

March, 2009

Apple Service Diagnostic Test Results Guide

NOTE, This Guide is for informational purposes only and is not intended to be used as an official Apple repair guide.

For the following Macintosh (Intel) CPUs:

MacBook Air (Late 2008)
MacBook (13-inch, Aluminum, Late 2008)
MacBook Pro (15-inch, Late 2008)
MacBook (13-inch, Early 2009)
MacBook Pro (17-inch, Early 2009)
iMac (20-inch, Early 2009)
iMac (24-inch, Early 2009)
Mac Mini (Early 2009)
Mac Pro (Early 2009)

For failed test results, use this guide to help determine corrective action.

This document is intended to assist in repairing the unit and is not a complete factory repair procedure. You should consult the unit's specific repair document for proper action.

Mass Storage-Hard Drive

- a) Reseat drive cables and retest.
- b) Replace the drive.

Mass Storage-Optical

- a) Reseat drive cables and retest.
- b) Replace the drive.

Memory

Replace memory module or replace logic board if memory is soldered to logic board.

Processor

Rerun tests. Replace logic board if appropriate.

FireWire

Disconnect any FireWire cable connected to the unit under test and retest.

For FireWire server tests be sure that the server-.FireWire setup is correct and working properly.

If error persists, replace the Logic Board.

USB

Disconnect any USB cable connected to the unit under test and retest.

If error persists, replace the Logic Board.

Bluetooth

Check servers for proper configuration and connectivity then retest.

If error persists, replace the Logic Board.

AirPort

Check servers for proper configuration and connectivity then retest.

If error persists, replace the AirPort device or Logic Board if AirPort is on Logic Board.

Video

Replace the Logic Board (MacBook, MacBook Air, MacBook Pro)

Ethernet Controller

Disconnect any network/crossover cable connected to the unit under test and retest.

If error persists, replace the Logic Board.

Fans/Motors

Check fan electrical connection, if applicable.

Replace fan module or fan sensor.

Sensors

Check that sensor is connected, where appropriate.

Replace or repair sensor connector. If sensor is on Logic Board replace Logic Board.

SENSOR DESCRIPTIONS

Notes:

1. This table is based on the best information available at time of release. If you find errors, please notify the responsible Apple engineer for correction.
2. Updates for newer products will only happen if there are significant differences with earlier products.
3. For a given sensor, the table on the next two pages lists the sensor and on which subassembly the sensor is located. Related components that may be contributing to the failure are listed in the small table on this page.
4. Most sensors are located on the MLB and failures of those sensors will require an MLB replacement.
5. Sensors located off of the MLB should have connections checked first, then the subassembly on which the sensor is located.
Although rare, even these sensors may require MLB replacement.
6. Not all of the listed sensors will be on a specific product.
7. The upper and lower sensor limits can be found in the applications Hardware Profile menu.
8. Sensor descriptions may vary from product to product.

<u>Abbrev.</u>	<u>Sensor location</u>
AC	AC adapter/Mag safe connector/MLB
ALS	Ambient Light Sensor
Air	Airport Extreme Card/MLB Sensors with special UI tests
Batt	Battery/MLB
BC-L	Bottom case near left fan/MLB
BC-R	Bottom case near right fan/MLB
Cam	By camera in display
Htsk	Heat Sink/MLB
LIO	Left IO Board/MLB
MLB	Main Logic Board
TC	Topcase/MLB

MacBook Pro (17-inch, Early 2009)

<u>Sensor</u>	<u>Type</u>	<u>Name</u>
ALSL	Photometer	ALS Ambient Light Reading in Lux
IC0C	Current	CPU 0 Core
ID0R	Current	DC In current
IC1C	Current	CPU Core - High side current
IC2C	Current	CPU Front Side Bus (1.05V) current
IG0C	Current	GPU 0 Core current
IG1C	Current	GPU 1.8V current
IN0R	Current	MCP Core current
IN1R	Current	NorthBridge 1 Rail current
IP0R	Current	Battery - BMON Eng current
TB0T	Temperature	Battery TS_MAX Temp
TB1T	Temperature	Battery TS1 Temp
TB2T	Temperature	Battery TS2 Temp
TB3T	Temperature	Battery TS3 Temp
TC0D	Temperature	CPU 0 Die Temp
TC0P	Temperature	CPU 0 Proximity Temp
TG0D	Temperature	GPU Die - Digital
TG0P	Temperature	GPU 0 Proximity Temp
TG0T	Temperature	GPU 0 Die - Analog Temp
TG0H	Temperature	Left Heat Pipe/Fin Stack Proximity Temp
TG1H	Temperature	Left Heat Pipe/Fin Stack Proximity Temp
TN0P	Temperature	MCP Proximity
TN0D	Temperature	MCP Die
Th2H	Temperature	Right Fin Stack Proximity Temp
Tm0P	Temperature	Battery Charger Proximity Temp
Ts0P	Temperature	Palm Rest Temp
VC0C	Voltage	CPU 0 Core
VG0C	Voltage	GPU VCore voltage
VN0R	Voltage	MCP VCore voltage
VP0R	Voltage	P-Bus voltage
ALSL	Photometer	ALS Ambient Light Reading in Lux (OS only)
MO_X	Accelerometer	Motion Sensor (OS only)
MSLD	Magnetometer	Magnetometer

MacBook Pro (15-inch, Late 2008)

<u>Sensor</u>	<u>Type</u>	<u>Name</u>
ALSL	Photometer	ALS Ambient Light Reading in Lux
IC0C	Current	CPU 0 Core
ID0R	Current	DC In current
IC1C	Current	CPU Core - High side current
IC2C	Current	CPU Front Side Bus (1.05V) current

IG0C	Current	GPU 0 Core current
IG1C	Current	GPU 1.8V current
IN0R	Current	MCP Core current
IN1R	Current	NorthBridge 1 Rail current
IP0R	Current	Battery - BMON Eng current
MSC0	CalibrationKeys	Calibration Key 0 (OS only)
MSC1	CalibrationKeys	Calibration Key 1 (OS only)
TB0T	Temperature	Battery TS_MAX Temp
TB1T	Temperature	Battery TS1 Temp
TB2T	Temperature	Battery TS2 Temp
TC0D	Temperature	CPU 0 Die Temp
TC0P	Temperature	CPU 0 Proximity Temp
TG0D	Temperature	GPU Die - Digital
TG0P	Temperature	GPU 0 Proximity Temp
TG0T	Temperature	GPU 0 Die - Analog Temp
TG0H	Temperature	Left Heat Pipe/Fin Stack Proximity Temp
TG1H	Temperature	Left Heat Pipe/Fin Stack Proximity Temp
TN0P	Temperature	MCP Proximity
TN0D	Temperature	CPU Vcore voltage
Th2H	Temperature	Right Fin Stack Proximity Temp
Tm0P	Temperature	Battery Charger Proximity Temp
Ts0P	Temperature	Palm Rest Temp
VC0C	Voltage	CPU 0 Core
VG0C	Voltage	GPU VCore voltage
VN0R	Voltage	MCP VCore voltage
VP0R	Voltage	P-Bus voltage
ALSL	Photometer	ALS Ambient Light Reading in Lux (OS only)
MO_X	Accelerometer	Motion Sensor (OS only)

MacBook Air (Late 2008)

<u>Sensor</u>	<u>Type</u>	<u>Name</u>
IB0R	Current	Battery Rail 0
ID0R	Current	DC In Rail 0
IN0C	Current	MCP 0 Core
Ic0R	Current	Sensor Rail 0 (OS Only)
TB0T	Temperature	Battery Thermal Diode 0
TB1T	Temperature	Battery Thermal Diode 1
TB2T	Temperature	Battery Thermal Diode 2
TC0D	Temperature	CPU 0 Die Temp
TC0P	Temperature	CPU 0 Proximity
Th0H	Temperature	Heat Pipe 0 Heatsink

TN0D	Temperature	MCP 0 DIE
Tp0P	Temperature	Power Supply 0 Proximity
Tp1P	Temperature	MLB Front Edge
Ts0P	Temperature	Skin 0 Proximity
TV0P	Temperature	AIR Vent Exit
TW0P	Temperature	AirPort 0 Proximity
VD0R	Voltage	DC in 0 Rail
VN0C	Voltage	MPU 0 Core
VP0R	Voltage	PBus 0 Rail
MO_X	Accelerometer	Motion Sensor (OS only)

MacBook (13-inch, Aluminum, Late 2008)

MacBook (13-inch, Early 2009)

<u>Sensor</u>	<u>Type</u>	<u>Name</u>
IC0C	Current	CPU 0 Core
ID0R	Current	DC In Rail 0
IP0R	Current	PBUS 0 Rail
IN1C	Current	NorthBridge Rail 1
MSC0	CalibrationKeys	Calibration Key 0
TB1T	Temperature	Battery Thermal Diode 1
TB2T	Temperature	Battery Thermal Diode 2
TC0D	Temperature	CPU 0 Die Temp
TC0P	Temperature	CPU proximity temperature
TN0P	Temperature	North Bridge Proximity top side
Th0H	Tempepature	Heat Pipe 0 Heatsink
Th1H	Temperature	Fin Stack
VC0C	Voltage	CPU 0 Core Voltage
VP0R	Voltage	PBus Rail 0
MO_X	Accelerometer	Motion Sensor

Mac Mini (Early 2009)

<u>Sensor</u>	<u>Type</u>	<u>Name</u>
IC0C	Current	CPU 0 Vcore Average Current
IC0R	Current	CPU 1.05 V Rail Average Current
ID0R	Current	DC IN Average Current
IN0C	Current	MCP Vcore Average Current
IN1C	Current	MCP 1.5 Mem Average Current
IM0R	Current	SoDimm VDD Average Current

TC0D	Temperature	CPU 0 Die
TC0H	Temperature	CPU 0 Heatsink
TC0P	Temperature	CPU 0 Proximity
TN0D	Temperature	MCP Die
TN0H	Temperature	MCP Heatsink
TN0P	Temperature	MCP Proximity
TH0P	Tempepature	HDD Case
TW0P	Temperature	Fin Stack
VC0C	Voltage	CPU 0 Core
VN0C	Voltage	MCP Vcore
VD0R	Voltage	DC-In

iMac (20-inch, Early 2009)

iMac (24-inch, Early 2009)

IC0C	Current	CPU 0 Vcore Average Current
TA0P	Temperature	Incoming air
TN0H	Temperature	Northbridge heatsink
TN0D	Temperature	Northbridge die temperature
TN0P	Temperature	Northbridge proximity
TO0P	Temperature	Optical drive proximity
TH0P	Temperature	Hard disk proximity
TC0H	Temperature	CPU 0 heatsink
TC0D	Temperature	CPU T-diode
TC0P	Temperature	CPU proximity
Tm0P	Temperature	MLB proximity
TL0P	Temperature	LCD proximity 0
Tp0P	Temperature	AC-DC proximity
VC0C	Voltage	CPU 0 Core
PC0C	Power	CPU 0 Core

Mac Pro (Early 2009)

ICAC	Current	CPU A, Core Low Side (Vcore) Current
ICBC	Current	CPU B, Core Low Side (Vcore) Current
Ie1S	Current	PCIe Slot 1, 12V Current
Ie2S	Current	PCIe Slot 2, 12V Current
Ie3S	Current	PCIe Slot 3, 12V Current
Ie4S	Current	PCIe Slot 4, 12V Current
IeAS	Current	PCIe BoostA, 12V Current
IeBS	Current	PCIe BoostB, 12V Current
IH1Z	Current	HDD1, 12V Current
IH2Z	Current	HDD2, 12V Current
IH3Z	Current	HDD3, 12V Current

IH4Z	Current	HDD4, 12V Current
IO0Z	Current	ODD, 12V Current
IH5Z	Current	HDD+ODD, 5V Current
IMAS	Current	DIMM, PP1V5_S3_MEMA Current
IMBS	Current	DIMM, PP1V5_S3_MEMB Current
IN0C	Current	IOH Core, PP1V1_S0_IOH Northbridge Current
Ip0C	Current	PSU, 12V Current (PSMI)
ICAB	Current	PVTT, CPUA Current
ICBB	Current	PVTT, CPUB Current
IS1C	Current	PP1V05_S0_SB Current
IS2C	Current	PP1V5_S0_SB Current
Ip1M	Current	PP12V_S0 CPUA 240VA Main Current
Ip2M	Current	PP12V_S0 CPUB 240VA Main Current
Ip3M	Current	PP12V_S0 MEMA 240VA Main Current
Ip4M	Current	PP12V_S0 MEMB 240VA Main Current
Ip5M	Current	PP12V_S0 MLB1 240VA Main Current
Ip6M	Current	PP12V_S0 MLB2 240VA Main Current
Ip7M	Current	PP12V_S0 PCIE1 240VA Main Current
Ip8M	Current	PP12V_S0 PCIE2 240VA Main Current
TA0P	Temperature	System Ambient Temperature
TCAC	Temperature	CPU A, Core 0 Relative Temperature to ProcHot (PECI)
TCAD	Temperature	Temperature, CPU A Tdiode
TCBC	Temperature	CPU B, Core 0 Relative Temperature to ProcHot (PECI)
TCBD	Temperature	CPU B Tdiode
TCAH	Temperature	CPU A, HeatSink
TCBH	Temperature	CPU B, HeatSink
Te1S	Temperature	PCIE slot 1
Te2S	Temperature	PCIE slot 2
Te3S	Temperature	PCIE slot 3
Te4S	Temperature	PCIE slot 4
Te5S	Temperature	PCIE RAID card
TH1P	Temperature	Drive Bay 1, HDD (On Drive Carrier)
TH2P	Temperature	Drive Bay 2, HDD (On Drive Carrier)
TH3P	Temperature	Drive Bay 3, HDD (On Drive Carrier)
TH4P	Temperature	Drive Bay 4, HDD (On Drive Carrier)
TM1P	Temperature	DIMM Proximity 1 (On Riser)
TM2P	Temperature	DIMM Proximity 2 (On Riser)
TM3P	Temperature	DIMM Proximity 3 (On Riser)
TM4P	Temperature	DIMM Proximity 4 (On Riser)
TM5P	Temperature	DIMM Proximity 5 (On Riser)
TM6P	Temperature	DIMM Proximity 6 (On Riser)
TM7P	Temperature	DIMM Proximity 7 (On Riser)
TM8P	Temperature	DIMM Proximity 8 (On Riser)
TMA1	Temperature	DIMM, CPUA, SLOT1, CHA - SPD Temperature
TMA2	Temperature	DIMM, CPUA, SLOT2, CHB - SPD Temperature
TMA3	Temperature	DIMM, CPUA, SLOT3, CHC - SPD Temperature
TMA4	Temperature	DIMM, CPUA, SLOT4, CHC - SPD Temperature
TMB1	Temperature	DIMM, CPUB, SLOT5, CHA - SPD Temperature
TMB2	Temperature	DIMM, CPUB, SLOT6, CHB - SPD Temperature
TMB3	Temperature	DIMM, CPUB, SLOT7, CHC - SPD Temperature
TMB4	Temperature	DIMM, CPUB, SLOT8, CHC - SPD Temperature

TN0D	Temperature	IOH Tdiode
TN0H	Temperature	IOH, HeatSink
Tp0C	Temperature	PS, AC/DC Supply 1
Tp1C	Temperature	PS, AC/DC Supply 2
VCAC	Voltage	CPU A, Core Voltage
VCBC	Voltage	CPU B, Core Voltage
Ve1S	Voltage	PCIe Slot 1, 12V Voltage
Ve2S	Voltage	PCIe Slot 2, 12V Voltage
Ve3S	Voltage	PCIe Slot 3, 12V Voltage
Ve4S	Voltage	PCIe Slot 4, 12V Voltage
VeAS	Voltage	PCIe BoostA, 12V Voltage
VeBS	Voltage	PCIe BoostB, 12V Voltage
VH1Z	Voltage	HDD1, 12V Voltage
VH2Z	Voltage	HDD2, 12V Voltage
VH3Z	Voltage	HDD3, 12V Voltage
VH4Z	Voltage	HDD4, 12V Voltage
VO0Z	Voltage	ODD, 12V Voltage
VH5Z	Voltage	HDD+ODD, 5V Voltage
VM1S	Voltage	PP1V5_S3_MEMA Voltage
VM2S	Voltage	PP1V5_S3_MEMB Voltage
VN0C	Voltage	PP1V1_S0_IOH Northbridge Voltage
Vp0C	Voltage	PSU, 12V Voltage
VCAB	Voltage	PPVTT_S0_CPUA Voltage
VCBB	Voltage	PPVTT_S0_CPUB Voltage
VS1C	Voltage	PP1V05_S0_SB Voltage
VS2C	Voltage	PP1V5_S0_SB Voltage
VS8C	Voltage	PP3V3_S5 Voltage