SKYWAY® 7000 Series
User's Guide

1. Introduction

Congratulations on your purchase of Solectek's SKYWAY 7000 Series Bridge/Router, a feature rich, best-in-class wireless solution. This User's Guide will describe the operation of your SKYWAY 7000 unit in detail.

SYSTEM FEATURES

- Field proven OFDM modulation allowing near line-of-sight deployment and strong immunity to multi-path.
- Data rates from 6 Mbps to 72 Mbps.
- High power radio (400mW) and improved radio sensitivity for best in class link ranges – over 10 miles with only 1-foot panel antenna.
- Power over Ethernet (PoE) for simplified cable routing – only a single outdoor CAT5 cable is needed.
- Integrated antenna/radio simplifies installation and eliminates lossy RF coax runs.
- AES encryption for the ultimate in security and data protection.
- Client access control via MAC address filtering.
- Intuitive Web based user interface.

PACKAGE CONTENTS

- (2) SKYWAY point-to-point radios: 7101, 7301 or 7501.
- (2) 24VDC Power Supplies.
- (2) Power over Ethernet (PoE) injectors.
- (2) Two-axis mast mounting kits.
- (2) Ethernet cable weatherproofing glands.

- CD-ROM containing documentation and software utilities.
- Registration Card.
- Warranty and Compliance Card.

NOTE: CAT5 Ethernet cable is <u>not</u> included in the package. Please contact Solectek for information on available UV-protected Ethernet cables for outdoor use.

System Requirements

- Indoor CAT 5 cable – straight cable if connecting to a hub/switch, cross-over cable if connecting to a PC.
- A computer running TCP/IP over Ethernet for testing of the client in a live multipoint wireless network.

2. Physical Installation

A. INTRODUCTION

Your SkyWay radio is designed to be mast mounted on a rooftop or radio tower. After determining the best location for your radio, installation can begin. (Please refer to Solectek's *RF Site Design Guide* on the included documentation CD for more information about choosing an ideal radio location.)

B. MOUNTING KIT ASSEMBLY

A two-axis mounting kit is included with each SkyWay radio allowing secure, adjustable mounting to a pole or mast. The mounting kit must first be assembled and then attached to the back of the SkyWay radio. Please refer to the printed directions included in the mounting kit box for more information.

There are three possible methods in arranging the clamp pieces to accommodate small, medium and large mast diameters. Please refer to the figure on the next page. Note that the middle and rightmost images differ only in the length of bolt used to fasten the two clamp pieces together.

The mounting kit attaches to the back of the SkyWay radio by way of four self-tapping screws. Be sure screws are perpendicular to the radio back before driving the screws inward.

Wrench tighten all screws/nuts prior to outdoor installation.

C. ETHERNET CABLE

Only a single, outdoor rated, Cat5 Ethernet cable is needed to connect the Skyway radio to the indoor PoE Injector. To ensure all-weather operation, the included weatherproofing cable gland must be built onto the Ethernet cable. This seal can be slipped onto the Cat5 cable before attaching the RJ45 connectors at the end(s).

Note: the total combined length of the two Ethernet cables between the radio and hub/switch/PC must not exceed 300 feet.

Note: In order to maintain FCC compliance, use of a shielded Ethernet cable with Skyway 7000 is required.
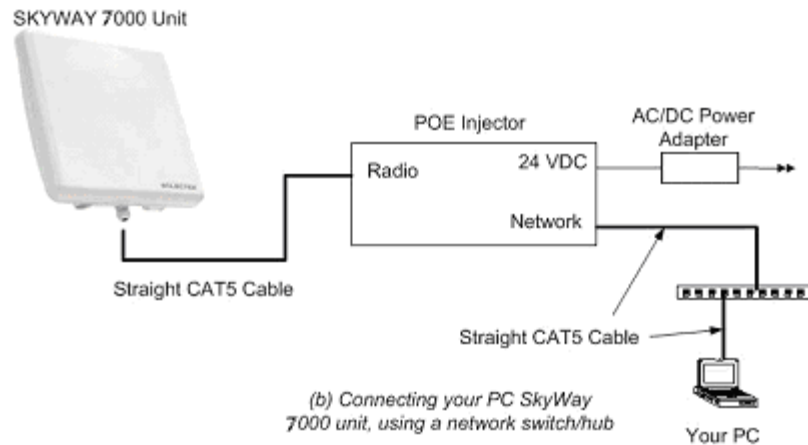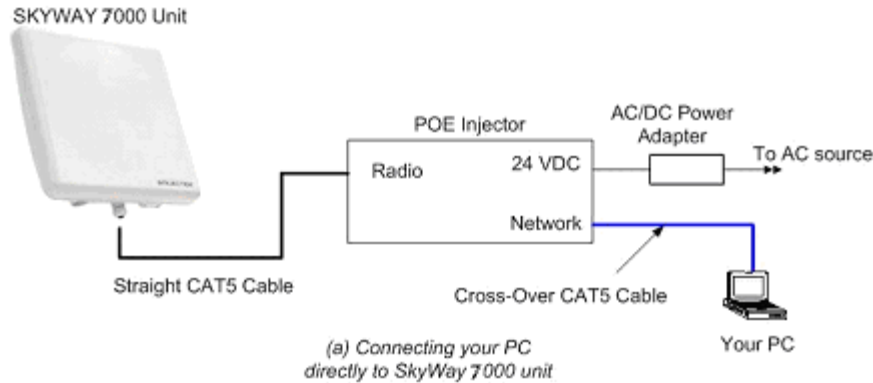
D. INSTALLATION

After locating and installing the radio mast, the physical installation of your Skyway 7000 radio can begin. If benchtesting the system first, you may want to skip this step and return to it after testing is completed.

1. Using the clamp on the mast mounting kit, attach the SkyWay radio to the chosen mast. Wrench tighten mast clamp bolts.
2. Using the two axis adjustment pivots, point the radio antenna in the general direction of the target radio. Partially tighten axis bolts so that fine-tuning can be performed later.
3. Connect RJ45 connector to the SkyWay radio.
4. Slide cable gland up the Ethernet cable to radio housing and screw gland into threaded opening. Wrench tighten, but do not overtighten the nylon gland.
5. At opposite end of gland (pointing away from the radio), tighten seal nut against Ethernet cable. Wrench tighten, again being careful not to overtorque the gland.

6. Place PoE Injector and Power Supply in a convenient, indoor location near to the destination hub, switch or PC.
7. Route and connect outdoor Cat5 cable to PoE Injector.
8. You may now plug in the Power Supply to power the unit.

3. System Configuration

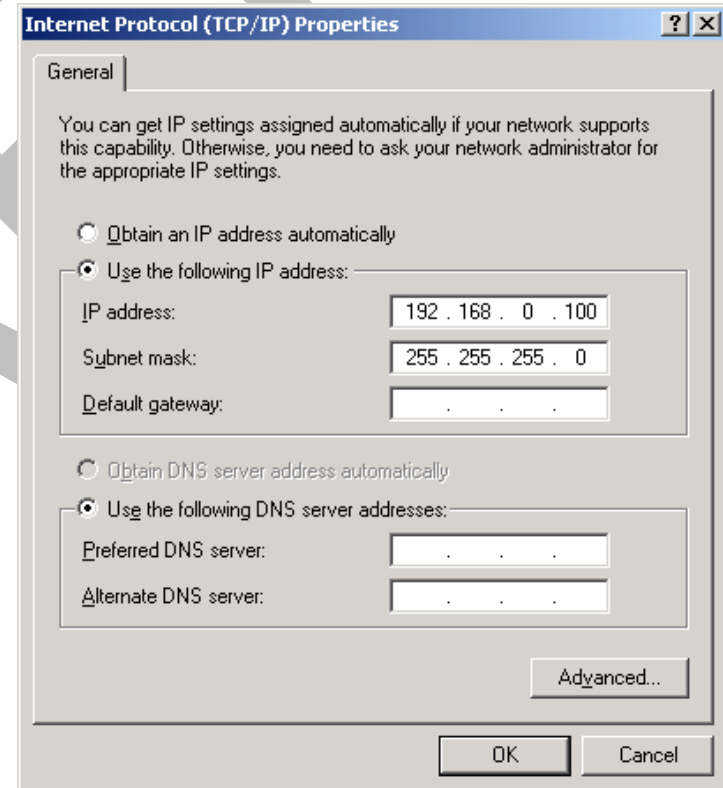## A. CONNECTING THE SKYWAY UNIT FOR CONFIGURATION

Using the appropriate diagram below as a guide, cable together your SkyWay test system. Connect your PC to the POE injector using (a) crossover Ethernet cable or (b) straight cable and a hub/switch.

SKYWAY 7000 Unit

POE Injector

AC/DC Power Adapter

Radio   24 VDC   To AC source

Network

Straight CAT5 Cable

Cross-Over CAT5 Cable

Your PC

(a) Connecting your PC directly to SkyWay 7000 unit

SKYWAY 7000 Unit

POE Injector

AC/DC Power Adapter

Radio   24 VDC

Network

Straight CAT5 Cable

Straight CAT5 Cable

Your PC

(b) Connecting your PC SkyWay 7000 unit, using a network switch/hub

B. SET UP YOUR COMPUTER'S TCP/IP PROPERTIES

Open *networking properties* in your Windows OS. Find the TCP/IP setup window of your **wired Ethernet adapter**. The details on how to set the IP address of your computer's Ethernet adapter are different, depending on Windows versions (95/98/2000/Me/XP). Please consult your Windows OS documentation. Shown below is the Windows 2000 TCP/IP Properties window. Set the IP addresses to the following values.

Ethernet's IP Address: 192.168.0.100
Subnet Mask: 255.255.255.0

Internet Protocol (TCP/IP) Properties   ? X

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
⦿ Use the following IP address:
IP address: 192 . 168 . 0 . 100
Subnet mask: 255 . 255 . 255 . 0
Default gateway: .   .   .

○ Obtain DNS server address automatically
⦿ Use the following DNS server addresses:
Preferred DNS server: .   .   .
Alternate DNS server: .   .   .

Advanced...

OK   Cancel

C. LOG-IN TO YOUR SKYWAY

- Start a Web Browser on your computer (such as Netscape Navigator or Microsoft Explorer).
- At the URL line, type in the following: http://192.168.0.1 or http://192.168.0.2 to access the **Welcome** screen below.

  The Skyway 7000 Point-to-Point kits are shipped in preconfigured pairs. One unit will be configured to have a default IP address of 192.168.0.1 and the other will have an IP address of 192.168.0.2.
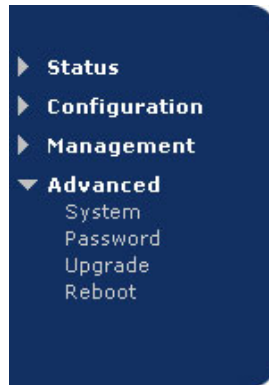

- Click on the **login** menu option located in the navy-blue left menu bar. The following screen should appear:

- The default username is **admin** and the default password is **default**. Once logged in, the password can be changed. Click OK and you will see the Main Status screen and Navigation Toolbar:

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4. Basic Configuration - Bridging

CHOOSING BRIDGING OR ROUTING

- Click the **System** menu option under the **Advanced** category on the Navigator Toolbar to access the following screen:

- Mode of Operation

  The user needs to determine whether the unit will operate in the **Bridge** or **Router** mode. The **Bridge** mode is the system default option.

  Reminder: Be sure to reboot the unit if you change the mode of operation.

- Throughput Optimization

  Distance to Farthest Client: The system can adjust internal parameters according to the chosen link distance in order to optimize the RF link conditions and maximize the data throughput.

  Enter the longest link distance (in miles) to client units, known or expected, in the multipoint network. Options are 1-27 miles in increments of 1 mile.

  Note that the actual maximum distance depends on the specific network configuration. Please check the range guide available on Solectek's web site, www.solectek.com

  Output Transmit Power: This controls the output power of the radio transmitter. There are three options: **High**, **Medium**, and **Low** (system default).

  NOTE: This Output Transmit Power feature is available only on the 7100 Client Unit only. The higher-power, longer-distance client units have fixed output power.

- VLAN Support

  o **VLAN** : VLAN support can be turned on or off. Choose between Enable or Disable.

  o **VLAN ID** : ID for the VLAN management traffic. This ID is used to access the unit's user interface in a VLAN environment.

If you have made any changes, click the **Update** button. Then, go to the **Reboot** menu option and follow instructions to restart the unit.

IP and Wireless Configuration

Go to the Configuration – Basic menu option as seen in the above navigation bar to see the following screen:

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- Click the **Configuration -> Basic** menu option on the Navigator Toolbar to access the following screen:

Configuration

System Name: bridge-North

LAN

IP Address: 192 .168 .0 .2

Subnet Mask: 255 .255 .255 .0

Default Gateway: 0 .0 .0 .0

Wireless

Radio Spectrum Bandwidth: Normal

Press the 'Select' button below before you proceed with the selection of Radio Frequency and Data Rate!

Select

Radio Frequency (MHz): 5795

Data Rate (Mbps): 36

Update   Reset

- System name

  This is an optional description of the unit for convenience that eliminates the need to remember the MAC address when trying to identify a particular radio in the wireless network. This is not related to the identification of the unit on your wired local area network.

- IP properties (LAN)

  - **IP Address**: This is the IP address of the unit.

  - **Subnet Mask**: This is the subnet mask of the unit.

  - **Default Gateway**: the default gateway of the unit.

After changes are complete, click on the **Update** button. If a mistake is made, you can restore the previous setting by clicking the **Reset**

button. To make changes effective, reboot the unit by clicking on **Advanced** -> **Reboot** from the Navigation Toolbar.

- Wireless properties

- **Radio Spectrum Bandwidth**: Two choices are available - **Normal** (default setting) and **Wideband**. In the Normal mode, each channel occupies 20 MHz of radio spectrum. In the wideband mode, each channel occupies 40 MHz of spectrum.

If a radio is likely to be installed in an area with other 5.8 GHz radios nearby, it is best to use the Normal bandwidth setting as this allows for more non-overlapping channels. This is also the case if multiple radios are to be co-located on a single tower or rooftop.

If maximizing throughput and distance is of primary importance, then it may be best to use a Wideband bandwidth. At any given datarate (e.g. – 36 Mbps), the Wideband setting will attain a longer link distance as compared to the Normal setting. The Wideband setting also allows for higher data rate settings not available on the Normal setting.

After changing the Radio Spectrum bandwidth value, be sure to click the **Select** button below.

The following is a table of available radio frequencies and data rates for each option. (Note that the allowable frequencies may differ from the table below depending on the country of operation)

NORMAL (20MHz)	
Frequency (MHz)	5735, 5755, 5775, 5795, 5815, 5835
Data Rate (Mbps)	36, 24, 18, 12, 6

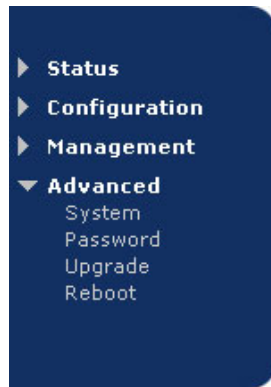| **WIDEBAND** (40MHz)	
Frequency (MHz)	5745, 5785, 5825
Data Rate (Mbps)	72, 48, 36, 24, 12

- **Radio Frequency (MHz)**: the center frequency of the selected frequency channel. In the Normal mode, each channel is 20 MHz wide. In the wideband mode, it is 40 MHz.

- **Data Rate**: air transmission/receive data rates. Note that different data rates are available for normal and wideband modes, as detailed in the table above.

All radios on a given wireless network must use the same Bandwidth, Frequency and Data Rate setting.

After changes are complete, click on the **Update** button. If a mistake is made, you can restore the previous setting by clicking the **Reset**

button. To make changes effective, reboot the unit by clicking on **Advanced** -> **Reboot** from the Navigation Toolbar.

5. Basic Configuration - Routing

Go to the **Advanced** –> **System** menu option above to see the following screen:

- Mode of Operation

  The user needs to determine whether the unit will operate in the **Bridge** or **Router** mode. The **Bridge** mode is the system default option. Switch to the **Router** option in order to activate the unit as a wireless router.

  Reminder: Be sure to reboot the unit if you change the mode of operation.

- Throughput Optimization

  Distance to Farthest Client: The system can adjust internal parameters according to the chosen link distance in order to optimize the RF link conditions and maximize the data throughput.

  Enter the longest link distance (in miles) to client units, known or expected, in the multipoint network. Options are 1-27 miles in increments of 1 mile.

Note that the actual maximum distance depends on the specific network configuration. Please check the range guide available on Solectek's web site, www.solectek.com

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NOTE: This Output Transmit Power feature is available only on the 7100 Client Unit only. The higher-power, longer-distance client units have fixed output power.

- VLAN Support

    o **VLAN** : VLAN support can be turned on or off. Choose between Enable or Disable.

    o **VLAN ID** : ID for the VLAN management traffic. This ID is used to access the unit's user interface in a VLAN environment.

If you have made any changes, click the **Update** button. Then, go to the **Reboot** menu option and follow instructions to restart the unit.

Once the unit has rebooted, go to the **Configuration** –> **Basic** menu option to see the following screen:

Basic Configuration

System Name: [   ]

Ethernet Port
IP Address: 192 . 168 . 0 . 1
Subnet Mask: 255 . 255 . 255 . 0

RF Port
IP Address: 192 . 168 . 1 . 1
Subnet Mask: 255 . 255 . 255 . 0

Default Gateway
IP Address: 192 . 168 . 0 . 254

Wireless
Radio Spectrum Bandwidth: Normal

Press the 'Select' button below before you proceed with the selection of Radio Frequency and Data Rate!
[Select]

Radio Frequency (MHz): 5735
Data Rate (Mbps): 36

[Update] [Reset]

- System name

    This is an optional description of the unit for convenience that eliminates the need to remember the MAC address when trying to identify a particular radio in the wireless network. This is not related to the identification of the unit on your wired local area network.

Note that, unlike the Bridge mode, there is a separate IP address for the Ethernet and RF port. Both ports must be configured with a valid IP address in order to use the routing correctly.

- Ethernet Port
    IP Address – Enter the IP address of the Ethernet port.
    Subnet Mask – Enter the correct Subnet Mask of the Ethernet port

- RF Port
  IP Address – Enter the IP address of the Ethernet port.
  Subnet Mask – Enter the correct Subnet Mask of the Ethernet port

- Default Gateway

  Enter the correct gateway IP address

- Wireless properties

- **Radio Spectrum Bandwidth**: Two choices are available - **Normal** (default setting) and **Wideband**.   In the Normal mode, each channel occupies 20 MHz of radio spectrum. In the wideband mode, each channel occupies 40 MHz of spectrum.

If a radio is likely to be installed in an area with other 5.8 GHz radios nearby, it is best to use the Normal bandwidth setting as this allows for more non-overlapping channels. This is also the case if multiple radios are to be co-located on a single tower or rooftop.

If maximizing throughput and distance is of primary importance, then it may be best to use a Wideband bandwidth. At any given datarate (e.g. – 36 Mbps), the Wideband setting will attain a longer link distance as compared to the Normal setting. The Wideband setting also allows for higher data rate settings not available on the Normal setting.

After changing the Radio Spectrum bandwidth value, be sure to click the **Select** button below.

The following is the table for available radio frequencies and data rates for each option. (Note that the allowable frequencies may differ from the table below depending on the country of operation)

NORMAL (20MHz)	
Frequency (MHz)	5735, 5755, 5775, 5795, 5815, 5835
Data Rate (Mbps)	36, 24, 18, 12, 6

WIDEBAND (40MHz)	
Frequency (MHz)	5745, 5785, 5825
Data Rate (Mbps)	72, 48, 36, 24, 12

- **Radio Frequency (MHz)**: the center frequency of the selected frequency channel. In the Normal mode, each channel is 20 MHz wide. In the wideband mode, it is 40 MHz.

- **Data Rate**: air transmission/receive data rates. Note that different data rates are available for normal and wideband modes, as detailed in the table above.

All radios on a given wireless network must use the same Bandwidth, Frequency and Data Rate setting.

After changes are complete, click on the **Update** button. If a mistake is made, you can restore the previous setting by clicking the **Reset** button. To make changes effective, reboot the unit by clicking on **Advanced** -> **Reboot** from the Navigation Toolbar.

Static Routing

There are two possible choices in configuring the unit as a router: Static routing or RIP. The choice depends on your overall network consideration and your preference. For details, consult any textbook on IP routing.

In order to activate Static Routing, go to the **Configuration – Static Routes** menu option in the navigation toolbar to see the screen below

For each static route, you need to add the following information

- **Network Address** – Enter the network address of the static route.

- **Network Mask** – Enter the network mask of the static route.

- **Gateway** – Enter the gateway of the static route.

Once you have typed in the above, click the **Add** button to include the newly typed static route to your static route list. Then, your static route screen will look like the following:

Static Routes Configuration

Network Address	Network Mask	Gateway	
			Add

Network Address	Network Mask	Gateway	Delete
192.168.2.0	255.255.255.0	192.168.1.2	☐

Check All   Clear All   Delete

You can delete a static route by checking the box to the right of the static route and clicking the **Delete** button.

- **Check All** – You can check all boxes by clicking this button. This is usually used when you want to delete all static routes. Be careful in using this button, as it could erase all of your routing information.

- **Clear All** – Clicking this button will uncheck all boxes.

- **Delete** - Both **Delete** buttons on the screen achieve the same result: delete all route entries with boxes to the right of entries checked.

RIP (Router Information Protocol)

Go to the **Configuration –> RIP** menu option to activate the RIP routing

RIP Configuration

Common

RIP Enable: ● Yes ○ No
Multicast: Disable
Update Interval (sec): 30
Expire Time (sec): 180

Ethernet Port

Authentication Type: Clear
Authentication Key:
Send Mode: Version 1
Receive Mode: Version 1
RIP Default Metric: 1

RF port

Authentication Type: Clear
Authentication Key:
Send Mode: Version 1
Receive Mode: Version 1
RIP Default Metric: 1

Update   Reset

The following describes the menu items in the RIP Configuration screen:

- Multicast

  Though typically not implemented across the public Internet, Multicast for IP support is possible across SkyWay 7000 when routing with RIP v.2 is enabled. SkyWay 7000 can be configured to use the multicast address 224.0.0.9 to proliferate route updates, thus reducing broadcasts of route updates.

- Update Interval

By default, every 30 seconds the SkyWay 7000 router will advertise its routes to other RIP v.II devices. This value can be changed, but it must remain a multiple of the value for EXPIRE TIME.

- Expire Time

  This field defines how long the route table entries remain in the SkyWay 7000 route table. The default is 180 seconds.

The following describes port configuration related to RIP. Please note that default configuration fields are identical for the Ethernet and RF ports, but can be configured differently.

- Authentication Type

  - **Clear**: RIP will announce updates and listen for all RIP updates on the specified interface.

  - **Simple**: RIP expects updates to include an authentication key. The key will be transmitted in clear text.

  - **MD5**: per RFC 1321, MD5 Message Digest Algorithm & RFC 2082 RIP-2 MD5 Authentication. Route update authentication keys are entered by user as plain text. Keys are taken as input by the MD5 algorithm and output as a 128-bit "fingerprint" or "message digest"

- Authentication Key

  Enter the authentication key for the given port.

- Send Mode

  - **Version 1**: sends only RIP version 1 updates.

  - **Ver1 Compatible**: sends version 2 updates but will listen for version 1 (if MULTICAST is enabled only version 2 is used).

  - **Version 2**: sends RIP Version 2 updates only, no backwards compatibility.

  - **None**: will still listen for and process updates but will not send any updates on this interface

- Receive Mode

  - **Version 1**: listens for and will update self with version 1 updates only.

  - **Version 2**: listens for and will update self with version 2 updates only.

  - **VERSION 1 & 2**: listens for and will update self with version 1 & version 2 updates

- RIP Default Metric

  - **1**: at the default, this SkyWay interface believes it is one hop away from the nearest gateway interface. Increasing this value by single digit orders this routing interface to let all other RIP-enabled routers believe that it is a secondary or higher cost path (typically used for redundancy).

After changes are complete, click on the **Update** button. If a mistake is made, you can restore the previous setting by clicking the **Reset** button. To make changes effective, reboot the unit by clicking on **Advanced** -> **Reboot** from the Navigation Toolbar.

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6. Encryption

To manage a unit's security settings, click on **Management** -> **Security** from the Navigation Toolbar to display the following screen.

Security Manager

Encryption

○ WEP
  WEP Key Length: [64 bit / 10 hex Digits ▼]
  WEP Key Value: [   ]

● AES
  AES Key Length: [152 bit / 32 hex Digits ▼]
  AES Key Value: [abcd4321   ]

○ Clear

[Submit] [Reset]

Three data encryption options are available: none, AES and WEP. Within both AES and WEP, there are several key length choices.

If encryption is enabled, the key value must be the same for all units within a wireless network. Key values are entered in hexadecimal format – each digit can be a number from 0 - 9 or a letter from a - f.

After changes are complete, click on the **Submit** button. If a mistake is made, you can restore the previous setting by clicking the **Reset** button. To make changes effective, reboot the unit by clicking on **Advanced** -> **Reboot** from the Navigation Toolbar.

7. Access Control

For security purposes, each point-to-point radio must be programmed with the MAC address of its peer unit.

Point-to-point pairs are shipped from Solectek with these complementary MAC addresses preprogrammed. However, if there is any need to modify the wireless network, the MAC address of the peer unit can be modified.

To access the relevant web screen click on the **Management** -> **Peer Unit's Info** menu option on the Navigation Toolbar.

Peer Unit's Information

Peer Unit's MAC: [00] [C0] [61] [00] [3C] [2C]
Description: [   ]

[Update]

- **Peer Unit's MAC**: This is the hardware MAC address of the peer station and can be found on the peer's user interface or back label.
- **Description**: Type in any description that will easily identify the peer with the above MAC address. This is an optional field and can be left blank.

  CAUTION: Descriptions must be a single word only. No spaces are allowed.

Once both point-to-point units have valid MAC addresses, a link will be established.

8. SNMP

The Skyway 7000 provides support for SNMP ("Simple Network Management Protocol") a remote management utility. To configure a unit's SNMP settings, click on **Configuration** -> **SNMP** from the Navigation Toolbar to display the following screen:

Status
▼ **Configuration**
　　Basic
　　SNMP
▶ **Management**
▶ **Advanced**

SNMP Configuration

Read Community Name: `public`
Write Community Name: `private`

[Update]　[Reset]

Community Name fields should be entered based on the configuration of your SNMP Agent software.

Click on **Update** to activate changes.

Please refer to the User Manual of your SNMP Agent software for detailed information on establishing and managing units via SNMP.

9. Monitoring Operation

The basic status of the unit can be viewed in the Main Status screen:

Status screen in the bridging mode

Main Status

System Name:
Firmware Version: 01.08.00
Serial Number: 6309120170
MAC Address: 00:C0:61:00:3B:B0
Operational for: 00:00:11

LAN
IP Address: 192.168.0.1
Subnet Mask: 255.255.255.0
Default Gateway: 0.0.0.0

Wireless
Wireless Mode: Normal Spectrum
Radio Frequency: 5795 MHz
Data Rate: 36 Mbps

Peer Unit's MAC	Description
00:C0:61:00:3C:2C	

Main Status

System Name:
Firmware Version: 01.08.00
Serial Number: 6309120170
Operational for: 00:00:09

Ethernet Port

MAC Addr: 00:C0:61:00:3F:FC
IP Address: 192.168.0.1
Subnet Mask: 255.255.255.0

RF Port

MAC Addr: 00:C0:61:00:3B:B0
IP Address: 192.168.1.1
Subnet Mask: 255.255.255.0

Wireless

Wireless Mode: Normal Spectrum
Radio Frequency: 5795 MHz
Data Rate: 36 Mbps

Peer Unit's MAC	Description
00:C0:61:00:3C:2C	

Status

Client's MAC: 00:C0:61:00:3C:2C
Description:
State: joined
Encryption: None
Data Rate (Mbps): 6
RSSI: 30

Signal Level: �████████████

	Receive	Transmit
MSDU:	30	0
Data:	30	74
Multicast:	0	0
Management:	0	0
Control:	0	0
Errors:	0	0

Detailed Receive Errors

Discarded Frames:	0
Duplicate Frames:	0
CRC Errors:	0
PHY Errors:	0
DMA Errors:	0

Detailed Transmit Errors

Discarded Frames:	0
Excessive Retries:	0
DMA Errors:	0

Back

This screen shows current values of the field items displayed. Navigate to the **Configuration** screen if you would like to change any of these properties.

Three noteworthy items:

- **Operational For**: This is the elapsed that the unit has been running since the last reboot or power cycle.

- **MAC Address**: this is the MAC address of the unit. Clicking on the hyperlink will lead you to the detailed wireless **Status** screen, referencing the physical unit currently logged into.

- **Peer Unit's Station's MAC**: If you have configured the point-to-point link, the peer's description and MAC address will appear here. You can click on the MAC address hyperlink to see its detailed wireless **Status**, from the point of view of the unit currently logged into.

Fields for the detailed wireless status screen include:

- **MAC**: The MAC address of the unit.
- **Description**: The description assigned to that unit in its Configuration screen.
- **State**: Indicates the status of the radio operation.
- **Encryption**: Indicates whether encryption has been enabled.
- **Data Rate**: The currently selected RF data rate.

- **RSSI**: A relative measure of power received by the radio currently logged into.

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At 36 Mbps, the RSSI should be at least 20. For higher data rates, the RSSI must be higher to support reliable operation. At lower data rates, the RSSI can fall below 20 and still maintain a reliable link.

- **MSDU**: MAC Service Data Unit. Specifies the total number of packets sent and received by the unit.
- **Data:** The total number of data frames (e.g. containing TCP/IP payload) transmitted across the RF link. This represents a subset of the MSDU total.
- **Multicast:** The total number of IP multicast user frames transmitted across the RF link. This represents a subset of the Data and MSDU total.
- **Management**: The total number of non-user wireless management frames sent and received by the radio.
- **Control:** The total number of non-user wireless control frames sent and received by the radio.
- **Errors:** The sum total number of wireless PHY and MAC errors received or prevented from transmitting.

Detailed Receive Errors

- **Discarded Frames**: A wireless MAC layer statistic - specifies the number of received frames discarded because frame has already been received or because frames have encryption errors or VLAN errors.
- **Duplicate Frames**: A wireless MAC layer statistic - specifies the number of received frames discarded because frame has already been received.
- **CRC Errors**: A wireless PHY layer statistic - specifies the number of frames rejected with CRC errors.
- **PHY Errors**: A wireless PHY layer statistic - specifies the number of frames rejected due to other PHY layer errors.
- **DMA Errors**: A wireless MAC/PHY statistic - specifies the number of DMA errors caused by hardware bottlenecks in the receive system.

Detailed Transmit Errors

- **Discarded Frames**: A wireless MAC layer statistic - specifies the number of transmit frames discarded due to invalid VLAN tags.
- **Excessive Retries**: A wireless MAC layer statistic - specifies the number of data frames requiring one or more MAC retries.
- **DMA Errors**: A wireless MAC/PHY statistic - specifies the number of DMA errors caused by hardware bottlenecks in the transmit system.
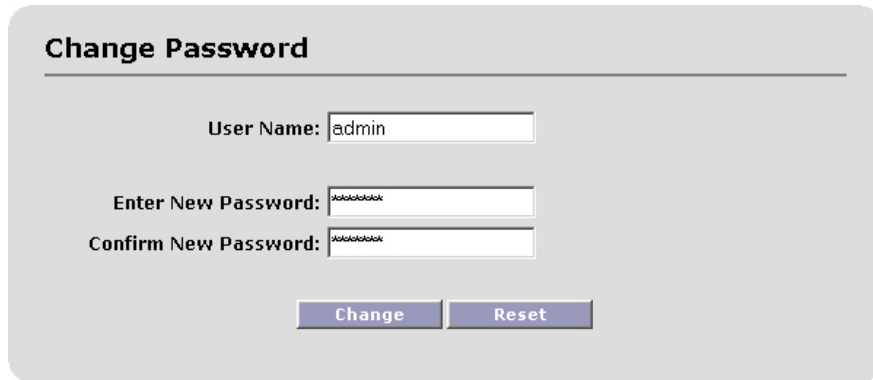
You can find the current routing status by going to **Status** -> **Routing** menu option:

Routing Status

Network	Network Mask	Gateway	Type	Cost	Age
192.168.0.0	255.255.255.0	192.168.0.1	LOCAL	0	4294
127.0.0.1	255.255.255.255	127.0.0.1	LOCAL	0	4294
192.168.1.0	255.255.255.0	192.168.1.1	LOCAL	0	4294

10. Changing Your Login

To change the unit's password, click on **Advanced** -> **Password** from the Navigation Toolbar to display the following screen.

Change Password

User Name: admin

Enter New Password: ********

Confirm New Password: ********

[Change] [Reset]

- **User Name**: User selected login name.
- **Password**: User selected password.
- **Confirm Password**: Used to validate user password

   Click the **Change** button to activate your new password.

Notes:

(a) Keep in mind that all three fields are case sensitive and no spaces are allowed.

(b) Please keep this password safe in your records. For your convenience you can write down the password in Appendix C.

11. Benchtesting

Before mounting units into their final location, it is often a good idea to benchtest the system to ensure settings are correct. To ensure a successful benchtest, be sure to follow these recommended steps:

Setup. The most straightforward approach to benchtesting is to establish a Point-to-Point link or a Base Station linked with a single Client. Each radio should be configured per Sections 3 - 5, with a laptop or PC connected to each radio directly (or through a hub). Be sure that Access Control MAC addresses are correct and that units share the same frequency, bandwidth, data rate and encryption settings.

Positioning. It is important to remember that the Skyway 7000 radio and antenna system generate and transmit a great deal of RF power. During benchtesting in an average sized room, the antennas should not be pointed directly at each other. Instead, rotate the unit 90 degrees away from the other. Fine tune the antenna position so that the Signal Level field in the Detailed Status Screen is at mid-span.

Testing. If the system has been properly configured, the radios will begin communicating immediately. The following steps are recommended to verify operation:

- Local ping. From each laptop/PC be sure a ping to the local radio is successful.

- Link ping. Now ping from one laptop/PC to the other laptop/PC. This will verify the RF link.

- Throughput test. Using Qcheck, or equivalent throughput measurement utility, verify system performance.

Notes:

(a) Keep in mind that the Skyway7000 data rates can easily stress the performance of a poorly performing TCP/IP/Ethernet stack on a laptop or PC. To ensure that the test equipment is not the bottleneck, testing with a direct connection between laptops/PCs is recommended.

(b) Using a single FTP session on a Windows machine is not adequate to accurately measure throughput.
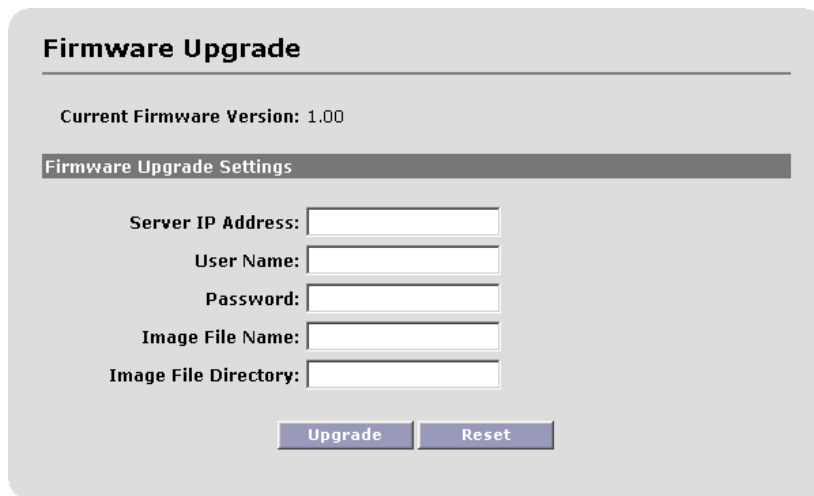
12. Upgrading the Software

There may be newer software releases from Solectek from time to time. If you would like to upgrade your unit, first obtain the new file from Solectek. The current version will be posted on Solectek's website.

NOTE: You need to install an FTP server program on your computer to complete the following upgrade procedure. You can use an FTP program of your choice although Solectek has included FileZilla, an FTP server program, on the installation CD. For details on the configuration of this application, please refer to the document called FTP-Guide.pdf included on the CD.

- Click on the **Upgrade** menu option under the **Advanced** parent menu to see the following screen:

Firmware Upgrade

Current Firmware Version: 1.00

Firmware Upgrade Settings

Server IP Address: [   ]
User Name: [   ]
Password: [   ]
Image File Name: [   ]
Image File Directory: [   ]

[Upgrade]   [Reset]

Verify that the version available from Solectek is a newer than the one current installed on your SKYWAY 7000.

Save the new software file in a directory of your computer you can easily access. For convenience, you may prefer to use the same computer that you use to access the SKYWAY 7000 user interface, since the computer already has been configured to be on the same network as the SKYWAY 7000.

Next, enter the appropriate information into the following fields:

- **Server IP Address**: The address of the computer that stores the upgrade software file.

- **User Name**: User name used to login onto the upgrade FTP server. For convenience, you may want to use **anonymous** login.

- **User Password**: Password used to login onto the upgrade FTP server.

- **Image File Name**: The name of the binary file to be loaded onto your SKYWAY 7000 unit. This file should have an *.img extension and the full filename, including extension, should be entered into this field.

- **Image File Directory**: Directory path to find the software upgrade file on the FTP server.

   NOTE: This path name is relative to the root path of the FTP server.

After all information has been entered correctly, click on the **Upgrade** button. The upgrade should take less than a minute, and the unit will automatically reboot once the upgrade is complete.

REMINDER: Do not power down or unplug the unit during the upgrade process.
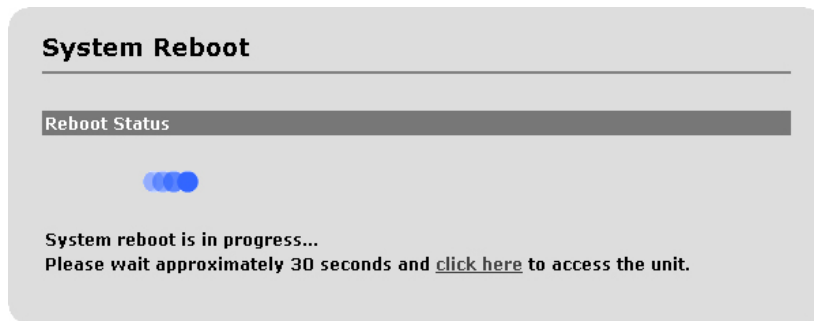
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13. System Reboot

To reboot the system from the Web Interface:

- Click on the **Reboot** menu option under the **Advanced** parent menu of the Navigation Toolbar. The following screen will appear:

System Reboot

Are you sure?
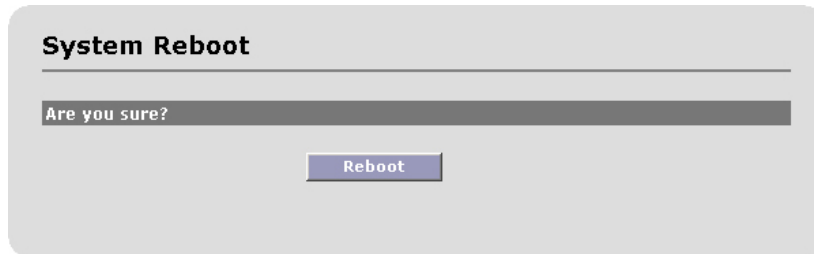
Reboot

Click on the **Reboot** button to reset/reboot. The reboot process will take approximately 30 seconds. Once the rebooting is done, you can use the **Click Here** button below to access the user interface again.

System Reboot

Reboot Status

System reboot is in progress...
Please wait approximately 30 seconds and click here to access the unit.

Appendix A

Factory Default Values

The following table details the factory default values. These are the values that will be set initially at the factory.

WIRELESS	
Radio Spectrum bandwidth	Normal
Channel	5795 MHz
Transmission Rate	36 Mbps

LAN	
IP Address	192.168.0.1 for Skyway 5600 or 5700 Base Stations
	192.168.0.2 for Skyway 7100, 7300 or 7500 Clients
	192.168.0.1 / .2 for Skyway 7101, 7301 or 7501 point to point pairs
Subnet Mask	255.255.255.0
Login Name / Password	admin / default

Appendix B

Troubleshooting Guide

1. *"I can't get a wireless connection with a client unit".*

- Verify that the Client MAC address has been correctly added to the Base Station and the Base MAC address has been correctly entered in the Client.
- Verify that Base and Client are operating on the same Radio Spectrum Bandwidth, Frequency and Data Rate.
- If encryption is enabled, verify that the key information been entered correctly.
- Make sure that the distance between the base and client units is within the specified system range. A quick check of the signal strength and quality indicators can help assess a marginal RF link. Poor indicator response may be due to the following reasons:
  - Your link distance has exceeded the unit's capability: Review your link budget to make sure that the system is able to handle the distance. Use GPS devices to accurately determine the link distance first. If you are unsure about the link budget, you may contact Solectek Technical Support for help.
  - Antenna misalignment: antennas must be aligned correctly to achieve maximum link distance.

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- Radio interference: The radio activity in the environment is too strong and may interfere with your signals. You may try to determine the source by using a spectrum analyzer and a directional antenna.

2. "I can't access the SKYWAY 7000 over Ethernet from my PC."

- Make sure the Ethernet connection is properly established.
- Make sure that the right IP address is used. Please refer to Section 2: **System Configuration** for setting up the right IP addresses for your PC and SKYWAY 7000 unit.

3. Can't access the Internet through the SKYWAY 7000 unit.

- First, make sure that the wireless connection is established. Good RF conditions need to be established between the units' radios. MAC address of the other unit needs to be correctly typed in at both the base and sub units.
- From a PC on the client unit side, pings the IP address of the SKYWAY 7000. If this does not work, the wireless may still not be properly established or the LAN IP setting is not correctly set between the SKYWAY 7000 and client.
- Ping a known IP address on the Internet, such as Yahoo's IP address, 66.218.71.81. (From the DOS prompt command line, type "ping 66.218.71.81"). If this does not work, you have a problem getting out to the Internet. Make sure that the IP setting is set correctly between the SKYWAY 7000 and the surrounding IP network. Check with your IT administrator or ISP to see if the Internet connection is up and running.
- If you can ping an Internet IP address, but still cannot browse the Internet, make sure the DNS is set correctly on your network. Check with your IT administrator or ISP for proper DNS setting for your wireless network.

Appendix C

For your records please record following items about your unit and keep it safe in your records:

Username and Password:	
Encryption key:	

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