



Hardware Reference Guide

SMB/CIFS, NFS, FTP, RSYNC and HTTP

TABLE OF CONTENTS

Overview	2
How to Use This Reference	2
Network Interface Devices	2
IDE Controller Devices	8
SATA Controller Devices	10
SCSI Controller Devices	12
Hardware RAID Controller Devices	13
Getting NASLite-2	16
Internet Resources	16
Disclaimer	16
Copyrights and Trademarks	16

Revision History

Revision 1.0 Aug 18, 2006



*Before using this reference, it is important to understand that the following indices list chipsets used in various devices and not necessarily specific device models. It is also important to note that this reference is compiled using information automatically derived from the associated kernel driver sources as well as information contained in the **PCI ID Repository** maintained by Martin Mares at <http://pciids.sourceforge.net>.*

GA311 chipset as the popular RTL-8169 by Realtek Semiconductor. Referencing the listed devices under the **Realtek Semiconductor** heading reveals that RTL-8169 Gigabit Ethernet is listed. That in turn is a pretty good indication that our Netgear GA311 Gigabit Ethernet adapter is fully supported by NASLite-2 and will likely operate well if properly installed and configured.

Network Interface Devices

NASLite-2 supports a wide array of PCI network interfaces. Many computers utilize a motherboard with a built-in or on-board PCI network interface while others can use separate add-on network interface cards. NASLite-2 will work well with most PCI network interfaces provided a supported chipset is used. Below is a general list of chipset drivers included in the NASLite-2 kernel:



This reference covers the following device types:

- Network Interface Devices
- IDE Controller Devices
- SATA Controller Devices
- SCSI Controller Devices
- Hardware RAID Controller Devices

How to Use This Reference

NASLite-2 supports a wide array of PCI devices. Many computers utilize a motherboard with a built-in or on-board PCI network and storage interface adapters while others can use separate add-on interface cards. NASLite-2 will work well with most PCI interfaces provided a supported chipset is used.

Each driver included with NASLite-2 supports one or more associated device chipsets. There are many unique device makes and models that may use the same chipset. To verify if a particular device is supported by NASLite-2, make sure to reference the associated chipset and not the unique device make or model.

For example, let's assume that we have a Netgear model GA311 Gigabit Ethernet adapter. Referencing the listed devices under the **Netgear** heading reveals that the GA311 is not listed. On closer examination however, we can identify the associated

3Com Corporation

• 3Com 3c59x/3c9xx Ethernet Driver

- 3c450 HomePNA [Tornado]
- 3c555 Laptop Hurricane
- 3c556 Hurricane CardBus [Cyclone]
- 3c556B CardBus [Tornado]
- 3c575 Megahertz 10/100 LAN CardBus [Boomerang]
- 3c590 10BaseT [Vortex]
- 3c592 EISA 10Mbps Demon/Vortex
- 3c595 100Base-MII [Vortex]
- 3c595 100BaseT4 [Vortex]
- 3c595 100BaseTX [Vortex]
- 3c595 Megahertz 10/100 LAN CardBus [Boomerang]
- 3c597 EISA Fast Demon/Vortex
- 3c900 10BaseT [Boomerang]
- 3c900 10Mbps Combo [Boomerang]
- 3c900B-Combo Etherlink XL [Cyclone]
- 3c900B-FL 10base-FL [Cyclone]
- 3c900B-TPC Etherlink XL [Cyclone]

- 3c900B-TPO Etherlink XL [Cyclone]
- 3c905 100BaseT4 [Boomerang]
- 3c905 100BaseTX [Boomerang]
- 3c905B 100BaseTX [Cyclone]
- 3c905B Deluxe Etherlink 10/100/BNC [Cyclone]
- 3c905B-FX Fast Etherlink XL FX 100baseFx [Cyclone]
- 3c905B-T4 Fast EtherLink XL [Cyclone]
- 3c905C-TX/TX-M [Tornado]
- 3C920B-EMB Integrated Fast Ethernet Controller [Tornado]
- 3C920B-EMB-WNM Integrated Fast Ethernet Controller
- 3c980-C 10/100baseTX NIC [Python-T]
- 3c980-TX Fast Etherlink XL Server Adapter [Cyclone]
- 3c982-TXM 10/100baseTX Dual Port A [Hydra]
- 3c982-TXM 10/100baseTX Dual Port B [Hydra]
- 3cCFE575BT Megahertz 10/100 LAN CardBus [Cyclone]
- 3cCFE575CT CardBus [Cyclone]
- 3cCFE656 CardBus [Cyclone]
- 3cCFEM656B 10/100 LAN+Winmodem CardBus [Cyclone]
- 3Com 3C920B-EMB-WNM Integrated Fast Ethernet Controller
- 3cSOHO100-TX Hurricane
- 3cXFEM656C 10/100 LAN+Winmodem CardBus [Tornado]

• **3Com Typhoon Family Ethernet Driver**

- 3C990B-TX-M/3C990BSVR [Typhoon2]
- 3C990SVR [Typhoon Server]
- 3C990-TX [Typhoon]
- 3CR990-FX-95/97/95 [Typhon Fiber]
- 3CR990SVR95 [Typhoon Server 56-bit]
- 3CR990SVR97 [Typhoon Server 168-bit]
- 3CR990-TX-95 [Typhoon 56-bit]
- 3CR990-TX-97 [Typhoon 168-bit]

• **AceNIC/3C985/GA620 Gigabit Ethernet Driver**

- 3c985 1000BaseSX (SX/TX)

• **Digital 21*4* Tulip Ethernet Driver**

- 3CSOHO100B-TX 910-A01 [tulip]

Abocom Systems Inc

• **Digital 21*4* Tulip Ethernet Driver**

- 21x4x DEC-Tulip compatible 10/100 Ethernet
- ADMtek Centaur-C rev 17 [D-Link DFE-680TX] CardBus Fast Ethernet Adapter

• **RealTek RTL-8139 Ethernet Driver**

- RTL8139 [FE2000VX] CardBus Fast Ethernet Attached Port Adapter

Accton Technology Corporation

• **Digital 21*4* Tulip Ethernet Driver**

- 21x4x DEC-Tulip compatible Fast Ethernet
- EN-1216 Ethernet Adapter
- EN-1217 Ethernet Adapter

• **RealTek RTL-8139 Ethernet Driver**

- SMC2-1211TX

Adaptec

• **Adaptec Starfire Ethernet Driver**

- ANA620xx/ANA69011A

Addtron Technology Co, Inc.

• **RealTek RTL-8139 Ethernet Driver**

- RTL8139 Ethernet

ADMtek

• **Digital 21*4* Tulip Ethernet Driver**

- 21x4x DEC-Tulip compatible 10/100 Ethernet
- NC100 Network Everywhere Fast Ethernet 10/100

Advanced Micro Devices [AMD]

• **PCnet32 and PCnetPCI Ethernet Driver**

- 79c970 [PCnet32 LANCE]
- 79c978 [HomePNA]

ALi Corporation

• **Davicom DM910X Ethernet Driver**

- M5261 Ethernet Controller

• **Digital 21*4* Tulip Ethernet Driver**

- M5261 Ethernet Controller

Allied Telesyn International

• **Digital 21*4* Tulip Ethernet Driver**

- 21x4x DEC-Tulip compatible 10/100 Ethernet

• **RealTek RTL-8139 Ethernet Driver**

- RTL81xx Fast Ethernet

Alteon Networks Inc.

- **AceNIC/3C985/GA620 Gigabit Ethernet Driver**
 - AceNIC Gigabit Ethernet
 - AceNIC Gigabit Ethernet (Copper)
 - Farallon PN9100-T Gigabit Ethernet

AlTIMA (new Broadcom)

- **Broadcom Tigon3 Gigabit Ethernet Driver**
 - AC1000 Gigabit Ethernet
 - AC1001 Gigabit Ethernet
 - AC1003 Gigabit Ethernet
 - AC9100 Gigabit Ethernet

Apple Computer Inc.

- **Broadcom Tigon3 Gigabit Ethernet Driver**
 - Tigon3 Gigabit Ethernet NIC (BCM5701)

Asix Electronics Corporation

- **Digital 21*4* Tulip Ethernet Driver**
 - ALFA GFC2204 Fast Ethernet

AT&T GIS (NCR)

- **HP CASCADE Ethernet Driver**
 - 100VG ethernet

Broadcom Corporation

- **Broadcom 4400 10/100 Ethernet Driver**
 - BCM4401 100Base-T
 - BCM4401-B0 100Base-TX
 - BCM4402 Integrated 10/100BaseT
- **Broadcom Tigon3 Gigabit Ethernet Driver**
 - 570x 10/100 Integrated Controller
 - NetLink BCM5781 Gigabit Ethernet PCI Express
 - NetLink BCM5789 Gigabit Ethernet PCI Express
 - NetXtreme BCM5700 Gigabit Ethernet
 - NetXtreme BCM5701 Gigabit Ethernet
 - NetXtreme BCM5702 Gigabit Ethernet
 - NetXtreme BCM5702A3 Gigabit Ethernet
 - NetXtreme BCM5702FE Gigabit Ethernet
 - NetXtreme BCM5702X Gigabit Ethernet
 - NetXtreme BCM5703 Gigabit Ethernet
 - NetXtreme BCM5703X Gigabit Ethernet
 - NetXtreme BCM5704 Gigabit Ethernet

- NetXtreme BCM5704S Gigabit Ethernet
- NetXtreme BCM5705 Gigabit Ethernet
- NetXtreme BCM5705_2 Gigabit Ethernet
- NetXtreme BCM5705M Gigabit Ethernet
- NetXtreme BCM5705M_2 Gigabit Ethernet
- NetXtreme BCM5721 Gigabit Ethernet PCI Express
- NetXtreme BCM5751 Gigabit Ethernet PCI Express
- NetXtreme BCM5751F Fast Ethernet PCI Express
- NetXtreme BCM5751M Gigabit Ethernet PCI Express
- NetXtreme BCM5752 Gigabit Ethernet PCI Express
- NetXtreme BCM5752M Gigabit Ethernet PCI Express
- NetXtreme BCM5753 Gigabit Ethernet PCI Express
- NetXtreme BCM5753F Fast Ethernet PCI Express
- NetXtreme BCM5753M Gigabit Ethernet PCI Express
- NetXtreme BCM5782 Gigabit Ethernet
- NetXtreme BCM5788 Gigabit Ethernet
- NetXtreme BCM5901 100Base-TX

Compaq Computer Corporation

- **RealTek RTL-8139 Ethernet Driver**
 - HNE-300 (RealTek RTL8139c) [iPaq Networking]
- **TI ThunderLAN Ethernet Driver**
 - Integrated NetFlex-3/P
 - Netelligent 10 T PCI UTP
 - Netelligent 10 T/2 PCI UTP/Coax
 - Netelligent 10/100 TX Embedded UTP
 - Netelligent 10/100 TX PCI UTP
 - Netelligent 10/100 TX UTP
 - Netelligent Dual 10/100 TX PCI UTP
 - Netelligent Integrated 10/100 TX UTP
 - NetFlex-3/P ThunderLAN 1.0
 - NetFlex-3/P ThunderLAN 2.3

Compex

- **Digital 21*4* Tulip Ethernet Driver**
 - RL100TX Fast Ethernet
- **HP CASCADE Ethernet Driver**
 - ENet100VG4
- **NE2000 Ethernet Driver**
 - ReadyLink 2000
- **Winbond W89c840 Ethernet Driver**
 - RL100-ATX 10/100

Conexant

- **Digital 21*4* Tulip Ethernet Driver**

- HCF 56k Modem

Davicom Semiconductor, Inc.

- **Davicom DM910X Ethernet Driver**

- 21x4x DEC-Tulip compatible 10/100 Ethernet
- Ethernet 100/10 MBIT

- **Digital 21*4* Tulip Ethernet Driver**

- 21x4x DEC-Tulip compatible 10/100 Ethernet

DELTA Electronics, Inc.

- **RealTek RTL-8139 Ethernet Driver**

- RTL81xx RealTek Ethernet

Digi International

- **Digi Ethernet Driver**

- RightSwitch SE-6

Digital Equipment Corporation

- **AceNIC/3C985/GA620 Gigabit Ethernet Driver**

- Farallon PN9000SX Gigabit Ethernet

- **Digital 21*4* Tulip Ethernet Driver**

- DECchip 21040 [Tulip]
- DECchip 21041 [Tulip Pass 3]
- DECchip 21140 [FasterNet]
- DECchip 21142/43

D-Link System Inc

- **Digital 21*4* Tulip Ethernet Driver**

- DFE-680TXD CardBus PC Card
- DRP-32TXD Cardbus PC Card

- **D-Link DL2000-based Gigabit Ethernet Driver**

- DL2000-based Gigabit Ethernet

- **RealTek RTL-8139 Ethernet Driver**

- DFE-690TXD CardBus PC Card
- RTL8139 Ethernet

- **Sundance Alta Ethernet Driver**

- DL10050 Sundance Ethernet

Edimax Computer Co.

- **RealTek RTL-8139 Ethernet Driver**

- RTL81xx Fast Ethernet

Hawking Technologies

- **Digital 21*4* Tulip Ethernet Driver**

- PN672TX 10/100 Ethernet

Hewlett-Packard Company

- **HP CASCADE Ethernet Driver**

- J2585A DeskDirect 10/100VG NIC
- J2585B HP 10/100VG PCI LAN Adapter

Holtek Microelectronics Inc.

- **NE2000 Ethernet Driver**

- PCI NE2K Ethernet

Intel Corporation

- **Digital 21*4* Tulip Ethernet Driver**

- 21145 Fast Ethernet

- **Intel(R) PRO/100 Ethernet Driver**

- 82551QM Ethernet Controller
- 82557/8/9 [Ethernet Pro 100]
- 82559 Ethernet Controller
- 82559 InBusiness 10/100
- 8255xER/82551IT Fast Ethernet Controller
- 82562 EM/EX/GX - PRO/100 VM (LOM) Ethernet Controller
- 82562 EM/EX/GX - PRO/100 VM Ethernet Controller
- 82562EM/EX/GX - PRO/100 VM (LOM) Ethernet Controller Mobile
- 82562ET/EZ/GT/GZ - PRO/100 VE (LOM) Ethernet Controller
- 82562ET/EZ/GT/GZ - PRO/100 VE (LOM) Ethernet Controller Mobile
- 82562ET/EZ/GT/GZ - PRO/100 VE Ethernet Controller
- 82562EZ 10/100 Ethernet Controller
- 82562G - PRO/100 VE (LOM) Ethernet Controller
- 82562G - PRO/100 VE Ethernet Controller Mobile
- 82801BA/BAM/CA/CAM Ethernet Controller

- 82801CAM (ICH3) PRO/100 VE (LOM) Ethernet Controller
- 82801CAM (ICH3) PRO/100 VE Ethernet Controller
- 82801CAM (ICH3) PRO/100 VM (KM) Ethernet Controller
- 82801CAM (ICH3) PRO/100 VM (LOM) Ethernet Controller
- 82801CAM (ICH3) PRO/100 VM Ethernet Controller
- 82801DB PRO/100 VE (CNR) Ethernet Controller
- 82801DB PRO/100 VE (LOM) Ethernet Controller
- 82801DB PRO/100 VE (MOB) Ethernet Controller
- 82801DB PRO/100 VM (CNR) Ethernet Controller
- 82801DB PRO/100 VM (LOM) Ethernet Controller
- 82801DB PRO/100 VM (MOB) Ethernet Controller
- 82801IE Ethernet Controller 0
- 82801IE Ethernet Controller 1
- 82801EB/ER (ICH5/ICH5R) integrated LAN Controller
- PRO/100 VM Network Connection

• **Intel(R) PRO/1000 Gigabit Ethernet Driver**

- 82540EM Gigabit Ethernet Controller
- 82540EM Gigabit Ethernet Controller (LOM)
- 82540EP Gigabit Ethernet Controller
- 82540EP Gigabit Ethernet Controller (LOM)
- 82540EP Gigabit Ethernet Controller (Mobile)
- 82541EI Gigabit Ethernet Controller
- 82541EI Gigabit Ethernet Controller (Copper)
- 82541ER Gigabit Ethernet Controller
- 82541GI Gigabit Ethernet Controller
- 82541GI/PI Gigabit Ethernet Controller
- 82541PI Gigabit Ethernet Controller
- 82542 Gigabit Ethernet Controller
- 82543GC Gigabit Ethernet Controller (Copper)
- 82543GC Gigabit Ethernet Controller (Fiber)
- 82544EI Gigabit Ethernet Controller (Copper)
- 82544EI Gigabit Ethernet Controller (Fiber)
- 82544GC Gigabit Ethernet Controller (Copper)
- 82544GC Gigabit Ethernet Controller (LOM)
- 82545EM Gigabit Ethernet Controller (Copper)
- 82545EM Gigabit Ethernet Controller (Fiber)
- 82545GM Gigabit Ethernet Controller
- 82546EB Gigabit Ethernet Controller
- 82546EB Gigabit Ethernet Controller (Copper)
- 82546EB Gigabit Ethernet Controller (Fiber)
- 82546GB Gigabit Ethernet Controller
- 82547EI Gigabit Ethernet Controller
- 82547EI Gigabit Ethernet Controller (LOM)
- 82547GI Gigabit Ethernet Controller

KTI

• **NE2000 Ethernet Driver**

- ET32P2

LevelOne

- **RealTek RTL-8139 Ethernet Driver**
- FPC-0106TX misprogrammed [RTL81xx]

Linksys

- **Digital 21*4* Tulip Ethernet Driver**
- 21x4x DEC-Tulip compatible 10/100 Ethernet

Lite-On Communications Inc.

- **Digital 21*4* Tulip Ethernet Driver**
- LNE100TX
- LNE100TX [Linksys EtherFast 10/100]

LSI Logic / Symbios Logic

- **Packet Engines Yellowfin G-NIC Gigabit Ethernet Driver**
- 83C885 NT50 DigitalScape Fast Ethernet
- Yellowfin G-NIC gigabit ethernet

Macronix, Inc. [MXIC]

- **Digital 21*4* Tulip Ethernet Driver**
- MX98713
- MX987x5

MYSON Technology Inc.

- **Myson MTD-8xx Ethernet Driver**
- MTD-8xx 100/10M Ethernet PCI Adapter
- SURECOM EP-320X-S 100/10M Ethernet PCI Adapter

National Semiconductor Corporation

- **National Semiconductor DP8381x Ethernet Driver**
- DP83815 (MacPhyter) Ethernet Controller
- **National Semiconductor DP83820 10/100/1000 Gigabit Ethernet Driver**
- DP83820 10/100/1000 Ethernet Controller

Netgear

- AceNIC/3C985/GA620 Gigabit Ethernet Driver
 - GA620 Gigabit Ethernet
 - GA630 Gigabit Ethernet

NetVin

- NE2000 Ethernet Driver
 - NV5000SC

Northern Telecom

- RealTek RTL-8139 Ethernet Driver
 - 10/100BaseTX [RTL81xx]

nVidia Corporation

- Reverse Engineered nForce Ethernet Driver
 - CK804 Ethernet Controller
 - CK8S Ethernet Controller
 - MCP04 Ethernet Controller
 - MCP2A Ethernet Controller
 - nForce Ethernet Controller
 - nForce2 Ethernet Controller
 - nForce3 Ethernet

Olicom

- TI ThunderLAN Ethernet Driver
 - OC-2183/2185
 - OC-2325
 - OC-2326

Packet Engines Inc.

- Packet Engines 'Hamachi' GNIC-II Gigabit Ethernet Driver
 - GNIC-II PCI Gigabit Ethernet [Hamachi]

Peppercon AG

- RealTek RTL-8139 Ethernet Driver
 - ROL/F-100 Fast Ethernet Adapter with ROL

Planex Communications, Inc.

- RealTek RTL-8139 Ethernet Driver
 - FNW-3603-TX CardBus Fast Ethernet
 - RTL81xx RealTek Ethernet

Realtek Semiconductor Co., Ltd.

- NE2000 Ethernet Driver
 - RTL-8029(AS)
- RealTek RTL-8139 Ethernet Driver
 - RT8139 (B/C) Cardbus Fast Ethernet Adapter
 - RTL-8129
 - RTL-8139/8139C/8139C+
- RealTek RTL-8139C+ Ethernet Driver
 - RTL-8139/8139C/8139C+
- RealTek RTL-8169 Gigabit Ethernet Driver
 - RTL-8169 Gigabit Ethernet

Silicon Graphics, Inc.

- AceNIC/3C985/GA620 Gigabit Ethernet Driver
 - AceNIC Gigabit Ethernet

Silicon Integrated Systems [SiS]

- SiS 900 PCI Ethernet Driver
 - SiS7016 PCI Fast Ethernet Adapter
 - SiS900 PCI Fast Ethernet

SpeedStream

- RealTek RTL-8139 Ethernet Driver
 - 1012 PCMCIA 10/100 Ethernet Card [RTL81xx]

Standard Microsystems Corp [SMC]

- SMC 83c170 EPIC Ethernet Driver
 - 83c170 EPIC/100 Fast Ethernet Adapter
 - 83c175 EPIC/100 Fast Ethernet Adapter

STMicroelectronics

- Digital 21*4* Tulip Ethernet Driver
 - 21x4x DEC-Tulip compatible 10/100 Ethernet

Sundance Technology Inc / IC Plus Corporation

- Sundance Alta Ethernet Driver
 - ST201 Sundance Ethernet

- W89C940F
- Winbond W89c840 Ethernet Driver
 - W89C840

Surecom Technology

- NE2000 Ethernet Driver
 - NE-34

SysKonnect

- Broadcom Tigon3 Gigabit Ethernet Driver
 - SK-9Dxx Gigabit Ethernet Adapter
 - SK-9Mxx Gigabit Ethernet Adapter

TDK Semiconductor Corporation

- Digital 21*4* Tulip Ethernet Driver
 - RTL81xx Fast Ethernet

Trident Microsystems

- PCnet32 and PCnetPCI Ethernet Driver
 - 4DWave DX

TTTech AG

- RealTek RTL-8139C+ Ethernet Driver
 - TTP-Monitoring Card V2.0

VIA Technologies, Inc.

- NE2000 Ethernet Driver
 - VT82C926 [Amazon]
- VIA Rhine Ethernet Driver
 - VT6102 [Rhine-II]
 - VT6105 [Rhine-III]
 - VT6105M [Rhine-III]
 - VT86C100A [Rhine]

Winbond Electronics Corporation

- NE2000 Ethernet Driver
 - W89C940

IDE Controller Devices

NASLite-2 supports almost all IDE controller chipsets commonly found on commodity PC hardware. Optimized, chipset-specific drivers for most common devices are provided. In addition to IDE, many SATA chipsets can be driven in "Legacy Mode" using the appropriate IDE driver. Other more obscure devices are also likely to be supported by the included generic IDE driver. NASLite-2 includes support for the following IDE controller chipsets:



Advanced Micro Devices [AMD]

- AMD PCI IDE Driver
 - AMD-755 [Cobra] IDE
 - AMD-756 [Viper] IDE
 - AMD-766 [ViperPlus] IDE
 - AMD-768 [Opus] IDE
 - AMD-8111 IDE

ALi Corporation

- ALi 15x3 IDE Driver
 - M5229 IDE

Artop Electronic Corp

- ARTOP AEC62xx IDE Driver
 - ATP850UF
 - ATP860
 - ATP860 NO-BIOS

- ATP865
- ATP865 NO-ROM

ATI Technologies Inc

- **ATI IXP IDE Driver**
 - ATI Dual Channel Bus Master PCI IDE Controller

Broadcom

- **Serverworks OSB4/CSB5/CSB6 IDE Driver**
 - CSB5 IDE Controller
 - CSB6 IDE Controller
 - CSB6 RAID/IDE Controller
 - OSB4 IDE Controller

Compaq Computer Corporation

- **Compaq Triflex IDE Driver**
 - Triflex Dual EIDE Controller

Contaq Microsystems

- **Cypress CY82C693 IDE Driver**
 - 82c693

Cyrix Corporation

- **Cyrix/NS 5530 IDE Driver**
 - 5530 IDE [Kahlua]

Efar Microsystems

- **SLC90E66 IDE Driver**
 - SLC90E66 [Victory66] IDE

Intel Corporation

- **Intel PIIx IDE**
 - 430MX - 82371MX Mobile PCI I/O IDE Xcelerator (MPIIX)
 - 450NX - 82451NX Memory & I/O Controller
 - 6300ESB PATA Storage Controller
 - 82371AB/EB/MB PIIx4 IDE
 - 82371FB PIIx IDE [Triton I]
 - 82371FB PIIx ISA [Triton I]
 - 82371SB PIIx3 IDE [Natoma/Triton II]
 - 82372FB PIIx5 IDE
 - 82440MX EIDE Controller

- 82801AA IDE
- 82801AB IDE
- 82801BA IDE U100
- 82801BAM IDE U100
- 82801CA Ultra ATA Storage Controller
- 82801CAM IDE U100
- 82801DB (ICH4) IDE Controller
- 82801DBM (ICH4-M) IDE Controller
- 82801E IDE U100
- 82801EB (ICH5) SATA Controller
- 82801EB/ER (ICH5/ICH5R) IDE Controller
- 82801FB/FBM/FR/fw/fw (ICH6 Family) IDE Controller

Micron

- **RZ1000 IDE Driver**
 - PC Tech RZ1000
 - PC Tech RZ1001

National Semiconductor Corporation

- **NS SC1200 IDE**
 - SCx200 IDE
- **NS87415 IDE Driver**
 - 87415/87560 IDE

nVidia Corporation

- **AMD PCI IDE Driver**
 - CK804 IDE
 - CK8S Parallel ATA Controller (v2.5)
 - CK8S Serial ATA Controller (v2.5)
 - MCP04 IDE
 - MCP2A IDE
 - nForce IDE
 - nForce2 IDE
 - nForce2 Serial ATA Controller
 - nForce3 IDE

OPTi Inc.

- **Opti621 IDE Driver**
 - 82C621 [Viper-M/N+]

Pacific Digital Corp

- **ADMA100 IDE Driver (Basic PIO Support)**
 - ADMA-100 DiscStaQ ATA Controller

Promise Technology, Inc.

- Older Promise IDE Driver
 - 20246
 - PDC20262 (FastTrak66/Ultra66)
 - PDC20265 (FastTrak100 Lite/Ultra100)
 - PDC20267 (FastTrak100/Ultra100)
- Promise PDC20268 and Newer IDE Driver
 - 20269
 - 20275
 - PDC20268 (Ultra100 TX2)
 - PDC20270 (FastTrak100 LP/TX2/TX4)
 - PDC20271 (FastTrak TX2000)
 - PDC20277 (SBFastTrak133 Lite)

Silicon Image, Inc.

- CMD64x IDE Driver
 - PCI0643
 - PCI0646
 - PCI0648
 - SiL 0649 Ultra ATA/100 PCI to ATA Host Controller
- SiL IDE Driver
 - Adaptec AAR-1210SA SATA HostRAID Controller
 - PCI0680 Ultra ATA-133 Host Controller
 - SiL 3112 [SATALink/SATARaid] Serial ATA Controller

Silicon Integrated Systems [SiS]

- SIS IDE Driver
 - 5513 [IDE]

Tekram Technology Co.,Ltd.

- Tekram TRM290 IDE Driver
 - DC290

Triones Technologies, Inc.

- Highpoint 34x IDE Driver
 - HPT343/345/346/363
- Highpoint HPT366 IDE Driver
 - HPT302/302N
 - HPT366/368/370/370A/372/372N
 - HPT371/371N
 - HPT372A/372N
 - HPT372N

- HPT374

VIA Technologies, Inc.

- VIA IDE Driver
 - VT82C576M/VT82C586
 - VT82C586A/B/VT82C686/A/B/VT823x/A/C PIPC Bus Master IDE

Other

- Generic IDE Driver
 - Other PCI IDE Controllers

SATA Controller Devices

NASLite-2 supports a good number of SATA controller chipsets commonly found on PC motherboards or on SATA PCI adapter cards. Optimized, chipset-specific drivers for most common SATA devices are provided. In addition, many SATA chipsets can be driven in "Legacy Mode" using the appropriate IDE driver. This approach may be best suited for more obscure devices that are not supported directly by the included low-level SATA drivers. It is important to note that the following SATA devices are supported in non-RAID mode only. NASLite-2 includes support for the following SATA controller chipsets:



ALi Corporation

- AHCI SATA Controller Driver
 - ULI M5288 SATA
- ULI Electronics SATA Controller Driver
 - ALI M5281 Serial ATA / RAID Host Controller
 - ULI 5287 SATA
 - ULI 5289 SATA

ATI Technologies Inc

- **Silicon Image SATA Controller Driver**
 - ATI 436E Serial ATA Controller
 - ATI 4379 Serial ATA Controller
 - ATI 437A Serial ATA Controller

Broadcom

- **K2 SATA Controller Driver**
 - BCM5785 (HT1000) SATA Native SATA Mode
 - K2 SATA
 - RAIDCore BC4000
 - RAIDCore RC4000

Intel Corporation

- **AHCI SATA Controller Driver**
 - 631xESB/632xESB SATA Storage Controller AHCI
 - 631xESB/632xESB SATA Storage Controller RAID
 - 82801FBM (ICH6M) SATA Controller
 - 82801FR/FRW (ICH6R/ICH6RW) SATA Controller
 - 82801GBM/GHM (ICH7 Family) Serial ATA Storage Controller AHCI
 - 82801GR/GH (ICH7 Family) Serial ATA Storage Controller AHCI
 - 82801GR/GH (ICH7 Family) Serial ATA Storage Controller RAID
- **Intel PIIX/ICH ATA Controller Driver**
 - 6300ESB SATA RAID Controller
 - 6300ESB SATA Storage Controller
 - 631xESB/632xESB/3100 Chipset SATA Storage Controller IDE
 - 82801EB (ICH5) SATA Controller
 - 82801ER (ICH5R) SATA Controller
 - 82801FB/FW (ICH6/ICH6W) SATA Controller
 - 82801FBM (ICH6M) SATA Controller
 - 82801FR/FRW (ICH6R/ICH6RW) SATA Controller
 - 82801GB/GR/GH (ICH7 Family) Serial ATA Storage Controller IDE
 - 82801GBM/GHM (ICH7 Family) Serial ATA Storage Controller IDE
- **Vitesse VSC7174 SATA Controller Driver**
 - GD31244 PCI-X SATA HBA

nVidia Corporation

- **NVIDIA nForce SATA Controller Driver**
 - CK804 Serial ATA Controller
 - CK8S Serial ATA Controller (v2.5)
 - MCP04 Serial ATA Controller

- nForce2 Serial ATA Controller

Promise Technology, Inc.

- **Promise ATA TX2/TX4/TX4000 Controller Driver**

- PDC20318 (SATA150 TX4)
- PDC20319 (FastTrak S150 TX4)
- PDC20371 (FastTrak S150 TX2plus)
- PDC20375 (SATA150 TX2plus)
- PDC20376 (FastTrak 376)
- PDC20378 (FastTrak 378/SATA 378)
- PDC20518/PDC40518 (SATAII 150 TX4)
- PDC20571 (FastTrak TX2200)
- PDC20575 (SATAII150 TX2plus)
- PDC20579 SATAII 150 IDE Controller
- PDC20619 (FastTrak TX4000)

- **Promise SATA Controller Driver**

- PDC20621 [SATA150 SX4] 4 Channel IDE RAID Controller

Silicon Image, Inc.

- **Silicon Image SATA Controller Driver**

- Adaptec AAR-1210SA SATA HostRAID Controller
- Sil 3112 [SATALink/SATARaid] Serial ATA Controller
- Sil 3114 [SATALink/SATARaid] Serial ATA Controller
- Sil 3512 [SATALink/SATARaid] Serial ATA Controller

Silicon Integrated Systems [SiS]

- **Silicon Integrated Systems SATA Controller Driver**

- RAID bus controller 180 SATA/PATA [SiS]
- SATA

VIA Technologies, Inc.

- **VIA SATA Controller Driver**

- VIA VT6420 SATA RAID Controller
- VT6421 IDE RAID Controller

Vitesse Semiconductor

- **Vitesse VSC7174 SATA Controller Driver**

- VSC7174 PCI/PCI-X Serial ATA Host Bus Controller

SCSI Controller Devices

NASLite-2 supports only a limited set of commonly available PCI SCSI controllers. It is important to note that the following SCSI devices are supported in non-RAID mode only. NASLite-2 includes support for the following SCSI chipsets and controllers:



- AHA-3944AUWD
- AHA-3944U/UWD / AIC-7885
- AHA-3950U2B
- AHA-3950U2B
- AHA-3950U2D
- AHA-3960D U160/m
- AHA-3985 / AIC-7873
- AHA-4944UW / AIC-7886
- AHA-4944W/UW / AIC-7876
- AHA-7850
- AIC-1480 / APA-1480
- AIC-1480 / APA-1480 Cardbus
- AIC-7855
- AIC-7860
- AIC-7861
- AIC-7880P Ultra/Ultra Wide SCSI Chipset
- AIC-7880P Ultra/Ultra Wide SCSI Chipset
- AIC-7880U
- AIC7890_ARO
- AIC-7896 SCSI Controller mainboard implementation

Adaptec

- **Adaptec AIC-7xxx Series SCSI Controller Driver**
 - 19160 Ultra160 SCSI Controller
 - 29160 Ultra160 SCSI Controller
 - 29160LP Low Profile Ultra160 SCSI Controller
 - 29160N Ultra160 SCSI Controller
 - 2940U2W SCSI Controller
 - 2940UW Pro Ultra-Wide SCSI Controller
 - AHA-2904/Integrated AIC-7850
 - AHA-2904/Integrated AIC-7850
 - AHA-29160C
 - AHA-2930CU
 - AHA-2930UW SCSI Controller
 - AHA-2940/2940W / AIC-7871
 - AHA-2940AU Single
 - AHA-2940AU Single
 - AHA-2940U/2940UW Dual
 - AHA-2940U/2940UW Dual AHA-394xAU/AUW/AUWD AIC-7895B
 - AHA-2940U/UW/D / AIC-7881U
 - AHA-2940U2 SCSI Controller
 - AHA-2940U2B SCSI Controller
 - AHA-2940U2W SCSI Controller
 - AHA-2940UW SCSI Host Adapter
 - AHA-2940UW SCSI Host Adapter
 - AHA-2944/2944W / AIC-7874
 - AHA-2944UW / AIC-7884U
 - AHA-294x / AIC-7870
 - AHA-2950U2B SCSI Controller
 - AHA-3940/3940W / AIC-7872
 - AHA-3940AU/AUW/AUWD/UWD
 - AHA-3940U/UW / AIC-7883U
 - AHA-3940U/UW/UWD / AIC-7882U
 - AHA-3944/3944W / AIC-7875

American Megatrends Inc.

- **Qlogic QLA1280 (Ultra2) and QLA12160 (Ultra3) SCSI Controller Driver**
 - QLA12160 on AMI MegaRAID

BusLogic

- **BusLogic MultiMaster and FlashPoint SCSI Host Controller Driver**
 - BT-946C (BA80C30) [MultiMaster 10]
 - BT-946C (old) [multimaster 01]

Compaq Computer Corporation

- **Adaptec AIC-7xxx Series SCSI Controller Driver**
 - Compaq 64-Bit/66MHz Dual Channel Wide Ultra3 SCSI Adapter
 - Compaq 64-Bit/66MHz Wide Ultra3 SCSI Adapter

Future Domain Corp.

- **Future Domain TMC-3260 SCSI Controller Driver**
 - TMC-18C30 [36C70]

QLogic Corporation

- **Qlogic ISP1020 Intelligent SCSI Controller**

Driver

- ISP1020 Fast-wide SCSI
- **Qlogic ISP2x00 SCSI-FCP driver**
 - QLA2100 64-bit Fibre Channel Adapter
 - QLA2100 64-bit Fibre Channel Adapter
 - QLA2200
 - QLA2200
 - QLA2200 64-bit Fibre Channel Adapter
- **Qlogic QLA1280 (Ultra2) and QLA12160 (Ultra3) SCSI Controller Driver**
 - ISP10160 Single Channel Ultra3 SCSI Processor
 - ISP1080 SCSI Host Adapter
 - ISP12160 Dual Channel Ultra3 SCSI Processor
 - ISP1240 SCSI Host Adapter
 - ISP1280 SCSI Host Adapter
 - QLA12160 on AMI MegaRAID

Hardware RAID Controller Devices

NASLite-2 supports true hardware RAID controllers only. RAID functionality is not supported with software RAID or “Fake RAID” controllers. The following list includes all supported IDE, SATA, SCSI, etc. hardware RAID controllers. Due to the relatively high cost of hardware RAID controllers, chipsets as well as specific card models are listed. The following list provides considerably more details compared to previous sections in this reference. NASLite-2 includes support for the following hardware RAID chipsets and controllers:



3ware Inc

- **3ware Storage Controller Driver**
 - 7xxx/8xxx-series PATA/SATA-RAID

Acer Incorporated [ALI]

- **LSI Logic MegaRAID Controller Driver**

- MegaRAID ACER ROMB-2E RAID Controller

Adaptec

- **Adaptec AAC Series RAID Controller Driver**
 - 2120S (Crusader)
 - 2200S (Vulcan)
 - 2200S (Vulcan-2m)
 - 3230S (Harrier)
 - 3240S (Tornado)
 - 5400S (Mustang)
 - AAC-RAID
 - AAR-21610SA PCI SATA 16ch (Corsair-16)
 - AAR-2410SA PCI SATA 4ch (Jaguar II)
 - AAR-2810SA PCI SATA 8ch (Corsair-8)
 - ASR-2020ZCR
 - ASR-2025ZCR (Terminator)
 - Catapult
 - Dell PowerEdge RAID Controller 2
 - ESD SO-DIMM PCI-X SATA ZCR (Prowler)
 - Tomcat
- **IBM ServeRAID Controller Driver**
 - ServeRAID Controller

Adaptec (formerly DPT)

- **Adaptec I2O RAID Controller Driver**
 - 2000F Fibre Channel
 - 2000S Ultra3 Dual Channel
 - 2000S Ultra3 Single Channel
 - 2400A UDMA Four Channel
 - 2400A UDMA Four Channel DAC
 - 3000F Fibre Channel
 - 3000S Ultra3 Dual Channel
 - 3000S Ultra3 Single Channel
 - 3010S Fibre Channel
 - 3010S Ultra3 Dual Channel
 - 3410S Ultra160 Four Channel
 - 5000F Fibre Channel
 - 5000S Ultra3 Dual Channel
 - 5000S Ultra3 Single Channel
 - ASR-2005S I2O Zero Channel
 - ASR-2010S I2O Zero Channel
 - PM1554U2 Ultra2 Single Channel
 - PM1554U2 Ultra2 Single Channel (NON ACPI)
 - PM1564U3 Ultra3 Dual Channel
 - PM1564U3 Ultra3 Single Channel
 - PM1654U2 Ultra2 Single Channel
 - PM2554U2 Ultra2 Single Channel
 - PM2554U2 Ultra2 Single Channel (NON ACPI)
 - PM2654U2 Ultra2 Single Channel
 - PM2654U2 Ultra2 Single Channel (NON ACPI)
 - PM2664U3 Ultra3 Dual Channel
 - PM2664U3 Ultra3 Single Channel
 - PM2865F Fibre Channel

- PM2865U3 Ultra3 Dual Channel
- PM2865U3 Ultra3 Single Channel
- PM3754U2 Ultra2 Single Channel (NON ACPI)
- PM3755F Fibre Channel (NON ACPI)
- PM3755U2B Ultra2 Single Channel (NON ACPI)
- PM3757U2 Ultra2 Dual Channel
- PM3757U2 Ultra2 Single Channel
- PM3767U3 Ultra3 Dual Channel
- PM3767U3 Ultra3 Quad Channel
- SmartRAID V Controller

American Megatrends Inc.

- **LSI Logic MegaRAID Controller Driver**

- MegaRAID
- MegaRAID 428 Ultra RAID Controller
- MegaRAID 431 RAID Controller
- MegaRAID 434 Ultra GT RAID Controller
- MegaRAID 438 Ultra2 LVD RAID Controller
- MegaRAID 466 Express Plus RAID Controller
- MegaRAID 467 Enterprise 1500 RAID Controller
- MegaRAID 471 Enterprise 1600 RAID Controller
- MegaRAID 475 Express 500/500LC RAID Controller
- MegaRAID 477 Elite 3100 RAID Controller
- MegaRAID 490 Express 300 RAID Controller
- MegaRAID 493 Elite 1600 RAID Controller
- MegaRAID 494 Elite 1650 RAID Controller
- MegaRAID 503 Enterprise 1650 RAID Controller
- MegaRAID 511 i4 IDE RAID Controller
- MegaRAID 522 i4133 RAID Controller
- MegaRAID 762 Express RAID Controller
- PowerEdge Expandable RAID Controller 2/SC

Compaq Computer Corporation

- **Adaptec AAC Series RAID Controller Driver**
- SATA 6Ch (Bearcat)

Cyclone Microsystems, Inc.

- **LSI Logic MegaRAID Controller Driver**
- MegaRAID

Dell

- **Adaptec AAC Series RAID Controller Driver**
- CERC SATA RAID 2 PCI SATA 6ch (DellCorsair)
- PowerEdge 2400
- PowerEdge 2450
- PowerEdge 4400
- PowerEdge Expandable RAID Controller 2/Si
- PowerEdge Expandable RAID Controller 3/Di
- PowerEdge Expandable RAID Controller 3/Si

- PowerEdge Expandable RAID Controller 320/DC

- **LSI Logic MegaRAID Controller Driver**

- MegaRAID 518 DELL PERC 4/DC RAID Controller
- MegaRAID 520 DELL PERC 4/SC RAID Controller
- PowerEdge Cost Effective RAID Controller ATA100/4Ch
- PowerEdge Expandable RAID Controller 2/DC
- PowerEdge Expandable RAID Controller 2/SC
- PowerEdge Expandable RAID controller 4
- PowerEdge Expandable RAID controller 4/Di
- PowerEdge Expandable RAID Controller 4/QC
- PowerEdge Expandable RAID Controller 4e/Di
- PowerEdge Expandable RAID Controller 4e/Si
- PowerEdge RAID Controller 3/DC
- PowerEdge RAID Controller 3/QC
- PowerEdge RAID Controller 3/SC
- PowerEdge RAID Controller PERC4e/DC
- PowerEdge RAID Controller PERC4e/SC

Digital Equipment Corporation

- **Adaptec AAC Series RAID Controller Driver**

- DECchip 21554

EKF Elektronik GmbH

- **LSI Logic MegaRAID Controller Driver**

- CG1-RADIO
- CU1-CHORUS
- CU2-QUARTET
- CX1-BAND

Fujitsu Siemens Computer GmbH

- **LSI Logic MegaRAID Controller Driver**
- FSC MegaRAID PCI Express ROMB

Hewlett-Packard Company

- **Adaptec AAC Series RAID Controller Driver**

- Hewlett-Packard NetRAID-4M

- **LSI Logic MegaRAID Controller Driver**

- HP NetRAID-1Si
- MegaRAID
- MegaRAID 438, HP NetRAID-3Si
- MegaRAID T5, Integrated HP NetRAID
- MegaRAID, Integrated HP NetRAID
- NetRAID-1M

IBM

- **IBM ServeRAID Controller Driver**

- SCSI RAID Adapter [ServeRAID]
- ServerAID Controller
- ServerAID-3x
- ServerAID-4H
- ServerAID-4L
- ServerAID-4Lx
- ServerAID-4M
- ServerAID-4Mx
- ServerAID-5i
- ServerAID-xx

- GDT 6550
- GDT 6553RS/6653RS
- GDT 6555
- GDT 6555/6555-ECC
- GDT 6557/6557-ECC
- GDT 6557RD
- GDT 6557RP
- GDT 6557RP2
- GDT 6558RD/6658RD
- GDT 6558RS/6658RS
- GDT 6563RS/6663RS
- GDT 7113RN/7513RN/7613RN
- GDT 7118RN/7518RN/7518RN
- GDT 7123RN/7523RN/7623RN
- GDT 7128RN/7528RN/7628RN
- GDT 7519RN/7619RN
- GDT 7529RN/7629RN
- GDT 7533RN/7633RN
- GDT 7538RN/7638RN
- GDT 7543RN/7643RN
- GDT 7553RN/7653RN
- GDT 7558RN/7658RN
- GDT 7563RN/7663RN
- GDT 8x13RZ
- GDT 8x23RZ
- GDT 8x33RZ
- GDT 8x43RZ
- GDT 8x53RZ
- GDT 8x63RZ
- GDT MAXRP
- GDT NEWRX

ICP Vortex Computersysteme GmbH

- **GDT Disk Array Controller Driver**

- GDT 4x13RZ
- GDT 4x23RZ
- GDT 6000/6020/6050
- GDT 6000B/6010
- GDT 6110/6510
- GDT 6111RD/6511RD
- GDT 6111RP/6511RP
- GDT 6111RP2/6511RP2
- GDT 6113RS/6513RS
- GDT 6115/6515
- GDT 6117/6517
- GDT 6117RD/6517RD
- GDT 6117RP/6517RP
- GDT 6117RP2/6517RP2
- GDT 6118RD/6518RD/6618RD
- GDT 6118RS/6518RS/6618RS
- GDT 6120/6520
- GDT 6121RD/6521RD
- GDT 6121RP/6521RP
- GDT 6121RP2/6521RP2
- GDT 6123RS/6523RS
- GDT 6125/6525
- GDT 6127/6527
- GDT 6127RD/6527RD
- GDT 6127RP/6527RP
- GDT 6127RP2/6527RP2
- GDT 6128RD/6528RD/6628RD
- GDT 6128RS/6528RS/6628RS
- GDT 6519RD/6619RD
- GDT 6529RD/6629RD
- GDT 6530
- GDT 6533RS/6633RS
- GDT 6535
- GDT 6537
- GDT 6537RD
- GDT 6537RP
- GDT 6537RP2
- GDT 6538RD/6638RD
- GDT 6538RS/6638RS
- GDT 6543RS/6643RS

Intel Corporation

- **GDT Disk Array Controller Driver**

- ICP Vortex GDT8546RZ
- RAID Controller
- SCRUM32
- SRCZCR

- **LSI Logic MegaRAID Controller Driver**

- 80960RP [i960RP Microprocessor]
- MegaRAID Intel RAID Controller SRCU42E
- MegaRAID Intel RAID Controller SRCU42X
- MegaRAID Intel RAID Controller SRCZCRX
- MegaRAID RAID Controller Alief SROMB42E
- MegaRAID RAID Controller Harwich SROMB42E
- MegaRAID RAID Controller SRCS16
- MegaRAID RAID Controller SRCS28X
- MegaRAID RAID Controller SRCU41L

Lenovo

- **Adaptec AAC Series RAID Controller Driver**

- Legend S220 (Legend Crusader)
- Legend S230 (Legend Vulcan)

LSI Logic / Symbios Logic

- **LSI Logic MegaRAID Controller Driver**

- MegaRAID
- MegaRAID 518 SCSI 320-2 Controller
- MegaRAID 520 SCSI 320-1 Controller
- MegaRAID 522 i4 133 RAID Controller
- MegaRAID 530 SCSI 320-0X RAID Controller
- MegaRAID 531 SCSI 320-4X RAID Controller
- MegaRAID 532 SCSI 320-2X RAID Controller
- MegaRAID SATA 150-4 RAID Controller
- MegaRAID SATA 150-6 RAID Controller
- MegaRAID SATA 300-4X RAID Controller
- MegaRAID SATA 300-8X RAID Controller
- MegaRAID SCSI 320-1E RAID Controller
- MegaRAID SCSI 320-2E RAID Controller
- MegaRAID ZCR SCSI 320-0 Controller

Promise Technology, Inc.

- **LSI Logic MegaRAID Controller Driver**

- SuperTrak
- SuperTrak Pro
- SuperTrak66/100

Santa Cruz Operation

- **LSI Logic MegaRAID Controller Driver**

- MegaRAID 466, PowerEdge Expandable RAID Controller 2/SC
- PowerEdge Expandable RAID Controller 2/SC

Getting NASLite-2

NASLite-2 CD-ROM or a downloadable CD-ROM ISO image is available for purchase from the Server Elements (www.serverelements.com) website.

NOTE: *NASLite-2 is a commercial product and is not freely distributable. Please do not make or distribute illegal copies. Doing so is not only illegal, but undermines our efforts and further impedes our ability to develop the product.*

Internet Resources

Additional information, the latest releases, as well as well-mediated user forums covering NASLite-2 and related OS products can be found on the Server Elements (www.serverelements.com) website. In

addition to this manual, the user forums are the best place for information regarding the use, administration and maintenance of your NASLite-2 file server.

Disclaimer

The information in this document is provided 'as is' without warranty or guarantee of any kind. The user assumes the entire risk as to the results and the performance of the information. In no event will Server Elements or the authors be liable for any consequential, incidental or direct damages suffered in the course of using the information in this document.

Copyrights and Trademarks

© 2006 Tony Z. Tonchev (tzt@serverelements.com)
© 2006 Ralph Hargis (rh@serverelements.com)

This manual may be reproduced in whole or in part, without fee, subject to the following restrictions:

- The copyright notice above and this permission notice must be preserved complete on all complete or partial copies.
- Any translations or derived works must be approved in writing by the author before distribution.
- If you distribute this work in part, instructions and means for obtaining the complete version of this manual must be included.
- Small portions may be reproduced as illustrations for reviews or quotes in other works without this permission notice if proper citation is given.