

TECHNICAL BULLETIN INDEX
Sorted by Bulletin Number
04/03/86

No.	Catalog Description	Rev. Date
4:001	26-1069 Modification to FDC board.	06/20/83
4:002	26-1123 Proper wrapping procedure for ferrite toroid.	04/05/83
4:003	26-1069 FDC board not being recognized (MANDATORY MOD).	07/07/83
4:004	26-1125 Installing Model III graphics in Model 4.	04/25/84
4:005	26-1069 Problems when using SPOOLER feature with 128K.	08/02/83
4:006	26-1123 Garbage on screen after modifying Model III to 4.	05/25/83
4:007	26-1069 FDC won't write in single density (MANDATORY MOD).	08/08/83
4:008	26-1069 Various versions of ROMs in the Model 4.	12/05/83
4:009	26-1069 Making TCE PCB meet FCC specifications (MANDATORY)	08/22/83
4:010	26-1069 With Hard Drive attached Computer appears dead.	09/14/83
4:011	26-1069 Video malfunctions when using Motorola 68045 VDG.	09/23/83
4:012	26-1069 Problems with the RESET circuitry and their fixes.	09/29/83
4:013	26-1069 To describe tuning procedure for capacitor C210.	10/27/83
4:014	26-1068 Part number identification for U206.	02/08/84
4:015	26-1069 P/S causing unit to appear dead or shrink screen.	03/11/85
4:016	26-1069 Screen says "DISKETTE?" if no diskette is inserted	04/26/84
4:017	26-1126 Installation procedures of Hi-Res graphics board.	05/05/84
4:018	26-1069 Changes for Model 4's with Gate Array Logic.	05/29/84
4:019	26-1069 Increase video brightness on units with Gate Array	05/30/84
4:020	26-1067 Correct insufficient brightness in 80 char. mode.	06/22/84
4:021	26-1069 Procedure for 128K RAM upgrade on Gate Array PCB.	07/31/84
4:022	26-1069 Timing problem with video RAM on Gate Array PCB.	08/21/84
4:023	26-1067 Procedure for 16K to 64K RAM upgrade.	09/05/84
4:024	26-1069 Installation of Mod 4 Hi-Res PCB into Gate Array.	09/11/84
4:025	26-1069 Power supply modification kit.	10/05/84
4:026	26-1069 Eliminate noise injected on 12VDC by monitor PCB.	10/10/84
4:027	26-1067 Increase video stability.	10/12/84
4:028	26-1069 Test points of gate array floppy drive logic PCB.	09/21/84
4:029	26-1070 Upgrade procedure to 128K for Model 4D.	09/24/85
4:030	26-1069 Problems with stepper motor in low current mode.	03/08/85
4:031	26-1067 Repair of Astec 38 watt power supply.	06/18/85
4:032	26-1069 Allow use of VTI gate array for timing purposes.	05/18/85
4:033	26-1069 To ensure compatibility with ALPS keyboard.	03/13/86
4:034	26-1070 Test points for Model 4D double sided disk drives.	01/31/86
4:035	26-1070 Eliminate shakey video with VTI gate array.	02/18/86

DATE: May 11, 1983
REVISION DATE: June 20, 1983
BULLETIN NO.: 4:1
PRODUCT: 26-1068/9 Model 4 with 1 or 2 disk drives
SUBASSEMBLY: Model 4 style FDC board Revision blank, Revision A

PURPOSE: To discuss and describe modifications to Model 4 FDC board.

DISCUSSION:

It has been determined that, under certain circumstances, the WAIT state generated by the FDC board will violate the RAS HOLD DOWN specification of the memory ICs.

The RAS HOLD DOWN specification is something often overlooked. The RAS hold down is specified by the manufacturer to be 10 µS for the 4116-type (16K) AND 4164-type (64K) memory ICs. In the TRS-80 Computers, the RAS signal lasts for no more than approximately 300 nS. This produces no problem in a normally operating system.

However, if the RAS hold down specification is violated, the result is almost as bad as violating the refresh timing. Depending on how badly the RAS hold down timing is violated, results could range from highly intermittent errors to complete system lockup.

The problem lies in the timing of the WAIT signal. Unmodified, the WAIT is a function of Bit 6 of port F4H. When this bit is latched (to select the WAIT), the WAIT is not recognized until the next Z-80 opcode fetch cycle. Under this condition the WAIT occurs while RAS is active (LOW).

Under normal system operation the FDC chip will begin to perform its assigned command, and generate a DRQ (Data Request) which clears the WAIT and signals the CPU that data can be written or read. Under error conditions DRQ may not be produced and the WAIT may not be released until the 1 ms watchdog timer times out. RAS is held LOW during this wait, far exceeding the RAS hold down specification.

Radio Shack®

On the unmodified board the WAIT signal was latched by the trailing edge of the DRVSEL* signal. On the modified board the WAIT is now latched by the leading edge of DRVSEL*. The result is that the WAIT is now recognized during the actual I/O cycle. RAS is not active during this cycle, so even a 1 ms WAIT will not violate the RAS hold down specification. We now need to be concerned only with the REFRESH timing, a problem cured by the 1 ms watchdog timer.

On the unmodified board the WAIT could be selected or deselected by proper manipulation of Bit 6. On the modified board a WAIT is ALWAYS generated. However, if a WAIT is not desired (Bit 6 is not set), a short 1-2 μ s WAIT is selected.

A second, more obscure problem may exist with unmodified boards. On the unmodified board the 2MHz/1MHz divider (U21) is held inactive by the RESETI signal. When RESETI is released the FDC chip takes a certain number of clock cycles to become READY. When the CPU is released from RESET (during power up or after the reset button is pressed) it checks for the presence of the FDC chip. It is possible, on the unmodified board, for the CPU to miss the FDC chip due to this timing problem.

On the modified the board the RESETI line to the U21 is broken. U21 is always active, and the FDC board always becomes ready in time.

PROCEDURE:

You will need a very small set diagonal wire cutters (dykes), some wire wrap wire, and two (2) 47 Ω ohm 1/4 watt 5% resistors to perform the modifications.

MAKE THE FOLLOWING CUT ON THE FOIL SIDE OF THE PCB

- 1) Cut the trace leaving U15 pin 3. Cut the trace close to pin 3.

MAKE THE FOLLOWING CUTS ON THE COMPONENT SIDE OF THE PCB

- 1) Cut the trace leaving U15 pin 2. Cut the trace between pin 2 and the first feedthrough.
- 2) Cut U22 pin 3 at the LEFT MOST trace running between U22 and U17.

CUT THE PIN ON THE FOLLOWING IC:

- 1) U21 pin 2. Use the small dykes and cut the pin loose from the PCB. DO NOT cut the pin loose from the IC. Bend the pin upwards so you can solder to it later.

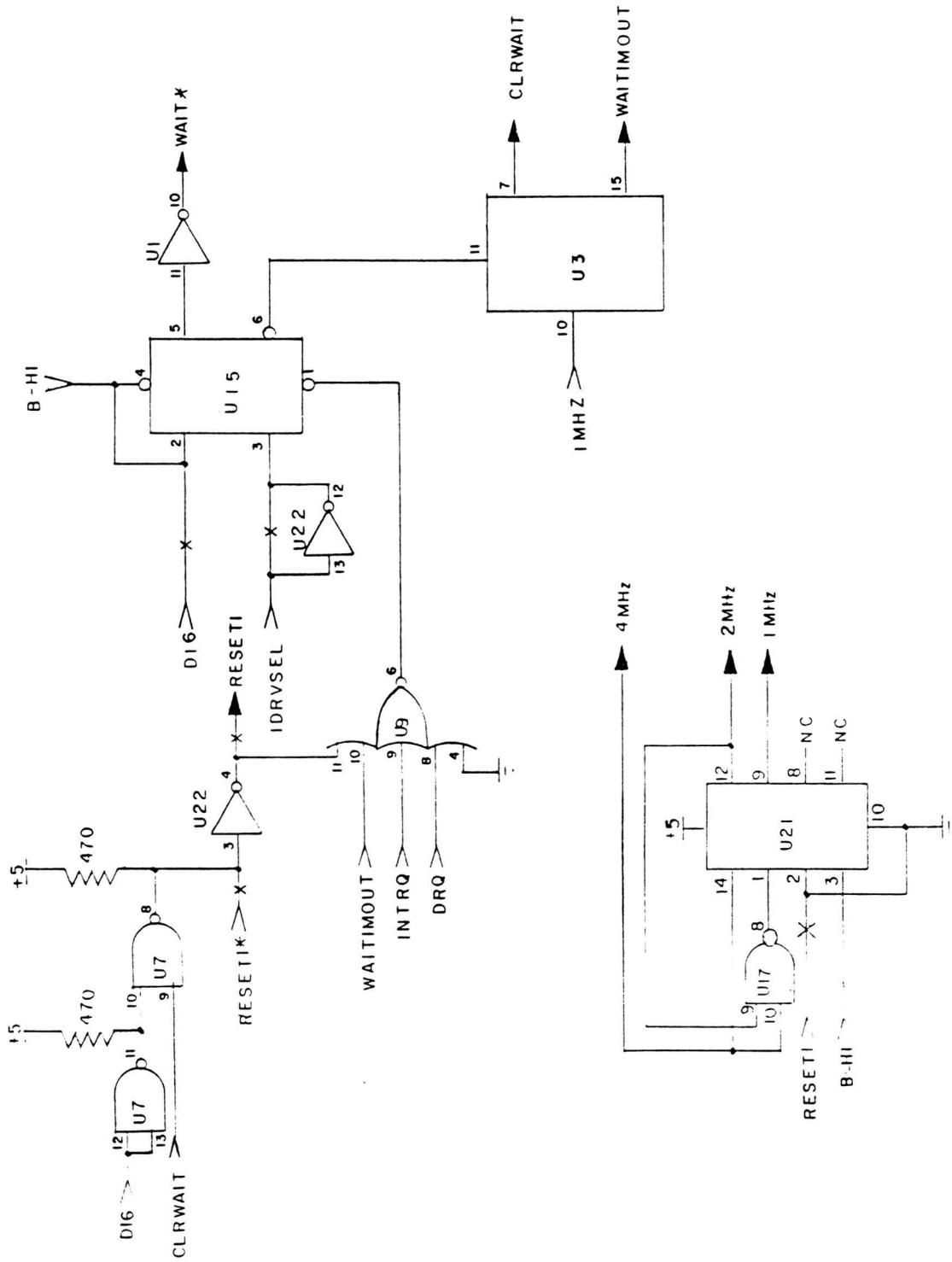
Get the two 47 Ω ohm resistors you were asked to obtain earlier. Cut each lead on each resistor to approximately 3/8 inch in length. Bend the resistors into a "U" shape. Install the resistors as follows:

- 1) One resistor from U7 pin 14 to U7 pins 10 and 11. Place the resistor lead between pins 10 and 11 and solder the two pins and the resistor lead together.
- 2) One resistor from U7 pin 8 to U12 pin 14.

USING WIRE WRAP WIRE, INSTALL THE FOLLOWING JUMPERS ON THE COMPONENT SIDE OF THE PCB. SOLDER DIRECTLY TO THE IC PINS.

- 1) U3 pin 7 to U7 pin 9.
- 2) U7 pin 12 to U7 pin 13 to U12 pin 12. Note that U7 pins 12 and 13 are close together and can be connected by one end of the jumper to U12 pin 12.
- 3) U15 pin 2 to U15 pin 4.
- 4) U15 pin 3 to U22 pin 12.
- 5) U15 pin 11 to U22 pin 13.
- 6) U21 pin 2 (the bent up pin) to U21 pin 10.
- 7) U7 pin 8 (with the resistor lead) to U22 pin 3.

Check and recheck all cuts and jumpers. Make sure that no pins have been accidentally shorted with solder. Check the system using Format, Backup, and DRV4M version 4.1 or greater to verify operation.

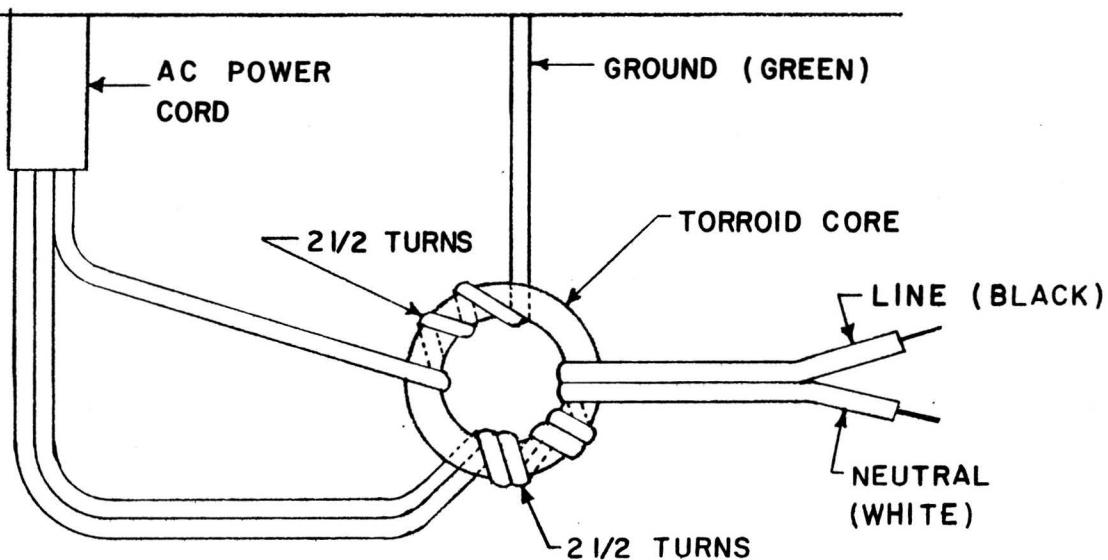


DATE: April 5, 1983
REVISION DATE: April 5, 1983
BULLETIN NO.: 4:2
PRODUCT: 26-1123 Model III to Model 4 upgrade
SUBASSEMBLY: N/A

PURPOSE: Proper wrapping procedure for the ferrite toroid.

DISCUSSION/PROCEDURE:

For proper RFI suppression, the ferrite toroid supplied with the Model III to Model 4 upgrade needs to be wrapped correctly. The correct procedure is to wrap the AC wires 2 1/2 turns in one direction and the ground wire 2 1/2 turns in the opposite direction.



DATE: June 7, 1983
REVISION DATE: June 7, 1983
BULLETIN NO.: 4:3
PRODUCT: 26-1068/9 Model 4 with 1 or 2 drives
SUBASSEMBLY: Model 4 FDC board Revision blank, Revision A

PURPOSE: On power up or reset, computer may go into CASS? mode. The FDC board is not recognized, even though it is properly connected and powered.
THIS MODIFICATION IS MANDATORY!

DISCUSSION:

This modification is MANDATORY. All units in for repair should be checked to see if this modification has been installed. The modifications should be installed if it is not present, or repaired if it is broken.

On the unmodified Model 4 FDC board the clock divider, U21, is held inactive during RESET. The RESET happens during power on or by pressing the RESET button on the keyboard of the computer.

Once RESET is released U21 begins to become active. Once U21 is active it may take up to 1 μ s until U21 begins producing the 1 MHz clock for the FDC. The FDC chip will take a certain number of 1 MHz clock cycles to become ready.

Under the right conditions the FDC chip will not become ready by the time the CPU checks the FDC port. If this happens the CPU will assume that no FDC is attached, and jump directly into Cassette BASIC (CASS?).

To prevent this problem, the clock must be permanently enabled.

PROCEDURE:

You will need a very small set of diagonal wire cutters and some wire wrap wire.

MAKE THE FOLLOWING CUT ON THE COMPONENT SIDE OF THE PCB:

Cut U21 pin 2. Using the small cutters, cut the pin loose from the PCB. DO NOT cut the pin from the IC. Bend the pin up and away from the PCB so that you can solder to it later.

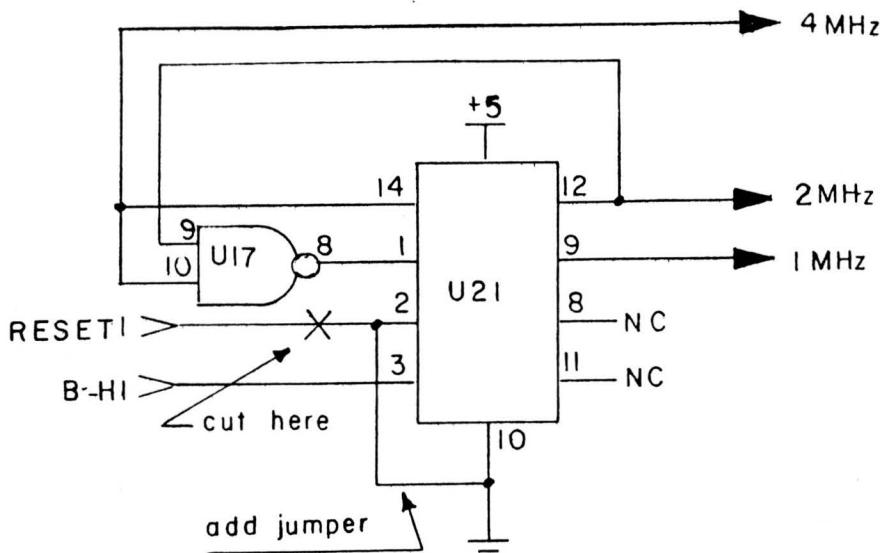
Radio Shack®

USING WIRE WRAP WIRE, INSTALL THE FOLLOWING JUMPER:

U21 pin 2 (the bent up pin) to U21 pin 10

After completing the modification, reinstall the board and verify operation using DRV4M, FORMAT, and BACKUP.

NOTE: This modification need be done ONLY on the Model 4 style (no potentiometers) FDC board. The Model 3 style (3 potentiometers) FDC board does not exhibit this problem.



DATE: June 7, 1983

REVISION DATE: April 25, 1984

BULLETIN NO.: 4:4

PRODUCT: 26-1069 Model 4

SUBASSEMBLY: 26-1125 Model III Hi-Res Graphics Board

PURPOSE: Installation instructions for Model III Graphics PCB into the Model 4 computer.

DISCUSSION/PROCEDURE:

CASE:

1. Remove all cables from the bottom and rear of the computer. Position the computer on its rear panel to provide easy access to the case bottom. Remove the ten screws from the case bottom. Notice the types and length of the screws and their positions.
2. Position the computer upright and remove the #6 screw from the top, back panel of the case.
3. Very carefully remove the case top by lifting straight up and set it aside to the left (when facing the CRT). Be careful not to exceed the length of the video cable.

CPU BOARD:

1. Remove all cables connecting the CPU board (power supply cable, video, keyboard and cassette cables. If applicable, also remove the RS-232 and FDC inter-connect cables).
2. Remove the five screws fastening the CPU board.
3. Make sure all cables to the CPU Board have been disconnected.
4. Remove the CPU Board.

On the component side of the Model 4 logic board cut pin 12 of U22 (7432) free from the PCB. Jumper the now free pin 12 to ground (U22 pin 7).

GRAPHICS BOARD MODIFICATION:

A 74LS02 must be added to the Model III Graphics Board. First bend all pins except 7 and 14 out from the body of the LS02. Pins 7 and 14 should be connected the same pins on U25, piggyback style. Cut the trace from U25 pin 8 to U8 pin 11. Jumper pin 9 of the LS02 to pin 25 of the 50 pin connector. Jumper pin 8 of the LS02 to pin 21 of the 50 pin connector. Jumper pin 10 of the LS02 to U8 pin 11.

GRAPHICS BOARD INSTALLATION:

1. Connect the 50 pin flat cable to the CPU and the Graphics board (refer to the diagram). The middle edge card connector plugs into the Model III CPU I/O Bus connector.
2. Replace the CPU board back into the case. The third unused connector of the 50 pin flat cable exits the case through the opening for the I/O Bus.
3. Replace the mounting screws removed from the CPU Board.
4. Make sure all of the components of the Graphics board assembly are in place. The Graphics board should be attached to a new back shield for the CPU Board. Attached to the back of the Graphics board should be three layers of material. Two layers are the insulator and ground plane for the Graphics board. The third layer is the insulator (clear tape) to prevent the CPU board from shorting against the Graphics board ground plane.
5. Connect the remaining cables to the Graphics board and the CPU. The short six pin jumper cable connects the video output of the CPU (J5) to the Graphics board video input (J3). The video cable from the CRT assembly connects to the Graphics board video output (J2). The final cable supplied with the Graphics board is a replacement for the power connector from the power supply to the FDC Interface board, with an additional connector for the Graphics Board. Remove the old power connector to the FDC and replace it with the new connector. The extra two pin connector plugs into the power input of the Graphics Board.
6. Place the Graphics Board and shield assembly in the proper position and reconnect the shield with the screws removed from the old shield. **NOTE:** If this modification is being made to an older, non-FCC approved (i.e. no rear shield) Model III, utilize the holes that do line up on top of the shield. Spring clamps will be used to secure the edges.

Radio Shack®

ALIGNMENT:

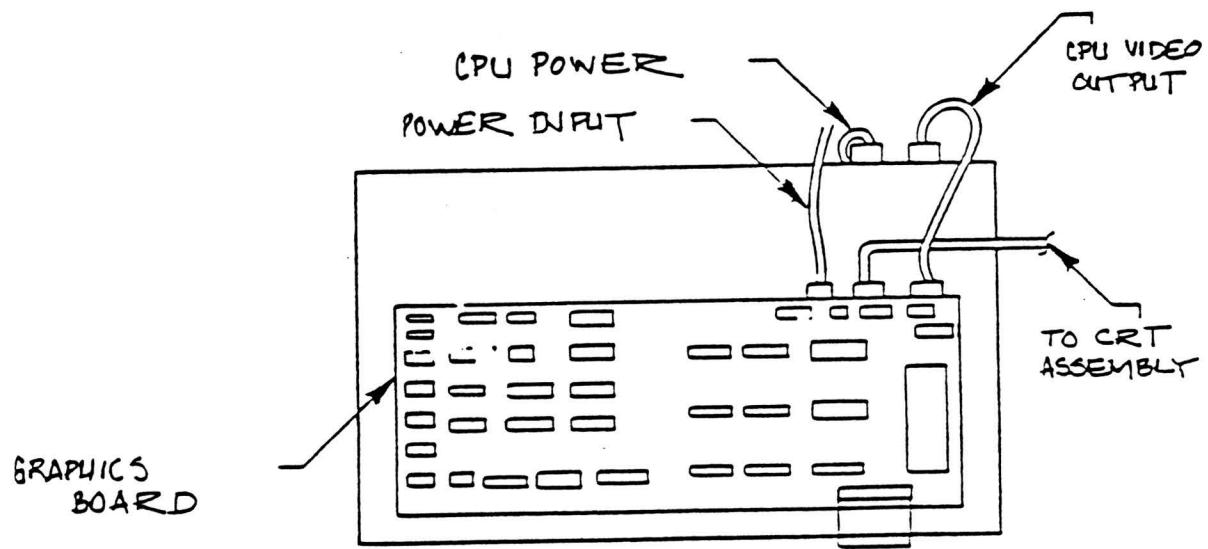
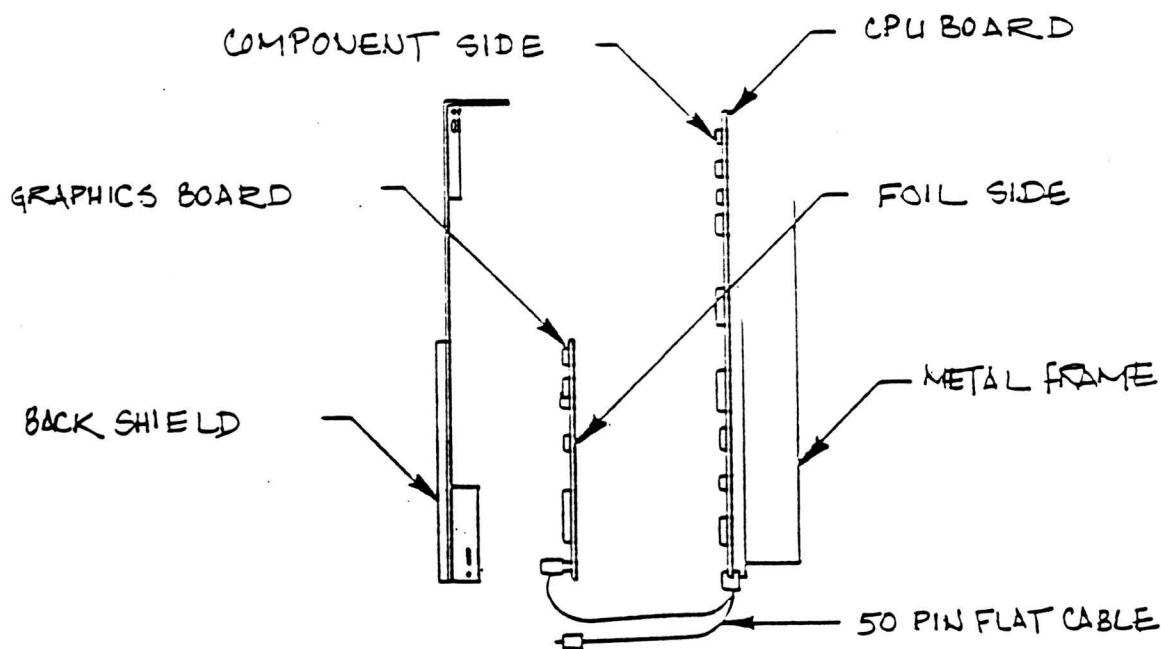
1. Load the alignment pattern from the Model III Diagnostic Diskette using the command GRXX ALGNPAT/GRA. You will see the test pattern load and then the diagnostic option menu will appear.
2. Press the <ENTER> key and the test pattern will be displayed. At this time adjust the video monitor board so that circles will appear as circles and straight lines are straight. Video alignment instructions may be found in the Model III Service Manual.
3. Again, press the <ENTER> key to toggle back to the alpha-display (menu). There may be some noticeable compression of the alpha-display (top to bottom of the screen) but this is normal.
4. There are no adjustments on the graphics board

CASE:

1. Double-check to be sure all wires are connected correctly and all boards are properly fastened.
2. Carefully place the case top over the case bottom. Do Not hit the neck of the CRT -- It could implode.
3. Install the #6 X 3/8" sheet metal screw and flat washer in the top rear panel of the case.
4. Carefully rest the Computer on its rear panel and replace the screws.

CHECKOUT:

1. Power system up and again verify proper operation with GRXX
2. Run GRAPHIC/CMD (on the Model III Diagnostic diskette) to verify the graphic memory and other functions
3. Refer to the Model III Graphics PCB Diagnostics manual for further information.



DATE: June 14, 1983
REVISION DATE: August 2, 1983
BULLETIN NO.: 4:5
PRODUCT: 26-1069 Model 4
SUBASSEMBLY: AX-9383 Main Logic PCB
MX-5725 U72 PAL16L8CN (or HAL16L8CN) IC

PURPOSE: Problems when using SPOOLER feature with 128K of memory.
Symptoms vary -- SPOOLER prints bad data, SPOOLER won't work, system locks up, system reboots, system may select a program from disk by itself. Problem may appear to be heat related.

DISCUSSION:

This problem only appears in machine having 128K of memory. The problem lies in a timing problem with the original U72, the memory PAL. Since this chip is not present in 16K or 64K machines, the problem does not exist in these units. The problem is aggravated by heat, but is not directly caused by overheating.

SPOOLER actually loads a small section of machine level code into the upper 64K bank of memory. To use this section of program code it is necessary to select this bank of memory and jump to the code. The extra code then does what it was designed to do and jumps back to the controlling program. The controlling program then deselects the upper bank and continues normally.

The problem in U72 lies with the timing of the A15 address line and the CAS* signal. It is possible, under the right circumstances, for A15 to end before CAS* is complete. This produces a "glitch" in U72 that usually effects the the bank of memory NOT currently selected by U72. The problem is usually much worse during an M1 (op code fetch) cycle, and while the upper bank is selected. Therefore, the small section of code used by SPOOLER is more likely to affect the lower banks of memory, causing system lockup or reboot. However, it IS possible for "glitches" occurring during operation in the lower bank to affect the upper bank, causing failure of the SPOOLER data or failure of SPOOLER itself. These timing errors are aggravated by heat, but are not caused by overheating of the unit.

Since the problem actually lies with U72, the problem will only appear in machines upgraded to 128K. Since the problem is most severe during M1 cycles the problem may only appear when using the SPOOLER function. MEMDISK does not contain operational code in the upper banks, making it less susceptible to this problem.

PROCEDURE:

U72 must be replaced with an improved version of U72, National Parts number MX-5725 under catalog number 26-1122. The replacement U72 **MUST** be marked in one of two ways:

- 1) The manufacturer's logo, the part number, and the date code will be written on the body of the part with yellow ink.

- or -

- 2) The Tandy part number must be **8075968**.

The old version is marked with white ink, or has a Tandy part number of 8075468. The manufacturer's part number, PALL6L8CN, PALL6L8ACN, HAL16L8CN, or HAL16L8ACN, is the same on both the old and revised versions of U72.

DATE: May 25, 1983
REVISION DATE: May 25, 1983
BULLETIN NO.: 4:6
PRODUCT: 26-1123 Model III to Model 4 Upgrade
SUBASSEMBLY: AX-9382 or AX-9383 Main CPU cards

PURPOSE: Garbage on screen after modification.

DISCUSSION: It has been found that some of the upgrade kits are being sent out minus the mylar insulating washers on the backside of the board. These are the bottom three, center top, and left center mounting holes looking at the board from the foil side with the edge connectors down.

This will cause garbage to appear on the screen when the board is tightened down to the chassis. We suggest stocking some of these in the event you receive an uninsulated board.

These insulators are under 26-1063, Part Number AHC-0787.

PROCEDURE: Inspect board before installation and install washers as required.

DATE: August 8, 1983
REVISION DATE: August 8, 1983
BULLETIN NO.: 4:7
PRODUCT: 26-1068/9 Model 4 with one or two disk drives
SUBASSEMBLY: AX-8793 "new style" (no adjustment) FDC board
Revision NC, Revision A, Revision C

PURPOSE: FDC won't write in single density mode

THIS MODIFICATION IS MANDATORY!

DISCUSSION:

Note that this problem appears only on Revision NC, A, and C PCBs. The Revision B PCB does not exist in the field.

PROCEDURE:

You will need the following tools:

Small pair of diagonal cutters
Wire wrap wire
Soldering iron and solder

CUT THE IC PIN ON THE COMPONENT SIDE OF THE PCB:

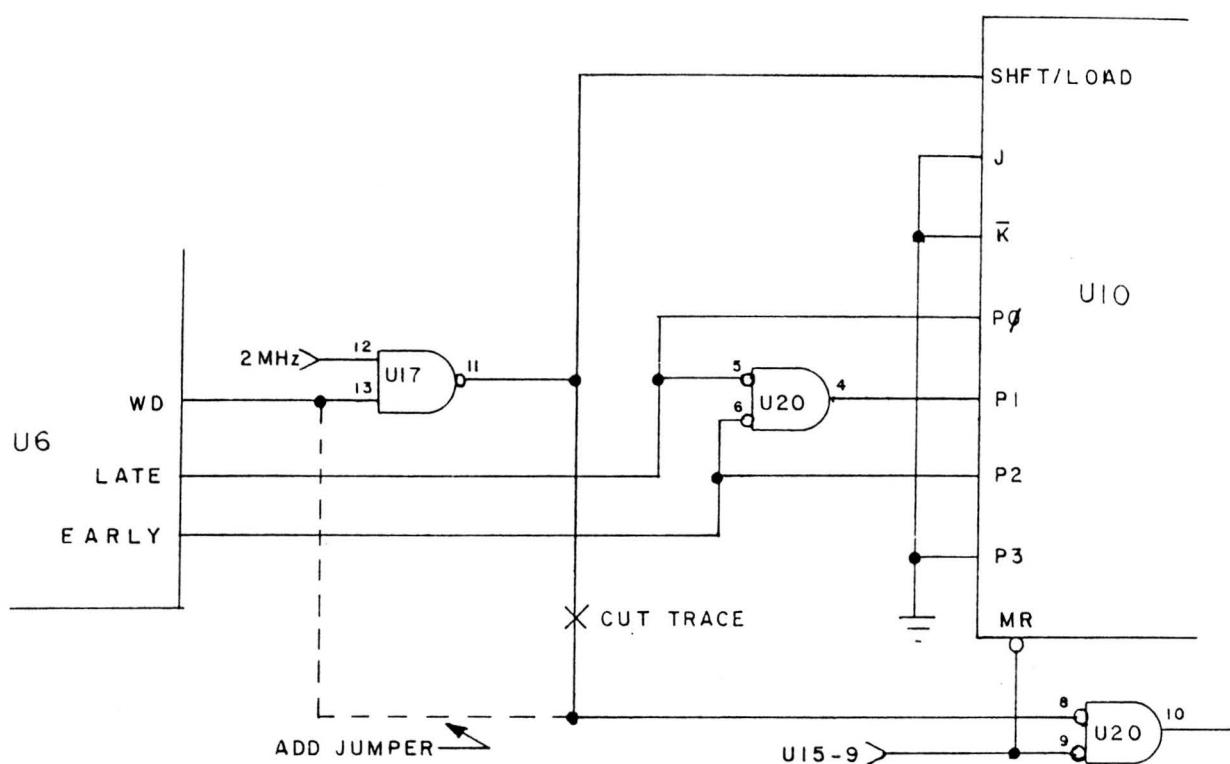
- 1) Cut pin 8 of U20 loose from the PCB. **DO NOT cut the pin away from the IC.** Bend the pin up to solder to later.

INSTALL THE FOLLOWING JUMPER ON THE COMPONENT SIDE OF THE PCB:

- 1) Jumper U20 pin 8 to U17 pin 13

Reinstall the PCB and verify its operation using TDC3. Check the PCB in both SINGLE and DOUBLE density writes.

Radio Shack®



Radio Shack®

DATE: August 17, 1983
REVISION DATE: September 30, 1986
BULLETIN NO: 4:8
PRODUCT: 26-1067/8/9 Model 4
26-1069A/70 Model 4 Gate Array, Model 4D
26-1058/59 Model 4 Student Stations
SUBASSEMBLY: AX-9383 Main Logic PCB
AX-9499 Gate Array Main Logic
SUBASSEMBLY REVISION: A11

PURPOSE: To discuss various versions of ROMS available for Model 4

DISCUSSION:

There are presently two different ROM sets in use in the Model 4 computers. At present, the only way to determine the ROM set in use in any particular unit is to run one of the Model 4 Memory Diagnostics (BD16K, MIV64K, or MIV128K) available on the Model 4 Diagnostic Diskette. Note that the ROM A checksum is in two parts.

The first ROM set is the first production ROMs found in the standard Model 4 configurations. ROM A and ROM B are the same ROMs used in the Model III Computer. Only the ROM C is different.

	Manufacturer	National	Checksum
	Part #	Parts #	
ROM A	8041364	MXP-0428	BBC4 DA75
ROM B	8040332	MXP-0427	407C
ROM C	8048316	MXP-0249	1591

The Model 4 Network III Student Station uses a different set of ROMs. Both ROM A and ROM C have been changed. ROM B remains the same. The Network III entry point (SYSTEM entry) has been changed to /12363.

	Manufacturer	National	Checksum
	Part #	Parts #	
ROM A	8048364	MXP-0021	B523 DA42
vers. A	8048364A	MXP-0021	B504 DA42
ROM B	8040332	MXP-0427	407C
ROM C	8042316	MXP-0167	48BC

If the Model 4 is a Network 4 student station (26-1058), or has been upgraded

to work in a Network 4 system, ROM C will have been changed with the part listed below. This ROM C will only function properly when used with the version A ROM A listed above (B504 DA42).

	Manufacturer	National	Checksum
ROM C	8075317	MXP-0011	33CB

Gate Array Model 4s and Model 4Ds contain only two ROM chips, ROM B and C being combined in one ROM. The actual code in the ROM remains the same, only the ROM size has been changed.

	Manufacturer	National	Checksum
ROM A	8075364	MXP-0143	B504 DA42
ROM B/C	8075369	MXP-0144	407C 48BC

The B/C ROM must be replaced when Network 4 is installed.

ROM B/C	8075370	MXP-0010	407C 33CB
---------	---------	----------	-----------

The second production, and all subsequent productions, of Model 4's will have ROMS identical to the EPROMS used in the Model 4 Student Station. This means that from the second production on, all Model 4's will be capable of Network III operation without further upgrade. If the Model 4 is upgraded for use with Network 4, it will no longer boot Network III from the ROM. At present, the only way to determine the ROM set in use in any particular unit is to run one of the Model 4 Memory Diagnostics (BD16K, MIV64K, or MIV128K) available on the Model 4 Diagnostic Diskette.

DATE: August 22, 1983
REVISION DATE: August 22, 1983
BULLETIN NO.: 4:9
PRODUCT: 26-1067/8/9, 26-1059 Model 4 all configurations
SUBASSEMBLY: AX-9383 Revision 'B' Main LOGIC PCB
AXX-8397 TCE Monitor PCB

PURPOSE: To make TCE monitor / Revision 'B' Main PCB combination meet RFI specifications

THIS MODIFICATION IS MANDATORY!

DISCUSSION:

This modification is necessary to make the Revision B Main PCB / TCE Video Monitor PCB combination meet Radio Frequency Interference specifications. There should be no visable difference in the operation of the computer after this modification is done.

All units should have this modification done during manufacture. However, TCE monitor replacement parts from National Parts may or may not have been modified. If the modification has not been done, it must be done by the repair Technician.

PROCEDURE:

- 1) Disconnect the small printed circuit board from the neck of the cathode ray tube (CRT).
- 2) Cut and remove the plastic wire ties on the wiring harness going to the sweep board. Desolder and remove the yellow wire at point "E" (video) and the black wire at point "F" (ground) on the small PCB.
- 3) Twist the yellow and black wires together at a rate of 2 turns per inch.
- 4) Resolder the yellow wire to point "E" and the black wire to point "F". Install new plastic wire ties on the wiring harness, and reinstall the small PCB to the neck of the CRT.

Check the video alignment after modifications, and realign if necessary.

Radio Shack®

DATE: September 14, 1983
REVISION DATE: September 14, 1983
BULLETIN NO.: 4:1Ø
PRODUCT: 26-1Ø68/69 Model 4 with one or more disk drives
26-113Ø 5-Megabyte Hard Drive
SUBASSEMBLY: AX-9282 Hard Drive Controller PCB

PURPOSE: When Model 4 is turned on with Hard Drive attached and running the Model 4 appears dead -- no drive activity, no filament voltage to CRT. This problem may be intermittent, and it may seem to cure itself if both units are left on for a few minutes.

DISCUSSION:

A loading problem exists when the 5-Megabyte Hard Drive is connected to the Model 4 I/O Bus connector. This problem can cause a foldback condition in the power supply until enough current is available to drive the lines to and from the Hard Drive.

This loading problem can be cured by supplying open collector drivers on the Hard Drive Controller PCB inside the Hard Drive. These drivers connect to the EXTIOSEL* and XIOBUSWAIT* input lines on the Model 4 I/O Bus.

PROCEDURE:

Modify the Hard Drive Controller PCB inside the Hard Drive. You will need an X-acto™ knife, some wire wrap wire, wire cutters, and soldering equipment.

Make the following cut on the FOIL side of the PCB:

Cut the trace going from J7 pin 41 to U73 pin 5.

Make the following cut on the COMPONENT side of the PCB:

Cut the trace going from J7 pin 43 to U73 pin 7.

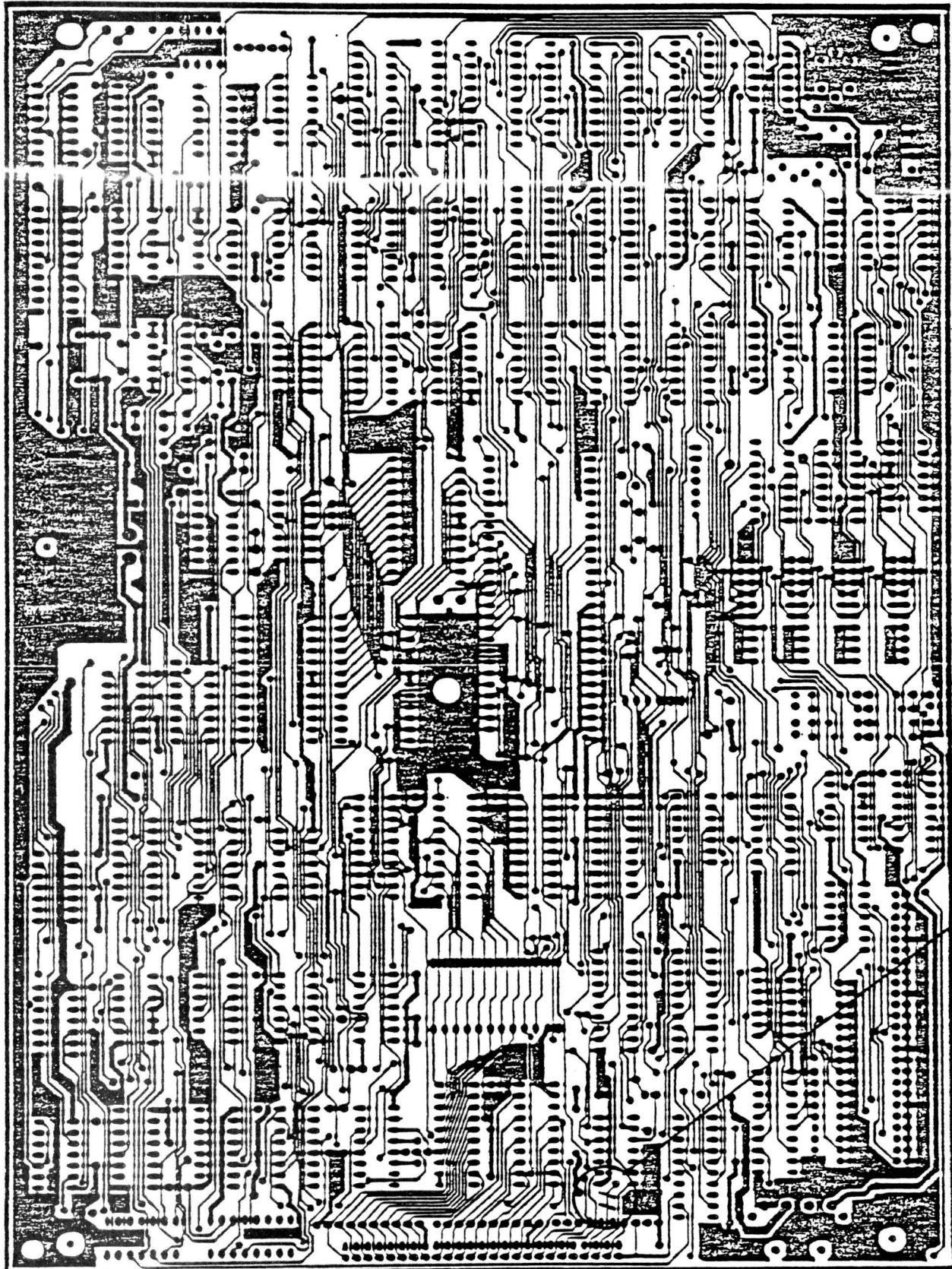
Install the following jumpers on the COMPONENT side of the PCB:

- 1) Jumper U38 pin 11 to U72 pin 1
- 2) Jumper U72 pin 2 to J7 pin 41
- 3) Jumper U58 pin 10 to U72 pin 3
- 4) Jumper U72 pin 4 to J7 pin 43

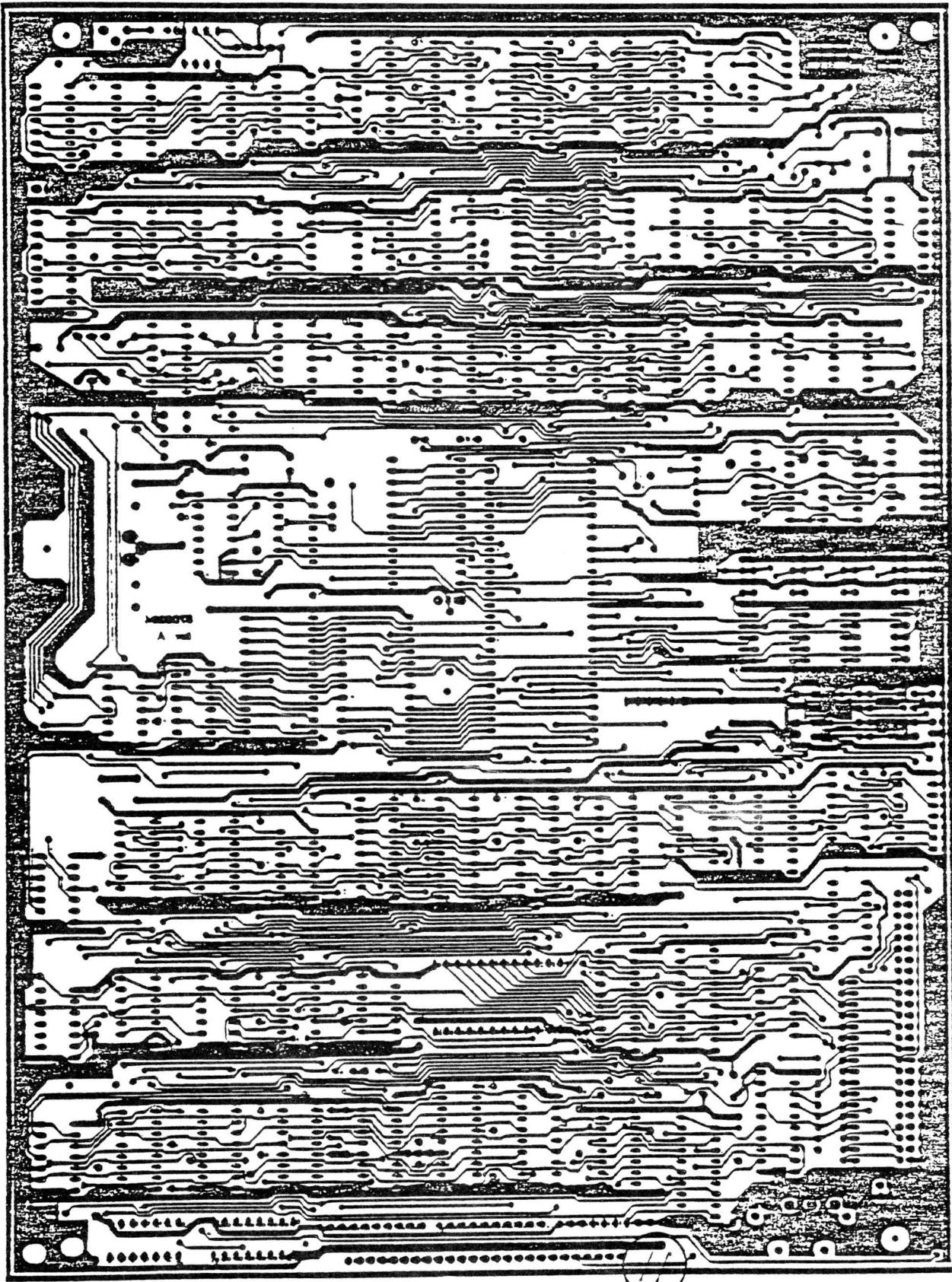
While this modification would not normally cause alignment problems, the alignment procedure should be performed as part of the normal repair procedures.

** !WARNING! !WARNING! !WARNING! !WARNING! !WARNING! !WARNING! **

If this Hard Drive is ever used with a Model II, 12, 16, or 16B the Hard Drive Interface Card inside the computer MUST be modified as per Technical Bulletin HD:13.



Radio Shack®



CUT HERE

DATE: September 23, 1983
REVISION DATE: September 23, 1983
BULLETIN NO.: 4:11
PRODUCT: 26-1067/8/9, 26-1059 Model 4 all configurations
SUBASSEMBLY: AX-9383 Rev PP3, Rev N/C, Rev A Main Logic PCB

PURPOSE: Video malfunctions when using Motorola 68045 VDG chip, especially in 32 character mode while running VIDD/BAS on the Model 4 Test Diskette. The screen may display garbage or all zeros.

DISCUSSION:

The timing of the Memory Address Delay time (tMAD) parameter of the Motorola 68045 VDG chip is not compatible with the timing of the Rev PP3, Rev N/C, and Rev A PCBs.

PROCEDURE:

The preferable option is to NOT use a Motorola 68045 VDG chip in Rev PP3, Rev N/C, or Rev A Main Logic PC boards. Reserve the Motorola IC for use in Revision B or greater PC boards.

Use a 68045 VDG chip (National Parts #AMX-5855 under catalog #26-1069) from any other manufacturer as a replacement part on the Rev PP3, Rev N/C, and Rev A PCB.

The Motorola IC may be used in the Model III High Resolution Graphics board without problems.

In some instances the Motorola part may be the only part available. If this is the only option available the CPU board can be modified to accept the Motorola VDG chip.

1) ADD THE FOLLOWING CAPACITOR ON THE FOIL SIDE OF THE PCB:

GND MAD

150 pf between pins 1 and 4 of U47 (VDG). Use plastic tubing if necessary to prevent the leads from shorting to other IC pins.

150 pf ceramic capacitor 50V +/- 10% National Parts Number CC-151KJCP catalog number 26-9999C.

Radio Shack®

DATE: September 29, 1983
REVISION DATE: September 29, 1983
BULLETIN NO.: 4:12
PRODUCT: 26-1067/8/9 Model 4
26-1059 Model 4 Student Station
SUBASSEMBLY: AX-9383 Main logic PC board

PURPOSE: To describe some common problems with the RESET circuitry and their fixes.

DISCUSSION:

The Model 4 reset circuitry works as follows. Please refer to the Model 4 schematics.

Before the power is turned on C20 is discharged. When the power is turned on, U17 pin 3 is at a logic LOW, producing a HIGH at pin 4. As soon as power is applied, C20 begins charging to +5 volts through R22. The values of R22 and C20 are chosen to produce a time constant long enough to allow the power supplies and system clocks to stabilize. When pin 3 of U17 reaches 1.7 volts, pin 4 goes LOW, forcing pins 6 and 8 HIGH, bringing the system out of reset. U17 pin 8 is connected only to the processor, U57. U17 pin 6 is responsible for supplying the RESET* signal to other devices like the VDG chip, FDC board, or Model 4 High Resolution Graphics.

When the RESET button is pushed one end of R24 is grounded. This provides a voltage divider consisting of R24 and R22 across the +5 volts, and C20 discharges through R24. This puts U17 pin 3 at approximately 20 millivolts, sufficiently close to ground to switch U17 pin 4 to a logic HIGH. This will cause pins 6 and 8 to go LOW, resetting the system. When the RESET button is released the procedure is identical to a power on reset.

PROCEDURE:

There are several problems that can result from failure of the RESET circuit:

- 1) Garbage on screen during power up. Garbage clears and unit functions normally when RESET is pressed. Pin 26 of U57 changes state as RESET button is pressed.
- 2) Garbage on screen during power up. Garbage will not clear, even if RESET is pressed. There is a constant voltage (HIGH or LOW) at pin 26 of U57.
- 3) Unit intermittently resets itself.

Of the above failures, faulty capacitors (C20, C21, C32) are the most common. C21 and C32 may show intermittent shorts. Failure of U17 is a close second. Failure of U57 is known but not common. Failure of the remaining passive components (R22, R24, CR1) are uncommon, but should be considered.

DATE: October 4, 1983
REVISION DATE: October 27, 1983
BULLETIN NO.: 4:13
PRODUCT: 26-1067/8/9 Model 4
26-1059 Model 4 Student Station
SUBASSEMBLY: AX-9383 Rev 'B' and Rev 'C' PCB

PURPOSE: To describe tuning procedure for capacitor C210 on Model 4 PCB.

DISCUSSION:

The Model 4 Revision 'B' and 'C' main logic PC boards contain a phase locked loop (PLL) circuit to synchronize the 64 character and 80 character video clocks. This circuitry will prevent the "swimming" or apparent rolling of the video found in the earlier Model 4 boards.

Due to a parts availability problem, a small number of Revision "C" Boards were manufactured without the tunable capacitor C210. This capacitor was replaced with a 33 picofarad 2% NPO ceramic capacitor, and R204 (3K ohm) was removed. This changes does not effect the operation of the circuit, except that the PLL circuit is not tuneable.

PROCEDURE:

To function properly the PLL circuit must be "tuned" using the following procedure:

- 1) Hold down the <BREAK> key and turn on the computer. The CASS? prompt should appear. Answer the CASS and MEMORY SIZE questions with <ENTER> to bring the system to BASIC READY. At the READY prompt, type:

OUT132,4 <ENTER>

This puts the video circuits into the 80 character mode.

- 2) Move jumper E22/E23 to E20/E21. The video will roll and probably be unreadable. These jumpers are found in the upper left hand section of the PCB, near U203.

Radio Shack®

- 3) Using a non-metallic adjustment tool, adjust C21Ø until the video display is as stable as you can possibly adjust it. The video display may not lock into sync, but should be adjusted so that any rolling is very slow.
- 4) Move jumper E2Ø/E21 to E22/E23. The video should lock tightly into sync.

DATE: February 8, 1984
REVISION DATE: February 8, 1984
BULLETIN NO.: TB 4:14
PRODUCT: 26-1068/9 Model 4
SUBASSEMBLY: AX-9383 Main Logic Board
U206 Crystal Oscillator

PURPOSE: Part Number identification for U206 (Crystal Oscillator) on Revision B and C Main Logic Boards.

DISCUSSION:

With the revision "B" of the Main Logic board, the oscillator circuit for the Model 4 was revised to eliminate some of the discrete components and incorporate them into the present form of a single circuit encased in metal. The Crystal from the earlier versions is packaged similar to that of the present version; however it contains only the crystal portion of the present crystal oscillator circuit, and is not compatible with Revisions B and C.

PROCEDURE:

On Main Logic Boards with revisions prior to "B":

National Parts Number is AMX-1014 (Crystal Parallel 20.2752 MHZ) listed under RS Cat. 26-1069.

On Main Logic Boards with revisions "B" or "C":

National Parts Number is MX-1101 (Crystal 20.2752 MHZ) listed under RS Cat. 26-1080.

Radio Shack®

DATE: March 22, 1984
REVISION DATE: March 11, 1985
BULLETIN NO.: 4:15
PRODUCT: 26-1069, 26-1069A Model 4
SUBASSEMBLY: ATA-1015 Tandy 65 watt Power Supply

PURPOSE: To correct problem of power supply going into current limiting and the Model 4 appearing dead.

DISCUSSION:

The Tandy 65 watt power supply incorporates a current limiting mode. This current limiting mode shuts down the supply in the event that the unit draws too much current. The 65 watt power supply is overly sensitive to current load and may shut down without there being a problem with the Model 4. To correct this, values of two resistors need to be changed. This will increase the amount of current the 65 watt power supply may draw. Additionally, R-15 (Variable Pot) may not be making proper contact or may be defective. To correct this problem, the pot needs to be changed to a network of resistors.

**** Compliance With This Bulletin Is Mandatory ****

PROCEDURE:

R-21 must remain a 220 ohm resistor.

Change R7 from 4.7k ohm to 1k ohm and change R35 from 47 ohm to 68 ohm.

Remove R-15 and install two (2) 510 ohm resistors, joining them where the center tap on the trim pot was. Check the 5 volt line (V1) for a tolerance of 4.95 to 5.25 volts. To trim the power supply, an additional 1k resistor may be used. To raise the output, locate R14 and install the 1k resistor across the 510 ohm resistor closest to R14. To lower the output, locate R16 and install the 1k resistor across the 510 ohm resistor closest to R16.

The fix kit needed for this modification may be ordered as:

Catalog # 26-1080

Part # AXX-7098

All units should be checked for these modifications.

Please note that only the power harness modification and not the resistor modifications apply to Astec power supplies.

DATE: April 26, 1984
REVISION DATE: April 26, 1984
BULLETIN NO.: 4:16
PRODUCT: 26-1067/8/9 Model 4
SUBASSEMBLY: N/A

PURPOSE: Screen says "DISKETTE?" if no diskette is inserted. As soon as a diskette is inserted and the door is closed the system boots normally. No other problems are present.

DISCUSSION:

This is normal operation. If NO other problems are present then no attempt should be made to repair the computer.

The Index Pulse Detector assembly is actually an LED and photo sensor, and is quite sensitive. The photo sensor can be activated by ambient light in the room, or even by the LED itself, producing an active Index Pulse indication even with no disk present and the door open. BOOTSTRAP, finding an active Index Pulse indication tries to read the disk. This might tend to lock the system up and require pressing the reset button after the disk is inserted.

It is NOT uncommon for the drive motor to run continuously with the drive active light on, and "DISKETTE?" on the screen, until the diskette is inserted. This is caused by the FDC receiving a false Index Pulse and not being able to verify it. The FDC will continue to loop until it can verify the Index Pulse, which is when the diskette is inserted into the drive and the door closed.

For further indepth synopsis of the problem refer to Technical Bulletin III:29

DATE: May 5, 1984

REVISION DATE: May 5, 1984

BULLETIN NO.: 4:17

PRODUCT: 26-1069 Model IV

SUBASSEMBLY: 26-1126 Model IV High Resolution Graphics Board

PURPOSE: To describe the proper procedure for installing the Model IV high resolution graphics board in the Model IV.

DISCUSSION/PROCEDURE: To install the high resolution board, disassemble the unit to expose the main pcb and plug the graphics board into J10, located closest to the notched end of U55. Remove and discard the jumper from E14-E15 located next to U46. Run the Model IV high resolution graphics test to insure proper operation and reassemble unit.

DATE: May 29, 1984

REVISION DATE: May 29, 1984

BULLETIN NO.: 4:18

PRODUCT: 26-1067/8/9 Model 4

SUBASSEMBLY: Main Logic Board

PURPOSE: Production run changes for Model 4's with Gate Array Logic

DISCUSSION: The following corrections have been made to current production versions and may not have been made to all that have been released.

PROCEDURE:

1. Change C70 from a 100pf to a 1000pf capacitor.
C70 is located between U63 and U64.
National Parts #(CC102JJCP)
2. Cut PCB etch runs to U22 pins 6 & 7.
3. Add jumpers on the component side of the PCB as follows;
 - (a) R26 bottom (close to CR3 & CR4) to U22 pin 6
 - (b) R28 bottom (close to CR3 & CR4) to U22 pin 7
4. Cut Pins 5 & 6 of RP2 (Resistor Pack) located at the bottom of the Board just above the Disk Drive Edge Card connector.

Radio Shack®

DATE: May 30, 1984
REVISION DATE: July 28, 1986
BULLETIN NO: 4:19
PRODUCT: 26-1069A Model 4
SUBASSEMBLY: Gate Array CPU PCB
SUBASSEMBLY REVISION: All gate array revisions.

PURPOSE: To increase video brightness on Model 4's with Gate Array CPU PCB.

DISCUSSION: Some Model 4's with gate array CPU boards may have a limited range of video brightness due to the drive capabilities of IC U20, a 74LS02. The solution to this problem is to replace this IC with one with higher drive capabilities.

PROCEDURE:

- 1.) Change U20 from a 74LS02 device to a 74S02 device.
- 2.) Verify proper operation of the machine.

Part number for the IC is:
74S02 Catalog# 26-1069A MX-5726

DATE: June 22, 1984

REVISION DATE: June 22, 1984

BULLETIN NO.: 4:20

PRODUCT: 26-1067/1068/1069 Model 4

SUBASSEMBLY: AX-9382 Model 4 16K logic board (Rev C)
AX-9383 Model 4 64K logic board (Rev C)

PURPOSE: To reduce "jail bars" associated with insufficient brightness in the 80 character mode.

DISCUSSION: This modification is required only if you are experiencing "jail bars" or a raster while in the 80 character mode.

PROCEDURE: 1.) On the component side of the board cut leg of U17 pin 12, and bend it away from the PCB.
2.) On the foil side of the PCB, run a jumper from U17 pin 12, to U17 pin 13.

DATE : July 31, 1984
REVISION DATE : July 31, 1984
BULLETIN NO.: 4:21
PRODUCT : 26-1069A Model 4
SUBASSEMBLY: Gate Array CPU

PURPOSE: Procedure for 128K RAM upgrade

DISCUSSION: The Model 4 Gate Array version CPU's with 64K of RAM will have a wire jumper connecting the ENPAGE signal at pin 16 of U5 to ground. In order to select 128K of RAM on this board this jumper must be removed from ground and attached to pin 16 of U33.

PROCEDURE:

- (1) Locate the wire jumper going from U5 pin 16 to ground. Remove the ground side of this jumper, and attach it to pin 16 of U33.
- (2) Install the 64K RAM IC's in positions U67 to U74.
- (3) Test the machine for proper operation.

DATE: August 21, 1984
REVISION DATE: August 21, 1984
BULLETIN NO.: 4:22
PRODUCT: 26-1069A Model 4 Gate Array
SUBASSEMBLY: Gate Array CPU board

PURPOSE: To correct timing problem with video RAM.

DISCUSSION: To correct a timing problem with the video RAM the following modification must be done. Problems caused by lack of this modification are most likely to manifest themselves as video RAM errors, incorrect characters on the display, or other character display problems.

PROCEDURE:

- 1.) Cut the trace going from U30 pin 5 to U30 pin 10.
- 2.) Run a jumper from U31 pin 3 to U32 pin 1.
- 3.) Run a jumper from U30 pin 5 to U32 pin 2.
- 4.) Verify proper operation of the machine.

DATE: September 5, 1984

REVISION DATE: September 5, 1984

BULLETIN NO.: 4:23

PRODUCT: 26-1067 Model 4

SUBASSEMBLY: AX-9383 Main Logic PCB

PURPOSE: To explain 16K to 64K upgrade procedure.

DISCUSSION: In order to upgrade a Model 4 from 16K to 64K, the following procedure must be used.

PROCEDURE:

- (1) Remove the 16K RAM's in positions U77 thru U84.
- (2) Move the following jumpers:
E5-E6 to E5-E4
E1-E2 to E2-E3
E12-E13 to E12-E11
- (3) Add a jumper in position E7-E8.
- (4) Remove capacitors C68, C72, C76, C80, C84, C88, C92, and C96.
- (5) Install the new 64K RAM's and verify proper operation with memory tests.

DATE: September 11, 1984
REVISION DATE: September 11, 1984
BULLETIN NO.: 4:24
PRODUCT: 26-1069/A Model 4/ Model 4 Gate Array
SUBASSEMBLY: 26-1126 Model 4 Hires

PURPOSE: Modification for installation of Model 4 Hires into Gate Array CPU, and to eliminate decoding problems with the RAS, CAS, and XADR7 signals.

DISCUSSION: If U1 is a 10L8 PAL chip, the Hires Graphics Board may display garbage and fail all diagnostics in a Model 4 and not work at all in a Model 4 Gate Array. To remedy this problem the PAL IC is being replaced with a 82S153 IFL IC. For use in the Gate Array CPU the Hires Board also requires an extra cut and jump.

PROCEDURE:

If the Model 4 Hires Board is to be installed in a Gate Array Board, both steps below must be completed. For installation in a regular Model 4, only step one below should be completed.

- (1) Check the IC at location U1. If it is a 10L8 PAL replace it with an 82S153 IFL chip.
- (2) For use with the Gate Array CPU cut the trace at pin 7 of U5 on the graphics board and jumper this pin to pin 1 of U1.

NOTE: The jumper in position E14-E15 on the Model 4 and the jumper on the graphics board staking pins on the Gate Array Model 4 must be removed to enable the graphics board.

IFL chip Catalog# 26-1126 Part# MX-6503

DATE: October 5, 1984
REVISION DATE: October 5, 1984
BULLETIN NO.: 4:25
PRODUCT: 26-1069/A Model 4
SUBASSEMBLY: ATA-1015/1051 Power Supplies

PURPOSE: To describe kit to remedy AC harness problems causing intermittent power supply failures and revise resistor modification on Tandy power supplies.

DISCUSSION: It has been found that an intermittent AC harness has been causing some failures on both the Astec and Tandy 65W power supplies. The current limiting resistor modification described in Technical Bulletin 4:15 for the Tandy power supply has also been revised. A kit is now available from National Parts which incorporates both of these modifications.

PROCEDURE:

Order the modification kit from National Parts and install as per instructions included in the kit.

Catalog # 26-1080

Part # AX-7098

NOTE: The AC harness portion of this modification is mandatory to all power supplies. The resistor modification applies only to Tandy power supplies.

DATE: October 10, 1984
REVISION DATE: October 10, 1984
BULLETIN NO.: 4:26
PRODUCT: 26-1069A Model 4 Gate Array
SUBASSEMBLY: AW-3306 Harness Assembly

PURPOSE: To eliminate noise injected on to 12V DC line by the monitor PCB

DISCUSSION: Excessive noise has been found to be present on the 12V line on the Model 4 Gate Array. This noise is being injected on to the DC lines by Video Monitor PCB. In order to remedy this problem a new harness has been manufactured which includes a toroid coil on the 12V line.

PROCEDURE:

- 1.) On any units in for service the video harness should be checked to see if it contains a toroid coil around the 12V lines. If it does not, replace it with the harness assembly listed below.

Catalog# 26-1069A Part# AW-3306

NOTE: If you wish to modify the harness yourself the orange and green leads must be lengthened 10 inches and wrapped around the toroid coil 8 times.

Toroid Coil Catalog# 26-1069 Part# ACA-8293

DATE: October 12, 1984

REVISION DATE: October 12, 1984

BULLETIN NO.: 4:27

PRODUCT: 26-1067/8/9 Model 4

SUBASSEMBLY: AX-9382 16K Main Logic Board.
AX-9383 64K Main Logic Board.

PURPOSE: Increase video stability.

DISCUSSION: Unstable or "swimming video" has been noted in some Model 4 computers. In many cases existing modifications clear the problem. However, an additional step may be required. Replacement of C210 with a negative coefficient capacitor may be necessary.

PROCEDURE: Remove the existing tuning capacitor C210 on the Model 4 main logic PCB and replace it with a negative coefficient type. This Capacitor is available through National Parts under catalog number 26-4004, Part Number ACF-7364. This Component is the same as the one used in the Model 12 FDC circuit, and the 8X300 hard drive controller VCO circuit.

DATE: September 21, 1984

REVISION DATE: September 21, 1984

BULLETIN NO.: 4:28

PRODUCT: 26-1069A Gate Array

SUBASSEMBLY: Drive Logic Board AX-9574

PURPOSE: To explain the Test points for alignment.

DISCUSSION:

The gate array logic board for the floppy disk drives contains only four IC's. The test points are as follows:

PROCEDURE:

TEST	CHANNEL A	CHANNEL B	SYNC
RADIAL	TP2	TP3	TP1
AZIMUTH	TP2	TP3	TP1
HEAD AMPLITUDE	TP2	TP3	TP1
INDEX	TP2	TP3	TP1
GND	GND	GND	GND
TRACK ØØ	PIN 15 U-3		CHN A
RAW DATA	TP6 Adjust R16		CHN A

MOTOR SPEED MAY BE ADJUSTED WITH VARIABLE RESISTOR R7

Radio Shack®

DATE: September 24, 1985

REVISION DATE: September 24, 1985

BULLETIN NO: 4:29

PRODUCT: 26-1070 Model 4D

SUBASSEMBLY: AX-9499 Gate Array Main Logic Board REV. C

PURPOSE: To discuss upgrade procedure to 128K for Model 4D.

DISCUSSION: The Model 4D Gate Array Main Logic Board comes with 64K of RAM already installed in it. There is a new REV. C Gate Array Main Logic Board which has a jumper labeled JPR 13. It is a 3 position pin configuration with a push on jumper on the top two pins for 64K and on the bottom two pins for 128K. If the Gate Array Main Logic Board is REV. B or earlier refer to Technical Bulletin 4:21 for the proper upgrade procedure.

PROCEDURE: Move jumper JPR 13 from the top position to the bottom position, install the 2nd bank of RAM and verify proper operation by running the M4MEM/CMD diagnostic program off of your Model 4/4P diagnostic diskette.

Date: June 17, 1985
To: All Computer Service Personnel
From: Technical Support ✓
Subject: Rescind Technical Bulletin 4:29

With this memo is a revised Technical Bulletin dealing with Network 4 installations (I/O:51). Replace Technical Bulletin 4:29 dated April 24, 1985 with this memo. A new 4:29 will be reissued at a later date.

DATE: February 15, 1985
REVISION DATE: February 15, 1985
BULLETIN NO.: 4:29
PRODUCT: 26-1136/37 Network 4
SUBASSEMBLY: N/A

PURPOSE: Installation procedures for Network 4.

DISCUSSION: The Network 4 is a daisy chain Local Area Network which allows up to 63 Model 4 student stations and 1 master station to be hooked together in a network. In order for a machine to function in the network it must have a Network 4 upgrade kit installed. The computer may use either a master or a slave upgrade kit, the only difference between the two being that the master kit includes an extension cable for the I/O port to enable both a hard disk and the network board to be installed. Each machine has a number from 0 to 63 which is setup by means of a dip switch on the back panel. No two computers may have the same number and the master must be number 63. Installation procedures for these kits are given below.

PROCEDURE:

- 1.) Remove the case top and the RFI shield covering the main CPU. Remove the screw clip from the old RFI shield and put it on the new one.
- 2.) Remove the connector bracket that holds the power cord and cassette connector by removing the four base screws and the ground screw. The power cord must be unsoldered from the power switch at this time.
- 3.) The cassette connector and power cord must now be removed from the back plate by squeezing the sides of the connectors with a pair of pliers. The torroid ring must also be removed from the power cord.
- 4.) Attach the 50-pin I/O edge card connector to the CPU I/O port leaving the female socket on the inside and the expansion edge card connector (if the kit is a master kit) on the outside. If installing a master kit, install the card adapter provided in the external card edge connector.

— Radio Shack® —

- 5.) Remove the old "C" ROM (U70) from the CPU and install the ROM provided with the upgrade kit. The Model 4 memory test must also be run in order to verify that the "A" ROM checksum is B504/DA42 or 8F46, the correct version to work with the Network ROM. If the unit is a Gate Array Model 4, the "D" ROM (U4) must be replaced with a different ROM, part# MX-3084 under catalog# 26-1136.
- 6.) Mount the power cable and cassette connector on the new rear panel connector bracket supplied with the kit. Rewrap the torroid coil the same way it was before and resolder the power cable to the power switch. Mount the new back panel onto the computer.
- 7.) Mount the new RFI shield containing the Network 4 PCB. Connect the 50-pin cable to the header on the Network PCB. Connect the 10-pin cable between the dip switch assembly on the back panel and the Network 4 PCB.
- 8.) If the computer is a regular Model 4 with a 65 watt power supply, pull the 2-pin power supply connector from the harness and plug it into the 2-pin connector on the Network 4 PCB.

If the power supply is a 38 watt power supply, the power connector from the upgrade kit must be used. This cable is plugged into the floppy drive power supply and takes the place of the FDC power cable unless the unit contains only one power supply. If the unit contains only one 38 watt power supply and has a RS-232 board the yellow wire must be removed from the CPU plug and installed into the new power cable in the open slot. The new power cable must then be substituted for the old CPU harness.

If the unit is a Gate Array Model 4 you must add the new power cable to the D.C. harness. To do this, cut off the 4-pin connector and insert the brown lead into one of the "common" slots (the first three slots) of the harness. Then insert the red lead into one of the "V1" (the next three slots) of the power supply connector.

- 9.) Tie off all of the cables with tie-wrap and replace the case top.
- 10.) Run Network 4 diagnostics and verify proper operation of the machine.

DATE: March 8, 1985
REVISION DATE: March 8, 1985
BULLETIN NO.: 4:30
PRODUCT: 26-1069/A Model 4
SUBASSEMBLY: AX-9574 Gate Array Drive Logic

PURPOSE: Modification to eliminate errors when stepper motor is put into low current mode.

DISCUSSION: When the stepper motor is not actually stepping, the Gate Array IC on the drive logic board places the stepper in low current mode so as not to cause excessive power drain on the system. This is done by removing power to two of the phases of the motor. It has been found that in doing this the stepper may drift off track causing problems during the next read or write. Indications of this are read/write errors, problems locating programs on a disk. This has been remedied by adding a piggy-back chip to the gate array which causes power to be removed from all phases of the stepper between seeks.

PROCEDURE:

- 1.) Replace the Gate Array IC (U3) with the modified Gate Array IC. The modified IC can be identified by a 7416 piggy-backed on top of it. This IC is available from National Parts under:
Part# MX-2983 Catalog# 26-1069A
- 2.) Test the drive completely to verify proper operation.

DATE: May 1, 1985
REVISION DATE: June 18, 1985
BULLETIN NO: 4:31
PRODUCT: 26-1067/8/9 Model 4
SUBASSEMBLY: ATA-1055 Astec 38 watt switching power supply

PURPOSE: To aid in the repair of the Astec 38 watt power supply.

DISCUSSION:

Failures of the 38 watt power supply can usually be traced down to one or two components which are readily available and inexpensive to replace.

The most common failure is with the fusible resistor R25. This 2 ohm, 2 watt resistor is designed to act as a fuse and open should excessive current flow through the input filter.

Another common failure is with the bridge rectifier DB1. DB1 converts the A.C. voltage off the line into rapidly pulsating D.C. Should one of the diodes within this component short, excessive current would cause the fusible resistor R25 to open.

Transistor Q2 is the main switching transistor. Each cycle of operation brings this transistor into saturation (maximum current flow), so a failure here is not too uncommon.

Along with transistor Q2, R10 is also in the primary circuit. R10 is a current sensing device. Should excessive current flow through R10, transistor Q1 would turn on, which in turn turns off Q2, shutting down the power supply. This is the over current protection and regulatory circuitry. Should Q2 fail by shorting, R10 will burn.

If the power supply "chirps", it is working but the over voltage protection circuit is being activated shutting the system back down. Should the 5 volt output exceed approx. 5.8 volts, zener Z1 will conduct turning on SCR1. When SCR1 turns on, a direct short across the +12 volt output forces excessive current to flow through Q2 on the primary side. This excessive current will be sensed by R10 and the over current protection would be activated.

***** CAUTION *****
***** DANGEROUSLY HIGH VOLTAGES ARE PRESENT *****
***** ALWAYS USE AN ISOLATION TRANSFORMER *****
***** WHEN ANY POWER SUPPLY IS UNDER TEST *****

PROCEDURE:

- Step 1: With an ohm meter, check the resistance of R25 and replace if found open. Do not apply power yet until reason for failure has been found. (see step 2)
- Step 2: With an ohm meter, check all four diodes within DB1. If any are found shorted, replace DB1. If any diode within DB1 has shorted, R25 is sure to burn open.
- Step 3: Check transistor Q2 for a short or open across the collector-emitter. This is the most common type of failure. Also check the resistance of R10 for .75 ohms. If Q2 shorts it may cause R10 to burn open.
- Step 4: Listen for power supply "chirping". Examine cables for shorts. Check for shorts across any of the outputs. Should transistor Q3 or Q1 fail, there would be no +5 volt regulation, the output of the +5 volts would rise triggering SCR1. Replace as needed Q1, Q3, SCR1, Z1.

Common Parts List:

R25	2 ohm, 2 watt resistor	ARX-0251	Catalog 26-1062
DB1	200 volt PIV bridge rectifier	ADX-1709	Catalog 26-1062
Q2	2SC-2502 transistor	2SC2502	Catalog 26-1062
R10	.75 ohm, 1/2 watt resistor	AN-0196EEC	Catalog 26-1160
Q3	B561 transistor	MX-3106	Catalog 26-1062
Q1	D467 transistor	MX-4331	Catalog 26-1062
Z1	5.8 volt zener diode	ADX-1633	Catalog 26-1062
SCR1	GE-8252 rectifier	ADX-1642	Catalog 26-1062

DATE: May 18, 1985
REVISION DATE: May 18, 1985
BULLETIN NO.: 4:32
PRODUCT: 26-1069A Model 4 Gate Array
SUBASSEMBLY: AX-9499 Main Logic PCB

PURPOSE: To allow use of VTI gate array for timing purposes.

DISCUSSION: Some Model 4 Gate Array machines contain a VTI gate array IC in position U9. Most of the older machines will contain a Mantra gate array IC. The VTI IC is identified by the letters VTI on the IC, the Mantra by the letters MHS. If this IC is ordered either part may be received. Either chip may be used as a replacement for the other by following the procedures below.

PROCEDURE:

To replace a Mantra IC with a VTI IC:

- 1.) On the component side of the board cut the trace at U9 pin 2 directly at the IC pin.
- 2.) On the solder side of the IC cut the traces at U9 pins 21 and 22.
- 3.) On the solder side of the board add a 1K 5% 1/4W resistor from U9 pin 2 to the bottom side of R14 (this is the side closest to pin 5 of U9). Use heat shrink to insulate this and the other resistors to prevent shorting.
- 4.) Add two 82 ohm 5% 1/4W resistors, one across each of the cuts made in step 2 above at U9 pins 21 and 22. Insulate with heat shrink.
- 5.) Add two jumpers on the component side of the board for grounding purposes. The first jumper should go from the top land left vacant by the missing capacitor C93 located to the right of RAM chip U85, to the feed thru coming off the bottom of C120 closest to J4. The second jumper should be made from the top land of missing capacitor C102 located to the right of U88 to the ground plane next to J6.

- 6.) Check your work for possible shorts and verify proper operation of the machine.

To replace a VTI IC with a Mantra IC:

- 1.) Check to insure that the modifications mentioned above to allow use of the VTI gate array chip have been done to this board.
- 2.) Add a wire jumper across the 1K resistor installed from pin 2 of U9 to the bottom of R14.
- 3.) Install the Mantra gate array and verify proper operation of the machine.

The parts needed for this modification may be obtained under the following part numbers:

1K ohm 5% 1/4W resistor	Part# N-Ø196EEC	Catalog# 26-9999R
82 ohm 5% 1/4W resistor	Part# N-Ø122EEC	Catalog# 26-9999R

DATE: January 20, 1986
REVISION DATE: March 13, 1986
BULLETIN NO: 4:33
PRODUCT: 26-1069A Model 4 Gate Array
 26-1070 Model 4D
SUBASSEMBLY: AX-9499 Main Logic Board
SUBASSEMBLY REVISION: Rev. A, Rev. C

PURPOSE: To prevent spurious characters being read from the keyboard when operating in the TRSDOS 6.x environment.

DISCUSSION:

To prevent spurious characters being read from the keyboard in the TRSDOS 6.x environment, the resistor pack at RPL must be a 10 pin, 820 ohm resistor pack. If it is a 1500 ohm resistor pack, spurious characters will be displayed on the CRT if two keys in the same scan row of the keyboard are pressed simultaneously while operating under TRSDOS 6.x.

**** Compliance With This Bulletin Is Mandatory ****

PROCEDURE:

Check the value of the resistor pack located at RPL on the main logic board. If it is not an 820 ohm resistor pack, replace it with a 10 pin, 820 ohm resistor pack. This part may be ordered as:

part # ARX-0388, cat. # 26-1069A

After replacement, check the correct operation of the keyboard under TRSDOS 6.x.

DATE: January 31, 1986
REVISION DATE: January 31, 1986
BULLETIN NO: 4:34
PRODUCT: 26-1070 Model 4D
SUBASSEMBLY: AXX-5056 TEC FB503 5 1/4" Double Sided Disk Drive
SUBASSEMBLY REVISION: All revision levels.

PURPOSE: To discuss test points and motor speed adjustment for the Model 4D double sided disk drives.

DISCUSSION/PROCEDURE: The Model 4D microcomputer comes with TEC FB 503 double sided, double density drives installed in it, yielding a storage capacity of 368K per double sided floppy disk.

The test points for this drive are listed below. Motor speed is adjustable by a pot labeled VR1 on the underside of drive, accessible through a small hole in the circuit board.

TP1-1	N/C	TP2-1	STEP PULSE
TP1-2	GROUND	TP2-2	TRACK 00
TP1-3	PRE-AMP OUTPUT	TP2-3	READ DATA
TP1-4	PRE-AMP OUTPUT	TP2-4	INDEX PULSE
		TP2-5	GROUND

A service manual is available from National Parts.
Part # MS-2601070 Catalog # 26-1070

DATE: February 18, 1986
REVISION DATE: February 18, 1986
BULLETIN NO: 4:35
PRODUCT: 26-1069A/1070 Model 4 Gate Array, Model 4D
SUBASSEMBLY: AX-9499 Gate Array Main Logic
SUBASSEMBLY REVISION: Rev.C

PURPOSE: To eliminate shakey video with VTI gate array.

DISCUSSION: The following outlines changes to the clock circuitry around timing array U9 in order to improve the stability of the clock. This will eliminate shakey video when using a VTI array. If you have a VTI chip in position U9 and are experiencing shakey video, perform the modifications listed below.

PROCEDURE:

- 1.) Replace resistor R70 with a 510 ohm 1/4W resistor.
- 2.) Add a 2200 pfd capacitor from U9 pin 12 to U9 pin 24.
- 3.) Remove the ground wire connected to U9 pin 12.

Parts for the above modifications may be ordered as listed below.

Resistor 510 ohm 1/4W Part# N-0173EEC Catalog# 26-9999R
Capacitor 2200 pfd Part# CC-222KJCP Catalog# 26-9999C

DATE: July 7, 1986
REVISION DATE: July 7, 1986
BULLETIN NO: 4:36
PRODUCT: 26-1067/68/69/69A/70 Model 4/4 Gate Array/4D
SUBASSEMBLY: MX-5244 64K Dynamic RAMs
SUBASSEMBLY REVISION: All revision levels.

PURPOSE: To insure the use of 128 cycle, 2 msec refresh dynamic RAMs in the Model 4/4 Gate Array/4D Z-80 environment.

DISCUSSION:

The Z-80 system in the Model 4 is designed to use a 128 cycle, 2 msec. refresh. Certain manufacturers' RAM chips require a 256 cycle, 4 msec. refresh. If RAM chips with 256 cycle, 4 msec. refresh are used in a system designed for 128 cycle, 2 msec. refresh, the data will not be refreshed properly causing loss of data and/or computer lockup.

PROCEDURE:

Check the RAM chips in the computer. insure that **only the following** manufacturers' RAM chips are used.

Motorola - These RAMs can be identified by either an MCM designation before the RAM ID number, for example MCM6664A-20, or by an M with a circle around it, followed by the Radio Shack manufacturers' part such as 8040665.

Hitachi - These RAMs can be identified by an HM designation before the RAM ID number, for example HM4864AP-20. Also the name HITACHI may be written on the chip itself.

Mostek - These RAMs can be identified by an MK designation before the RAM ID number, for example MK4164-20. Also, the name MOSTEK may be written on the chip itself.
