SkyWay® Excel PTP Series

User's Guide
v1.4

1. Introduction

Congratulations on your purchase of Solectek's SkyWay Excel Series PTP Radio System, a feature rich, best-in-class wireless solution. This User's Guide will describe the operation of your SkyWay unit in detail.

SYSTEM FEATURES
- Field proven, MIMO- OFDM modulation allowing high capacity, near line-of-sight deployment and strong immunity to multi-path.
- Power over Ethernet (PoE) for simplified cable routing.
- Integrated antenna/radio simplifies installation and eliminates lossy RF coax runs.
- Frame aggregation for enhanced data throughput.
- Line speed QoS packet inspection prioritizes latency sensitive, real-time data.
- Intuitive Web based user interface and Telnet CLI.

KIT CONTENTS
- SkyWay Radio (2)
- External antennas & RF Cables (2 sets)[1]
- +48VDC AC-DC Power Supply (2)
- Power over Ethernet (PoE) injector (2)
- Pre-assembled, two-axis mast mounting kit (2)
- Cat5 weatherproofing feedthrough (2)
- Coax/grommet seals
- Documentation CD
- Warranty and Compliance Card.

NOTE: The requisite Cat5 Ethernet cables are <u>not</u> included in the package. Please contact Solectek for information on available outdoor grade shielded Ethernet cables.

Management Platform Requirements
a) For GUI/Telnet management: Pentium IV (or later) computer; Windows XP SP2; Internet Explorer v7.0.

b) For SNMP monitoring: SNMP v1 or v2c compatible SNMP manager, running on appropriate PC/Server platform.

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[1] For external antenna model, only

2. Installation Outline

This section summarizes the steps needed to properly configure and install the SkyWay Excel Radio. As the background and guidelines for much of the radio installation process are well covered in many in-depth publications and training classes, only those steps that uniquely relate to the SkyWay product are covered in this User Guide.

A. System Design
    RF Design and Site Survey
    IP Network Design

B. Unit Preparation
    Unit connection (Section 3)
    Initial Configuration (Sections 4-6)
    Bench testing (Section 7)

C. Site Preparation
    Selection of unit mounting location
    Cable routing
    Preparation of mast and other supporting structures

D. Physical Installation
    Mounting (Section 8)
    Antenna alignment (Section 9)

E. Verification
    Link status + metrics (Section 10)
    Ping connectivity
    Performance testing
    Reliability monitoring

F. Optimization
    RF channel tuning
    Data rate tuning
    QoS (Section 11)

G. Management + Maintenance
    VLAN (Section 12)
    Telnet (Section 13)
    SNMP (Section 14)
    Network Time (Section 15)
    Password Management (Section 16)
    Software upgrades (Section 17)
    Reboot (Section 18)

H. Troubleshooting
    Event Log (Section 19-20)
    Diagnostics (Section 21)

3. System Connection

A. PORT DESCRIPTIONS

SkyWay Excel has the following access ports:
- (1) 10/100 Ethernet + Power Connector: RJ45 jack
- (2) RF Ports: N type, female (connectorized unit only)

The RJ45 connector is accessed at the bottom of the unit, through a multi-piece waterproofing feedthrough.
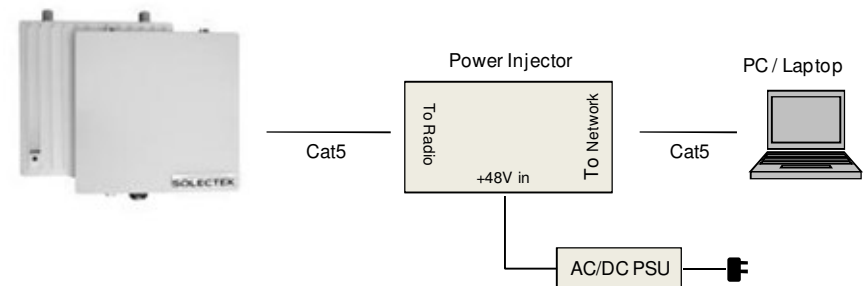
If included, the two RF Ports are accessed on the top of the unit.

Unit Top

B. CONNECTING THE SKYWAY UNIT

Using the diagram below as a guide, cable your SkyWay test system using a PC or Laptop and a pair of Cat5 cables

C. LOG INTO THE HTTP MANAGEMENT SYSTEM

- Open *networking properties* in your Windows OS. Find the TCP/IP setup window of your wired Ethernet adapter. Set the IP addresses to the following values.

  Ethernet's IP Address: 192.168.1.1
  Subnet Mask: 255.255.255.0

- Open a Web Browser on the Test PC
- At the URL line, type in the following: http://192.168.1.100 to access the login prompt for a Slave unit, or http://192.168.1.200 to access a Master unit.

- The username is **admin** and the default password is **admin**. Click OK and you will see the Main Status screen as shown below:

Main Status

Unit

System Mode:	Master
System Name:	PTP_MASTER
Firmware Version:	1.2.19
Serial Number:	0000000000
Up Time:	00:37:01
Network Time:	Wed Dec 3 17:08:36 2008 UTC-08:00
Network Mode:	Bridge
IP Address:	192.168.1.102
Subnet Mask:	255.255.255.0
Default Gateway:	0.0.0.0
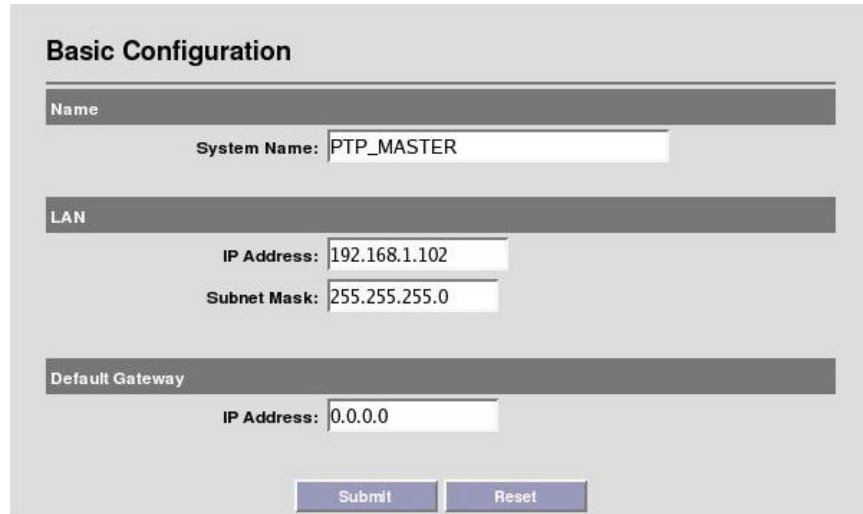
Ethernet Port details

MAC Addr:	00:C0:61:00:B5:04
State:	

RF Port details

MAC Addr:	00:0B:6B:B0:04:5C
Bandwidth:	20 MHz
Frequency:	5735 MHz
Modulation:	QAM64 3/4
Streams:	2
State:	

Status
Installation
Configuration
Management
Diagnostics
Reboot

SOLECTEK   SkyWay *Excel* Series

4. Initial Configuration

A. IP Configuration

Navigate to **Configuration -> Basic** to access the Basic Configuration screen:

Basic Configuration

Name

System Name: PTP_MASTER

LAN

IP Address: 192.168.1.102

Subnet Mask: 255.255.255.0

Default Gateway

IP Address: 0.0.0.0

Submit   Reset

System Name   This is an optional description of the unit used to simplify the identification of a particular radio in the wireless network. This parameter is not related to the identification of the unit on your wired local area network. For security purposes, the System Name is not broadcast across the RF link.

Name can be up to 32 characters long, and consist of all alphanumerics, plus the following symbols: @ (at sign) - (dash) . (period) ' (tick) _ (underscore). Name may not include spaces.

LAN IP Configuration

> **IP Address**: IP address of the local unit.
> **Subnet Mask**: Subnet mask of the local unit.
> **Default Gateway**: Default gateway for the local unit.

B. System Mode

In each Excel PTP link, one radio must be a Master device and the other a Slave device. To verify correct configuration, navigate to **Configuration -> Advanced** and confirm the state of each radio:
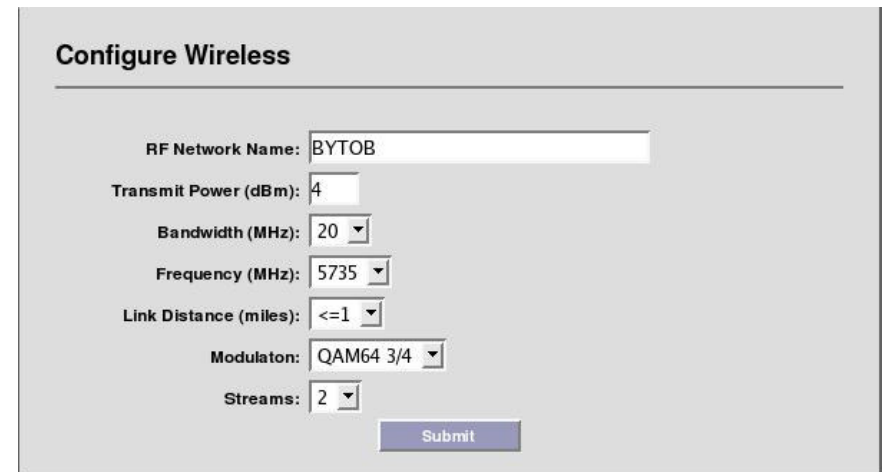
System Mode

Mode: ○ Slave ● Master

A change to the System Mode setting requires that the Submit button be pressed and the radio be restarted.

C. Wireless Configuration

Navigate to **Configuration -> Wireless** to access the Wireless Configuration screen:

Configure Wireless

RF Network Name: BYTOB

Transmit Power (dBm): 4

Bandwidth (MHz): 20

Frequency (MHz): 5735

Link Distance (miles): <=1

Modulaton: QAM64 3/4

Streams: 2

Submit

RF Network Name The wireless network name assigned to this PTP network. Both sides of the link must share the same RF Network Name. RF Network Name can be up to 32 characters long, and consist of all alphanumerics, plus the following symbols: @ (at sign) - (dash) . (period) ' (tick) _ (underscore). RF Network Name may not include spaces.

Transmit Power This parameter sets the RF output power of the radio. Increasing this value will extend the range of the PTP system. However, the maximum available power is limited by both the country of operation, and by the chosen RF modulation.

For example, in the US, the maximum operating power should be limited as follows:

Modulation	Max Output Power
QAM64	17 dBm
QAM16	20 dBm
QPSK, BPSK	23 dBm

Bandwidth   Allows selection of the bandwidth (BW), in MHz, of the RF network. Allowable options depend on your country of operation.

If a radio is likely to be installed in an area with other 5.8 GHz radios nearby, it is best to use the 20 MHz 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 40 MHz bandwidth.

Both Master and Slave must share the same Bandwidth setting.

Frequency   Allows selection of the center frequency of the RF link, based on the region of operation and operating bandwidth. The Frequency parameter is available on Master PTP unit only. On a Slave unit, the radio will search across the available channels in order to find the Master.

A sample frequency list is as follows:

Frequency	Bandwidth
5745 MHz	20 MHz
5765 MHz	20 MHz
5785 MHz	20 MHz
5805 MHz	20 MHz
5765 MHz	40 MHz
5805 MHz	40 MHz

Both Master and Slave must share the same Bandwidth setting.

Link Distance   Should be set to the actual link distance, rounded up to the nearest mile. This parameter is used to optimize the performance of the SkyWay protocol across long links.

Note that the maximum link distance at 20 and 40 MHz bandwidths is 32 and 16 miles, respectively.

Modulation   Used to establish the modulation and FEC rate of the OFDM/MIMO radio. The higher the modulation setting (or "density"), the higher the link data rate, but the lower the receive sensitivity.

From lowest to highest datarates, the available modulation/FEC settings are:

- BPSK- ½
- QPSK- ½
- QPSK- ¾
- QAM16- ½
- QAM16- ¾
- QAM64- ⅔
- QAM64- ¾

Streams   The power of MIMO technology rests on the ability to define the number of data streams that are carried across the multiple RF links. At all times, the SkyWay link utilizes a 2x2 dual-chain MIMO format where 2 RF transmit and 2 RF receive chains are enabled and active. However, these dual chains can be used to carry 1 or 2 data streams.

In a 2 stream configuration, unique data is carried across each RF chain, greatly increasing the amount of data capacity over a non-MIMO system. The 100 Mbps capability of the product requires that 2 streams operation be configured.

In contrast, when increased link robustness and noise immunity is desired, MIMO can be used in a 1 stream configuration. In this scenario, the same information is carried across both RF chains, increasing the reliability of reception.

It is recommended that both Master and Slave units share the same Modulation and Stream settings.

5. Security

Navigate to **Configuration -> Security** to access the Security Configuration screen:

Security

Encryption/Authentication

- ⦿ Open
- ◯ AES
  - Passphrase: my-big-secret-01
- ◯ Radius
  - Radius Server: 255.255.255.255
  - Radius Secret: my-big-secret-01

[Submit] [Reset]

Three security options are available: Open, AES and Radius. All units on a wireless network must share the same security settings.

Open: Removes all encryption and formal authentication methods. Note that even with an Open setting, there is still a MAC address based Access Control system which provides a basic level of security. (See next section)

AES: Provides 128-bit AES data encryption with passphrase based authentication.

Radius: This option combines AES data encryption with Radius/802.1x authentication capability, compatible with MS-CHAPv2/EAP authentication servers.

Notes:
(a) AES passphrase and Radius identity / secret / password fields are case sensitive with no spaces allowed. Fields must be between 8 and 64 characters in length.
(b) Radius identity must contain an '@' symbol, and is typically in email address format.
(c) Legal characters are: all alphanumerics, plus the following symbols:
    @ (at sign) - (dash) . (period) ` (tick) _ (underscore)

6. Access Control

In addition to the formal security methods detailed in the previous section, a second, independent access control layer is available.

This Layer2 access control system requires that the Master be programmed with the MAC address of the Slave.

On the *Master Unit*, Navigate to **Configuration -> ACL** to access the following screen:

Access Control List

Slave's MAC	Slave's Description	
00 :00 :00 :00 :00 :00		Add

Slave's MAC	Slave's Description	Delete
00:0B:6B:B0:03:C3		☐

Slave's MAC: This is the hardware RF MAC address of the Slave unit. This MAC address can be found on the Slave's user interface or on the rear label. The correct address must be used to establish an RF link with the base.

Slave's Description: Type in any description that will easily identify the peer with the above MAC address. This is a mandatory field.

Click **Add** after typing in MAC address and Description. Note that the slave unit is in the Master's access list and is shown on the bottom half of the screen.

7. Benchtesting

Before mounting units into their final location, it is recommended that the system be benchtested to verify basic operation. The following benchtest steps are suggested:

Setup. Each radio should be connected and configured per the previous Sections, with a laptop or PC connected to each radio directly (or through a hub/switch). Be sure that Access Control MAC addresses are correct and that units share the same bandwidth, data rate and security settings.

It is also important to have identified and prepared the antenna, RF coax and Cat5 solutions that will be used in the intended application

Positioning. It is important to remember that the SkyWay 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 each other. Fine tune the antenna position so that the Local RSSI is between -30 and -60 dBm.

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

- Link State. On the Main Status screen, verify that the RF Link State is Green (connected).

- 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 end-to-end link.

- Throughput test. Using Iperf or equivalent utility, verify traffic can be passed successfully across the link.

Notes:

(a) Keep in mind that the SkyWay Excel data rates stress the performance of a PC, OS and IP stack. To ensure that the test equipment is not the performance bottleneck, testing with a direct connection between PCs is strongly recommended.

(b) Using a single FTP session on a typical Windows/Intel machine is not adequate to accurately measure throughput.

(c) Units benchtested in an indoor, side-by-side configuration should not be expected to deliver full rated throughput.

8. Physical Installation

A. INTRODUCTION

Your SkyWay radio is designed with a flexible, multi-axis mounting system. The radio can be mast, tower, pole or wall mounted using the appropriate hardware. After determining the best location for your radio, installation can begin. Please refer to Solectek's *RF Site Design Guide* on Solectek's website (www.solectek.com) for more information about choosing an ideal radio location.

To mount a SkyWay radio, both the mast mounting kit and Ethernet cable feedthrough need to be correctly assembled. The recommended approach consists of 3 steps, detailed in the following sections:
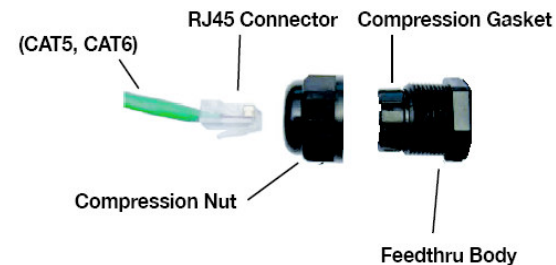
1. Ethernet cable / feedthrough assembly
2. Bracket preparation
3. Mounting

With the exception of the CAT5 cable, all parts and hardware described in the following sections are included with your SkyWay radio.

B. ETHERNET CABLE / FEEDTHROUGH ASSEMBLY

Only a single Ethernet cable is needed to connect the SkyWay radio to the indoor PoE Injector. Since the cable is exposed to the outdoor elements (heat, moisture, and UV light), only outdoor rated, shielded Cat5 Ethernet cable should be used. To ensure all-weather operation, the weatherproofing cable feedthrough (also known as grommet or gland) must be properly assembled onto the Ethernet cable and radio.

The following diagram depicts each of the feed-through parts:

The following steps must be followed to make sure that the feedthrough is assembled correctly:

1. Remove the **Compression Nut** and slip it over the Ethernet CAT5 cable as shown below.

2. Feed the Ethernet CAT5 Cable through the **Feedthrough Body** (pre-installed on the enclosure at the factory) and insert the RJ-45 connector to the female connector inside the enclosure.

3. Install the **Compression Nut** and hand tighten until the cable resists slipping when gently pushed or pulled. Lightly wrench-tighten, being careful not to overtorque the **Compression Nut**.

The unit with properly installed feedthrough appears as follows:

Notes:

(a) Removal of the RJ45 plug from the radio can be aided by a thin screwdriver, or opened paperclip. Care must be taken not to damage the Feedthrough Body or RJ45 plug.

(b) The total combined length of the Ethernet cables between the radio and your network access device (hub/switch/PC) must not exceed 300 feet.
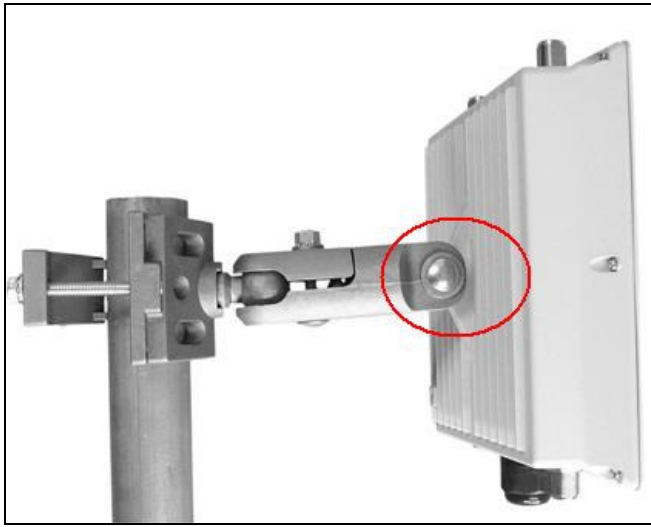
(c) Once mounted in a permanent location, additional weatherproofing tape (included) should be applied around the assembled fitting to further enhance durability.

(d) In order to maintain FCC compliance, the use of shielded CAT5 cable is required.

C. BRACKET PREPARATION

The SkyWay mounting bracket is pre-assembled at the factory for ease of installation.

Using the supplied Bolt/Nut/Washer, attach the bracket tab to the SkyWay enclosure ear, as shown above. Moderately tighten all bolts to prevent inadvertent movement during the installation.

D. MOUNTING

The final installation step involves mounting your SkyWay radio to an outdoor mast or wall.

Mast Mount: The mounting jaws can accommodate mast diameters from 0.75" – 3.0". Note that the smaller jaw piece can be reversed. Small diameter masts require the use of the jaw configuration shown in the first picture, below. Large diameter masts must use the configuration shown in the second picture.
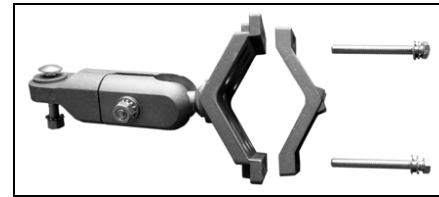
Once the jaws are oriented appropriately, the two remaining bolts are used to tighten the mounting kit jaws around the pole/mast.

Wall Mount: The larger, integrated jaw has (4) corner through-holes which accommodate either M5 or #10 screws/bolts (not included) to mount the system to a wall or soffit. In such a mounting configuration, the smaller jaw, and (2) jaw bolts are not used.

9. Antenna Alignment

SkyWay Excel contains several tools to aid with the antenna alignment process:

Audible Alignment: The radio produces an audible tone allowing antenna alignment without the need for additional monitoring hardware.

The pulsed tone will begin once an RF link has been established, regardless of quality. It is useful to reduce the RF Data rate setting to its lowest value during the antenna alignment procedure to maximize the system's link capture envelope/angle.

The audible repetition rate will increase as a function of RSSI; a higher value will cause a faster rate. To assist with both coarse and fine tuning, the rate is NOT a simple function of RSSI value. Rather, the rate will continue to increase as long as adjustments deliver an improved RSSI. As soon as any degradation (alignment 'overshoot') is detected, the rate quickly falls, regardless of the amount of reduction. Thus, the system is useful for both coarse and fine tuning of the antenna position.

To ensure the system will deliver adequate link reliability, it is recommended that the operator verify the numerical RSSI following antenna alignment.

The audible function is enabled for the first 30 minutes of operation following a power cycle. If desired, the audible function can be manually disabled using the telnet command: *set audioalign 0* or via the **Alignment Page** (below).

Alignment Page: An alternative tool to assist with antenna alignment is the Antenna Alignment page. Navigate to **Installation -> Antenna Alignment** to display the following page:
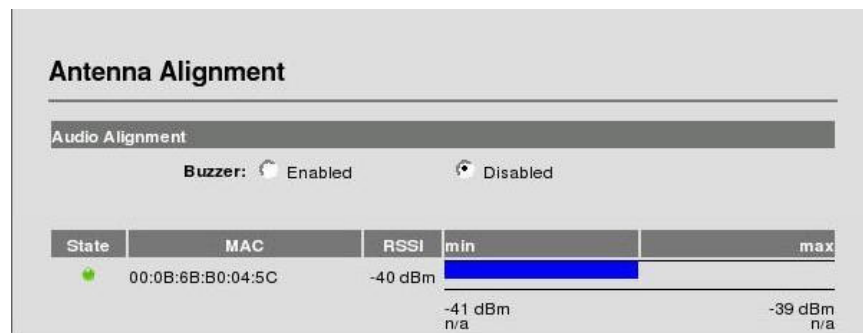
On this page is a dynamic display of the RF link state and local RSSI, in both numerical and graphical format. In addition to displaying current RSSI, the bar graph format has an auto-scale function which tracks the minimum and maximum achieved RSSI values since power-up.

10. Verifying Operation

The basic status of the unit can be viewed in the Main Status screen:
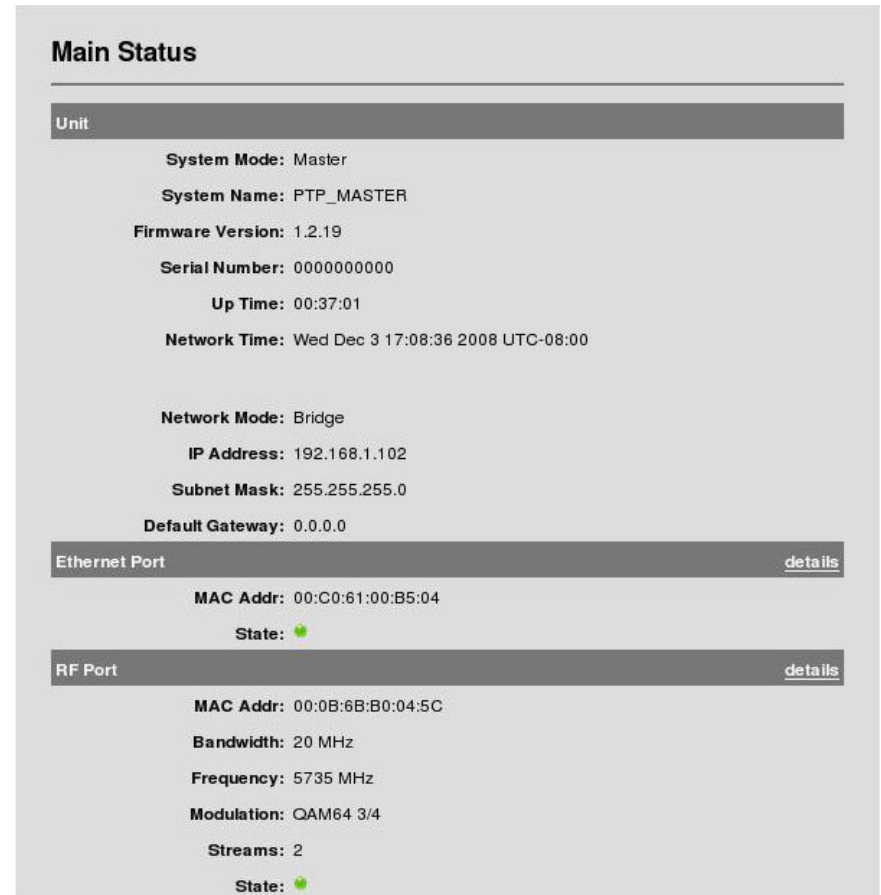
This screen updates periodically and thus displays current field values. Navigate to the **Configuration** screen if setting changes are necessary.

Three noteworthy items:

Up Time The elapsed time that the unit has been running since the last reboot or power cycle.

MAC Address The MAC address of the local unit.

RF Port Link State The link state has two values.

Green – An RF link has been established
Red – an RF link is NOT established.

Each of the ports also has its own, detailed status screen. For the Ethernet Port status, navigate to the **details** button located on the far right side. The screen below is typical:

Ethernet Port

Main		Clear Statistics

MAC Address: 00:C0:61:00:B5:04

MTU Size: 1500

State: 🟢

Local Statistics	Receive	Transmit
Total Frames:	921	851
Total Octets:	97589	269068
Errors:	0	0

Detailed Receive Errors		
Framing Errors:	0	
FIFO Overrrun:	0	

Detailed Transmit Errors		
Collisions:		0

Back

MTU Size The maximum datagram size that the system is able to transmit. Note that this refers to Ethernet payload not total Ethernet frame size.

State: There are two states, Green – Port Up. Red – Port Down.

Total Frames: Total number of frames received and transmitted by the Ethernet port.

Total Octets: Total number of octets (bytes) received and transmitted by the Ethernet port.

The RF Port (navigate to the **details** button on the Main Status screen next to each client's description) also has its own detailed screen:

RF Port

State	

Master MAC: 00:0B:6B:B0:04:5C

Slave MAC: 00:0B:6B:B0:03:C3

Link State: 🟢

Link Distance: <= 1 mile

Security: Open

Bandwidth: 20 MHz

Frequency: 5735 MHz

Modulation: QAM64 3/4

Streams: 2

Local RSSI: -39 dBm

Local Statistics	Receive	Transmit	Clear
Total Frames:	17	79	
Data Packets:	0	62	
Throughput:	n/a	n/a	

Receive Errors		
PHY Errors:	0	
CRC Errors:	0	
Decryption Errors:	0	
Duplicates:	0	

Transmit Errors		
PHY Retries:	0	
MAC Retries:	0	

Back

Key fields for this screen include:

Master / Slave MAC: The RF port MAC address of the Master and Slave unit.

Link State: Green if a link is established and Red if not.

Local RSSI: Receive Signal Strength as measured by unit currently being accessed. For reliable link operation, RSSI should be a minimum of 6-10 dB above the radio's receive sensitivity.

Total Frames: Total number of aggregated RF data frames received and sent by the unit. *Note*: this number should not be expected to match the Ethernet frames count. Packet framing, aggregation and QoS operations will all affect the manner in which data is transported from Ethernet to RF port.

Data Packets: Total number of data packets prior to aggregation, on the transmit side, and following de-aggregation, on the receive side.

Throughput: Displays the instantaneous, RF traffic rate, in Mbps. Due to framing overhead, actual IP throughput will be slightly less.

Receive Errors: Total number of errored frames received by the local unit.

Note: RF Frames which are significantly damaged can not be accurately attributed to a paired radio and will not affect this count.

Transmit Errors: Total number of frames transmitted by the local radio that were not successfully acknowledged by the remote radio.

Errors of this type can be attributed to two causes: (a) Data packet not received by remote radio, or (b) Acknowledgement packet not received by local radio.

It is often instructive to compare RX and TX error counts so that RF impairments can be isolated to the appropriate link direction and radio.

11. Quality of Service (QoS)

For the transport of real-time data, such as VoIP or streaming video, a QoS system provides end-to-end prioritization of pre-tagged Ethernet frames.

The QoS system relies upon the originating network device/appliance to tag frames using an 802.1p VLAN priority tag

As a frame enters the Radio, a tag inspection is performed and frames are prioritized as follows:

a. A priority queuing method assigns tagged frames to one of the 4 priority queues, allowing higher priority data to then be pushed onto the RF stack ahead of lower priority frames. Tagged frames are assigned to queues based on the following tag matrix:

	Voice	Video	Normal	Background
Tag Method 802.1p	0x3 0x7	0x2 0x6	0x0 0x4	0x1 0x5

b. Once on the RF stack, the RF MAC gives prioritized frames early access to the 'air' resulting in the frames being delivered sooner to the receiving radio.

Notes:
- The QoS system does not add or alter priority tags
- QoS is always 'enabled.'
- For best results, all network devices (switches, routers, gateways) between source and destination devices should be QoS aware.

12. VLAN Access

A VLAN configuration section is available under **Configuration** -> **Advanced**.

Units will bridge VLAN frames transparently at all times. That is, all frames tagged with VLAN IDs will be recognized and passed though the system. The unit will NOT tag or strip VLAN ID's.

The VLAN feature option affects the *accessibility* of the Radio's *user interface* by Management computers from within a VLAN.

Enable/Disable. If access to the Web GUI will be from a PC within a VLAN, then this feature should be Enabled. If access is from a PC outside of a VLAN, then this feature should be disabled.

VLAN ID: The ID should be set to match the VLAN ID used on your management PC. This setting does not affect any other VLANs running on your network or the ability to pass VLAN traffic.

⚠ **Warning:** Enabling Management Access via VLAN will *lock-out* HTTP and Telnet access if attempting to connect from a PC without the proper VLAN configuration.

13. Telnet

Using the radio's IP address, the system can be managed using a Telnet connection.

Access login and password are the same for a Telnet session as for the HTTP GUI.

Sessions can be initiated from both the Ethernet and RF side of the Network, and multiple sessions are permitted.
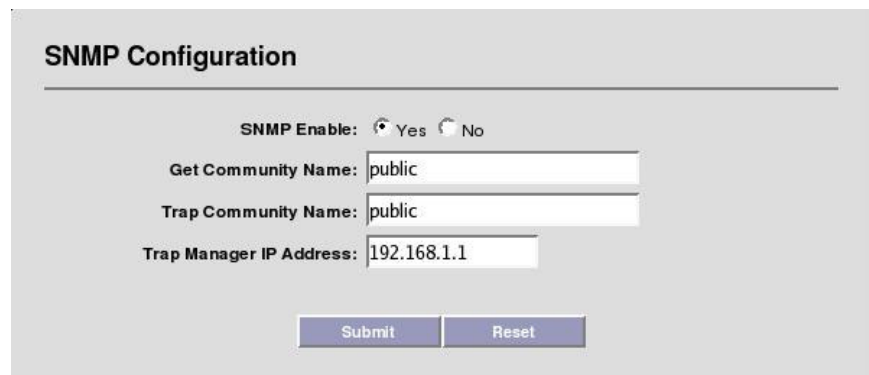
⚠ **Note:** the 'savecfg' command must be used to save Telnet configuration changes to non-volatile memory.

See Appendix B for a complete Telnet command set, syntax and usage.

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14. SNMP

The SkyWay management system includes '*get*' support for SNMP v1 and v2c via standard and private MIB tables.

Navigate to **Management** -> **SNMP** access the SNMP Configuration screen:

SNMP Enable: For security purposes, the SNMP engine can be disabled, if not used.

Community Names and **Trap Manager IP Address** fields should be entered based on the configuration of your SNMP Manager software.

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

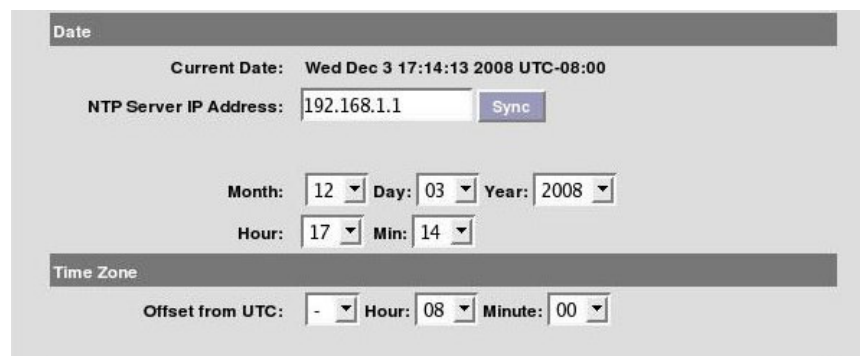To obtain Solectek's private MIB, please contact technical support.

Notes:
(a) SNMP community fields are case sensitive with no spaces allowed. Fields must be between 1 and 64 characters in length.

(b) Legal characters are: all alphanumerics, plus the following symbols:
   @ (at sign) - (dash) . (period) ' (tick) _ (underscore)

15. Network Time

Using the NTP protocol, the SkyWay Excel radio can be time synchronized to other network devices.

To setup this feature, navigate to **Configuration** -> **Advanced** to access the Date and Time feature configuration:

To time synchronize the radio, the NTP server IP address must be established and the 'sync' button pressed. If connection is successful, the local time/date will be updated to match NTP time.

An NTP resync will occur automatically twice per day.

If the NTP server is off-line, time is still kept locally on the radio. However, a reboot of the unit will blank the time. A re-connection to the NTP server or manual re-configuration of the time is required to correct the time/date.

Time zone information must be entered manually as a fixed offset from UTC. Once entered, this information is stored in non-volatile local memory and does not need to be re-entered.

All changes should be followed by a 'Submit' to make active.

16. Password Management

Navigate to **Management** -> **Password** to access the Login configuration screen:

Enter New Password: Enter the new password.
Confirm Password: Re-enter the new password for confirmation.

At the time of the first password change, a password 'hint' prompt will be displayed.

Once established, this hint answer can be used to reset the admin password, if it has been forgotten, via the 'recover' Telnet login, as follows:

> Login: recover
> Password: (default)

Once logged in as 'recover', the hint will be given:

> What is the name of your favorite pet?

Upon successful answer, the admin password can then be changed.

⚠ **It is strongly advised that the admin password, and hint answer be recorded and stored in a secure location.**

Notes:
(a) Password & hint fields are case sensitive and no spaces are allowed.
(b) Password & hint should be 6-32 characters in length.
(c) To avoid a 'weak password' warning when changing the password via Telnet, it is required that passwords contain a mix of uppercase letters, lowercase letters, numbers and symbols.
(d) Legal characters are: all alphanumerics, plus the following symbols:
    @ (at sign) - (dash) . (period) ` (tick) _ (underscore)

17. Upgrading the Software

There may be newer software releases from Solectek periodically. The latest version will be posted on Solectek's website and available from Solectek Technical Support.

The software is comprised of three sections: Firmware, Kernel and Bootloader. However, only a single upgrade operation is required to bring all three up to the latest revision.

Upgrading the software will not affect the system configuration, but does require a short period of system downtime to complete the process.

NOTE: A PC based FTP server program running on a locally connected PC is required to complete the following upgrade procedure. Solectek recommends FileZilla, a free, open-source FTP server program available via http://filezilla-project.org/

Once the FTP server is installed, the following procedure should be followed:

1. Copy .zip software release package from Solectek website or Technical Support to FTP Server desktop.
2. Unzip / extract files to any convenient directory.
3. Navigate into the extracted fileset to reach the SetupFirmware.exe tool.
4. Launch tool by double-clicking on tool icon; the following screen will be displayed:

5. Press the 'Browse' button and select the local FTP server Home Directory.
6. Press the 'Start' button. This begins a file copy operation and ensures that all upgrade files and folders are properly moved into the FTP directory.

7. On the Radio management GUI, navigate to **Management** -> **Upgrade** to access the Upgrade screen (see sample below).
8. Enter the FTP Server IP Address, Username and Password information as requested.
9. Enter the three digit software version to be loaded onto the Radio. Format will be x.y.0 (e.g – 1.3.0).
10. Press the 'Upgrade' button to begin the file transfer process.
11. Once complete, the unit must be rebooted for the upgrade to take effect.

⚠ **Do not power down or unplug the unit during the upgrade process.**

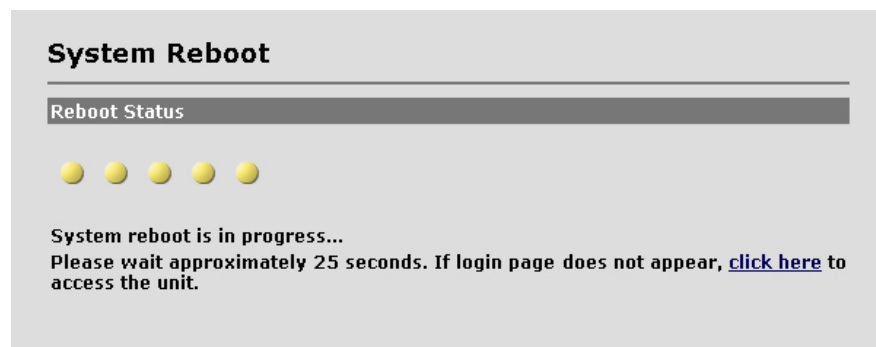If the upgrade fails to complete, or times out:

- Verify the FTP user account has read permission on the target folder.
- Verify that the FTP server's software firewall is disabled. For example, Windows XP has an integrated firewall that can block the upgrade.
- Retry Upgrade procedure.

18. System Reboot

Navigate to **Reboot** to access the System Reboot function:

System Reboot

Are you sure?
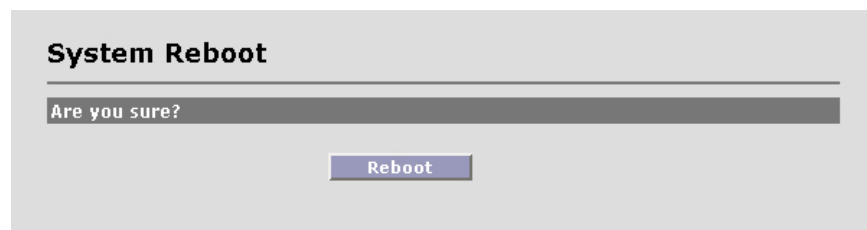
[Reboot]

Click on the **Reboot** button to reset/reboot. The reboot process will take approximately 25 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 25 seconds. If login page does not appear, <u>click here</u> to access the unit.

19. Event Log

The Event Log displays all major events that may be noteworthy for the system administrator for both monitoring and troubleshooting purposes.

Navigate to **Status** -> **Event Log** to access the Event Log Screen:

Event Log

Display Rules:
☑ NOTICE   ☑ WARN   ☑ ERROR   [Last 100]   [All]

Idx	Timestamp	Type	Message
1	Jan 1 00:00:15	notice	klogd started: BusyBox v14.2 (2008-08-05 13:54:10 PDT)
2	Jan 1 00:00:15	notice	Linux version 26.13-004 (gcc version 3.4.3) #1 Tue Aug 5 13:52:27 PDT 2008
3	Jan 1 00:00:15	warn	CPU: XScale-IXP42x Family [690541f1] revision 1 (ARMv5TE)
4	Jan 1 00:00:15	warn	Memory policy: ECC disabled, Data cache writeback
5	Jan 1 00:00:15	warn	CPU0: D VIVT undefined 5 cache
6	Jan 1 00:00:15	warn	CPU0: I cache: 32768 bytes, associativity 32, 32 byte lines, 32 sets
7	Jan 1 00:00:15	warn	CPU0: D cache: 32768 bytes, associativity 32, 32 byte lines, 32 sets
8	Jan 1 00:00:15	warn	Built 1 zonelists
9	Jan 1 00:00:15	notice	Kernel command line: console=ttyS0,115200 initrd=0x800000,8M root=/dev/ram0 rootfstype=ext2 mem=64M@0 init=/sbin/init ramdisk_size=16384 mtdparts=IXP4XX-0:-(mtd0)
10	Jan 1 00:00:15	warn	PID hash table entries: 512 (order: 9, 8192 bytes)
11	Jan 1 00:00:15	warn	INITRD start=c0800000, below=0, min_low_pfn=0

There are three categories of events:

Notice: This is informational in monitoring the operation of the unit. A Notice entry is part of the normal operation.
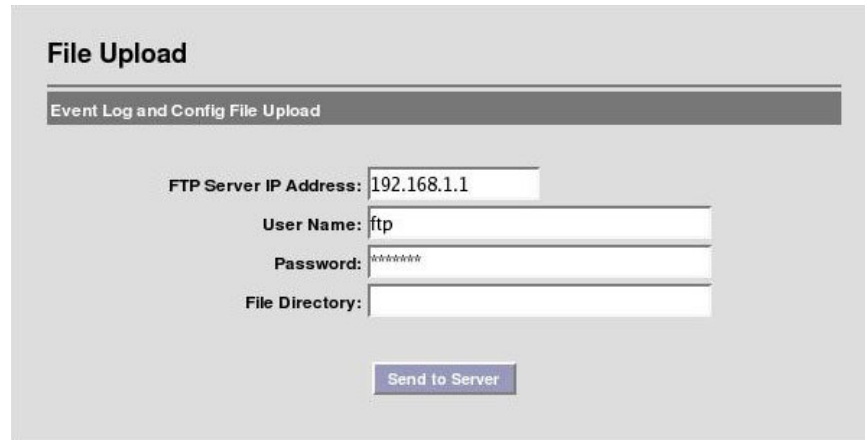
WARN: This may indicate something wrong with the unit or operation. For example, downing of the RF port may be due to malfunction or user intervention (power off).

ERROR: This is indicative of unanticipated or erroneous operating conditions.

20. Log/Configuration Transfer

For diagnostic purposes, the Event Log and System Configuration database can be transferred from the Radio to a local PC via FTP.

Navigate to **Diagnostics -> File Upload** to access the following screen:

FTP Server IP Address: Local FTP server address.

User Name: User name used to login onto the FTP server.

Password: Password used to login onto the upgrade FTP server.

File Directory: Location on Local FTP server to save Event and Configuration files. If left blank, files will be transferred to the FTP server's home directory.
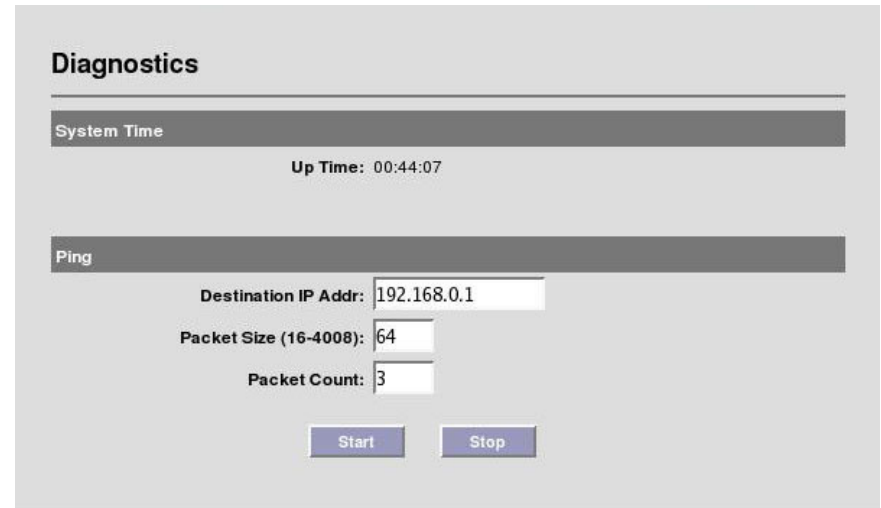
Notes:
(a) FTP Username and password fields are case sensitive with no spaces allowed. Fields must be between 1 and 32 characters in length.

(b) Legal characters are: all alphanumerics, plus the following symbols:
        @ (at sign) - (dash) . (period) ` (tick) _ (underscore)

21. Diagnostics

For diagnostics, navigate to **Diagnostics => Time/Ping** menu to view the following:

The ping tool can be used to isolate an issue to the wireless link only, not involving other network elements such as switches and host computers. You can ping the remote unit from the unit you are accessing via the user interface.

Destination Addr: The IP address of the device to be pinged.

Packet Size: The size of the ping packets to be sent (in bytes).

Packet Count: The number of packets to be sent to the destination IP address.

Click on the **Start** button to initiate the ping session. Click **Stop** to terminate it.

Appendix A: Factory Configuration

WIRELESS	
Radio Spectrum bandwidth	20 MHz
Frequency (Master-only)	Region Specific
RF Power	17 dBm
Modulation	QAM16-1/2
Streams	1
Distance	16 miles
RF Network Name	Name_1
Security	Open (AES, Radius disabled)
Access Control List (ACL)	Enabled

LAN	
IP Address (Master / Slave)	192.168.1.200 / 192.168.1.100
IP Mask	255.255.255.0
IP Gateway	192.168.1.1
Login Name / Password	admin / admin
Ethernet Port	Auto

Appendix B: Telnet Commands

Command	R/W	Default	Usage	Description
acl	RW	Enabled	*acl* [add | del | list] [aa:bb:cc:dd:ee:ff] [client-name] *acl* [enable | disable]	Master only Add/Delete/List entries in the RF access control list. Enable or Disable acl function

arp	RW		*arp [OPTION]*
			
			Options:
			   -a Display (all) hosts
			   -s Set new ARP entry
			   -d Delete a specified entry
			   -v Verbose
			   -n Don't resolve names
			   -i IF Network interface
			   -D Read [hwaddr] from given device
			   -A, -p AF Protocol family
				Manipulate the system ARP cache

audioalign	RW	1800 secs	*set audioalign [duration_secs]* *show audioalign*	Set/show Audio Antenna Alignment duration in seconds. Duration 0 disables alignment tone.
bridge	R		show *bridge*	Show Bridge Table
bw	RW	20	set *bw* [20 | 40] show *bw*	Set RF bandwidth in Mhz
chanplan	R	Varies by Region	show chanplan	Show channel plan.
clear	W		*clear*	Clears all Ethernet & RF Port counters
clearevtlog	W		*clearevtlog*	Clear event log
counters	R		show *counters*	Show RF statistics
date	RW		*date* [-u]... [MMDDhhmmYYYY Options: -u Apply the UTC time zone offset to the date	Display or set current date
default	W		*default*	Restores system to factory defaults
distance	RW	16	set *distance* [miles] show *distance*	Set distance in miles

encrypt	RW	open	set *encrypt* [open | AES | radius] show *encrypt*	Open: no authentication/encryption AES: PSK authentication / AES encryption Radius: 802.1x authentication / AES encryption
ethcfg	RW	auto	set *ethcfg* [auto-neg | 10baseT-HD | 10baseT-FD | 100baseTx-HD | 100baseTx-FD] show *ethcfg*	Set ethernet speed and duplex
exit	W		*exit*	Logout from Telnet session
freq	RW	Varies by region	set *freq* [frequency] show *freq*	Set RF frequency in MHz
ftppass	RW	p	set *ftppass* [password] show *ftppass*	Set remote ftp server password
ftpuser	RW	ftp	set *ftpuser* [user] show *ftpuser*	Set remote ftp server username
get	R		*get*	Get commands
gwaddr	RW	192.168.1.1	set *gwaddr [a.b.c.d] show gwaddr*	Set default gateway IP address
help	R		*help*	Show commands
history	R		*history*	Show command history
ipaddr	RW	192.168.1.100	set *ipaddr* [a.b.c.d] show ipaddr	Set IP address
ipmask	RW	255.255.255.0	set *ipmask* [a.b.c.d] show ipmask	Set IP netmask
log	R		show log	Show Event Log
logout	W		*logout*	Logout from Telnet session
macaddrs	R		show macaddrs	Show Ethernet and RF MAC addresses
mod	RW	QAM16 ½	show mod set mod <bpsk-1/2 | qpsk-1/2 | qpsk-3/4 | qam16-1/2 | qam16-3/4 | qam64-2/3 | qam64-3/4>	Show Current Modulation
name	RW	(blank)	set *name* [name] show name	Set system name
ntpaddr	RW	192.168.1.1	set ntpadd [a.b.c.d] show ntpaddr	Set NTP server address
password	W	admin	*password* (prompts lead user for password change)	Change admin password

ping	W		*ping* [OPTION]... Host
			
			Options:
			    -c CNT Send only CNT pings
			    -s SIZE Send SIZE data bytes in packets
			(default=56)
			    -I iface/IP Use interface or IP address as
			source
			    -q Quiet, only displays output at start
			           and when finished
				Test network connectivity

power	RW	17	set *power* [rfpower] show power	Set RF Transmit power, in dBm
product	R	PTP_SLAVE	show *product*	Show product type
psk_phrase	RW	my-big-secret-01	set *psk_phrase* [phrase] show psk_phrase	Set pre-shared key passphrase
radius_pass	RW	abcd1234	set *radius_pass* [password] show radius_pass	Slave only Set Radius user password
radius_secret	RW	my-big-secret-01	set *radius_secret* [secret] show radius_secret	Master only Set Radius secret
radius_timer	RW	86400	set *radius_timer* [period] show radius_timer	Master only Set Radius reauthentication period, in Seconds
radius_user	RW	wpa1@host.local	set *radius_user* [name] show radius_user	Slave only Set Radius client user name
reboot	W		*reboot*	Reboot system
rfnetname	RW	NAME_1	set *rfnetname* [netname] show *rfnetname*	Set RF Network Name
route	R		show *route*	Show IP route table
rssi	R		show *rssi*	Show Local Recv Signal Strength
savecfg	W		*savecfg*	Save configuration to permanent memory
serialnum	R		show *serialnum*	Show system serial number
set	R		*set ?*	Set ? for commands
show	R		*show*	Show commands
snmp	RW	enabled public – for all strings 192.168.1.1 for trap manager	set snmp enable=[yes|no] set snmp [read-community|rc]=[abcdef] set snmp [trap-community|tc]=[abcdef] set snmp [trap-manager|tm]=[a.b.c.d] show snmp	Set SNMP configuration parameters
status	R		*status*	Show system status

streams	RW	1	*show streams* *set streams <1 | 2 >*	Show / Set the number of MIMO data streams
sysmode	RW	PTP_SLAVE	*show sysmode* *set sysmode <PTP_MASTER | PTP_SLAVE>*	Show / Set the PTP operating mode
tz	RW	"+00:00"	*tz [+hh:mm | -hh:mm]*	Set/Show time zone
updatesw	W		*updatesw [options] [swver]* *Options: -v -verbose output* *-b -update uboot* *-k -update kernel* *-r -update rootfs* *-h -use http* *-i -ignore existing configuration* *-f -force the update*	Download and install new system software
upload	W		*upload [[config | syslog] [<localfile> [<remotefile>]]]*	Upload files to remote server
uptime	R		*uptime*	Display current system uptime
version	R		*version*	Display current software version
vlan	RW	disabled	*vlan [enable | disable]*	Enable/Disable management via VLAN
vlanid	RW	1	set *vlanid* [vlan id] show vlanid	Set VLAN ID for management channel

Appendix C: Regulatory Information

1. FCC Radio Frequency Interference Statement

FCC ID: KA358WAN3

This device is certified to comply with Part 15 of Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions:
1. It may not cause harmful interference.
2. It must accept any interference that may cause undesired operation.

Changes or modifications not expressly approved by Solectek could void the user's authority to operate the equipment.

2. U.S. Government Restricted Rights Legend

The Product is provided with Restricted Rights. Use, duplication, reproduction or disclosure by the Government is subject to restrictions in subdivision (c)(1)(ii) of the Rights in Technical Data and Computer Product clause at 252.227-7013 and in subparagraphs (a) through (d) of the Commercial Product-Restricted Rights Clause at 52.227-19. Contractor/Manufacturer is Solectek, 6370 Nancy Ridge Drive, Suite 109, San Diego, California.

3. Radio Transmission Notice

This product is a low power (less than 1 Watt), OFDM radio system pre-set to transmit and receive signals in the 5.725 – 5.850 GHz frequency band. This product has been certified by the U.S. Federal Communications Commission for use in the United States of America in that band. Other markings on the unit label shall indicate regulatory compliance in other international areas.

Any prospective user of this product outside the United States of America should, prior to such use, contact the government department or other agency responsible for assigning radio frequencies in the country in which use is proposed to determine whether such department or agency has any objection to operation of the product given current regulatory label markings on said product, and whether there are any other local devices generating signals in that band which might be expected to interfere with the operation of this product.

Solectek shall not be responsible for any operation of this product which is in violation of local law, creates interference harmful to other local devices, or results in a malfunction of this product caused by outside interference.

This device must be professionally installed and used in strict accordance with the manufacturer's instructions. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded, including the requirements of FCC Part 15.203

However, there is no guarantee that interference to radio communications will not occur in a particular commercial installation. In case the device does cause harmful interference with an authorized radio service, the user/ operator shall promptly stop operating the device until harmful interference has been limited. Solectek Corporation is not responsible for any radio or television interference caused by unauthorized modification of this device or the substitution or attachment of connecting cables and equipment other than specified by Solectek Corporation. The correction of interference caused by such unauthorized modification, substitution, or attachment will be the responsibility of the user.

Warning:

The antennas used for this transmitter must be installed to provide a separation distance of at least 100 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter

This device has been designed to operate with the antennas listed below, and having a maximum gain of 29 dBi. Antennas not included in this list or having a gain greater than 29 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

1. Pulse 10dBi RO5810NM (3) 5.8 GHz Radome Omni 10 dBi

2. ARC Wireless Solutions 5.15-5.875GHz 24/23dBi Dual Polarization Panel Antenna

3. Laird HD Series High Performance Dish Antenna HDDA5W-29-DP - 29dBi dual polarity (H and V)

The use of Antennas #2 and #3 above shall be restricted to Point-to-Point use only.

This equipment has been tested and found comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. 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 the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

SOLECTEK

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