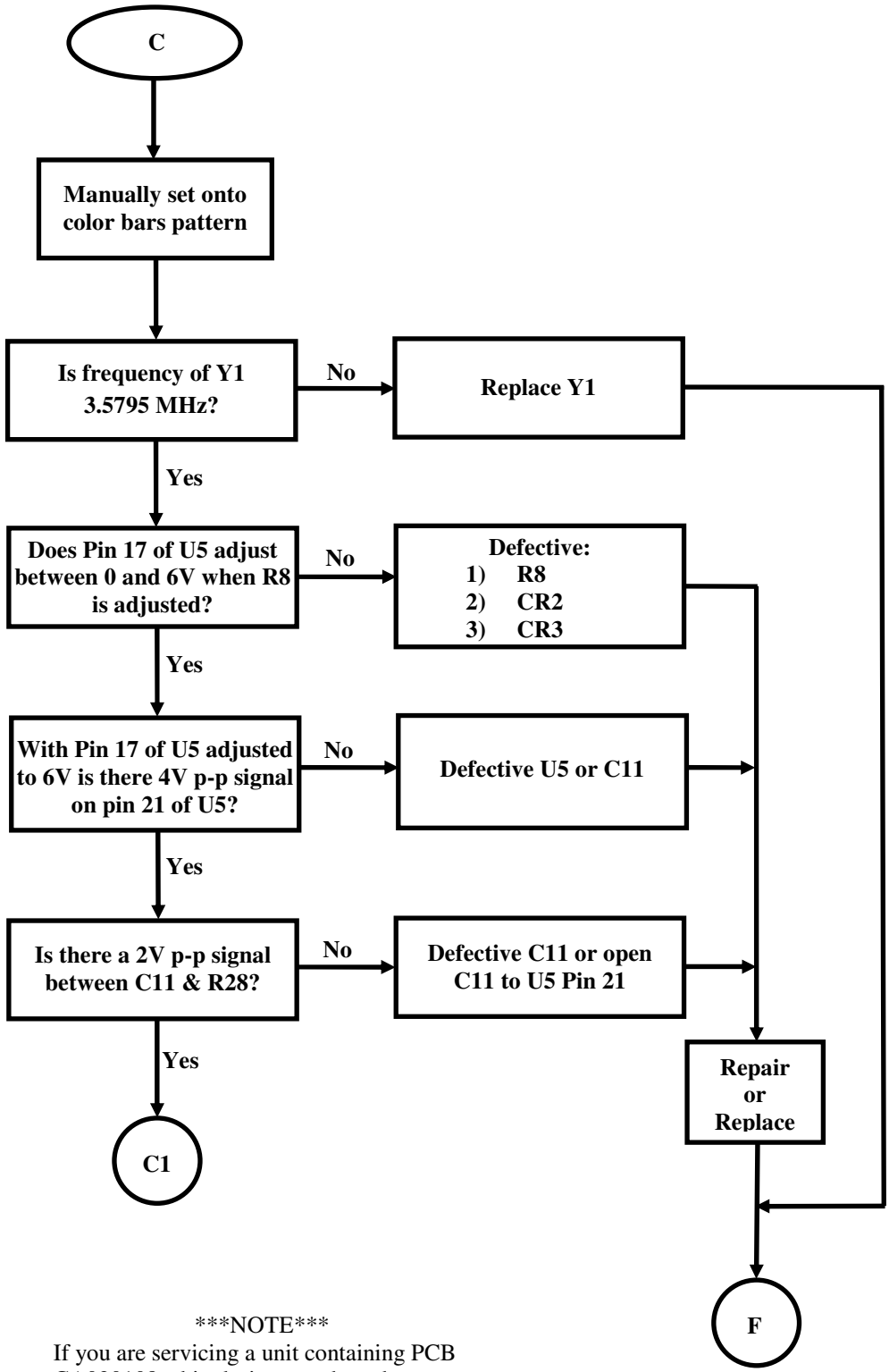
*U29 is chip designation on PCB # CA018087 A26 is chip designation on PCB # CA020108

NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

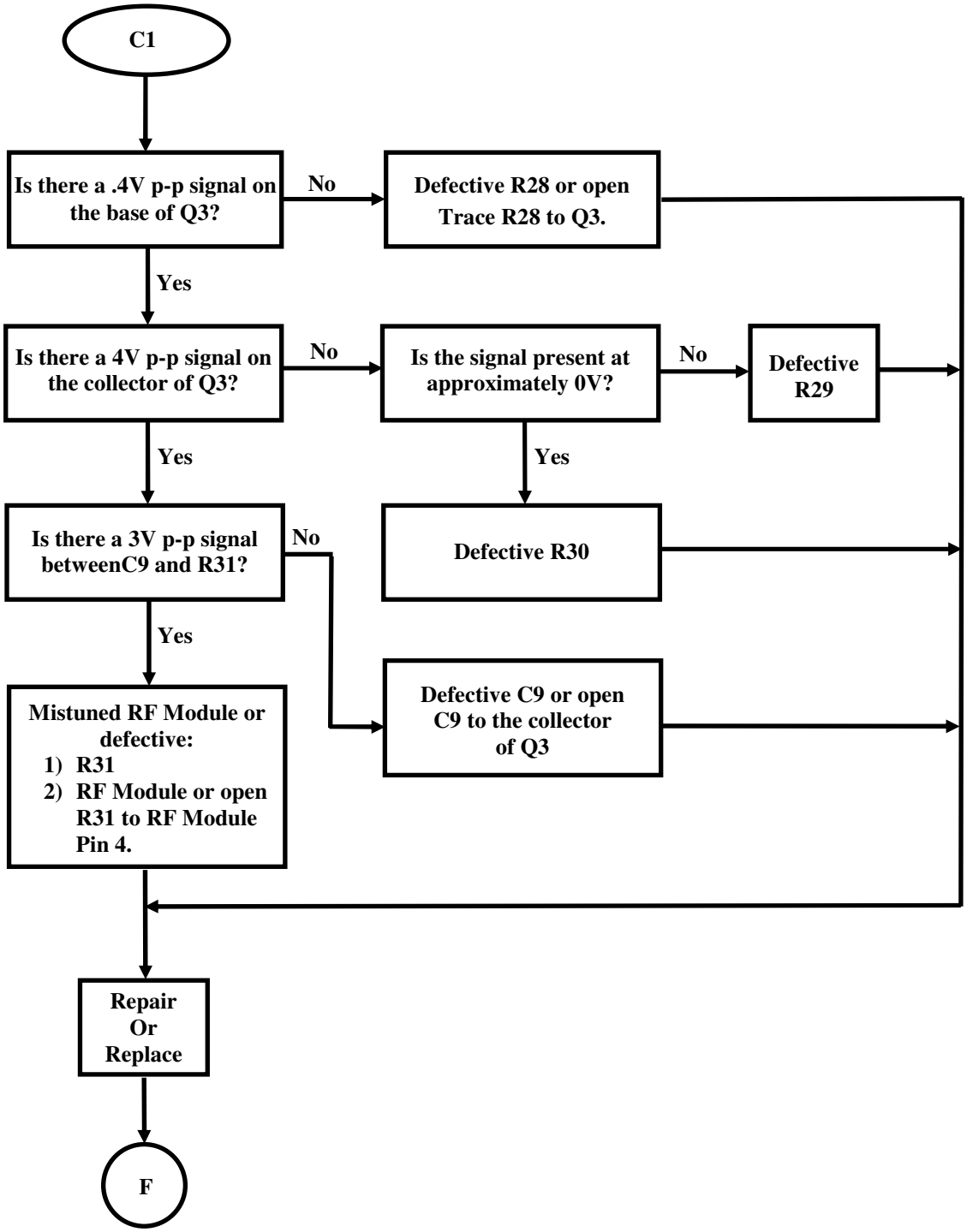


NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

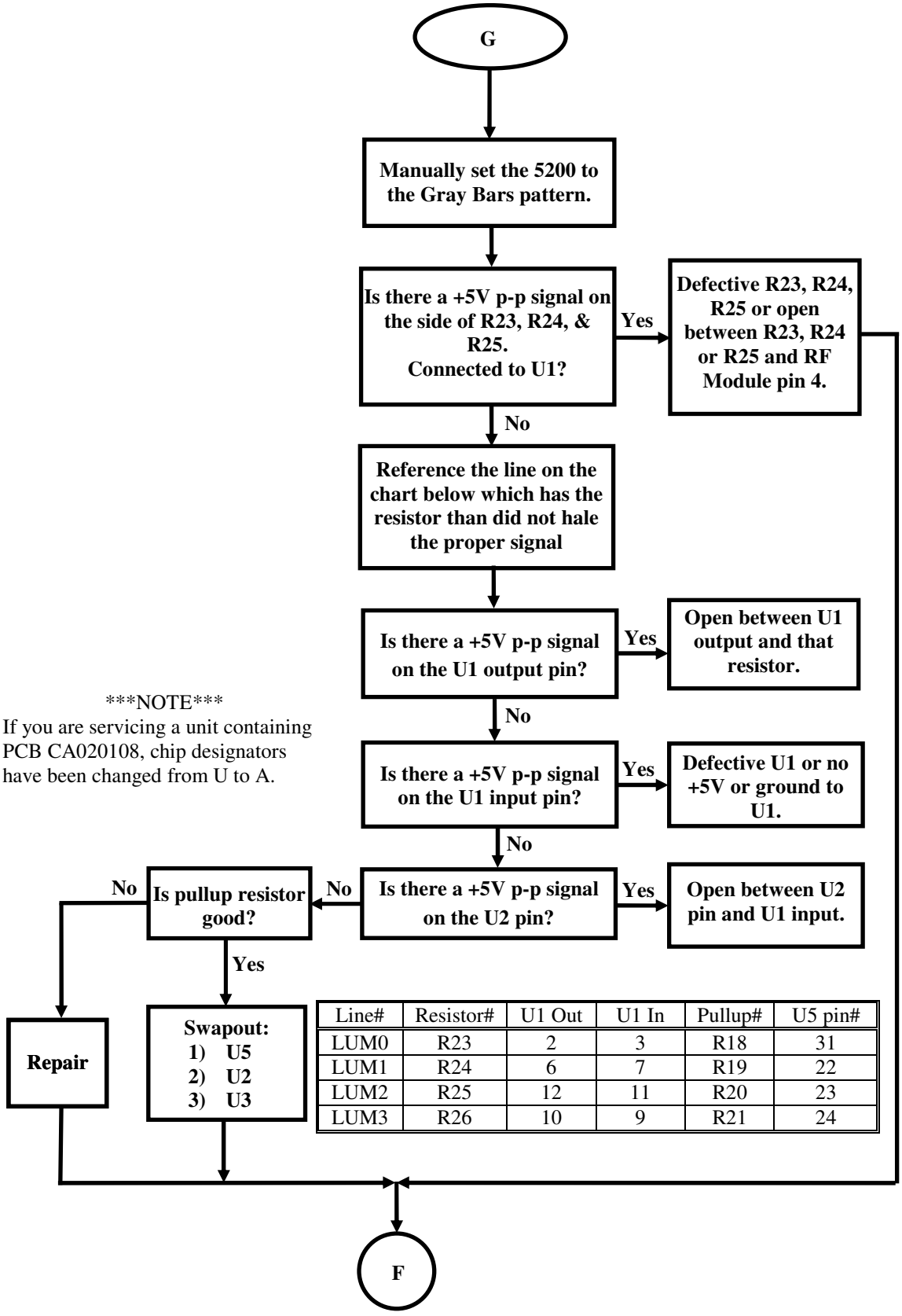

A
Manually set on Power-Up screen
Is there +5V p-p signal on the leg of R22 connected to Pin4 of A1?
Yes
Is R22 good?
No
No
Yes
Open between Pin 4 of U1 & R22
Yes
Is there +5V p-p signal on Pin 4 of U1?
Mistuned or defective RF module or L12 or open between R22 & RF module Pin 4.
No
Defective U1 or no power or ground to U1.
Yes
Is there +5V p-p signal on Pin 5 of U1?
No
Open between U5 Pin 25 and U1 Pin 5.
Yes
Is there +5V p-p signal on Pin 25 of U5?
Repair or Replace
No
Repair
Swapout:
1) U5
2) U2
3) U3
F



NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.



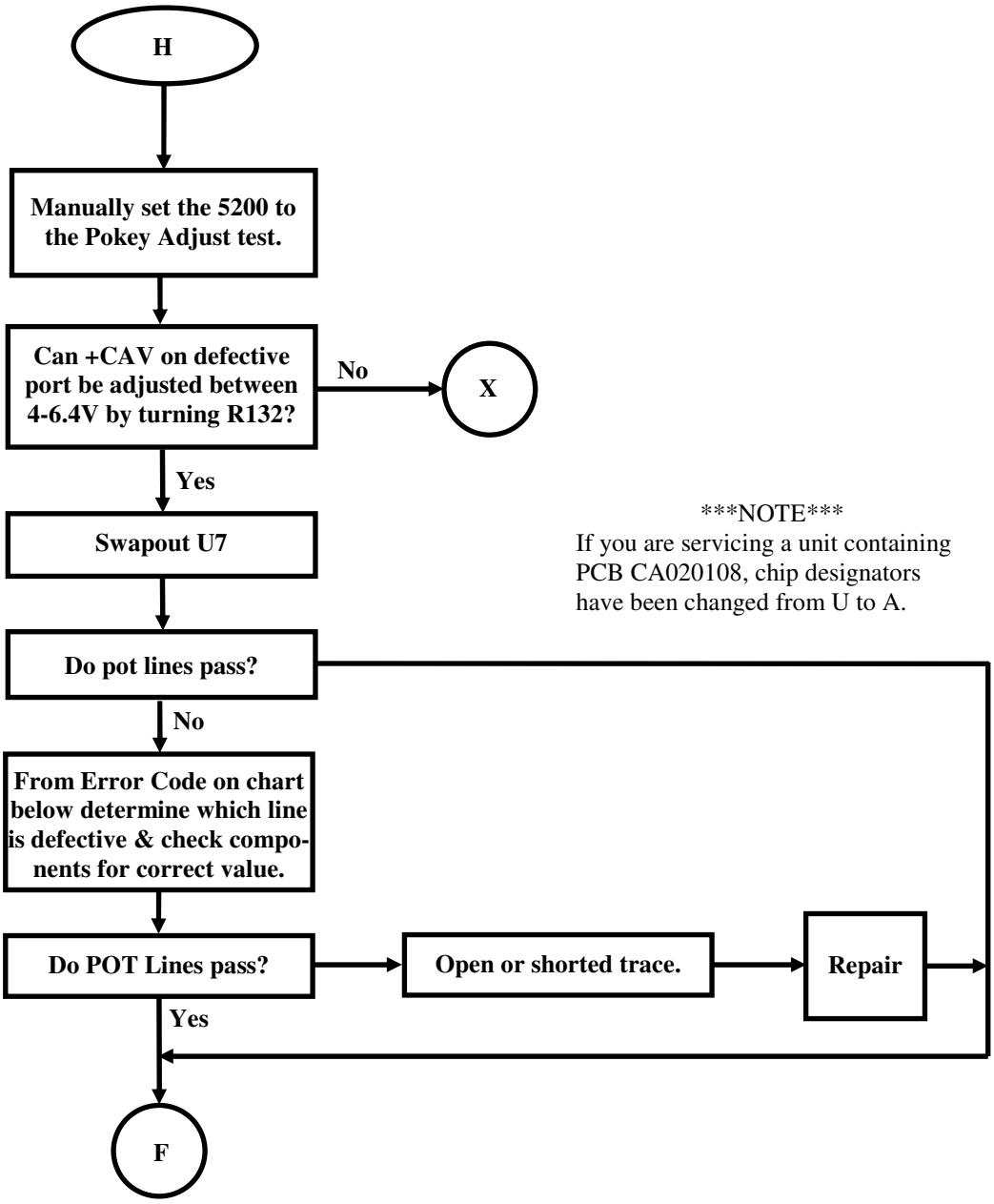
NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.



NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

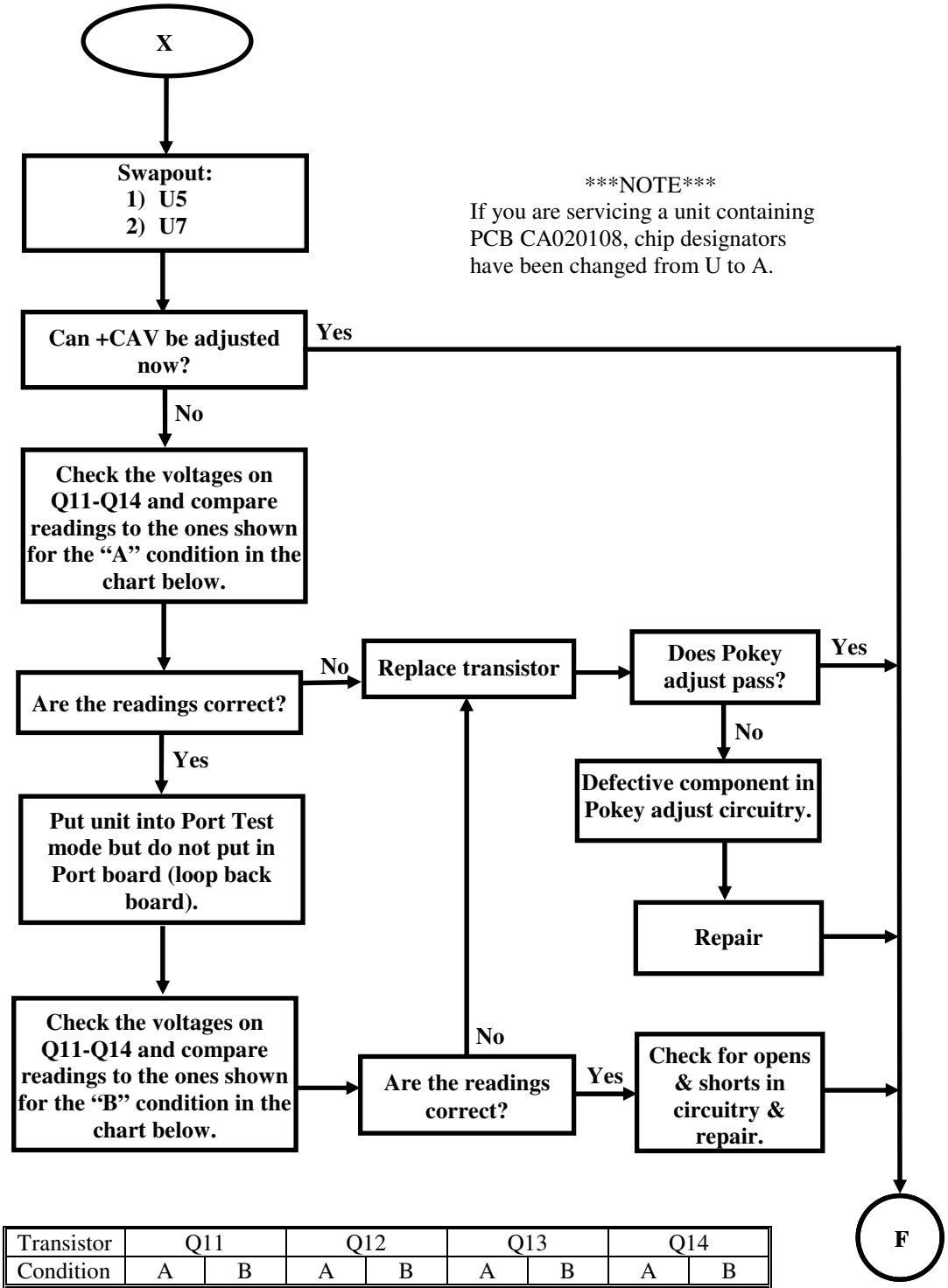
Line#	Resistor#	U1 Out	U1 In	Pullup#	U5 pin#
LUM0	R23	2	3	R18	31
LUM1	R24	6	7	R19	22
LUM2	R25	12	11	R20	23
LUM3	R26	10	9	R21	24

Pot Control Line Troubleshooting



NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

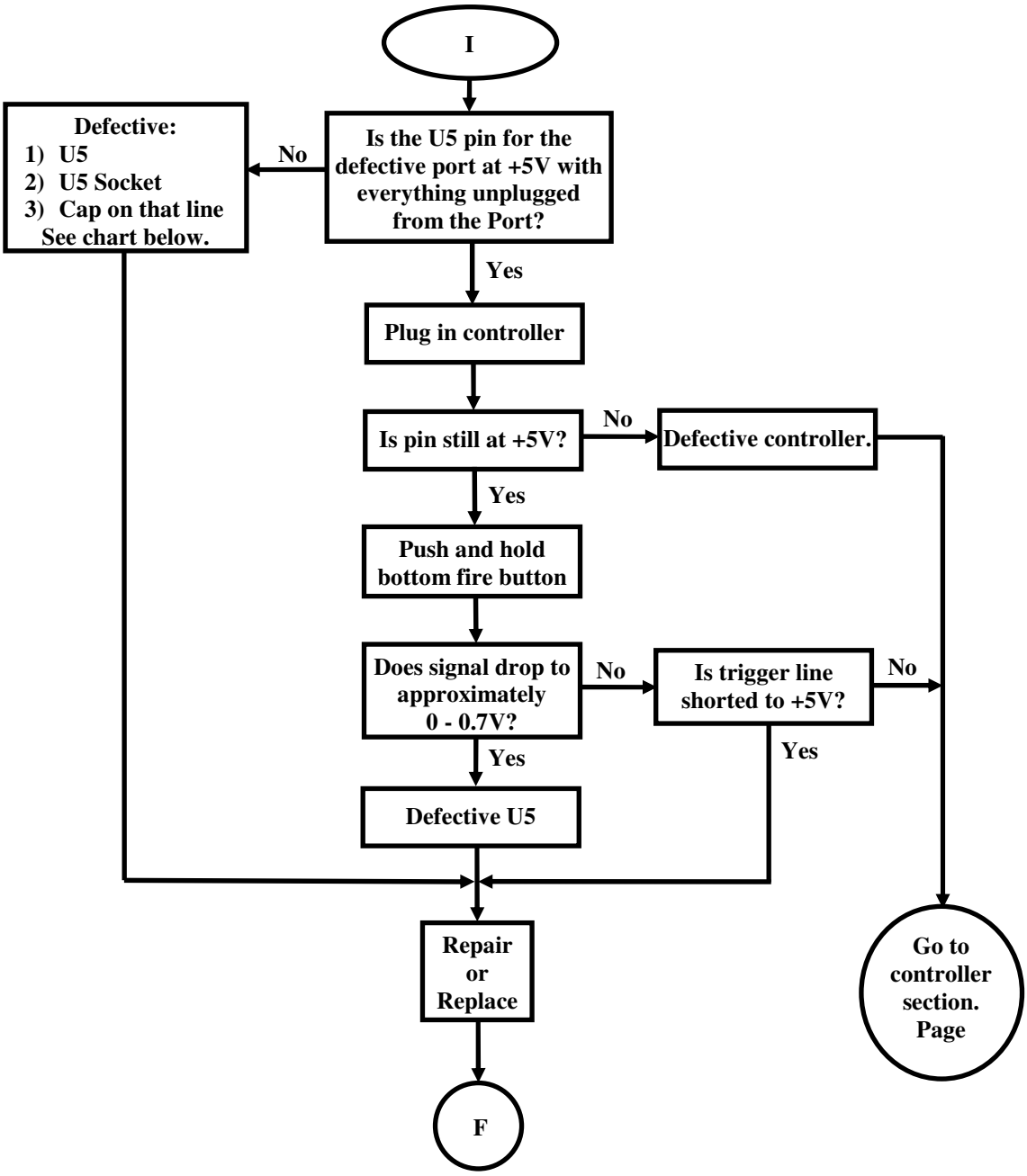
POT Line Error Code	Pokey Adj. Failure	Port and Pin #	Pokey U7 Pin #	CAP#1	CAP#2	Resistor
22	HOR 1	1-10	14	C98	C106	R106
23	VERT 1	1-11	15	C97	C105	R110
24	HOR 2	2-10	12	C96	C104	R107
25	VERT 2	2-11	13	C95	C103	R111
26	HOR 3	3-10	10	C94	C102	R108
27	VERT 3	3-11	11	C93	C101	R112
28	HOR 4	4-10	8	C92	C100	R109
29	VERT 4	4-11	9	C91	C99	R113



Transistor	Q11		Q12		Q13		Q14	
Condition	A	B	A	B	A	B	A	B
Emitter	13V	13V	3.2V	0V	0V	0V	3.2V	0V
Base	12V	13V	4V	0V	0V	0.7V	3.8V	0V
Collector	4-6.4V	0V	13V	13V	3.8V	0V	12V	13V

A: Pokey Adjust Selected
B: Other 1.1 tests (excluding Port Test)

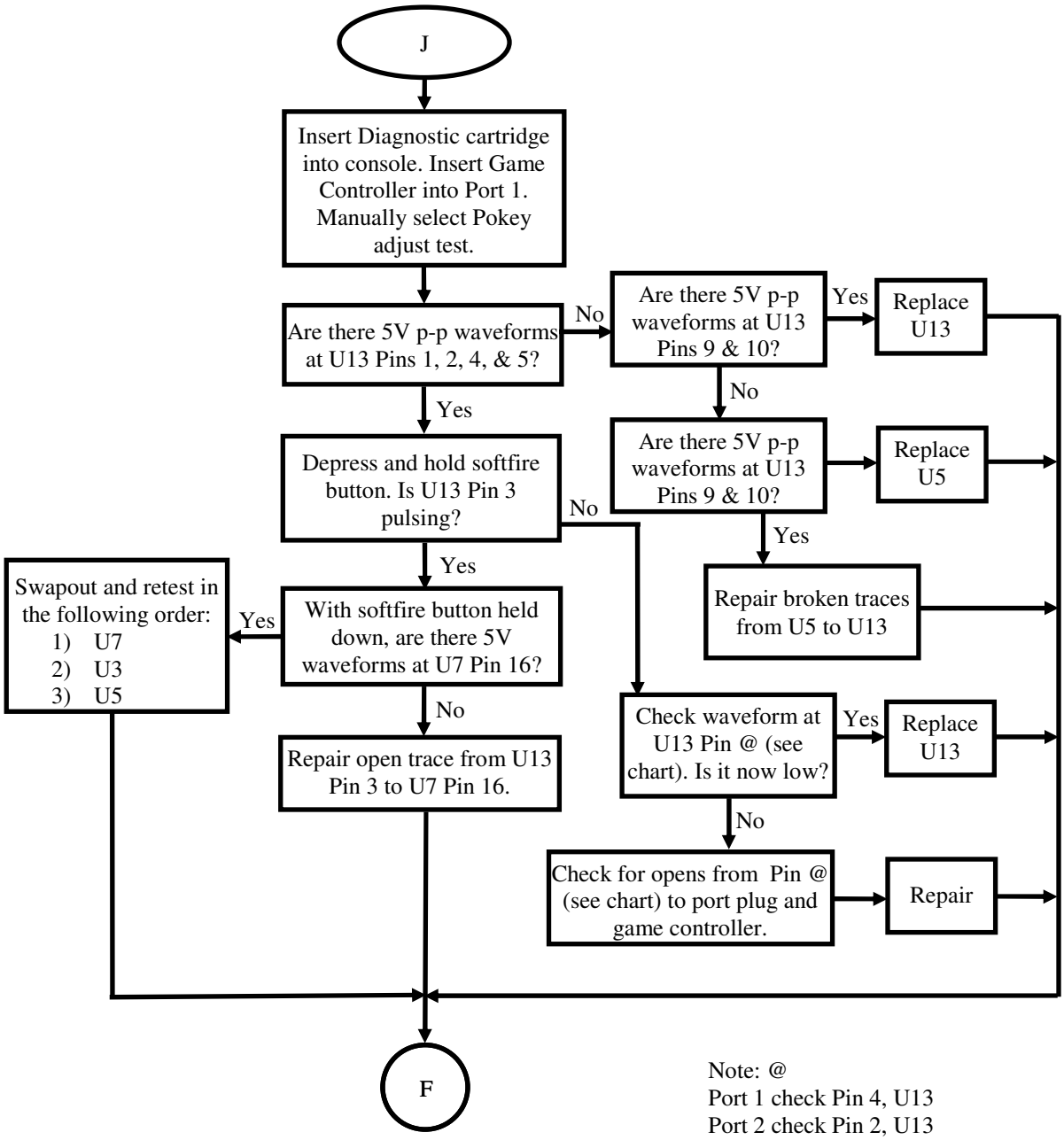
Trigger Line Troubleshooting (Bottom Fire Button)



NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

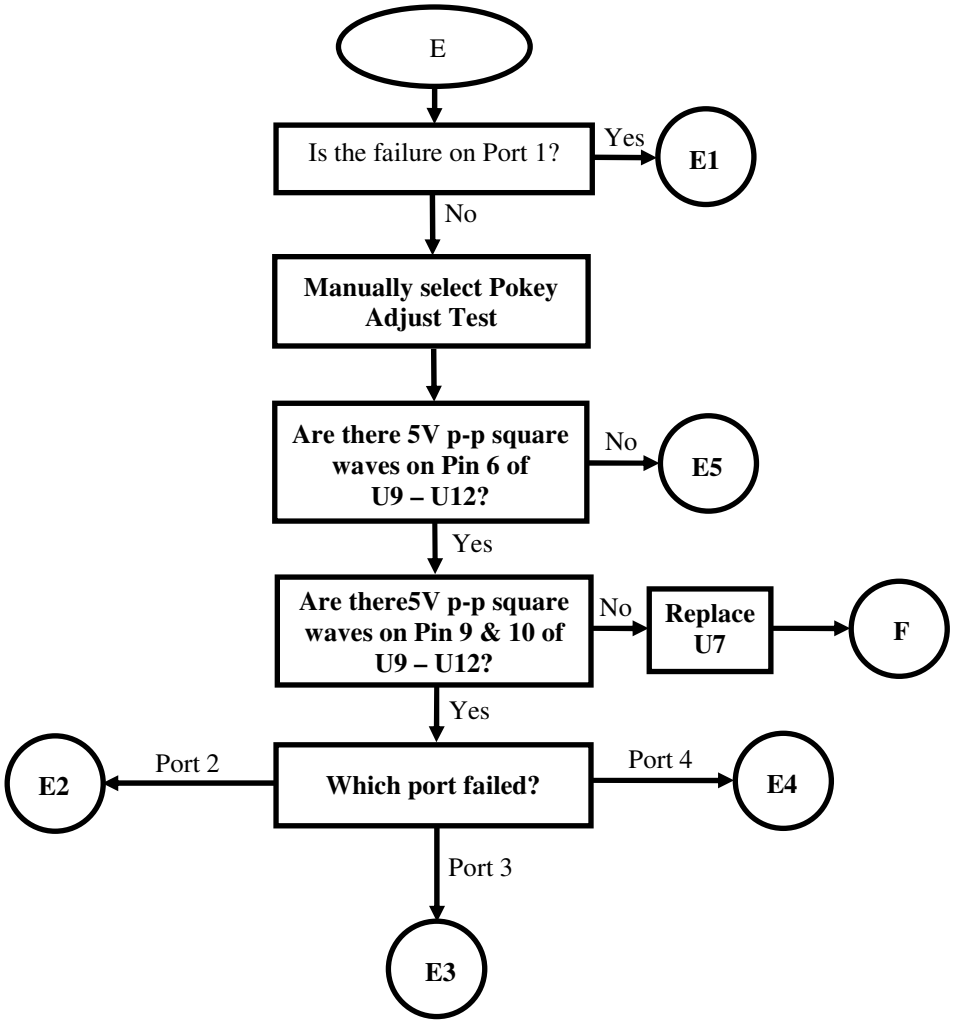
Port	U5 Pin#	Cap#
1	8	110
2	9	109
3	10	108
4	11	107

Softfire (Top Fire Button) Troubleshooting

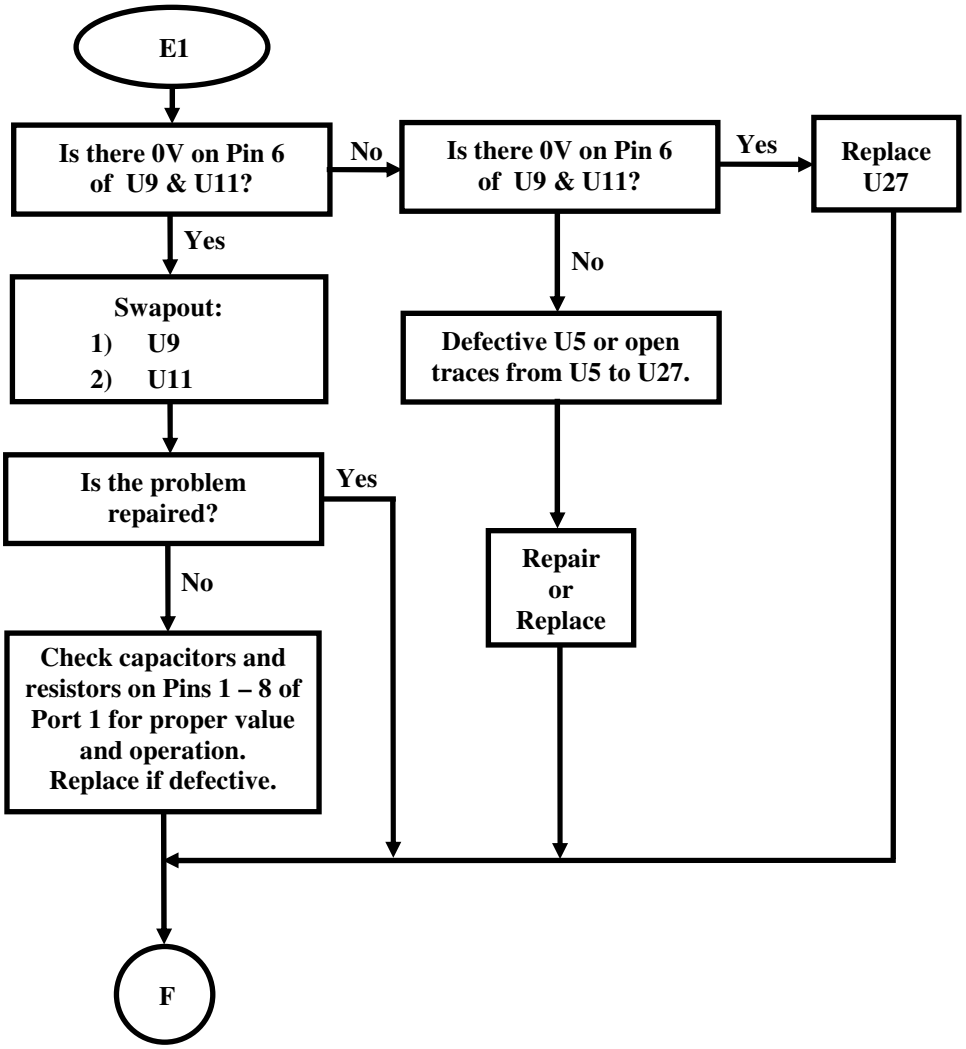


Note: @
Port 1 check Pin 4, U13
Port 2 check Pin 2, U13
Port 3 check Pin 5, U13
Port 4 check Pin 1, U13

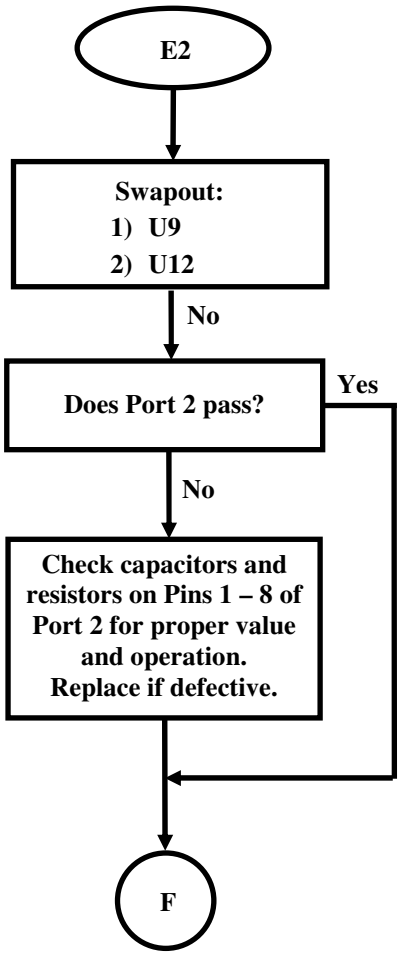
NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.



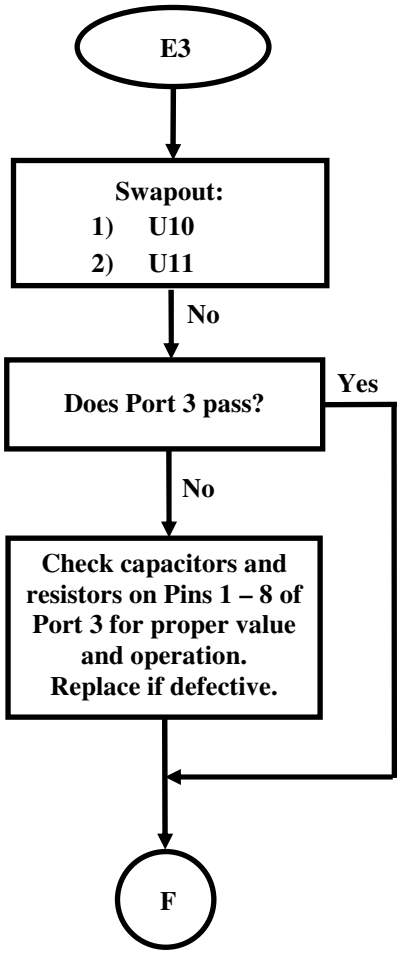
NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.



NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.



NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.



NOTE
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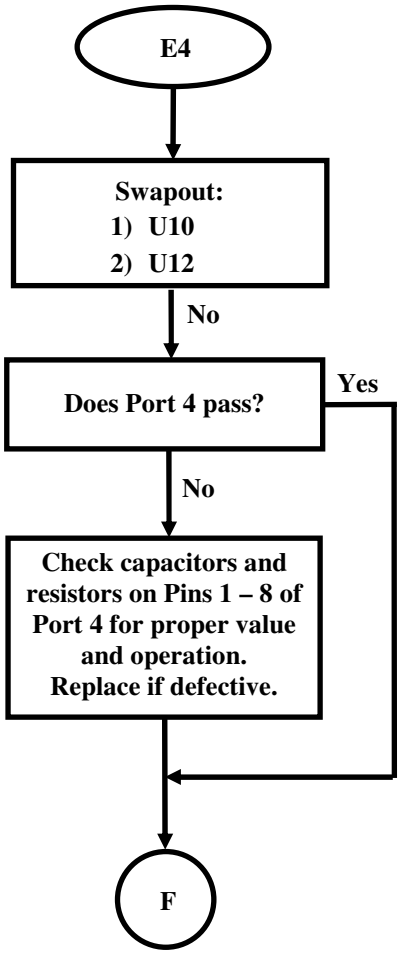

NOTE
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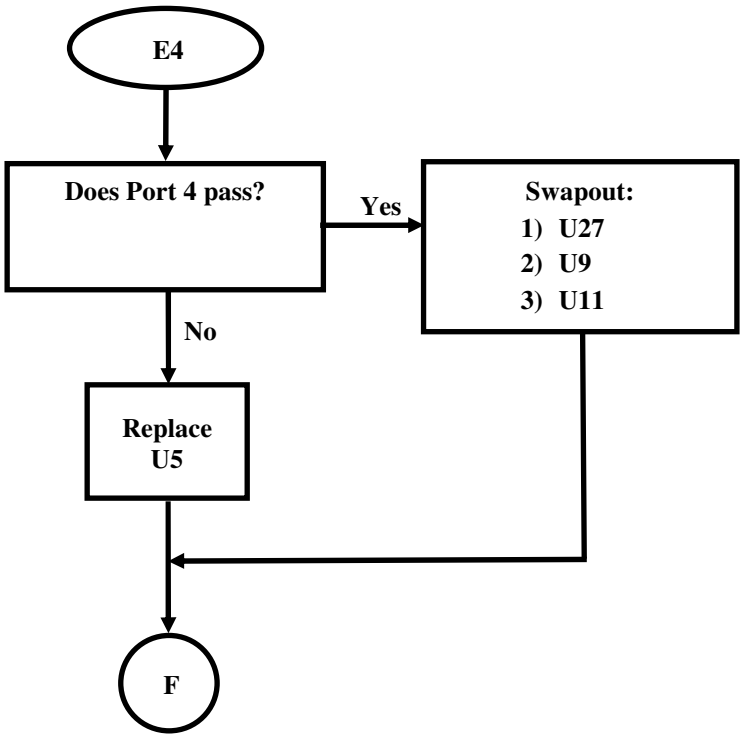

NOTE
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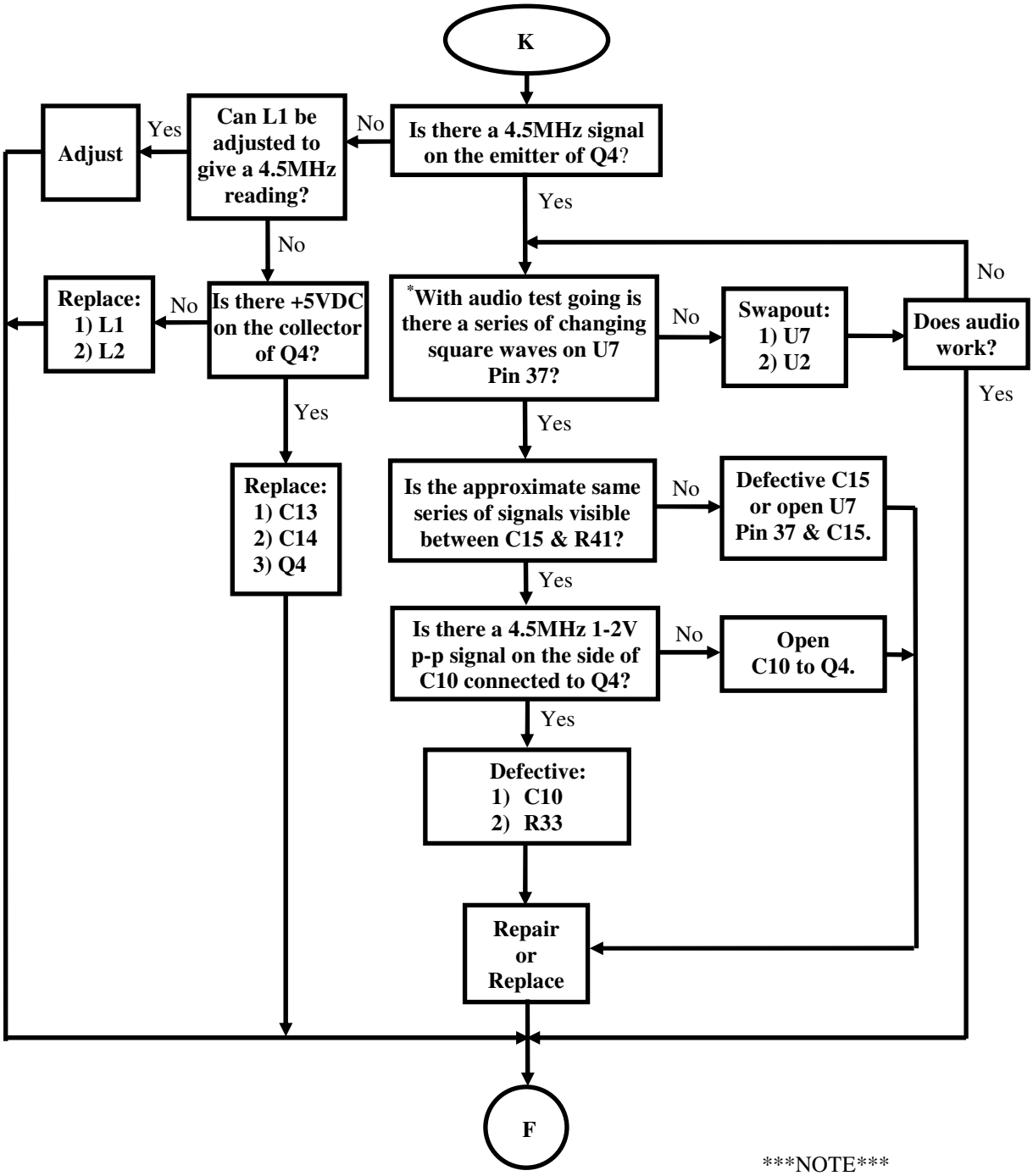


NOTE
If you are servicing a unit containing PCB CA020108, chip designators have been changed from U to A.

SECTION 4A

2 – PORT 5200 DIAGNOSTIC FLOWCHART

The Diagnostic Flowchart is intended to be easy to use and the primary aid when troubleshooting the 2 – Port 5200. Follow the prompts in the order presented. When a question is asked, follow the line from the box that best applies to your unit's condition. When that line terminates with a letter inside a circle, locate the letter on a different page and continue the diagnosis. The flowchart leaves nothing to chance; it tells you when to perform a specific test and when to replace components.

SWAPOUT PROCEDURE

At many places in the diagnostic flowchart, a box tells you to "刼wapout" a component, a chip, or a number of chips in a particular order. The "刼wapout" instruction means that you should replace the indicated components (one at a time) with known-good components of the same type. The unit should then be tested with the new, known-good components) in place to see whether the 刼wapout solved the problem being checked. If the 刼wapout did not fix the problem, leave the new chip in and 刼wapout the next. Repeat this procedure for the rest of the components. Once the unit functions properly, reinstall the original IC's one by one to determine which are actually defective.

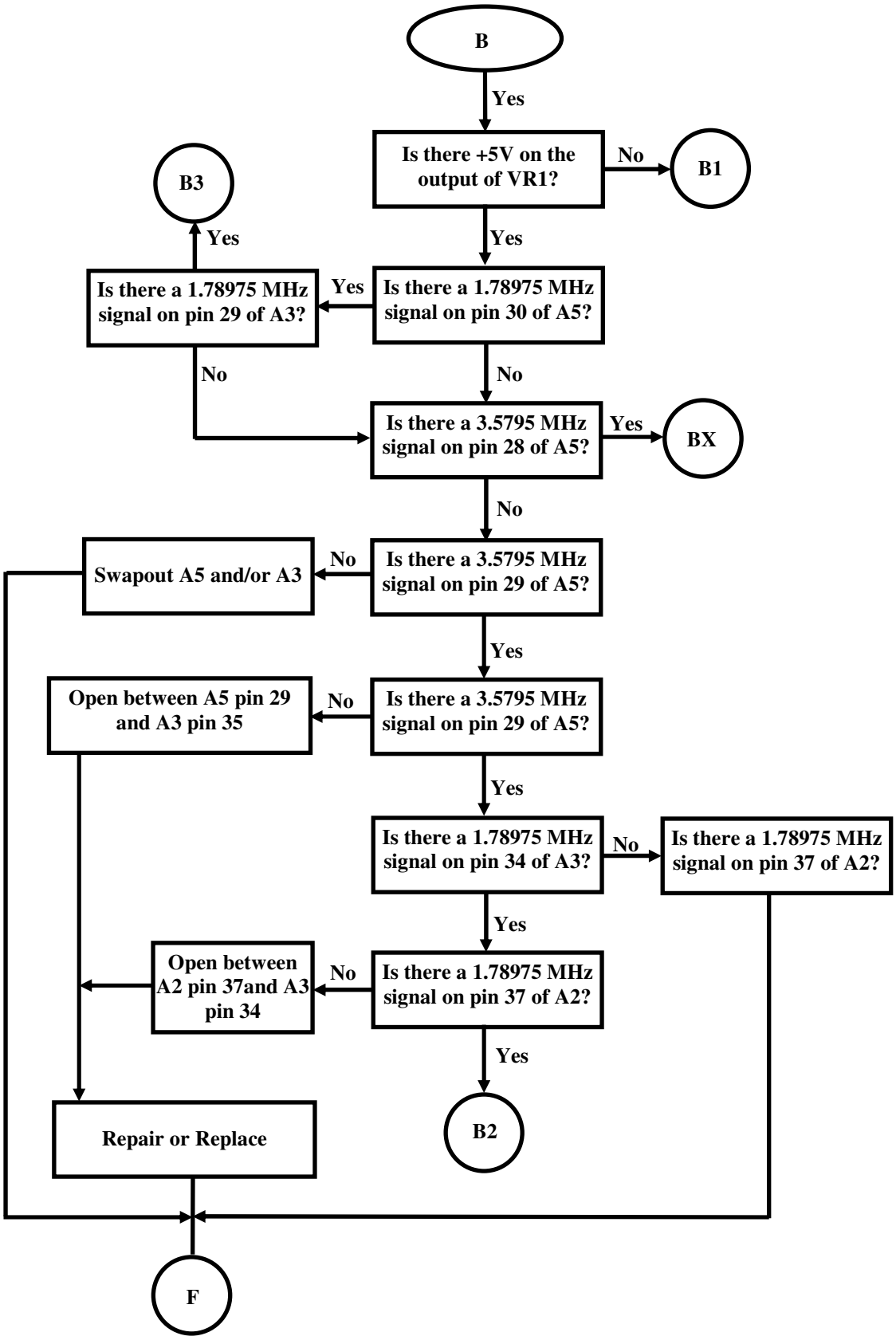
REPLACE IN ORDER

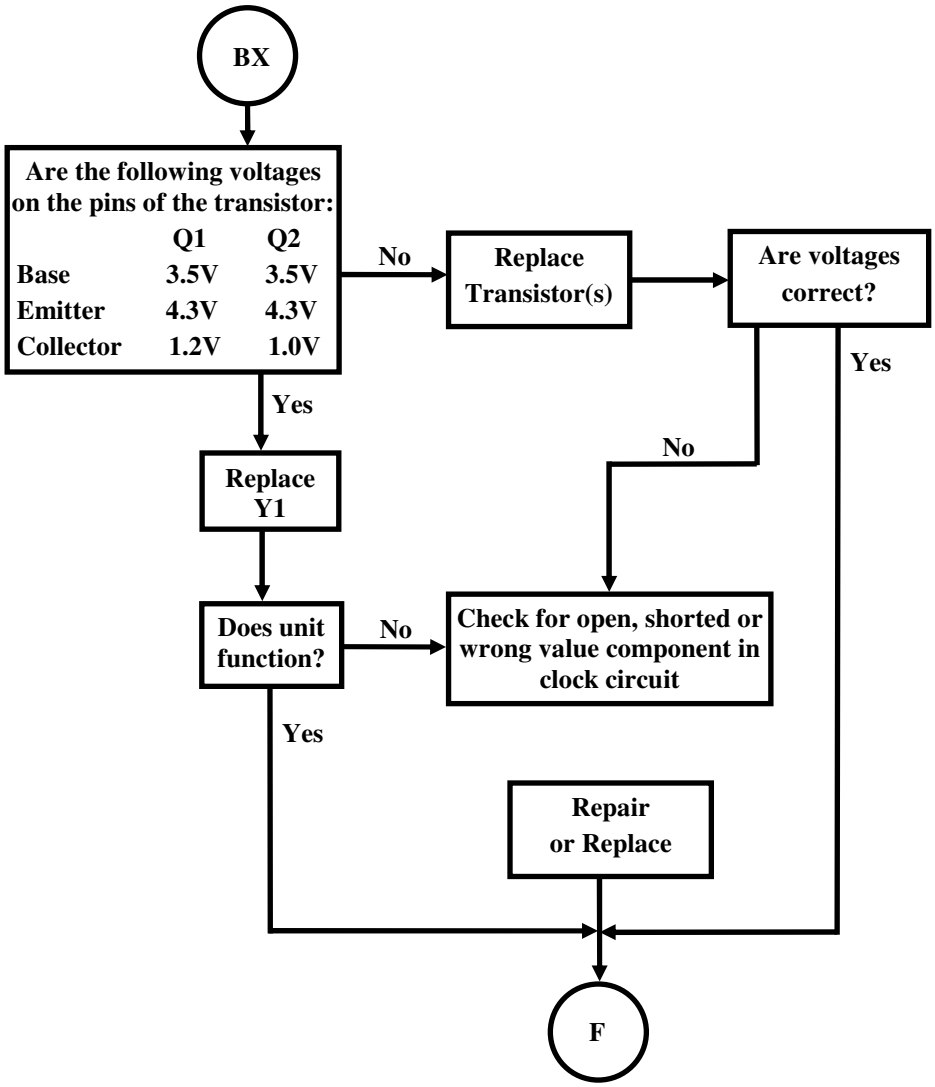
The "replace in order" instruction means that you should replace the components indicated in the order listed until the result called out in the previous block is obtained.

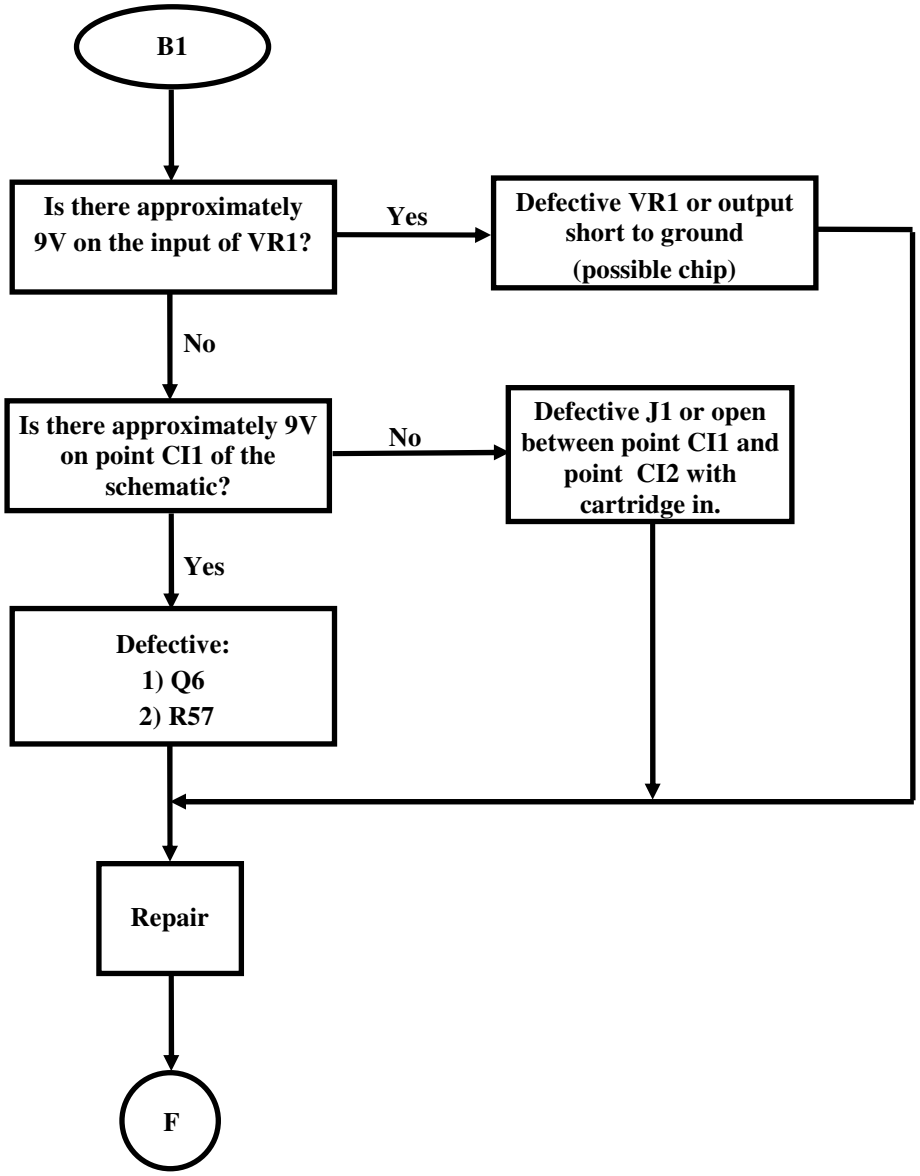
F – Whenever the flowchart directs you to F, returnreturn to the beginning of the testing procedure in Section 3. Proceed until another error is encountered and you are again directed to enter the flowchart or until the unit has proven to be fully operational.

N – Some lines terminate with an N inside a circle. When this occurs, call you:

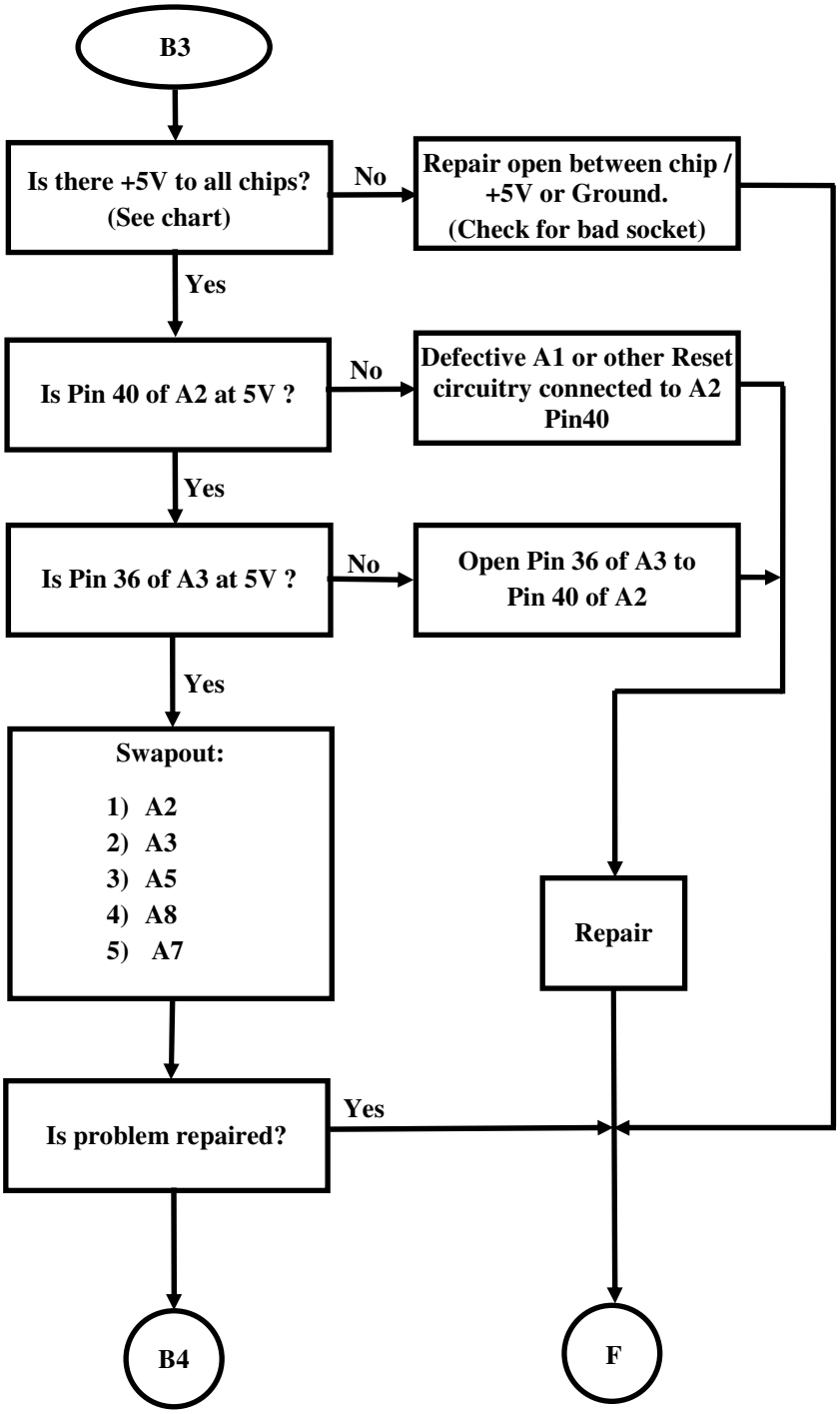
Atari Repair Hotline.
Inside California (800) 672-1466
Outside California (800) 538-1535 (300) 538-1536

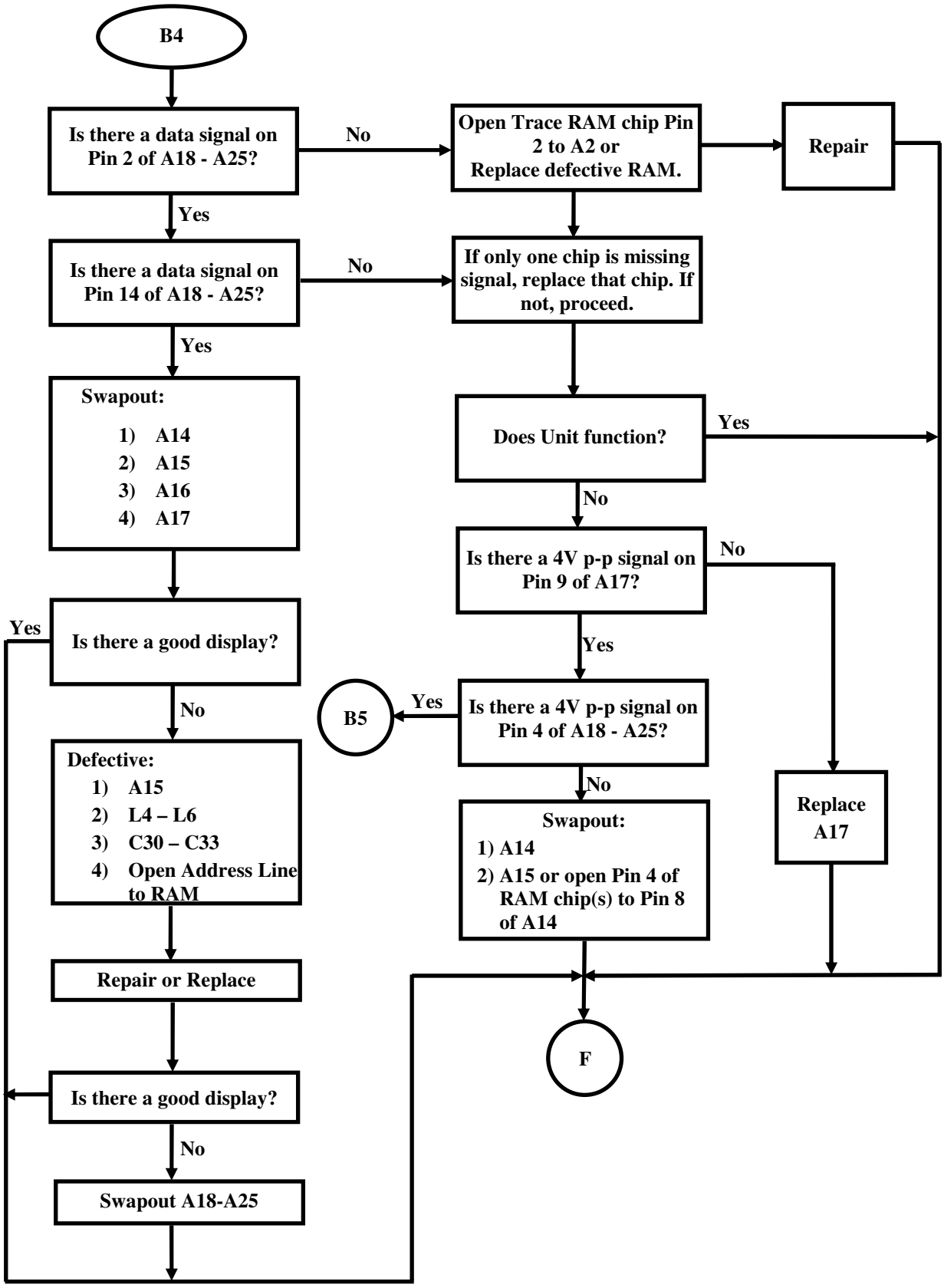

B
Yes
Is there +5V on the output of VR1?
No
B1
Yes
B3
Yes
Is there a 1.78975 MHz signal on pin 29 of A3?
Yes
Is there a 1.78975 MHz signal on pin 30 of A5?
No
No
Is there a 3.5795 MHz signal on pin 28 of A5?
Yes
BX
No
Swapout A5 and/or A3
No
Is there a 3.5795 MHz signal on pin 29 of A5?
Yes
Open between A5 pin 29 and A3 pin 35
No
Is there a 3.5795 MHz signal on pin 29 of A5?
Yes
Is there a 1.78975 MHz signal on pin 34 of A3?
No
Is there a 1.78975 MHz signal on pin 37 of A2?
Yes
Open between A2 pin 37and A3 pin 34
No
Is there a 1.78975 MHz signal on pin 37 of A2?
Yes
Repair or Replace
B2
F

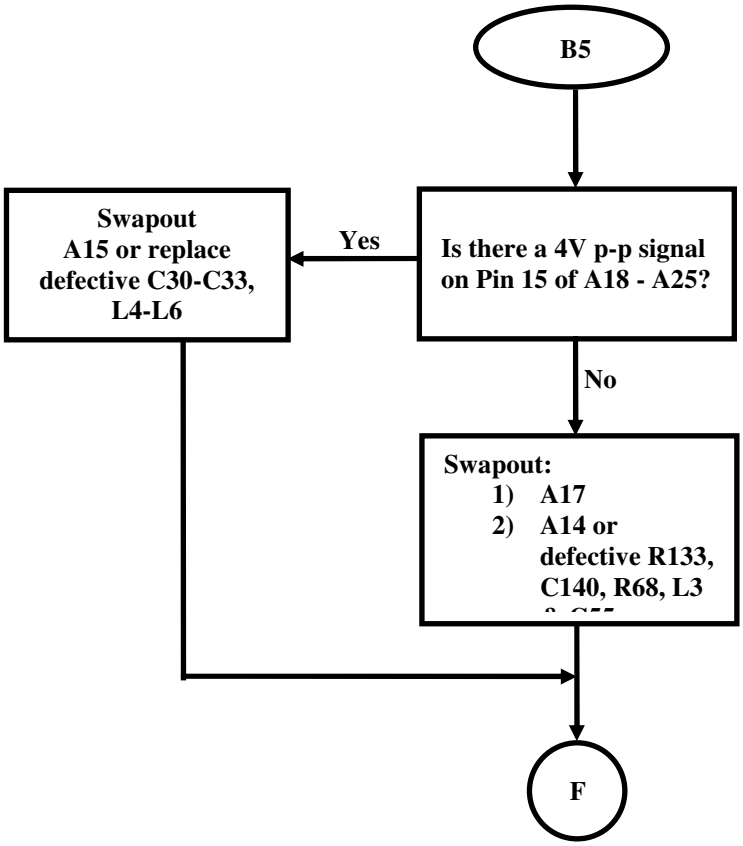

BX
Are the following voltages on the pins of the transistor:
Q1 Q2
Base 3.5V 3.5V
Emitter 4.3V 4.3V
Collector 1.2V 1.0V
No
Replace Transistor(s)
Are voltages correct?
Yes
No
Yes
Replace Y1
Does unit function?
No
Check for open, shorted or wrong value component in clock circuit
Yes
Repair or Replace
F

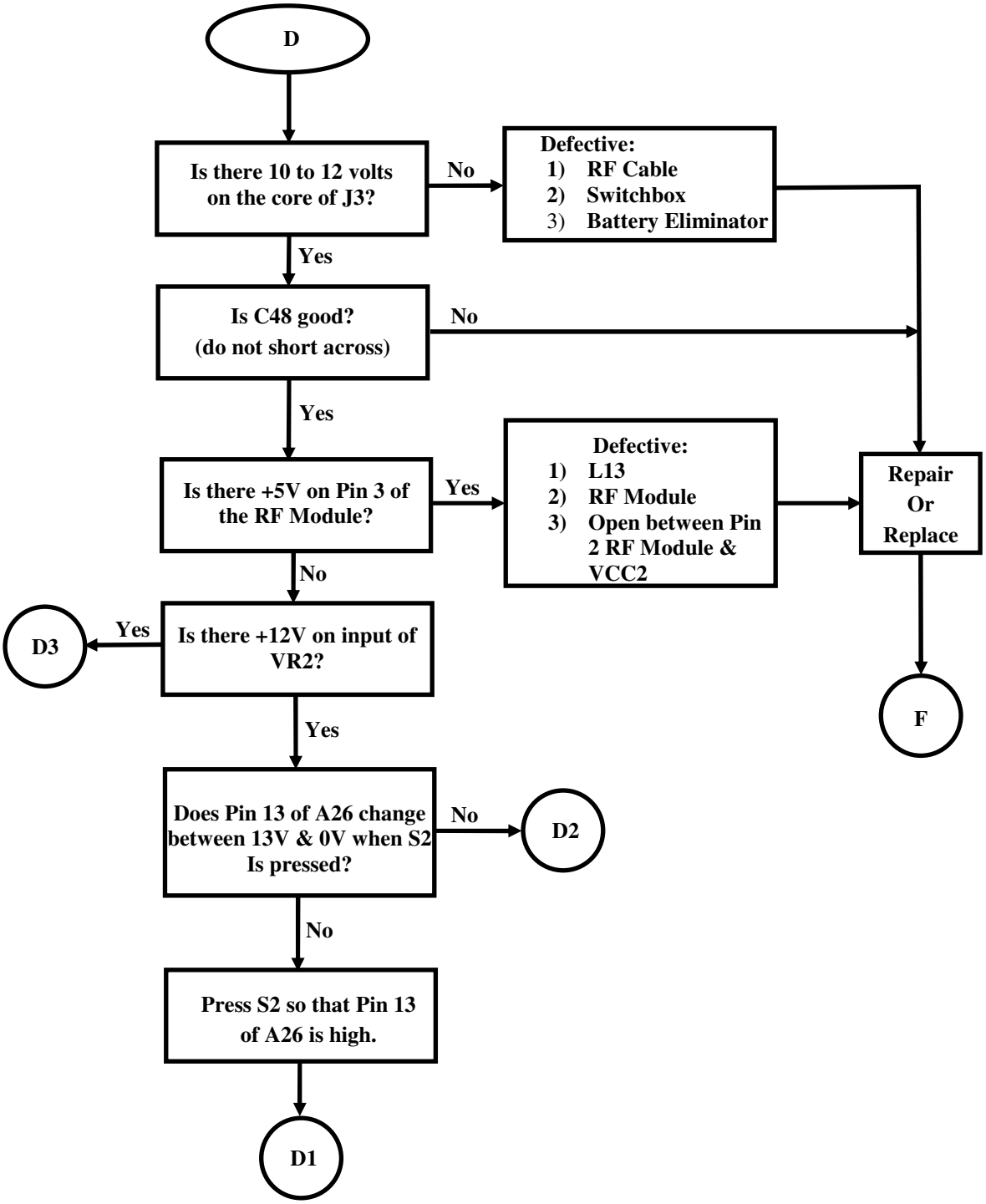

B1
Is there approximately 9V on the input of VR1?
Yes
Defective VR1 or output short to ground (possible chip)
No
Is there approximately 9V on point CI1 of the schematic?
No
Defective J1 or open between point CI1 and point CI2 with cartridge in.
Yes
Defective:
1) Q6
2) R57
Repair
F

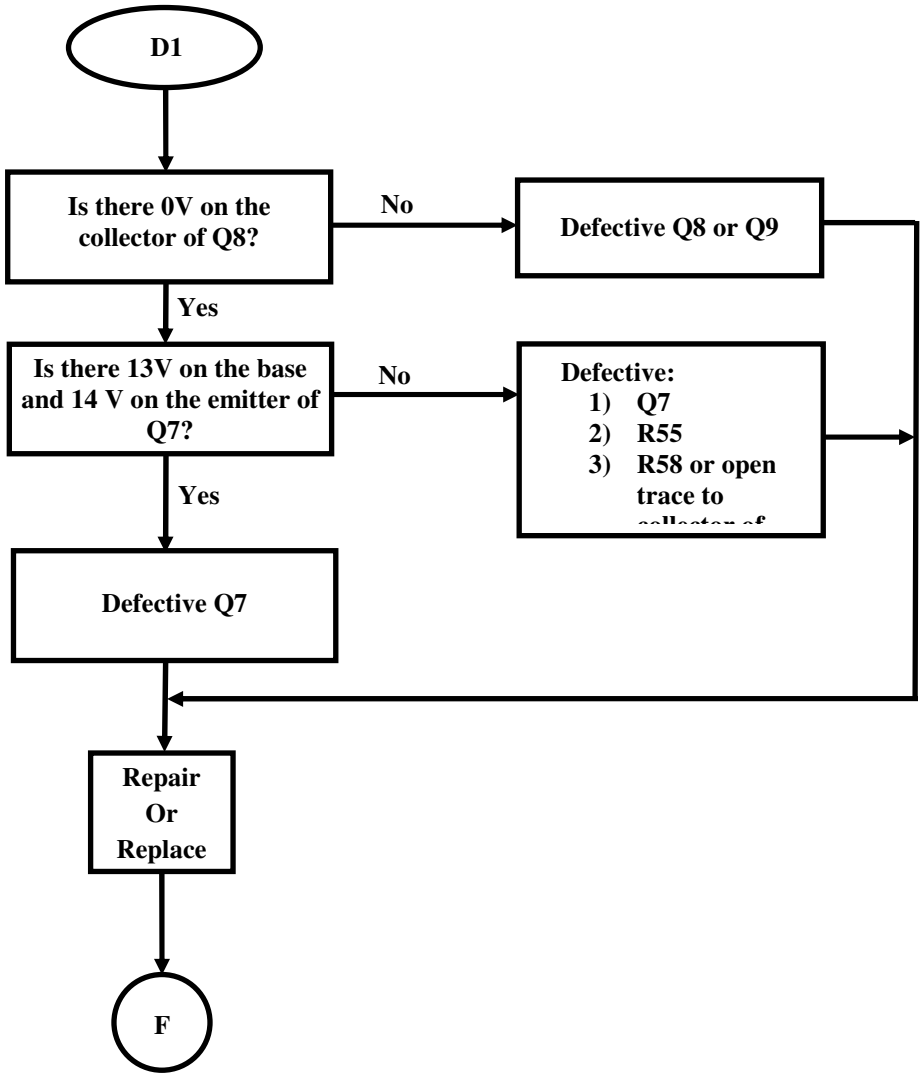
IC#	+5V Pin#	GND Pin#
A1	1	8
A2	8	1,21
A3	21	1
A5	27	3
A6	16	8
A7	17	1
A8	24	12
A9	16	8
A10	16	8
A11	16	8
A14	14	7
A15	14	7
A16	16	8
A17	16	8
A18	8	16
A19	8	16
A20	8	16
A21	8	16
A22	8	16
A23	8	16
A24	8	16
A25	8	16
A27	14	7

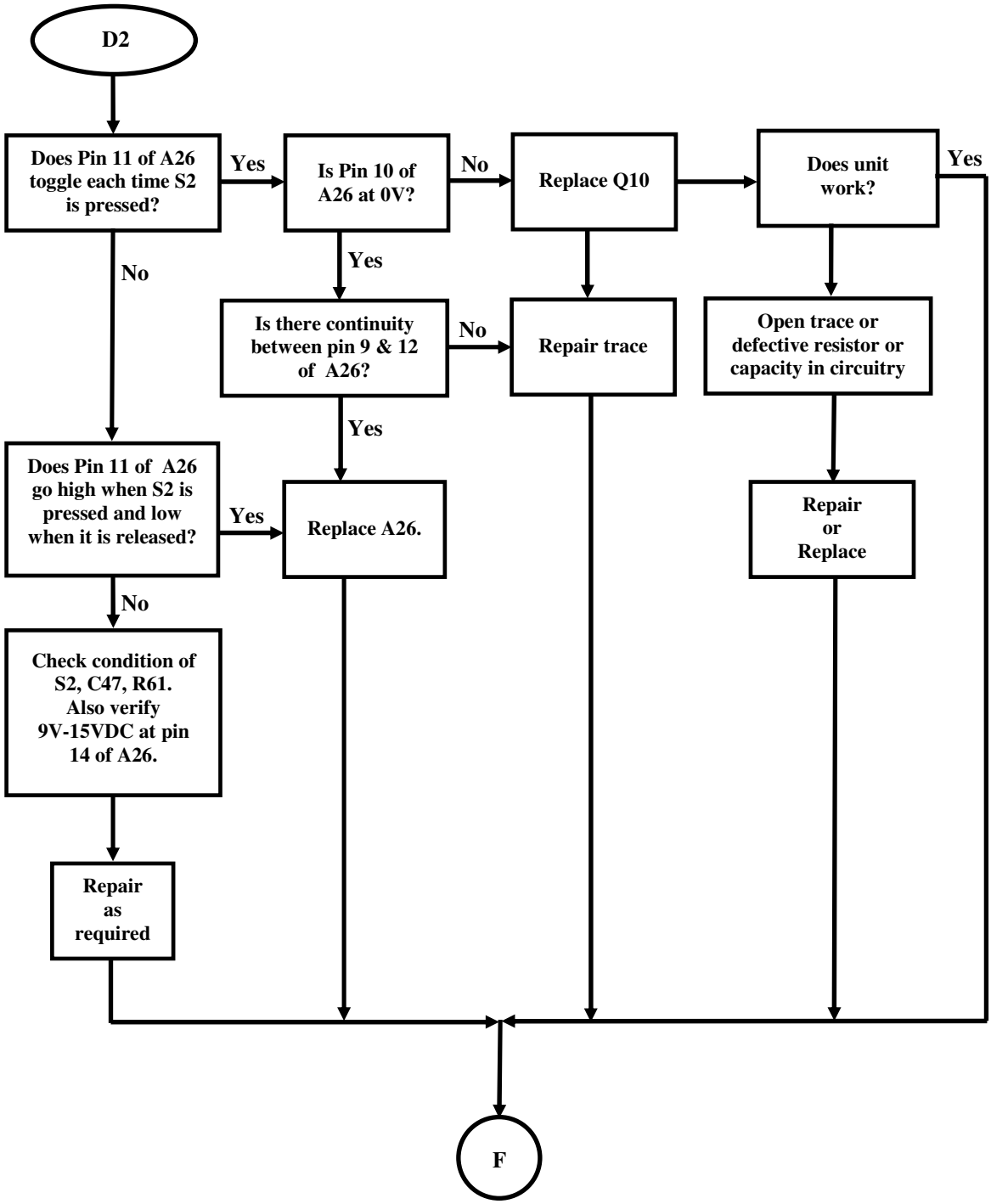


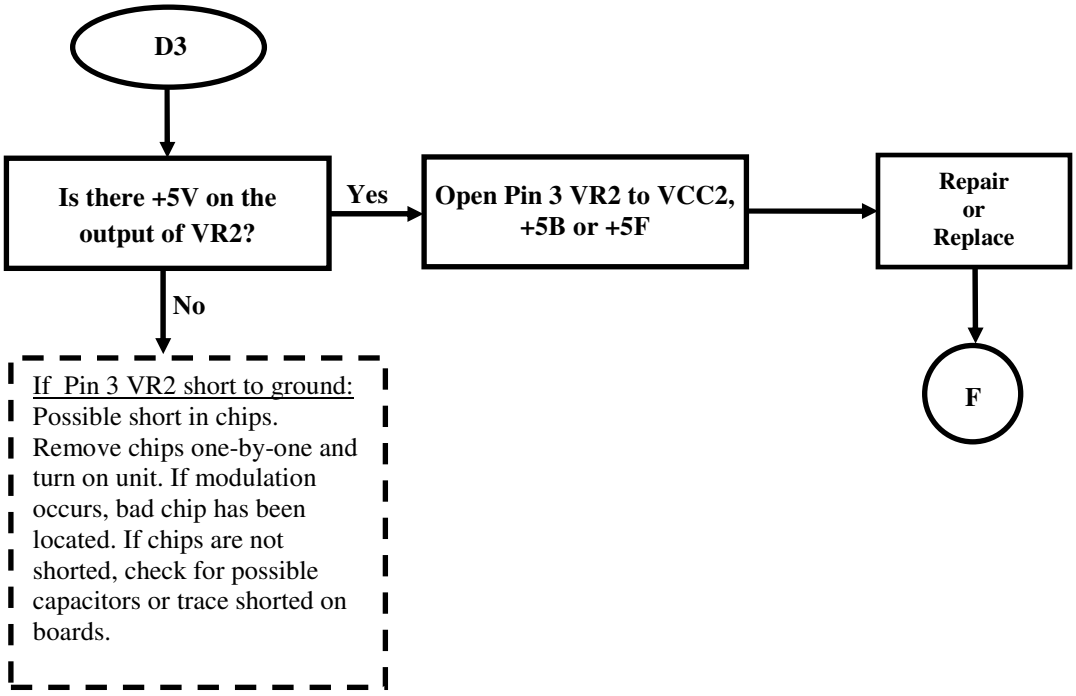

B4
Is there a data signal on Pin 2 of A18 - A25?
No
Open Trace RAM chip Pin 2 to A2 or Replace defective RAM.
Repair
Yes
Is there a data signal on Pin 14 of A18 - A25?
No
If only one chip is missing signal, replace that chip. If not, proceed.
Yes
Swapout:
1) A14
2) A15
3) A16
4) A17
Does Unit function?
Yes
No
Is there a 4V p-p signal on Pin 9 of A17?
No
Yes
Is there a good display?
Yes
B5
Yes
Is there a 4V p-p signal on Pin 4 of A18 - A25?
No
Defective:
1) A15
2) L4 – L6
3) C30 – C33
4) Open Address Line to RAM
Swapout:
1) A14
2) A15 or open Pin 4 of RAM chip(s) to Pin 8 of A14
Replace A17
Repair or Replace
F
Is there a good display?
No
Swapout A18-A25

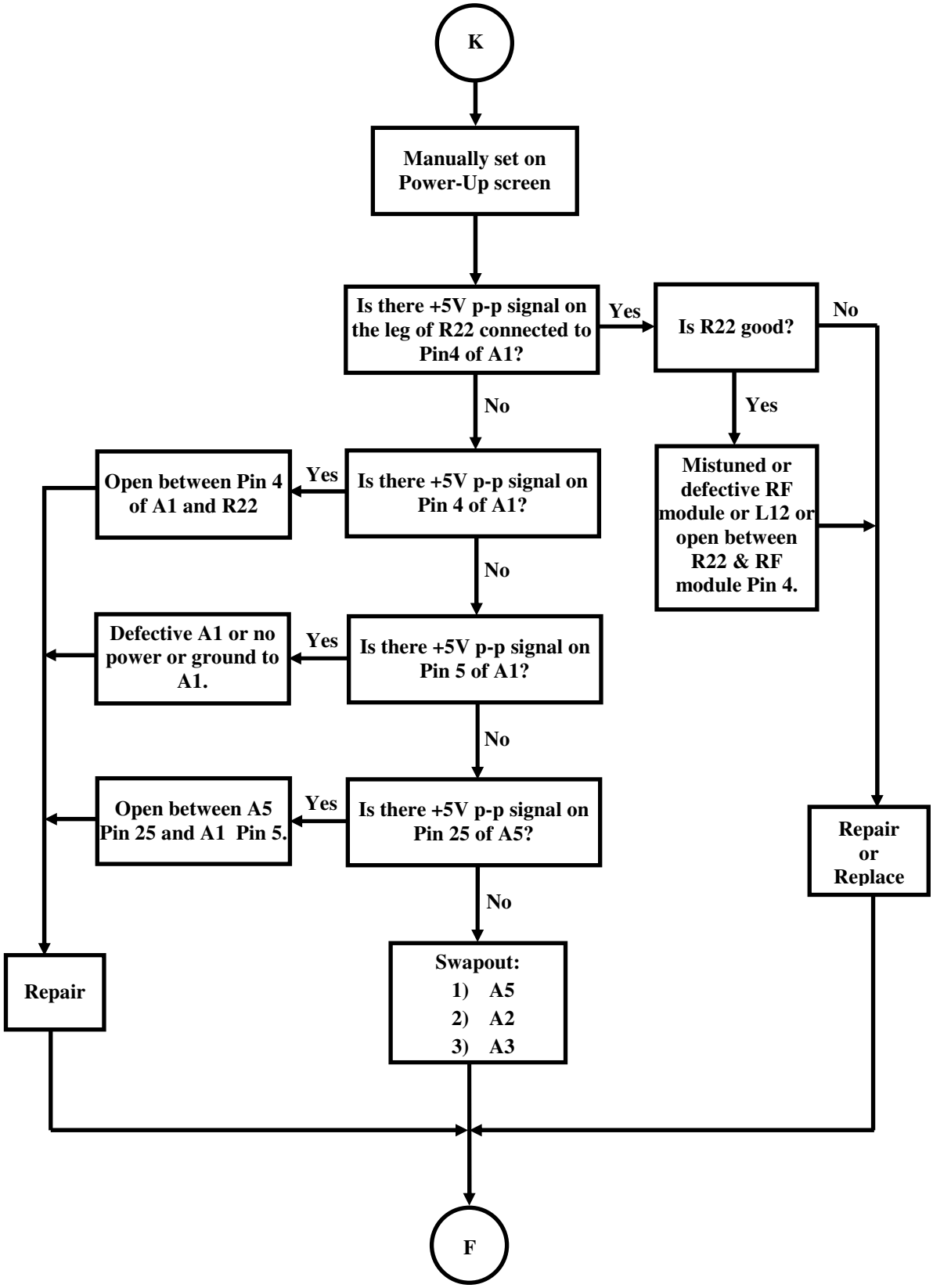

B5
Is there a 4V p-p signal on Pin 15 of A18 - A25?
Yes
Swapout A15 or replace defective C30-C33, L4-L6
No
Swapout:
1) A17
2) A14 or defective R133, C140, R68, L3
F

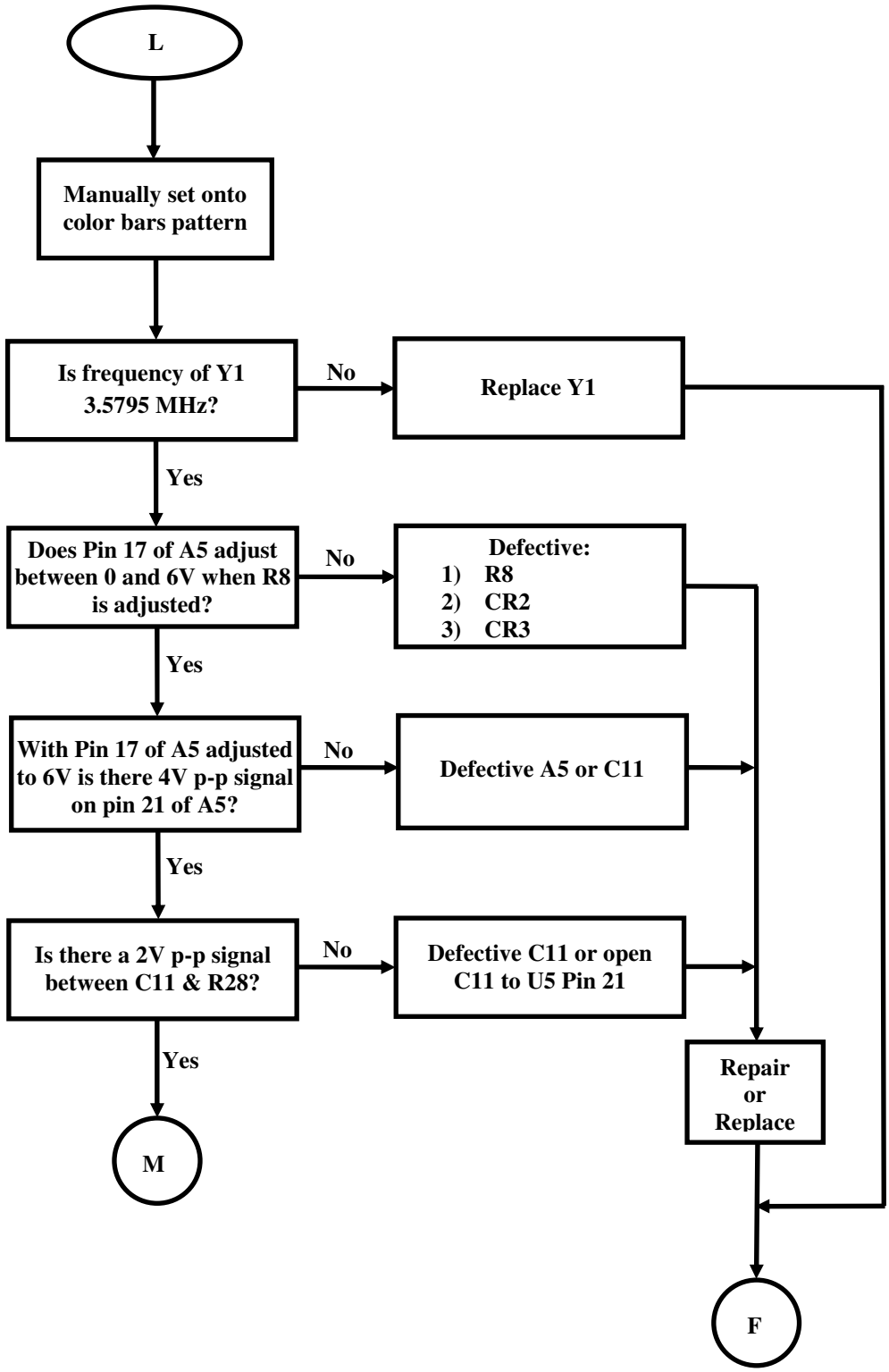

D
Is there 10 to 12 volts on the core of J3?
No
Defective:
1) RF Cable
2) Switchbox
3) Battery Eliminator
Yes
Is C48 good? (do not short across)
No
Yes
Is there +5V on Pin 3 of the RF Module?
Yes
Defective:
1) L13
2) RF Module
3) Open between Pin 2 RF Module & VCC2
Repair Or Replace
No
D3
Yes
Is there +12V on input of VR2?
F
Yes
Does Pin 13 of A26 change between 13V & 0V when S2 Is pressed?
No
D2
No
Press S2 so that Pin 13 of A26 is high.
D1

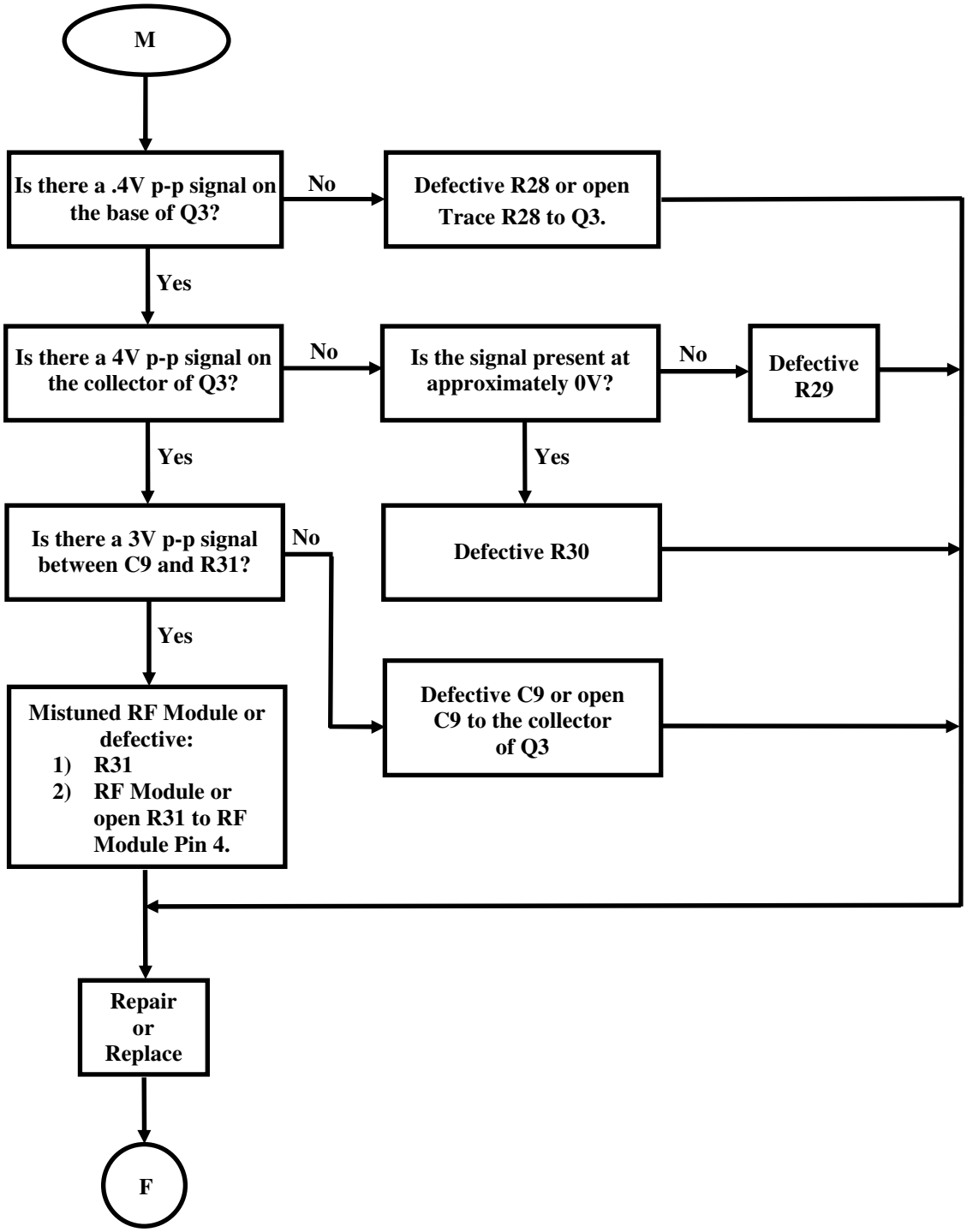

D1
Is there 0V on the collector of Q8?
No
Defective Q8 or Q9
Yes
Is there 13V on the base and 14 V on the emitter of Q7?
No
Defective:
1) Q7
2) R55
3) R58 or open trace to
Yes
Defective Q7
Repair
Or
Replace
F

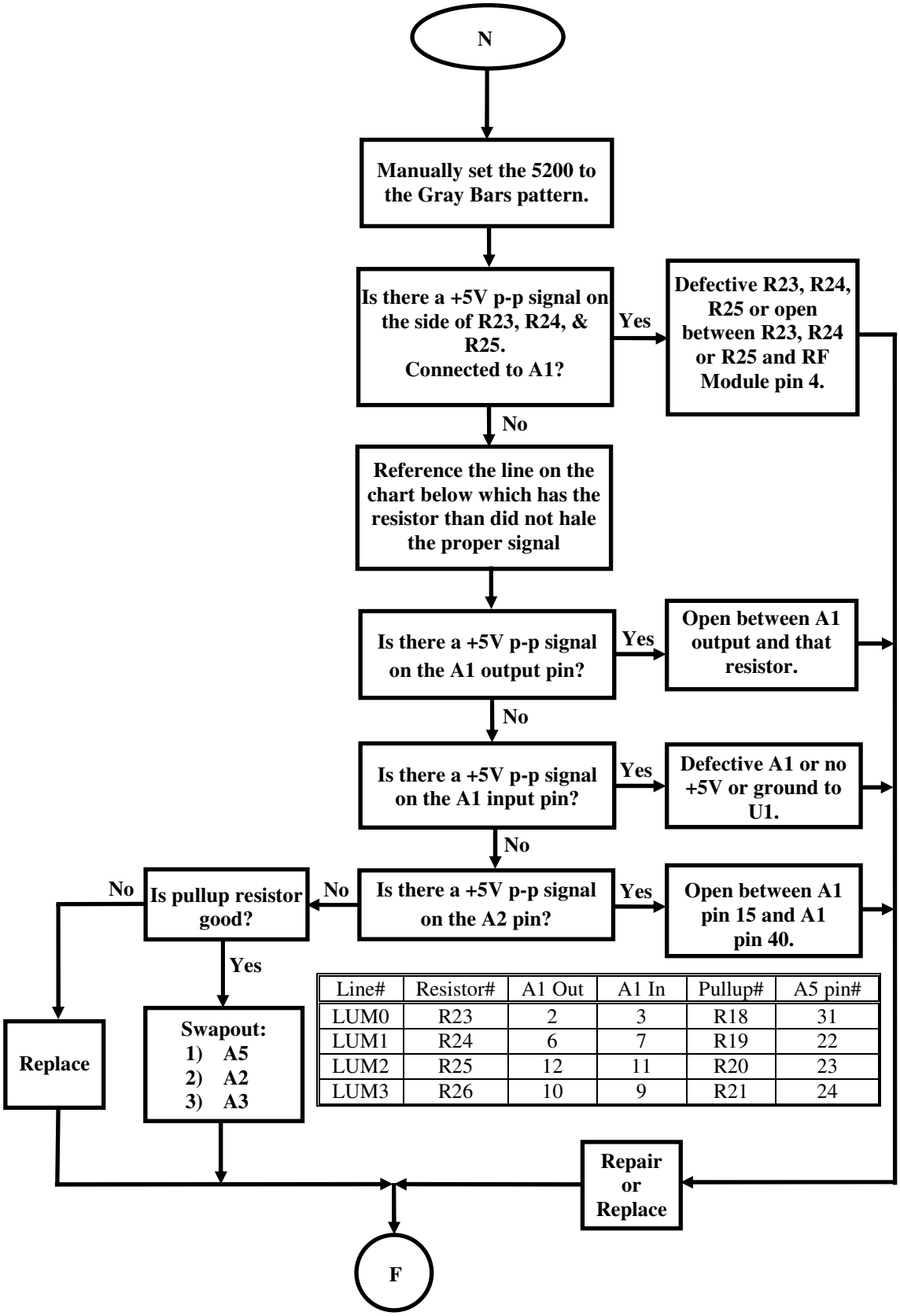

D2
Does Pin 11 of A26 toggle each time S2 is pressed?
Yes
Is Pin 10 of A26 at 0V?
No
Replace Q10
Does unit work?
Yes
No
Yes
Is there continuity between pin 9 & 12 of A26?
No
Repair trace
Open trace or defective resistor or capacity in circuitry
Yes
Does Pin 11 of A26 go high when S2 is pressed and low when it is released?
Yes
Replace A26.
Repair or Replace
No
Check condition of S2, C47, R61. Also verify 9V-15VDC at pin 14 of A26.
Repair as required
F


D3
Is there +5V on the output of VR2?
Yes
Open Pin 3 VR2 to VCC2, +5B or +5F
Repair or Replace
F
No
If Pin 3 VR2 short to ground:
Possible short in chips. Remove chips one-by-one and turn on unit. If modulation occurs, bad chip has been located. If chips are not shorted, check for possible capacitors or trace shorted on boards.

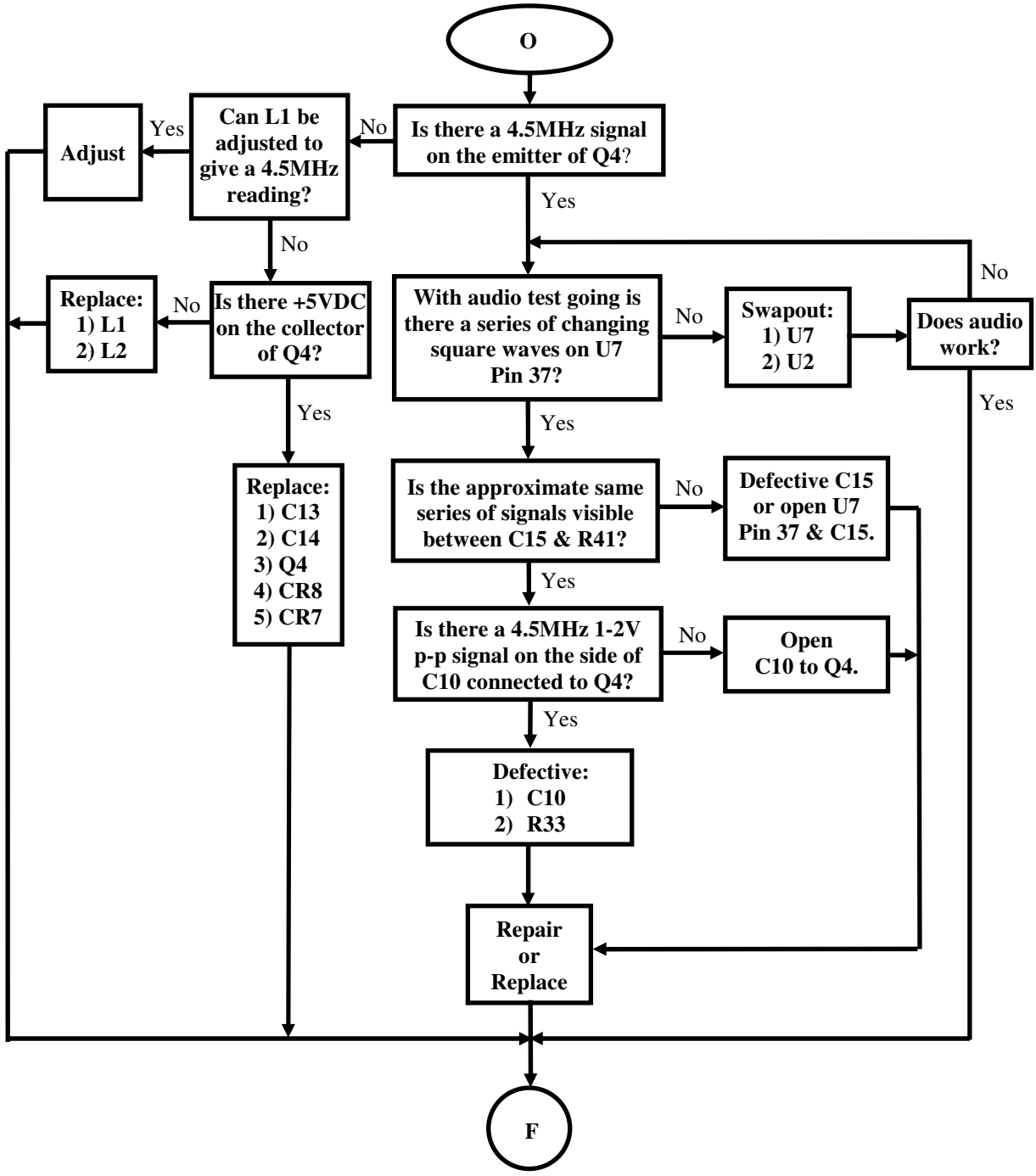

K
Manually set on Power-Up screen
Is there +5V p-p signal on the leg of R22 connected to Pin4 of A1?
Yes
Is R22 good?
No
No
Yes
Open between Pin 4 of A1 and R22
Yes
Is there +5V p-p signal on Pin 4 of A1?
Mistuned or defective RF module or L12 or open between R22 & RF module Pin 4.
No
Defective A1 or no power or ground to A1.
Yes
Is there +5V p-p signal on Pin 5 of A1?
No
Open between A5 Pin 25 and A1 Pin 5.
Yes
Is there +5V p-p signal on Pin 25 of A5?
Repair or Replace
No
Repair
Swapout:
1) A5
2) A2
3) A3
F


L
Manually set onto color bars pattern
Is frequency of Y1 3.5795 MHz?
No
Replace Y1
Yes
Does Pin 17 of A5 adjust between 0 and 6V when R8 is adjusted?
No
Defective:
1) R8
2) CR2
3) CR3
Yes
With Pin 17 of A5 adjusted to 6V is there 4V p-p signal on pin 21 of A5?
No
Defective A5 or C11
Yes
Is there a 2V p-p signal between C11 & R28?
No
Defective C11 or open C11 to U5 Pin 21
Yes
Repair or Replace
M
F

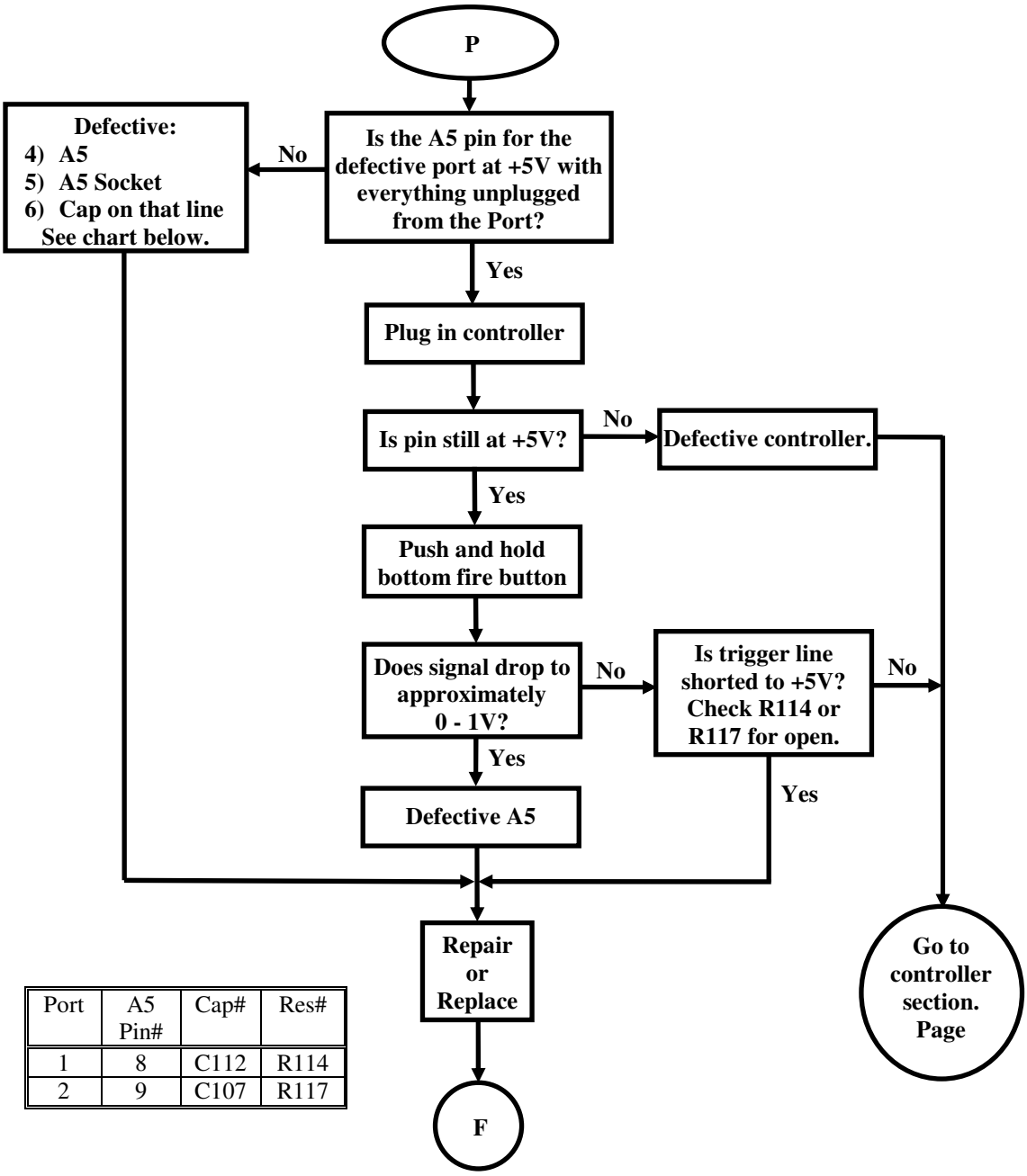

M
Is there a .4V p-p signal on the base of Q3?
No
Defective R28 or open Trace R28 to Q3.
Yes
Is there a 4V p-p signal on the collector of Q3?
No
Is the signal present at approximately 0V?
No
Defective R29
Yes
Yes
Is there a 3V p-p signal between C9 and R31?
No
Defective R30
Yes
Mistuned RF Module or defective:
1) R31
2) RF Module or open R31 to RF Module Pin 4.
Defective C9 or open C9 to the collector of Q3
Repair or Replace
F



Line#	Resistor#	A1 Out	A1 In	Pullup#	A5 pin#
LUM0	R23	2	3	R18	31
LUM1	R24	6	7	R19	22
LUM2	R25	12	11	R20	23
LUM3	R26	10	9	R21	24

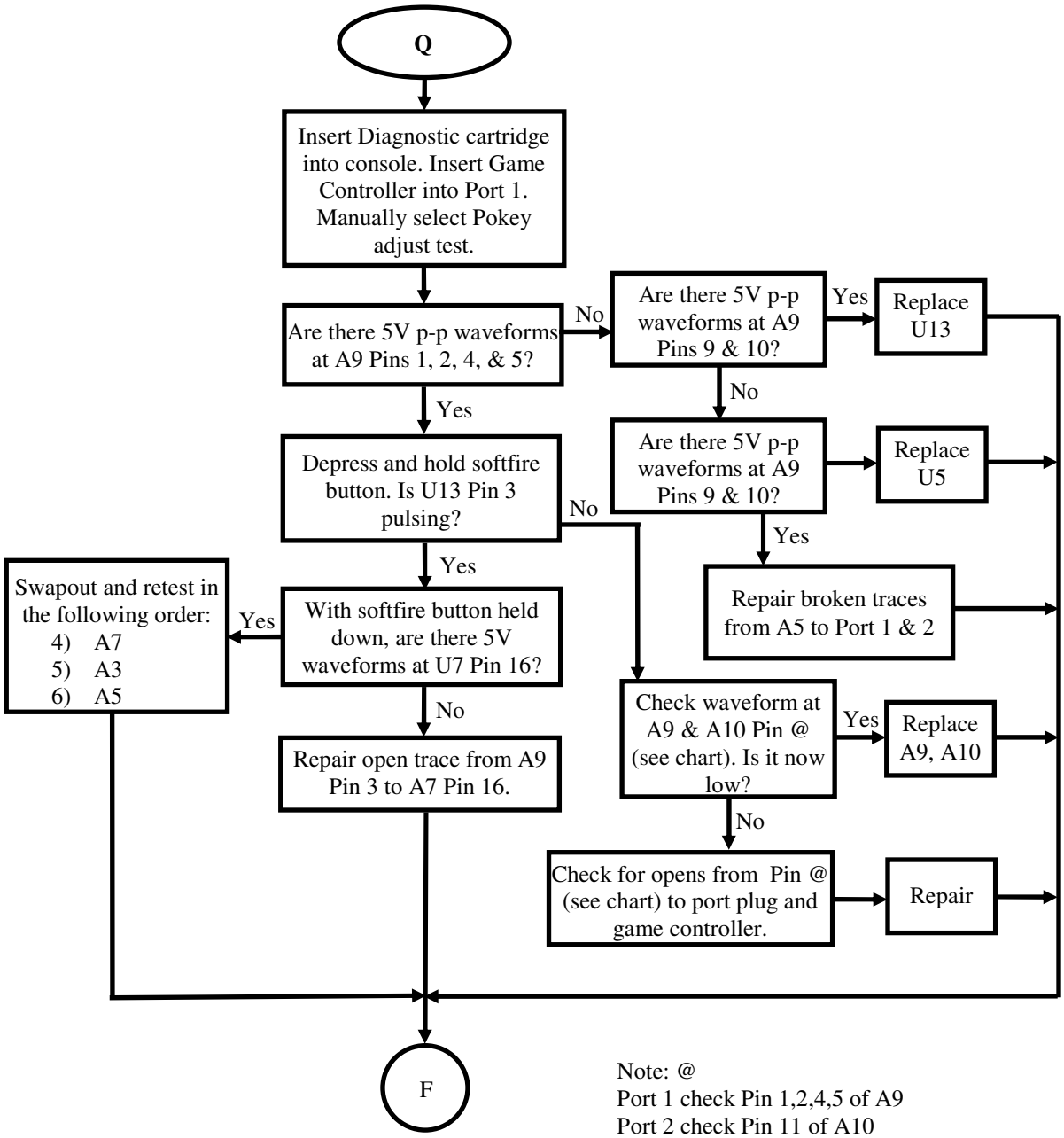

O
Is there a 4.5MHz signal on the emitter of Q4?
No
Can L1 be adjusted to give a 4.5MHz reading?
Yes
Adjust
No
Is there +5VDC on the collector of Q4?
No
Replace: 1) L1 2) L2
Yes
Replace: 1) C13 2) C14 3) Q4 4) CR8 5) CR7
Yes
With audio test going is there a series of changing square waves on U7 Pin 37?
No
Swapout: 1) U7 2) U2
Does audio work?
No
Yes
Yes
Is the approximate same series of signals visible between C15 & R41?
No
Defective C15 or open U7 Pin 37 & C15.
Yes
Is there a 4.5MHz 1-2V p-p signal on the side of C10 connected to Q4?
No
Open C10 to Q4.
Yes
Defective: 1) C10 2) R33
Repair or Replace
F

Trigger Line Troubleshooting (Bottom Fire Button)

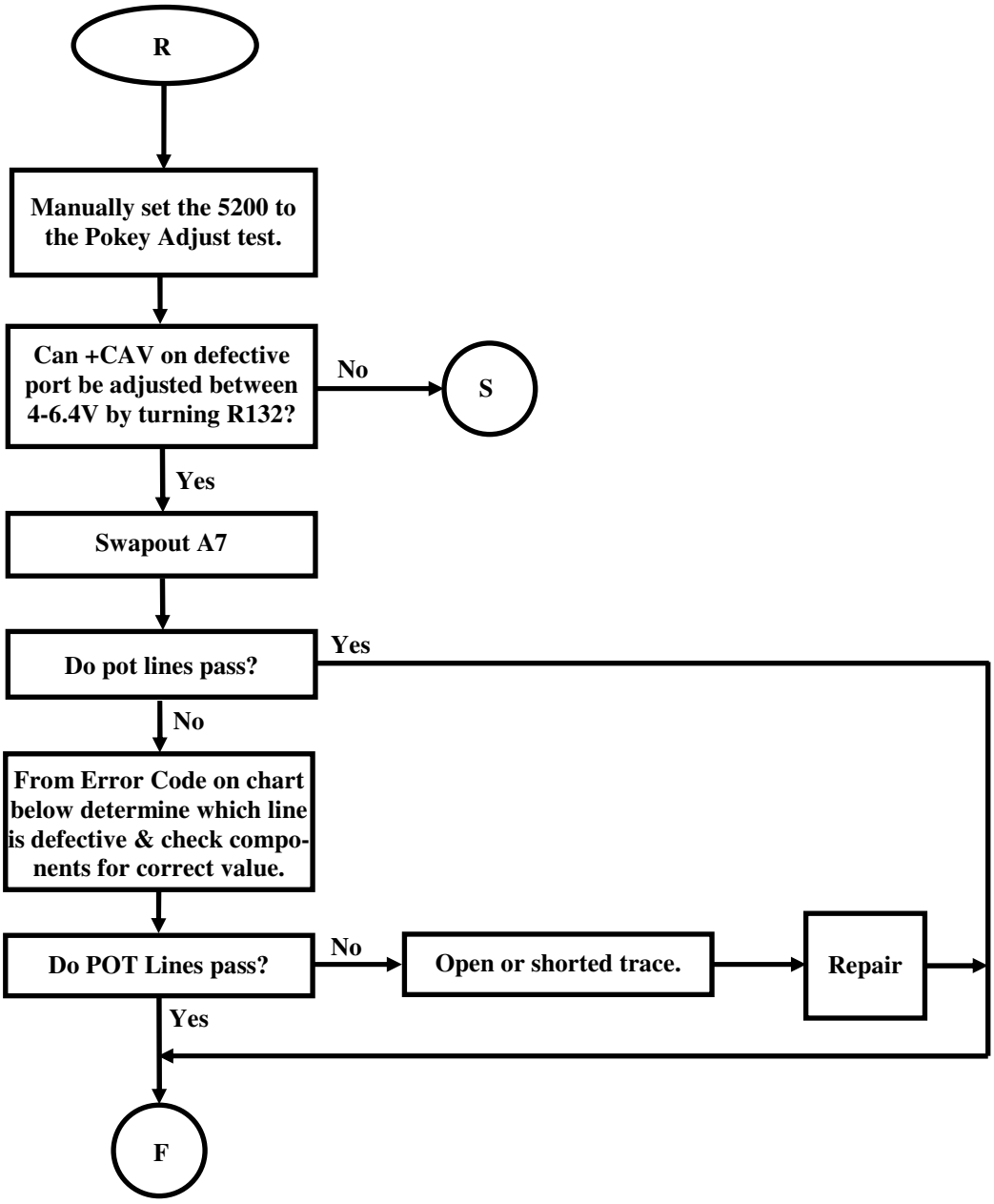


Port	A5 Pin#	Cap#	Res#
1	8	C112	R114
2	9	C107	R117

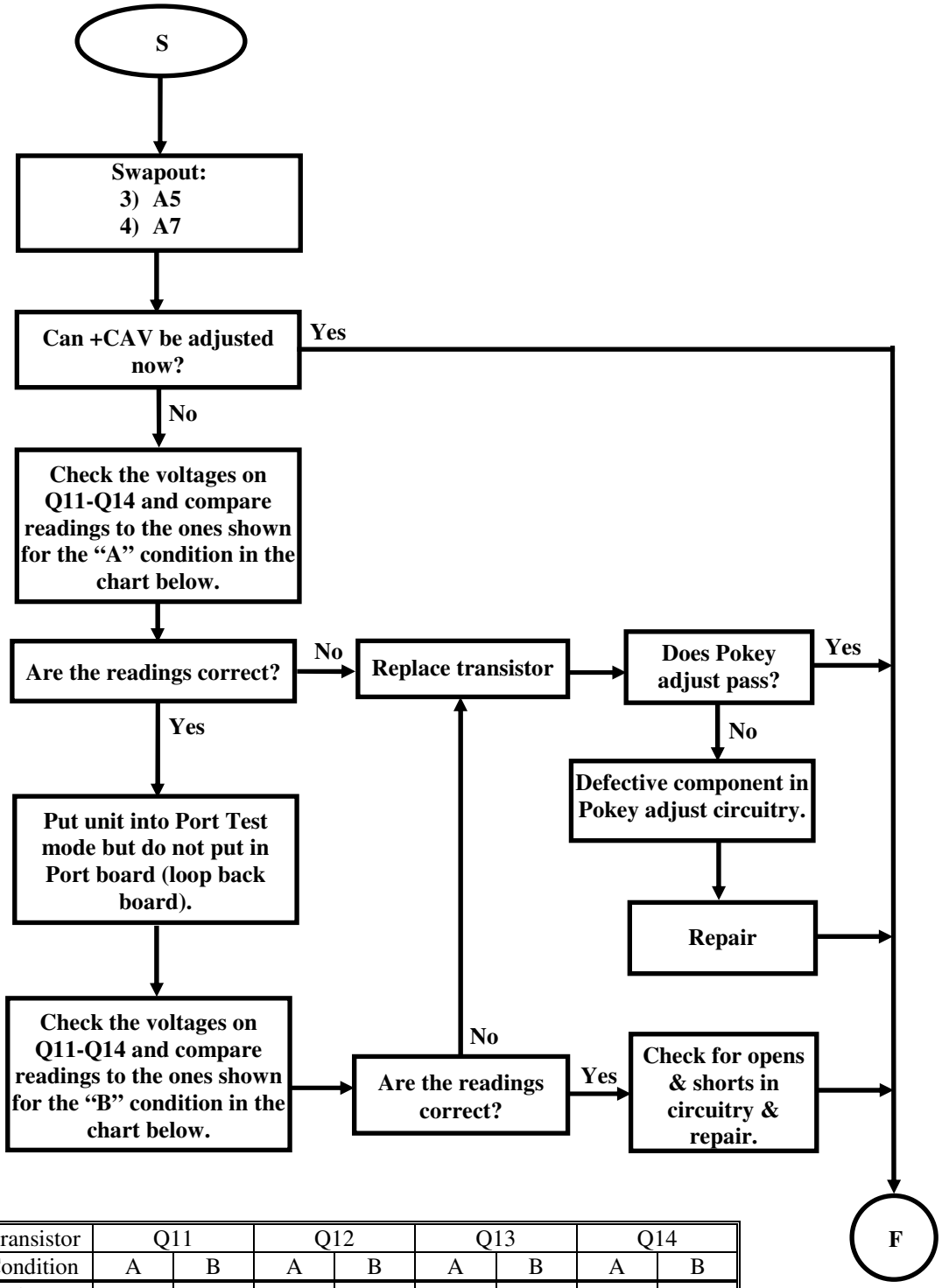
Softfire (Top Fire Button) Troubleshooting



Pot Control Line Troubleshooting

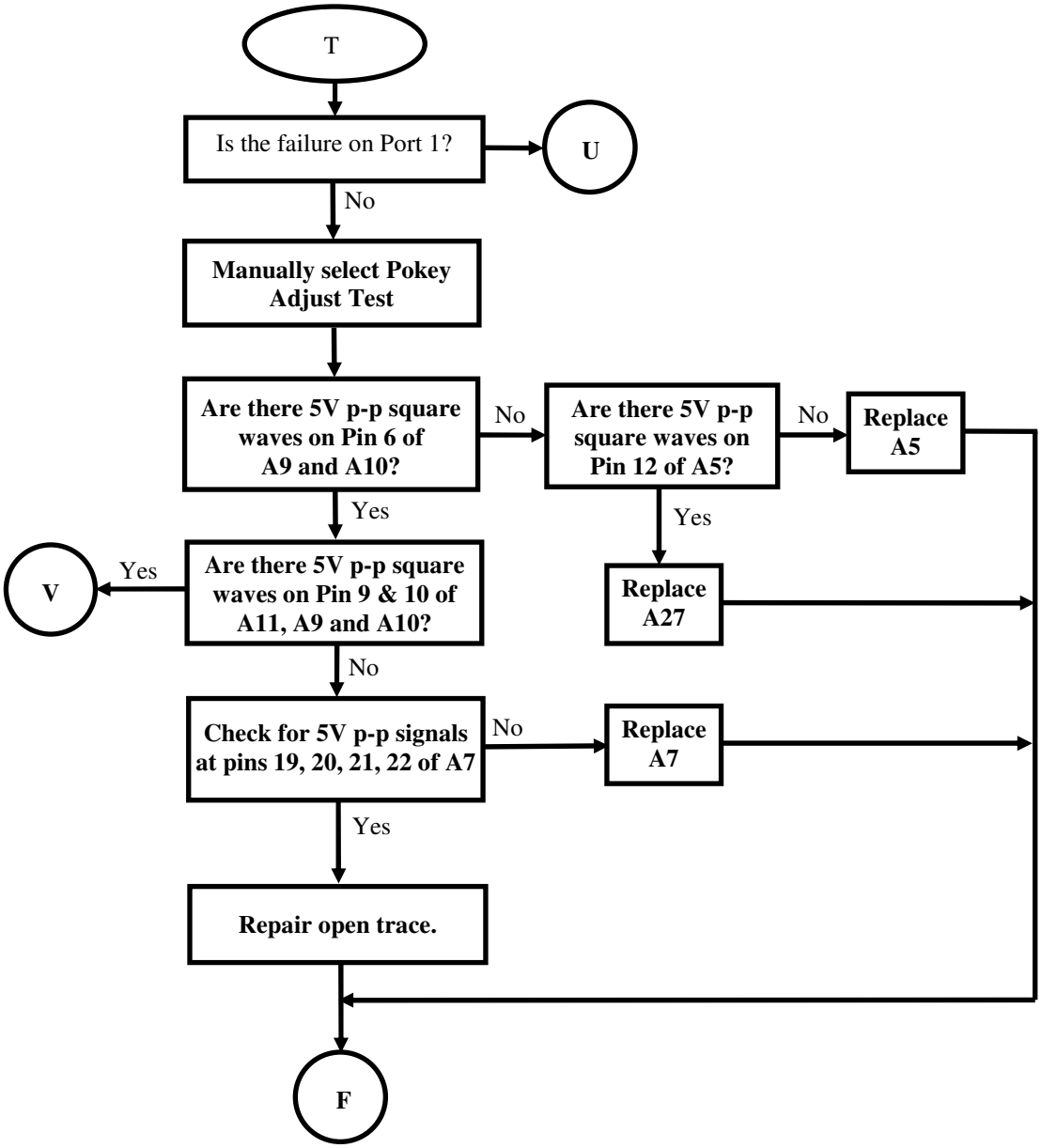


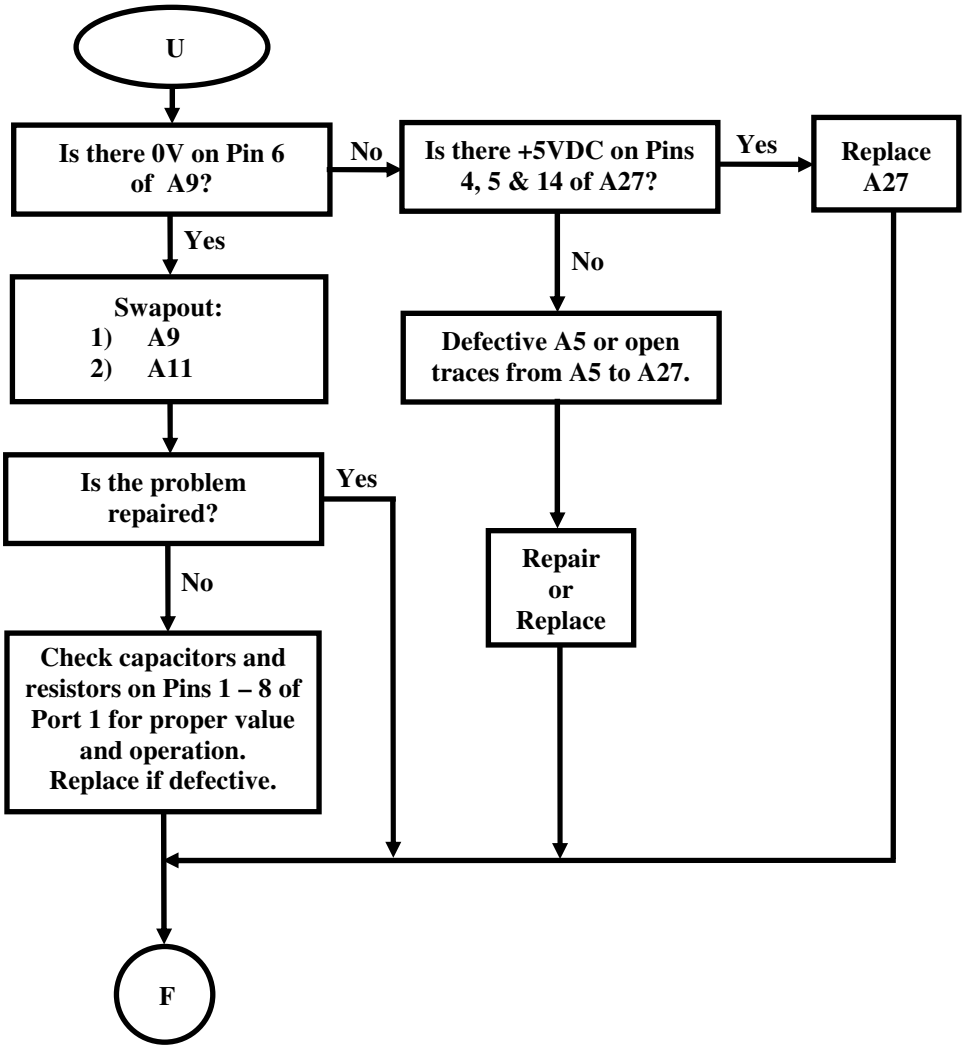
POT Line Error Code	Pokey Adj. Failure	Port and Pin #	Pokey U7 Pin #	CAP#1	CAP#2	Resistor
22	HOR 1	1-10	14	C98	C106	R106
23	VERT 1	1-11	15	C97	C105	R110
24	HOR 2	2-10	12	C92	C100	R109
25	VERT 2	2-11	13	C91	C99	R113

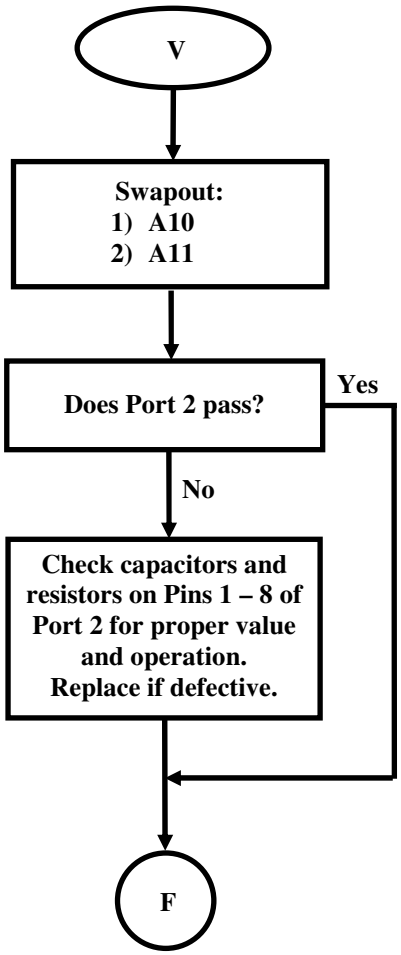


Transistor	Q11		Q12		Q13		Q14	
Condition	A	B	A	B	A	B	A	B
Emitter	13V	13V	3.2V	0V	0V	0V	3.2V	0V
Base	12V	13V	4V	0V	0V	0.7V	3.8V	0V
Collector	4-6.4V	0V	13V	13V	3.8V	0V	12V	13V

A: Pokey Adjust Selected
B: Other 1.1 tests (excluding Port Test)


T
Is the failure on Port 1?
U
No
Manually select Pokey Adjust Test
Are there 5V p-p square waves on Pin 6 of A9 and A10?
No
Are there 5V p-p square waves on Pin 12 of A5?
No
Replace A5
Yes
Yes
Replace A27
V
Yes
Are there 5V p-p square waves on Pin 9 & 10 of A11, A9 and A10?
No
Check for 5V p-p signals at pins 19, 20, 21, 22 of A7
No
Replace A7
Yes
Repair open trace.
F


U
Is there 0V on Pin 6 of A9?
No
Is there +5VDC on Pins 4, 5 & 14 of A27?
Yes
Replace A27
Yes
No
Swapout:
1) A9
2) A11
Defective A5 or open traces from A5 to A27.
Is the problem repaired?
Yes
No
Repair or Replace
Check capacitors and resistors on Pins 1 – 8 of Port 1 for proper value and operation. Replace if defective.
F


V
Swapout:
1) A10
2) A11
Does Port 2 pass?
Yes
No
Check capacitors and resistors on Pins 1 – 8 of Port 2 for proper value and operation.
Replace if defective.
F

SECTION 5

4 – PORT 5200 SYMPTOM CHECKLIST

The Symptom Cecklist is designed to assist the experienced technician arrive at a rapid diagnosis for model 5200 problems. The checklist is not intended to replace the Diagnostic Flowcharts as the primary troubleshooting guide, but rather, to supplement the flowchart. To save your time, Diagnostic Flowchart entry points are indicated on the checklist where applicable.

Table 5-1 4 – Port 5200 Symptom Checklist

SYMPTOM	POSSIBLE CAUSES	FLOWCHART ENTRY POINT (Page no.)
SOLID COLORED SCREEN		
Solid Colored Screen	U7, U2, U3, U5, Y1, Q1, Q2, VR1	47
Vertically Lined Screen	J1, U2, U3, U5, U7 or open or shorted data or address line	47
VIDEO FAILURES		
Snowy Screen	VR2, U29 (A26)*, RF Module	53
Warped Picture	RF Module, U1, U5, U3	57
COLOR FAILURES		
No Color	U5, Q3, C9, C11, Y1	58
Weak Color	Q3, C11, C9, R29, R32	58
AUDIO FAILURES		
Audio Failures	U7, Q4, C14, C13, L1	71
Only a Few Tones Fail	U7	71
CONTROLLER FAILURES		
Joystick does not work	PORT, U5, U7, C91 - 106, R106 - 113	61
Keypad does not work	PORT, U7, U9 - U12	65
Fire Button does not fire	PORT, U5, R114-117, C107-110	63

***U29 is chip designation on PCB #CA018087; A26 is chip designation on PCB #CA0200108. If you are servicing a unit cointaining PCB #CA020108, chip designators have been changed from U to A.**

SECTION 5A

2 – PORT 5200 SYMPTOM CHECKLIST

The Symptom Cecklist is designed to assist the experienced technician arrive at a rapid diagnosis for 2 – Port 5200 problems. The checklist is not intended to replace the Diagnostic Flowcharts as the primary troubleshooting guide, but rather, to supplement the flowchart. To save your time, Diagnostic Flowchart entry points are indicated on the checklist where applicable.

Table 5A-1 2 – Port 5200 Symptom Checklist

SYMPTOM	POSSIBLE CAUSES	FLOWCHART ENTRY POINT (Page no.)
SOLID COLORED SCREEN		
Solid Colored Screen	A7, A2, A3, A5, Y1, Q1, Q2, VR1	73
Vertically Lined Screen	J1, A2, A3, A5, A7 or open or shorted data or address line	73
VIDEO FAILURES		
Snowy Screen	VR2, A26, RF Module, Jack, Cable	79
Warped Picture	RF Module, A1, A5, A3	83
COLOR FAILURES		
No Color	A5, Q3, C9, C11, Y1	84
Weak Color	Q3, C11, C9, R29, R32	84
AUDIO FAILURES		
Audio Failures	A7, Q4, C14, C13, L1	87
Only a Few Tones Fail	A7	87
CONTROLLER FAILURES		
Joystick does not work	PORT, A5, A7, C91 - 106, R106 - 113	90
Keypad does not work	PORT, A7, A9 - 12	92
Bottom Fire Button does not fire	PORT, A5, R114 - 117, C107 - 110	88
Top (Softfire) Fire Button does not fire	PORT, A7, A8, A2, multiplexer	89