

ASR

Advanced Services Router

ASR 6000 Installation Guide



waystream



ASR 6000 Installation Guide

ASR 6000 Installation Guide

WS-DOC-ASR6K-INSTALL. Published May 1, 2018.

Copyright and Legal notice

Copyright 2012-2016 Waystream AB. All rights reserved.

iBOS, the ASR Bootloader, program models and other software content and this documentation (“the Intellectual Property Rights”) are protected by the Swedish Copyright Act (Sw: Upphovsrättslagen) and, if applicable, the Swedish Patents Act (Sw: Patentlagen). All and any copying and distribution of the Intellectual Property Rights, without authorization by Waystream is prohibited. The prohibition includes every form of reproduction and distribution.

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change without notice. Waystream assumes no liability for damages incurred directly or indirectly from errors, omissions or discrepancies between the software and this document.

iBOS, ServiceEngine, MS4000-series switches and ASR are trademarks of Waystream.

All other trademarks, service marks and trade names are proprietary to their respective owner.

Purchasers, licensees and users accept and acknowledge that the products contain components (including components carrying certain firmware) and combinations of components that constitute trade secrets protected by Waystream or its partners. Purchasers, licensees and users warrant that the delivered products will not be opened or dismantled, copied, altered or in any other way modified. Furthermore, purchasers, licensees and users agree not to attempt to reverse engineer, disassemble, modify, translate, create derivative works, rent, lease, loan, or without written permission distribute or sublicense the software, in whole or in part.

The products and its hardware, firmware and software, including technical data, may be subject to EU and U.S export control laws, including the U.S Export Administration Act and its associated regulations and the International Traffic in Arms Regulations administered by the US Department of State, and may be subject to export or import regulations in other countries. Purchasers and licensees agree to comply strictly with all such regulations and acknowledges that it has the responsibility to obtain licenses to export, re-export, or import hardware, firmware and software.

Purchasers and licensees are not entitled to, and Waystream is not in any event liable to pay, compensation for damages which delivered products or software has caused to other property or to persons or any other consequential damages, including but not limited to loss of profit, loss of production or any other indirect damages.

Contents

Introduction	3
Product Overview	5
Product Models	6
ASR6026	6
ASR6126	7
ASR6226	7
ASR6326	8
The ASR6000 Front Panel	9
LED Panel	9
Console Port	13
ASR6000 Power Connector	13
ASR6000 Ground Connector	14
Installing the ASR6000	15
Tools Required	15
Safety Guidelines	15
General Safety	15
Lithium Battery Safety	16
Operating Safety	16
EMC Notice	16
Equipment List	17
ASR6000 Environment	18
Ventilation of ASR6000	19
Rack Installation of ASR6000	19
Connecting Power to the ASR6000	20
Installing SFP Modules	21
Connecting the ASR6000 to the Network	21
Checking the ASR Installation	23
Connecting to the Console Interface Port	23
The Boot Process	24
Troubleshooting the Bootloader	24
No uplink during Boot	24
No valid iBOS Image during Boot	25
Troubleshooting iBOS	26
Check System	26
Check Available Devices	27
Check SFP Interface	27
Check the Uplink Interface	28
Check OSPF	29
Check CSAR Connections	29

Appendix A – ASR6000 Product Description	31
ASR Interfaces	31
Interface Specification	31
Technical Data	32
Physical Dimensions	32
Power and Safety	32
Environmental	32
Appendix B – SFP Products for ASR6000	33
Overview	33
Safety	35
Insertion and Removal	37
Inserting an SFP module	37
Removing an SFP Module	37

Introduction

The Advanced Services Router (ASR) series 6000 is a versatile access-layer switch for broadband networks. The router is available in two models with different interface types that makes it possible to use the ASR6000 for all types of network access solutions.

This manual is intended for persons installing ASR6000 units in a network. You will need to be familiar with the Wavestream products including iBOS, and the hardware used in your networking system.

After reading this manual, you will be able to install, power up and handle basic troubleshooting of the ASR6000 series routers.

This manual describes the following:

- “Product Overview” on page 5
- “Installing the ASR6000” on page 15
- “Checking the ASR Installation” on page 23
- “ASR6000 Product Description” on page 31
- “SFP Products for ASR6000” on page 33

For complete information of the product, including specifications for hardware and software functionality, refer *ASR6000 Product Specification*.

For more information on configuring the boot options of the ASR6000, refer *ASR6000 Bootloader User Guide*.

Product Overview

This chapter provides an overview of the ASR6000 for installation purposes only.

For a complete specification of the product, refer “ASR6000 Product Description” on page 31.

Figure 1 ASR6000 Series Switch



The ASR6000 is designed for installation in a standard 19” rack.

Product Models

The ASR6000 series switches are fan-cooled, and are designed for central office environments.

This installation guide covers the following models of the ASR6000 series router.

- ASR6026
- ASR6126
- ASR6226
- ASR6326

ASR6026

The ASR6026 has the following interfaces:

- Two (2) 10 GigabitEthernet SFP+ uplink ports
- One (1) RJ-45 serial console port
- Twenty Four (24) GigabitEthernet SFP downlink slots
- Four (4) RJ-45 combo ports

The ASR6026 is available as an AC model.

Figure 2 ASR6026



The 24 GigabitEthernet interfaces are capable of running 100/1000 Mbps on fibre cables. In addition, there are four RJ-45 interfaces that can be used with twisted pair (TP) Category 3-6 UTP/STP cables.

ASR6126

The ASR6126 series has the following interfaces:

- Two (2) 10 GigabitEthernet SFP+ uplink ports
- One (1) RJ-45 serial console port
- Twenty Four (24) GigabitEthernet RJ-45 downlink ports
- Four (4) SFP combo ports

The ASR6126 is only available as an AC model.

Figure 3 ASR6126



The 24 GigabitEthernet interfaces are RJ-45 ports that are capable of running 10/100/1000 Mbps on twisted pair (TP) Category 3-6 UTP/STP cables. In addition, there are four SFP combo ports that can be used with fiber connectors at 100/1000 Mbps.

ASR6226

The ASR6226 has the following interfaces:

- Two (2) 10 GigabitEthernet SFP+ uplink ports
- One (1) RJ-45 serial console port
- Twenty Four (24) GigabitEthernet SFP downlink slots
- Four (4) RJ-45 combo ports

The ASR6226 is available as an AC model.

Figure 4 ASR6226



ASR6326

The ASR6326 series has the following interfaces:

- Two (2) 10 GigabitEthernet SFP+ uplink ports
- One (1) RJ-45 serial console port
- Twenty Four (24) GigabitEthernet RJ-45 downlink ports
- Four (4) SFP combo ports

The ASR6326 is only available as an AC model.

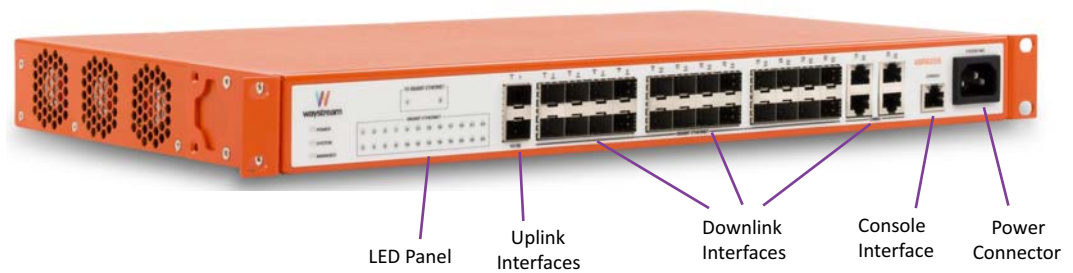
Figure 5 ASR6326



The ASR6000 Front Panel

All connectors are placed in the front of the ASR for easy operation. There is also an LED panel that shows the status for all interfaces and the power supply.

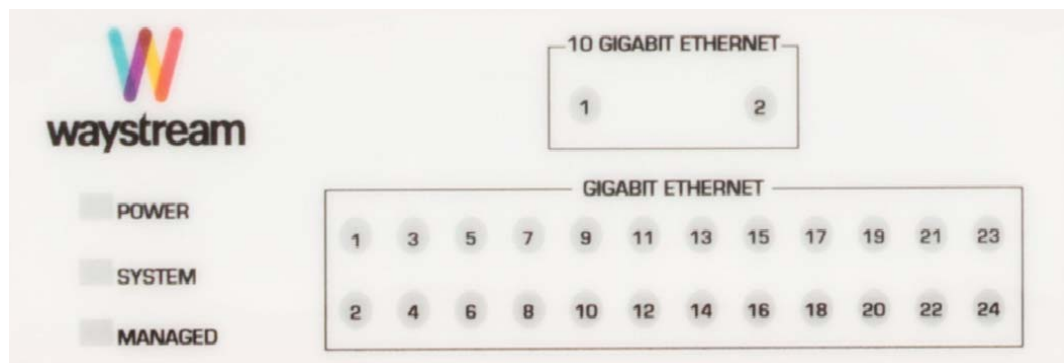
Figure 6 ASR6000 Front Panel



LED Panel

The LED panel shows the status of the power supply, system status, remote management, as well as for the uplink and downlink interfaces.

Figure 7 ASR6000 LED panel



System LEDs

The ASR6000 has three LEDs for showing system status; POWER, SYSTEM and MANAGED. Refer for more information.

Figure 8 System Status Indicators

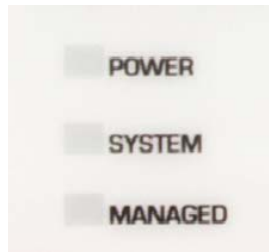


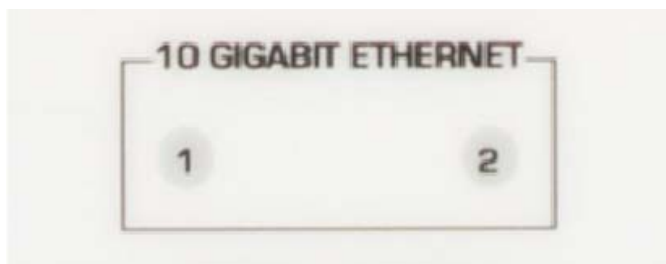
Table 1 System Status LED Status

LED	STATE	Description
POWER	OFF	Power is OFF
	ON	Power is ON.
	FLASHING	ASR is overheating.
SYSTEM	OFF	System is not loaded
	ON	System successfully booted.
	FLASHING	System is booting
MANAGED	OFF	iBOS has started
	ON	Connected to remote management system
	FLASHING	Manual configuration

LED for Uplink Interfaces

For the uplink interfaces, the unit has two slots for SFP+ modules that can reach speeds of upto 10 Gbps. Read more about the SFPs in “SFP Products for ASR6000” on page 33.

Figure 9 Uplink LEDs



When an uplink interface is active, the status is shown on the LED panel. See the table below

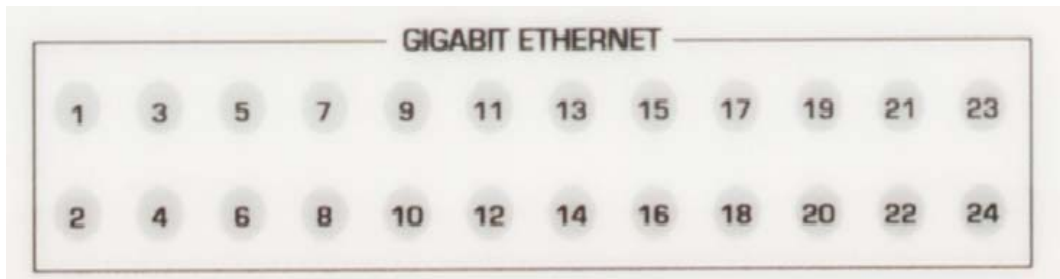
Table 2 Uplink LED Status

10 GE LED	STATE	Description
1-2	OFF	No uplink established
	ON	Uplink is established GREEN=10 Gbps AMBER= 1 Gbps
	FLASHING	Uplink port is active, packets sent on port GREEN= 10 Gbps AMBER=1 Gbps

LED for Downlink Interfaces

For the downlink interfaces, the unit has 24 LEDs. Each number corresponds to the respective downlink port.

Figure 10 Downlink LEDs



Depending on the model and usage of the combo ports, these interfaces can operate at 10, 100 or 1000 Mbps. See the table below for a description of the different states:

Table 3 Downlink LED Status

GIGABITETHERNET LED	STATE	Description
1-24	OFF	No downlink established.
	ON	Downlink is established GREEN= 1 Gbps AMBER=10-100 Mbps
	FLASHING	Downlink port is active, packets sent on port GREEN= 1 Gbps AMBER=10-100 Mbps

Console Port

The ASR6000 has one serial console port for management of the unit that is able to operate from 9600 to 115200 bps. The connector type is RJ-45. Default speed is 115200 bps, but can be changed through the command line interface of the Bootloader or iBOS software. Refer “*ASR6000 Bootloader Configuration Guide*” and/or the bootloader section of the “*iBOS Command Reference Guide*” for more information.

To connect to the console port, a RS-232 RJ-45 to 9 pin D-Sub cable is supplied. Your terminal software should be configured to 8 data bits, no parity and 1 stop bit (8N1). No flow-control or hardware flow-control (RTS/CTS) should be used.

ASR6000 Power Connector

The power connector is located at the front of the ASR6000. A standard IEC C13 EU power cable is supplied.

Figure 11 ASR6000 AC Power Connector

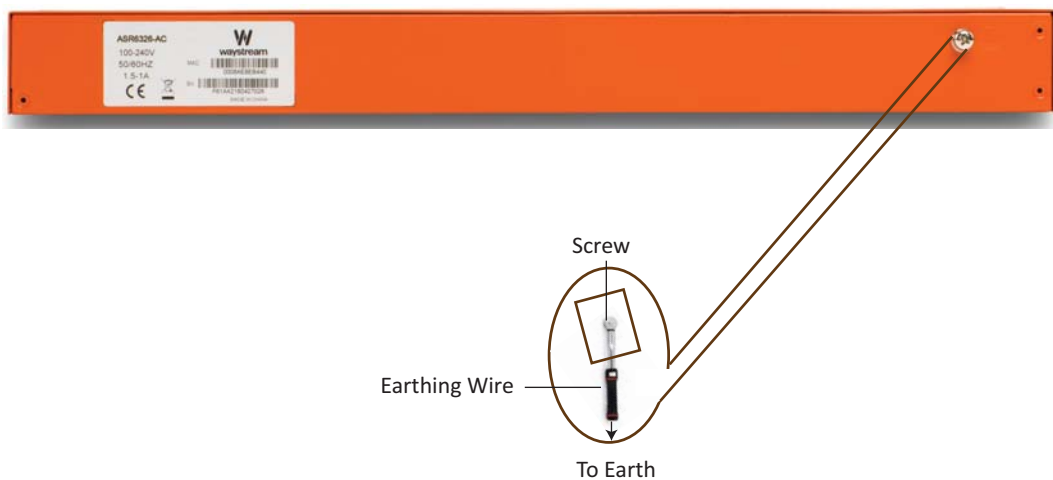


ASR6000 Ground Connector

If required, a ground connector screw is located on the back of the ASR. Using the ground screw and washer supplied, fasten the ground cable to the chassis in the following way:

1. Loosen the ground terminal screw
2. Attach the lug of the grounding cable between screw and washer and ensure that the other end of the grounding cable is connected to GND
3. Tighten the screw and check that the grounding cable is securely fixed to the chassis.

Figure 12 Attach Grounding Cable to ASR6000 Chassis



Warning

- Connect the ASR casing to earth before the ASR is powered ON for the first time,
- Proper grounding (connection to earth) is very important to protect the ASR from bad effects of external noise and to reduce the risk of electrocution in the event of a direct lightning strike.
- For removal of the ASR, disconnect the grounding cable after the power is switched OFF and all other cables are disconnected.
- For the earthing wire, green and yellow insulation is required and the cross-sectional area of the conductor must not be less than 0.75 mm^2 or 18 AWG.

Installing the ASR6000

Tools Required

The ASR6000 does not include any tools required to install the units. Appropriate screwdrivers, ratchets etc. must be obtained elsewhere.

To complete this installation, the following extra materials are also needed:

- 10 GigabitEthernet (SFP+) or GigabitEthernet (SFP) modules for uplink ports
- 1-2 patch cables, fibre for uplink ports
- GigabitEthernet SFP modules (depending on model)
- 1-24 patch cables, UTP/STP or SC/LC fibre for downlink ports (depending on model)

Safety Guidelines

Follow these guidelines to ensure the required level of safety.

General Safety

- Keep the chassis area clear and dust-free during and after installation.
- Do not wear loose clothing or jewellery that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or that makes the equipment unsafe.
- Disconnect all power by turning OFF the power and unplugging the power cord before installing or removing a chassis or working near power supplies.
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit; always check the circuit first.

Lithium Battery Safety

- There is a risk of explosion if the battery is replaced with the incorrect type.
- Dispose of used batteries according to manufacturer instructions

Operating Safety

- Electrical equipment generates heat. Ambient air temperature may not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Be sure that the room in which you choose to operate your system has adequate air circulation.
- Ensure that the chassis cover is secure. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.
- Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures. Be sure to follow ESD-prevention procedures when removing and replacing components to avoid these problems.
- Wear an ESD-prevention wrist strap, ensuring that it has good skin contact, If no wrist strap is available, ground yourself by touching the metal part of the chassis.
- Periodically check the resistance value of the anti-static strap, which should be between 1 and 10 megaohms.

EMC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to EN 55022. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this document, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case owners will be required to correct the interference at their own expense.

Equipment List

The following table lists the typical quantities of items supplied with each ASR6000 unit.

- ASR6000 unit
- One (1) 180 cm EU power cable with mains plug
- One (1) 180 cm RS-232 cable (DB9 female to RJ-45)
- Rack kit (pre-installed) including:
 - Two (2) angle brackets
 - Eight (8) screws for angle bracket
 - Four (4) cage nuts and screws (M6) with plastic washers
- Grounding kit including:
 - Two (2) screws for grounding (M5) with lock washers

ASR6000 Environment

The ASR6000 is designed to be mounted in a 19-inch rack in a restricted access location. For restricted access locations, the following applies:

- Access can only be gained by SERVICE PERSONS or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken
- Access is through the use of a TOOL or lock and key, or other means of security, and controlled by the authority responsible for the location

The ASR is designed to be mounted in a single shelf of a 19-inch rack. The cooling fans are located on the side of the unit so ventilation must be available to allow free airflow so that the fans can maintain a persistent and satisfactory ambient temperature.

Figure 13 ASR6000 in Rack



For rack installations, the following considerations must be taken:

- **Elevated Operating Ambient Temperature** - When installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the room ambient. Therefore, consideration should be given to installing the equipment in a rack environment compatible with the maximum ambient temperature, refer “ASR6000 Product Description” on page 31
- **Reduced Air Flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- **Mechanical Loading** - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- **Circuit Overloading** - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- **Reliable Earthing** - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Ventilation of ASR6000

The ASR6000 is cooled by three built-in fans. Ensure that air can flow freely from right-to-left in the cabinet. To extend the lifetime of the fans, ensure that the air is filtered and free from dust particles.

Rack Installation of ASR6000

As shown in Figure 13, multiple ASR6000 units can be mounted in a 19-inch rack on top of each other. All connectors are located in the front of the ASR6000 for easy access.

The rack brackets are pre-attached for fast installation. When the ASR is installed, the front panel will be flush with the front of the rack frame, see Figure 14.

Figure 14 Default Rack Bracket on ASR



For cabinets with doors that require more space for cables etc. in front of the unit, it is possible to remove the four bracket screws and reposition the brackets using the extra screwholes to provide 25 mm space in front of the ASR, see Figure 15.

Figure 15 Rack Bracket Installed for Extra Space



To install the ASR in the rack, hold the ASR6000 firmly in position and use the supplied screws and nut baskets to fix the unit in the 19-inch rack space.

Connecting Power to the ASR6000

The information below is valid for all ASR6000 units.

The ASR6000 runs on 110/240V 50-60Hz AC. Installation of 110/220V mains power outlets must be performed by a licensed electrician.



Warning

The ASR6000 unit must be connected to ground before power supply units, computers or other electrical or electronic equipment is connected to the ASR6000 (including the serial console port).

Power ON

When the mains power is connected to the ASR6000, the ASR6000 will automatically boot and attempt to establish the uplink connection with the network. To prevent any sudden power surges at startup, it is recommended to have a separate ON/OFF switch for the main power supply.

To power up the ASR, do the following:

1. Connect the mains power cable to the ASR power connector.
2. Connect the mains power cable to the power socket.
3. If there is an ON/OFF switch, then flip the ON/OFF switch to ON.

The ASR6000 power LED will now light up.

Note: *The fans take 5-6 seconds before starting.*

Installing SFP Modules

The ASR6000 is designed to use Small Form Factor Pluggables (SFP+) modules for 10 GigabitEthernet uplinks. For information about insertion and removal of SFP+ modules and important safety information, please refer “SFP Products for ASR6000” on page 33.

Connecting the ASR6000 to the Network

In most network topologies, the 10 GigabitEthernet SFP+ modules will be used as uplinks, connecting the ASR6000 to the network.

Connecting Uplink Interfaces

To connect the uplink interfaces to the ASR:

1. Select the appropriate patch cables for the SFP modules installed.
2. Remove dust cover on SFP and connect the patch cable to the SFP
3. Connect the patch cable to the network fibre patch panel or fibre connector

If the ASR establishes an uplink, connection the uplink LED will light up.

Connecting Downlink Interfaces

Determine what type of downlink interfaces are used by the unit. Depending on the ASR model, different connectors and cable types are used.

1. Connect the patch cables to the ASR6000 interfaces,
2. Connect the patch cable to the network patch panel

If the ASR6000 has received configuration and there are client devices connected at the subscriber side of the connection, the LED panel will indicate that link is present on the GigabitEthernet interface.

Table 4 Downlink Interfaces

Model	Patch cable type	ASR6000 connector type
ASR6026	Category 5e or Cat6 Twisted Pair (TP)	RJ-45
ASR6126	Depending on type of SFP	SFP (refer "SFP Products for ASR6000" on page 33)

Checking the ASR Installation

The ASR6000 router has a console interface that is used to view configuration information when the ASR is running. During the boot process, the ASR outputs information about the boot progress, and if any problems are encountered.

Figure 16 Console Interface



To connect to the console port, you need the RJ-45 to 9 pin D-Sub cable supplied with the unit.

Connecting to the Console Interface Port

1. Connect your terminal to the console port using the supplied cable.
2. Configure your terminal software using the following settings:
 - 8 data bits, no parity and 1 stop bit (8N1)
 - No flow-control or hardware flow-control (RTS/CTS)
 - 115200 bps send rate

The Boot Process

When the power is first turned on, the ASR6000 immediately starts the bootloader software. The bootloader performs basic system initialization, decompresses, and runs the iBOS software image that is stored on flash memory. The boot process can be followed on the console.

1. The Bootloader locates a bootable image either on the flash memory (if it exists), or in the network if BOOTP options provided to the ASR by the network so indicate. The image is compressed to conserve file system space, and must therefore be decompressed when read into memory. The Bootloader displays the following message when it is decompressing the iBOS image:

```
Decompressing ibos-asr6k-6.1.0-ED-R.bz2 (press any key to abort)
```

Note: *The local filename of the image being decompressed is displayed, e.g. the image filename is ibos-asr6k-6.1.0-ED-R.bz2.*

2. When the iBOS image has been loaded into RAM, the Bootloader will start the main software. The following message is displayed:

```
Running ELF executable at address: 0x80200000
```

Troubleshooting the Bootloader

When a terminal is connected to the ASR console port, pressing any key aborts the boot process and enters the bootloader command line interface. Situations where the bootloader fails to complete the boot process are:

- If the boot process is looping, it may be necessary to download new software or to make changes to the boot configuration if the ASR is not able to complete the boot process.
- If there is no valid iBOS image on the flash file system, the boot process will continue to loop until there is an active uplink and contact is established with a boot server.

No uplink during Boot

If the boot process is looping because of no link on the uplink interfaces, the bootloader will print the following to the terminal:

```
..
Autoboot in progress (press any key to abort).
Scanning boot image information on flash.
No image found.
Trying BOOTP over tengigabitethernet1 and tengigabitethernet2.
No link on tengigabitethernet1.
No link on tengigabitethernet2.
BOOTP failed.
Retrying BOOTP (press any key to abort).
Trying BOOTP over tengigabitethernet1 and tengigabitethernet2.
No link on tengigabitethernet1.
```

```
No link on tengigabitethernet2.  
BOOTP failed.  
Retrying BOOTP (press any key to abort).  
...
```

The example above shows that no link was detected on the `tengigabitethernet1` or `tengigabitethernet2` interfaces. Check that the SFP is properly inserted and that the fiber is connected. If no problem can be found in the connections the probable cause is the other end of the fiber.

No valid iBOS Image during Boot

If a default image is found in the flash file system and one BOOTP attempt fails to get a new image name from the boot server, the selected image is booted (or if it is damaged the newest image found on the flash is used instead). The following text is printed on the terminal

```
..  
Autoboot in progress (press any key to abort).  
Scanning boot image information on flash.  
Found image version ibos-asr6k-6.1.0-ED-R  
Trying BOOTP over tengigabitethernet1 and tengigabitethernet2.  
BOOTP failed.  
Decompressing ibos-asr6k-6.1.0-ED-R (press any key to abort).  
...
```

If no image is selected for default boot, but at least one image is found and no connectivity with boot server is acquired within ten BOOTP attempts, the newest image found on the flash is booted. The following text will be printed on the terminal

```
..  
Autoboot in progress (press any key to abort).  
Scanning boot image information on flash.  
Found fallback image version ibos-asr6k-6.0.1-ED-R  
Trying BOOTP over tengigabitethernet1 and tengigabitethernet2.  
BOOTP failed.  
Retrying BOOTP, 9 attempts left.  
..  
Retrying BOOTP, 2 attempts left.  
Trying BOOTP over tengigabitethernet1 and tengigabitethernet2.  
BOOTP failed.  
Retrying BOOTP, 1 attempts left.  
Trying BOOTP over tengigabitethernet1 and tengigabitethernet2.  
BOOTP failed.  
No file to boot.  
Trying to find another image to boot.  
Booting ibos-asr6k-6.1.0-ED-R.  
Decompressing ibos-asr6k-6.1.0-ED-R (press any key to abort).  
...
```

For more information on the Bootloader CLI, refer *ASR6000 Bootloader User Guide*.

Troubleshooting iBOS

The iBOS software is the ASR operating system that enables services and also has internet connection features. When connected to the ASR using the console port or the management port, an iBOS command line interface appears after a successful boot process.

Access to iBOS command line normally requires login. There is no default username or password configured, and if the ASR is unconfigured simply press the Enter key when prompted for username and password.

Note: *If local or remote user authentication has been configured in the ASR, the correct username and password must be used to gain access to the command line interface via the console port.*

The command line interface displays the ASR6000 hostname (if configured), the CSAR connection status, the system uptime etc.

Check System

To display the system information, use the **show version** command. The information displayed includes the version of iBOS running in the system, the system hostname and uptime, the model and characteristics of the ASR6000, its serial number, and other information.

Example 1 show version

```
asr6k> show version
Intelligent Broadband Operating System (iBOS), Version 6.1.0-ED-R
Copyright (c) 2012-2016 by Waystream AB
Routing Engine Copyright (C) 2001-2009 IP Infusion, Inc.
Compiled Fri Jan 13 02:17:56 CET 2012 by builder
Source ID: 34cb4619b322a417e097832b2a55145e05ce9bd0

asr6k uptime is 1 day, 17 hours, 35 minutes
Last boot: cold start

System image file is "ibos-asr6k-6.1.0-ED-R.bz2", version ibos-
asr6k-6.1.0-ED-R
System: ASR6126C-CO, 2 1/10GE SFP+, 20 10/100/1000BaseTX ports, 4
BaseTX/SFP combo, Central Office AC
Bootloader version: asrboot-asr6k-3.5.0-R-dbg
Board revision: 0
Product ID: FJG042MN
Serial number/Base MAC address: 0008AE860440
Processor: CN6230 [pass 2.2] (mipseb)
262144K bytes CPU RAM
Automatic exception dump server 10.66.110.10:10000
asr6k>
```

Check Available Devices

The PFDP protocol is exchanged between all Waystream network products. The iBOS command **show pfdp neighbours** displays a summary of all known Waystream devices that are connected this system. The information is valuable to identify what other PFDP-enabled devices (ASR, SE, DRG, CPS etc.) are connected to this system.

Example 2 show pfdp neighbours

```
asr6k> show pfdp neighbours
gigabitethernet23    with 1 neighbour(s):
  "DRG800" running "drgosl-drg800-1.1.0-RC3" on model "DRG886"
  remote interface uplink1, last activity 0s ago, unidirectional

gigabitethernet24    with 1 neighbour(s):
  "DRG508s_MK1" running "DMA0081-R2N20" on model "DRG508s_MK1"
  remote interface wan1, last activity 53s ago, unidirectional

tengigabitethernet1  with 1 neighbour(s):
  "Small-BTU1-2" running "iBOS 3.21.4-ED-R" on model "ASR4124C"
  remote interface gigabitethernet2, last activity 22s ago,
bidirectional

tengigabitethernet2  with 1 neighbour(s):
  "Small-BTU1-8" running "iBOS 6.1.0-ED-RC2" on model "ASR5124C-CO"
  remote interface gigabitethernet1, last activity 28s ago,
bidirectional

asr6k>
```

Check SFP Interface

To examine the SFP statistics on the uplink interface, use the iBOS command **show interface sfp** for one of the uplink interfaces. (Pay special attention to the TX/RX input/output power details).

Example 3 show interface sfp

```
asr6k# show interface tengigabitethernet1 sfp
Small Form-factor Pluggable (SFP) at tengigabitethernet1
LC connector
10000-SR capable
64B/66B encoding, nominal bitrate: 10300 Mbps
Supported links
  50um multi mode fiber: 80 m
  62.5um multi mode fiber: 30 m
Laser wavelength: 850 nm

Diagnostics
Entity          Status  Unit  Current      Normal      Warning
                Status  Unit  Current      Low         High         Low
High
-----
Operating temp: OK      C      40.88    -3.00     73.00     -5.00
75.00
```

```

Supply voltage:  OK      V      3.27   3.14   3.47   2.97
3.63
TX current:      OK      mA      5.30   2.00  11.00   1.00  12.00
TX output power: OK      mW      0.55   0.32   0.66   0.25
0.83
RX input power:  ALRM(L) mW      0.00   0.02   0.79   0.01
1.00

asr6k#

```

Check the Uplink Interface

To check that the uplink interface gets an IP address from the network boot server, use the command **show ip bootp**.

Example 4 show ip bootp

```

asr6k> show ip bootp
BOOTP Client state: Standby
    mode: Persistent
    serial: 0008.ae86.0440
    protos: http,tftp
    version: ibos-asr6k-6.1.0-ED-R

Interface tengigabitethernet2
  BOOTP mode is Standby, interface is Up
  Last assigned: 10.130.1.29/30 gateway 0.0.0.0 server 10.66.110.10
(1D17h49m41s ago)
  Packet counters:
    1 sent, 1 received
    0 dropped due to erroneous data
    0 dropped because we couldn't comply
    0 with matching addresses, 1 used assignments

Interface tengigabitethernet1
  BOOTP mode is Standby, interface is Up
  Last assigned: 10.130.1.2/30 gateway 10.130.1.1 server
10.66.110.10 (1D17h49m40s ago)
  Packet counters:
    1 sent, 1 received
    0 dropped due to erroneous data
    0 dropped because we couldn't comply
    0 with matching addresses, 1 used assignments

asr6k#

```


Check OSPF

To check that OSPF Routing is functioning properly, display the active OSPF processes with the command **show ip ospf neighbor**.

Example 5 show ip ospf neighbor

```
asr6k# show ip ospf neighbor
OSPF process 0:
Neighbor ID    Pri   State           Dead Time   Address        Interface
-----
10.130.0.1     1     Full/Backup     00:00:37   10.130.1.1    tengigabitethernet1
10.130.0.5     1     Full/DR         00:00:35   10.130.1.30   tengigabitethernet2
```

Check CSAR Connections

To check CSAR connection for a BECS3 network and to ensure there is a service provision, use the command **show csar**.

Example 6 show csar

```
asr6k# show csar
Server          Address                State  Flags
-----
em-ibos@small-.. 10.66.110.10          Up    Connected, Learned
Active server: em-ibos@small-cell-1-p
```

Appendix A – ASR6000 Product Description



This appendix describes product details for specific models that may be required while installing the ASR.

ASR Interfaces

- Two SFP+ module slots for 10 GigabitEthernet uplink ports (all models)
- 24 SFP module slots for GigabitEthernet downlink ports (6026 only)
- Two RJ-45 combo ports for GigabitEthernet downlink ports 21-24 (6026 only)
- 24 RJ-45 GigabitEthernet downlink ports (6126 only)
- Two SFP module slots for GigabitEthernet combo ports 21-24 (6126 only)

Interface Specification

For a detailed specification and pictures of the interfaces for each specific model, refer “Product Overview” on page 5.

Technical Data

Physical Dimensions

Table 1 Physical Dimensions

ASR6000-CO
H*W*D (mm) = 43 x 441 x 240
Weight: 4 kg
Standard 19-inch rack mounting

Power and Safety

- Single power input 100 – 240V, 50 – 60 Hz, compliant with ETSI EN 300132 V2.1.1 Part1.
- CE mark
- IEC/EN/UL 60950
- IEC/EN/UL 60826
- CB certificate
- ETSI EN 300386
- FCC Part 15 Subpart B
- RoHS directive 2002/95/EC

Environmental

All ASR6000 models:

- Operating temperature: 0° to 45° C
- Storage temperature: -10° to 70° C
- Operating humidity: 5% to 95%, non-condensing
- Heat dissipation: max 46 watts

Appendix B – SFP Products for ASR6000

Overview

The Waystream SFP (Small Formfactor Pluggable) GigabitEthernet products are a series of optical transceiver modules that enable the ASR to be fitted with suitable network interfaces for different needs.

Using standardized safety requirements, the modules are certified for use together with the Waystream products.

Waystream-approved SFP modules have a serial EEPROM that contains the module serial number, the vendor name and ID, a unique security code, and cyclic redundancy checksum (CRC).

This manual does not describe the full product specifications for all approved SFP modules. Model and data for Waystream SFPs is listed in separate data sheets. The SFPs named in this document are used for examples only, and are not ranked in any preferential order.

All Waystream SFPs have bale-clasp latches for safe operation.

Figure 1 SFP with bale-clasp Latch



Table 2 Waystream SFP Products

Waystream SFP Product Name	Wavelength	Connector	Fibre type	Speed (Mbps)
SFP-1000BASE-BX-D	TX:1490nm RX:1310nm	SC Simplex	Single mode	1000
SFP-1000BASE-BX-U	TX:1310nm RX:1490nm	SC Simplex	Single mode	1000
SFP-1000BASE-BX10-D1550LC	TX:1550nm RX:1310nm	LC Simplex	Single mode	100/1000
SFP-1000BASE-BX10-D1550SC	TX:1550nm RX:1310nm	SC Simplex	Single mode	100/1000
SFP-1000BASE-BX10-U1550LC	TX:1310nm RX:1550nm	LC Simplex	Single mode	100/1000
SFP-1000BASE-BX10-U1550SC	TX:1310nm RX:1550nm	SC Simplex	Single mode	100/1000
SFP-1000BASE-LX	1310 nm	LC Duplex	Single mode	1000
SFP-1000BASE-LX-M	1310nm	LC Duplex	Single mode	100/1000
SFP-1000BASE-SX	850 nm	LC Duplex	Multimode	1000
SFP-1000BASE-SX-M	850nm	LC Duplex	Multimode	100/1000
SFP-1000BASE-T	N/A	RJ45	N/A	10/100/1000
SFP-1000BASE-ZX	1550 nm	LC Duplex	Single mode	1000
SFP-10GE-LR	1310nm	LC Duplex	Single mode	10000
SFP-10GE-SR	850nm	LC Duplex	Multimode	10000

Note: *The selection of Waystream SFP products is being constantly improved, please contact your local sales representative for an up-to-date list of Waystream approved SFPs.*

When the SFP is inserted in the ASR, the ASR software reads the EEPROM to check the serial number, vendor name and ID, and recomputes the security code and CRC.

The SFP also provides link status information and other valuable statistics to determine the operation and quality of the connection to the adjacent device. This information is displayed using the iBOS command **show interface sfp**.



Caution

Use of non-Waystream approved SFPs will void the product warranty.

Safety

Before installing an SFP module or handling a Waystream broadband router equipped with SFP slots, you should read and understand the safety information in this document. Laser warnings only apply to fiber-optic SFP modules.

Figure 2 Warning symbol



Figure 3 Caution symbols



Warning

Class 1 laser product. Do not position your eye directly in front of the SFP if the dust plugs are not installed!



Warning

Laser beam is exposed when dust plug is removed and fiber not installed.



Warning

Only trained staff should install or replace SFPs.



Caution

SFPs are electronic devices and sensitive to static electricity. Always use an ESD-preventive wrist strap when handling an SFP. ESD damages can cause performance and lifetime degradation.



Caution

Protect your fiber-optic components, like SFPs and cables, by inserting clean dust plugs when not connected to other equipment. Clean the optic components whenever you intend to connect them. Avoid getting dust and other contaminants into the optical receptacles, as fibre optics do not work correctly when obstructed with dust.



Caution

When using shorter distances of single-mode fiber cable, you may need to insert an inline optical attenuator in the link to avoid overloading the receiver. When the fiber-optic cable is less than 20 km and the link budget is more than 15dB, insert a 5 to 10 dB optical attenuator between the fiber-optic cable plant and the receiving port of the SFP.



Caution

Under no circumstances should the SFP insertion or removal require physical force. handling. Always be gentle and use only your thumb and index finger!

Insertion and Removal

When inserting or removing SFPs, always observe the following precautions:

- Attach an ESD-preventive wrist strap to your wrist and to a bare metal surface on the chassis or the common ground connector at the back of the module.
- Hold the SFP modules by the side only and do not touch the connectors on the insertion end of the module

Note: *For other SFPs, please see the manufacturer instructions for installation and removal.*

Inserting an SFP module

1. Align the SFP module in front of the SFP slot. Note that the top side (with Waystream sticker) faces up for upper row slots but faces down for lower row slots. This allows more space for connecting the cables to the SFPs.
2. Carefully slide the SFP module into the slot until you feel the connector on the module snap into place.
3. Push the bale-clasp latch up until it locks the SFP in position.
4. Remove the dust plugs from the cable and the SFP. Clean the connectors and the SFP with dedicated fibre cleaning tools and carefully insert the cable(s) until they snap into place.
5. The SFP is now ready. The SFP state is indicated by the port LED

Note: *Do not remove the dust plugs from the fiber-optic SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light.*

Removing an SFP Module

1. Disconnect the cable from the SFP module and reinstall the dust plugs.
2. All Waystream SFPs have bale-clasp latches. Gently pull the bale-clasp latch out and down until the SFP releases.

Note: *For other SFPs, please see the manufacturer instructions for installation and removal*

3. Place the removed SFP module in an antistatic bag or other protective environment.



waystream

www.waystream.com