Mega STE

Field Diagnostics
ver 1.5

MEGASTE FIELD DIAGNOSTICS

OVERVIEW

The MegaSTe Diagnostic Cartridge is used to detect and isolate component failures in the MegaSTe computers. This document refers to revision 1.5. Users of earlier versions should refer to the appropriate Troubleshooting Guide. This section gives a brief guide to use with a description of each test, error codes or pass/fail criteria, and recommendations on repair.

POWER-UP

With the power switch off, install the Diagnostic Cartridge with the label facing up.

IMPORTANT--if the cartridge does not have the plastic enclosure, BE SURE THE CARTRIDGE IS INSTALLED WITH THE CHIPS FACING DOWN).

The diagnostic program performs several tests on power-up. In particular, the message "Testing MFP, GSTMCU timing, Video will appear, and the screen will appear scrambled for a few seconds before the menu is printed. The screen will turn red (dark background in monochrome) if an error occurs in the initial testing, with a message indicating the failure. The lowest 2 Kbytes of RAM is tested on power-up; if a location fails, the error will be printed to the RS-232 device. It is assumed that if RAM is failing, the screen may not be readable and program execution will fail because there is no stack or system variables. The program will continue to test RAM and print errors, but no screen will be displayed (the screen may turn red). Repair RAM.

If the keyboard fails, it will be inactivated. The user must connect a terminal to the RS-232 port. The diagnostic program looks for keystrokes from the RS-232 device. If the display is unreadable, the RS-232 terminal should be used. All messages are printed to the RS-232 port as well as the screen.

POWER-UP INITIALIZATION ERRORS

Errors occurring before the title and menu appear

I1 RAM data line is stuck.

I2 RAM disturbance. Location is altered by write to another location.

I3 RAM addressing. Wrong location is being addressed.

I4 MMU error. No DTACK after RAM access.

I5 RAM sizing error. Uppermost address fails.

I6 Bus Error handling failed. Bus Error occurred (on purpose), but caused a crash (e.g. system was unable to read the vector from RAM).

I7 Bus Error not detected. GSTMCU not asserting Bus Error or the signal is not reaching the 68000.

T0 MFP timers failed.

T1 Vertical sync timing failed.

T2 Horizontal sync timing failed.

T3 Display Enable Interrupt failed.

T4 Memory Controller video address counter failed.

T5 PSG Bus test. PSG chip is causing a bus error by staying on the data bus too long.

T6 Floppy Disk Controller Bus test. FDC chip is causing a bus error by staying on the data bus too long.

K0 Stuck key

K1 Keyboard controller is not responding.

K2 Keyboard controller reports error.

TEST MENU

The normal screen will be dark blue with white letters. The test title and revision number are displayed at the top, with the amount of RAM and keyboard controller revision below, and a test menu below that. To select tests, the user types the keys corresponding to those tests, and then the RETURN key. After the operator selects a test, the program will not proceed until the key break is detected (when the operator releases the key).

This prevents false "stuck key" messages in the keyboard test. Many iterations of the test or tests chosen can be run by typing in the number of cycles just before typing RETURN. Typing a zero will cause the test sequence to run continuously. To stop a cycle before completion, hit the ESC key (there may be some delay in some tests before the test stops). As each cycle completes, the total numbers of cycles will be displayed on the screen. Several hidden key sequences are also provided.

Mega-STE Field Service Diagnostic Test Rev. 1.5
(c) 1991, Atari Corp.
4M RAM Keyboard revision 2 60 Hz O.S. Version 2.02 USA NTSC

R RAM Test	O O.S. ROM	K Keyboard
M MIDI	S Serial Port	T Timing
D DMA Port	I SCC	L Real-Time Clock
F Floppy Disk	P Printer/Mouse/Joy Ports	
G short BLiT	Y long BLiT	V VME

Q Run All Unattended Tests (R,O,K,M,S,T,D,I,L,F,P,Y,V)
Z Run Unattended Internal tests (R,O,K,G,T,V,L)

A Audio	C Color	H High resolution
J Hard Disk Read/Write		

E Examine/Modify memory
B Set RS-232 rate
X Toggle video output--50/60 Hz
? Help

Enter Letter(s), and Return

Hidden Key Sequences:

F1 System Clock 8 MHz cache off

F2 System Clock 16 MHz cache off

F3 System Clock 16 MHz cache on

F5 8 MHz floppy clock set

F6 16 MHz floppy clock set (1.44 Meg Drive)

F7 Software Date

The RAM size, keyboard revision, O.S. version, country (or language), and television standard (PAL or NTSC) are shown.

The 'Q' selection sequences through all the tests except for Audio, Color, High resolution monitor, and Hard Disk Read/Write. The 'Z' selection sequences through RAM, ROM, Keyboard, short BLiT, Timing, VME, and Real-Time Clock. Selection 'E' enables the operator to examine or modify RAM or hardware registers. 'B' enables the operator to change the baud rate on the RS-232 port. Pressing the up arrow increases it, pressing the down arrow decreases it.

For example T M2 L3 V0 <ENTER> would result in the Timing test being run once, Real-Time Clock test three times, and VME indefinitely or until the <ESC> key is pressed.

After a test or series of tests completes, the pass/fail status and error report, if any, will be displayed. When the selected test(s) have passed the screen will turn green accompanied by a short beep. If the selected test(s) fails the screen will turn red accompanied by an audible tone which oscillates. This allows the user to perform other troubleshooting functions while the running diagnostics without having to look directly at the screen for an indication of a Pass or Fail status. Press the space bar to return to the menu.

If multiple tests are selected, the sequence can be halted before completion by pressing the ESC key. At the completion of the current test, the sequence will halt, with the options of either continuing or returning to the menu. In some cases there will be a considerable delay before the current test completes and the keystroke is detected.

SUMMARY OF TESTS

GENLOCK (REQUIRES STE TEST FIXTURE)

The GENLOCK switch position allows the system to synchronize the MegaSTe video with an external source. The system clock is also phase-locked to the input sync signal. To do this pin three of the monitor connector is grounded, and the external clock is sent to the system on pin 4.

The GENLOCK test can be run using the INT/GENLOCK switch on the STe port test fixture. The GENLOCK test is run twice. Toggling the switch to the GENLOCK position on the STe test fixture should switch between the normal menu and no menu. With no menu a "sweeping" cycle should be heard. Reset the computer between each change of the INT/GENLOCK switch.

NOTE: RUN THIS TEST ONLY WITH A COLOR MONITOR.

RAM TEST (R)

System RAM is tested in three stages: low 2 kbytes, middle (up to 64k), and from 64k to top. The test patterns used are: all ones, all zeros, a counting pattern (data=low word of the address), reverse counting pattern (data=complement of address low word). The counting pattern is copied from the top and bottom of a 32 Kbyte buffer into the current 32 Kbytes of video RAM, then shifts video RAM to a new area, verifies the pattern, and repeats the test, until the top of RAM is reached. Finally, addressing at 64k boundaries is checked by writing unique pattern in last 256 bytes of each 64k block. The cache RAM is also tested as well as a CAS1 test to detect opens and shorts on the CAS signal for the upper bank of memory.

If an error occurs, the display turns red accompanied by an oscillating tone and the error code is displayed, followed by the address, data written, data read, and the bits which did not agree.

For example: " R2 45603E W:603E R:613C bad bits: 1,8".

In units having more than one bank the address as well as the bit position must be used to find the correct SIMM. The following table gives a correspondence between the addresses and banks for various models:

ONE MEGABYTE MACHINES

Address	Bank	Bad Bit(s)	SIMM
0-07FFFF	bank 0	1-8	U703
	bank 0	9-16	U701
080000-0FFFFF	bank 1	1-8	U704
	bank 1	9-16	U702

TWO AND FOUR MEGABYTE MACHINES

Address	Bank	Bad Bit(s)	SIMM
0-1FFFFF	bank 0	1-8	U703
	bank 0	9-16	U701
200000-3FFFFF	bank 1	1-8	U704
	bank 1	9-16	U702

A BANK IS 16 BITS WIDE AND CONSISTS OF TWO 1MBIT X 8 SIMMS.

RAM ERROR CODES

Except where noted, repair by replacing the SIMM corresponding to the indicated bit(s).

R0 Error in low memory, possibly affecting program execution.

R1 Error in SIMM.

R2 Address error. Bad SIMM or memory controller. Address line not working.

R3 Address error at 64k boundary.

R4 Error during video RAM test. Bad SIMM.

Cache RAM Error during cache RAM test. Bad cache RAM chip.

ROM TEST (O)

This test reads the configuration bytes of the operating system to determine the version, language/country, and TV standard (PAL or NTSC). All bytes from operating system ROMs are then read and the checksums are calculated and displayed. A CRC is then calculated for each EPROM.

The test fails if the CRC calculated does not match the CRC found in the last location in each EPROM (e.g. Version 2, French). Incorrect CRCs are indicated by the display turning red and an oscillating tone followed by a message. If an error is displayed, replace the corresponding ROM.

COLOR TEST (C)

This test verifies the Video Shifter. Seven color bands are displayed: red, green, blue, cyan, magenta, yellow, and white. Each band consists of 8 levels of intensity. All 16 color palettes are represented, each palette is a vertical strip across the screen (strips should not be discernable, but each color should be a straight line across the screen). Because of the tight timing involved, keystroke interrupts will cause the display to jitter.

The operator should see that there are no gaps or missing scan lines in the display. If lines are missing, check the three outputs on the Video Shifter for that color, and verify the values of the resistors on the output. Too low a brightness setting on the monitor will cause the monitor not to distinguish between fine levels, making it appear there are only four levels being output. The Video Shifter has four outputs for red (R0,R1,R2,R3), green (G0,G1,G2,G3) and blue (B0,B1,B2,B3). Each of these outputs is summed together by a resistor network to give 8 levels of intensity for each color, depending on which of the outputs are on. The values of the resistors give different weight to each output. The value of the resistor at R0 is twice that of R1, which is twice that of R2. (Note: some versions have these resistors inside the shifter.)

This allows us to get 8 equal steps on the summed outputs. For example, R0 on and R1 and R2 off = 1/8, R0 off, R1 and R2 on = 7/8. This signal then passes through a transistor amplifier, and from there to the video monitor connector.

NOTE: THIS RESISTOR NETWORK IS INCORPORATED INTO THE GATE ARRAY CHIP IN LATER VERSIONS.

SYMPTOMS AND FIXES:

1. Missing primary color. Check the output of the transistor amplifier. Q503 is blue, Q502 is green, Q501 is red. Look for a staircase pattern (eight levels of intensity). If the signal is there, trace forward to the video connector, if not, trace backward to the Video Shifter, until the faulty component is found.
2. Primary colors present, secondaries missing or incorrect. Replace the Video Shifter (U502).
3. Coarse change in intensity (not a smooth dark to light transition). Replace Video Shifter (U502) or look for a short on the output of one of the three color outputs for the appropriate color.
4. Specks or lines on the screen. This can be caused by bad RAM; if RAM has been tested and is good, replace the Video Shifter (U502).
5. Wavering display, horizontal lines not occurring in the same place every time. The processor may be getting extra interrupts (if the processor is required to handle additional interrupts, it will not have time to change all color registers during a horizontal scan time). Examine the MFP interrupt request (pin 32). There should be an interrupt every 126 microseconds (2 display lines) from Display Enable (pin 20). If additional interrupts occur, locate the source: the inputs at pins 22-29 should all be high. If no external (to the MFP) source for the interrupts is found, replace the MFP (U306). **NOTE:** if the keyboard is not connected, the input to the 6850 will be low, causing continual interrupts.

KEYBOARD TEST (K)

Two types of test are run. The keyboard self-test is done first, and if this passes, a screen is displayed representing the keyboard. The operator presses keys and observes that the corresponding character on the screen changes (reverses background color). The key will also be displayed in the lower half of the screen. The mouse buttons and four directions are also shown on the screen. Connect the mouse and move in any direction and the arrow will flicker. Any key clicks while the mouse is moving indicates a short. NOTE: it is possible, if pressing keys very rapidly, to leave the representation of the key on screen in a depressed state.

This does not indicate a problem with the hardware. The self-test checks communication between the CPU and the keyboard microcomputer, and checks RAM and ROM in the keyboard microcomputer, and scans the keyboard for stuck keys.

KEYBOARD ERROR CODES

K0 Stuck key. A key closure was detected while the keyboard self test was executing.

K1 Keyboard not responding. A command was sent to the keyboard processor and no status was returned within the allowed time. The keyboard needs to be replaced or the communication channel through the 6850 (U304) is not functional.

K2 Keyboard status error. The self test command was sent to the keyboard, on completion of the test, the keyboard sent an error status. Replace the keyboard.

MIDI TESTS (M) (REQUIRES MIDI LOOPBACK CABLE)

This test sends data out the MIDI port, (data loops back through the cable) and reads from the input and verifies the data is correct. This also tests the interrupt from the 6850 through the MFP chip. The LED in the loopback cable will blink as data is sent (not all cables have the LED).

MIDI ERROR CODES

M0 Data not received. Trace the signal from the output of the 6850 (U303), through the drivers (U301), loopback cable, and receivers to the input of the 6850 (U303). Replace the defective component.

M1 Write/Read data mismatch. The data written was not the same as the data read. Replace 6850 (U303).

M2 Input frame error. Bad 6850 (U303) or bad driver (U301) or receiver causing noisy signal.

M3 Input parity error. Bad 6850 (U303) or bad driver (U301) or receiver causing noisy signal.

M4 Input data overrun. The 6850 received a byte before the previous byte was read. Probable bad 6850 (U303), also can be caused by the MFP (U306) not responding to the interrupt request.

SERIAL PORT TESTS (S) (REQUIRES SERIAL LOOPBACK CONNECTORS)

NOTE: DO NOT INSTALL THE RS-232 LOOPBACK CONNECTORS UNTIL AFTER THE MAIN MENU IS DISPLAYED.

First the RS-232 control lines are tested (which are tied together by the loopback connector), then the data loopback is tested. Data is checked transmitting/receiving using a polling method first, then using interrupts. Data is transmitted at 300, 600, 1200...19200 bps. Data transmission is performed by the MFP and the 1488 and 1489 driver and receiver chips (U310, U311). Interrupts are a function of the MFP (U306). Control lines are output by the PSG chip (U305) and input on the MFP. Note that this test does not thoroughly test the drive capability of the port. If the test passes, but the unit fails in use, it is likely that the 1488 (U311) or 1489 (U310) chips are bad.

SERIAL PORT ERROR CODES

Data transmission error:

S0 Data not received. Check signal path: MFP (U306) pin 9 to 1488 (U311) pin 5 to J305 pin 3 to J305 pin 2 to 1489 (U310) pin 1 to MFP (U306) pin 10.

S1 Data mismatch. Data read was not what was sent. Check integrity of the signal. May be bad driver (U311), receiver (U310), or MFP (U306).

S2 Input frame error. Incorrect time between start and stop bits. Probable MFP failure (U306).

S3 Input parity error. Input data had incorrect parity. Probable MFP failure (U306).

S4 Input data overrun. A byte was received before the CPU read the previous byte. MFP failure (U306) or, less likely, GSTMCU (U501) failure.

S5 No IRQ. CPU did not detect an interrupt by the MFP. MFP (U306) or GSTMCU (U501) failure.

S6 Transmit error. MFP (U306) transmitter failed.

S7 Transmit error interrupt. An error condition was created intentionally to cause an interrupt, and the MFP did not respond.

S8 Receive error interrupt. An error condition was created intentionally to cause an interrupt, and the MFP did not respond.

S9 RI/DTR connection. Signal sent at DTR is not detected at RI.

SA DCD/DTR connection. Signal sent at DTR is not detected at DCD.

SB RTS/CTS connection. Signal sent at RTS is not detected at CTS.

SC RS-232 input shorted to output. The input and outputs of the MFP serial port are shorted together.

SCC TEST (I) (REQUIRES LOOPBACK CONNECTORS)

The SCC diagnostic tests the SCC chip for several functions. Internal loopback polled (asynch), break (test ext loopback), external loopback polled (asynch), modem control lines, and external loopback interrupt (asynch). Ports A and B are tested in RS-232 mode, and the LAN at port A is also tested.SCC Error Codes

Port A Errors:

SCC A internal loopback: Transmitter time-out	Transmitter failed.
SCC A internal loopback: Receiver time-out	Receiver failed.
SCC A internal loopback: Overrun	A byte was received before the CPU read the previous byte.
SCC A internal loopback: Framing error	Incorrect time between start and stop bits.
SCC A internal loopback: Parity error	Input data had incorrect parity.
SCC A internal loopback: Data compare	Data read was not what was sent.
Port A has no loopback connector	The loopback connector is not installed on Port A.
LAN has no loopback connector	The loopback connector is not installed on the LAN Port.

LAN ERROR: DCD IS ACTIVE WITHOUT RTS ON	
	The Carrier detect signal is active without a request to send.
LAN ERROR: RTS IS ACTIVE BUT DCD IS NOT RESPONDING	
	The request to send signal is on but no carrier is active.
Port A async mode: Transmitter time-out	Transmitter failed.
Port A async mode: Receiver time-out	Receiver failed.
Port A async mode: Overrun	A byte was received before the CPU read the previous byte.
Port A async mode: Framing error	Incorrect time between start and stop bits.
Port A async mode: Parity error	Input data had incorrect parity.
Port A async mode: Data compare	Data read was not what was sent.
Port A modem control error: DTR-DCD	Signal sent at DTR is not detected at DCD.
Port A modem control error: DTR-DSR	Signal sent at DTR is not detected at DSR.
Port A modem control error: RTS-CTS	Signal sent at RTS is not detected at CTS.
Port B Errors:	
SCC B internal loopback: Transmitter time-out	Transmitter failed.
SCC B internal loopback: Receiver time-out	Receiver failed.
SCC B internal loopback: Overrun	A byte was received before the CPU read the previous byte.
SCC B internal loopback: Framing error	Incorrect time between start and stop bits.

SCC B internal loopback: Parity error	Input data had incorrect parity.
SCC B internal loopback: Data compare	Data read was not what was sent.
Port B has no loopback connector	The loopback connector is not installed on Port B.
Port B async mode: Transmitter time-out	Transmitter failed.
Port B async mode: Receiver time-out	Receiver failed.
Port B async mode: Overrun	A byte was received before the CPU read the previous byte.
Port B async mode: Framing error	Incorrect time between start and stop bits.
Port B async mode: Parity error	Input data had incorrect parity.
Port B async mode: Data compare	Data read was not what was sent.
Port B modem control error: DTR-DCD	Signal sent at DTR is not detected at DCD.
Port B modem control error: DTR-DSR	Signal sent at DTR is not detected at DSR.
Port B modem control error: RTS-CTS	Signal sent at RTS is not detected at CTS.
SCC Interrupt Errors:	
SCC interrupt error: Transmitter time-out	Transmitter failed.
SCC interrupt error: Receiver time-out	Receiver failed.
SCC interrupt error: Overrun	A byte was received before the CPU read the previous byte.
SCC interrupt error: Framing error	Incorrect time between start and stop bits.
SCC interrupt error: Parity error	Input data had incorrect parity.
SCC interrupt error: Data compare	Data read was not what was sent.

No Tx interrupt	A transmit command was issued but no interrupt occurred.
No Rx interrupt	A receive command was issued but no interrupt occurred.

AUDIO TEST (A)

This test requires the operator to decide subjectively if the test passes or fails.

PSG SOUND

A sound is output on each of the three sound generator channels. The 5/8 sound is a sweep from low to high frequency. Verify that the sound can be heard throughout the range with no drop in audio level.

DMA SOUND

Connect an oscilloscope at the stereo output jacks. Set the oscilloscope to 1 ms/division and 5 volts/division. There are four parts to this test. After observing the signals in each part of the test, proceed to the next part of the test by pressing the space bar. In each case the output signal amplitude should go from 0 volts to maximum amplitude in steps. The four parts of this test are as follows:

a. Mono 1 kHz. Both channels will output the same signal which should approximate a sine wave of 5-6 volts in amplitude.

b. Stereo 1 kHz/500 kHz. Verify that the right and left channels have the correct frequency. As one channel increases in amplitude, the other channel decreases. Maximum amplitude is 5-6 volts.

c. Treble. A 12.5 kHz signal is output on both channels. Maximum amplitude is about 6 volts.

d. Bass. a 50 kHz is output on both channels. Maximum amplitude is about 6 volts.

TIMING TESTS (T)

These tests are run at power-up as well as being selectable from the menu. The MFP timers, the GSTMCU timing for VSYNC and HSYNC, and video display counters are tested. The video display test redirects display memory throughout RAM and verifies that the correct addresses are generated. Odd patterns may flash on screen as this test is run. There are two tests which check the bus timing for the Floppy Disk Controller and PSG chips. An error message is printed to the screen, then the test is run. If the test passes, the message is erased. If not, a Bus Error will occur and the message will remain. If a terminal is connected to the RS-232 port, the message will not be erased, but "Pass" will be printed.

TIMING TEST ERROR CODES

T0 MFP timer error. One or more of the four timers in the MFP (U306) did not generate an interrupt on counting down .

T1 Vertical Sync. GSTMCU (U501) is not generating vertical sync in the required time period.

T2 Horizontal Sync. GSTMCU (U501) is not generating horizontal sync in the required time period.

T3 Display Enable. GSTMCU (U501) is not generating DE output or the MFP (U306) is not generating an interrupt.

T4 Video Counter in Memory Controller. The GSTMCU chip (U501) is not generating the correct addresses for the display. This will result in a broken-up display in some or all display modes.

T5 PSG Bus Test. The PSG chip (U305) is defective.

T6 1772 Bus Test. The Floppy Disk Controller chip (U405) is defective.

DMA TESTS (D) (REQUIRES ST DMA PORT TEST FIXTURE)

Four sectors (2048 bytes) of data are written to the RAM on the port test fixture via high speed DMA, then read back and verified. This test is repeated many times for RAM addresses throughout the range of RAM.

DMA TEST ERROR CODES

D0 DMA time-out. No DMA occurred due to faulty DMA Controller (U404), GSTMCU (U501), or the HDINT interrupt was not processed by the MFP (U306). The failure can be isolated by seeing if the DMA Controller responds to HDRQ from the test fixture with ACK. Verify the MFP by seeing that the HDINT input causes an INTR output from the MFP.

D1 DMA count error. the number of bytes transferred was incorrect. The GSTMCU chip (U501) or DMA Controller (U404) is bad.

D2 Data mismatch. The data received from the DMA port was not the same as the data sent. Replace the DMA Controller (U404). If the problem persists, check the data lines to the port for opens and shorts. A third possibility is that a defective Floppy Disk Controller (U405) is loading the bus.

D3 DMA not responding. Replace the DMA Controller (U404).

FLOPPY DISK TESTS (F)

In single test mode, a menu is displayed showing seven options:

1. Quick test. For each disk installed, formats, writes, and reads tracks 0, 1, and 79 of side 0. If double sided, formats and writes track 79 of side 1 and verifies that side 0 was not overwritten. If no disks are installed, checks to see what drives are on-line and if they are double or single sided. To assure that the drives are correctly tested, the operator should install (menu option 7) before calling the test. Once the test is run, the drives become installed, and will be displayed on the menu screen (below the RAM size).
2. Read Alignment Disk. Continuously reads a track, for checking alignment with an analog alignment diskette. The track to be read may be input by the operator. If "Return" is pressed without entering a number, the default is track 40.
3. Disk Interchange Test. Checks to see if diskettes from two disk drives each can be read by the other disk drive.
4. Disk Exerciser. A more thorough disk test; tests all sectors on the disk for an indefinite period of time.
5. Check copy protect tracks (80-82). Tests tracks 80-82, which are used by some software companies for copy protection. Not all manufacturers disk drives will write these tracks. NOTE: this test is for information only and should not be used to reject a mechanism.

6. Test Speed. The rotational speed of the drive is tested and displayed on the screen as the period of rotation. The acceptable range is 196-204 milliseconds. The highest and lowest values measured are displayed. The test stops when any key is pressed.

7. Install disk drives. Specify how many and what type of disks to test. Allows testing of 360K, 720K, and 1.44 MB drives.

One additional test which can be performed is testing the write protect detection. Slide the write protect tab to the protected position, and run test #1. You should see "F5 Write protected" displayed if the drive has been installed, or "Unable to write disk" displayed if the drive has not been installed.

If more than one test is selected from the main menu, the floppy menu will not appear, but the Quick Test will be selected automatically.

FLOPPY TEST ERROR CODES

No floppies connected

The controller cannot read index pulses. The cable may be improperly connected, or the drive has no power, or the drive is faulty.

F0 Drive not selected. Drive was installed, but failed attempting restore (seek to track 0). Check connection of cables, power to drive. Verify the light on the front of the drive goes on. Listen for the sound of the head seeking (the slide on the diskette should open). If all this occurs, TR0 (pin 23 on the Floppy Disk Controller U405) should go low. If so, check for an interrupt on pin 28 of the Floppy Disk Controller. If none, replace the Floppy Disk Controller (U405). Else trace the interrupt to the MFP (U306), verify that the MFP responds by asserting INTR. If the drive is not being selected (no light), check the PSG chip (U305). Pin 20 should go low when drive A is selected, and pin 19 should go low when drive B is selected. If not, replace the PSG (U305).

Error Writing (Formerly F1)

Error Reading (Formerly F2)

Error Formatting (Formerly F3)

Displays one of the above text messages with a more specific error code such as Error Reading F9 CRC error".

F4 Seek error. Verify that the STEP, MO, and DIRC outputs from the Floppy Disk Controller are sent to the drive. Probable failure in the Floppy Disk Controller (U405), but the drive is also suspect.

F5 Write protected. Check the write protect tab on the diskette. If OK, verify that the WP input (Floppy Disk Controller U405 pin 25) is going low during the test; if it is, then the Floppy Disk Controller is defective; if not, the problem is with the disk drive.

F6 Read compare error. Data read from the disk was not what was supposed to be written. Check in the following order: diskette, disk drive, Floppy Disk Controller (U405), and DMA Controller (U404).F7 DMA error. DMA Controller could not respond to a request for DMA. Replace the DMA Controller (U404). If error persists, check FDRQ while running the test. It should normally be low and go high with each data byte transferred. If stuck high, push the reset button and verify that MR (Floppy Disk Controller U405 pin 13) goes low. If not, trace RESET to its source. If MR is OK, but FDRQ is still stuck, replace the Floppy Disk Controller (U405).

F8 DMA count error. Replace the GSTMCU (U501), if that does not fix it, replace the DMA Controller (U404).

F9 CRC error. The diskette or disk drive may be bad, else replace the Floppy Disk Controller (U405).

FA Record not found. The Floppy Disk Controller could not read a sector header. May be a bad diskette, drive or Floppy Disk Controller (U405). If the test fails drive A but not drive B, the Floppy Disk Controller is not at fault (likewise fails B not A).

FB Lost data. Data was transferred to the Floppy Disk Controller faster than the Floppy Disk Controller could transfer to the DMA Controller. If DMA Port test passes, the Floppy Disk Controller is probably bad (U405). The DMA Controller (U404) could also be at fault.

FC Side select error - single sided drive. The test tried to write both sides of the diskette, but writing side 1 caused side 0 to be overwritten.

FD Drive not ready. The format/write/read operation timed-out. Probably a bad disk drive. Verify by checking another drive. Could also be a faulty Floppy Disk Controller (U405).

PRINTER AND JOYSTICK PORT TESTS (P) (REQUIRES ST DMA PORT TEST FIXTURE)

The port test fixture is used to test the parallel printer port and joystick ports. The parallel port test writes to a latch on the test fixture and reads back data. The joystick port test outputs data on the parallel port, which is directed through the test fixture to the joystick ports. The keyboard reads the joystick data in response to commands from the CPU. The cables connecting the joystick ports to the test fixture must not be reversed, or the printer and joystick tests will fail.

PRINTER/JOYSTICK ERROR CODES

P0 Printer port error. Data read from the printer port was not what was written. Verify that the data lines on the PSG chip (U305 pins 6-13) are toggling when the test is run. If not, run the RS-232 test. If the RI-DTR and DCD-DTR errors occur, the chip is probably not being selected. Check if the chip selects are being activated and the 2MHz clock is present. If the PSG is selected and not outputting signals, replace it (U305). If the data lines toggle, verify continuity. Also verify that J11 (Joystick 0) pin 3 is pulled up. Verify the test fixture is good by testing another computer. If it is OK, replace the PSG (U305).

P1 Busy input error. The input to the MFP is not being read, or the STROBE output from the PSG is not functioning, or Joystick 0 pin 3 is not connected. If the P0 error also occurs, see handling for that. Otherwise, look for a signal arriving at MFP (U306) pin 25 from J304 pin 11. If no signal at J5, the test fixture may be bad. Verify with another computer.

J0 Joystick Port 0. The keyboard input is not functioning. If the Busy input error occurs, fix that first. Otherwise, replace the keyboard. If error persists, check continuity from J11 pins 1,2,3,4 to J12 pins 12,10,9,8 respectively.

J1 Joystick Port 1. The keyboard input is not functioning. If the Busy input error occurs, fix that first. Otherwise, replace the keyboard. If error persists, check continuity from J11 pins 1,2,3,4 to J12 pins 7,5,4,3 respectively.

J2 Joystick time-out. Joystick inputs were simulated by outputting data on the printer port and routing it via the test fixture to the joystick ports. Joystick inputs are detected by the keyboard and sent to the CPU via the 6850. This error can be caused by printer port failure (code P0), keyboard failure, keyboard-CPU communication line, or a faulty test fixture. If the power-up keyboard test passes, this eliminates any problem with keyboard-CPU communication.

J3 Left button input. If P1 error occurs, fix that first. Otherwise replace the keyboard.

J4 Right button input. If P1 error occurs, fix that first. Otherwise replace the keyboard.

HIGH RESOLUTION MONITOR (H)

If this test is selected while a color monitor is connected, a message is displayed to connect the monochrome monitor. The CPU waits for an interrupt from the MONOMON input to the MFP, and when received (the operator connects the monochrome monitor), changes the display to high resolution. The display screen shows horizontal and vertical lines, each 2 pixels in width. The screen will reverse every two seconds. When the operator sees the display is correct, he unplugs the monochrome monitor and re-connects the RGB monitor and the display should return to normal.

(BLIT) (G,Y)

Two tests are available for this chip. The "short BLiT tests the ability of the blitter to move blocks of memory around and perform logical operations on the data. No patterns appear on the screen. If an error is detected, one of the error codes (G1-G12) is displayed. In the "long BLiT test", a triangle is drawn on the screen and rotated 180 degrees until a rectangle is formed. If a color monitor is used, two identical images will be drawn. If an error occurs, the error code G14 will be displayed. Corrective action for any error is the same: 1) verify the jumpers for the BLiT chip are installed correctly, 2) replace the chip (U205).

GRAPHICS CHIP ERROR CODES

G1 halftone RAM (internal RAM in BLiT chip)

G2 endmask

G3 operation

G4 halftone op

G5 skew

G6 reverse blt

G7 force extra source read

G8 smudge

G9 x count

G10 y count

G11 time-out

G12 address count

G13 Blitter Bus Error

REAL-TIME CLOCK (L)

The test saves the current time and date, and writes a new time, waits one second, and verifies that hours, minutes, seconds, etc. have all rolled over. This procedure is repeated for another date to verify all registers.

VME CONNECTOR (V)

This test is performed in two parts. The test is designed to check the bus connected to VME option cards, not the VME cards themselves. One part of the test requires that a XYCOM 4-port serial adapter be installed. The test is run and then the system is powered down and the board removed. The other part of the test requires that a Greenspring VME memory card be installed. The switches on the card must be set to 2 and 4 off and the rest on. The system is then powered up and the VME test run again. Failures during this test are most likely to show up as bad address or data errors.

HARD DISK READ/WRITE (J)

This tests the hard disk interface by writing and reading one complete track of the hard disk. It is not intended to test the hard disk drive. It does test the computer DMA circuitry. The test has been found to be more effective than the DMA test for some types

of failures. These failures normally show up as "Data Compare" errors. The test program will save the data on the cylinder used for testing and restore the data when the test is complete. (Quit or Park Heads is selected). The test will run until the operator presses the ESC key. There is no pass condition. A failure will normally show up within a few seconds if it is going to occur.

HARD DISK READ/WRITE ERROR MESSAGES

Controller Not Responding.	This means there is no communication between the system and the hard disk. Cycling power on the hard disk may correct this condition.
Operation Timed Out.	The system sent a command which was accepted by the hard disk. The hard disk did not return a completion code in time.
Command Error.	The hard disk attempted to execute a command but an error in the hard disk occurred.
DMA Count Error.	After completing a data transfer the byte count of the data in system memory did not match the number of bytes sent.
Data Compare Error.	The data written to the hard disk and then read back did not match.

ERROR CODES QUICK REFERENCE

This is a brief summary of all error code which may occur when running the diagnostic.

INITIALIZATION (ERRORS OCCURRING BEFORE THE TITLE AND MENU APPEAR.)

I1 RAM data line is stuck.

I2 RAM disturbance. Location is altered by write to another location.

I3 RAM addressing. Wrong location is being addressed.

I4 MMU error. No DTACK after RAM access.

I5 RAM sizing error. Uppermost address fails.

I6 Bus Error handling failed. Bus Error occurred (on purpose), but caused a crash (e.g. system was unable to read the vector from RAM).

I7 Bus Error not detected. GSTMCU not asserting Bus Error or the signal is not reaching the 68000.

EXCEPTIONS (MAY OCCUR AT ANY TIME)

E1-E5 not used

E6 Autovector error. IPL0 is grounded or 68000 is bad.

E7 Spurious interrupt. Bus error during exception processing. Device interrupted, but did not provide interrupt vector.

E8 Internal Exception (generated by 68000).

E9 Bad Instruction Fetch.

EA Address error. Tried to read an instruction from an odd address or read or write word or long word at an odd address. Usually this error is preceded by a bus error or bad instruction fetch.

EB Bus error. Generated internally by the 68000 or externally by GSTMCU. Usually caused by device not responding. Displays the address of the device being accessed.

RAM

R0 Error in low memory, possibly affecting program execution.

R1 Error in RAM chip.

R2 Address error. Bad RAM chip or memory controller. Address line not working.

R3 Address error at 64k boundary.

R4 Error during video RAM test. Bad RAM chip.

Cache RAM Error during cache RAM test. Bad cache RAM chip.

KEYBOARD

K0 Stuck key

K1 Keyboard controller is not responding.

K2 Keyboard controller reports error.

MIDI

M0 Data not received.

M1 Data received is not what was sent.

M2 Data input framing error.

M3 Parity error.

M4 Data overrun. Byte was not read from the 6850 before next byte arrived.

RS-232

S0 Data not received.

S1 Data received is not what was sent.

S2 Data input framing error.

S3 Parity error.

S4 Data overrun. Byte was not read from the MFP before the next byte arrived.

S5 IRQ. The MFP is not generating interrupts for transmit or receive.

S6 Transmitter error - MFP.

S7 No interrupt from transmit error (MFP).

S8 No interrupt from receive error (MFP).

S9 DTR - RI. These signals are connected by the loopback connector. Changing DTR does not cause change in RI.

SA DTR - DCD. Same as S9 for these signals.

SB RTS - CTS. Same as S9 for these signals.

SC RS-232 input shorted to output. The input and outputs of the MFP serial port are shorted together.

SCC

PORT A ERRORS:

SCC A internal loopback: Transmitter time-out Transmitter failed.

SCC A internal loopback: Receiver time-out Receiver failed.

SCC A internal loopback: Overrun A byte was received before the CPU read the previous byte.

SCC A internal loopback: Framing error Incorrect time between start and stop bits.

SCC A internal loopback: Parity error	Input data had incorrect parity.
SCC A internal loopback: Data compare	Data read was not what was sent.
Port A has no loopback connector	The loopback connector is not installed on Port A.
LAN has no loopback connector	The loopback connector is not installed on the LAN Port.

LAN ERROR: DCD IS ACTIVE WITHOUT RTS ON

The Carrier detect signal is active without a request to send.

LAN ERROR: RTS IS ACTIVE BUT DCD IS NOT RESPONDING

The request to send signal is on but no carrier is active.

Port A async mode: Transmitter time-out	Transmitter failed.
Port A async mode: Receiver time-out	Receiver failed.
Port A async mode: Overrun	A byte was received before the CPU read the previous byte.
Port A async mode: Framing error	Incorrect time between start and stop bits.
Port A async mode: Parity error	Input data had incorrect parity.
Port A async mode: Data compare	Data read was not what was sent.
Port A modem control error: DTR-DCD	Signal sent at DTR is not detected at DCD.
Port A modem control error: DTR-DSR	Signal sent at DTR is not detected at DSR.
Port A modem control error: RTS-CTS	Signal sent at RTS is not detected at CTS.

PORT B ERRORS:

SCC B internal loopback: Transmitter time-out	Transmitter failed.
SCC B internal loopback: Receiver time-out	Receiver failed.
SCC B internal loopback: Overrun	A byte was received before the CPU read the previous byte.
SCC B internal loopback: Framing error	Incorrect time between start and stop bits.
SCC B internal loopback: Parity error	Input data had incorrect parity.
SCC B internal loopback: Data compare	Data read was not what was sent.
Port B has no loopback connector	The loopback connector is not installed on Port B.
Port B async mode: Transmitter time-out	Transmitter failed.
Port B async mode: Receiver time-out	Receiver failed.
Port B async mode: Overrun	A byte was received before the CPU read the previous byte.
Port B async mode: Framing error	Incorrect time between start and stop bits.
Port B async mode: Parity error	Input data had incorrect parity.
Port B async mode: Data compare	Data read was not what was sent.
Port B modem control error: DTR-DCD	Signal sent at DTR is not detected at DCD.
Port B modem control error: DTR-DSR	Signal sent at DTR is not detected at DSR.
Port B modem control error: RTS-CTS	Signal sent at RTS is not detected at CTS.

SCC INTERRUPT ERRORS:

SCC interrupt error: Transmitter time-out	Transmitter failed.
SCC interrupt error: Receiver time-out	Receiver failed.
SCC interrupt error: Overrun	A byte was received before the CPU read the previous byte.
SCC interrupt error: Framing error	Incorrect time between start and stop bits.
SCC interrupt error: Parity error	Input data had incorrect parity.
SCC interrupt error: Data compare	Data read was not what was sent.
No Tx interrupt	A transmit command was issued but no interrupt occurred.
No Rx interrupt	A receive command was issued but no interrupt occurred.

DMA

D0 Time-out. DMA did not take place, or interrupt not detected.

D1 DMA count error. Not all bytes arrived. Possible GSTMCU error.

D2 Data mismatch. The data received from the DMA port was not the same as the data sent.

D3 DMA Controller not responding.

TIMING

T0 MFP timers failed.

T1 Vertical sync timing failed.

T2 Horizontal sync timing failed.

T3 Display Enable Interrupt failed.

T4 Memory Controller video address counter failed.

T5 PSG Bus test. PSG chip is causing a bus error by staying on the data bus too long.

T6 Floppy Disk Controller Bus test. Floppy Disk Controller chip is causing a bus error by staying on the data bus too long.

PRINTER AND JOYSTICK PORTS

P0 Printer port error.

P1 Busy (printer port input) failed.

J0 Joystick port 0 failed.

J1 Joystick port 1 failed.

J2 Joystick (keyboard controller) timed-out.

J3 Left button line failed.

J4 Right button line failed.

FLOPPY DISK DRIVE

F0 Drive off-line. Not responding to restore (seek track 0).

Former F1, F2, and F3 write, format, and read errors are deleted. The message now will say "error writing" [reading or formatting] and display the specific error found.)

F4 Seek error.

F5 Write protected.

F6 Data compare. (Data read not equal to data written.)

F7 DMA error.

F8 DMA count error (Memory Controller counter.)

F9 CRC error.

FA Record not found.

FB Lost data.

FC Side select error.

FD Drive not ready. Timed-out performing the command.

HARD DISK

Controller Not Responding.	This means there is no communication between the system and the hard disk. Cycling power on the hard disk may correct this condition.
Operation Timed Out.	The system sent a command which was accepted by the hard disk. The hard disk did not return a completion code in time.
Command Error.	The hard disk attempted to execute a command but an error in the hard disk occurred.
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BLIT

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G10 y count

G11 time-out

G12 address count

G13 Blitter Bus Error

REAL-TIME CLOCK

C0 no real-time clock

C1 increment error

MEGASTE DIAGNOSTIC MANUAL RELEASE NOTES

This is the first release of the MegaSTe Diagnostic Manual. At the time it was produced the Main PCB Assembly drawing (IPB) and the Test Configuration Setup drawing were not available. Photocopies of these drawings have been provided in the meantime until the actual drawings are complete. The new drawings will then be sent to each subsidiary to replace the existing photocopies.