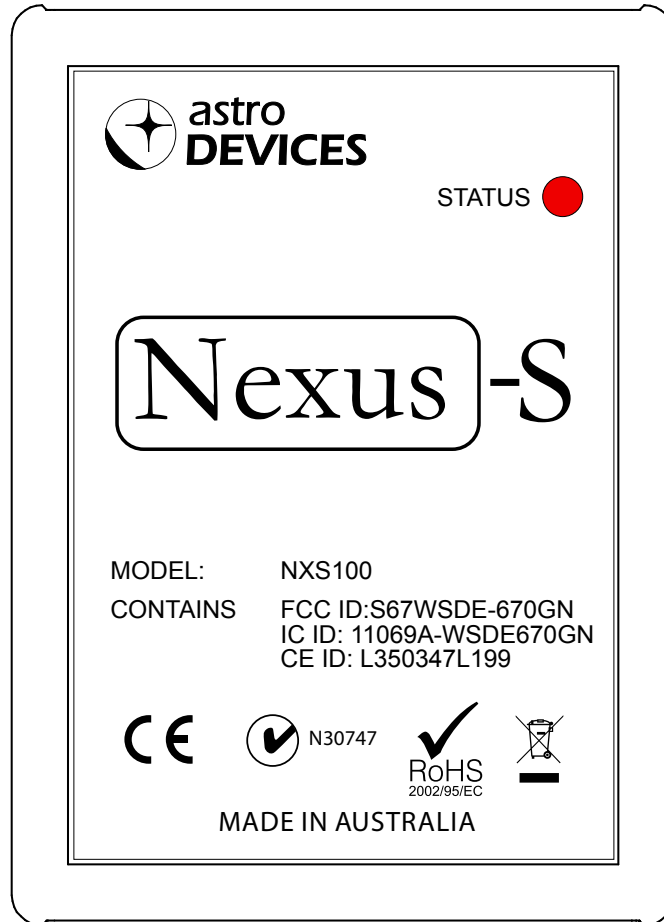


USER MANUAL



User Guide for Nexus-S

Version 1.0
Firmware version 1.x.x
Last revised on October 28th, 2013
Printed in Australia

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Precautions and Safety

Electricity



Do not handle power plug and adapter with wet hands. Electrical shock may result.

Immediately power off the product and unplug the DC adapter and/or batteries if smoke or odours emit from the product.

Immediately power off the product and unplug the DC adapter and/or batteries if water or other liquids are present.

Product



Do not drop or subject the device to impact.

Keep it away from harsh environments including humid, dusty, and smoky areas.

Do not use excessive force on the connectors or attempt to disassemble the device.

Do not place heavy objects on the product. Damage to your products may result from improper use.

Technical Support

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198 The Esplanade,
SYLVANIA, NSW 2224
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ABN 75 270 616 917
E-Mail: support@astrodevices.com
Website: <http://www.astrodevices.com>

Thank you

Thank you for purchasing Nexus-S WiFi electronic telescope interface adapter. We hope you enjoy it! This user manual will get you started and help you make the most of your Nexus-S.

Introduction

Nexus-S is a computerised WiFi wireless adapter for your telescope. It works with most popular telescopes – on equatorial or Alt-Azimuth mounts. Nexus-S can be used as a Serial RS232 to WiFi adapter or Serial TTL to WiFi.

You will need [planetarium software](#) in order to use Nexus-S.

Product Features

Below is a short outline of main features of your Nexus-S.

- Plug and play support for SynScan based telescopes
- Supports direct interface to EQ6/HEQ5 mounts
- External power source – 5-16V DC
- Operating temperature range from -20 °C to +50 °C (-5 °F to +120 °F)
- Humidity 10%-90% non-condensing
- FCC / CE/ IC certified 2.4GHz IEEE 802.11b/g transceiver
- Supports Access Point and infrastructure WiFi networks
- Secure Wi-Fi authentication schemes
- Class I WiFi device (up to 150 meters)
- Uses 2412 ~ 2484MHz Unlicensed ISM band (channels 1-14)
- One RS232 port
- Uses a 32-bit Cortex-M3 CPU.
- Power consumption – 35 mA from 12V DC external power
- Reverse polarity protection
- RoHS compliant

System Requirements

Nexus-S uses a WiFi communication module and requires one of the following to be connected to:

- iOS devices (iPhone, iPad, iPod touch) running iOS 3.0+
- Android devices with WiFi support
- PCs with WiFi support (running Windows XP or Windows 7).
- Apple computers with WiFi support (running Mac OS X).

Please also refer to the system requirements for your favourite [planetarium software](#).

Package Content

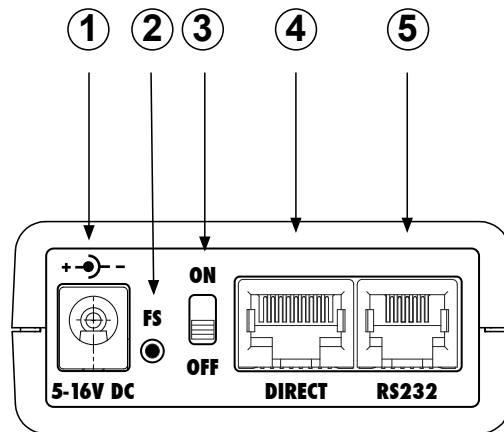
The package contains:

- Nexus-S
- User manual
- RJ12 to DB9 male serial cable

- RJ45 to DB9 male EQDirect cable (optional)
- RJ12 to DB9 female serial cable (for firmware updates)
- DC 2.1mm to cigarette lighter power cable
- USB to DC 2.1mm cable

Controls

All controls are situated on bottom panel of Nexus-S:



- 1 – 2.1mm DC power connector
- 2 – Factory settings/firmware update
- 3 – ON/OFF slide switch
- 4 – RJ45 serial TTL port
- 5 – RJ12 serial RS232 port



WARNING:

Do not connect Nexus-S to an external power source that is not within the specified voltage range. Nexus has internal over-current protection but it is safer to use it with the power source specified. Do not plug any cable into 'DIRECT' port other than the cable supplied with Nexus-S

Do not connect a power source to the DC connector (1) if Nexus-S is powered from SynScan hand controller or EQ6/HEQ5 mount.

The status LED reports different states of Nexus:

Blinking type	Description
Slow blinking	No computing device is connected to Nexus-S
Solid ON	A computing device has joined Nexus-S' WiFi network
OFF	Updating firmware
Flashing	Flashing LED is indicating communications are in progress

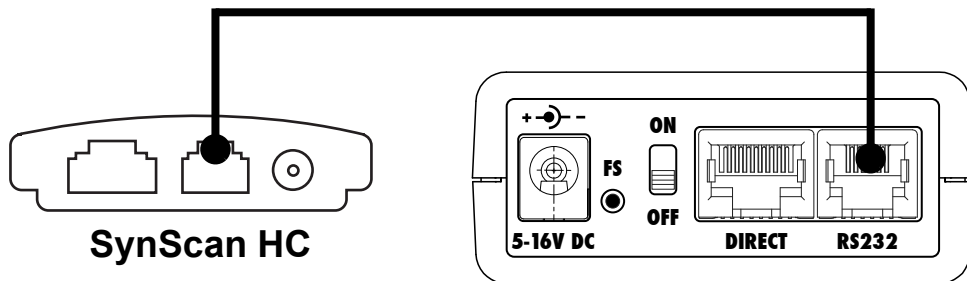
Connecting Nexus to Your Telescope/Other Devices

Nexus-S can operate as:

- Serial RS232 to WiFi adapter
- Serial TTL (5V) to WiFi adapter

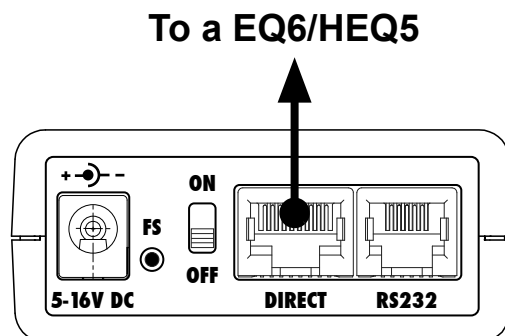
Connecting to SynScan hand controller

Nexus-S can be connected directly to SynScan hand controller using the supplied cable (labelled 'SynScan HC – Nexus-S'). In this case Nexus-S is powered from the hand controller and there is no need to provide a separate power to Nexus-S. Port labelled RS232 on Nexus-S is connected to a 'Multi purpose' port on SynScan hand controller.



Connecting to EQ6/HEQ5 mount

Nexus-S can be connected directly to EQ6/HEQ5 telescope mount using the supplied cable (labelled 'EQ6 – Nexus-S' or 'HEQ5-Nexus-S'). In this case Nexus-S is powered from the mount and there is no need to provide a separate power to Nexus-S. Port labelled DIRECT on Nexus-S is connected to a hand controller port on EQ6/HEQ5 telescope mount.



WARNING

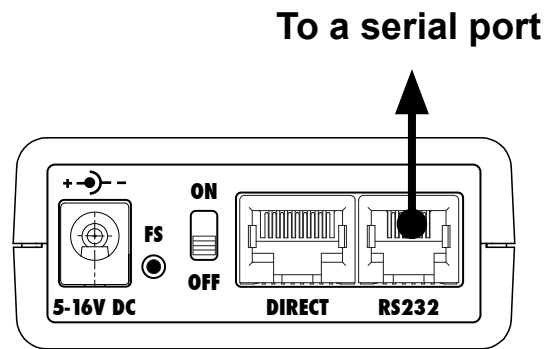
Do not connect port labelled 'Direct' to any other telescope types other than EQ6/HEQ5.

Never connect the hand controller to the port labelled Direct

Connecting to other telescopes

Nexus-S can be used to provide a WiFi interface to other computerised telescopes. In this case Nexus-S must be powered through the 2.1mm DC connector. Please use the provided serial cable (labelled 'Serial') to interface to your telescope. Please refer to the user manual of your telescope to determine which port is a standard RS232 port.

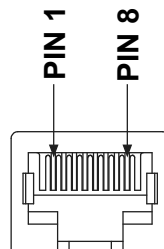
The serial cable must be plugged into port labelled RS232.



Ports Pin Descriptions

Direct

Nexus-S has a standard RJ-45 connector to connect it to EQ6/HEQ5 mount bypassing the hand controller. Please use the supplied cable for the direct connection of Nexus-S to your telescope mount. The pins are numbered according to the following diagram:

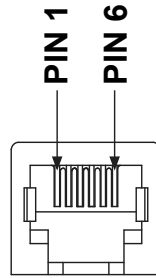


The pin descriptions are in the following table:

Pin	Description
1	RxD – received data (input)
2	+5-16V DC
3	TxD – transmitted data (output)
4	Ground
5	No connection
6	+5-16V DC
7	No connection
8	Ground

RS232 port

Nexus-S has one RS-232 serial port. It uses a standard 6P6C connector. The pins are numbered according to the following diagram:



The pins description is as follows:

Port	Pin	Description
RS232	1	Ground
	2	TxD – transmitted data (output)
	3	RxD – received data (input)
	4	Ground
	5	Ground
	6	+5-16V DC

Connecting To Tablet/PC/Mac

Nexus communicates with planetarium software using one or more TCP/IP ports. Nexus's default TCP/IP ports' configuration is described in the following table:

TCP/IP port	Port	Connection	Serial port parameters, baudrate, data bits, stop bits, parity
4060	RS232		9600, 8, 1, no
4061	DIRECT		9600, 8, 1, no
4070		Configuration protocol	

Nexus is operating in Access Point mode by default. The default SSID of Nexus is **ADNexusSXXXXX** where **XXXXX** is the serial number of your Nexus. The serial number is printed on the back of your Nexus-S. The SSID can be changed using the configuration utility.



The default IP address of your Nexus-S is 10.0.0.1.



The WiFi Configuration setup may differ based on the brand of the computer used and on the OS running on that device. Please refer to the user manual of the devices and the OS. The TCP/IP port used for configuration is always 4070 and cannot be changed.

Please refer to the user manual of your planetarium software for the explanation on setting up the communications with telescope. Some software is designed to operate a telescope directly through a serial port. You can use a special utility – virtual serial port driver for you computer. A number of utilities of this type is available with many of them free:

[COM2TCP](#) - with a 45-day free trial, by [AstroGeeks](#)

[HW VSP 3](#) - Free for personal use

Operating Nexus-S

Updating Firmware

Nexus-S' firmware can be updated using a firmware update cable by connecting it to a serial port of a Windows based PC/laptop. Please download the latest firmware from the support section of our website and copy it to a convenient location of your PC. Please install the firmware update utility on your computer. Then please follow these steps:

- Turn Nexus-S OFF
- Press and hold the 'Factory Setting' button
- Turn Nexus ON
- The status LED must be OFF
- Release the 'Factory Setting' button
- Run the firmware update utility and select the firmware image you downloaded. The firmware will be updated. Once the update is complete turn Nexus-S OFF and then ON. The Status LED will start blinking

Restoring factory settings

From time to time you may need to restore the settings of your Nexus-S. The following steps will allow you to reset them:

- Turn Nexus ON
- Press and hold the 'Factory Setting' button for 5 seconds
- Release the button
- The status LED will start 'pulsating' flashing
- The settings are restored as soon as the status LED will stop blinking
- Power cycle Nexus-S to use the new setting



Note: Please make sure that no device is connected/joined to Nexus-S' WiFi network when restoring factory settings.

List of Compatible Planetarium Software

Nexus is compatible with most planetarium software packages that support Ouranos or Bbox protocols. You can also use planetarium software that supports ASCOM platform (<http://ascom-standards.org>). The table below lists just a few software packages that Nexus was tested with.

Software Name	Platform	Website
AstroPlanner	Windows Mac OS X	http://www.astroplanner.net/
Cartes du Ciel	Windows	http://sourceforge.net/projects/skychart/
DeepSky	Windows	http://www.deepsky2000.net
Hallo northern sky	Windows	http://www.hnsky.org/
Megastar	Windows	http://www.willbell.com/
SkySafari Plus/Pro	Android iOS MacOS X	http://www.southernstars.com/
Starry Night [®]	Windows	http://www.starrynightstore.com
TheSky 6	Windows	http://www.bisque.com
Voyager-4.5	Windows Mac OS X	http://www.carinasoft.com

FREQUENTLY ASKED QUESTIONS (FAQ)

Q: What kind of power source can I use to power Nexus-S?

A: Nexus-S can be powered with a DC power source with a voltage from 5V to 16V. At 12V Nexus-S draws around 35mA.

Q: What type of batteries is recommended for operating in cold conditions?

A: The most economical type of batteries is 12V SLA (sealed lead acid). Lithium batteries have very good performance in cold conditions. Rechargeable Lithium batteries (Li-Poly) without over discharge protection are not recommended as Nexus-S does not have a low voltage cut-off level and they can be discharged below the recommended level.

Q: Can Nexus-S be connected to SynScan hand controller and external power at the same time?

A: No, it is not recommended to power Nexus-S from an external power source if connected to SynScan hand controller.

Q: Does Nexus-S work with a standard Android based device (without any modifications to the device's firmware)?

A: Yes, Nexus works with any recent Android based phone/tablet without any need to modify the firmware on that device. Nexus-S is acting as a WiFi access point.

Warranty

Nexus-S is covered by a one-year limited warranty. Please refer to the enclosed warranty certificate for full details.

Technical Support

You can find the latest version of the manual and firmware in the support section of our website. Please feel free to e-mail us should you require further technical assistance.

Technical Support

You can find software updates and user documentation on the Astro Devices website.

<http://www.astrodevices.com>

e-mail: [mailto:support@astrodevices.com?subject=Nexus support](mailto:support@astrodevices.com?subject=Nexus%20support)

FCC Statement for Nexus-S

Contains:
FCC ID:S67WSDE-670GN
IC ID: 11069A-WSDE670GN

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver



DECLARATION OF CONFORMITY

We, Astro Devices, ABN 75 270 616 917, 198 The Esplanade,
SYLVANIA, NSW 2224, AUSTRALIA, E-mail: info@astrodevices.com,

As manufacturer/producer declare that:

Product Name: Nexus-S
Product Series: NXS100
Product Description: Wireless multifunctional adapter for telescopes

conforms to the following directives and standards therein

Directives:

WEEE- Waste from Electrical and Electronic Equipment - 2002/96/EC
Radio Equipment & Telecommunications Terminal Equipment (R&TTE) - 1999/5/EC
RoHS- Restriction of use of Hazardous Substances in Electrical and Electronic
Equipment - 2002/95/EC

Standards:

EMC: EN 55022: EN 301 489-1 V1.8.1:2008-04, EN 301 489-17 V2.1.1:2009-05
RADIO: EN 300 328 V1.7.1:2006-10
Immunity: EN 55024: EN 61000-4-2:2001, EN 61000-4-3:2002
Safety: EN 60950-1:2006+A11:2009+A1:2010

Supplementary Information:

Nexus-S contains CE ID: L350347L199. This unit is a battery-operated appliance.

Date of issue:

December 10th 2013

Communication Protocols

Nexus-S Configuration Protocol

Nexus-S can be configured to operate in different modes. The configuration is performed by communicating with Nexus using TCP/IP port number 4070.

Each command has the following syntax:

`<set/get>_<parameter 1>[_<parameter 2>]_<value><CR>`

Nexus will send back the value requested or 'OK' in case of a 'set' command. The returned packet will be equal 'ERR' in case of invalid requests. The return packets are always terminated with <CR>.

The following table lists all command parameters:

WiFi configuration

CHANNEL		0-14	Specifies the WiFi channel to be used. Please note that the value of 0 should only be used when Nexus is setup to operate in infrastructure mode.	set CHANNEL 7<cr> get CHANNEL<cr>
DHCP		0,1	Specifies whether to use DHCP: 0 – disabled, 1 – enabled	set DHCP 0<cr> get DHCP<cr>
IPADDRESS		xxx.xxx.xxx.xxx	Specifies the IP address to be used. The IP address will only be used when DHCP is disabled.	set IPADDRESS 169.254.1.1<cr>
IPMASK		xxx.xxx.xxx.xxx	Specifies the IP mask.	set IPMASK 255.255.0.0<cr>
NTYPE		0 - infrastructure 7 – Access Point	Specifies the network mode to be used by Nexus.	
PASSWORD		up to 32 bytes	Specifies the password to be used to connect to a WiFi network.	set PASSWORD Pass123<cr> get PASSWORD<cr>
SSID		up to 32 bytes	Specifies SSID	set SSID MyNexus<cr> get SSID<cr>
TRANSPower		1÷12	Specifies the transmission power to be used by the WiFi module. Please note that the value of 1 specifies the minimum power and the battery will last longer at that level.	

Physical Port

RS232 DIRECT	baudrate	9600÷230400	Sets the baud rate to be used on the port specified. The value specified is in bits per second.	set RS232 baudrate 19200<cr> get RS232 baudrate<cr>
	databits	8,9	Sets the number of data bits.	set DIRECT databits 8<cr> get DIRECT databits<cr>
	parity	0, 1, 2	Sets the parity to be used on the ports specified: 0 – none, 1 – odd, 2 – even	set DIRECT parity 0<cr> get DIRECT parity<cr>
	stopbits	1,2	Specifies the number of stop bits.	set DIRECT stopbits 8<cr> get DIRECT stopbits<cr>

Port Routing

PORT	0÷1	1024÷65535	Sets the TCP/IP port number to be used with virtual port (0÷1)	set PORT 0 4060<cr> get PORT 5<cr>
PORTCONNECT	0÷1	0÷3	Specifies the connection type for the virtual port (0÷5), The connection type can be equal to one of the following values: 0 – Connection to RS232 port 1 – Connection to DIRECT port 2 – Configuration communication protocol 3 – no connection	

CONFIGURE			Saves the configuration into flash memory.	set CONFIGURE<cr>
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Glossary

PC is a personal computer. It includes computers running Windows, Linux or Mac OS.

SSID (Service Set Identifier) is the name of a wireless local area network (WLAN),

Standby mode is when the Nexus is passively waiting for a connection with a Tablet/PC.

TTL stands for Transistor-Transistor Logic, 5V level

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