Subject

After doing a visual inspection of the CMX and noting any areas that seem to be damaged, it is important to understand the reason such damage took place to avoid replacing the CMX and have it fail in the same manner.

The following information is an attempt to isolate the root cause of the failure so a determination can be made to replace the failing part along with the CMX to avoid any future instances.

Reference the P5000 Maintenance Manual (164253-001) to follow proper Adjustment, Removal and Replacement procedures. Part numbers have been provided for items that need to be replaced. If the replaced part fails to solve the problem, remove and replace with the original part and proceed to the next step. If a part needs to be replaced and the part number is not available in this document, please refer to the P5000 Maintenance Manual.

Information

CMX Component Area Information

IDENTIFYING CMX COMPONENT AREAS FOR P5000

The diagram on the next page is the layout of the main logic and power areas of the CMX. Use it to help isolate problems when there is no control panel display or when the printer boot sequence has been interrupted by an internal error.

This diagram is an aid for doing visual inspection on the following 2 CMX PCBAs:

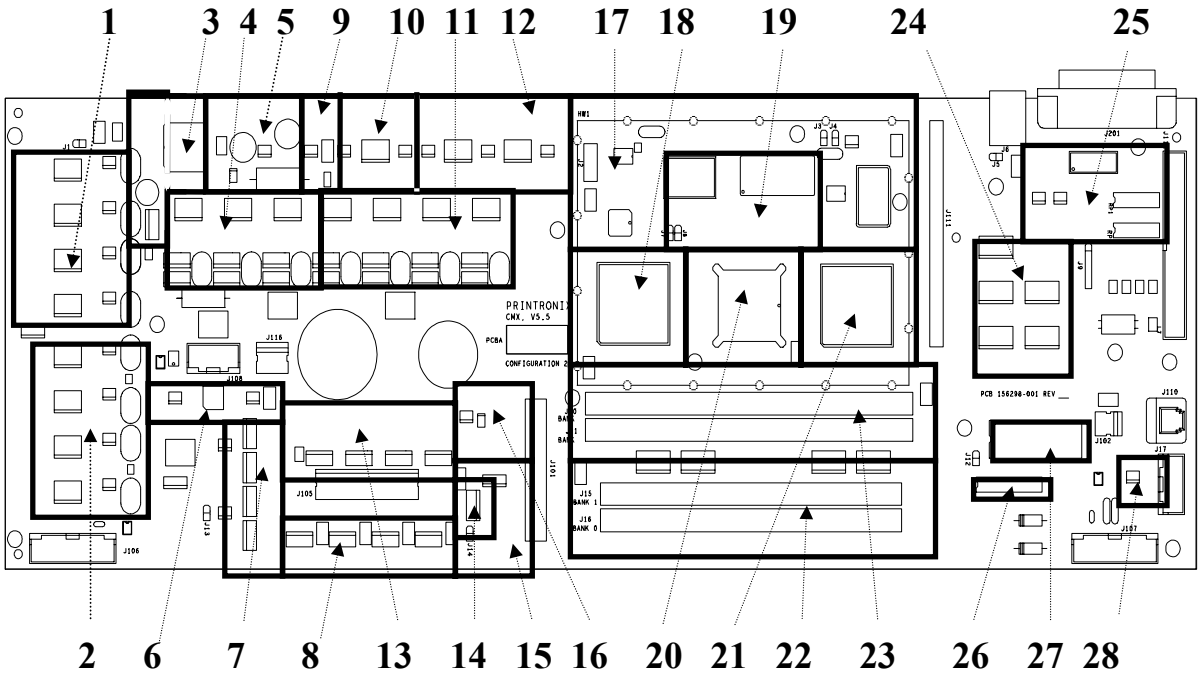
157450-901 - CMX 40 Mhz Subassy, V5.5, (PCBA is 156985-001)

156552-901 - CMX 25 Mhz Subassy, V5.5, (PCBA is 155802-001)

Find the area of interest and note the number pointing to that area. The number describes that area below the diagram. The following pages list those areas found on the diagram in numerical order. Beside each number the following are listed:

The main components for that area, the possible error messages, the definition of the area and the recommended troubleshooting that may help isolate the root cause of the failure.

CMX Component Area Information Diagram



CMX Component Area Listing

1 = Ribbon Drive (Right)
2 = Ribbon Drive (Left)
3 = Platen Drive
4 = Shuttle Drive
5 = +15V Regulator
6 = Hammer Bank Interface
7 = Coil Test
8 = Hammer Active Diode
9 = +2.5V Regulator
10 = Shuttle Control
11 = Paper Feed Drive
12 = Paper Feed Control
13 = Upper Hammer Drive
14 = VBoot Regulator (15V+8.5V)
15 = Fan Drive/Fault Detection
16 = Hammer Drive Short Detection
17 = Clocks
18 = MECA ASIC
19 = 80C166 / Engine Controller (EC)
20 = 68EC030 / Data Controller (DC)
21 = VX ASIC
22 = 72-Pin DRAM
23 = 80-Pin Flash Memory
24 = Cajun/Expansion Bus
25 = Host I/O Drivers and Termination
26 = Security PAL
27 = NVRAM
28 = MPU (Shuttle Encoder)

CMX AREA DEFINITIONS

Note: Components listed are for visual reference only and not to be construed as cause of root failure. CR1 Diagnostic LED is defined on the last page.

If the printer is still capable of printing an Error Log (if available), print one now and match the log to the following errors listed in this document. If the errors are resolved, clear the Error Log and monitor by printing the log every few days to see if the error has gone away or new errors are now showing up.

All readings may vary from meter to meter in the field. Always zero out the meter if possible. If not, note the value above zero and deduct from final measurement. Both windings on a dual-wound motor should be the same +/- 10%. If not, replace motor. Resistances shown for fans may vary between vendors. Values are subject to change.

1 = Ribbon Drive (Right)

Possible Error Messages = 15V CTL FAIL, RIBBON STALL, RIBBON DRIVE

Drives Right Ribbon Motor (154071-901) via Ribbon Motor Extension Cable Assy (154067-901) into connector P107 on the CMX board. Alternates drive and drag roles when the ribbon reaches turnaround.

a) Check resistance on the motor (P107 pins 2, 4 and 6, 8 = 7.2 to 8.8Ω).
b) Check continuity on the Extension Cable to verify that no opens or shorts are present.
c) Check for binding on the motor shaft or obstruction in the ribbon path causing excessive load.

2 = Ribbon Drive (Left)

Possible Error Messages = 15V CTL FAIL, RIBBON STALL, RIBBON DRIVE

Drives Left Ribbon Motor (154071-901) via Ribbon Motor Extension Cable Assy (154067-901) into connector P106 on the CMX board. Alternates drive and drag roles when the ribbon reaches turnaround.

a) Check resistance on the motor (P106 pins 2, 4 and 6, 8 = 7.2 to 8.8Ω).
b) Check continuity on the Extension Cable to verify that no opens or shorts are present.
c) Check for binding on the motor shaft or obstruction in the ribbon path causing excessive load.

3 = Platen Drive

Possible Error Messages = PAPER JAM, PLATEN OPEN, CLOSE PLATEN

Drives Platen Motor (152299-901) into connector P106 on the CMX board.
This motor is driven by a stepping motor controller IC and the EC Processor.

a) Check resistance on the motor (P106 pins 1, 3 and 5, 7 = 1.35 to 1.65Ω).
b) Check / Adjust Platen Open Pulley (155071-902) for looseness.
c) Check / Adjust Platen Open Belt (141516-901) condition and set belt deflection at 1/8".
d) Check / Adjust Platen Gap – 0.011" (0.28 mm).
e) Check for binding, jams and obstructions in the Platen Gap.

4 = Shuttle Drive

Possible Error Messages = SHUTTLE JAM, SHUTTLE STALL, 48V POWER FAIL

Applies up to 7 amps to the brushless DC Shuttle Motor (part of Shuttle Frame Assy) via Shuttle Motor Extension Cable Assy (152420-001) into connector J116 on the CMX board.

a) Check that the Forms Thickness Lever is set to match the thickness of the paper.
b) Check / Adjust the Platen Gap – 0.011" (0.28 mm).
c) Check / Replace the Hammer Bank Cover/Ribbon Mask Assy.
d) Check for obstructions in both the paper path and shuttle mechanism.
e) Check that related cables are attached at both the shuttle and CMX.
f) Check that related cables are not pinched, shorted or open.
g) Check / Adjust the MPU Gap to the Flywheel – 0.010 +/- .001" (0.254 +/- 0.025 mm).

5 = +15V Regulator

Possible Error Messages = 15V CTL FAIL, CTL VOLT FAIL, RIBBON DRIVE, TABLE MISMATCH

+15 Voltage Regulator is sourced on the CMX. Used by Hammer Bank Logic, Ribbon Drive, Shuttle Drive and Paper Feed Drive Logic on CMX.

a) Redownload Flash software.
b) Replace Flash Memory SIMM.
c) Check / Replace Hammer Bank Logic Cable Assy (152421-901).
d) Check / Replace Hammer Bank Power Cable Assy (164805-901
e) Refer to Items #1, 2, 4, and 11 to troubleshoot motors and extension cables.

6 = Hammer Bank Interface

Possible Error Messages = 15V CTL FAIL, HB NOT INSTALLD, TABLE MISMATCH

After image data has been processed by the EC, it is passed through this section as dot data, hammer fire data and clock data via the Hammer Bank Logic Cable Assy (152421-901).

a) Check / Replace Hammer Bank Logic Cable Assy (152421-901).
b) Check / Replace Hammer Bank Power Cable Assy (164805-901).
c) Replace the Shuttle Frame Assy.

7 = Coil Test

Possible Error Messages = EC STOPPED AT STATE 0009 (Enter Power-up Coil Diagnostic), HAMMER COIL BAD #, …etc., HAMMER COIL OPEN

Checks current handling of the Hammer Bank Coils during the boot procedure of the EC Processor. Determines the location of coils with open and shorted windings once power has been applied to the printer and the CMX boot sequence is allowed to begin.

a) Redownload Flash Software.
b) Replace Flash Memory SIMM.
c) Replace the Shuttle Frame Assy.
d) Replace the CMX PCBA.

8 = Hammer Active Diode

Possible Error Messages = UP DRV. SHORT, LO DRV. SHORT, Print Quality

Partially energizes and de-energizes the Hammer Coils during print operation.

a) Cycle Power. Press CLEAR if above messages are still displayed.
b) If messages are still evident, replace Hammer Bank Logic Cable Assy (152421-901).
c) Replace Hammer Bank Power Cable Assy (164805-901).
d) Replace the CMX PCBA.
e) Replace Shuttle Frame Assy.

9 = +2.5V Regulator

Possible Error Messages = PAPER OUT, PAPER JAM, PLATEN OPEN, CLOSE PLATEN, RIBBON STALL

Used by the various detection sensors (Platen Open Interlock, Paper Motion, Paper Out).

a) Check / Clean / Replace the Paper Detector Switch Assy (152415-901).
b) Check / Clean / Replace the Platen Interlock Switch Assy (152417-901).
c) Check / Clean / Replace the Right/Left Ribbon Guide Cable Assy(s) (163597-901).
d) Replace the CMX PCBA.

10 = Shuttle Control

Possible Error Messages = SHUTTLE JAM, SHUTTLE STALL, SHUTL OVR SPEED

Monitors Shuttle Speed and Position to allow MECA ASIC to properly time Hammer Fire.
Does Fault Reporting if the motor cannot be started or acquire the desired shuttle speed.

a) Check that the Forms Thickness Lever is set to match the thickness of the paper.
b) Check / Adjust the Platen Gap – 0.011" (0.28 mm).
c) Check / Replace the Hammer Bank Cover/Ribbon Mask Assy.
d) Check for obstructions in both the paper path and shuttle mechanism.
e) Check that related cables are attached at both the shuttle and CMX.
f) Check that related cables are not pinched, shorted or open.
g) Check / Adjust the MPU Gap to the Flywheel – 0.010 +/- .001" (0.254 +/- 0.025 mm).

11 = Paper Feed Drive

Possible Error Messages = PAPER JAM, PAPER OUT, Loss of TOF, Vertical Misalignment of Characters, Incorrect Line or Dot Row Spacing, Noisy / Poor Paper Feeds

Applies +48V and up to 5 Amps to the Paper Feed Motor (154068-901) which controls the position of the paper through the print station by using predefined step tables.
This motor is connected into P107 on the CMX board.

a) Check resistance on the motor (P107 pins 1, 3 and 5, 7 = 0.417 to 0.681Ω).
b) Check that the Forms Thickness Lever is set to match the thickness of the paper.
c) Check the Paper Feed Pulley (108627-901) for looseness and correct number of teeth (25T).
d) Check Paper Feed Timing Belt (108664-903) for wear and set belt deflection at 1/8".
e) Check / Adjust Platen Gap – 0.011" (0.28 mm).
f) Inspect / Replace Tractor set (140716-903) or Power Stacker Tractor set (158741-001) for excessive wear and equal door closing tension.

12 = Paper Feed Control

Possible Error Messages = PAPER JAM, PAPER OUT, Loss of TOF, Vertical Misalignment of Characters, Incorrect Line or Dot Row Spacing, Noisy / Poor Paper Feeds

Using the predefined step tables based on dot density to control both forward and reverse move distance, it is also used to detect Paper Out and Paper Jam Faults after time and distance debounce.

a) Check resistance on the P/F Motor (P107 pins 1, 3 and 5, 7 = 0.417 to 0.681Ω).
b) Check that the Forms Thickness Lever is set to match the thickness of the paper.
c) Check the Paper Feed Pulley (108627-901) for looseness and correct number of teeth (25T).
d) Check Paper Feed Timing Belt (108664-903) for wear and set belt deflection at 1/8".
e) Check / Adjust Platen Gap – 0.011" (0.28 mm).
f) Inspect / Replace Tractor Set (140716-903) or Power Stacker Tractor Set (158741-001) for excessive wear and equal door closing tension.
g) Replace the CMX PCBA.

13 = Upper Hammer Drive

Possible Error Messages = UP DRV. SHORT, LO DRV. SHORT, 8.5V POWER FAIL, 48V PWR FAIL

Connects to the positive side of the coils. Detects faulted drive MOSFETs to protect the hammer bank from damage. Applies 48V or 8.5V to the coils at all times.

a) Cycle Power. Press CLEAR if above messages are still displayed.
b) If messages are still evident, replace Hammer Bank Logic Cable Assy (152421-901).
c) Replace Hammer Bank Power Cable Assy (164805-901).
d) Replace the CMX PCBA.
e) Replace Power Supply PCBA.
f) Replace Shuttle Frame Assy.

14 = Vboot Regulator (15V+8.5V)

Possible Error Messages = 23.5V CTL FAIL, UP DRV. SHORT, LO DRV. SHORT

This 23.5 volt regulator supplies power to the Hammer Active Diode, Upper Hammer Drive and the Hammer Drive Short Circuit Detection circuits.

a) Cycle Power. Press CLEAR if above messages are still displayed.
b) Redownload Flash Software.
c) Replace Flash Memory SIMM.
d) Replace the CMX PCBA.
e) Replace the Power Supply PCBA.
f) Replace the Shuttle Frame Assy.

15 = Fan Drive/Fault Detection

Possible Error Messages = EXHAUST FAN FAULT, HMR BANK FAN FLT, INTAKE FAN FAULT, COIL HOT

The printer is cooled by up to three 48V fans powered and controlled by the CMX. The Intake (Card Cage) Fan (150261-901) blows across both the CMX and the Power Supply and is on when 48V is available. On cabinet models, the Exhaust Fan (150261-901) is also always on when 48V is available. The Hammer Bank Fan (152416-901) current is monitored for failure. If the current is too low due to a broken wire or a stalled fan attempting to restart, a fault is reported.

a) Inspect for obstructions of airways and vents.
b) Check for continuity, shorts and opens on the Card Cage Fan Cable Assy (152422-901).
c) Check resistance on the Card Cage Fan (P106 pins 9, 11 = 4.6KΩ).
d) Check resistance on the Hammer Bank Fan Assy (P107 pins 10, 12 = 2.7 KΩ).
e) Check for continuity, shorts and opens on the Exhaust Fan Cable Assy (152424-901).
f) Check resistance on the Exhaust Fan Assy (P107 pins 9, 11 = 4.6KΩ).

Note on Pedestal P5000: Boot code uses the control panel to determine if the printer is a pedestal or floor model. Boot code needs to know the difference so the EXHAUST FAN FAULT can be disabled on the pedestal model. If an EXHAUST FAN FAULT is displayed on the pedestal model, replace the Control Panel Assy (153366-901).

16 = Hammer Drive Short Detection

Possible Error Messages = HAMMER COIL BAD #, …etc., HAMMER COIL OPEN, LO DRV. SHORT, UP DRV. SHORT

Hot, open or low impedance Hammer Coils are detected. An Open Lower Hammer Driver will give the same indication as an Open Coil. This circuit prevents damage to the hammer bank and prevents printing when there is a hammer bank fault.

a) Cycle Power. Press CLEAR if above messages are still displayed.
b) If messages are still evident, replace Hammer Bank Logic Cable Assy (152421-901).
c) Replace Hammer Bank Power Cable Assy (164805-901).
d) Replace Shuttle Frame Assy.
e) Replace the CMX PCBA.

17 = Clocks

These external oscillators supply all of the clock generation and modulation for the 68EC030 (25 MHz or 40 MHz), the 80C166 (EC) and both MECA and VX ASICs.

18 = MECA ASIC

The MECA (Mechanism Engine Control ASIC) is a custom gate array used by the 80C166 (EC) to control the many printer motor functions. These functions include the control of numerous counters, PWM generators and FIFOs and the MECA is specifically designed to drive this system.
The MECA is responsible for integrating all of the timing information for Hammer Fire Control. The EC processor loads values to MECA. These values are formatted in tables known as Fire Tables located in Flash memory. Separate Fire Tables exist for each dot density. MECA uses these values to synchronize the firing of all of the different phases of the hammer bank with shuttle position.
MECA also performs the synchronization of the data stream to the hammer firing. The transfer of the image data consists of "dots" sent in a serial stream to the hammer bank performed by the VX ASIC. The MECA requests the bursts of this data from the VX to coincide with the next hammer fire. After the data has been sent to the hammer bank, MECA issues commands serially to the hammer bank to fire the data. Another ASIC on the hammer bank, which handles parsing of the data stream, actually causes the hammers to fire.

19 = 80C166 / Engine Controller (EC)

The Siemens SAB 80C166 Microcontroller is used to control all of the real-time functions of the printer. This makes it responsible for synchronizing the paper, ribbon, platen and shuttle motion with respect to each other and the dot data provided by the Data Controller (DC). It is also responsible for monitoring all mechanism, power supply and hammer bank faults as well as the Energy Star (Power Save) mode.
The 80C166 has its own local 128 KB 5.0V-only Flash Memory module. This is organized as 64K x 16 bits and has a minimum of 100,000 write/erase cycles. This memory is fixed and soldered to the CMX. It is used to store all Boot Code, Program Code, Step Tables and Hammer Fire Tables. The contents can be updated through the DC (serial or parallel ports) and can store additional tables in shared DRAM during run time. These components as well as all analog drive circuitry are used in conjunction with the MECA ASIC.

20 = 68EC030 / Data Controller (DC)

A Motorola 68EC030 microprocessor serves as the processor of the DC unit. In addition to the 68EC030, the DC is made up of the following elements: *two Flash SIMM sockets, two DRAM SIMM sockets, 8K x 8bit NVRAM, VX ASIC and Host I/O Drivers and Termination.*
The 68EC030 runs at 25 MHz on all models except the P5X05B, P5X10, P5214, P5X15, P5XKA and H-Series printers. These models (except H-Series) use the 68EC030 that runs at 40 MHz on what is known as the CMX 040. This board is backwards compatible with any P5000 Series printer. On H-Series, the 40 MHz 68EC030 is used on a CFX controller unique to this series. The 68EC030 is referred to as both the 030 and the DC.
The 68EC030 processor stores Program, Emulation and Boot Code in Flash Memory. System DRAM is used to store Program Variables, Image Buffers and Input Buffers. NVRAM is used to store Configuration and System Statistical Data. The DC is responsible for Host I/O, Operator I/O, Security Key Interface, Print Image Generation, and overall High Level Control.

21 = VX ASIC

The VX is a multifunction custom gate array ASIC containing all the logic for the DC that is not contained in the 68EC030 processor. The VX provides the following services:
Memory Access Controller – All 030 addresses go through the VX ASIC. The VX handles all Address Decoding, Chip Selects, DTACK'S, etc…
DRAM Controller – Supports up to 4 banks of Page Mode DRAM (32 Mb total).
Flash Controller – Supports up to 4 banks of Flash Memory (30 Mb total).
Two DMA Channels – These channels move data from the Host I/O or Expansion Bus to the DRAM or vice-versa. One address is an I/O Address, the other is a memory address with Auto-increment.
Operator Panel Interface – consists of 5 lines: serial clock, serial data, and 3 select lines. Also handles all Parallel-to-Serial (and vice-versa) conversion to and from the panel and timing for toggling select lines.
"Dot Plucking" and Adjacent Dot Checking – "Dot Plucking" is a specialized DMA function that removes dot data from a dot image buffer in DRAM in a programmable manner, serializes it, and sends it to the hammer bank. This function is controlled by the EC.
"Cajun" Bus Interface – connects the DC, the EC, and the Expansion Port. The EC uses this bus to access DC resources, including the Semaphore Registers. (The Semaphore Registers are the primary communications path between the EC and DC.)
Host I/O and Diagnostic Port – The VX controls the following I/O functions:
Interface to IEEE 1284 Level 2 Host.
Interface to R2-232E Serial Host.
Interface to RS-422B Serial Host.

22 = 72-pin DRAM

Possible Error Messages = ERROR: DRAM AT ADDRESS XXXXXXXX, ERROR: EC STOPPED AT STATE XXXX, ERROR: NO DRAM DETECTED, ERROR: PROGRAM NEEDS MORE DRAM, ERROR: SHORT AT ADDRESS XXXX, ERROR: WRONG CHECKSUM, Downloads Consistently Fail, Control Panel Display Shows Garbled, Broken Characters

Controlled by the 68EC030 Microcontroller, the system DRAM is used for Program Variables, Image Buffers, and Input Buffers. All DRAM supports Page Mode operation and is addressable by individual byte.

Two standard 72-Pin DRAM SIMM sockets are available on the CMX PCBA. Bank 0 is used to store current base data memory configuration. Bank 1 is provided for expansion as more memory is required to support more complex emulations such as graphics. The DC, through the VX ASIC, may address up to 32 Mb of DRAM organized as 4 banks with 2 banks per SIMM socket.

NOTE: J16 (Bank 0) must always be filled. The CMX PCBA does NOT support EDO DRAM.

a) Make sure non-EDO DRAM is used.
b) When both sockets are used, do not mix DRAM of different speeds.
c) When both sockets are used, it does not matter which SIMM goes into which bank as long as as J16 (Bank 0) is always filled.
d) Always use the minimum amount required by the emulation software. If you are not sure, use a 4 Mb DRAM SIMM in J16 (Bank 0).
e) If a DRAM SIMM is suspect to be bad, enter the BOOT DIAGNOSTICS MENU. With power off, press and hold both **PREV** and **DOWN** keys. Turn on the printer and by using the directional keys, select and run MISC UTILITIES / RUN MEMORY TESTS. The test used is TESTING FOR ADDRESS SHORTS. This tests if an address line is shorted to another line. If the memory test fails, replace the DRAM.
f) If emulation downloads consistently fail with no messages or erratic messages, run the above Memory Test. If it fails, replace the DRAM. If it passes, replace the Flash SIMM(s).
g) If the control panel display shows garbled or broken characters especially after an emulation download, replace the DRAM.

DRAM SIMMs currently available are:

1 Mb DRAM SIMM	(256X32, 70ns, 72-Pin)	202413-001
2 Mb DRAM SIMM	(512X32, 70ns, 72-Pin)	202502-001
4 Mb DRAM SIMM	(1MX32, 70ns, 72-Pin)	202412-001
8 Mb DRAM SIMM	(2MX32, 60ns, 72-Pin, FPM)	203142-001*

* Use only if emulation to be downloaded requires it.

More DRAM will NOT increase printer throughput or forms handling/paper format characteristics.

23 = 80-Pin Flash Memory

Possible Error Messages = ERROR: DC PROGRAM NOT VALID, ERROR: EC PROGRAM NOT VALID, ERROR: EC STOPPED AT STATE XXXX, ERROR: FLASH DID NOT PROGRAM, ERROR: FLASH NOT DETECTED, ERROR: PROGRAM NEEDS MORE FLASH, ERROR: WRITING TO FLASH, ERROR: WRONG CHECKSUM, ERROR OCCURRED FLUSHING QUEUES, FIRMWARE ERROR, Black Squares on Control Panel Display, Flash SIMM Won't Copy

The 68EC030 processor stores Program, Emulation and Boot Code in Flash Memory. Programs stored in Flash Memory are changed through the parallel or serial port. Flash Memory is erasable, non-volatile, and significantly faster than a disk drive. This Flash is AMD 5.0V-only memory, which does not require higher programming and erasing voltages on the board. (It has an internal charge pump to make these voltages itself). This memory supports at least 100,000 write/erase cycles. This Flash is 32 bits wide. It is byte, word, and double word readable, but is always written as double words.

Two 80-Pin SIMM sockets are provided for Flash memory. Up to 30 Mb of Flash (total), organized as up to 4 banks, may be installed in the two sockets on the CMX PCBA.

a) The Boot Code for the 68EC030 processor MUST reside in Bank 0. This means that J11 (Bank 0) must have a pre-programmed Flash SIMM. If a Flash SIMM is blank (no code), black squares on the control panel display is usually the result.
b) Always use the minimum amount required by the emulation software. If you are not sure, use a 4 Mb Flash SIMM in J11 (Bank 0).
c) Unlike the DRAM, Flash SIMM(s) from one CMX PCBA must be placed in the same slot(s) on a replacement CMX board. Installing Flash Memory from one controller to another does not always transfer all operating system software. The printer may behave in an unpredictable manner and post the errors mentioned above. Redownload the emulation software.

NOTE: Flash Memory SIMM(s) in the printer is/are analogous to a hard drive in a computer. When the printer first powers up, the 68EC030 is reading the Boot Code resident in the Flash SIMM located in J11 (Bank 0).

In the P5000 Maintenance Manual, a section is provided called *"The Power On Sequence"*. Two routines are listed in detail to help isolate problems that occur before the printer completes its boot and initialization sequences.

These two routines are:

Controller board handshake sequence (DC Hardware Initialization).

DC Software Initialization and Power Up.

Most problems that occur during boot up is because of code corruption that has taken place within the Flash Memory (similar to a hard disk crash on a computer). Redownload the Emulation Code to see if it allows the printer to complete its initialization cycle. If not, the Boot Code may be corrupted and the SIMM needs to be replaced.

In this case, the Flash Memory (like a hard disk) can be erased and have new boot code copied to it (provided a known good SIMM is available). Then have an Emulation Download attempted again.

HOW TO REFRESH A FLASH MEMORY SIMM:

If a Flash SIMM is suspect to contain corrupted code but another known good SIMM is available (usually from another printer) and a replacement SIMM is not readily available, enter the BOOT

DIAGNOSTICS MENU. With power off, press and hold both **PREV** and **DOWN** keys. Turn on the printer and by using the directional keys, select BOOT DIAGNOSTICS / MISC UTILITIES.

A) Run MISC UTILITIES / COPY FLASH SIMMS.
THE COPY FLASH SIMMS function is used to copy ALL of the code in a SIMM in J11 (Bank 0) to a SIMM in J10 (Bank 1). Use SIMMs of the same size or destination SIMM is larger than the source. This function will verify that the destination is at least as large as the source. If the destination is smaller than the source then the error message "SOURCE LARGER THAN DESTINATION" will be displayed on the panel. Use Step B below. The function will ERASE the contents of Bank 1 and copy an EXACT image of Bank 0 to Bank 1. This process usually takes less than 20 seconds and is a fast way to duplicate Flash SIMMs.
A new un-programmed (blank) SIMM may be placed in Bank 1 since an exact image is copied from Bank 0 to Bank 1.

B) Run MISC UTILITIES / COPY BOOT SIMMS.
THE COPY BOOT SIMMS function copies ONLY the Boot Code from the SIMM in J11 (Bank 0) to the SIMM in J10 (Bank 1). The function completely erases the contents of Bank 1 before copying the boot code. Since the function only copies the boot code, it does not care how much Flash Memory is in the destination location. The function was created because there was not a way to copy the boot code from a 2 Mb SIMM to a 1 Mb SIMM or a 4 Mb SIMM to a 2 Mb SIMM.

Flash SIMMs currently available are:

1 Mb Flash SIMM	(256X32, 90ns, 80-Pin)	202554-001
2 Mb Flash SIMM	(512X32, 90ns, 80-Pin)	202418-001
4 Mb Flash SIMM	(1MX32, 90ns, 80-Pin)	202417-001
8 Mb Flash SIMM	(2MX32, 90ns, 80-Pin)	171884-001

Note: All Flash SIMMs listed above have Boot Code resident. No blank Flash is offered.

24 = Cajun/Expansion Bus

The "Cajun" bus connects the DC, the EC, and the Expansion Port. The EC uses this bus to access DC resources, including the semaphore registers. (The semaphore registers are the primary communications path between the EC and DC.) The VX supports the interface to the Expansion Port as part of the overall Host I/O function. The Expansion Port is an auxiliary interface intended to accommodate the Expansion-CT (Coax/Twinax) option and although it is under VX control, the Expansion Port is actually treated as a device on the Cajun Bus.

25 = Host I/O Drivers and Termination

Possible Error Messages = BUFFER OVERRUN, PARITY ERROR, Fails to Print from Host, Prints Incorrect Characters, Prints Extra Characters, Drops Characters

Outside of the 030 and VX, additional circuitry is needed to complete the serial and parallel interfaces. These include:

RS-232 Drivers and Receivers – These parts have internal charge pumps to eliminate the need for +/- 12V Supplies.

RS-422 Drivers and Receivers.

Parallel Port Pull-up/Pull-down – These termination resistors are 14-pin DIP-socketed for end-user configurability. The resistor values used are typically 470/1K (101381-471/101381-102) for Centronics and 220/330 (101381-221/101381-331) for Dataproducts.

All interface IC's and Termination conforms to the following requirements:

Provide ESD 15 KV protection for all inputs.

Less than 0.05 Volts common mode ripple measured at the power and ground of the I/F ICs.

Less than 0.02 Volts common mode ripple measured between chassis ground and the ground pins of the I/F ICs.

Less than 200 Volts/us slew rate for all outputs.

Logic Levels Supported are TTL/EIA-232E/EIA-422B

Transfer Rates Supported are:

Up to 19.2 K baud on RS-232 Serial I/O.

Up to 115.2K baud on RS-422 Serial I/O.

Up to 200 Kilobytes on Parallel Interface.

Max Cable Lengths Supported are:

Serial RS-232	=	50 Feet (15 Meters)
Serial RS-422	=	4000 Feet (1220 Meters)
Centronics Parallel	=	15 Feet (5 Meters)
IEEE 1284 Bi-dir Parallel	=	32 Feet (10 Meters)
DataProducts Parallel Shortlines	=	40 Feet (12 Meters)
DataProducts Parallel Longlines	=	500 Feet (150 Meters)

Troubleshooting Serial RS-232/RS-422 Communications

a) Check to see if Host/Printer interface cable pinouts are incompatible; (i.e. for no communication, switch pins 2 and 3).
b) Check Host/Printer/Network configuration.
c) Check / Set DTR and RTS to both True.
d) Check / Replace Host Interface Cable if defective.
e) Check / Replace CMX PCBA.

Troubleshooting Parallel Communications

a) Check / Replace Host Interface Cable if defective.
b) Check Host/Printer/Network configuration.
c) Check / Replace CMX PCBA.
d) Check / Replace Terminator Resistors.

26 = Security PAL (Programmable Array Logic)

Possible Error Messages = SECURITY CODE VIOLATION, SECURITY PAL NOT DETECTED

The printer uses one of six security modules or keys, depending on the emulation and hardware options used by the customer. These removable DIP-socketed modules are required to allow a specific emulation to download into Flash Memory as a legal copy.

NOTE: PALs are normally made available by the purchasing of an option or upgrade kit. PALs are not made available through individual resale.

a) Check that the security module is correctly installed for the desired emulation with the notched end towards the Flash and DRAM sockets.
b) Look for bent or broken pins.
c) If PAL is not detected yet one is installed intact, replace it.
d) If after a printer power cycle the message has not cleared, replace the CMX PCBA.

NOTE: Some emulations will run under more than one security module.

Below is a list that shows which modules will work with which emulation.

EMULATION	PAL #
LP+/E	1,2,3,4,5,6
LP+/IGP (PGL/VGL)	2,4,6
CT/LP+/E	1,2,3,4,5,6
CT/LP+/E/IGP	2,4,6
ANSI/LP+	5
ANSI/PGL	6
ANSI/VGL	6
CT/IPDS/LP+	3,4
CT/IPDS/IGP	4
TCP/IPDS/LP+	3,4
TCP/IPDS/IGP	4

NOTE: IGP = PGL/VGL. CT = COAX/TWINAX. Ethernet capability is embedded into LP+; the hardware NIC needs to be installed to activate. ANSI = Genicom 44/48XX Emulation.

27 = NVRAM

Possible Error Messages = NON VOLATILE MEMORY FAILED, Invalid or Corrupted Data Saved in NVRAM, Control Panel Lock/Unlock Fails to Work, Missing Parameters and Ports from Sub-Menus, Cannot Save Parameter Changes to the Configuration, Random and Usually False Error Messages are seen in the Control Panel Display, Erratic Printer Behavior, Loss of Hammer Phase Value.

An 8K X 8 Bit Non-Volatile Battery-Backed Static RAM (NVRAM) provides for the storage of all Configuration and System Statistical Data. Supports at least 100,000 Access Cycles.

DO NOT ATTEMPT TO REPLACE THE NVRAM. REPLACE THE CMX ONLY.

a) If the NON VOLATILE MEMORY FAILED message is displayed on the control panel upon power-up, replace the Flash Memory.
b) If the message appears while saving a configuration, the printer is out of memory and will not save that or subsequent configurations. (Previously saved configurations are still okay).
c) If the message appears after replacing/increasing memory, replace the CMX PCBA.
d) For all other symptoms listed above, enter BOOT DIAGNOSTICS – MISC UTILITIES. Execute the CLEAR NVRAM parameter.
(See Tech Bulletin 5-0032A for more info)

NOTE: **Resetting (or clearing) the NVRAM will erase not only all Hammer Phasing values but also all printer statistics and User-Defined printer configurations.** Reset NVRAM before replacing the CMX PCBA. Printing all configurations will assure that the printer can come back on-line quicker with known working parameters.

28 = MPU (Shuttle Encoder)

Possible Error Messages = SHUTL OVR SPEED, SHUTTLE JAM, SHUTTLE STALL, PAP FIFO UNDRFL, PAP BSY TOO LNG, Hammer Phase/Horizontal Misalignment of Characters, Randomly Misplaced Dots, Shuttle Does Not Move.

The Magnetic Pick-Up (MPU) or Index Sensor (150281-901) located to the left of the shuttle motor's timing disk is pulsed by the slots in the disk so that timing signals relate precisely to the shuttle's position. This sensor is attached to the MPU Cable Assembly (152425-901) which is routed from beneath the Mech Base back to the CMX Connector P107 pins 17 and 19.

a) Check the MPU Gap. Using a feeler guage, adjust the gap between the MPU assembly and the flywheel to 0.010 +/- .001 inch (0.254 +/- 0.025 mm). Torque the 7/16 inch MPU clamp screw to 18 +/- 1 inch pounds (2.03 +/- 0.11 Newton-Meters).
b) Check for correct shuttle type on configuration printout.
c) Check the resistance of the MPU (P107 pins 17, 19 = 670Ω). Replace MPU if incorrect.
d) *Check / Adjust Hammer Phasing.
e) Replace Flash Memory and re-download Flash software if correct values for both Shuttle type and Hammer Phase does not hold in configuration or change symptom.
f) Clean / Inspect Shuttle Frame Assy for ink residue. Replace Shuttle Frame Assy (if needed).
g) Replace the CMX PCBA.

28 = MPU (Shuttle Encoder) continued.

Nominal Hammer Phasing Values based on Shuttle-Types and Factory Defaults.

NOTE: This data is to be used as a reference only as optimum print quality is the goal.

Model Type	Shuttle P/N	Phasing Value
P5X05 (475 LPM)	153320-001/-901	64 +/- 20
P5X05-12 (475 LPM,12 mil)	155884-001/-901	64 +/- 20
P5X05A (500 LPM)	158338-001/-901	64 +/- 20
P5X05A-12 (500 LPM,12 mil)	159397-001/-901	64 +/- 20
P5X05B (500 LPM)	163984-001/-901	*217 +/- 20
P5X05B-12 (500 LPM,12 mil)	164366-001/-901	*217 +/- 20
P5X08 (800 LPM)	153276-001/-901	61 +/- 20
P5X09 (900 LPM)	159925-001/-901	61 +/- 20
P5X10 (1000 LPM)	163985-001/-901	123 +/- 20
P5212 (1200 LPM)	153321-001/-901	75 +/- 20
P5214 (1400 LPM)	157282-001/-901	75 +/- 20
P5215 (1500 LPM)	157735-001/-901	62 +/- 20
P5XKA (Kanji/Hanzi)	157722-001/-901	61 +/- 20

***IMPORTANT:** When loading software versions that contain the current Hammer Fire Tables to support the 5B/10/15 shuttle-types (V3.03C or higher), the phase defaults marked by * will be applied to both the 475 LPM and 500A LPM shuttle-types and the default shuttle-type will be 500B.

(Verify by running a printer configuration printout and/or matching the part number of the shuttle with the list above.)

Reset the shuttle-type and the phase value (per the P5000 Maintenance Manual) if the printer is either a 475 or 500A printer or poor and unreadable print quality will result.

Diagnostic LED CR1

This Diagnostic LED, while using a minimum amount of hardware, can get information out when other forms of communication such as the Control Panel Display are unable to. This LED sends the information by blinking 3 or 4 digit codes. The codes are sent in the form of:
Blink 1st digit then pause ½ second
Blink 2nd digit then pause ½ second
Blink 3rd digit then pause ½ second (if last digit then pause 5 seconds)
Blink 4th digit (if applicable) and pause for 5 seconds then repeat starting from 1st digit.

NOTE: If the Control Panel Display is operational and the display has a message posted that is different from the Blink Code transmitted by this LED, go by the message in the display.

The following is a list of LED Error Codes:

Blink Code	Error Definition	Possible Cause
4-1-1-1	Bad Data Line D0 or VX Can't Read	Open or short D0. Buffer problem between the processor and the VX ASIC.
4-1-1-X	Bad Data Line (X-1 = Data Line)	Open or Shot on a Data Line.
4-3-4	Bad I/O Clock	Bad 18.432 MHz Crystal.
1-1-4	No DRAM Detected	Bad or Missing DRAM SIMM.
1-1-1	DRAM Address Short	Address Short on the CMX Board or SIMM.
1-1-1	Bad DRAM	Bad DRAM SIMM.
1-4-1	Bad NVRAM	Bad or Missing NVRAM.
4-3-2	DC Program not Valid	DC Program was Erased or not Loaded.
4-3-2	EC Program not Valid	EC Program was Erased or not Loaded.
4-3-2	Error Writing to Flash	Bad Flash or Software Error.
4-3-3	Program not Compatible	Trying to Download Software for a Different Printer. (e.g. CBO Software onto a CMX).
4-3-3	Bad Security PAL	Security PAL is Bad or Missing.
4-4-3	Security Code Violation	Wrong Security PAL or Software.
1-3-3	Unexpected Interrupt	Interrupt Dependent (See C/P Display).