TECHNICAL BULLETIN INDEX
Sorted by Bulletin Number
06/25/86

No.	Catalog	Description	Rev. Date
12/16B:001	26-4004	Differences between Motorola PCB in Model 16 & 12.	01/10/83
12/16B:002	26-4004	Increase the reset circuit's drive capability.	06/17/85
12/16B:003	26-4004	U81 powers up in an unknown state.	06/18/85
12/16B:004	26-4004	Bisync modifications procedures.	01/17/83
12/16B:005	26-4004	Mother board problem with interrupt daisy chain.	02/02/83
12/16B:006	26-4004	DMA modification.	06/17/85
12/16B:007	26-4004	Breaking of 10 pin connector on video driver PCB.	06/01/83
12/16B:008	26-4004	Proper drive termination.	06/07/83
12/16B:009	26-4004	Proper PCB jumpering for Model 12 and Model 16B.	09/27/83
12/16B:010	26-4004	Installation instructions for cooling enhancement.	07/12/84
12/16B:011	26-4004	Increase SIO reliability and make CD normally true	06/21/85
12/16B:012	26-4004	Slow video RAM access to increase data reliability	10/27/83
12/16B:013	26-4004	To reduce temperature drift of FDC chip.	10/17/83
12/16B:014	26-4004	To correct possible printer not ready.	06/17/85
12/16B:015	26-4004	Using new style delay line as a replacement part.	11/08/83
12/16B:016	26-4004	FDC alignment procedure.	11/29/83
12/16B:017	26-4004	To correct repeatedly breaking card guides.	11/11/83
12/16B:018	26-4004	Instructions for the Banked CP/M upgrade.	06/24/85
12/16B:019	26-4004	Switch settings for 68000 memory boards.	01/16'84
12/16B:020	26-4004	Brilliance problem in the Video Monitor.	01/31/84
12/16B:021	26-4004	Problems with Xenix on floppy drives.	05/01/84
12/16B:022	26-4004	Test point comparison for direct drive floppy.	03/12/84
12/16B:023	26-4004	Correction for low 5 volt supply in card cage.	09/04/84
12/16B:024	26-4004	Memory buffer problems on 68K RAM boards.	08/27/84
12/16B:025	26-6006	Eliminate "HN ERROR" on internal hard drive.	05/01/84
12/16B:026	26-4004	Power supply going into current limiting mode.	05/23/84
12/16B:027	26-6006	Hard drive power supply jumpered wrong.	06/11/84
12/16B:028	26-6002	Identify problems with direct drive floppys.	11/13/84
12/16B:029	26-6006	Cooling enhancement fan mount with RCA monitor PCB	08/09/84
12/16B:030	26-4004	Boot errors on the direct drive Tandon floppy.	10/02/84
12/16B:031	26-4004	Increase reliability of RCLOCK on VDG board.	10/17/84
12/16B:032	26-6006	Correct RFI between internal Hard and floppy drive	10/23/84
12/16B:033	26-6004	To allow system to boot TRSDOS 16.	06/17/85
12/16B:034	26-4004	Decoding chips on 68K CPU causing XENIX errors.	12/27/84
12/16B:035	26-6014	Correct timing to memory brd during write cycle.	02/13/85
12/16B:036	26-6014	To correct timing error.	01/21/85
12/16B:037	26-6014	Insure good ground between 68K CPU and RAM boards.	01/16/85
12/16B:038	26-6014	Outline 8 MHz upgrade procedure.	03/19/85
12/16B:039	26-6004	Faulty Texas Instruments "AS" type parts.	03/11/85
12/16B:040	26-6004	To correct errors in artwork.	08/27/85
12/16B:041	26-4004	Modifications for use of 512k/1 meg 68000 RAM PCB.	06/19/85
12/16B:042		Not Released	
12/16B:043	26-4004	Correct an error in installation of R87.	05/29/85
12/16B:044	26-6004	Modification for Xenix 3.0 on a 6 Mhz CPU board.	07/11/85

DATE: January 10, 1983

REVISION DATE: January 10, 1983

BULLETIN NO.: 12/16B:1

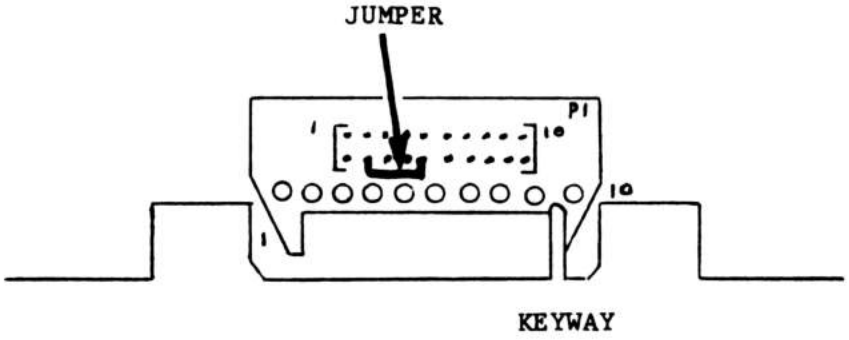
PRODUCT: 26-4004/5 (Model 12)

SUBASSEMBLY: Motorola Video Board

PURPOSE: To explain the differences between Motorola driver board used in the Model 16 and the version used in the Model 12.

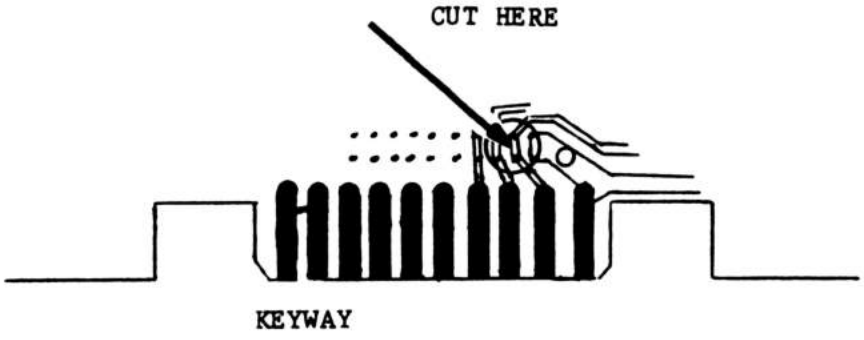
DISCUSSION: The Model 16 can use either an unmodified or modified Motorola video board, although it comes with an unmodified board. The Model 12 **must** use a video board that has been modified with a cut and jumper. This modification allows the video signal from the video/keyboard interface board to be routed through the video driver board on its way to the brightness control. This modification must be done to any Motorola board that is used in a Model 12.

PROCEDURE: The modification consists of a jumper that connects pin 2 of P1 to pin 5 placed in the holes closer to the edge connector as shown in figure 1. Then a cut must be made between the 2 holes in the trace that is connected to pin 2 which will disconnect pin 2 from the rest of the PC board as shown in figure 2.



COMPONENT SIDE VIEW

Figure 1



FOIL SIDE VIEW

Figure 2

DATE: January 10, 1983

REVISION DATE: June 17, 1985

BULLETIN NO.: 12/16B:2

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9364 Main Logic Board (Rev. PP3, Rev. Blank)

PURPOSE: To increase the reset circuit's drive capability.

DISCUSSION/PROCEDURE:

** **Compliance With This Modification Is Mandatory** **

Due to the number of IC's attached to the reset line of the Model 12/16B, the output of the reset circuit must be increased. Without the correct part on the reset line, fan-out problems may occur and the machine may not reset correctly. **This is only required on early Model 12's with the Rev. PP3 or Rev. Blank main logic boards.** To make the change, U16 (a 74LS04) must be removed and replaced with a 74S04. This part may be ordered as:

part # AMX-4945, cat. # 26-4005

Note: This modification does not apply to Rev. A main logic boards.

DATE: January 10, 1983

REVISION DATE: June 18, 1985

BULLETIN NO.: 12/16B:3

PRODUCT: 26-4004/5, 26-6004/5/6; Models 12 and 16B/B+

SUBASSEMBLY: AX-9364, main logic board (version PP3)

PURPOSE: To correct power-up problems by making U81 power up into a known state.

DISCUSSION: Since U81 uses the "CASEN" and the "MEMREQ*" signals to aid in the development of "CAS*" this power up problem might be seen as "BOOT ERROR MF."

****NOTE****

This Technical Bulletin has been incorporated into Revision A (REV A) main logic board (AX-9364). **Do not apply this bulletin to REV A boards**

PROCEDURE: U81, a 74S112 JK flip flop in the CAS* circuit, should power up in the preset state. To be sure this happens, the trace connected to pin 4 of U81 should be cut near the IC and a jumper installed connecting U81 pin 4 and U51 pin 1. This connects the preset input of the flip flop to the reset signal of the computer and assures that the flip flop will power up in the preset state.

DATE: January 17, 1983

REVISION DATE: January 17, 1983

BULLETIN NO.: 12/16B:4

PRODUCT: 26-4004/5 (Model 12)

SUBASSEMBLY: Main logic board

PURPOSE: To show how to modifiy the main logic board of the Model 12 for customers who request BISYNC operation and how to test it afterwards.

DISCUSSION: Synchronous operation (BySync) requires that the clock for the receive and transmit channels of the SIO be disconnected from the CTC and supplied by the device that the Model 12 is communicating with.

PROCEDURE: Before doing any modification run a full test of the serial channels using AUTO3 or the Model II family System Test.

After verifying proper operation of the SIO and CTC chips, ask the customer if the computer is going to be used with a modem or wired directly to another computer (this information will be needed later).

Remove jumpers E10-E11 and E53-E54 and install jumpers E53-E55, E9-E10, and E11-E12 as shown on page 4 in figure 2. You will need an additional jumper, National Parts part number AJ-6769 jumper plug. If these are not in stock wire wrap can be used instead.

The loopback connector used with AUTO3 should be modified as shown on page 5. The connector will then be usable on both BISYNC and async computers. Run AUTO3 or the Model II family System Test on the modified computer with the modified loopback connector to verify the hardware and jumpers.

If the Radio Shack BiSync package (26-4716) is available it should also be run to test out the SIO chip. This procedure follows.

Most modems for BiSync have an AL test switch on them. This stands for Analog Loopback test. The 3780 BiSync package (26-4716) has an ALTEST command to test modem operations.

If no modem is available, it is possible to fool the computer into thinking there is a modem attached in the AL test position by making a DB25 connector with the following pins shorted:

2-3 4-5 6-20 15-17-24

Install this connector on the Port A jack and execute BIS3780 from TRSDOS. After the prompt appears, type ALTEST and press <ENTER>. All errors will be displayed. If no error messages appear then the system is working properly. This connector should be used to test the modification because the customers modem may not be configured correctly.

This package (26-4716) is NOT to be transferred into a shop. Use a customer or store copy of the package for the test.

ONCE THE BOARD HAS BEEN TESTED.

If it is going to be used with a modem the main logic board should be modified as shown in figure 3 by removing E10-E9. If it is going to be wired directly to another computer it should be left as in figure 2. Also, it is recommended that the customer use a 12 conductor cable on their serial channel instead of a 25 conductor cable.

EXPLANATION OF OPERATION

Jumpering changes to the RS232:

Looking at the schematic on page 6, the new jumper positions take the transmit clock for channel A and connects it to pin 24 of the DB25 for channel A. This breaks the connection between the transmit clock and the SIO chip. The transmit clock will now be provided by the modem through pin 15 of then DB25 connector (I/O XMIT S.E.T.). The clock for the receive section of SIO channel A now comes from pin 17 of the DB25. This means that we are now using two sections of U23 and one section of U14 that have been previously unused.

NOTE:
Due to the fact that previously unused gates are now being used, it is strongly recommended that a modified and tested CPU board be taken along on any field service conversions.

No changes have been made to channel B and its operation with a printer or other software is unaffected.

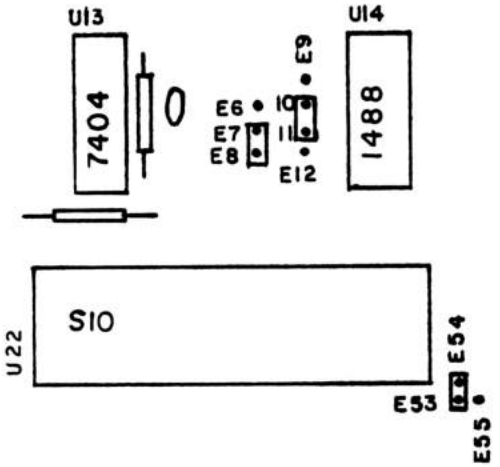
Channel A can be made to function as it did before the modification so it can be used with a modem I or II if the transmit clock is fed back to the SIO chip. A cable can be made for use with non-BySync modems by shorting pins 15, 17, and 24 together on the end connecting to the computer.

Both in async (normal) and BiSync modes a terminator is still required for any unused serial channel of the computer.

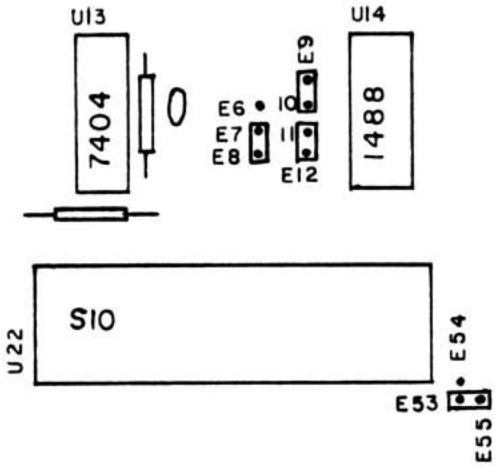
The reason for the two different modifications is that the transmit clock on channel A can cause noise problems when it is connected to the RS232 cable. When a modem is used with the computer this signal can be eliminated which reduces the noise problems. This signal is needed only when a loopback connector is used or two computers are wired directly together without modems.

NOTE: Radio Shack software (i.e. TERMINAL) and hardware (some modems), may not function properly with these modifications unless other changes are made that we cannot be responsible for.

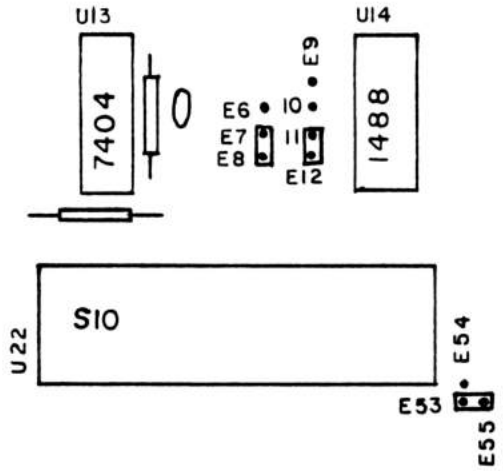
Jumpers for the Main logic board for use asynchronously (normal):
Figure 1



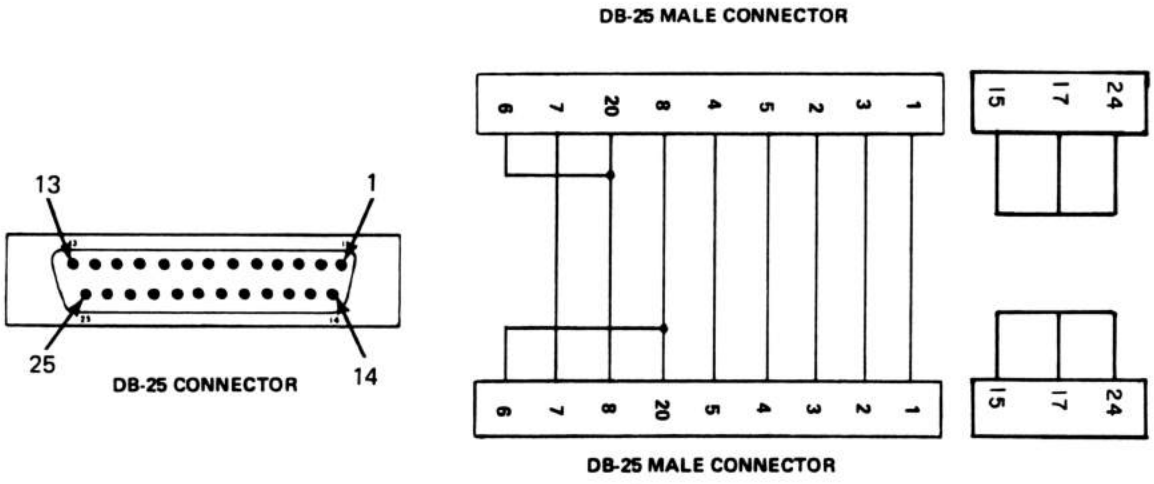
Jumpers for the Main logic board for use with another computer (Direct Wire) & the ALTEST DB25 connector
Figure 2:



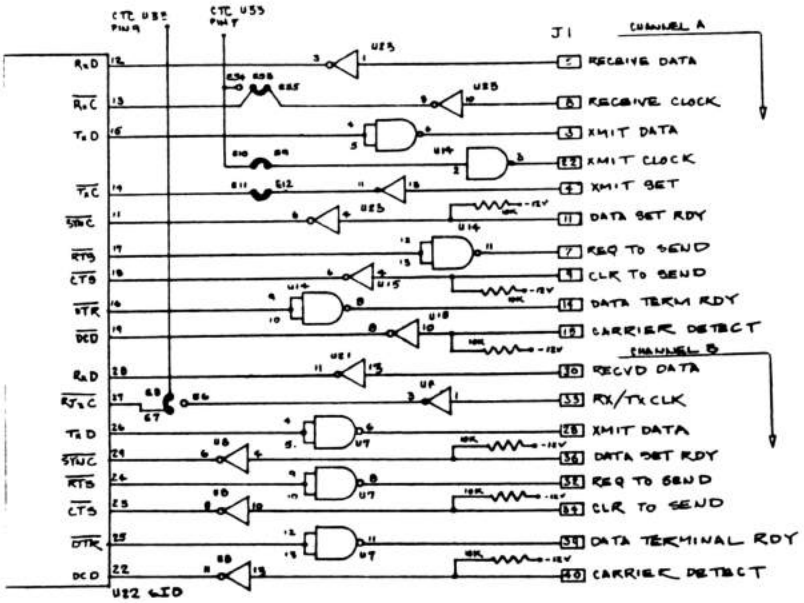
Jumpers for the Main logic board for use with a modem
Figure 3:



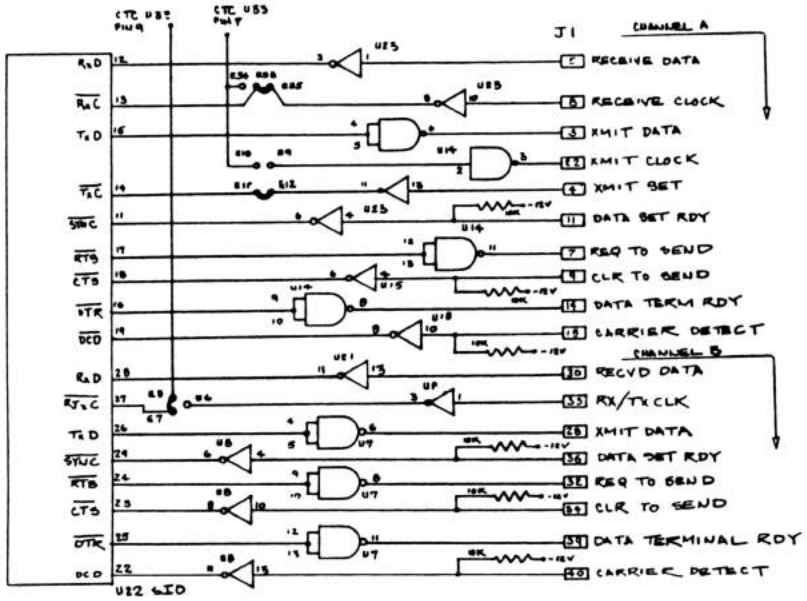
Loopback connector modifications



Schematic changes



WITHOUT MODEM



WITH MODEM

DATE: February 2, 1983

REVISION DATE: February 2, 1983

BULLETIN NO.: 12/16B:5

PRODUCT: 26-4004/5

SUBASSEMBLY: Mother board

PURPOSE: To correct an error in the interrupt daisy chain.

DISCUSSION: An error in the artwork of the mother board (revision PP4), will cause the 1st slot of the mother board to not function properly when a board using Z-80 family interrupts is installed.

PROCEDURE: Just above the point where the mother board plugs into the main logic board cut the two traces going to pins 13 and 14 of the plug (figure 1). Then run a jumper from pin 14 of the plug that goes into the mother board to pin 13 of the first socket in the mother board (J1).

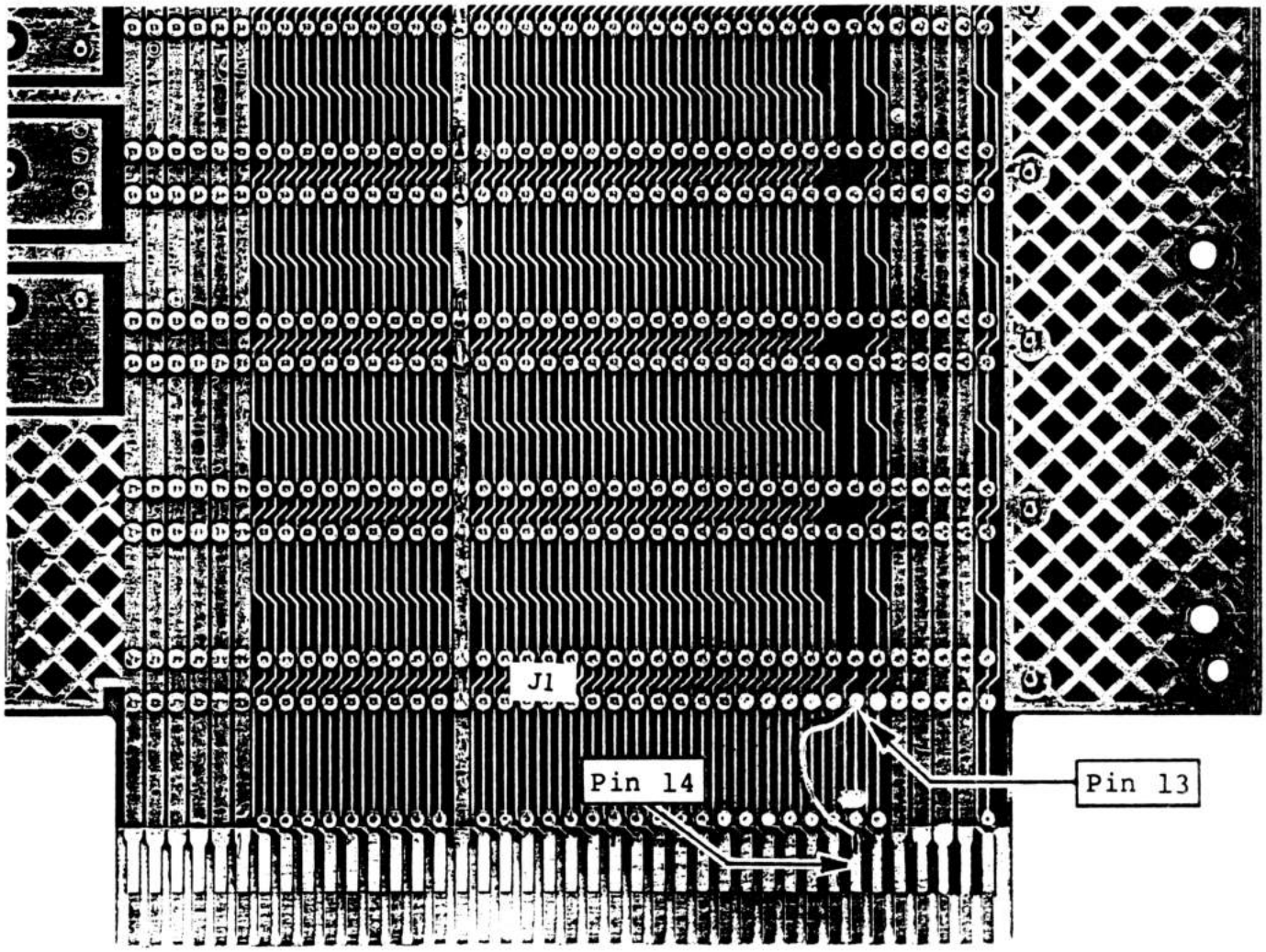


Figure 1

DATE: February 8, 1983

REVISION DATE: June 17, 1985

BULLETIN NO.: 12/16B:6

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9364 Main Logic Board (Rev. PP3, Rev Blank)

PURPOSE: To correct an error on the logic board that can cause the computer to lock up. When this occurs, the manual reset button will not function.

DISCUSSION:

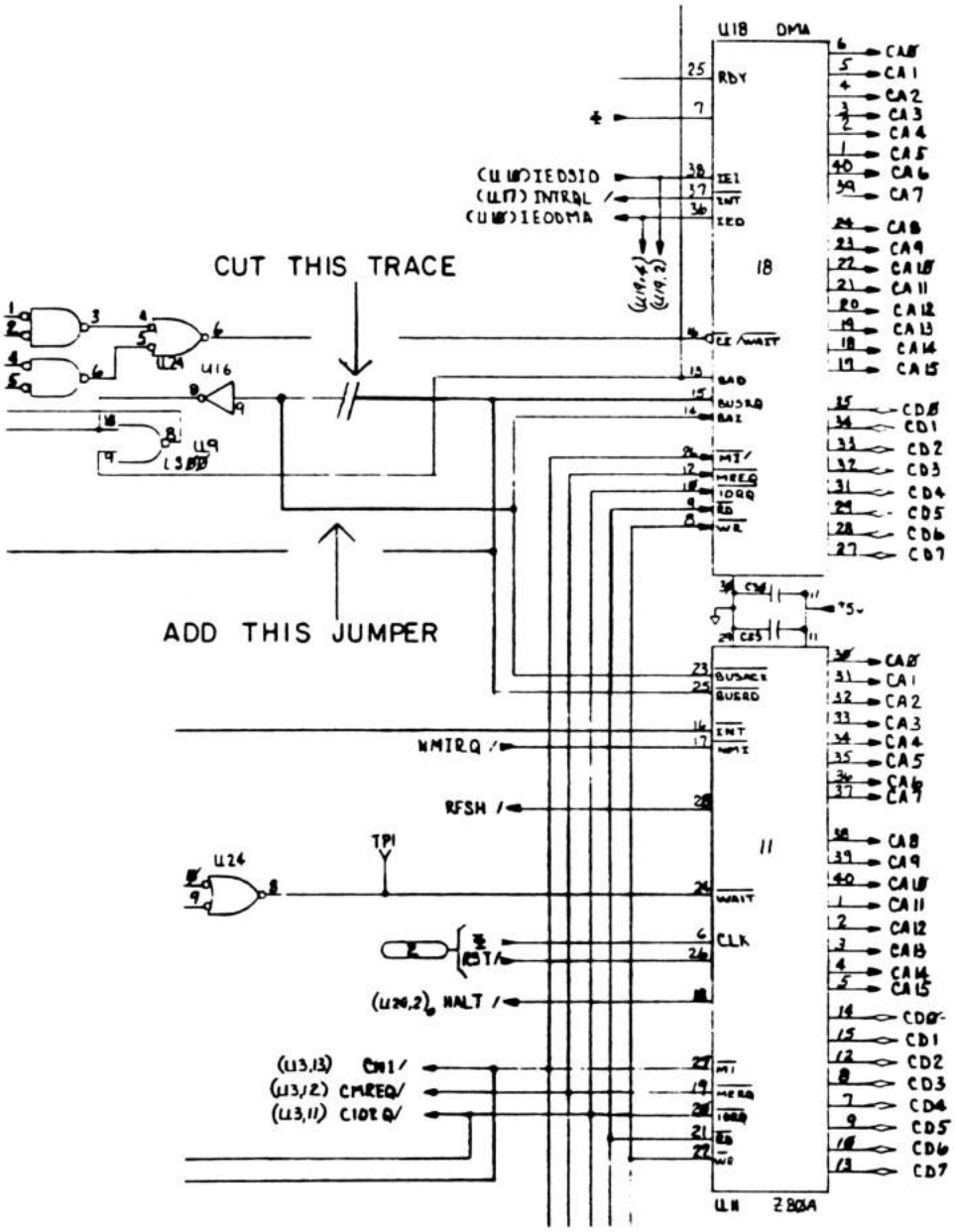
The DMA is being inadvertently selected at times causing 'garbage' to be written to the control registers. The modification described below will keep the DMA from being selected and will keep the Model 12/16B from locking up. **This modification applies to all Model 12/16B's with a Rev. PP3 or Rev. Blank main logic board.**

** Compliance With This Bulletin Is Mandatory **

PROCEDURE:

Cut the trace connected to U16, pin 9 right at the pin on the solder side of the board. Then connect a jumper from U16, pin 9 to the feedthrough connected to U11, pin 23.

Note: **This modification does not apply to Rev. A main logic boards.**



DATE: June 1, 1983

REVISION DATE: June 1, 1983

BULLETIN NO.: 12/16B:7

PRODUCT: Model 12 (26-4004/5)

SUBASSEMBLY: Video board

PURPOSE: To prevent breakage of the 10 pin connector on the video driver board in Model 12's with a card cage (26-6017).

DISCUSSION: When removing the top from a Model 12, a problem has occurred, the breaking of the 10 pin connector on the video driver board. This is due to tension on the cable between the video driver board and the video/keyboard interface board. To keep this from happening in the future, disconnect the video cables from the video/keyboard interface board before opening the case.

DATE: June 7, 1983

REVISION DATE: June 7, 1983

BULLETIN NO.: 12/16B:8

PRODUCT: 26-4004/5 One or Two drive Model 12
26-6004/5 One or Two drive Model 16B
26-4165/6 Thinline Expansion Bay

SUBASSEMBLY: N/A

PURPOSE: Proper termination for Thinline bay with a Model 12 or 16B.

DISCUSSION/PROCEDURE: On the internal drives in the Model 12/16B ONLY one drive is terminated. Locate resistor pack RP1. ALL pins of the resistor pack should be installed. The resistor pack is installed on the last drive on the cable.

On external drives in the Thinline expansion bay ONLY the last drive on the cable is terminated. The resistor pack is locationed at RP1. ALL pins on the resistor pack are used.

NOTE: Thinline bays from the factory are terminated for a Model 16 and the termination needs to be changed for use with a Model 12/16B.

DATE: July 5, 1983

REVISION DATE: September 27, 1983

BULLETIN NO.: 12/16B:Ø9

PRODUCT: 26-4ØØ4/5 26-6ØØ4/5 Model 12/16B

SUBASSEMBLY: AX-9364 Main Logic PCB

PURPOSE: To identify the proper jumpering for the Model 12 and Model 16B main logic board.

DISCUSSION/PROCEDURE:

The Model 12/16B jumpers are as follows:

E1-E2	Wait state inserted during M1 cycle.
E4-E5	8 MHZ Oscillator connected to clock divider.
E7-E8	Internal CTC clock source.
E1Ø-E11	Internal CTC clock source.
E15-E16	16k Ram operation.
E18-E19	2K by 8 ROM
E24-E25	No head load delay.
E27-E28	Ready signal source from floppy drive.
E31-E49	Normal FDC operation(E3Ø-E31 places FDC in test mode)
E42-E43	-5 vdc to pin 1 of U63 - U7Ø
E44-E45	-12 vdc to pin 8 of U63 - U7Ø
E46-E47	+5 vdc to pin 9 of U63 - U7Ø
E51-E52	Upper bank is 16K
E53-E54	Internal CTC clock source.

The following jumper is present only on the Model 12 main logic board:

E38-E39	Selects U63 - U7Ø as page 14 and 15.

On the Model 16B U63 - U7Ø are left blank and E38 - E39 is open.

Note: Always check all Model 16B units in for repair to make sure that E38 - E39 are NOT jumpered.

DATE: September 2, 1983

REVISION DATE: July 12, 1984

BULLETIN NO.: 12/16B:1Ø

PRODUCT: 26-6ØØ4/5/6 Model 12/16B/16B+

SUBASSEMBLY: AXX-7935 Cooling enhancment kit

PURPOSE: To improve cooling of computer.

DISCUSSION:

The following procedure is to be performed on Model 12 computers upgraded with 68ØØØ cards and all Model 16B or 16B+ computers. It involves relocating the current card cage fan, installing a new rear access panel, which has a new high velocity fan attached, and installing a new power supply wiring harness.

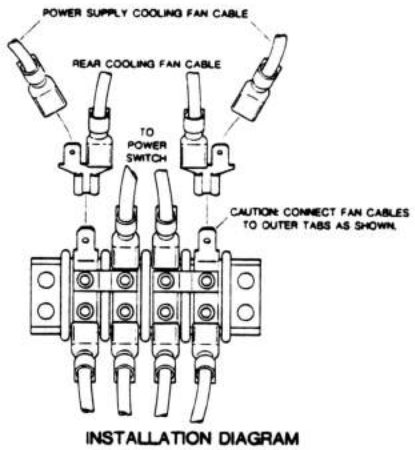
PROCEDURE:

1. Remove the top cover of the computer. Disconnect power supply, video, and ground wires to video driver board. Place the top half of the computer to the side.
2. Remove all the PCB's and disconnect the power cable from the card cage and then remove the card cage.
3. Remove the fan and the fan plenum that's attached to the card cage.
4. Remove the power supply's top plate by unscrewing the two screws towards the front of the computer and lifting the plate up. This part can be discarded.
5. Remove the power supply's rear plate by removing the two screws on each end and loosening the three screws in the middle. From it remove the power terminal block. The rear plate can be discarded.
6. Refer to the diagram on page 2 and disconnect the two AC wires, which are attached to the power supplies fan, from the terminal block. Attach the two "Y" spade connectors, supplied with the kit, in the position the AC wires had and then reconnect one of the AC wires onto one side of each "Y" spade (see note on page 2).
7. Disconnect the AC wire to the fan mounted on the new rear access panel. Attach the ends with the spade lugs to the "Y" spade connectors on the power terminal block.
8. Unplug the DC wire harness from the power supply and disk drives and remove it. If the unit has an internal hard drive the AC wire for the hard drive power supply will be wrapped with the DC harness. This wire should not be removed. Attach the power terminal block to the new power supply rear plate and then install the rear plate.

---

9. Using the new DC power harness attach the large plug to the power supply and route the longest wires, with the two small plugs, to the disk drives. Using two of the cable locks supplied attach them to the rear plate and place the disk drive power harness into them.
1Ø. Attach the fan you removed from the card cage to the new power supply top plate so the air flow arrow is pointing down.
11. Attach the new top plate, with the fan attached, to the rear plate with the two nuts and bolts supplied.
12. Of the two shorter DC power harness cables one has a heavier red wire than the other. Attach the plug with the thinner red wire to the main logic board. Reinstall the card cage and attach the plug with the heavier red wire to the card cage mother board.
13. Remove the metal mount supports from the computers rear access panel and install them on the new panel that has the large fan mounted to it.
14. Route the fan's AC cable around the card cage so the end connector can easily be attached.
15. Install the PCB's and reassemble the unit. When facing the rear of the machine affix the long self adhesive foam, supplied with the kit, to the left card holder. It should be affixed vertically such that the foam fills the gap between the plastic case and the card cage. Attach the shorter piece of foam to the base of the unit below the long piece. The foam prevents the air flow from going around the card cage forcing it to flow through the cage.
16. Plug in the fan on the rear access panel and install the panel.

NOTE: Some kits may not have the "Y" spade connectors. In this case the AC wire for the rear access panel fan needs to be spliced to the AC wires at the power terminal block. Be sure to wrap the splice in electrical tape to prevent shorting.



INSTALLATION DIAGRAM
COOLING FAN POWER CABLES

DATE: October 27, 1983

REVISION DATE: July 28, 1987

BULLETIN NO: 12/16B:11

PRODUCT: 26-4ØØ4/5 Model 12
26-6ØØ4/5/6 Model 16B/16B HD

SUBASSEMBLY: AX-9364 Main Logic Board

SUBASSEMBLY REVISION: Rev. Blank, Rev. A

PURPOSE: Modification to make carrier detect signal normally true and guarantee fail-safe signal level for SIO control signals. This modification may also correct problems with systems which will not initialize port B terminals in Xenix operation.

DISCUSSION:

To make the serial ports more reliable the pullups for SIO control signals need to be changed. The pullup for carrier detect needs to be changed not only in value, but from -12V to +12V so that it is normally true. This modification is required on all Rev. Blank boards.

On some boards which display problems initializing port B in Xenix operation (i.e. boards which refuse to communicate with terminals on port B), an additional modification may be necessary, which pulls carrier detect normally true on port B as well as on port A. This modification may be necessary on both Rev. Blank and Rev. A main logic boards.

** **Compliance with part (1) of the procedure is mandatory for Rev. Blank boards** **

PROCEDURE:

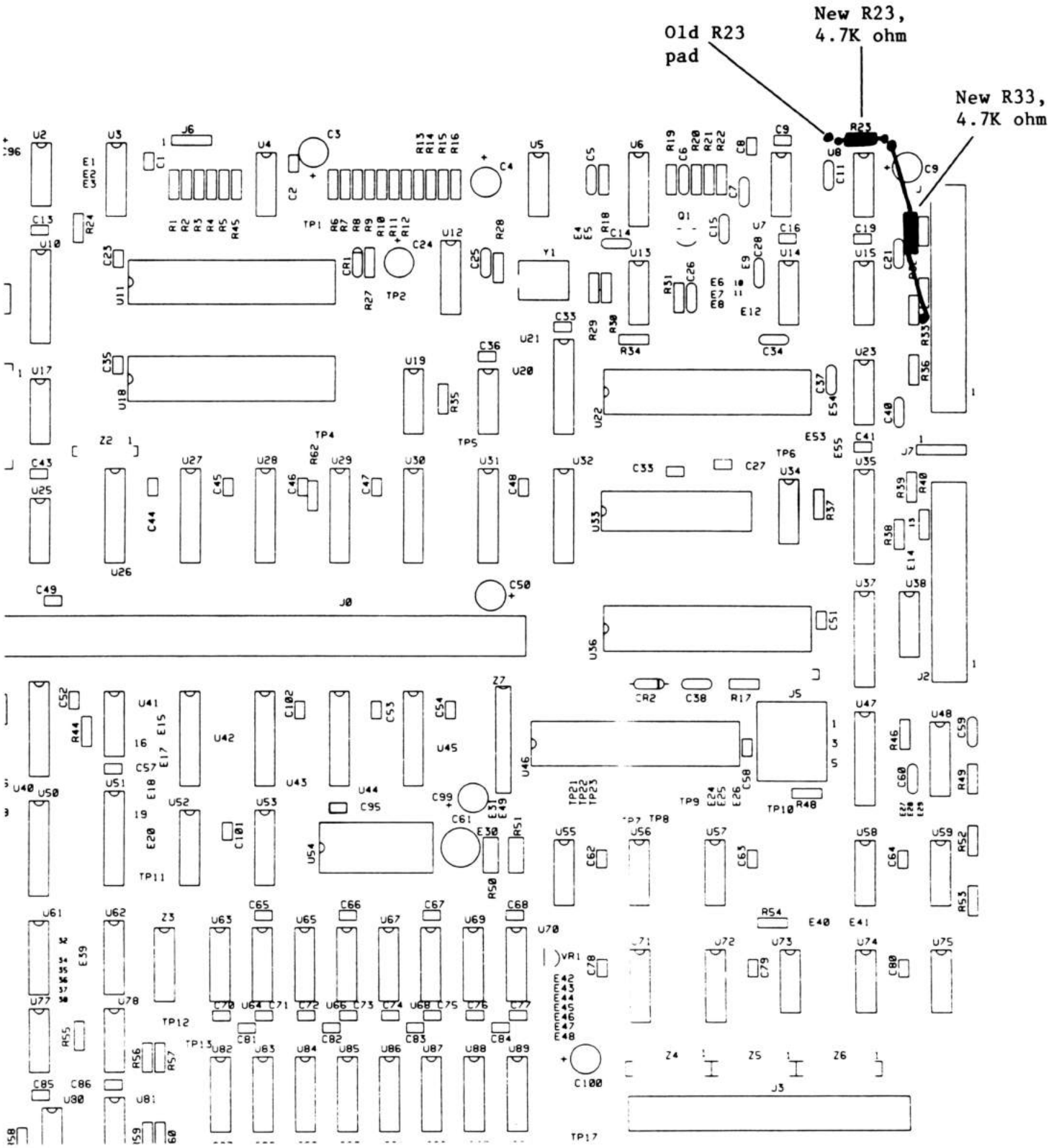
Part (1), mandatory for Rev. Blank boards:

Change R21, R23, R25, R32, R36 from 1ØK ohm to 4.7K ohm resistors. Remove resistor R33. On the component side of the board, install a 4.7K ohm resistor with one lead attached to the old R33 solder connection closest to R36 and the other lead attached to the +12V line at the feedthrough adjacent to R23 between U8 and C97 (refer to figure 1). The leads should be insulated to prevent them from shorting.

Part (2), apply as needed to all boards:

Remove resistor R23. On the component side of the board, install a 4.7K ohm resistor with one lead attached to the old R23 solder connection closest to C97, and the other lead attached to the +12V line at the feedthrough adjacent to the remaining R23 solder connection. The +12V line in question also connects directly to U7, pin 14 (refer to figure 1).

All resistors required for this modification should be 4.7K ohm +/- 5% 1/4W. They can be ordered through National Parts using part number N-Ø247EEC with catalog number 26-9999R.


Old R23
pad
New R23,
4.7K ohm
New R33,
4.7K ohm

DATE: October 27, 1983

REVISION DATE: October 27, 1983

BULLETIN NO.: 12/16B:12

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9240 Video Board

PURPOSE: To slow Video RAM access to increase data reliability.

DISCUSSION:

High memory addresses are shared by the Video and the 64K RAM. When the computer needs to use the video, it will activate the video RAM select logic allowing access to it. Occasionally when doing very fast RAM switching such as diagnostics, due to the access time specification of the RAM, the data transfer may not be reliable causing video failures. To correct this change the video select timing from 10ns to 100ns.

PROCEDURE:

Refer to Figure 1 and cut the trace on the component side at U32 pin 7. Add a jumper wire from U32 pin 7 to U32 pin 12.

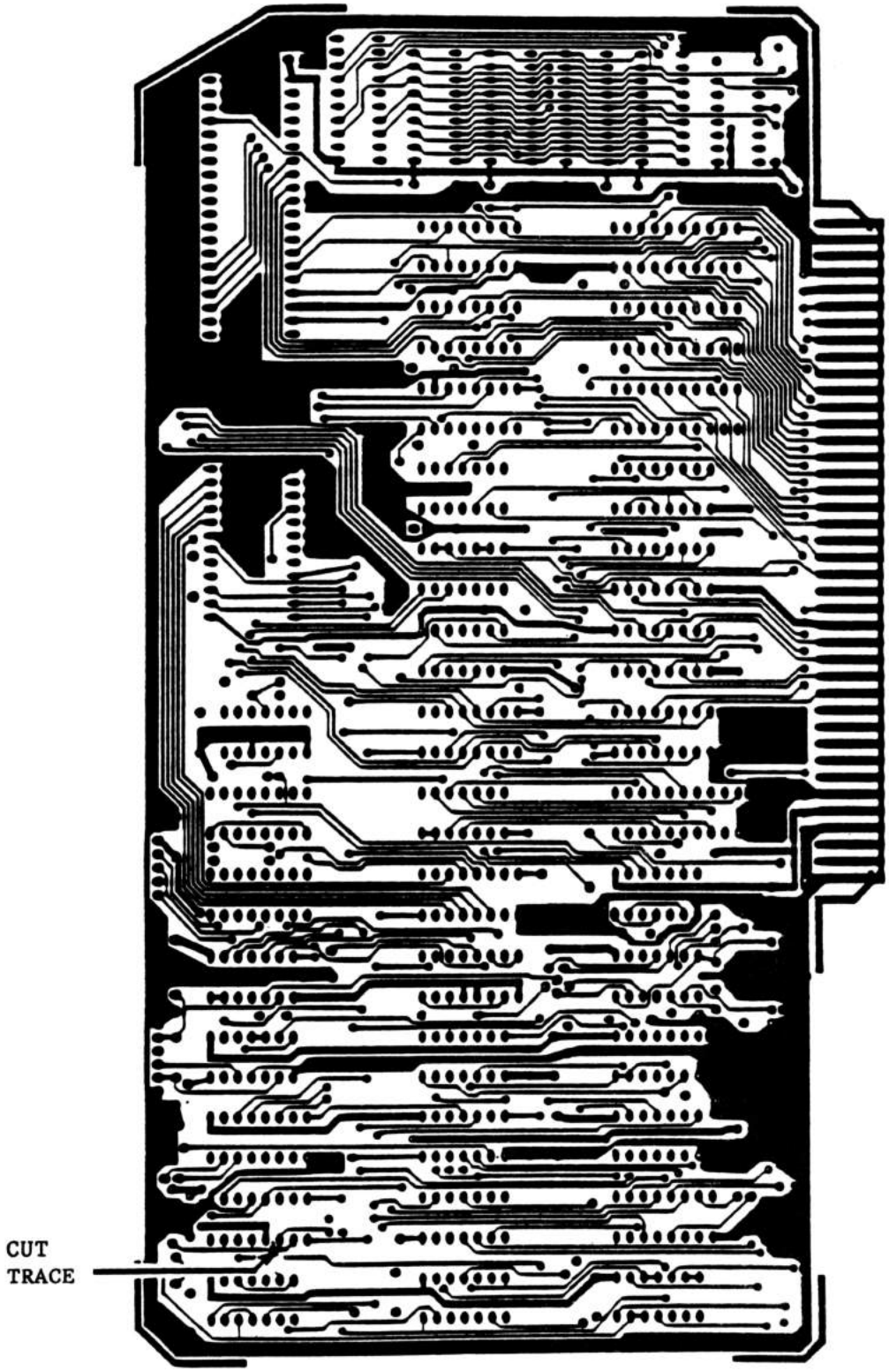


Figure 1 Video PCB (component side)

DATE: October 17, 1983

REVISION DATE: October 17, 1983

BULLETIN NO: 12/16B:13

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B/16B HD

SUBASSEMBLY: AX-9364 Main Logic PCB

PURPOSE: Modification to compensate for temperature drift of the Western Digital 2793 FDC chip.

THIS MODIFICATION IS MANDATORY!

DISCUSSION: Due to thermal characteristics of the Western Digital FDC chip the VCO and READ PULSE WIDTH tend to drift as the machine builds up heat. This can cause intermittent operation of the disk drives depending on whether the machine is cold or hot. To correct this problem the tuning capacitor for the VCO (C61), needs to be changed with a negative coefficient capacitor to counteract the FDC temperature drift.

PROCEDURE: Whenever a Model 12/16B comes in for repair whether disk drive related or not, replace C61 with a negative coefficient capacitor. FDC alignment is required whenever this modification is done.

This capacitor can be ordered through National Parts with part number ACF-7364 and catalog number 26-4004.

DATE: November 9, 1983

REVISION DATE: June 17, 1985

BULLETIN NO.: 12/16B:14

PRODUCT: 26-4004/5 Model 12
26-6004/5 Model 16B

SUBASSEMBLY: AX-9364 Main Logic Board (Rev. Blank only)

PURPOSE: To correct possible printer not ready condition/error.

DISCUSSION:

The printer select (PSEL) signal may not be used by all printers. Because of this possibility the printer interface needs to have a pull-up added. This will simulate a "TRUE" condition if the printer does not supply the signal.

PROCEDURE:

Add a jumper wire from pin 10 of Z1 to pin 15 of U35.

DATE: November 8, 1983

REVISION DATE: November 8, 1983

BULLETIN NO.: 12/16B:15

PRODUCT: 26-4ØØ4/5 Model 12

SUBASSEMBLY: AX-9364 Main Logic PCB Revision N/C (unmarked)

PURPOSE: To allow new style delay line to be used as a replacement part in old style PCB.

DISCUSSION:

There are presently two different delay lines used on the Model 12 Main Logic PCB. The first, found in the Rev. N/C PCB, is marked **DDU-7J-3ØØ** (National Parts number AMX-589Ø catalog number 26-4ØØ4). It has a complete 14-pin DIP pinout. Not all pins are connected into the circuit, however.

The second unit, found in the Rev. "A" PCB, is marked **DDU-4-52ØØ** (National Parts number AMX-57Ø6 catalog number 26-1Ø67). It also fits a standard 14-pin DIP pattern, but unused pins are removed from the package.

Whenever possible the DDU-7J-3ØØ device on the Rev. N/C PC board should be replaced with an exact replacement. Due to supply problems it may be necessary to modify the Rev. N/C PCB to allow use of the DDU-4-52ØØ chip as a repair-only replacement part.

PROCEDURE:

You will need the following parts:

DDU-4-52ØØ Delay line IC.
Wire wrap wire
Soldering equipment

INSTALL THE DELAY LINE

Install the DDU-4-52ØØ at IC position U8Ø. Make careful note of orientation of the IC. Pin 1 on the delay line is marked by a small white dot or indentation on the top of the package.

Solder the delay line in place.

INSTALL THE FOLLOWING JUMPER IN THE FOIL SIDE OF THE PCB:

Using wire wrap wire, install the following jumpers. Be careful not to overheat the IC.

1) Jumper U8Ø pin 3 to U8Ø pin 4

2) Jumper U8Ø pin 1Ø to U8Ø pin 11

3) Jumper U8Ø pin 12 to U8Ø pin 13

CHECK THE MODIFICATION

After the modification is complete, reassemble the computer. Turn the unit ON and wait for the **INSERT DISKETTE** message or a **BOOT ERROR** message.

If INSERT DISKETTE appears, boot the Model 12 Diagnostic Diskette and run MEMII. Select the CONTINUOUS timer function, and run one of the memory diagnostics. Let the unit run at least 3 hours to to be certain that the modification is functional and that no further problems appear.

If BOOT ERROR MF appears either the modification has been done incorrectly, the delay line is installed wrong, there are further memory problems other than the delay line, or the delay line is bad. Recheck the modification for incorrect component placement, incorrect wiring, or accidental shorts.

DATE: November 29, 1983

REVISION DATE: November 29, 1983

BULLETIN NO.: 12/16B:16

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B

SUBASSEMBLY: FDC

PURPOSE: FDC alignment procedure.

DISCUSSION:

The Model 12 and 16B have an advanced-design FDC chip, a Western Digital 2793. Along with many enhancements, this chip is also capable of being aligned with no software or diagnostics of any kind. The Western Digital 2793 contains all of the former three-chip Western Digital set-up, the 2743, 1691, and also a PLL. All former adjustments to an FDC board are no longer required to the Model 12 and 16B. By moving one jumper, the 2793 can be aligned with its built-in TEST mode.

PROCEDURE:

1. Check capacitor C61, if it is not a negative coefficient capacitor replace it with one. This capacitor is available under National Parts number ACF-7364 and catalog number 26-4004. Refer to Technical Bulletin 12/16B:13 for further details.

2. Turn on the computer and wait for **INSERT DISKETTE** to appear. Do **NOT** place any diskette in either drive. If you do not have the Insert Diskette prompt on the screen, first try adjusting the two video controls on the left front outer edge of the top cover. If still no prompt is present suspect the Boot ROM U54.

3. Move jumper E31-E49 to E30-E31 located near R50 and R51 on the right side of the FDC. This will place the 2793 in its TEST mode for alignment purposes.

   Do **NOT** perform a RESET after the jumper is in place.

4. Plug a test probe into channel A of the frequency counter. Set counter to read frequency by pushing in the **FREQ A** switch. Select resolution by pushing in the **.01, 100, 10** switch. All other switches should be out. Connect the probe to TP9.

   IMPORTANT NOTE: Due to the fact the FDC alignment drifts as it warms up, step 4 of this procedure must be done under special conditions:

   A. If the computer is warm (on for 8 minutes or more) then adjust C61 for a reading of 255 KHZ on the counter.

   B. If the computer is cold (off for 1 hour or more) then adjust C61 for a reading of 265 KHZ on the counter within 1 minute. If it can't be adjusted within 1 minute then allow the machine to warm up for 8 minutes and follow step 4A.

   By setting this signal at 265 KHZ we are compensating for the FDC drifting. As the machine warms up this signal will drift down to 250 KHZ. This is the only step affected by the FDC drift.

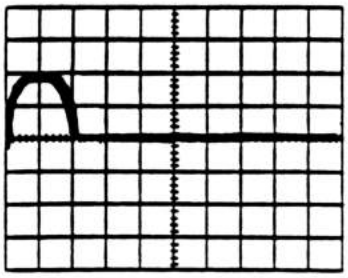
   Do **NOT** attempt to do the following steps with the frequency counter as it is unable to correctly read digital square waves.

5. Connect the scope probe to TP10 and adjust R50 to attain a positive pulse-width of 200ns. Refer to Figure 1.

6. Connect the scope probe to TP8 and adjust R51 to attain a positive pulse-width of 500ns. Refer to Figure 2.

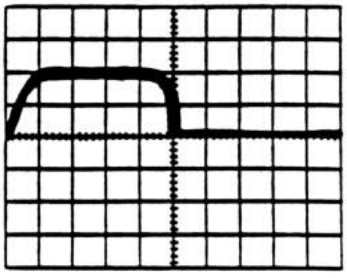
7. After these three adjustments have been done, replace jumper E30-E31 back to its original position, E31-E49.

8. Perform a system RESET then insert a Floppy Disk and proceed with diagnostic check-out.



200 nano seconds
TP10 .1 usec/div

Figure 1



500 nano seconds
TP8 .1 usec/div

Figure 2

DATE: November 11, 1983

REVISION DATE: November 11, 1983

BULLETIN NO.: 12/16B:17

PRODUCT: 26-4004/5 Model 12
26-6004/5 Model 16B

SUBASSEMBLY: 26-6017 Card Cage

PURPOSE: To correct repeatedly breaking card guides and increase circuit board stability.

DISCUSSION:

Due to continuous breaking of the guides and the unsecure fit of the circuit boards, the metal card guides in the card cage need to be replaced with plastic guides.

This modification is **MANDATORY** and should be done to all units in for repair.

PROCECURE:

PARTS REQUIRED:

PART NO.	CATALOG	DESCRIPTION
ART-5172	26-4004	Right side plate
ART-5173	26-4004	Left side plate

1. Remove the computers top case to allow access to the card cage. Remove all boards that are in the card cage.

   Refer to Figure 1 for the remaining steps.

2. Remove the 6 screws that hold the card cage to the chassis. Disconnecting the motherboard power plug and the fan wires will allow the card cage assembly to be pulled up and removed.

3. Remove the top plate, fan flume, and motherboard.

4. Replace the left and right side plates with the corresponding part numbers listed above.

5. Reassemble the card cage and the computer and check for proper operation.

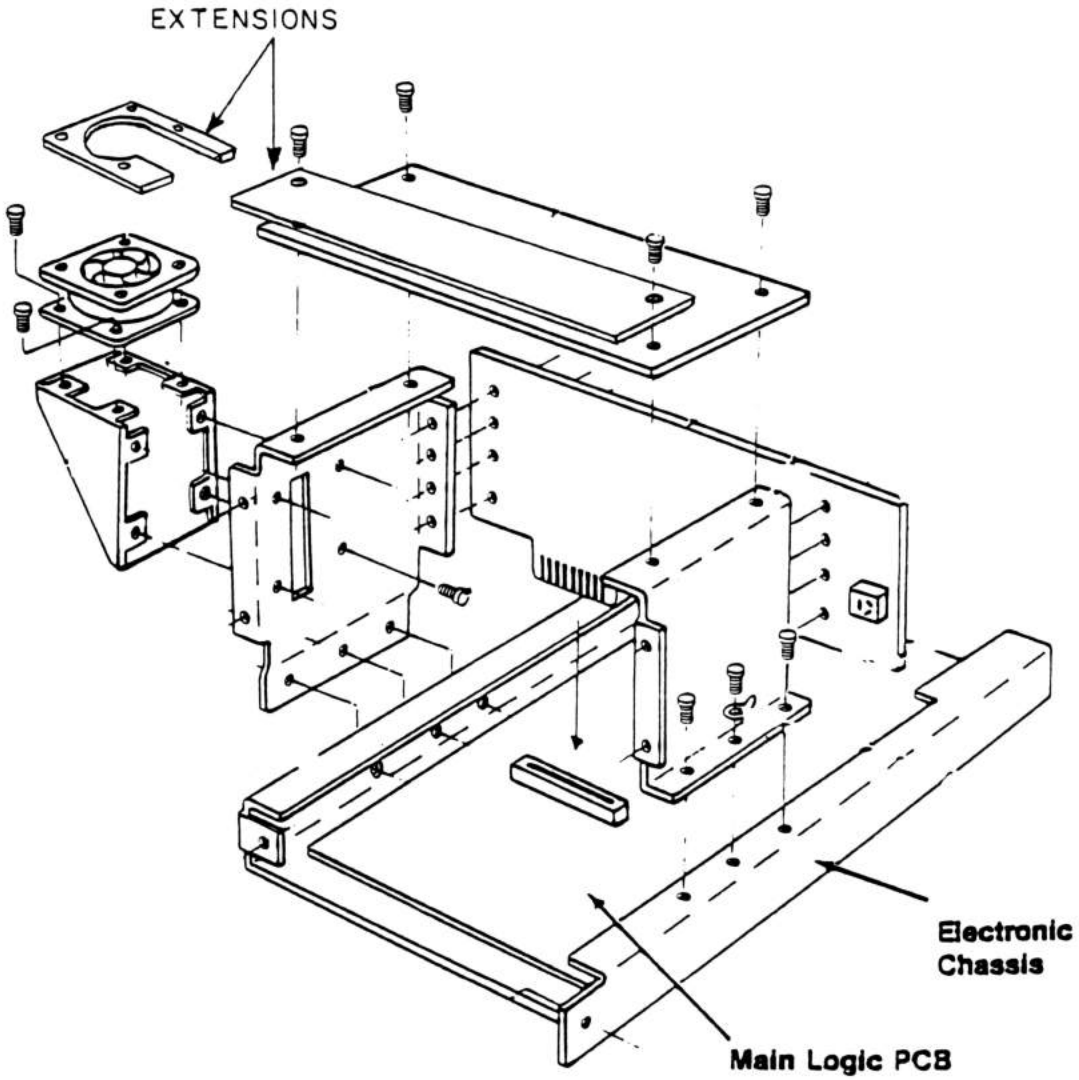


Figure 1

DATE: February 3, 1984

REVISION DATE: June 24, 1985

BULLETIN NO.: 12/16B:18

PRODUCT: 26-4004/5 26-6004/5 Model's 12/16B

SUBASSEMBLY: AX-9364 Main Logic Board (Rev. Blank and Rev. A)

PURPOSE: Instructions for the Banked CP/M upgrade for Model's 12 and 16B.

DISCUSSION: The CP/M operating system will require hardware modifications in order to function properly in the Model's 12 and 16B. The following must be accomplished prior to use; 64K of RAM must be added, verify or move the listed jumpers, and exchange IC U50 (82S153) included in the upgrade kit.

PROCEDURE: All steps to the CP/M upgrade kit (AXX-7091) are accomplished on the Main Logic board to the rear of the computer's power supply.

Model 12:
To gain access to this area you must first remove the top cover and bezel. After this is completed the you will have to remove the fan mounting bracket and the perforated plate which covers the rear portion of the Main logic board.

Model 16B:
To gain access to this area you must first remove the rear panel, and as many boards as you feel necessary for access to the rear area of the Main logic board.

Both Models:

WARNING: DO NOT APPLY POWER TO THE UNIT UNTIL ALL STEPS OF THE UPGRADE ARE COMPLETED!!!!

With the rear area of the Main logic board accessible the following steps will be taken:

1. Exchange U5Ø with the preprogrammed 82S153 IC in the kit.

2. Remove RAM IC's U63 thru U7Ø and add 64k RAM IC's in same locations.

3. Remove capacitors C81 thru C84.
   (NOTE: These capacitors may already be removed on some units.)

4. Remove jumper E42-E43 located next to U7Ø.

5. Install the following jumpers:

E16-E17	Next to U42
E45-E46	Next to U7Ø
E47-E48	Next to U7Ø
E5Ø-E51	Below U49

6. Install wire wrap jumper:

E38-E39	Next to U61

7. Test for proper operation, using MEMII memory diagnostics. Memory size should be 128k. Displaying the memory map should show an "X" at upper and lower pages "B", "1", "14", and "15".

8. As a final test boot the "Banked" CP/M disk (disk 1 of 4). It should come up to a large CP/M graphic display.

DATE: January 16, 1984

REVISION DATE: January 16, 1984

BULLETIN NO.: 12/16B:19

PRODUCT: All XENIX Systems

SUBASSEMBLY: AX-9238 Memory Board

PURPOSE: To explain switch settings for 68000 memory boards.

DISCUSSION/PROCEDURE:

With the addition of multiple 68000 RAM boards in XENIX systems, some confusion has come up about how the dip switch is setup to select the proper memory bank. The dipswitch is arranged as a binary counter, however, the switch numbers are not in sequential order.

Figure 1 is a section taken from the 68000 memory board schematics. U2 (74LS688) compares two 8 bit words sending the output (pin 19) low when the two words equal. Bits 2-6 of word P are tied to Address lines A22-A18, bits 1 and 7 are tied to bits 1 and 7 of word Q, and bit 0 of word P is tied low. Since bits 1 and 7 are tied together they will always equal each other regardless of position 4 and 1 of S1. Note also that position 2 of S1 must be in the closed position for bit 0 of word P and word Q to equal, this way position 2 of S1 is used as a board enable, if open, Q and P will never be equal. As seen from Figure 1, S1 positions 3, 5, 7, 8, and 6 correspond to Address lines 18, 19, 20, 21, and 22 respectfully. These switch positions can then be used as a binary count to select the board number or address range of the RAM.

Below is a chart of the switch positions that should be closed corresponding to the number of the memory board you are installing:

	Switch Positions "ON" (All others "OFF")	Address Range
First Memory Board	2	000000 - 03FFFF
Second Memory Board	2 and 3	040000 - 07FFFF
Third Memory Board	2 and 5	080000 - 0BFFFF
Fourth Memory Board	2, 3 and 5	0C0000 - 0FFFFF

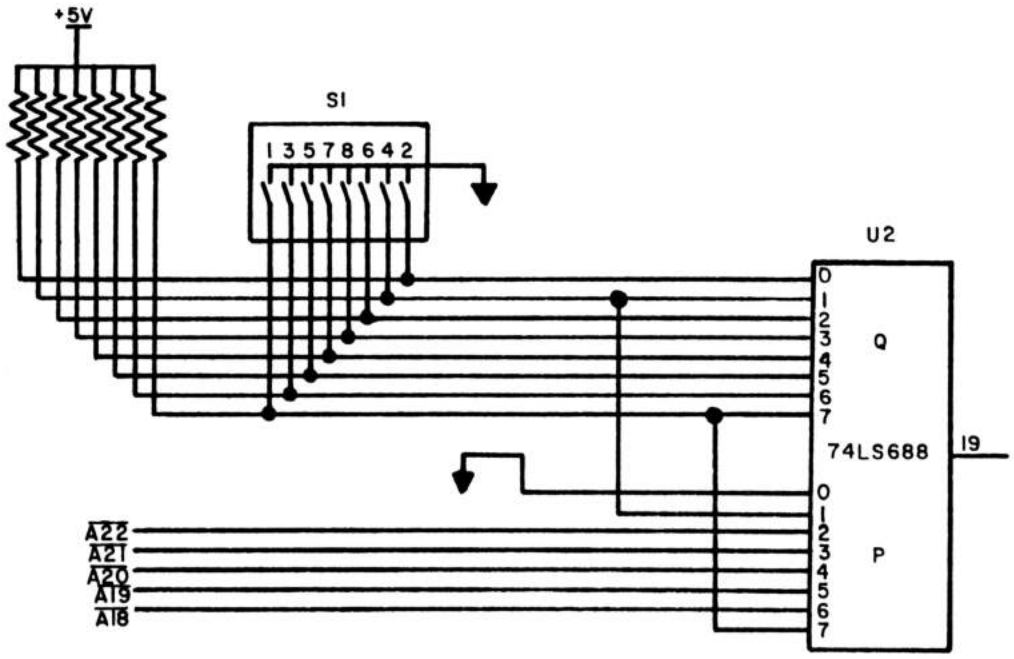


Figure 1

DATE: January 31, 1984

REVISION DATE: January 31, 1984

BULLETIN NO.: 12/16B:20

PRODUCT: 26-4004/5 Model 12

SUBASSEMBLY: AXX0345 Video monitor board (Motorola)

PURPOSE: To correct a brilliance problem in the Video monitor which is caused by age.

DISCUSSION: The Video monitor tends to display a weakening in the brightness of the monitor as a result of age.

NOTE: Schematic for this Board is found in the Service Manual VP41 (Motorola).

PROCEDURE: Disassemble the Model 12 so that the top cover with the Monitor can be worked on separately.

1. Change R107 from 47 ohm 1/4w 5% resistor to a 27 ohm 1/4w 5% resistor (NP# N0082EEC).
2. Clip the (yellow) lead going to pin (2) of the CRT (Video lead) approximately 1/2 inch from the CRT socket.
3. Desolder the opposite end from the PCB, remove and discard. (including the crimped resistor)
4. Prepare a 6 1/2 inch length of RG174/U coaxial cable as follows (FCC requirement) (NP# AW-3210).
5. Strip outer insulation and braid 1/2 inch from one end, then strip insulation 1/8 inch from center conductor.
6. Connect end of coaxial cable (as prepared in 5 above) to one end of a 470 ohm 1/2w 10% resistor (NP# N0169BFE).
7. Connect the opposite end of the resistor (6 above) to the (yellow) lead going to pin (2) of the CRT (Video lead). NOTE: Keep lead length as short as possible.
8. Strip opposite end of the coaxial cable outer insulation approximately 1/2 inch. Separate the braid from the center conductor and twist together. Strip the insulation on the center conductor 1/8 inch.
9. Solder the center conductor to the location on the PCB where the (yellow) lead originally occupied.
10. Solder the braid to the right side (side nearest the edge of the PCB) of R201 or R202 (ground).

DATE: January 24, 1984

REVISION DATE: May 1, 1984

BULLETIN NO.: 12/16B:21

PRODUCT: Model 12/16B 26-4004/5, 26-6004/5/6

SUBASSEMBLY: Thinline Drives AXX-5035

PURPOSE: Problems with Xenix on floppy drives.

DISCUSSION: If you are having intermittent problems getting Xenix to work correctly from the floppy drives, check to see if the RFI shield has been installed on the left side of the drives to protect them from interference off the main logic board. If this shield is not installed problems can be encountered when installing applications packages, saving files, etc.

PROCEDURE: Open unit and check for installation of this shield. If needed order ART-5005 under stock number 26-4004.

DATE: February 29, 1984

REVISION DATE: March 12, 1984

BULLETIN NO.: 12/16B:22

PRODUCT: Models 12 & 16B 26-4ØØ4/5, 26-6ØØ4/5/6

SUBASSEMBLY: Tandon 848-2E Thinline Drives

PURPOSE: Test point comparison to 848-2

DISCUSSION: The new style thinline drives that are now being used in the latest versions of the Model 12/16B are quite different from those previously installed in these machines. The logic board is smaller and the chassis is also shorter, which may cause problems in getting the cables to reach the connectors. Much of the circuitry has been incorporated into LSI's which reduced the size of the logic board, but also changed the Test Points used in alignment. A table comparing the old test points and the new test points follows:

TP	848-2E	848-2
Channel A	U2 Pin 14	TP 2
Channel B	U2 Pin 15	TP 3
Ground	TP 8	TP 1
Trigger	TP 1Ø	TP 12
Tack Ø	TP 3	TP 1Ø
Raw Data	TP 4	TP 9

NOTE:
There is no alignmemt for Head Load Timing.

DATE: March 12, 1984

REVISION DATE: September Ø4, 1984

BULLETIN NO.: 12/16B:23

PRODUCT: 26-4ØØ4/5 Models 12/16B

SUBASSEMBLY: AXX-6ØØ9 (Aztec AA11Ø82 power supply, early production)

PURPOSE: To correct a problem which may cause the 5 volt power supply to be low on the boards in the card cage.

DISCUSSION:

When boards are installed into the mother board of the card cage, the resistance of the traces on the mother board starts to become a factor. Since the 5 volt supply supplies the largest current, the voltage drop due to the resistance in the traces is also the greatest. Problems which may arise, but are not limited to, are primarily with the 68ØØØ assembly in processing errors, memory faults with certain data patterns, systems lock-ups, failures during initialization processes, and I/O errors. Although the effect on the Z8Ø family is not quite as apparent, the Xenix system/68ØØØ will indicate Z8Ø panic errors or ØØRST7 error message. The problem is corrected by increasing the output voltage of the AA11Ø82 power supply to approximately +5.15 volts. This voltage is low enough to prevent damage to the Tandon disk drive(s) and high enough to correct any low voltage problems on the boards in the card cage.

There seems to be some slight confusion on the new power supply harness that is being shipped with the Fan upgrade kits. To eliminate the confusion make sure that the Molex conector that has the heavier Red lead is connected to the Card Cage Molex socket and the other is connected to the Main Logic Board Molex socket.

Molex connectors are infamous for going bad if they are connected and disconnected repeatedly. Also a loose Molex connector can cause a voltage drop and/or induce noise into the circuit. They should be checked on all units in for repair.

PROCEDURE:

1. Measure the +5 volt supply at the Tandon disk drive (the red wire on the DC connector),and on the card cage slots J1 pins 9,1Ø,71, and 72. These pins can be counted on the outside of the card cage, above the power supply. If the voltage is less than +5.Ø5 volts then proceed to step 2. If it is greater the modification has already been done to the supply and nothing else needs to be done.

2. Add a 47K ohm 1/4 watt resistor at location R4Ø, R42, or R43 in the power supply. This resistor can be soldered across or (piggybacked) to any of the above resistors that are present in the supply.

3. Check the voltage at the drive again. It should now be between +5.Ø5 and +5.2Ø volts. If it is high, try a higher value for the resistor that was added, and if it is still low the power supply should be replaced.

DATE: July 16, 1984

REVISION DATE: August 27, 1984

BULLETIN NO.: 12/16B:24

PRODUCT: 26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9238 128K Memory PCB

PURPOSE: Modification to eliminate memory buffer problems on 128K PCB and listing of acceptable combinations of buffers in the U5, U6, U7 and U8 positions.

DISCUSSION:

A problem with model 16's recognizing secondary 128k memory boards has been noted. This problem has been traced to the chip select signal to buffer U8. In the current configuration, U8 is being selected on all memory boards simultaneously. The load caused by selecting U8 on all boards at once exceeds the circuit's driver capabilities causing a fan-out problem. By completing the following procedure, you are removing the chip select signal to U8 and utilizing a previously unused gate to to select this chip only when needed.

NOTE: THIS MODIFICATION IS MANDATORY FOR ALL UNITS BEING SERVICED.

PROCEDURE:

1.) On the **COMPONENT** side of the PCB, cut the trace going to U18, pin 11.

2.) On the **FOIL** side of the PCB, install the following jumpers.

a.) Jumper U25 pin 8, to U8 pin 1.
b.) Jumper U25 pin 9, to U9 pin 5.
c.) Jumper U25 pin 10, to U18 pin 9.
d.) Jumper U25 pin 11, to U18 pin 2.

The following is a listing of the acceptable combinations of buffers in the U5, U6, U7 and U8 positions on the 128K memory board. If any other combinations exist in these positions, change them to one listed below.

COMBINATION	U5	U6	U7	U8
1	MC3482AL	MC3482AL	MC3482AL	MC3482AL
2	MC3482BL	MC3482BL	MC3482BL	MC3482BL
3	MC3482BL	74S373	74S373	MC3482BL
4	74AS373	74S373	74S373	74AS373
5	74AS533	74AS533	74AS533	74AS533
6	74AS373	74AS373	74AS373	74AS373.

DATE: May 1, 1984

REVISION DATE: May 1, 1984

BULLETIN NO.: 12/16B:25

PRODUCT: Model 16B+ 26-6ØØ6

SUBASSEMBLY: Hard Drive Controller AX-9432, 26-4154

PURPOSE: To eliminate "HN ERROR" and blown boot track on internal hard drive.

DISCUSSION: It has been observed that many Model 16B+ units will lose information on the boot track as a result of powering the unit on and off. Some of the Rev. PP2 controller boards were shipped without some components that are silk screened but not installed. On power up without these components installed, spikes on the MR* line can be generated which will in turn cause the WRITE GATE* to glitch, destroying data on the boot track. All Rev. PP2 controller boards should be checked for the absence of these parts and corrected.

PROCEDURE: Change R28 to a 1ØK, 5% 1/4w resistor. Install a 1N4148 diode at CR7, and a 33uf 1Ø-16v electrolytic capacitor at C16.

Part Numbers:

R28	NØ281EEB	26-9999R
CR7	DX-ØØ22	26-4154
C16	CC336KDAP	26-9999C

NOTE: This Tech Bulletin is **MANDATORY** on all PP2 boards.

DATE: May 23, 1984

REVISION DATE: May 23, 1984

BULLETIN NO.: 12/16B:26

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B

SUBASSEMBLY: AXX-6009 Aztec AA11082 Power Supply

PURPOSE: To correct problem of power supply going into current limiting. The Model 12/16B appears dead or the 5 volt line cannot supply enough current.

DISCUSSION:

The Aztec power supply incorporates a current limiting mode. This current limiting mode shuts down the power supply in the event that the unit draws too much current. The 11082 power supply is overly sensitive to current load and may shut down without there being a problem with the Model 12/16B. To correct this, the values of three resistors need to be changed. This will increase the amount of current the 11082 power supply can provide.

Note: Some units may have an "improper" modification. The improper power supply modification consists of two 12 ohm 1/4 watt 5% resistors connected to Q3, Q4, Q6, and a 1 ohm 2 watt 5% resistor attached between R20 and R23. If this is the case, remove the improper modification and follow this procedure.

PROCEDURE:

Change R18 from 56 ohm to 10 ohm 1/4 watt 5%.
Change R19 from 47 ohm to 10 ohm 1/4 watt 5%.
Change R24 from .47 ohm to .33 ohm 2 watt 5%.

Part Numbers for the needed resistors are:
10 ohm 1/4 watt 5% - Catalog Number 260-9999R - Part Number N0063EEC.
.33 ohm 2 watt 5% - Catalog Number 260-9999R - Part Number N0522EHC.

DATE: June 11, 1984

REVISION DATE: June 11, 1984

BULLETIN NO.: 12/16B:27

PRODUCT: 26-6006 Model 16B+

SUBASSEMBLY: ATA-0904 power supply (bubble power supply)

PURPOSE: Clear Boot Error H0 or in some cases total HD system failure.

DISCUSSION: It has been noted that the small power supply (ATA-0904), used to provide power for the internal hard drives in the domestic Model 16B+'s, may be coming from the factory jumpered for 230 volt operation. This provides improper voltage for the hard disk system. Possible indications of this include boot error H0, or total hard disk system failure. In some cases the unit appears to operate properly with only occasional random errors. Be sure that the power supply is properly jumpered for 110 volt operation.

DATE: June 5, 1984

REVISION DATE: November, 13, 1984

BULLETIN NO.: 12/16B:28

PRODUCT: Tandon Direct Drive 8" Floppy AXX-5Ø45

SUBASSEMBLY: Drive Logic Board AX-9457

PURPOSE: To identify problems with direct drive Tandon floppy drives.

DISCUSSION: On initial boot-up of Model 12 and 16B equipped with the new Tandon direct drive floppy drives, some will not restore to Track Ø and the activity led will flash. This is a normal function of the Rev D controller chip on the drive logic board. If you are having problems getting the head to move freely clean head rails as outlined below.

The error codes exhibited by the activity LED on the floppy drive are:

(1). If the head is in the track Ø sensor, it is stepped away from it. If the track Ø sensor can not be cleared the drive fails the first test. The drive LED will then **flash three times, pause, flash twice, and then repeat.**

(2). If test 1 passes the drive will then step the head out to track Ø. If the track Ø sensor can not be activated, the drive fails the second test. The drive LED will then **flash three times, pause, flash three more times, and then repeat.**

(3). The third test is run whenever the drive door is closed. If the door is closed and **no** index pulse is found, the drive fails the third test. The drive LED will then **flash three times, pause, flash four times, and then repeat.**

PROCEDURE: Thoroughly clean the head rails with isopropyl alcohol. **DO NOT** under any circumstances use any kind of lubricant.

DATE: August 9, 1984

REVISION DATE: August 9, 1984

BULLETIN NO.: 12/16B:29

PRODUCT: 26-6004/5/6 Model 12/16B

SUBASSEMBLY: AXX-7935 Cooling enhancement kit.

PURPOSE: Fan mount for use with RCA monitor boards.

DISCUSSION: It has been found that installing the new cooling enhancement kit on Model 12/16B's containing an RCA monitor PCB with a sattelite board on the CRT neck may cause CRT implosion. This is due to the fan mounted on the power supply making contact with the CRT sattelite board and twisting the neck of the CRT. A new fan mount has been designed for use exclusively with 12/16B's containing the RCA monitor board.

PROCEDURE:

Model 12/16B's with RCA monitor board:

If the need arises to install a cooling enhancement kit in a Model 12/16B with the RCA monitor PCB, order the fan mount from national parts, and use this mount instead of the one supplied with the cooling enhancement kit.

Model 12/16B with built in hard drive and RCA monitor board:

If this fan mount is to be used in a machine with a built in hard drive, in order for the fan to clear the hard drive power supply, remove the fan mounted under the disk drives, and mount this fan on the power supply.

Fan mount N.P. Part No. ART-5592 Catalog No. 26-6006

NOTE: This fan mount is only to be used on 12/16B's containing the RCA video monitor board.

DATE: October 2, 1984

REVISION DATE: October 2, 1984

BULLETIN NO.: 12/16B:30

PRODUCT: 26-400X Model 12, and 26-600X Model 16B

SUBASSEMBLY: AX-9457 Direct Drive logic PCB.

PURPOSE: Solution of boot errors on the new direct drive thin line drives.

DISCUSSION: Two problems have been noted with the new direct drive thin line drives. First a high occurrence of BOOT ERROR PI 14, and second problems with the stepper motor which usually manifests itself in the form of an undocumented diagnostic LED code upon boot up. Both of these problems have been traced to the forty pin processor chip (U6) on the drive logic board.

PROCEDURE: Insure that the processor (U6) on the direct drive thin line drive logic board is a REV F chip. If it is not replace it with one. This part is available through National Parts stock number 26-4004, part number MX-6654.

DATE: October 17, 1984

REVISION DATE: October 17, 1984

BULLETIN NO.: 12/16B:31

PRODUCT: Model 12/16B/16B+ 26-4004/5 26-6004/5/6

SUBASSEMBLY: Video Keyboard Interface PCB (AX-9240)

PURPOSE: To improve circuit operation.

DISCUSSION:

This modification is to increase the reliability of the RCLOCK signal.

PROCEDURE:

Locate C34 between I.C. U1 and I.C. U17 and remove it from the PCB.

DATE: October 23, 1984

REVISION DATE: October 23, 1984

BULLETIN NO.: 12/16B:32

PRODUCT: 26-6006

SUBASSEMBLY: AXX-5045,AXX-5035,AXX-5040

PURPOSE: To correct RFI noise generation and interference between an internal hard disk and the floppy drive

---

DISCUSSION: There have been reported instances in which noise generated by either the internal hard disk or the internal floppy disk has interfered with the operation of the other component. If this problem is thought to exist, it may be addressed by shielding these items from each other.

PROCEDURE: To effect this shielding use the disk drive shield used on the Model 16A. This part can be ordered using the catalog number 26-6002 and part number ART-4440.
This installation can be done in three steps and without removing either the hard disk or floppy drive.

First: take off the top and remove the screws fastening the floppy drive to the top of the supporting frame.
Second: make a 90 degree bend in the shield about 1 inch from the bottom of the shield with the bend pointed in the direction of the hard drive.
Third: slide the shield between the hard drive and the floppy drive fastening the shield to the floppy drive the same way it is attached to the drive in a Model 16A. Finally, using a wire tie, fasten the bottom of the shield to the bracket.

DATE: December 21, 1984

REVISION DATE: June 17, 1985

BULLETIN NO.: 12/16B:33

PRODUCT: 26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9364 Main Logic Board (Rev. Blank and Rev. A)

PURPOSE: To allow system to boot TRSDOS 16.

DISCUSSION:

TRSDOS 16 is the TRSDOS operating system which makes use of the 68000 CPU and RAM. However on boot up it is necessary to have the 16K RAM on the main logic board of the upgraded 12 or the 16B. If this RAM is not at locations U63 through U70, and you wish to use TRSDOS 16, the following procedure must be followed.

PROCEDURE:

1. Install 16K RAM chips at locations U63 through U70.

2. Install the following jumpers:
   - E15-E16 Next to U42
   - E42-E43 Next to U70
   - E44-E45 Next to U70
   - E46-E47 Next to U70
   - E51-E52 Below U49
   - E38-E39 Next to U61, this is a jumper wire not a plug.

3. Install .1 uf capacitors at locations C65 through C68 and C81 through C84.

Note: Some of the above steps may already be complied with.

4. Test for proper operation, using MEMII diagnostics. Displaying the memory map should show an "X" at the upper and lower bank of pages "B" and "1" and at the lower bank only of pages "14" and "15".

A 26-1102 16K RAM upgrade kit part number AXX-7007 can be used for the eight RAM chips required. The capacitors are under part number CC-104JJCP and catalog 26-9999C. Eight capacitors are required.

DATE: December 27, 1984

REVISION DATE: December 27, 1984

BULLETIN NO.: 12/16B:34

PRODUCT: 26-4004 Model 12 with 68000 Upgrade
26-6004 Model 16B

SUBASSEMBLY: AX-9237 68000 CPU PCB

PURPOSE: Defective decoding chips causing errors under Xenix.

DISCUSSION:

A bad date code of the 74LS138 decoding chips has been found on the 68000 CPU boards. Located at U26, U34, and U41 (U6, U13, and U32 on the longer, early CPU PCB's) these chips switch too slow for the Xenix operating system causing random errors. Diagnostics, however, will pass flawlessly.

PROCEDURE:

The defective chip is the Motorola 74LS138 with a date code of 8417. Check U26, U34, and U41 on the late style (short) PCB and U6, U13, and U32 on the early style for this date code and replace as necessary. A 74LS138, 74S138, or a 74F138 type device may be used.

IMPORTANT NOTE: These chips are NOT socketed. Refer to the multi-layer board repair procedures and use extreme care during removal. You MUST add IC sockets before installing the new chips.

A 74S138 is available from National Parts under part number AMX-5713 and catalog 26-6002. A 16 pin socket is available under part number AJ-6581 and catalog 26-6002.

DATE: January 16, 1985

REVISION DATE: February 13, 1985

BULLETIN NO.: 12/16B:35

PRODUCT: 26-4004/5 (Model 12)
26-6004/5/6 (Model 16B)
26-6014 (8 MHz CPU upgrade kit)

SUBASSEMBLY: 8 MHz 68000 CPU board

PURPOSE: To correct data setup time to memory board during a write cycle.

DISCUSSION:

An error in the artwork on early revision 8 MHz 68000 CPU boards (Revision A) will cause the data setup time to the 68000 memory board to be incorrect during a write cycle.

PROCEDURE:

This modification is for Revision A boards only.

Using wire wrap wire, install the following four jumpers:

(1) Jumper U10, pin 9 to U2, pin 4.
(2) Jumper U2, pin 3 to U18, pin 11.
(3) On the solder side of the board, jumper U18, pin 12 to U19, pin 8.
(4) On the solder side of the board, jumper U18, pin 13 to U19, pin 7.

DATE: January 21, 1985

REVISION DATE: January 21, 1985

BULLETIN NO.: 12/16B:36

PRODUCT: 26-6Ø14 68ØØØ Upgrade

SUBASSEMBLY: 8 MHz 68ØØØ CPU PCB, Rev. A.

PURPOSE: To correct timing error.

DISCUSSION:

A timing error has been found involving signals BERR* and DTACK* on the 8 MHz 68ØØØ CPU board.

PROCEDURE:

1. On solder side of PCB cut the trace at U21 pin 9.

2. Add a jumper wire from U9 pin 4 to U33 pin 13.

NOTE: Modification applies to revision A boards only.

DATE: January 16, 1985

REVISION DATE: January 16, 1985

BULLETIN NO.: 12/16B:37

PRODUCT: 26-4004/5 (Model 12)
26-6004/5/6 (Model 16B)
26-6014 (8 MHz CPU upgrade kit)

SUBASSEMBLY: 8 MHz 68000 CPU board (AX-9006)

PURPOSE: To insure good ground connections between 68000 CPU and memory boards.

DISCUSSION:

Due to an error in the artwork on early revision (Revision A) boards, a modification to insure good ground connections between the 68000 CPU board and associated memory boards is required.

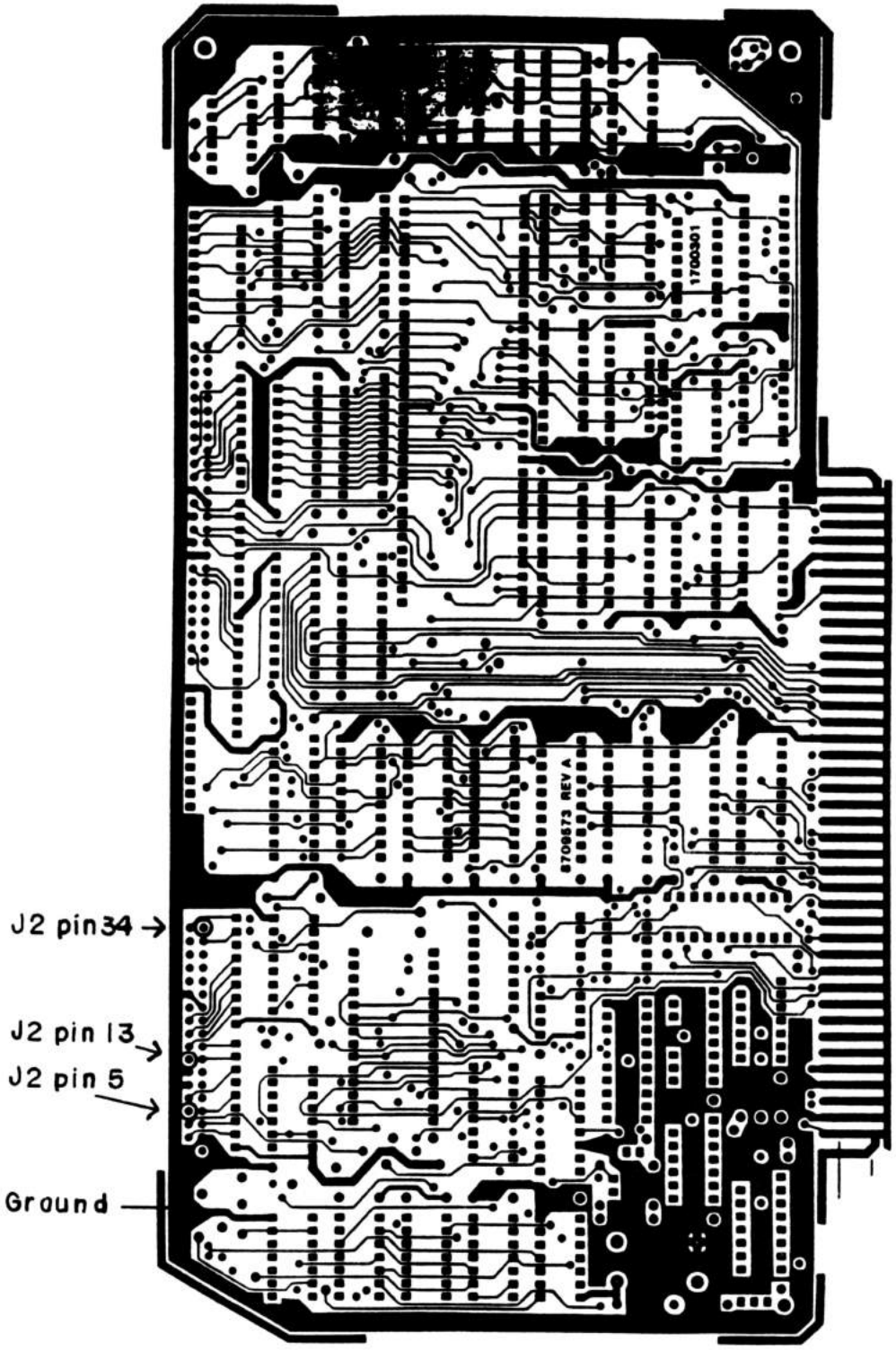
PROCEDURE:

This modification is for Revision A boards only.

Using wire wrap wire, install the following jumpers on the solder side of the 68000 CPU board:

(1) Jumper J2, pin 5 to ground.
(2) Jumper J2, pin 13 to ground.
(3) Jumper J2, pin 34 to ground.

Ground may be found at the feed-throughs on the ground plane near J2 on the solder side on the board.



SOLDER SIDE (LAYER 4)

DATE: March 19, 1985

REVISION DATE: March 19, 1985

BULLETIN NO.: 12/16B:38

PRODUCT:
26-4004/5 (Model 12)
26-6004/5/6 (Model 16B)
26-6014 (8 Mhz 68000 CPU upgrade kit)

SUBASSEMBLY:
26-6014 8 MHz 68000 CPU upgrade kit
AXX-6009 Aztec AA11082 power supply

PURPOSE: To outline 8 MHz upgrade procedure.

DISCUSSION:

When upgrading machines to the 8 MHz 68000 CPU board and 512k/1 meg memory board, the supply voltages from the Aztec AA11082 power supply (AXX-6009) need to be checked as they may now be too high. It is also essential that all pertinent 12/16B series and 6000 series Technical Bulletins be checked for and implemented to ensure reliability of the upgrade.

PROCEDURE:

Remove the 6 MHz 68000 CPU card and its associated memory cards. Install the 8 MHz 68000 CPU and the 512k/1 meg memory card. Measure the +5 volt supply at the Tandon floppy disk drive (red wire on the DC connector) and on the card cage slot J1 pins 9, 10, 71, and 72. These pins can be counted on the outside of the card cage, above the power supply. If the voltage is **less** than +5.05 volts, then perform Technical Bulletin 12/16B:23. If it is **greater** than +5.20 volts, then examine resistor locations R40, R42, and R43 on the power supply. If a resistor is piggy-backed on any of the above resistors and the +5 volt line is higher than +5.20 volts, the piggy-back resistor value should be raised to a higher value. After the value is changed, the +5 volt line should be measured again at the drives and on the card cage. If it is now between +5.05 and +5.20 volts, proceed to check out the operation of the machine using the SYSTEM test and the 68000 family diagnostics.

In addition to checking the power supply voltages, **it is essential** that **all** 12/16B series and 6000 series Technical Bulletins be checked for and implemented. After modification, a complete system check under diagnostics should be performed.

DATE: March 11, 1985

REVISION DATE: March 11, 1985

BULLETIN NO.: 12/16B:39

PRODUCT: 26-4004/5 (Model 12)
26-6004/5/6 (Model 16B)

SUBASSEMBLY: AX-9364 Main Logic Board

PURPOSE: To check for the presence of faulty Texas Instruments "AS" type parts.

DISCUSSION:

The presence of faulty Texas Instruments "AS" type parts needs to be checked and corrected if necessary on boards of **all** revision levels. The faulty parts are of the following types: 74AS240, 74AS241, 74AS242, and 74AS244, manufactured in 1984 or earlier (date codes "84xx" or "4xxxx" with "84" and "4" being year of manufacture).

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

PROCEDURE:

Disassemble the Model 12/16B so that the main logic board may be removed. Check to see that U26-U29, U31, U32, U35, U37, U40, U42, and U43 are **not** Texas Instruments "AS" type parts with a "84xx" or earlier, or "4xxxx" or earlier date code. If they are, replace them with the following:

U26, U29, U31: part # MX-5853, cat. # 26-6004

U27, U28, U32,
U40, U42, U43: part # MX-5933, cat. # 26-6006

U35, U37: part # AMX-3864, cat. # 26-6001

Note: The preceding modification is to be performed on all boards.

DATE: March 11, 1985

REVISION DATE: August 27, 1985

BULLETIN NO.: 12/16B:40

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9369 Mother Board

PURPOSE: To correct errors in artwork and prevent bus errors.

DISCUSSION:

To prevent bus errors, three traces need to be cut away from a resistor pack and three capacitors need to be installed on the card cage mother board.

** Compliance With This Bulletin Is Mandatory **

PROCEDURE:

Due to a change in the silk-screening for the resistor packs on the card cage mother board, the actual pin to be cut on the resistor packs will be different for certain board revision levels.

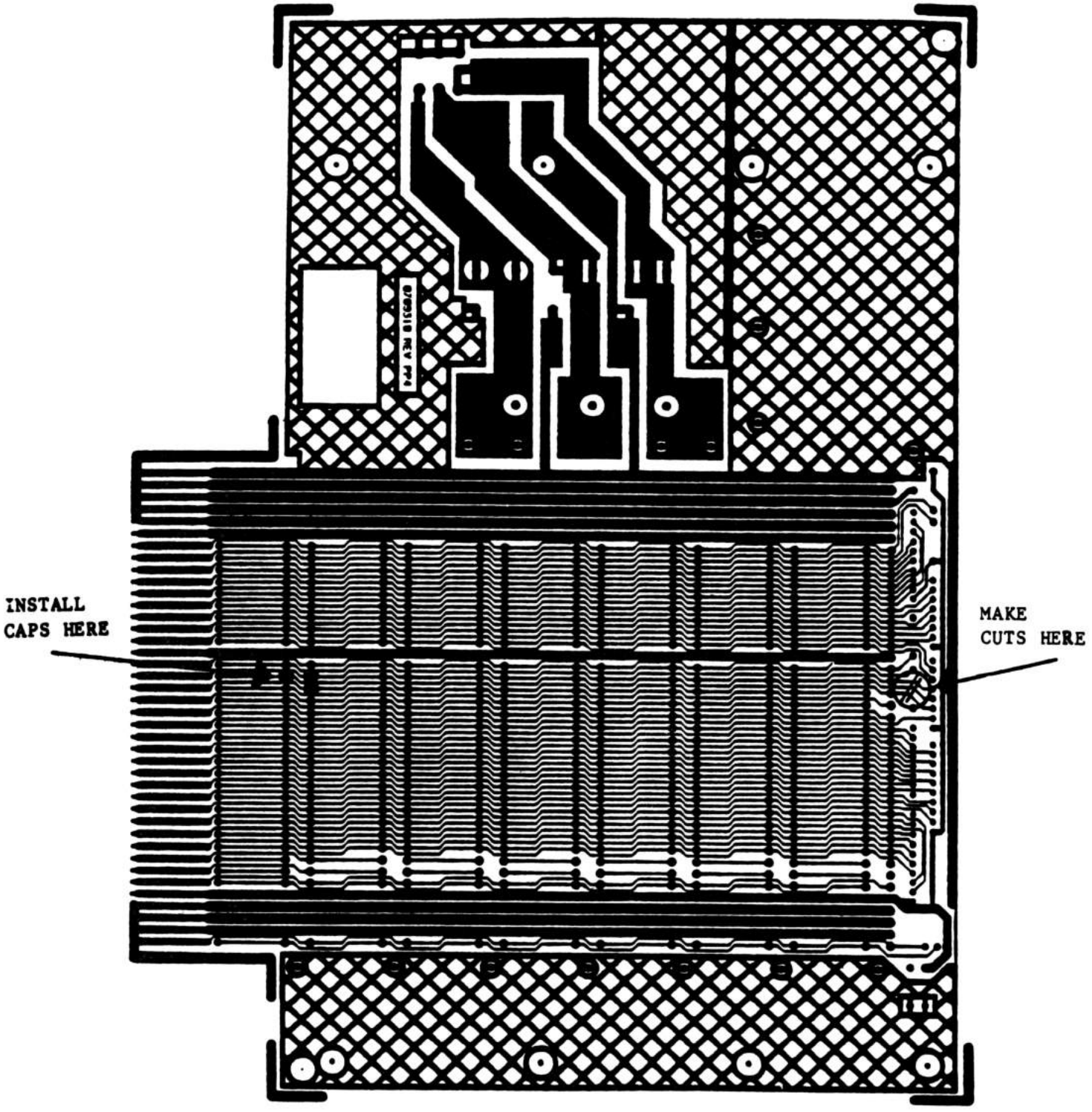
On mother boards of revision levels prior to Rev. B, pins 3, 4, and 5 on resistor pack R6 need to be cut.

On mother boards of revision level Rev. B or later, pins 4, 5, and 6 on resistor pack R6 need to be cut.

On boards of all revision levels, three (3) 220 pf caps should be jumpered from pins 44, 45, and 46 to ground on the bottom-most connector. These pins correspond to the traces cut on the resistor pack R6. See Figure 1 for clarification. The capacitors needed for this modification may be ordered as:

220 pf ceramic cap: part # CF-1490, cat. # 26-9999

If 330 pf caps are found installed on the mother board, they may be considered satisfactory; however, should they need replacement, 220 pf caps should be used.



Circuit Trace, Mother Board 8897701, Solder Side

Figure 1

DATE: April 2, 1985

REVISION DATE: June 19, 1985

BULLETIN NO.: 12/16B:41

PRODUCT: 26-4004/5 Model 12
26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9416 6 MHz 68000 CPU Board (short board)

PURPOSE: To outline modifications to increase operational reliability.

DISCUSSION:

For correct operation with both the 128k/256k and the 512k/1 meg 68000 memory boards, the following modifications need to be performed on the 6 MHz 68000 CPU board.

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

PROCEDURE:

Modifications for the 6 MHz 68000 CPU board are as follows:

(1) If PAL U48 is a 16R6 device, remove it and replace it with a new PAL which is a 16R4 device.

part # MX-2124, cat. # 26-6006

(2) Add a 330 pf ceramic capacitor from the ground end of C43 to the feedthrough near the +5V end of C37. This feedthrough connects to TP28. This capacitor may be ordered as part # CF-1514, cat. # 26-9999.
(3) Add a ground strap (22-24 gauge wire) from the ground end of C29 to the ground end of C28 on the solder side of the board.
(4) The refresh jumper option **must** be set to E1-E2.

In addition, the 68000 memory boards should be checked for the presence of all pertinent Technical Bulletins. System operation should be checked after performing the modifications with 68000 diagnostics in both the Z80 and 68000 modes.

DATE: May 29, 1985

REVISION DATE: May 29, 1985

BULLETIN NO.: 12/16B:43

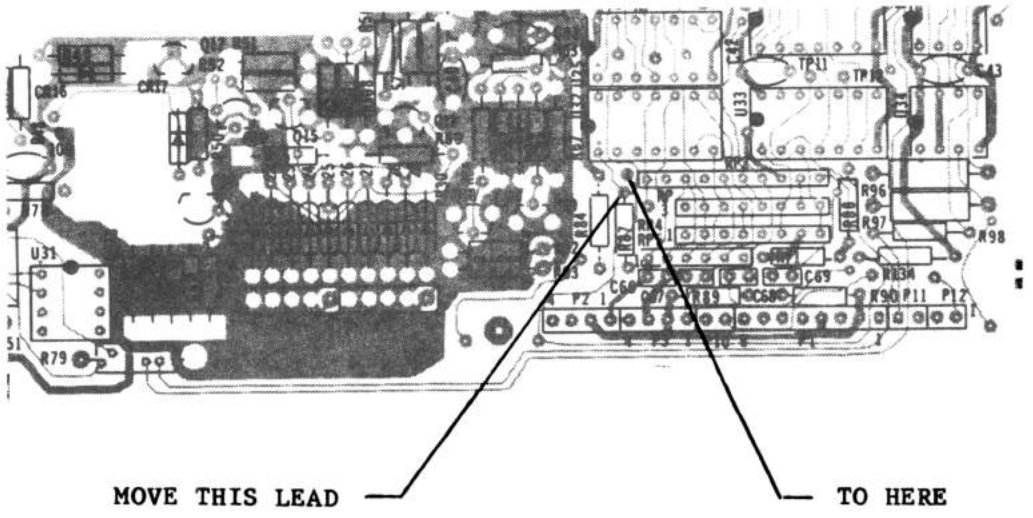
PRODUCT: 26-4ØØ4/5 Model 12
26-6ØØ4/5/6 Model 16B

SUBASSEMBLY: AXX-Ø344, Tandon Belt Drive Logic Board, Rev. Y

PURPOSE: To correct an error in installation of R87

DISCUSSION: Some Tandon Belt Drive Logic Boards (Rev. Y) have come from the vendor with R87, a 15Ø ohm pullup resistor, installed incorrectly. These boards may be identified by the existance of a small white sticker (bearing a bar code, three numbers, and the letter "Y") attached to the board right next to the "REV" marking. The defective boards will not see the index pulses at all and will not recognize an inserted diskette, i.e. will remain at the "Insert Diskette" prompt even after a diskette is inserted and the drive door is closed.

PROCEDURE: Locate R87 on the Drive Logic Board. Note that one lead is connected to a feedthrough which has a trace running to U32, pin 1. Unsolder this lead of R87 and resolder it to the feedthrough right above it. The correct feedthrough is a +5V trace.



DATE: July 11, 1985

REVISION DATE: July 11, 1985

BULLETIN NO.: 12/16B:44

PRODUCT: 26-6004/5/6 Model 16B

SUBASSEMBLY: AX-9416 6 Mhz (short) 68000 CPU board (All Revisions)

PURPOSE: Describe modifications to allow Xenix 3.0 to run on a 6 Mhz CPU board.

DISCUSSION: The following describes the procedures for modifying 6 Mhz, or "slow" 68000 CPU boards to allow the running of Xenix System 3. It is important to note that this modification applies only to the "short" 68000 CPU's only. **The "long" 68000 CPU boards cannot be modified to run Xenix System 3.** The terms "long" and "short" 68000 CPU board refers to width of the board itself. These boards can also be identified by the component location number silk screened on the board. For "long" boards the 68000 processor is located at U22. On the "short" boards its at U19.

PROCEDURE:

NOTE: The parts required for this upgrade will be supplied in the upgrade kit.

1.) Install the new PAL in U36.

   a.) Remove the old PAL in the U36 position on the 6 Mhz 68000 CPU board.
   b.) On the new PAL (U36) bend pin 5 up so as not to come in contact with the socket when installed.
   c.) Install new PAL U36. (device number 3646D4, or 46D4)
   d.) Jump U36 pin 5 to U25 pin 9.

2.) BERR modification.

   a.) On **SOLDER SIDE** cut trace at U21 pin 9.
   b.) Jump U9 pin 4 to U33 pin 13.

3.) Install the new U48 PAL.
   a.) Remove old U48 PAL (device type 16R6).
   b.) Install new U48 PAL (device type 16R4) This new PAL will have check sum 483999 stamped on top.

4.) WAIT modification.

a.) Add 330pf cap from the ground end of C43 to the feed-thru near the 5 volt end of C37 (this feed-thru is hooked to TP-28).

b.) On the **SOLDER SIDE** of the board, add a ground strap jumper (22-24 gauge stranded wire) from the ground end of C29 to the ground end of C28.

5.) Configure the refresh jumper to E1-E2 (E2 is the middle pin).

6.) Ensure compliance with ALL other Technical Bulletins, paying particular attention to the following:

12/16B:10 12/16B:23
12/16B:24 12/16B:39
12/16B:40

7.) Reassemble unit and test with 68000 diagnostics and Xenix 3.0.

REPLACEMENT PARTS LIST

New PAL U36	MX-2125	26-6021	(REPAIR PART ONLY)
New PAL U48	MX-2124	26-6021	
330pf capacitor	CF-1830	26-9999C	
Ground wire			Use 22-24 gauge insulated stranded wire.