Site Configuration: GPS Sync Unit

This window is the main GSU configuration tool:

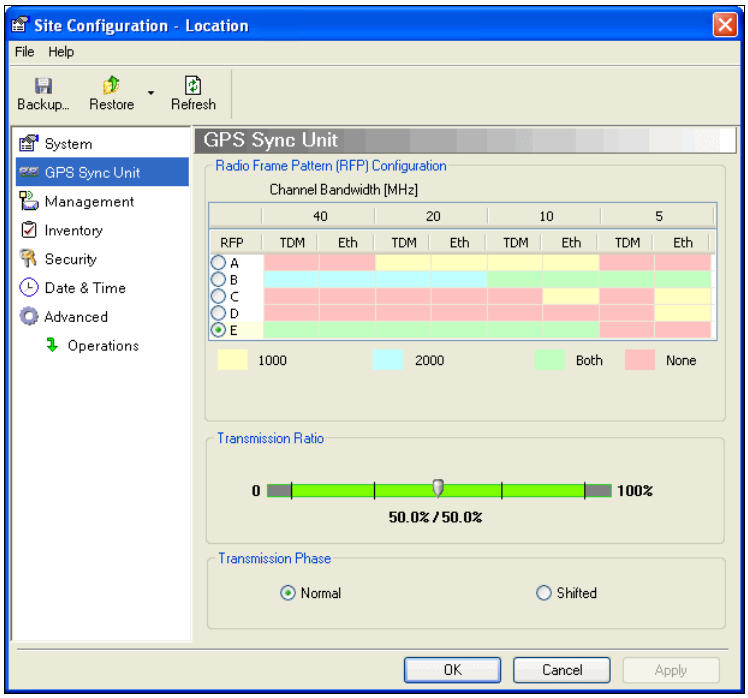


Figure 11-8: Site Configuration: GPS Sync Unit

Note

The 1000 and 2000 labels refer to WinLink 1000 and RADWIN 2000 radios, respectively. The actual annotation seen may vary, but the intention should be clear.

1. Setting the RFP for HSS

The GSU is automatically configured as HSS Master (HSM).

Note

Ensure that no other collocated ODU is configured as HSM.

If the hub site consists only of WinLink 1000 units, then any suitable RFP may be chosen. If there are one or more RADWIN 2000 units, you must use RFP B or E.

The permitted RFPs are also dependent on channel bandwidth and are color coded as follows:

You May use RFP / Channel Bandwidth combinations with this color	For these collocated radios
	WinLink 1000 only
	RADWIN 2000 only
	WinLink 1000 and RADWIN 2000 together
	None - unavailable

There is a further restriction: If there are two distributed sites transmitting to each other, they must both use the same RFP. This requirement, together with use of shifted transmission phase (item 3 below), ensures that communicating distributed sites to not interfere with each other by transmitting simultaneously.

Two GSU managed sites transmitting with shifted transmission phase and using the same RFP, transmit one half a RFD apart (see **Figure 11-3** above).

2. Setting the Tx Transmission Ratio

Since the GSU is always HSM, it must be able to cater for hub site RADWIN 2000 C based links. (See the RADWIN 2000 User Manual, Chapter 5). If you use asymmetric allocation, shifted transmission phase becomes unavailable and you cannot “cascade” links as described in step 1.

3. Choosing the Transmission Phase

Chose the Transmission Phase in accordance with considerations in step 1 above. If you choose Shifted Phase then the Asymmetric Ratio selector is disabled.

Site Configuration: Management

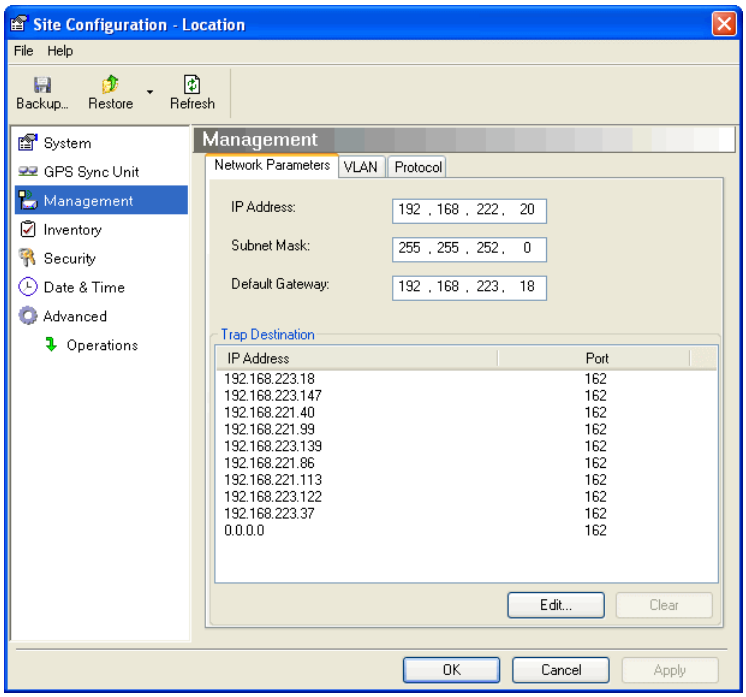


Figure 11-9: Site Configuration: Management

Here you set the GSU IP address, subnet mask and gateway. You also set trap addresses here. It is identical to the corresponding panel for WinLink 1000.

Site Configuration: Inventory

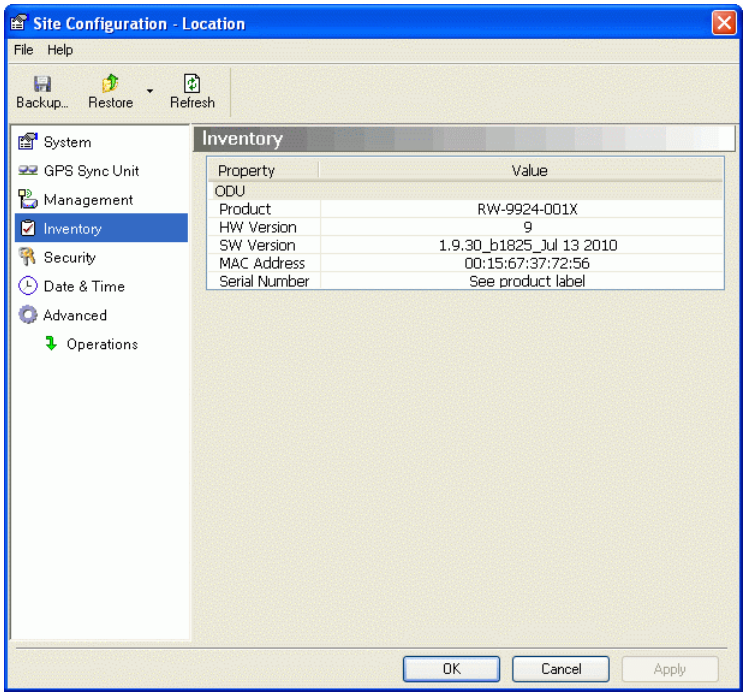


Figure 11-10: Site Configuration: Inventory

Site Configuration: Security

You can only change the SNMP Community stings:

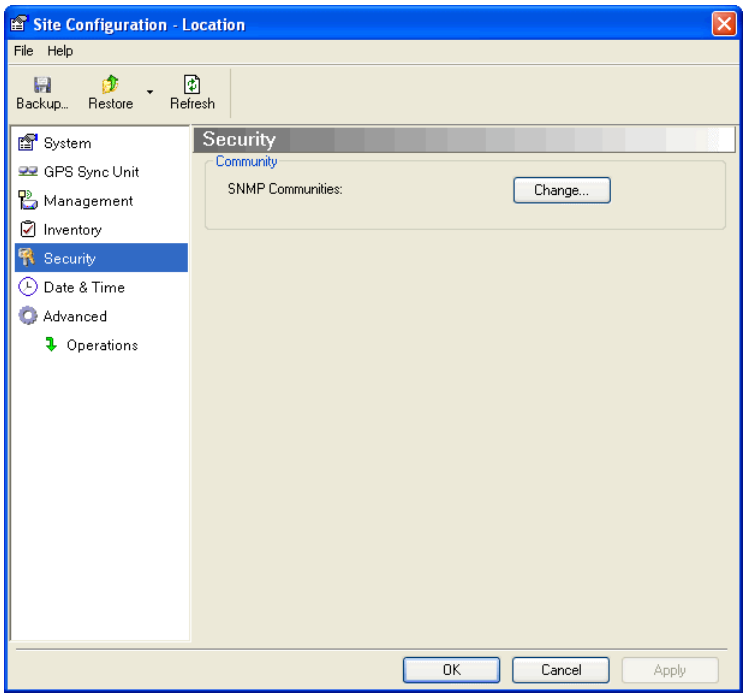


Figure 11-11: Site Configuration: Security

Site Configuration: Date and Time

ODU Recent events, alarms and traps are time-stamped from the time method chosen here (NTP, managing computer, ODU default).

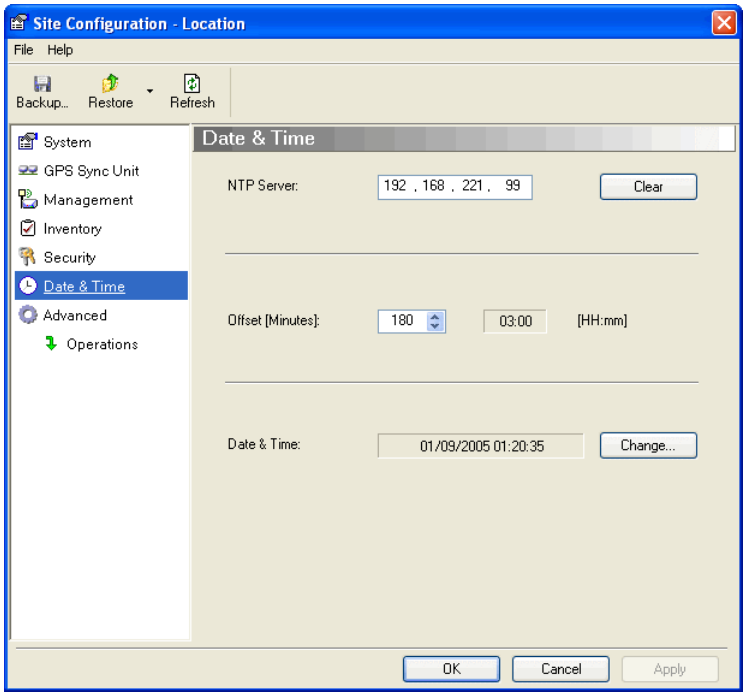


Figure 11-12: Setting the date and time for trap reporting

Site Configuration: Operations

The only available action here is Restore System Defaults:

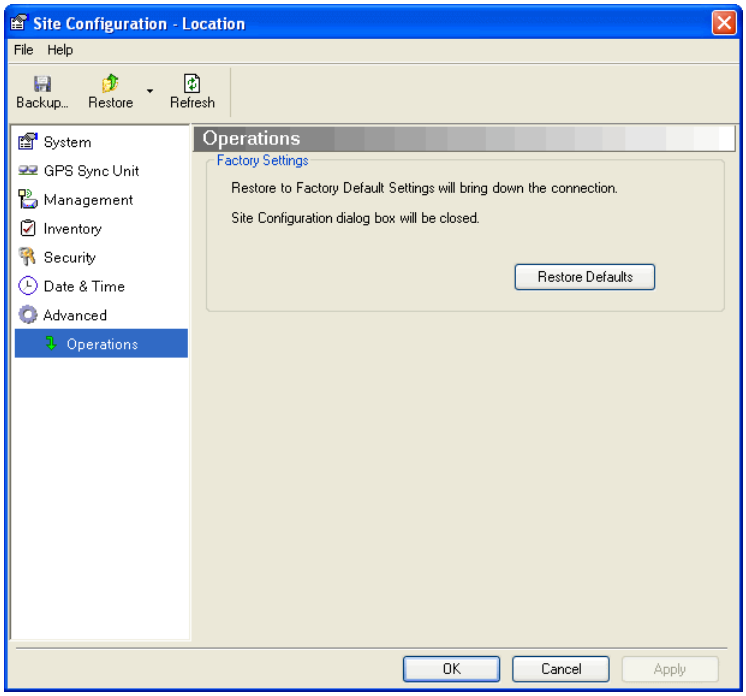


Figure 11-13: Site Configuration: Operations

GSU Preferences

The **Preferences** window adds a new tab for the GSU:

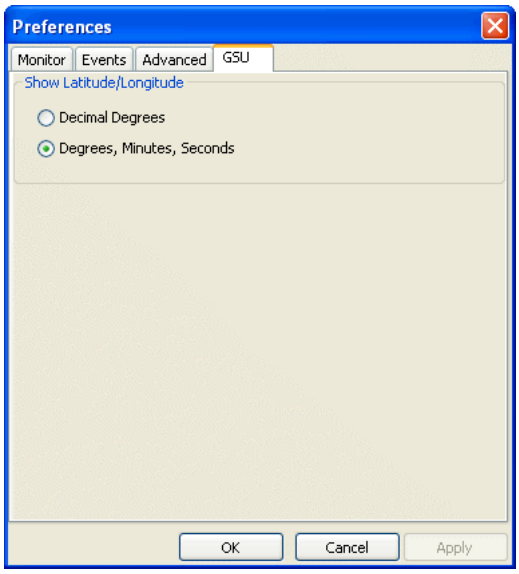


Figure 11-14: Site Configuration: Operations

You may chose the units for latitude/longitude coordinates.

GSU Monitoring and Diagnostics

The monitoring and diagnostic reports are similar to those of WinLink 1000.

GSU Telnet Support

To configure the GSU with Telnet, start a Telnet session, using

telnet <GSU_ipaddr>.

For example, if you run Telnet as follows,

telnet 192.168.222.20

you will be asked for a user name and password. You must log on with administrator privilege under user name, ***admin*** and password ***netman***.

The available commands are the same as for WinLink 1000 with the addition of four additional display commands and three additional set commands.

The additional **display** commands are

display rfp

display ratio

display tx_phase

display gpsinfo

The last one **display gpsinfo**, is the most interesting:

admin@192.168.222.20-> display gpsinfo

Current GPS time 102941.000

Current GPS latitude	51.500000
Current GPS N\S Indicator	N
Current GPS longitude	0.000000
Current GPS E\W Indicator	E
Current GPS number of satellites	09
Current GPS altitude	84.0

Command "display gpsinfo" finished OK.

The three additional **set** commands are

set rfp <index> (2-6)

set ratio <ratio>

set tx_phase <mode:1=normal,2=shifted>

Software Update for GSUs

All GSUs in a distributed site can be updated simultaneously. Use an IP list as described in **Chapter 15**.

RADWIN

RADWIN 2000

Broadband Wireless Transmission System

USER MANUAL

RELEASE 2.5.40

Part 3: Advanced Installation

UM 2000-2540/02.11

Chapter 12

Monitored Hot Standby Installation Procedure

What is a RADWIN Monitored Hot Standby

The RADWIN Monitored Hot Standby (MHS a.k.a 1+1) is a duplicated link set up as a primary link and a secondary link in hot standby mode as shown in **Figure 12-1** below.

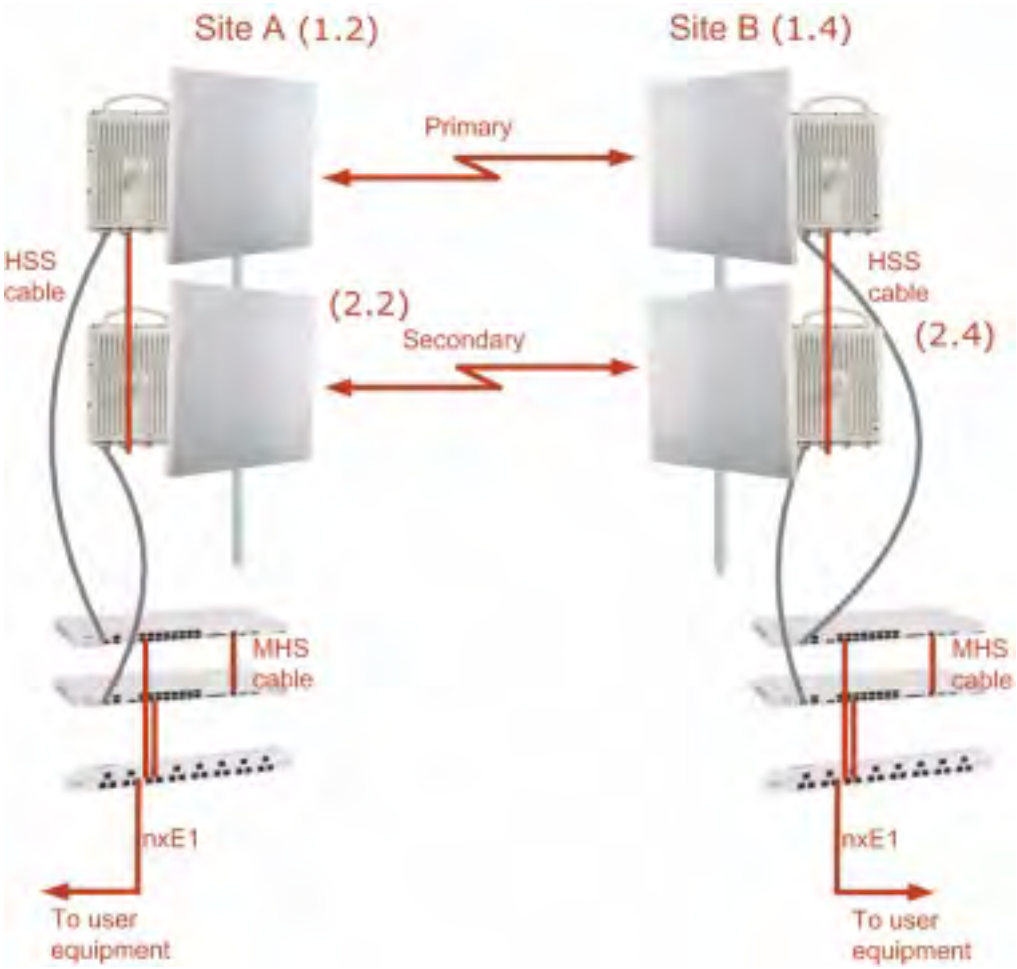


Figure 12-1: RADWIN Monitored Hot Standby

RADWIN MHS provides redundancy and backup to TDM services. It is designed to provide high reliability high-capacity Point-to-Point links. The RADWIN MHS is -

- Designed to provide redundancy and high reliability for carrier class operators
- Optimized for high capacity links operating in license-free bands
- A comprehensive solution providing protection against both equipment failure and loss of air interface, by simple connectivity between a primary link and a secondary link

The main service redundancy features of the RADWIN MHS are –

- TDM service cut-over from the primary to the secondary link is completely automatic
- TDM service cut-over time no more than 50 ms
- Automatic restore to primary link as soon as it becomes available
- Support for up to sixteen TDM channels for RADWIN 2000 and four TDM channels for WinLink 1000.

MHS is supported between -

- two WinLink 1000 links
- two RADWIN 2000 links
- a WinLink 1000 link and a RADWIN 2000 link.

What RADWIN MHS provides

Equipment Protection

Equipment protection is provided for the electrically-active network elements, ODU and IDU.

The primary IDU and the secondary IDU are connected by a cable to monitor failure and to control protection switching. Switching time is less than 50ms.

When connecting two WinLink 1000 links as 1+1, one dual-polarization antenna can be shared by the primary link and the secondary link.

Air-Interface Protection

Air-Interface protection is unique to RADWIN and is optimized for wireless links operating in license-free bands.

The primary link and the secondary link use different frequency channels. If the air-interface of the primary link is disturbed and cannot carry the required TDM service, then the system automatically switches to the secondary link.

In addition, improved robustness and frequency planning flexibility is achieved, as the primary and secondary air interfaces can operate in the same frequency band or in different frequency bands.

Automatic Channel Selection (ACS) can be configured for each link to add additional robustness.

The primary and secondary links are synchronized using Hub Site Synchronization (HSS).

It is recommended that both sites be installed with HSS cables. If HSS fails at one site, it can be operated from the other site by remote configuration.

Purpose of this Chapter

This chapter is an installation and maintenance guide for RADWIN MHS. It applies to all RADWIN radio products able to support the Monitored Hot Standby operational mode.

Who Should Read this

This chapter is intended for persons responsible for the installation and maintenance of RADWIN MHS. To use it you need to know how to -

- Install a WinLink 1000 radio link
- Install a RADWIN 2000 radio link
- Use the RADWIN Manager software

RADWIN MHS Kit Contents

- One Y-Connection Patch Panel
- One MHS cable

Figure 12-2: RADWIN Y-Connection Patch Panel

Installing a RADWIN MHS

The following procedure is substantially generic to all RADWIN radio products. Differences between WinLink 1000 and RADWIN 2000 class products will be stated explicitly. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

Figure 12-1 above is a schematic of a RADWIN MHS. **Figure 12-3** shows how to connect the IDUs to the Patch Panel.

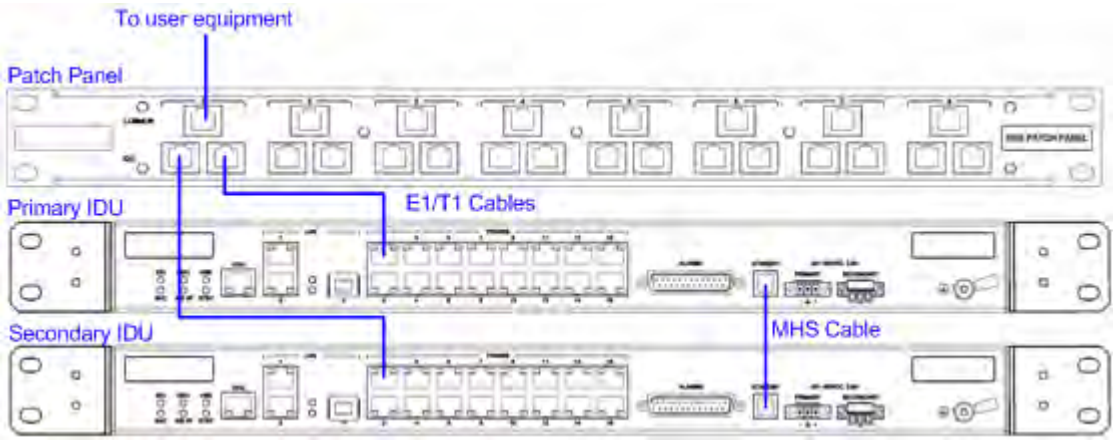


Figure 12-3: How to connect the IDUs to the Patch Panel

Note

- With RADWIN 2000 links you can protect up to 16 TDM ports. To protect more than eight TDM ports use two Patch Panels at each site.
- Ethernet services are carried independently by primary and secondary links. Each link carries different Ethernet traffic. MHS does not protect Ethernet traffic.

In what follows, it will be assumed that –

1. We will depart from our usual Site A / Site B conventions. Sites A and B on the primary link will be Sites 1.2 and 1.4 respectively. The corresponding sites on the secondary link will be Sites 2.2 and 2.4. The site names reflect their IP addresses. This is a useful convention and is reflected in the screen captures below.
2. The link will be managed from Site 1.2; Site 1.4 may be a remote site.
3. The links intended as the primary and secondary will be referred to their respective names, Primary Link and Secondary Link as shown in **Figure 12-1** above, despite their having yet to be installed.

➢ **To install a Hot Standby Link:**

1. Set up Primary Link in the usual way. Ensure that it is fully operational in accordance with the relevant instructions in Part 1 of the User Manual.

Note

Do not proceed unless this condition is fully met!

2. Connect user equipment to Site 1.4.
3. At Site 1.2, disconnect the TDM cables from the external equipment or disconnect external equipment from the Hot Standby Patch Panel.
4. The HSS cable (connecting the ODUs) should be connected at Site 1.2. The ODU belonging to the primary link should be configured as HSM, whereas the ODU belonging to the secondary link should be configured as HSC-CT.
5. Establish Secondary Link in the usual way, with HSS enabled. **The two link frequencies should be at least 5MHz apart.**

6. Connect the MHS cables at Sites A and B as shown in **Figure 12-1** and **Figure 12-3** above.
7. Run the Configuration Wizard for Primary Link. Activate TDM services in the usual way. Navigate to the **Hot Standby** tab, in the Services Configuration panel:

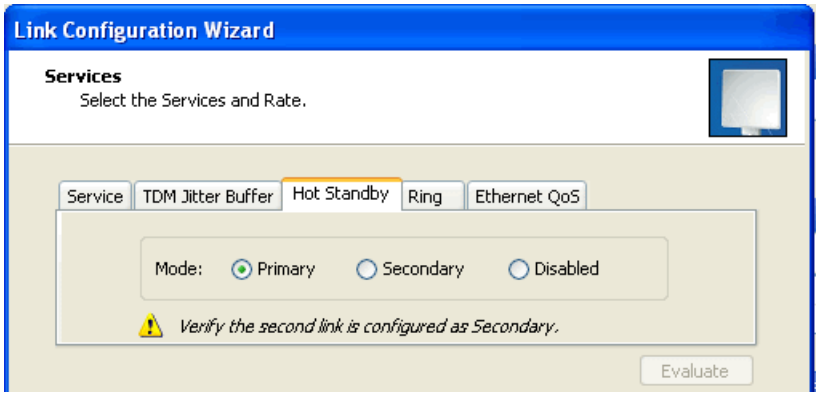


Figure 12-4: Services Configuration Panel: Hot Standby mode selection

Check the Primary button to configure Primary Link as the primary link.

8. Complete the Wizard, and then move to Secondary Link.
9. Repeat step 7 for Secondary Link. For the Services Hot Standby tab, this time, check the Secondary button.
10. Complete the Wizard.
11. At Site 1.2, reconnect the Hot Standby Patch panel to the external equipment.

From this point on, we will simply refer to primary and secondary link (no capitalized names).

At the end of the process, the RADWIN Manager main windows should look like this:

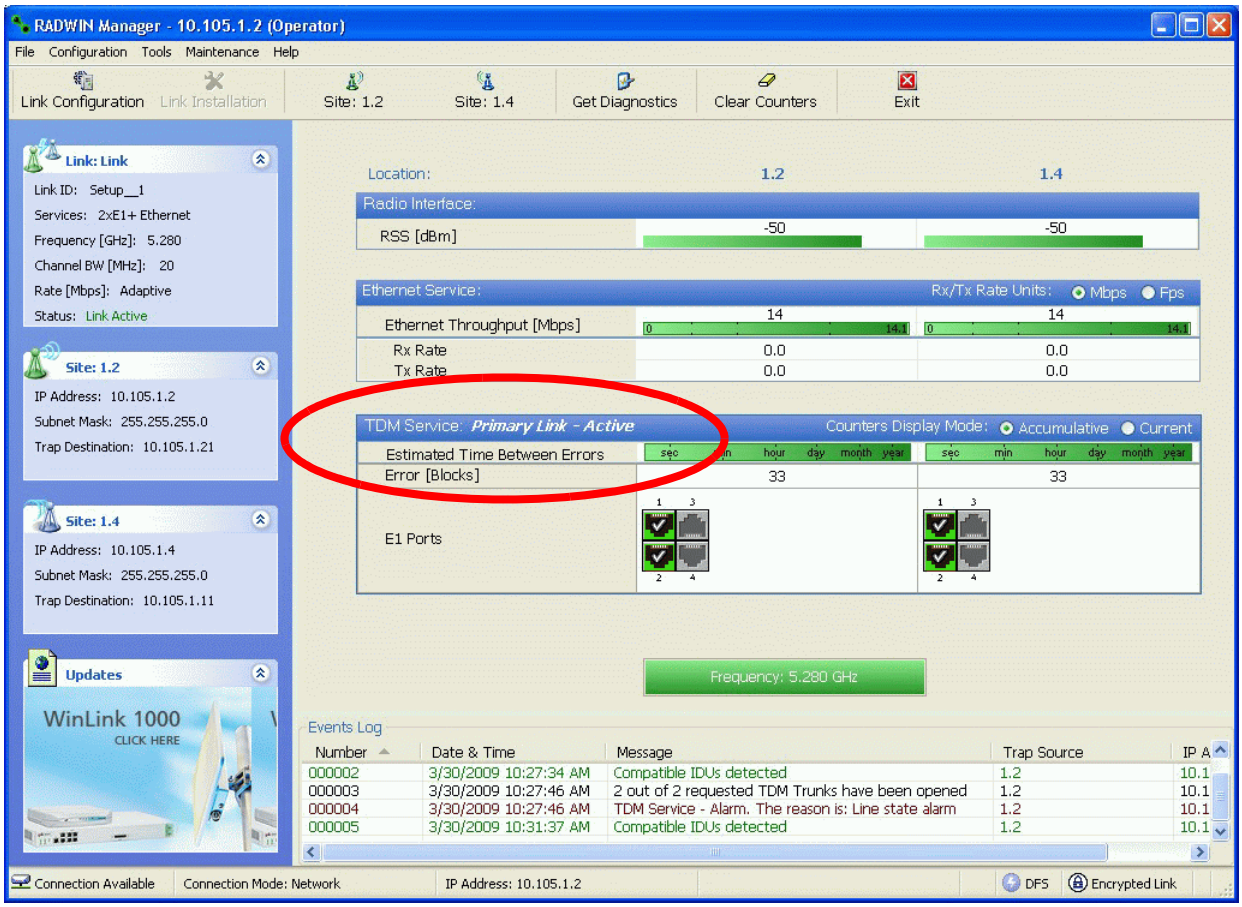


Figure 12-5: The primary link under normal operation

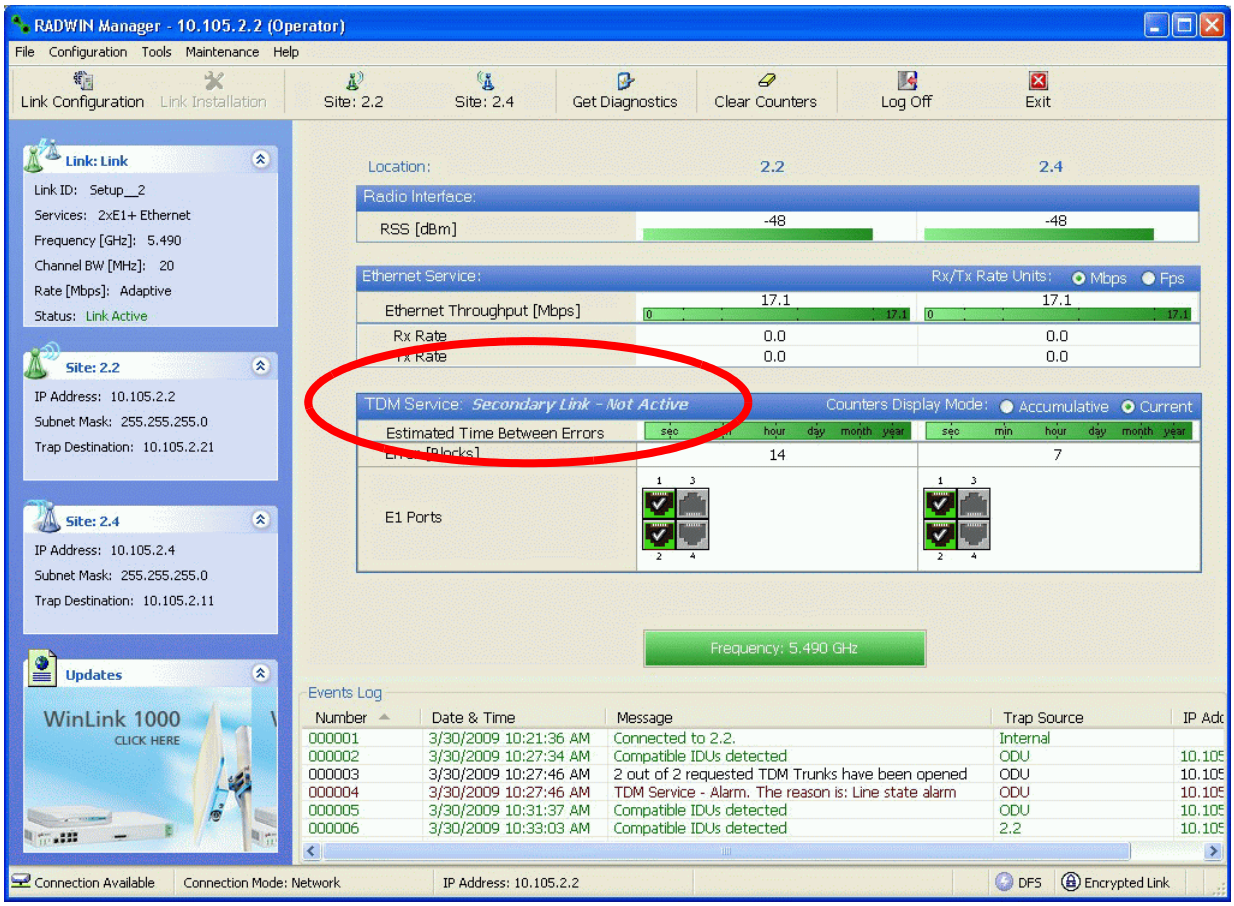


Figure 12-6: The secondary link under normal operation

To see what happens following a cut-over from the primary link to the secondary link, you need to have running two copies of the RADWIN Manager – one logged into the primary link, and one logged into the secondary link.

Here then, is the situation after a cut-over to the secondary link:

For the primary link, the following window will appear for a few seconds:

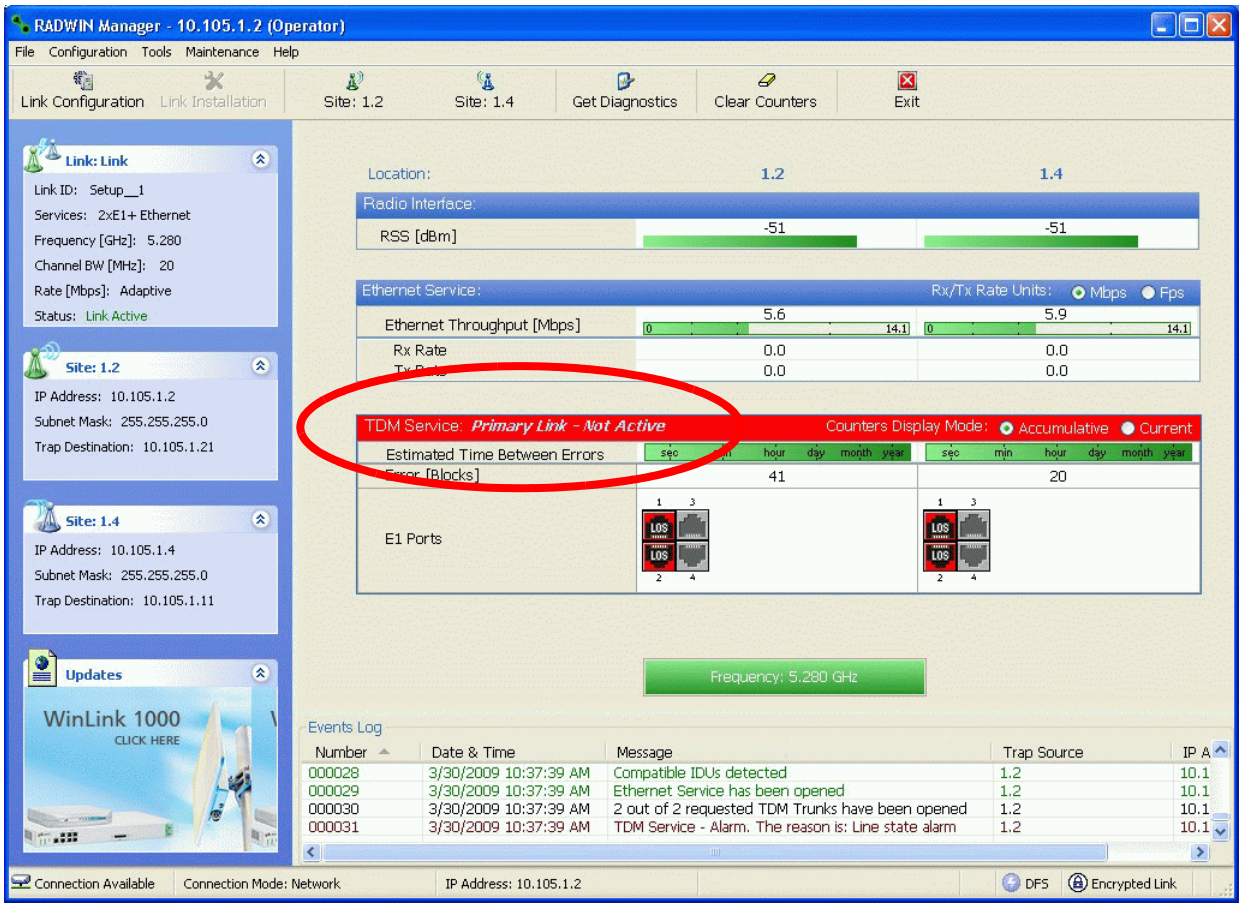


Figure 12-7: Primary link a few seconds before regular No-Link display

It will then revert to the standard No-Link-available window.

On the secondary link Manager window, you will see a window like this:

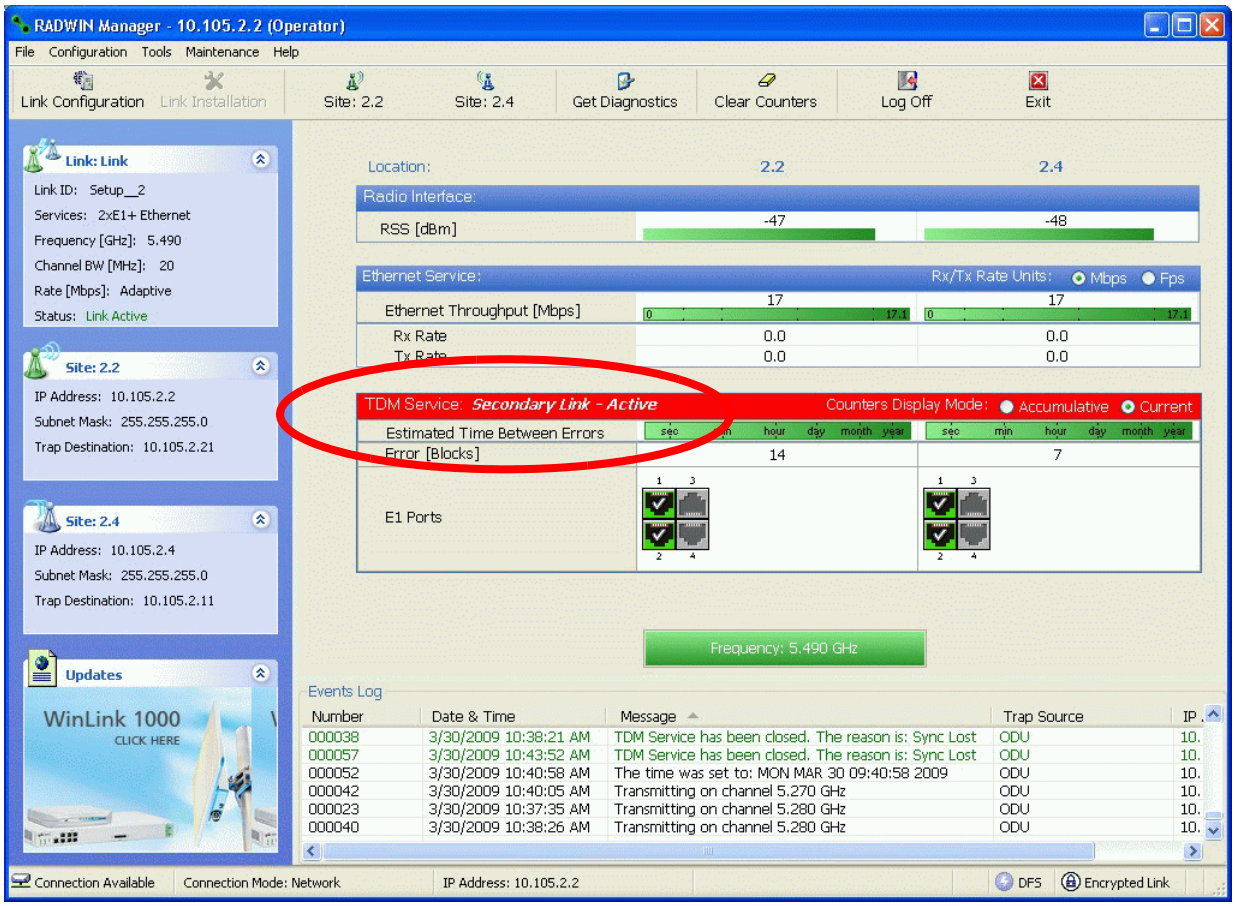


Figure 12-8: Secondary Link operating as the Hot Standby link

Notice that the active link notice is highlighted in red, so that there is no mistaking which link is operational.

Maintaining a RADWIN MHS Link

IDU Replacement

There are two situations, which must be treated differently.

Situation 1:

To replace either of the IDUs at Site 1.4 or the IDU at Site 2.2, nothing special is required. Simply disconnect the IDU to be replaced – and replace it with a new one. Replacing a secondary link IDU obviously has no effect on the TDM service. Disconnecting the Site 1.4 primary IDU activates Hot Standby. After the Site 1.4 primary IDU is replaced, the Link will detect the change and switch back to the primary link.

If you replaced the Site 2.2 IDU, remember to reconnect the MHS cable.

Situation 2:

Replacing the Site 1.2 IDU is different, and requires several steps.

➢ **To replace the Site 1.2 primary link IDU:**

1. Power off the Site 1.2 IDU. This activates the secondary link using Hot Standby.

2. Run the Configuration manager on the secondary link, and in the Hot Standby panel of **Figure 12-4** above, check the Disabled button.
3. Replace the Site 1.2 IDU without connecting it to the ODU (to prevent transmission by the primary link with the undefined IDU).
4. Reconnect the MHS cable between the IDUs at Site 1.2.
5. Again, run the Configuration Wizard on the secondary link, and in the panel of **Figure 12-4** above, check the Secondary button to re-enable the link as secondary.
6. Connect the new Site 1.2 IDU to its ODU.

   The Hot Standby will automatically revert to the primary link within 50ms.

ODU Replacement

Both the primary and secondary replacement ODUs require pre-configuration prior to insertion into the link. The items to be pre-configured are

- HSS mode
- Link ID
- Frequency
- Hot Standby mode – using the new Services panel in **Figure 12-4** above
- IP address (optional)

Pre-configuration **must** be carried out before the new ODU is connected to its IDU. If you try to do it “live” against its IDU, it will cause spurious transmissions and a service break.

To pre-configure an ODU:

1. Attach the new ODU to an IDU or a PoE device.
2. Run the RADWIN Manager and use Hot Standby tab of **Figure 12-4** above to configure the new ODU to Primary or Secondary mode as required.
3. Ensure that it is set to the proper HSS mode in accordance with **Figure 12-4** above. Enter the required Link ID and frequency.

To replace an ODU for primary or secondary link, at either site:

- Install the pre-configured ODU. (Since the other link is working normally, nothing need be done with it. If the secondary ODU was replaced, TDM service remains as is on the primary link. If the primary ODU was replaced, then the TDM service will shift back to the primary link.)

Switching Logic

Switching from Primary Link to Secondary Link

Switching from primary link to secondary link will occur following:

- Loss of the primary air interface due to sync loss

- Loss of the primary air interface due to failure of the receiver to acquire expected E1/T1 data during a period of 24ms
- The Primary equipment (either ODU or IDU, local or remote) is powered off

Following the switch from the primary to the secondary link, the primary and secondary link Manager main windows should look like this:

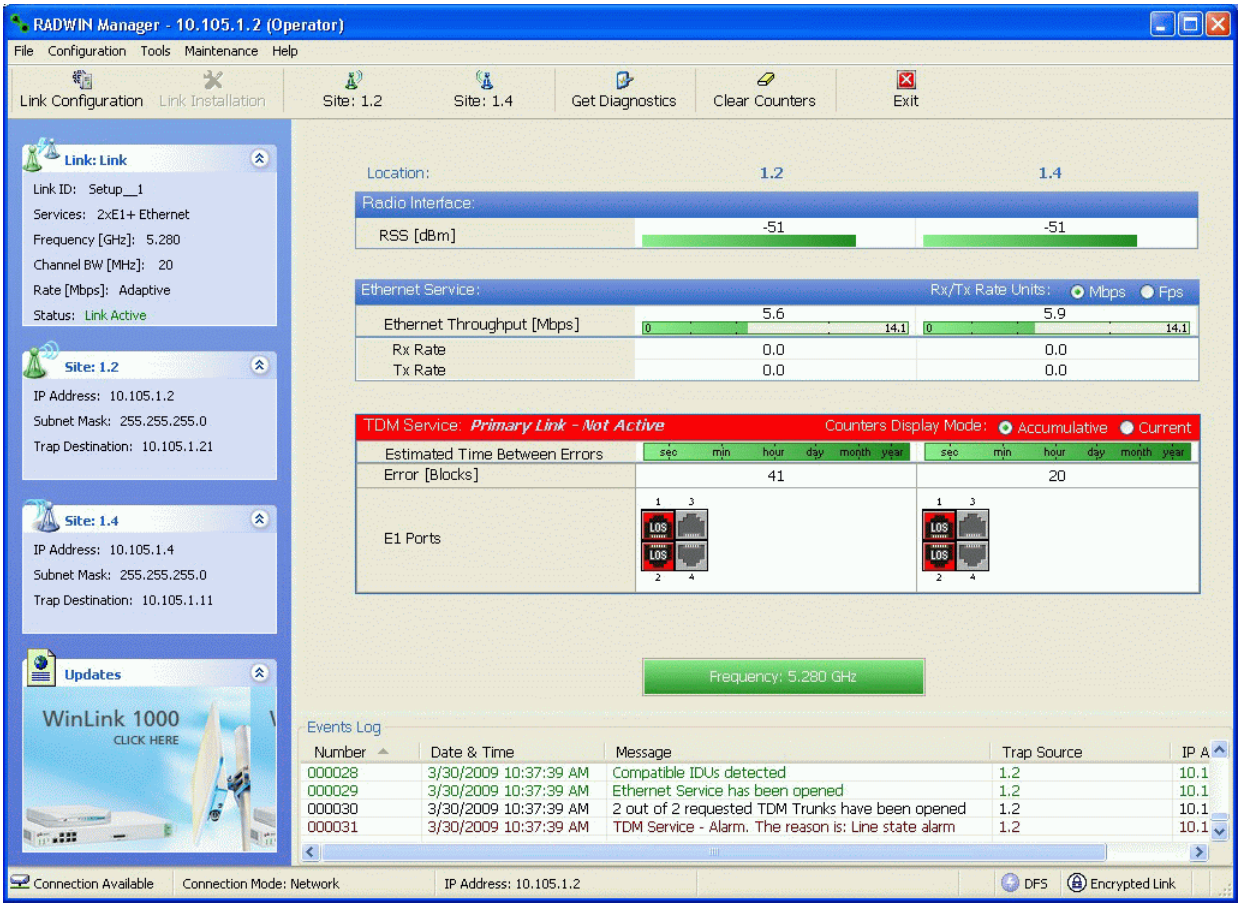


Figure 12-9: Primary link after the switch over to secondary link (After a few seconds the display moves to No-Link display, with TDM ports grayed out.)

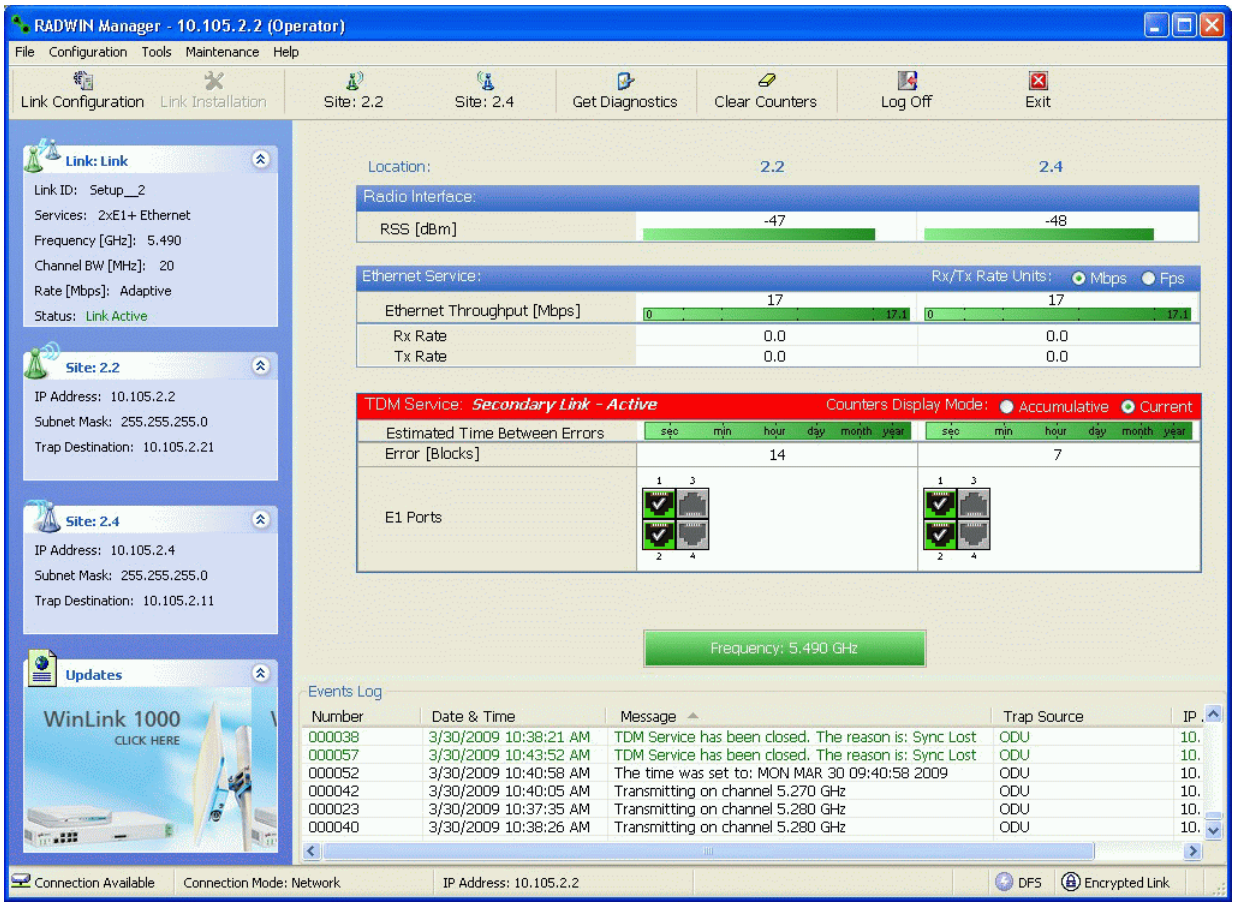


Figure 12-10: Secondary link operating after the switch over to secondary. (After a few moments the TDM icons become green.)

Switching back from the Secondary to the Primary Link

Switching back from the secondary link to the primary link will occur after the primary link has become and remains fully functional for a continuous period of at least one second. Following reversion from the secondary link to the primary link, the Manager main windows should look like this:

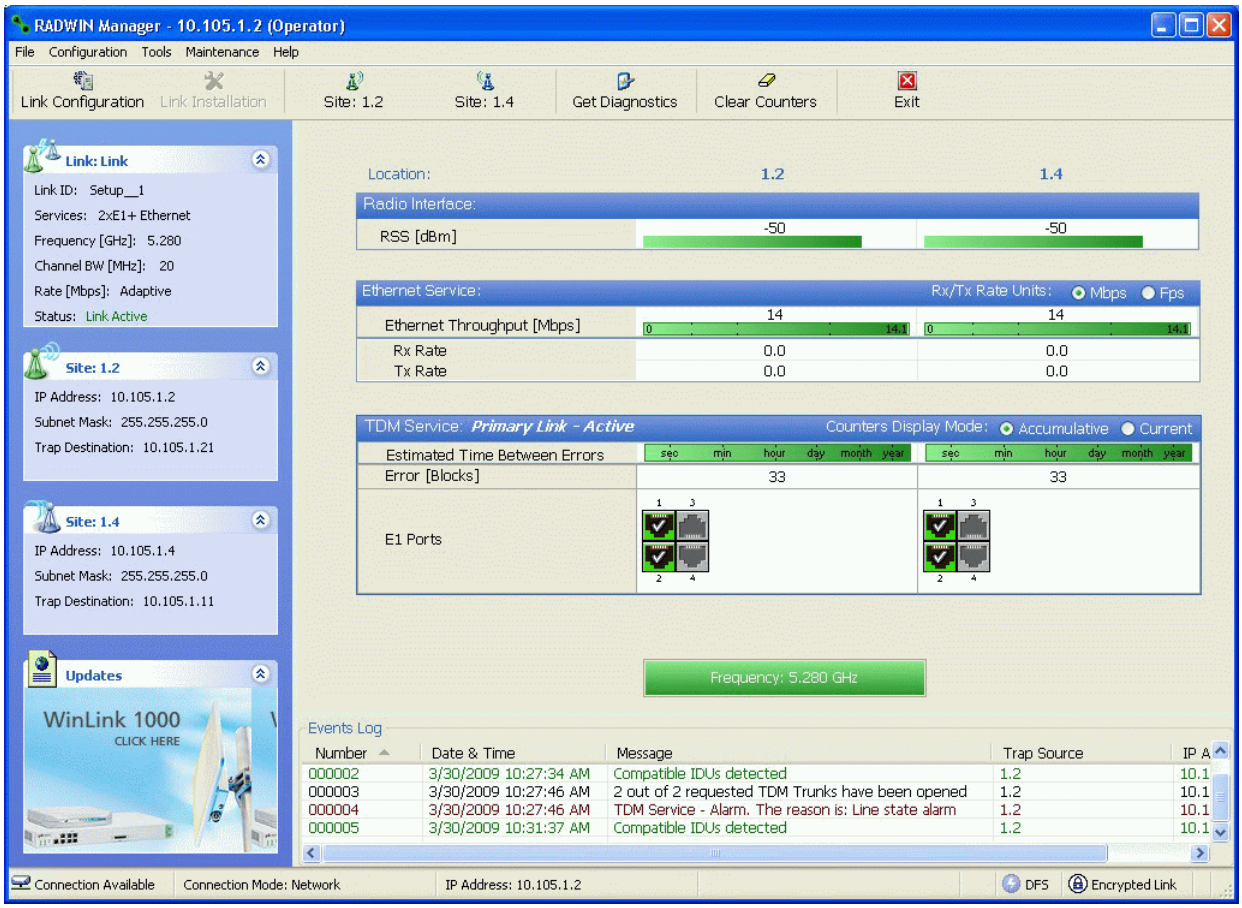


Figure 12-11: Primary link operating after the switch back from secondary

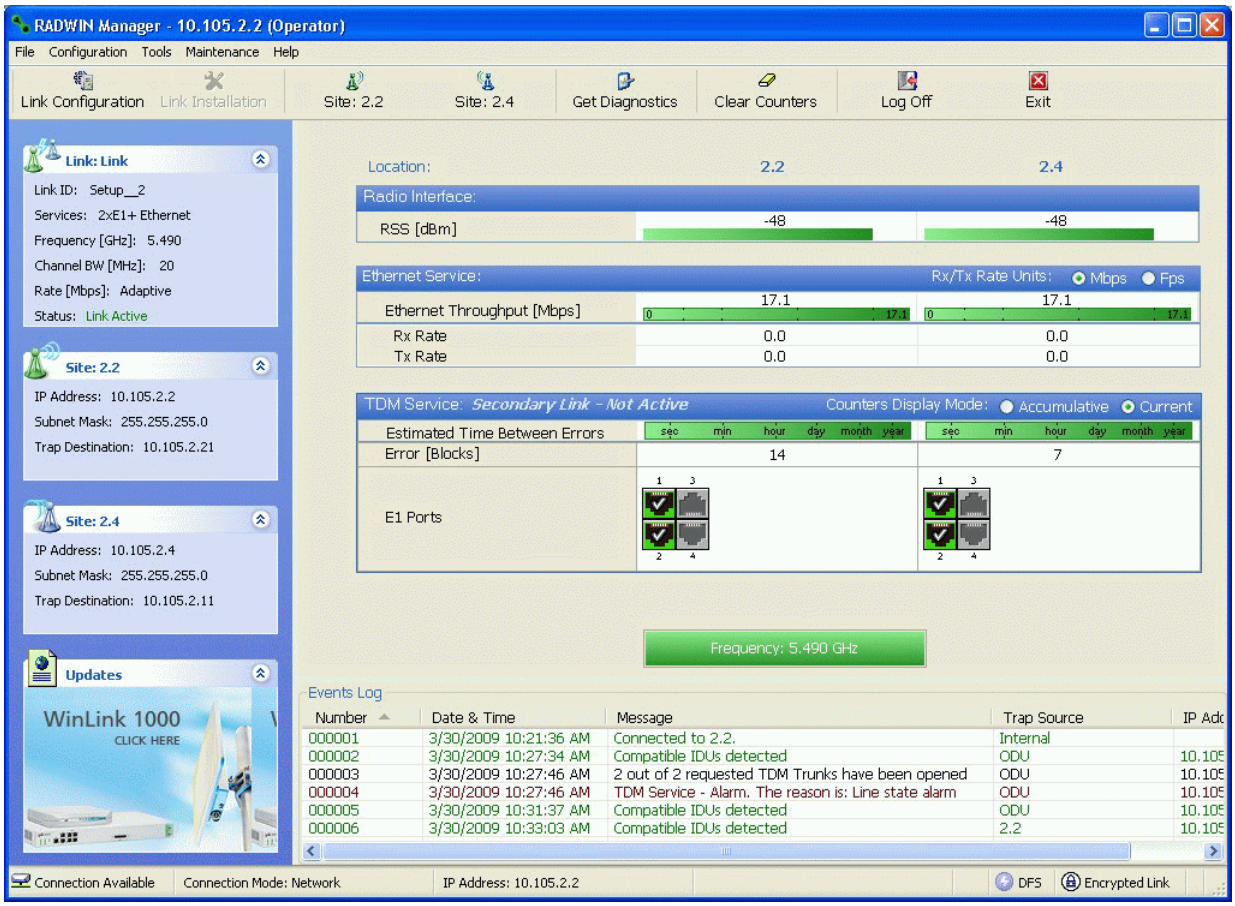


Figure 12-12: Secondary Link operating after the switch back to Primary

System Operation description

Normal operation	• TDM services are carried by the primary link • The secondary link (equipment and air interface) is operating but not carrying user traffic • TDM ports on the secondary IDUs are tri-state

Switching to backup	• Switching to secondary will occur in the following cases:
	  • Loss of the primary air interface due to sync loss
	  • Loss of the primary air interface due to failure of the receiver to acquire expected TDM data during a period of 24ms
	  • Primary equipment power off (either ODU or IDU, local or remote)
	• The switching result would be:
	  • TDM ports on the primary IDUs turn to tri-state
	  • TDM ports on the secondary IDUs become active

Backup operation	• TDM services are carried by the secondary link
Switching back to primary	• Switching back to primary will occur as soon as the Primary link is fully functional for 1 second

Chapter 13

The RADWIN Ethernet Ring

Scope

The description of RADWIN Ethernet Ring in this Chapter is completely generic: Both WinLink 1000 and RADWIN 2000 links may participate in an Ethernet ring.

VLAN IDs are used by RADWIN products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

What is an Ethernet Ring

An Ethernet ring consists of several nodes connected by hops (links). Loops are not allowed with Ethernet; therefore one hop is a **Ring Protection Link** (RPL) which "blocks" Ethernet traffic. In the event of failure in the ring, the Ring Protection Link unblocks and Ethernet traffic in the ring is restored.

Some terminology:

- **Normal State** – all member links are functional except the RPL which is blocked.
- **Blocked** - the air-link is up but Ethernet traffic is not transmitted across the link. The Ethernet service panel for the RPL in the RADWIN Manager is labeled **Idle**
- **Unblocked** - Ethernet traffic is transmitted across the RPL. The Ethernet service panel for the RPL in the RADWIN Manager is labeled **Active**
- **Protection State** – a member link is broken and the RPL passes Ethernet traffic
- **Ring Protection Link** - as described above
- **Ring Link** - any member link controlled by the RPL
- **Independent Link** - not subject to ring protection

- **Ring Protection Message** (RPM) - control message used to monitor and control the ring.

Note

RPM messages are **broadcast**, so it is essential (to prevent flooding) to associate the RPL and member Ring LInks with a VLAN ID. This requires in turn, that equipment used in the ring either supports VLAN or can transparently pass through VLAN tagged packets.

RADWIN Ethernet Ring

The following figure describes the RPL behavior during a ring failure and recovery cycle.

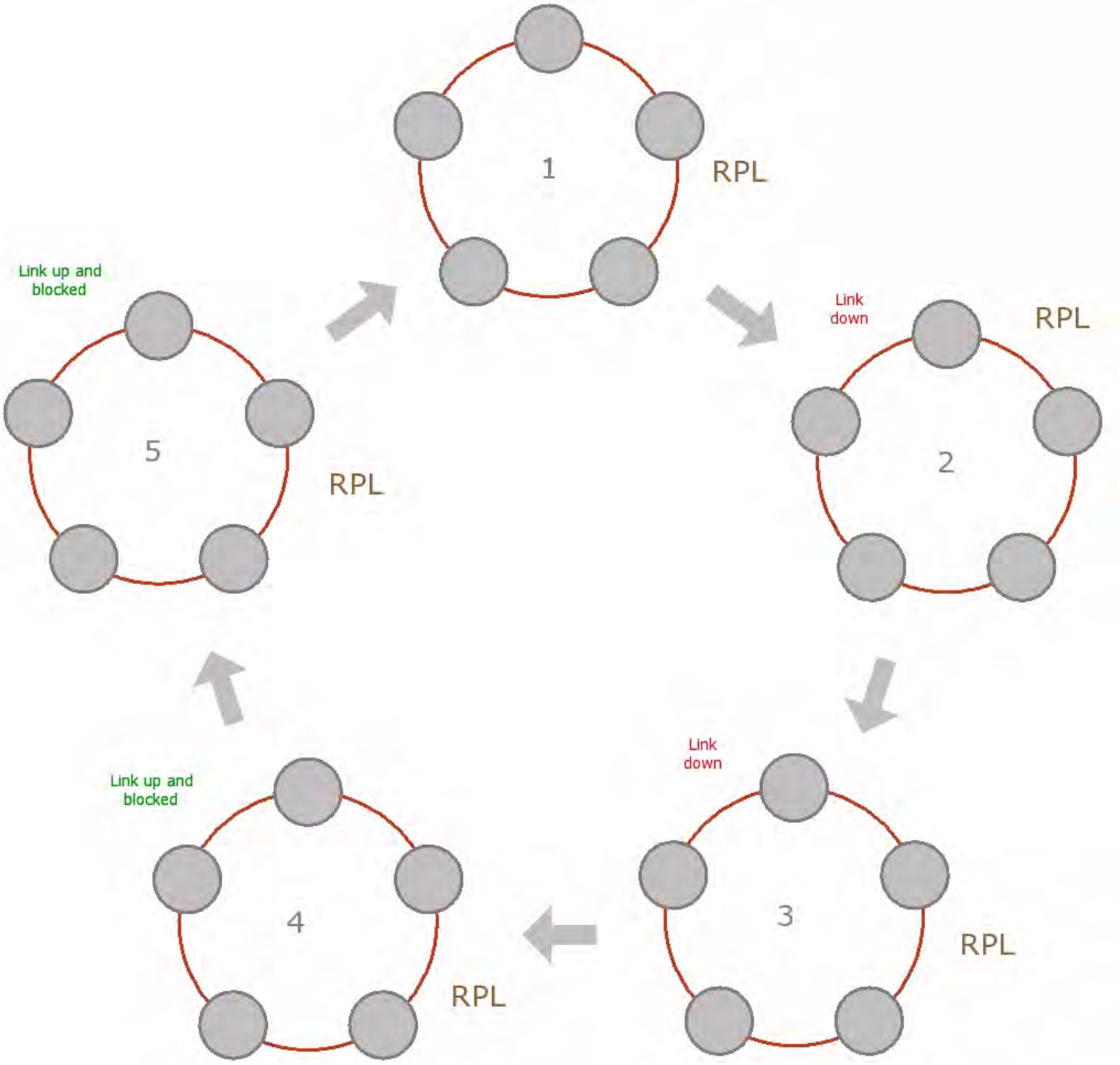


Figure 13-1: Ring Protection mechanism

The steps below follow the numbering in **Figure 13-1**:

1. Normal operation

Ethernet traffic runs in the ring, but does not pass through the RPL, which is blocked. The RPL does however, broadcast RPM packets through the ring.

2. Ring Link down, RPL notified

The RPL detects a link-down condition by the non-arrival of an RPM packet. It remains blocked for the **Minimum time for failure detection** which is configurable using the RADWIN Manager (see page **13-9**).

3. Ring Link down, RPL unblocked for traffic

The RPL unblocks for Ethernet traffic after the **Minimum time for failure detection** expires and no RPM message has been received.

4. Ring Link restored but still blocked for traffic

The Ring Link is restored, but remains blocked for the **Minimum time for recovery**, set using the RADWIN Manager, to avoid rapid fluctuations leading to potential short term loops (see page **13-9**).

5. Ring Link restored, RPL blocked for traffic

The RPL blocks to Ethernet traffic after the **Minimum time for recovery** expires and restores Ethernet traffic to the Ring Link (with a special RPM packet).

Return to 1.) Ring Link restored, RPL blocked for traffic

The ring is back to normal operation.

With RADWIN links, RADWIN's Ring Protection solution prevents Ethernet loops in the ring at all times. The ring is always broken somewhere.

- Under a ring configuration a RADWIN Ring Link that was down and commences recovery, keeps blocking Ethernet traffic. The RPL identifies this situation, blocks itself and then unblocks the other Ring Link. This is the transition from step 4 to 5 in **Figure 13-1**.
- If the failed hop is not a RADWIN link then there are two possibilities:
  - If the hop Ring Link can signal that it is down by issuing a Loss of Signal (LOS) at the Ethernet port, then the RPL will control the RADWIN link connected to that port in the same manner as described above, to prevent an Ethernet loop.
  - Otherwise, there may be a short loop period when the RPL is still open for traffic and the Ring Link is also unblocked during the **Minimum time for recovery**.

Ethernet Ring Topologies Supported by RADWIN

The following ring topologies are supported:

Table 13-1: Topologies supported by RADWIN Ethernet Ring

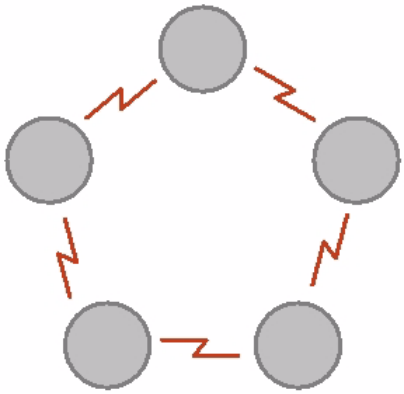
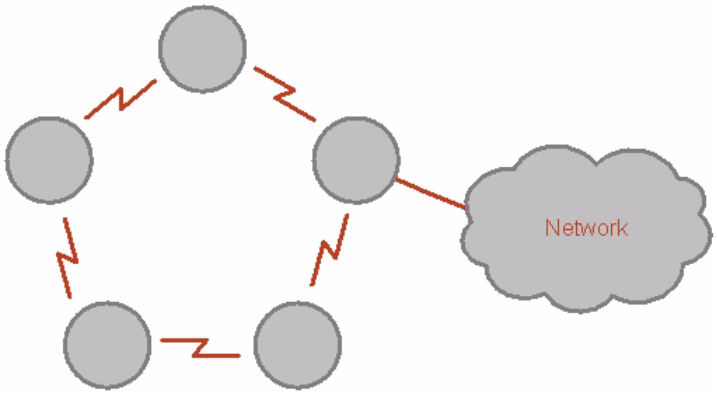
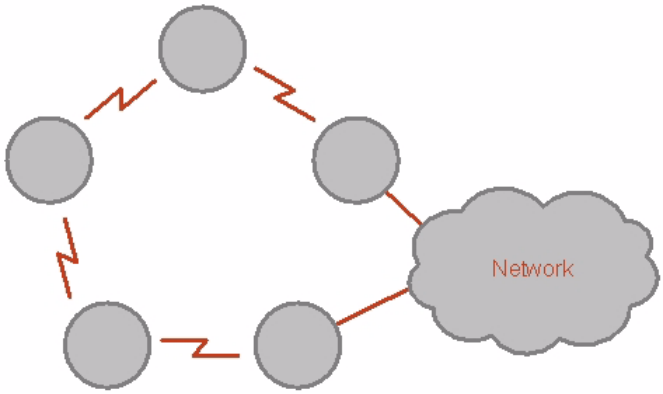
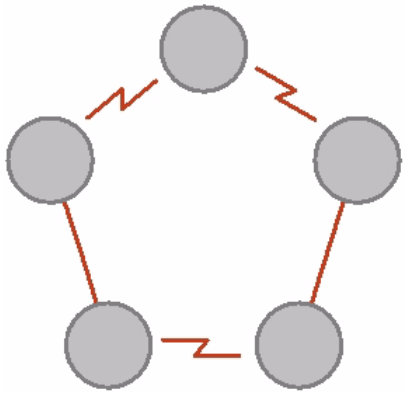
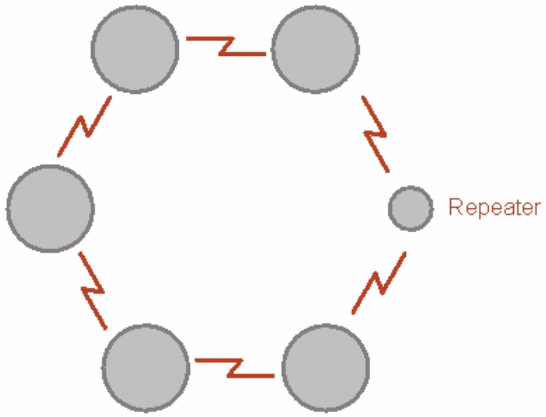
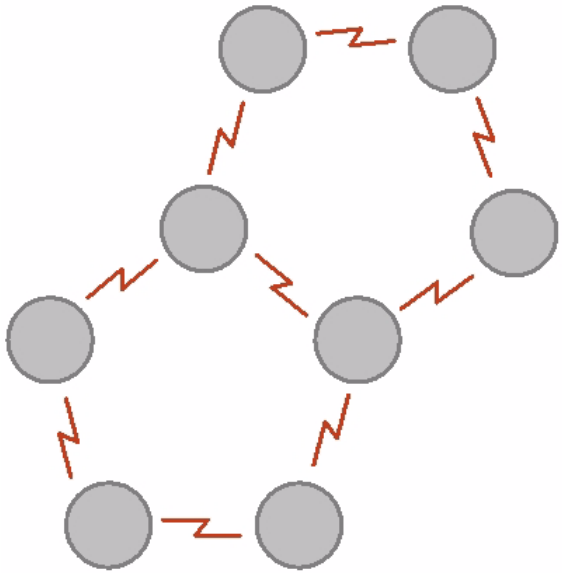
Stand-alone ring	The ring is not connected to other rings 
Single-homed ring	One of the nodes is connected to another network / ring: 
Dual-homed ring	Two adjacent nodes are connected through a non-RADWIN link (e.g. micro wave or fiber):  Note: • The network has to be layer 2 and support VLANs • The ring control broadcasts RPM packets. Hence it is recommended to prevent these packets from propagating into the network

Table 13-1: Topologies supported by RADWIN Ethernet Ring (Continued)

Mixed ring	Some of the hops are connected through non-RADWIN links: 
Repeater sites	Some of the hops are connected through RADWIN links with PoE devices, not supporting ring functionality: 
Shared ring	RADWIN rings with shared hops.  Note: • A RADWIN link hop can be a part of up to 4 rings • The RPL cannot be a shared link • The two RPLs should use different Minimum Time for Activation values to prevent duplicate action causing a loop

Protection Switching

Protection switching occurs upon failure in the ring.

The Ethernet service restoration time depends on the number of hops in the ring. With four hops the Ethernet service is restored in less than 50 ms.

In single and dual homed topologies the service restoration may take longer due to the aging time of the external switches. Switches that are immediately aware of routing changes reduce the restoration time.

Hardware Considerations

Ethernet Ring Protection is supported by the IDU-C, IDU-E and PoE.

A typical Ring Protection Link consists of an IDU-C or new style IDU-E, a PoE and two ODUs as shown in **Figure 13-2**. Hence one end of the RPL and of ring controlled links, as shown in **Figure 13-2** has to be an IDU. It is recommended to have an IDU at each node to have the flexibility to change the RPL.

A ring node is built from two ODUs from adjacent links. The ODUs can be connected to either an IDU or to a PoE device as in **Figure 13-2**. Port names in the IDU are shown.

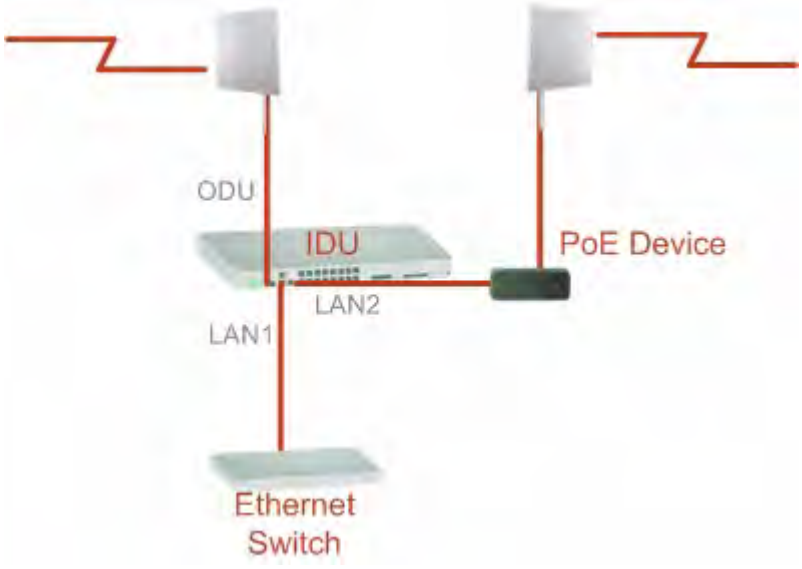


Figure 13-2: Node with IDU and PoE device

Note

Connect the switch at the site only to one IDU.

The switching function is carried out by the IDU-Cs and IDU-Es, both of which provide Layer 2 support (see **Chapter 14**).

Special Case: 1 + 1 Ethernet Redundancy

The same device may be used to provide economic 1 +1 redundancy for a single link.

A 1+1 Ethernet is a ring with two nodes. One of the links is RPL.

The equipment in a 1+1 Ethernet installation is as follows:

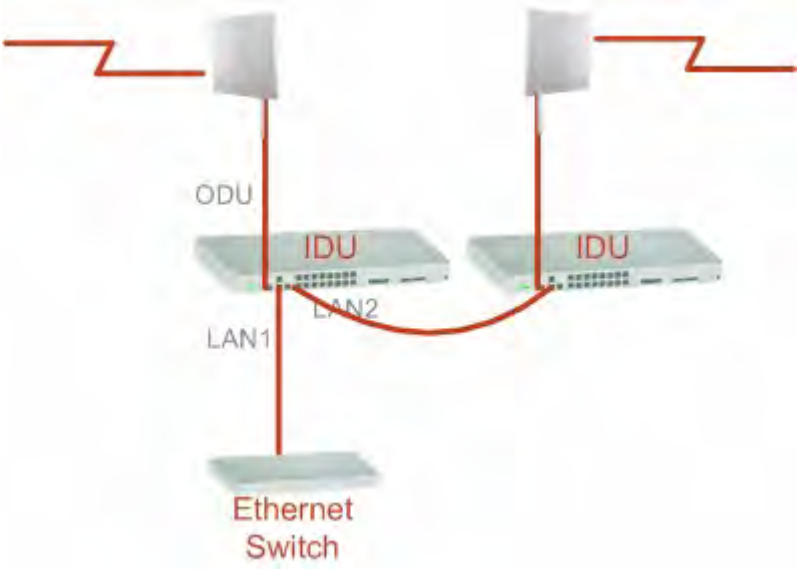


Figure 13-3: 1+1 Ethernet

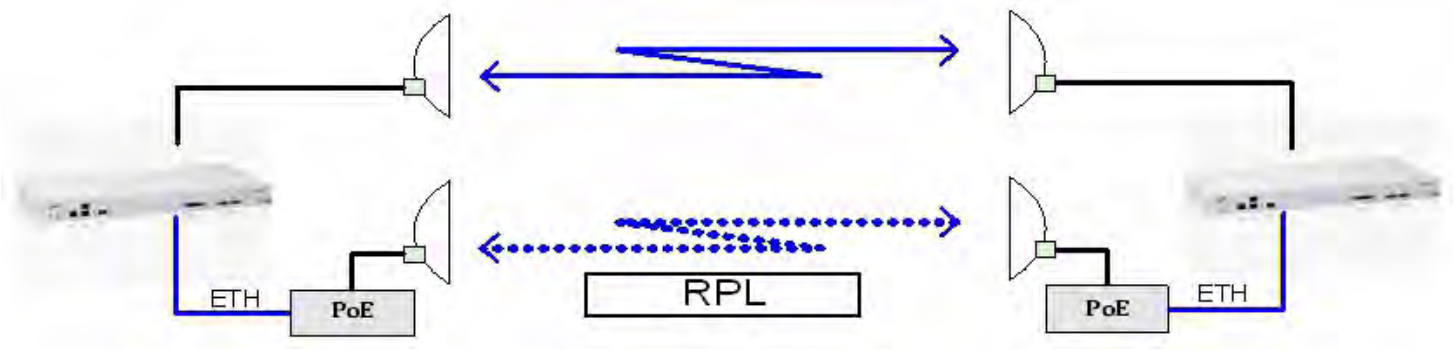


Figure 13-4: Using IDU-C or IDU-E with PoEs for the RPL

Notice that link content drops from four PoEs plus two switches to two PoEs and two IDU-Cs or IDU-Es.

Using RADWIN Manager to Set up a Ring

Creating a Ring using RADWIN Manager requires two stages:

6. Set up each participating link separately, in the usual way
7. For each link, run the Configuration wizard to define it as RPL or a Ring Link

- The Ring uses a VLAN ID for the RPL. It is used to manage the Ring and nothing else; it is completely separate from the management and traffic VLANs referred to elsewhere
- A regular Ring Link may be a member of up to four rings and each of their RPL VLAN IDs must be configured

Here then, is step 2 in more detail:

To integrate a link into an Ethernet Ring:

1. Using either the Installation or Configuration wizards, navigate to the Services window and chose the Ring tab.

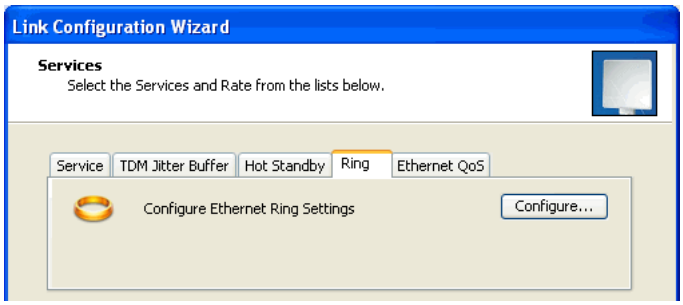


Figure 13-5: Services window with Ring selected

2. Click **Configure**. The Ring definition window is displayed. The default is Independent Link and is used when the link is not part of any Ring.

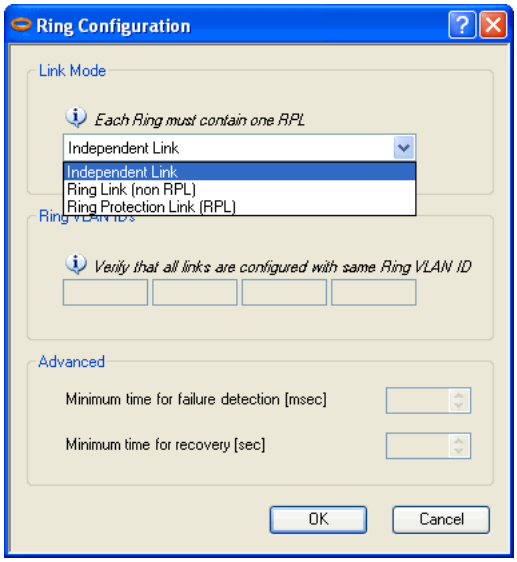


Figure 13-6: Ring Options

3. To configure the link as a regular Rink link, click **Rink Link (Non- RPL)** and enter the ring LAN VIDs (at least one) to which it belongs and click **OK**:

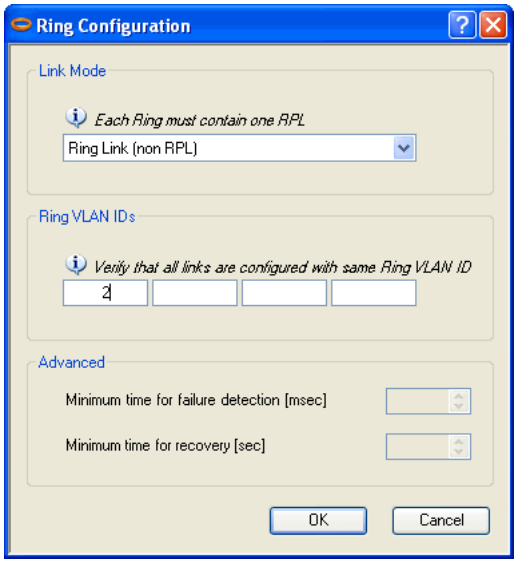


Figure 13-7: Configuring Ring LAN VIDs

4. To configure the link as RPL, click **Ring Protection Link (RPL)** and enter its Ring VID.

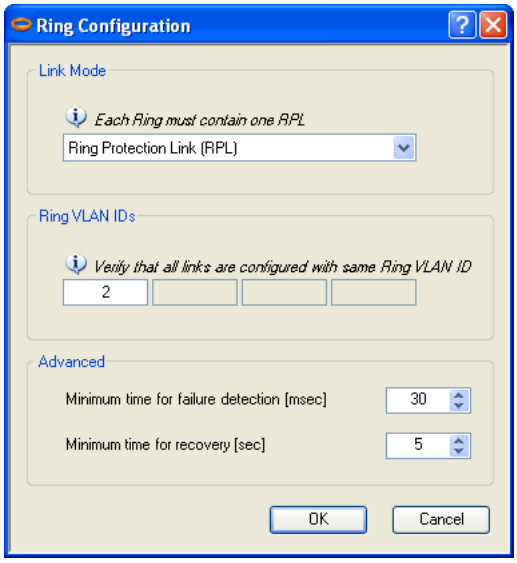


Figure 13-8: Configuring RPL VIDs

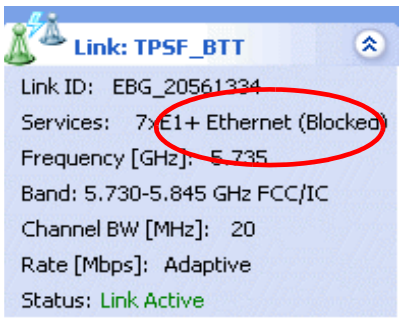
5. Enter the minimum times for failure detection and recovery.

   For dual-homed configurations, where part of the ring goes through the core, if a core segment fails, the core should be allowed to recover before the RPL enters Protection State. Otherwise, it could happen that both the core and the RADWIN ring will switch in parallel. You should therefore, configure a **Minimum time for failure detection** high enough to take this possibility into account.

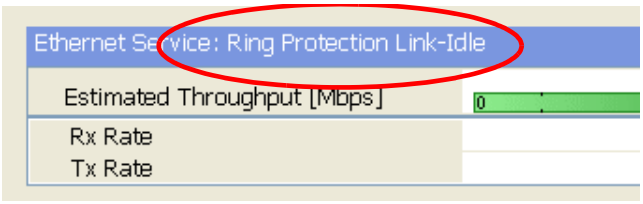
   The **Minimum time for recovery** is a delay switch to prevent rapid “on-off” fluctuations. It functions like a delay switch use to protect electrical devices from rapid “on-off” power fluctuations, which in this context, may lead to potential short term loops.

6. Click **OK** to accept your settings.

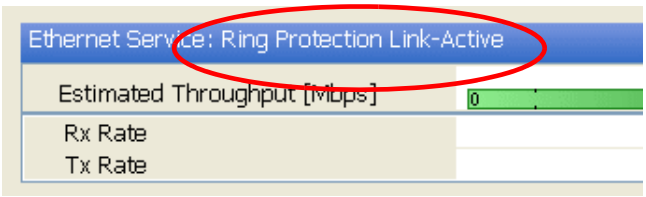
The RPL will be clearly indicated in the RADWIN Manager. In the Link status area on the top left, you will see an Ethernet (Blocked) notice:



A Link-Idle message is displayed on the Ethernet Services Bar:



When the RPL cuts in as a result of a failure, the “Ethernet (Blocked)” notice disappears. The Ethernet Services Bar indicated that the RPL is active:



Upon restoration of the broken link, the RPL returns to idle status with the appropriate indications on the RADWIN Manager main window.

On the status bar for all ring member links, you will see the ring membership indicator icon:

Caution

- Do not configure more than one RPL. If you do, you will break the Ring
- If you forget to configure one RPL in a Ring, you will introduce a loop into your network

Chapter 14

VLAN Functionality with RADWIN 2000

VLAN Tagging - Overview

VLAN Terminology

Both the technical literature and the RADWIN Manager use the terms VLAN ID and VID interchangeably to denote a VLAN identification number.

VLAN Background Information on the WEB

The standards defining VLAN Tagging are IEEE_802.1Q and extensions.

For general background about VLAN see **http://en.wikipedia.org/wiki/Virtual_LAN**.

Background information about **Double Tagging** also known as **QinQ** may be found here: **http://en.wikipedia.org/wiki/802.1QinQ**.

VLAN Tagging

VLAN tagging enables multiple bridged networks to transparently share the same physical network link without leakage of information between networks:

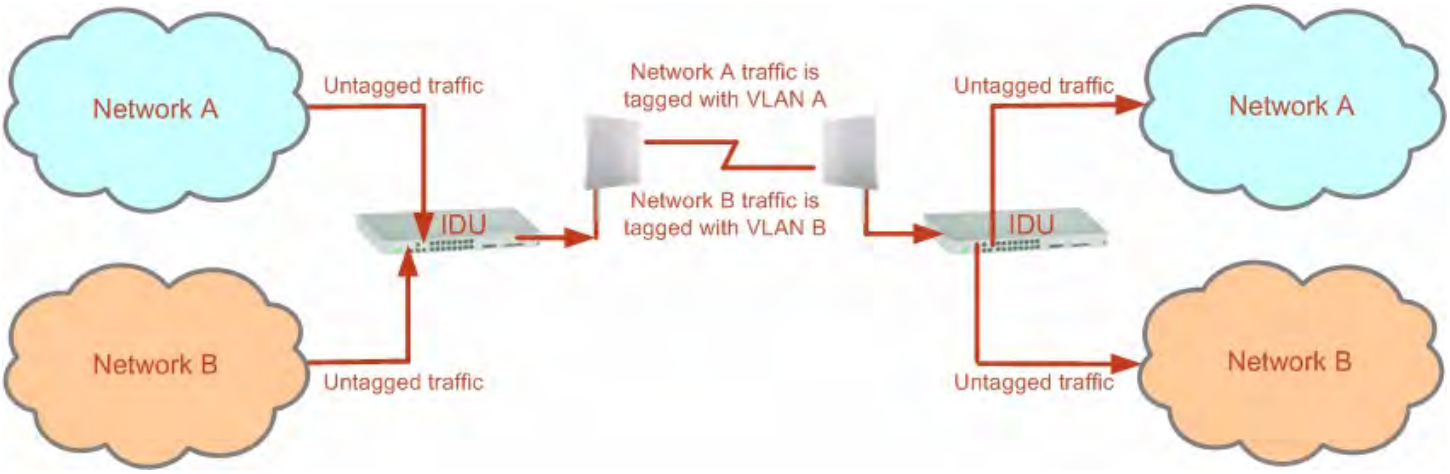


Figure 14-1: Two network using the same link with tagging

IEEE 802.1Q is used as the encapsulation protocol to implement this mechanism over Ethernet networks.

QinQ (Double Tagging) for Service Providers

QinQ is useful for Service Providers, allowing them to use VLANs internally in their “transport network” while mixing Ethernet traffic from clients that are already VLAN-tagged.

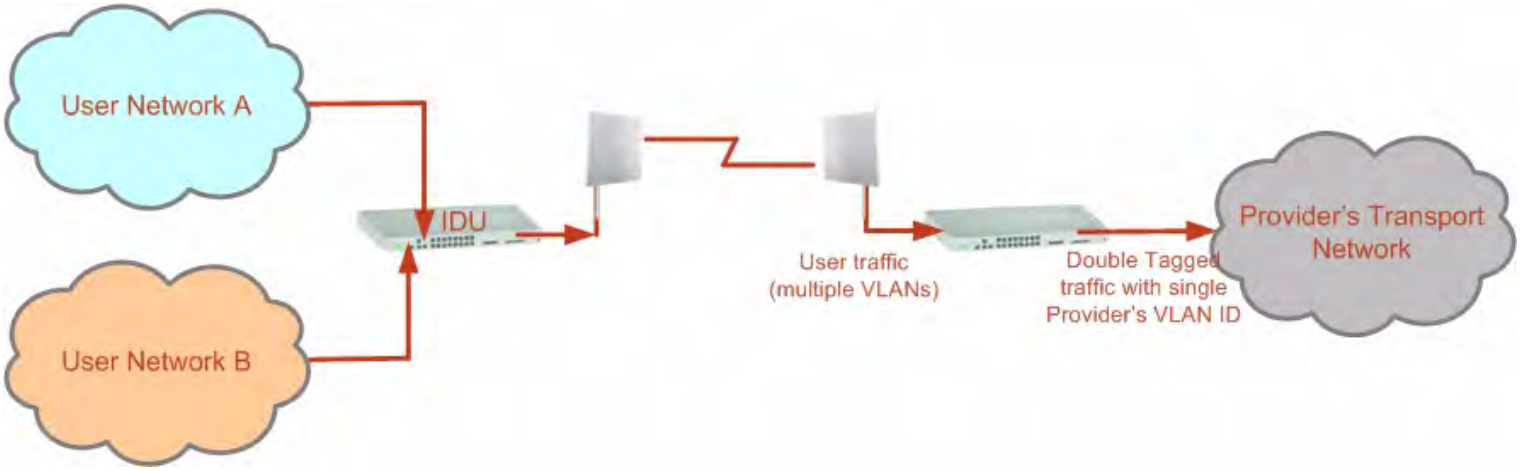


Figure 14-2: Separating client data streams using double tagging

The outer tag (representing the Provider VLAN) comes first, followed by the inner tag. In QinQ the EtherType = 0x9100. VLAN tags may be stacked three or more deep.

When using this type of “Provider Tagging” you should keep the following in mind:

- Under Provider Tagging, the system double-tags egress frames towards the Provider’s network. The system adds a tag with a VLAN ID and EtherType = 0x9100 to all frames, as configured by the service provider (Provider VLAN ID).
- The system always adds to each frame, tags with VLAN ID and EtherType = 0x9100. Therefore,
  - For a frame without a tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will have one tag
  - For a frame with a VLAN tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be double-tagged
  - For a frame with a VLAN tag and a provider tag – the system will add a tag with VLAN ID and EtherType = 0x9100 so the frame will be triple-tagged and so on

VLAN Untagging

VLAN Untagging means the removal of a VLAN or a Provider tag.

Port Functionality

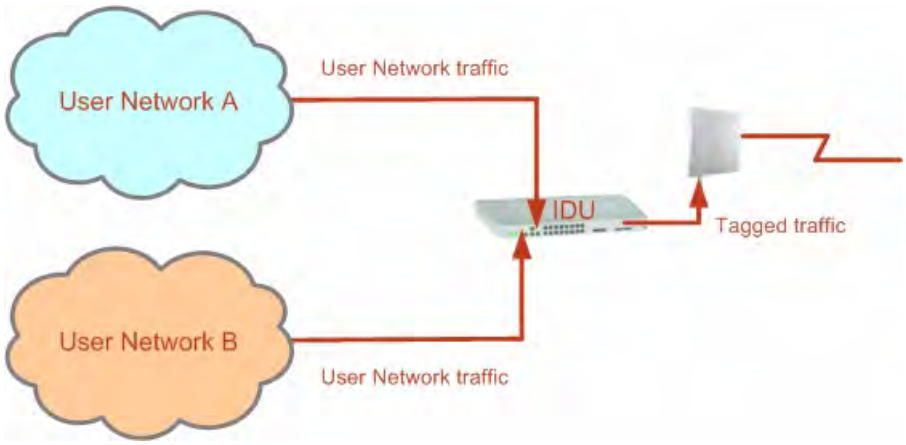
The VLAN functionality is supported by all LAN and SFP ports in the IDU.

Each port can be configured how to handle Ethernet frames at the ingress direction (where frames enter the IDU) and at the egress direction (where frame exit the IDU).

The configuration is independent at each port.

Ingress Direction

Table 14-1: Port settings - Ingress direction

Transparent	The port 'does nothing' with regard to VLANs - inbound frames are left untouched.
Tag	Frames entering the port without VLAN or QinQ tagging are tagged with VLAN ID and Priority[a], which are pre-configured by the user. Frames which are already tagged at ingress are not modified. 

a. Priority Code Point (PCP) which refers to the IEEE 802.1p priority. It indicates the frame priority level from 0 (lowest) to 7 (highest), which can be used to prioritize different classes of traffic (voice, video, data, etc).

Egress Direction

Table 14-2: Port settings - Egress direction

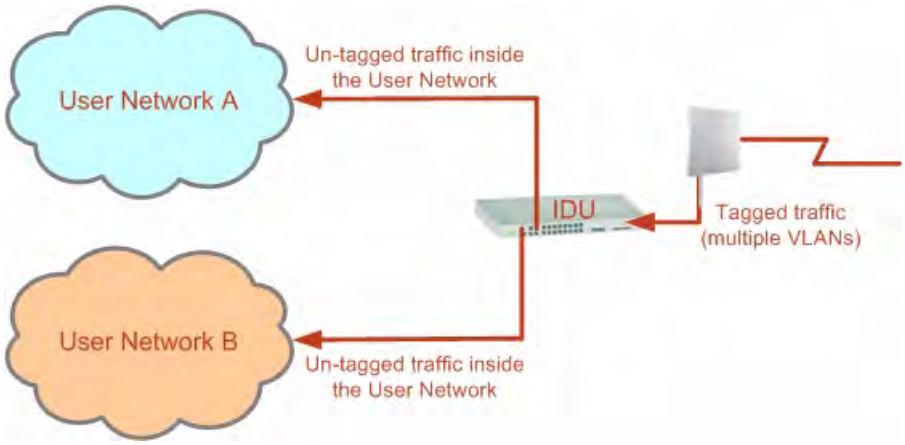
Transparent	The port 'does nothing' with regard to VLANs - outbound frames are left untouched.
Untag all	All frames are untagged. 

Table 14-2: Port settings - Egress direction (Continued)

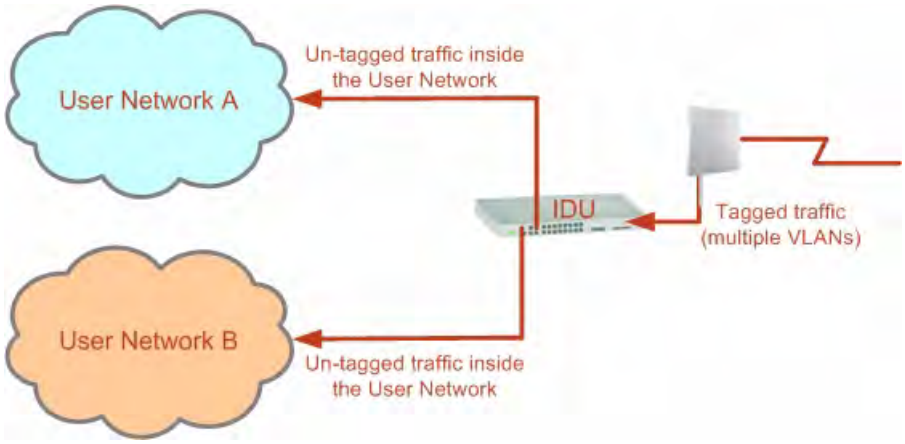
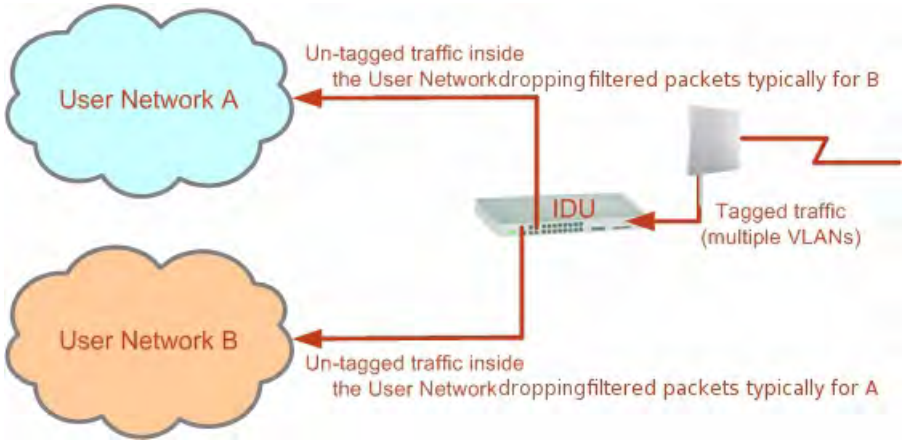
Untag selected VIDs	Untags only frames tagged with one of the user defined VIDs. You can define up to eight VIDs per port. Other frames are not modified. 
Filtered VLAN IDs at egress	This setting allows for mutual filtering of multiple ingress tags not relevant at the egress end: 

Table 14-2: Port settings - Egress direction (Continued)

Provider tagging	With Provider tagging, the system double-tags egress frames towards the provider's network. All frames are tagged QinQ with a VLAN ID, which is configured by the service provider (Provider VLAN ID).  With this setting, ingress frames which are not tagged with the configured Provider VLAN ID are blocked (filtered).  Note: Each port can be configured independently to a tagging mode. However, only a single Provider VLAN ID can be defined per IDU.
Provider tagging without filter	This setting functions like **Provider tagging**. However, all ingress frames are passed through. 

VLAN Availability

VLAN is available for links using either WinLink 1000 or RADWIN 2000 radios. VLAN support requires the use of IDU-Cs or new style IDU-Es.

VLAN Configuration Using the RADWIN Manager

Caution

VLAN IDs are used by RADWIN products in three separate contexts: Management VLAN, Traffic VLAN and Ethernet Ring. It is recommended that you use different VLAN IDs for each context.

Disclaimer

If you are **not** a VLAN expert, please be aware that incorrect VLAN configuration may cause havoc on your network. The facilities described below are offered as a service to enable you to get best value from your RADWIN 2000 links and are provided "as is". Under no circumstances does RADWIN accept responsibility for network system or financial damages arising from incorrect use of these VLAN facilities.

Management Traffic and Ethernet Service Separation

You can define a VLAN ID for management traffic separation. You should configure the system to prevent conflicts as detailed below.

When configured for the default operational mode, a “Provider port” will handle ingress traffic as follows:

- Filters frames that are not tagged with the Provider VLAN ID
- Removes the Provider double tag

Therefore, if a port is configured for management traffic separation by VLAN and as ‘Provider port’, then the received management frames must be double tagged as follows:

- The outer tag has to be the Provider’s tag (so the frame is not filtered)
- The internal tag has to be management VLAN ID

To avoid mix-ups, best practice is to:

- Separate the management and data ports
- Define only a data port with Provider function

All IDU-C and new style IDU-E models have two LAN ports so you can easily separate management and Ethernet service.

VLAN Tagging for Ethernet Service: Configuration

VLAN Configuration is carried out per site. It is up to you to ensure consistency between the link sites. The discussion below is based on Site A however, it also applies to Site B.

To set up VLAN tagging for Ethernet service, enter Site Configuration for Site A, choose the Ethernet tab and click the **VLAN Configuration...** button (**Figure 8-15**). The following window is displayed:

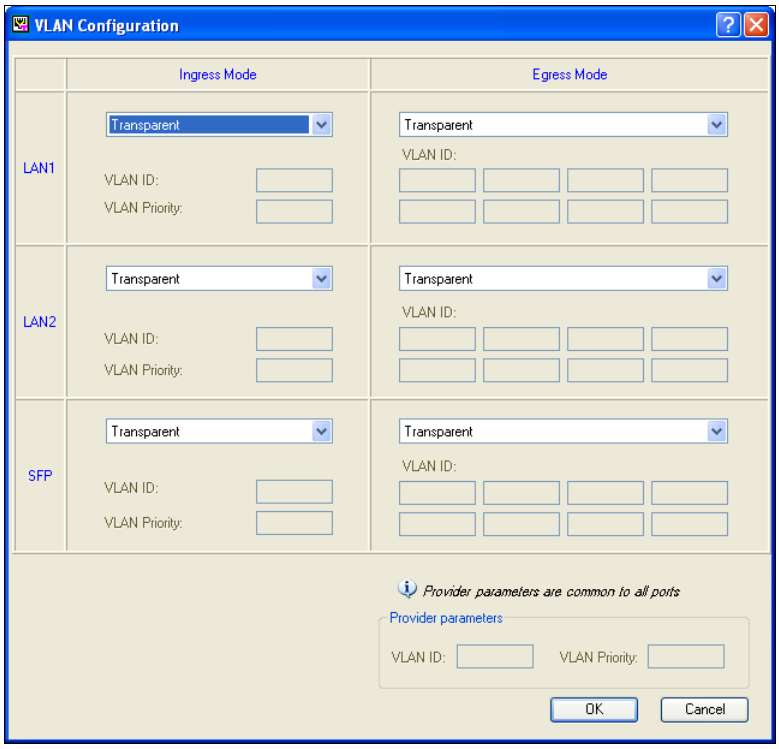


Figure 14-3: VLAN tag settings

Note

If you are using a new style IDU-E, the SFP row will not appear.

The choices for Ingress Mode are -

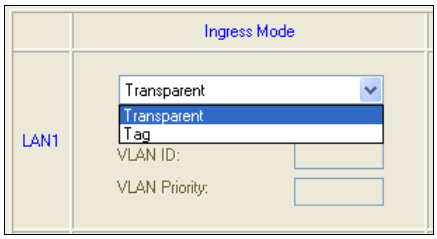


Figure 14-4: VLAN: Ingress modes

The two choices correspond respectively to the two rows of **Table 14-1**. Choosing **Tag** causes the VLAN ID and VLAN Priority fields to become available:

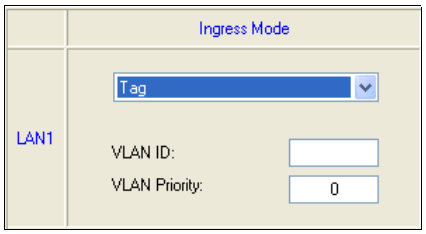


Figure 14-5: VLAN: Ingress mode - setting VLAN ID and Priority

Note

Throughout this chapter, all VLAN IDs must be between 1 and 4094, inclusive. All VLAN priorities must be between 0 and 6, inclusive. The values entered are range-checked. If for example, you enter a VLAN ID of 4095, then 4094 will be reflected back.

The choices for Egress Mode are -

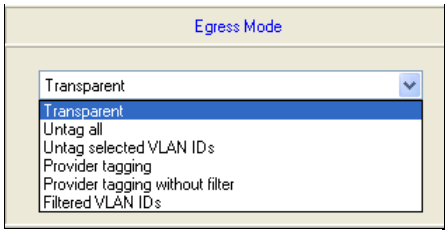


Figure 14-6: VLAN: Egress modes

The five non-transparent choices correspond respectively to the five rows of **Table 14-2** in the order, row 1, 2, 4, 5, 3.

The first two choices, **Transparent** and **Untag all** require no further action.

Untag selected VIDs causes the eight VLAN ID fields to become available:

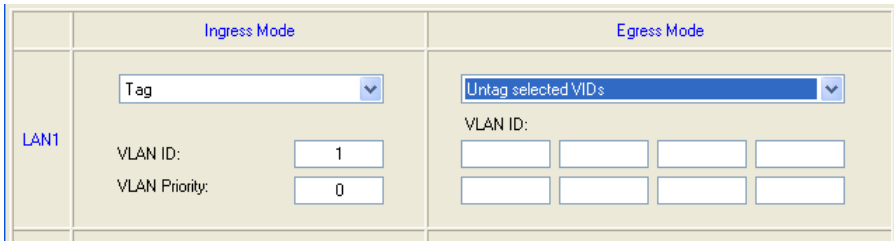


Figure 14-7: Untagging selected VIDs

You may nominate up to eight VIDs for untagging; beyond simple range checking, there is no other validation.

Both **Provider tagging** and **Provider tagging without filter** enable the **Provider parameters** fields:

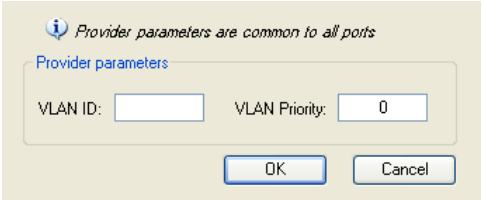


Figure 14-8: Provider parameters

There is of course only one Provider VLAN ID. It is most likely yours, as the Provider!

Filtered VLAN IDs enables you to filter and block only frames tagged with one of the user defined VIDs. You can define up to eight VIDs per port. Other frames are not modified and are forwarded transparently.

When you are finished, remember to click **OK** (**Figure 14-3**) to save your entries.

Chapter 15

Software Upgrade

What is the Software Upgrade Utility?

The RADWIN Manager provides a Software Upgrade Utility (SWU) to upgrade the software (firmware) of installed ODUs in a network. The update files may be located anywhere accessible by the operator.

The SWU provides for:

- Prior backup of the current files prior to upgrade
- Upgrade from a list
- Delayed upgrade
- Various ODU reset options

The default location of the software files is in the installation area, and can be used to restore factory defaults.

The following procedure is generic to all RADWIN radio and GSU products.

Upgrading an Installed Link

➢ **To upgrade software for a link:**

1. In the RADWIN Manager main menu, click **Tools | Software Upgrade ...** The following detached window appears

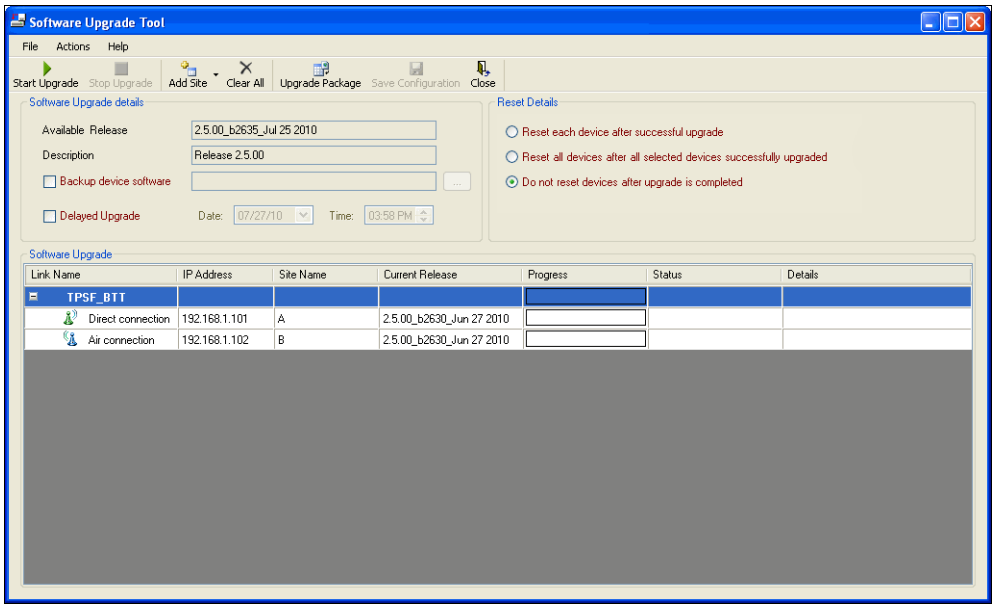


Figure 15-1: Software Upgrade Utility - Main window

The default sites shown in the Software Upgrade list panel belong to the currently link. The list may be empty if you are running the RADWIN Manager “offline”.

Warning

What follows about adding sites manually or from a list file, assumes that all sites to be upgraded are of the same type - either WinLink 1000 or RADWIN 2000. but not both. **This will not work with a mixed list.**

2. Click **Add Site** to add additional sites for upgrade.

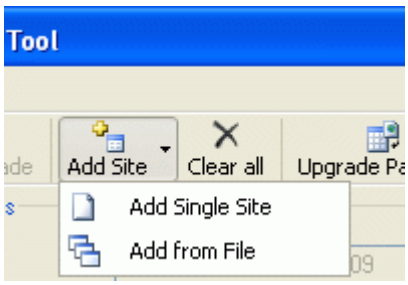


Figure 15-2: Add site options

Click **Add Single Site** for one site only:

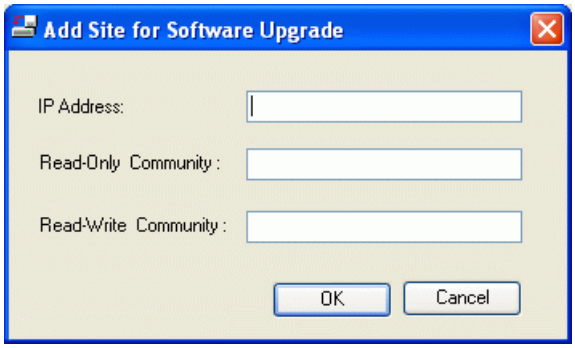


Figure 15-3: Adding a single site for upgrade

Enter the IP address of the site, the Community strings (Default: ***public*** and ***netman***, respectively) and then click OK. The site will appear in the Software Upgrade list box. For example if we add the site at IP address 192.168.2.101, the SWU main window of **Figure 15-1** looks like this:

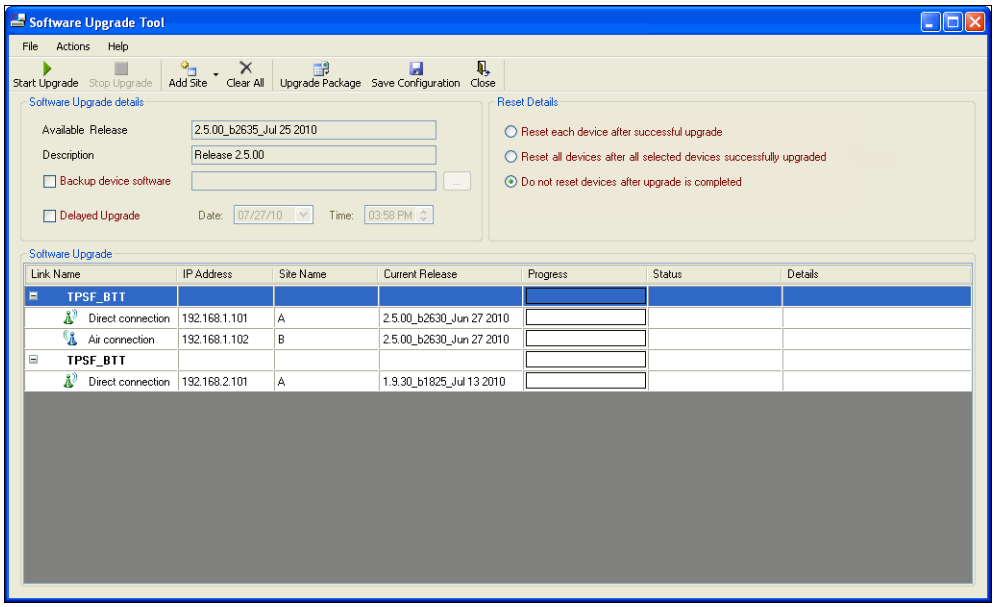


Figure 15-4: Single site added for upgrade

The list can be cleared using the **Clear All** button.

As an alternative to adding sites one at a time, you can add sites from a prepared list using the **Add from File** option in **Figure 15-2**. The list has the following format:

<IP address>,<Read-Only community>,<Read-Write community>

Here is an example:

192.168.1.101,public,netman

192.168.1.102,public,netman

192.168.2.101,public,netman

192.168.2.102,public,netman

3. Having created an update list, click **Upgrade Package** to chose the relevant files. The default files are located in the **SWU** subdirectory in the RADWIN Manager installation area. They are currently named **SWU_1k.swu** and **SWU_2k.swu**. You may have to find them elsewhere, depending on your system.

4. You make limited changes to the list by right-clicking any line:

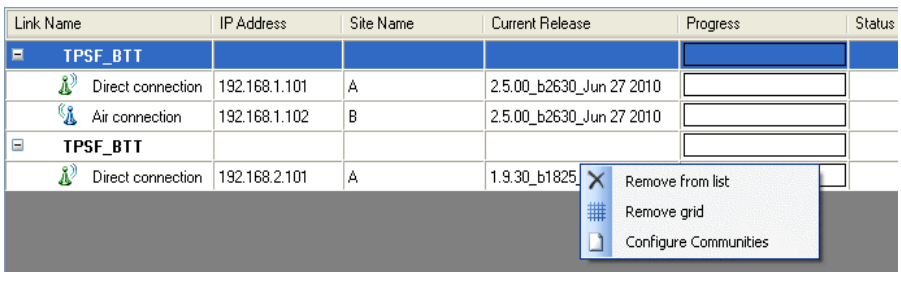


Figure 15-5: Software Upgrade site options

5. To back up your existing system, check **Backup device software** check-box. Then click the ... button for a standard file dialog. The default location is the My Documents directory on the managing computer or the last backup directory you used.

Note

The backup here is the same as that in page 8-32, and serves the same purpose. It provides a fallback if the upgrade proves problematic.

6. In addition to the previous step, you may opt to perform a delayed upgrade. Check the Delayed Upgrade box, and enter the date and time for the delayed upgrade.
7. The radio buttons on the right determines how your sites should be reset. Bear in mind that on the one hand, a reset involves a service interruption, but on the other hand, the software upgrade will not become effective until after the reset is carried out.
8. Click **Start Upgrade** to commence the process. For an immediate upgrade you will be able to observe the upgrade progress from the green progress bars:

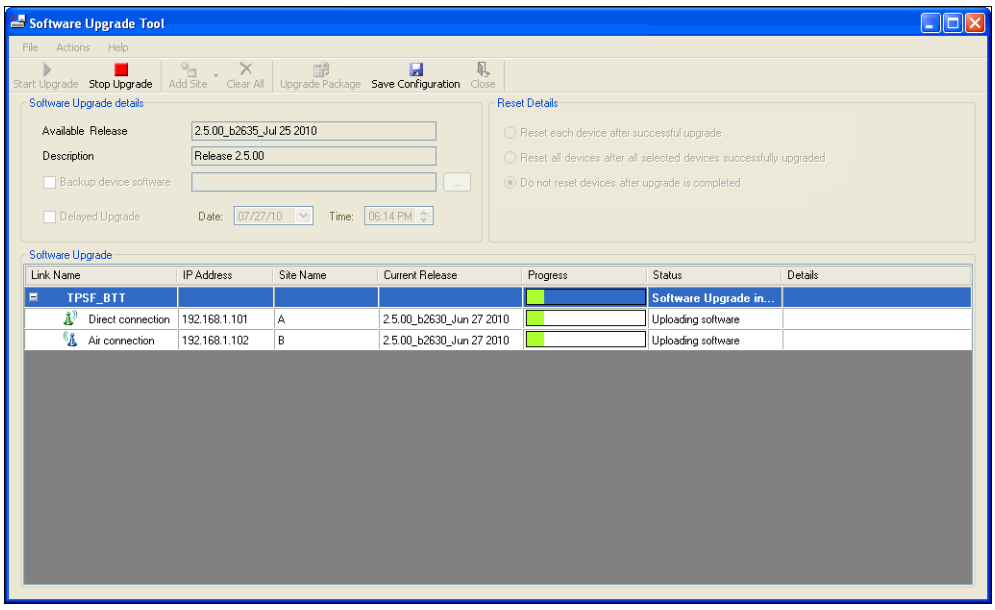


Figure 15-6: Software upgrade in progress - Note the stop button

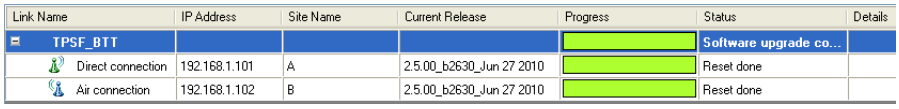


Figure 15-7: Software upgrade completed successfully

9. Click **Close** to exit.
10. If you requested a delayed upgrade, a notice like this will appear in the SWU title bar:

If one or both sites fail to update, a warning notice will be displayed.

If one site of a link updates but the other fails, you should correct the problem and update the second site as soon as possible. If you do not, following the next reset of the updated site, you could experience a link software mismatch which may affect service. See **page 9-3** for details.

Software Update for GSUs

All GSUs in a distributed site can be updated simultaneously. Use an IP list as described above.

Chapter 16

FCC/IC DFS Installation Procedure

FCC/IC 5.4/5.3 GHz Links: Background

The FCC/IC regulation for 5.4/5.3 GHz allows unlicensed wireless data equipment, provided that it does not interrupt radar services. If radar activity is detected, the equipment must automatically change frequency channel. This feature is termed Dynamic Frequency Selection (DFS). According to the standard, a channel with active radar is prohibited from use for 30 minutes. Before using a channel for transmission, the radio equipment must probe it for radar signals for a period of 60 seconds.

RADWIN radio products support DFS as well as ACS.

An immediate consequence of the FCC/IC regulation for 5.4/5.3 GHz is that the standard method of link installation using a single default fixed installation channel, cannot be used.

Instead of the installation procedure of **Chapter 5**, a **link activation** method is used.

The ODUs are either supplied from the factory ready for use at 5.4 GHz or 5.3 GHz FCC/IC or alternatively, they can be set up for these bands using the RADWIN Manager.

The following procedure is generic to all relevant RADWIN radio products. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

FCC/IC 5.4/5.3 GHz Link Activation

To Activate a FCC/IC 5.4/5.3 GHz Link:

1. Install RADWIN Manager software as usual.
2. Connect the PC to the IDU-ODU pair to be used as the local site.
3. Run the RADWIN Manager and log in as Installer. You will see the following window:

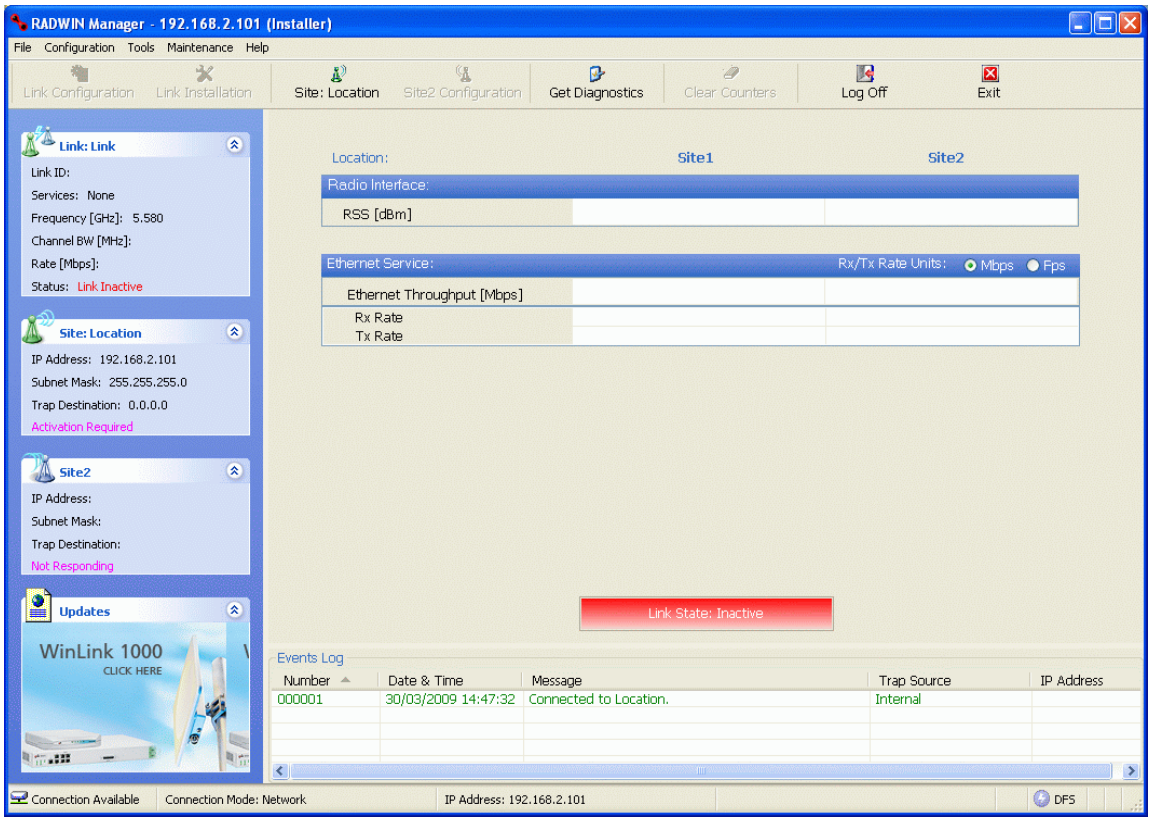


Figure 16-1: Activating an ODU - Inactive link

When the Manager Main Screen is displayed it appears with the Link Status label red and showing Inactive.

4. Click **Site:Location | Air Interface** for the logged in site.
5. The Air Interface dialog box opens:

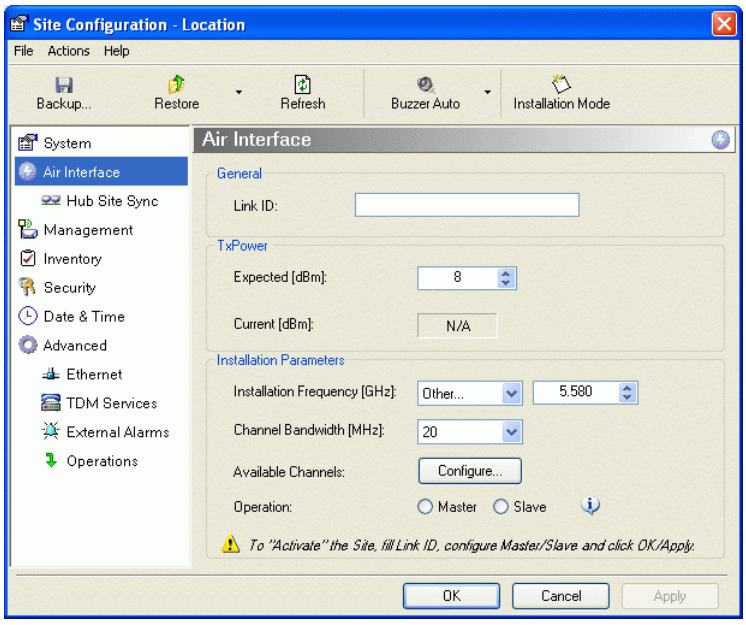


Figure 16-2: Air Interface dialog box

6. Enter the Link ID and note it for use with the second site of the link.
7. Check the **Master** radio button.

8. Click **OK.** The following window appears:

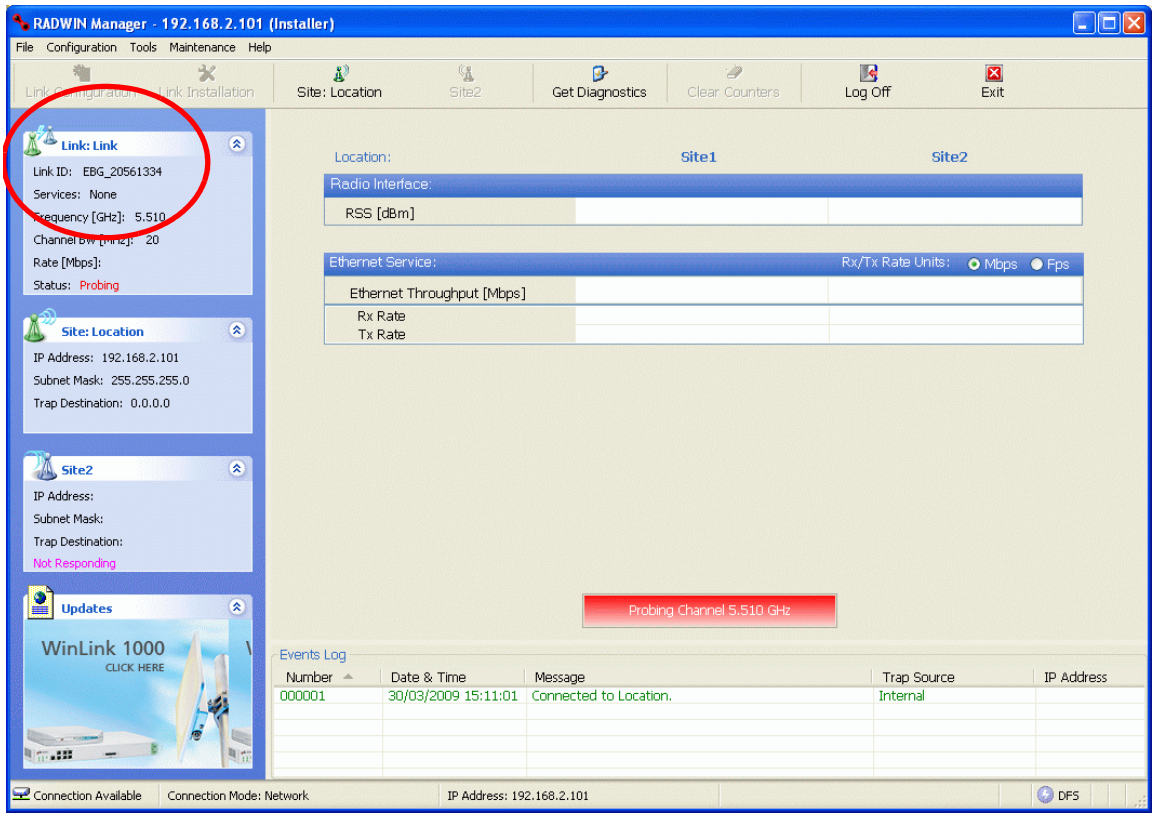


Figure 16-3: The local ODU after activation - Probing

Notice that the Link ID is shown in the Link details pane (circled).

9. Repeat the above procedure for the remote ODU, ensuring that in the Air Interface window, that you enter exactly the same Link ID, but this time that you check the **Slave** radio button.

   If both ODUs are powered up, after a minute or so a link will be established. If you are still connected to the remote site (from the previous steps), the window of **Figure 16-3** will look like this:

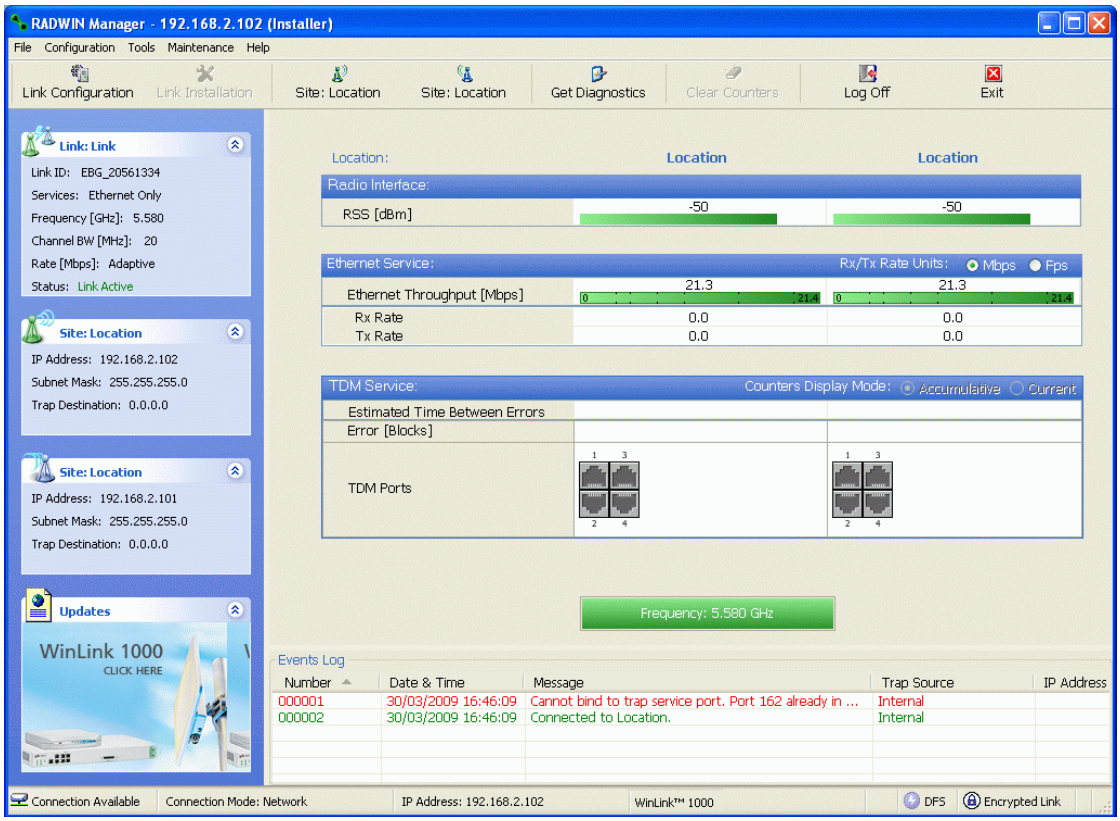


Figure 16-4: Both sites activated and awaiting configuration

FCC/IC 5.4/5.3 GHz Link Configuration

The Configuration procedure may be carried out from either site using the Configuration wizard as shown in **Chapter 7**.

Note

Both sites in a FCC/IC 5.4/5.3 GHz Link must be configured identically.

The only difference is in the Channel Settings window:

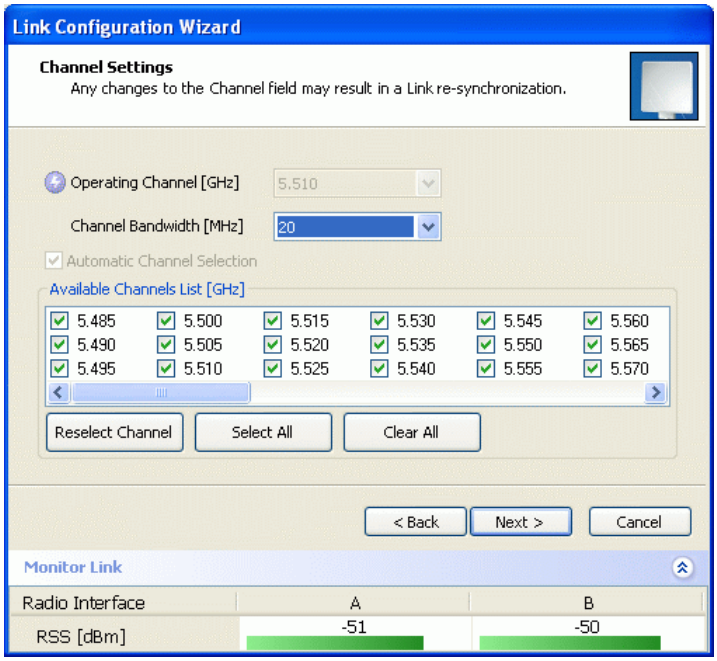


Figure 16-5: Channel Select dialog box - ACS permanently enabled

Note

ACS cannot be disabled.

Upon completion of the wizard, the Site configuration dialogs can be used in the usual way. Once operational, the RADWIN Manager window is the same as for other radio equipment models.

Here is the RADWIN Manager main window upon completion of the wizard:

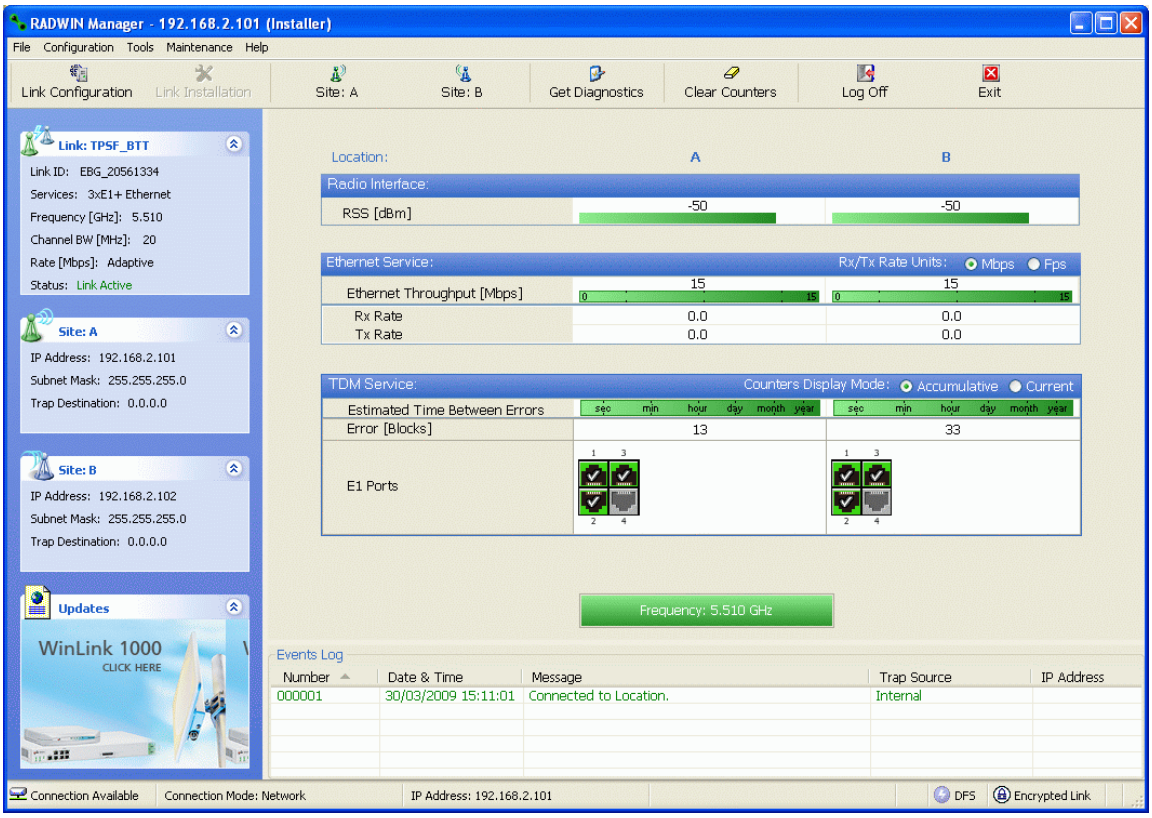


Figure 16-6: FCC/IC 5.4/5.3 GHz operational

RADWIN

RADWIN 2000

Broadband Wireless Transmission System

USER MANUAL

RELEASE 2.5.40

Part 4: Field Installation Topics

UM 2000-2540/02.11

Chapter 17

Pole and Wall Installation

ODU Mounting Kit Contents

Table 17-1: Bill of Materials: ODU mounting kit

Item	Qty
Large Clamp (see **Figure 17-1**)	1
Small Clamp (see **Figure 17-2**)	1
Arm (see **Figure 17-3**)	1
Screw hex head M8x40	4
Screw hex head M8x70	2
Washer flat M8	4
Washer spring M8	3
M8 Nuts	2

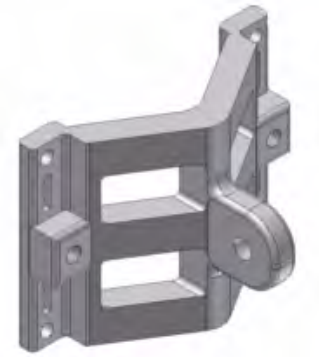


Figure 17-1: Large Clamp

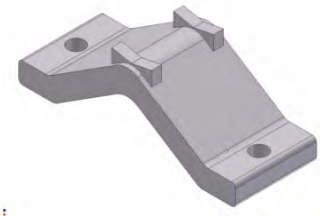


Figure 17-2: Small Clamp

Figure 17-3: Arm

Mounting an ODU on a Pole

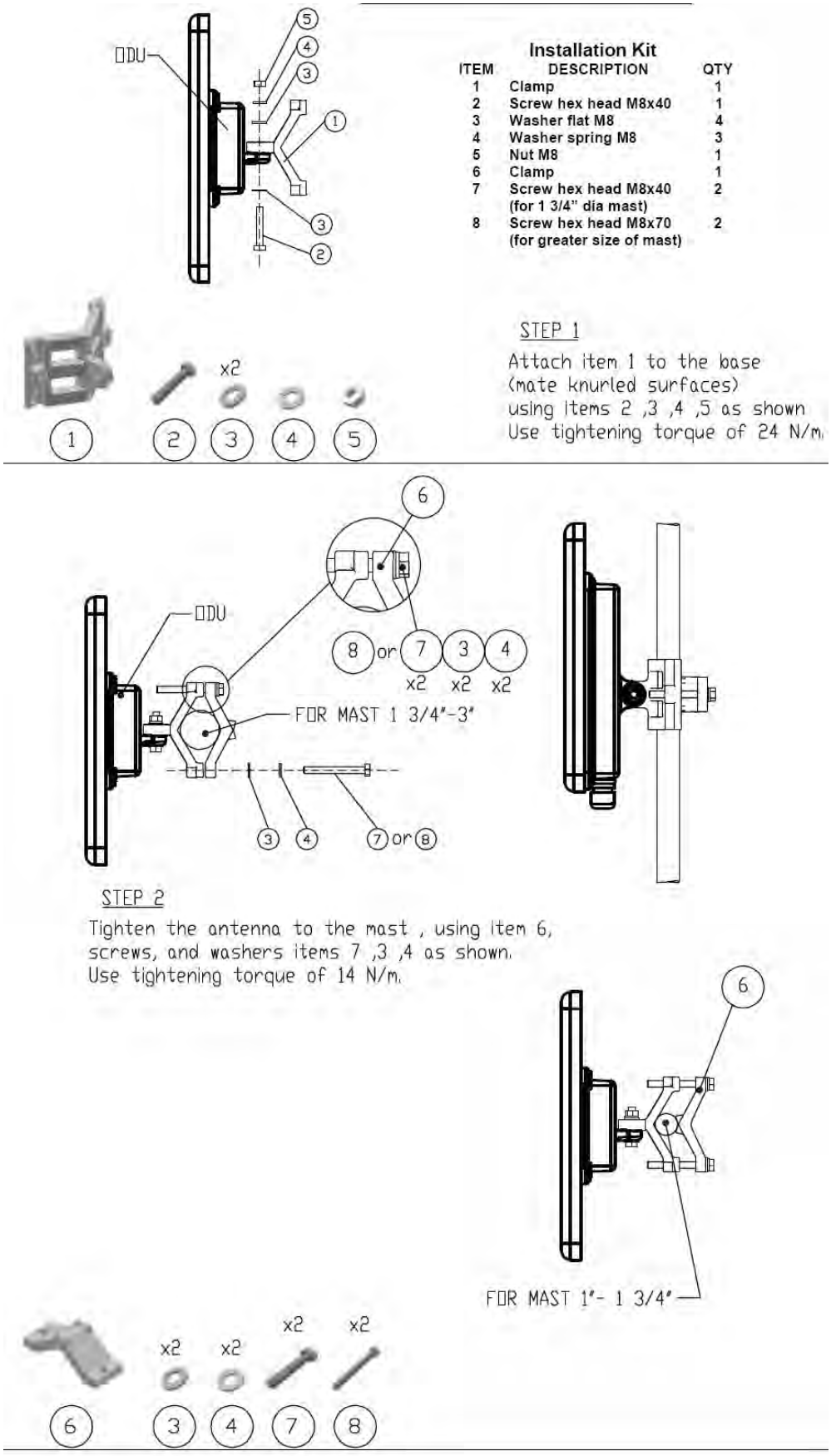


Figure 17-4: Mounting on a pole

Mounting an ODU on a Wall

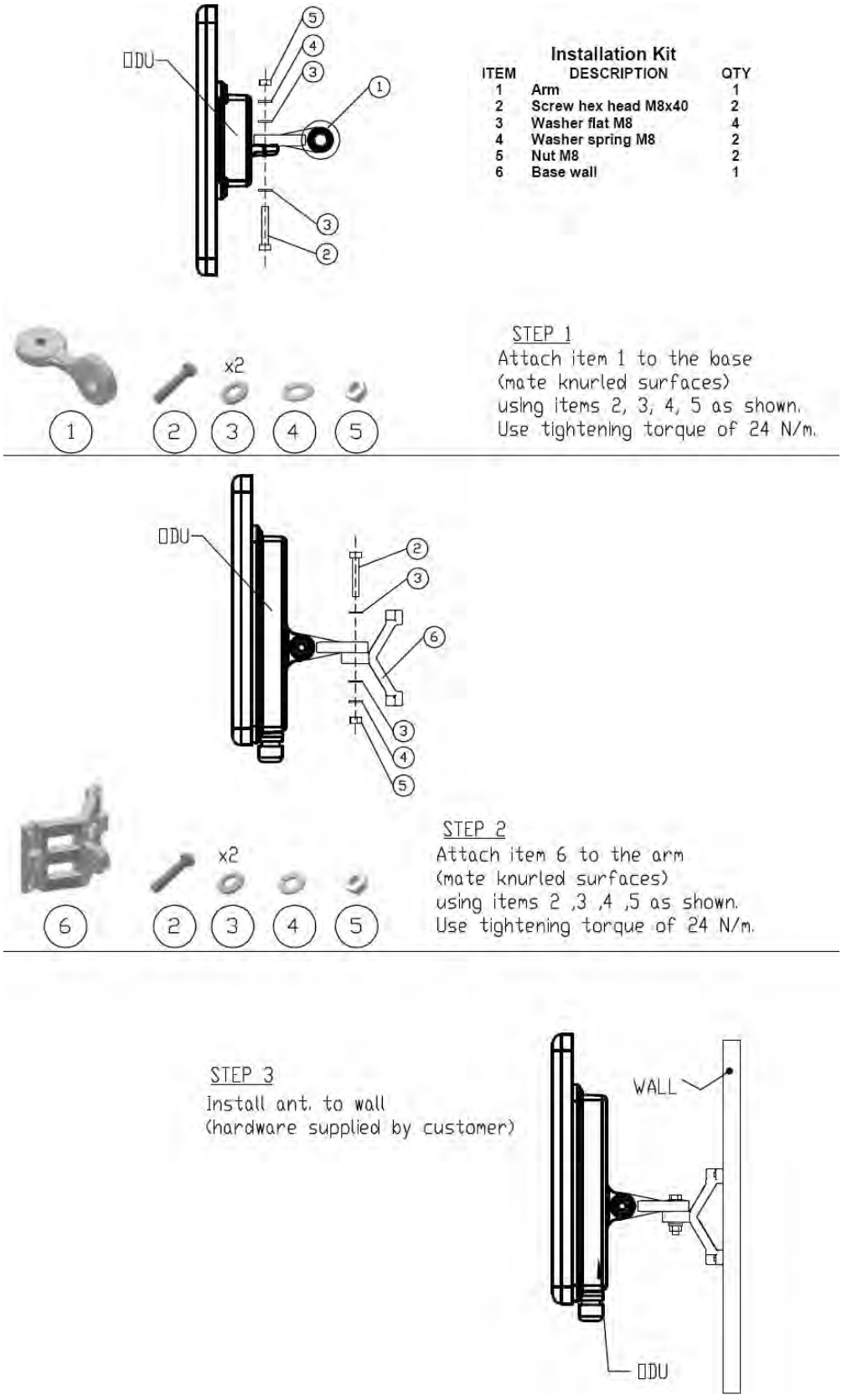


Figure 17-5: Mounting on a Wall

Mounting an External Antenna

Optional external antennas can be mounted on a pole. The external mounting kit varies according to the specific antenna model.

Mounting a Connectorized ODU Horizontally

What follows applies to both WinLink 1000 and RADWIN 2000 with obvious differences.

An ODU may be mounted horizontally as shown in **Figure 17-6**.

➢ **To mount an ODU horizontally, observe the following cautions:**

1. To ensure your warranty rights for horizontally installed ODUs, make sure that the four ports ANT1, ANT2, HSS and ODU are firmly secured or moisture sealed with the supplied caps.
2. Further, ensure that cables are connected using a “water nose” as shown in **Figure 17-6**.

Figure 17-6: Mounted ODUs with correct “water nose”

Do **not** do this:

Figure 17-7: Incorrectly mounted ODU (No “water nose”)

3. If you attach an external PoE device near the ODU, the same considerations apply.

Chapter 18

Lightning Protection and Grounding Guidelines

Meticulous implementation of the guidelines in this chapter will provide best protection against electric shock and lightning.

Warning

100% protection is neither implied nor possible.

Note

This chapter is at best a guide. The actual degree of lightning protection required depends on local conditions and regulations.

The RADWIN Lightning Protection System consists of the following components:

- Grounding for the antenna coax cable
- Grounding for each IDU and ODU
- External Primary Surge Suppressor units and grounding for the outdoor cable
- Internal ESD protection circuits over the Power/Telecom lines

Grounding for Antenna Cable

A Grounding Kit must be connected to the coax antenna cable and reliably grounded. The grounding kit is an Andrew Type 223158-2 (**www.andrew.com**). See **Figure 18-1** below.

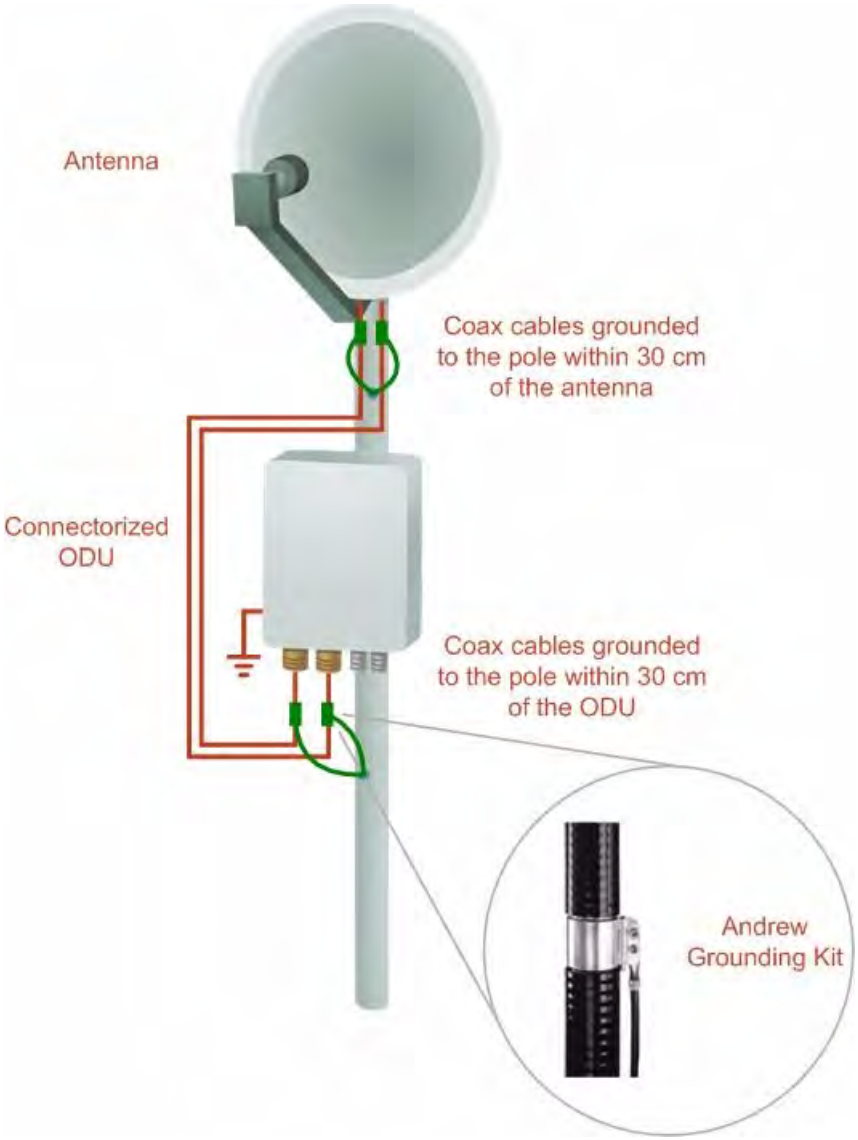


Figure 18-1: Grounding antenna cables

Grounding for Indoor/Outdoor Units

ODU Grounding

RADWIN Lightning Protection System uses a Shielded CAT-5e cable to interconnect the Outdoor (ODU) and Indoor (IDU) units.

However, this shielding does not provide a good lightning discharge path, since it can not tolerate the high Lightning Current surges.

To provide an alternate Lightning Discharge path, the ODU and antenna grounding posts should be connected to ground point by a 10 AWG short copper wire.

The device should be permanently connected to ground.

IDU Grounding

The IDU's grounding post should be connected to the internal ground point, using a grounding wire of at least 10 AWG. The grounding wire should be connected to a grounding rod or the building grounding system.

The device should be permanently connected to ground.

External Lightning Surge Suppressors and Grounding

A Grounding Kit and Surge Arrestor Unit must be located near the ODU and properly grounded as illustrated in Figures **18-2** and **18-3** below:

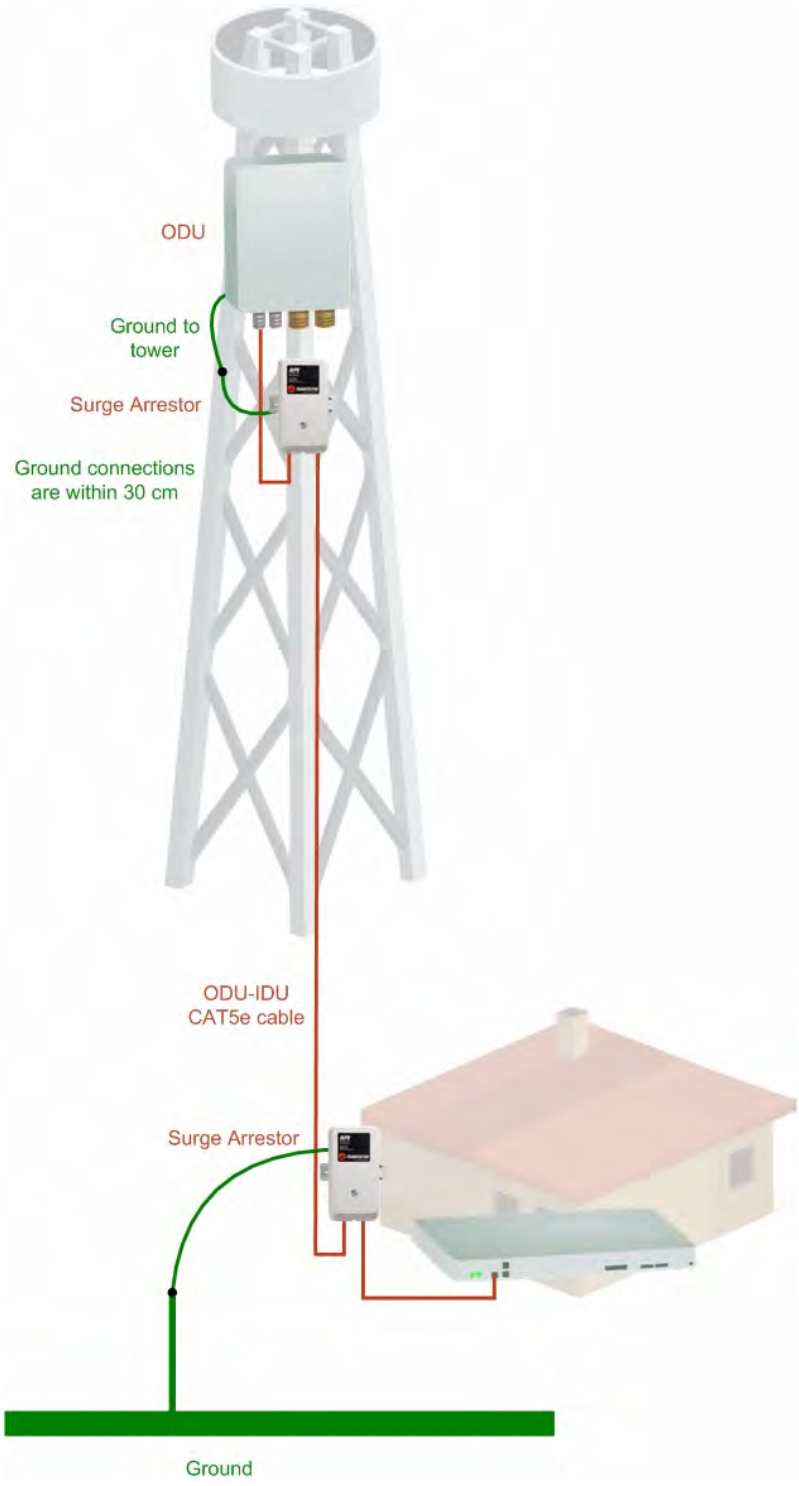


Figure 18-2: Grounding a typical pole installation

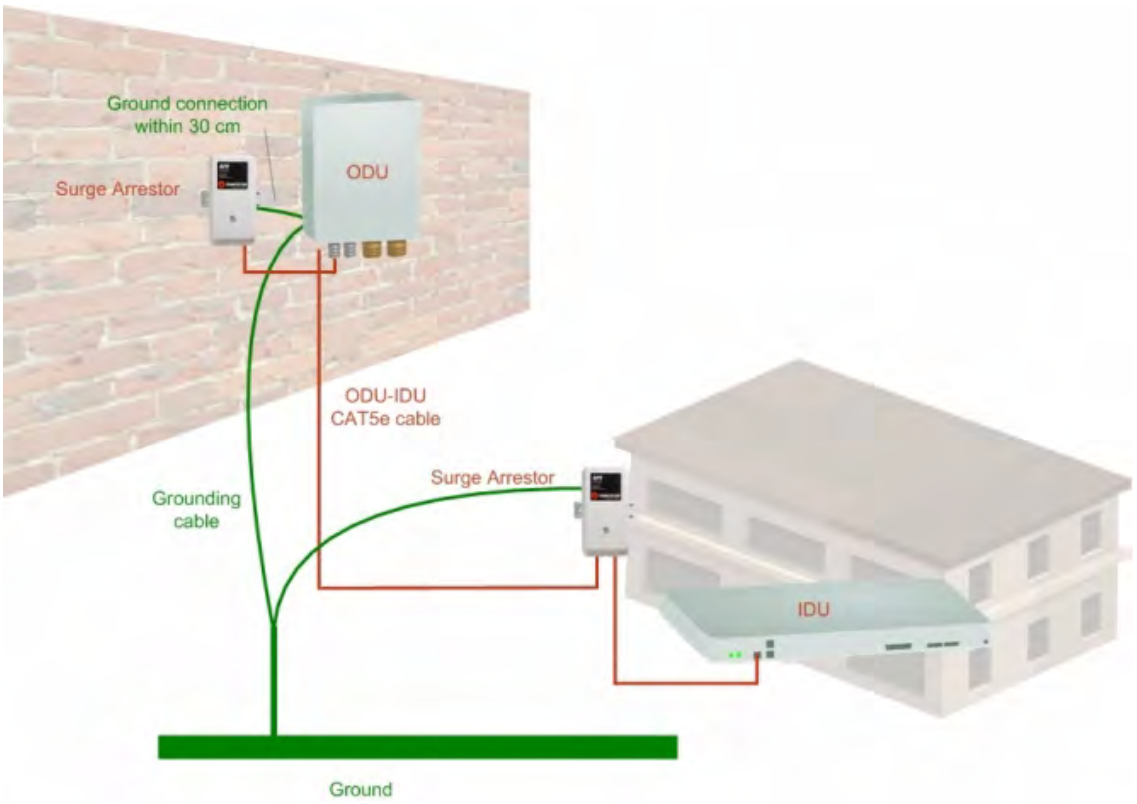


Figure 18-3: Grounding a typical wall installation

The next figure shows a close-up of the rear of grounded ODU:

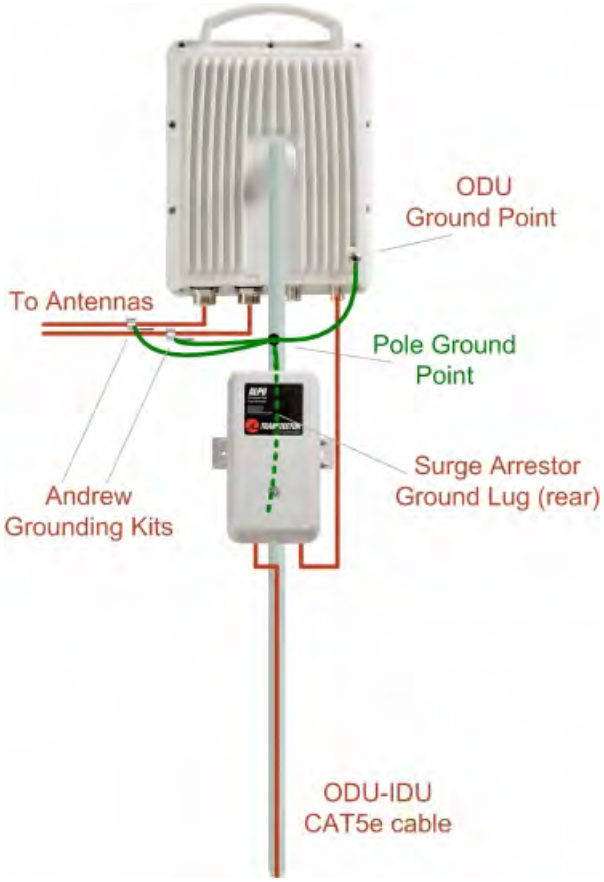


Figure 18-4: ODU Surge Suppressor and grounding

The Transtector protection circuits shown in **Figure 18-5** below, utilize silicon avalanche diode technology. The unit consists of an outdoor rated NEMA 3R type enclosure with easy mounting flanges, ground stud attachment and easy wiring.

The ALPU-POE features RJ-45 protection circuits for the ODU-IDU data pairs (pins 1,2 & 3,6) and DC power (pins 4,5 & 6,7 with the pairs bonded).

The unit is designed to be wall mounted. An optional set of bracket is available from the manufacturer to allow a wide range of pole mount applications. A dedicated ground stud is provided inside the unit that must be bonded to the nearest grounding system (or Master Ground bar) for proper surge protection.

The system wiring is installed with RJ-45 type connectors that can feed directly into the chassis without having to cut, splice or route through awkward strain relief holes.

Figure 18-5: Transtector's Surge Suppressor

To mount the lightning protection devices:

1. Mount the device as close to the ODU as possible. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the ODU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.
7. Replace the cover.

Note

There may also be regulatory requirements to cross bond the ODU-IDU CAT-5e cable at regular intervals up the mast. This may be as frequent as every 10 meters (33 feet).

A second Surge Arrestor Unit should be mounted at the building entry point and must be grounded, as shown in **Figure 18-3** above.

➢ **To mount the lightning protection at the building entry point:**

1. Mount the device outside the building, located as near as possible to the entrance of the CAT-5e ODU-IDU cable. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the IDU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.
7. Replace the cover

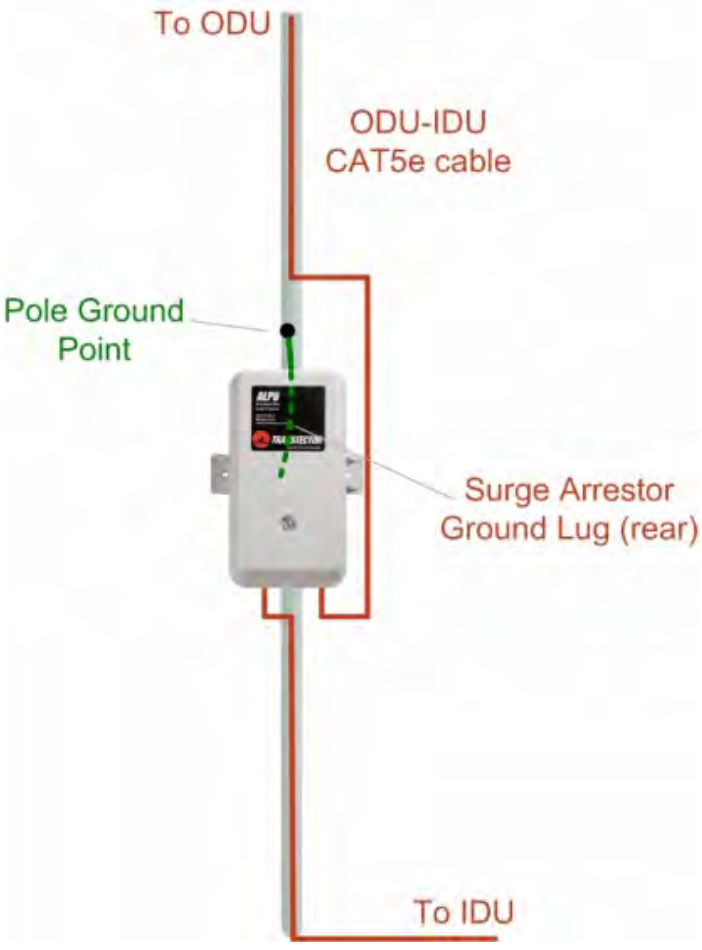


Figure 18-6: Surge Suppressor and grounding at building entry point

Internal ESD Protection circuits

RADWIN equipment is designed to meet the ETSI/FCC/Aus/NZ/CSA EMC and Safety requirements. To fulfill these requirements, the system's Telecom lines at the ODU/IDU are Transformer-isolated and include internal ESD (Electro-Static-Discharge) Protection circuits.

Chapter 19

Preloading an ODU with an IP Address

Why this is Needed?

All ODUs supplied by RADWIN come pre-configured with an IP address of 10.0.0.120. For use in a network, the ODUs must be configured with suitable static IP addresses. The method for doing this under office conditions is set out in **Chapter 5**.

There are two situations under which ODUs may need to be pre-loaded with an IP address prior to installation to a link:

- Changing an individual ODU in the field
- Preparing a large number of ODUs in a warehouse prior to deployment in the field, according to a network installation plan.

This chapter explains how do this.

Required Equipment

The minimal equipment required to pre-load an ODU with an IP address is:

- Laptop computer (managing computer) satisfying the requirements of **Table 4-1**
- An installed copy of the RADWIN Manager
- A PoE device
- A crossed Ethernet LAN cable
- An IDU-ODU cable
- If you have connectorized ODUs, two N-type RF terminators

Do **not** carry out this procedure using a multi homed managing computer also connected to a network. It will flood the network with broadcast packets. Further, it will throw any other links on the network into Installation mode.

The procedure

Note

The following procedure is generic to all RADWIN radio products. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

To Preolad an ODU with an IP address:

1. Using the IDU-ODU cable, connect the PoE device to the ODU, ensuring that the cable is plugged into the PoE port marked P-LAN-OUT.
2. For connectorized ODUs, screw the RF terminators into the two antenna ports.

Warning

A powered up ODU emits RF radiation from the antenna port (or connected antenna). When working with a powered up connectorized ODU, always use RF terminators.

For an ODU with an integrated antenna, ensure that the antenna is always directed away from other people.

3. Connect the Poe device to AC power.
4. Using a crossed LAN cable, connect the LAN-IN port of the PoE device to the Ethernet port of the managing computer. The ODU will commence beeping at about once per second, indicating correct operation.
5. Launch the RADWIN Manager.
6. At the log on window, choose Local Connection.

Figure 19-1: Log on Window for Local Connection

7. Enter the default password, ***admin***. After a few moments, the RADWIN Manager main window appears:

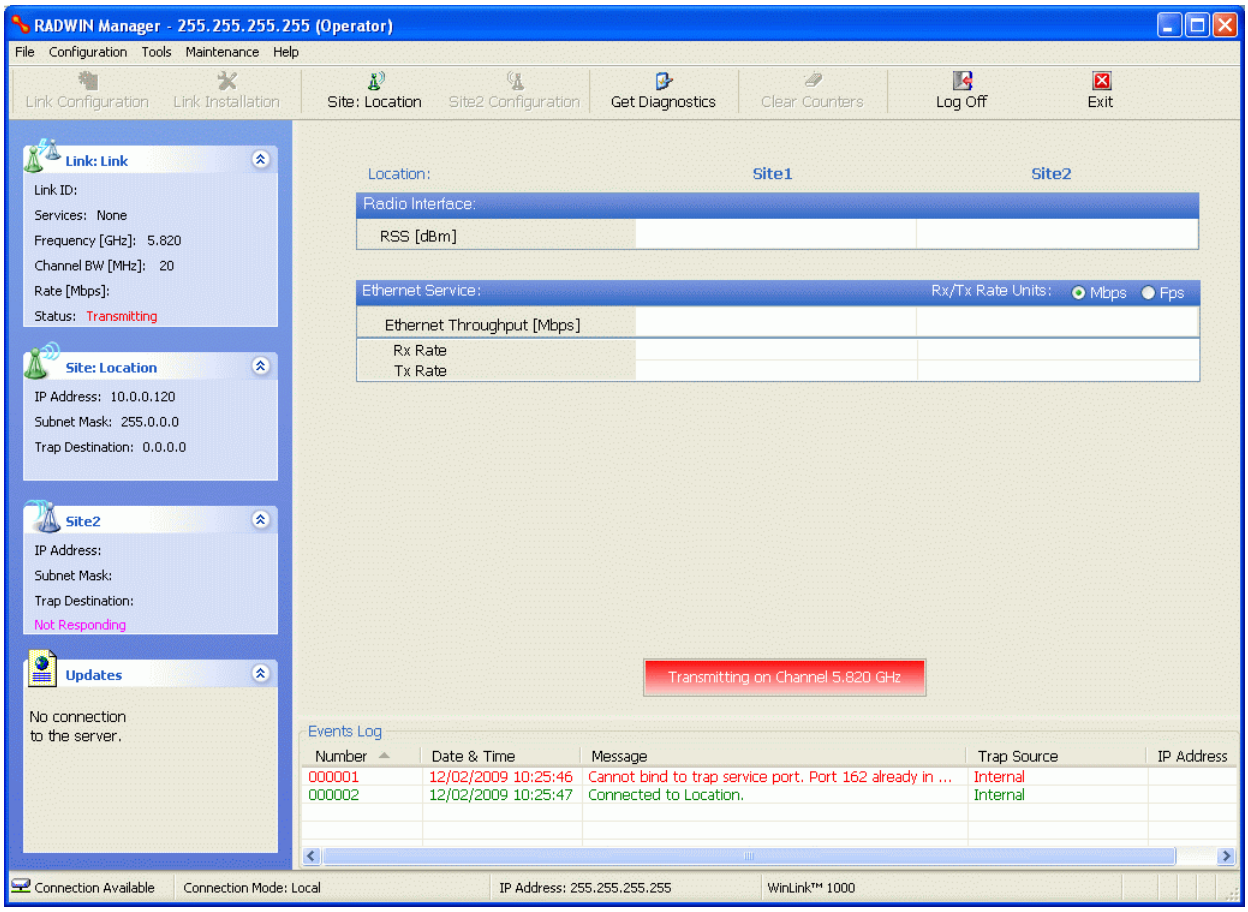


Figure 19-2: Opening RADWIN Manager window prior to installation

8. Click the un-grayed **Site:Location** button. The following dialog window appears:

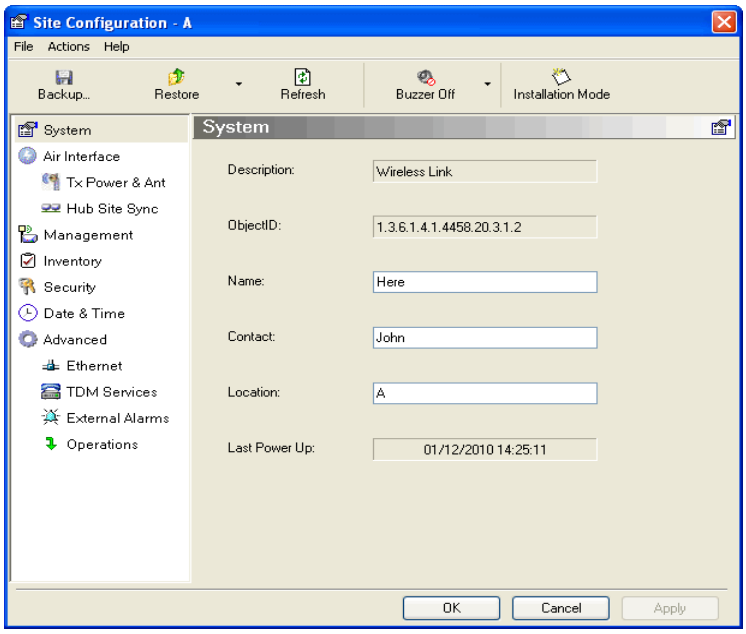


Figure 19-3: Configuration Dialog Box

9. Click the **Management** item in the left hand panel. The following window is presented:

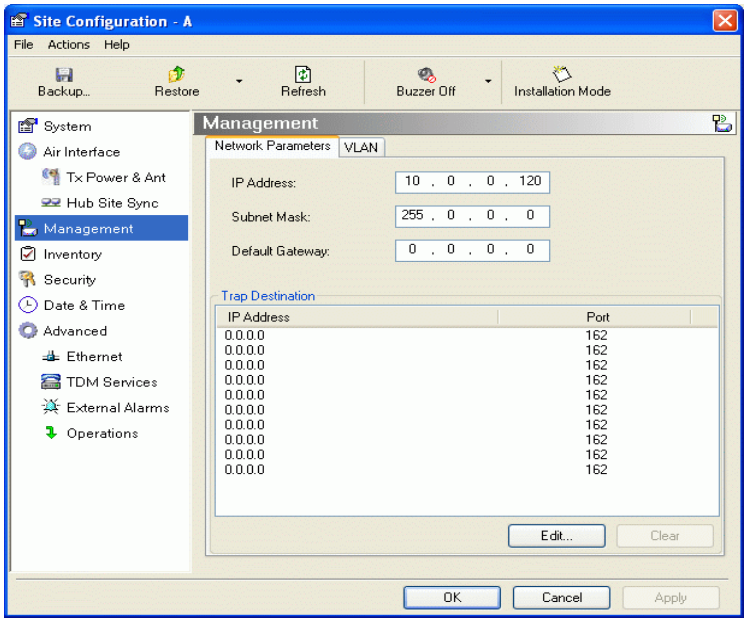


Figure 19-4: Management Addresses - Site Configuration dialog box

10. Enter the IP Address, Subnet Mask and Default Gateway as requested. For example, the ODU used here is to be configured as follows:

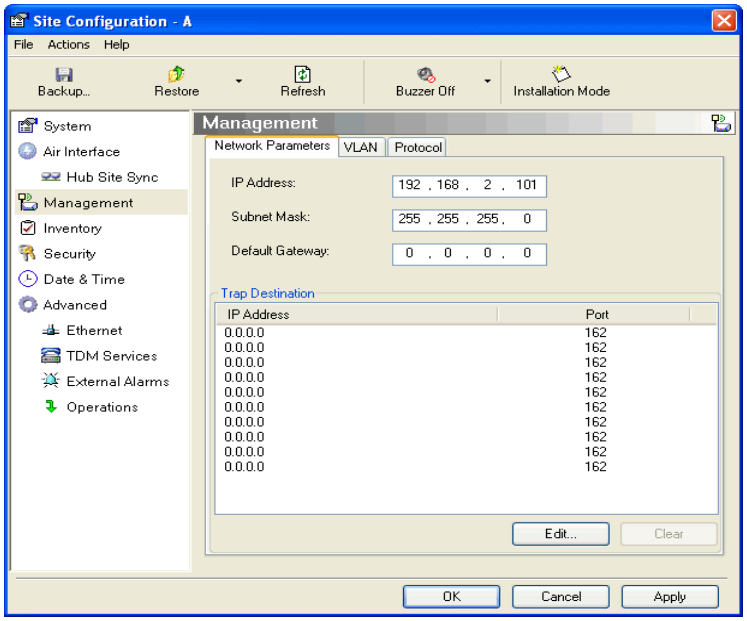


Figure 19-5: ODU with IP Addressing configured

11. Click **OK.** You are asked to confirm the change:

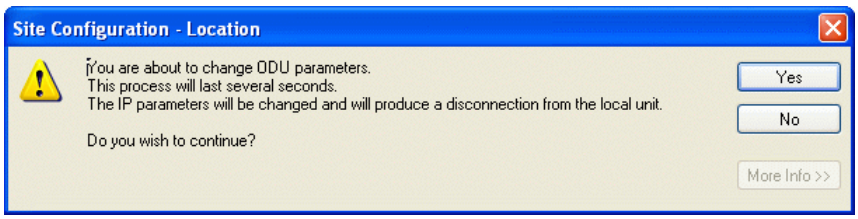


Figure 19-6: Confirmation of IP Address change

12. Click **Yes** to accept the change. After about half a minute the changes will be registered in the ODU. On the left hand panel of the main window, you will see the new IP configuration for the ODU.

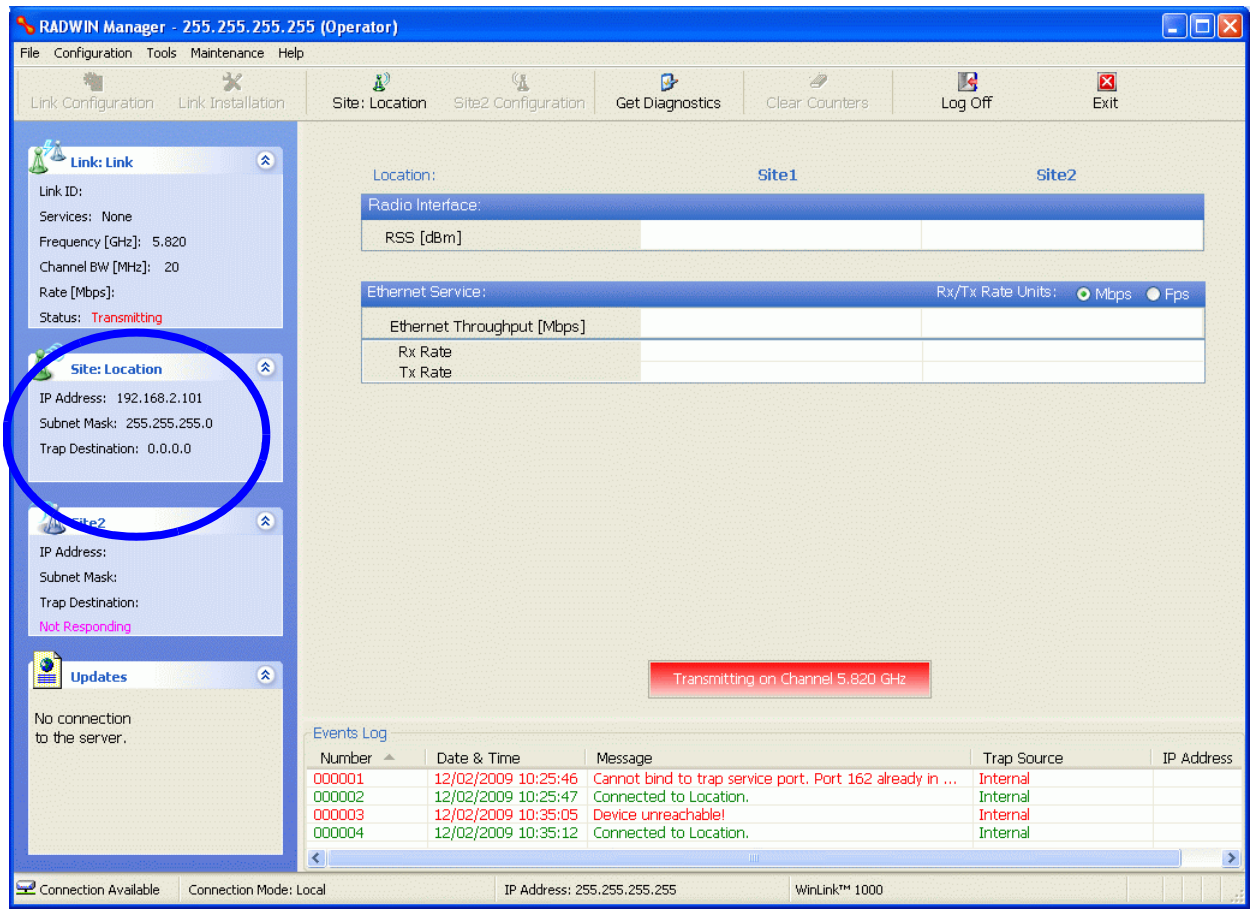


Figure 19-7: Main Window after IP Address change

Some additional things you may want to do now:

- Go to Site **Installation | Air Interface**. You can enter a Link ID and change the Installation Frequency and Channel Bandwidth.
- If you log on as Installer, you can change the default band (**Chapter 20**).

13. Click **Cancel** to leave the open Management dialog. You may now exit the RADWIN Manager, or connect to another ODU. If you choose to connect to another ODU, after about a minute, the main window of the RADWIN Manager will revert to that shown in **Figure 19-2** above. In any event, power down the changed ODU; your changes will take effect when you power it up again.

Don't forget to remove the RF terminators from a connectorized ODU after powering it down.

Tip: How to Recover a Forgotten ODU IP Address

If you have an ODU with lost or forgotten IP address, use the above procedure to log on to it using Local Connection. The IP address will appear in the left hand status area:

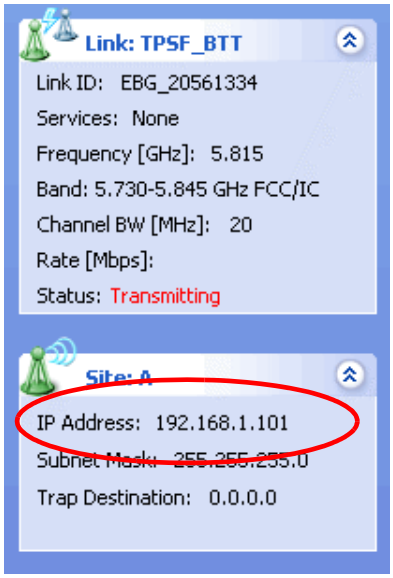


Figure 19-8: Existing IP address displayed after log-on with Local Connection

Chapter 20

Changing the Factory Default Band

Why this is Needed

All ODUs supplied by RADWIN come with pre-configured with a factory default product-dependent band according to the ODU part number.

For ODUs supporting Multi-band, it may be changed using the procedure in this chapter. The procedure is generic, applying to all ODUs with the Multi-band feature.

- If for some reason the default band needs to be changed, it should be done before link installation.
- Use of an incorrect band may be in violation of local regulations.

Required Equipment

The minimal equipment required to change an ODU default band is:

- Laptop computer (managing computer) satisfying the requirements of **Table 4-1**.
- An installed copy of the RADWIN Manager
- A PoE device
- A crossed Ethernet LAN cable
- An IDU-ODU cable

The procedure

The following procedure is generic to all relevant RADWIN radio products. What you see on your running RADWIN Manager may differ in some details from the screen captures used to illustrate this chapter.

To change the factory default band:

1. Using the IDU-ODU cable, connect the PoE device to the ODU, ensuring that the cable is plugged into the PoE port marked P-LAN-OUT.

2. Connect the Poe device to AC power.
3. Using a crossed LAN cable, connect the LAN-IN port of the PoE device to the Ethernet port of the managing computer. The ODU will commence beeping at about once per second, indicating correct operation.
4. Launch the RADWIN Manager.
5. Log on as Installer.

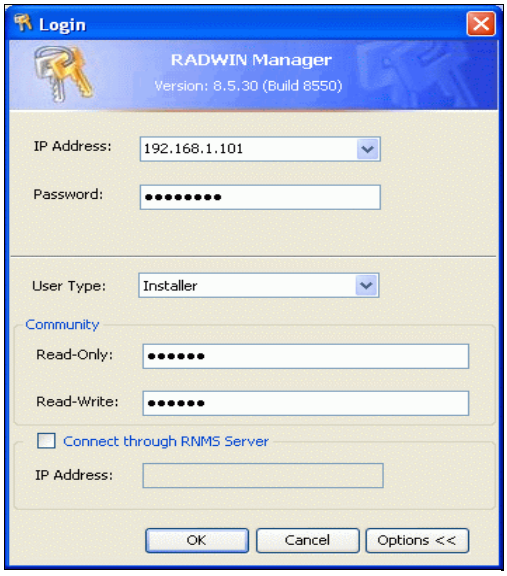


Figure 20-1: Becoming Installer

6. Enter the default password, ***wireless***. After a few moments, the RADWIN Manager main window appears:

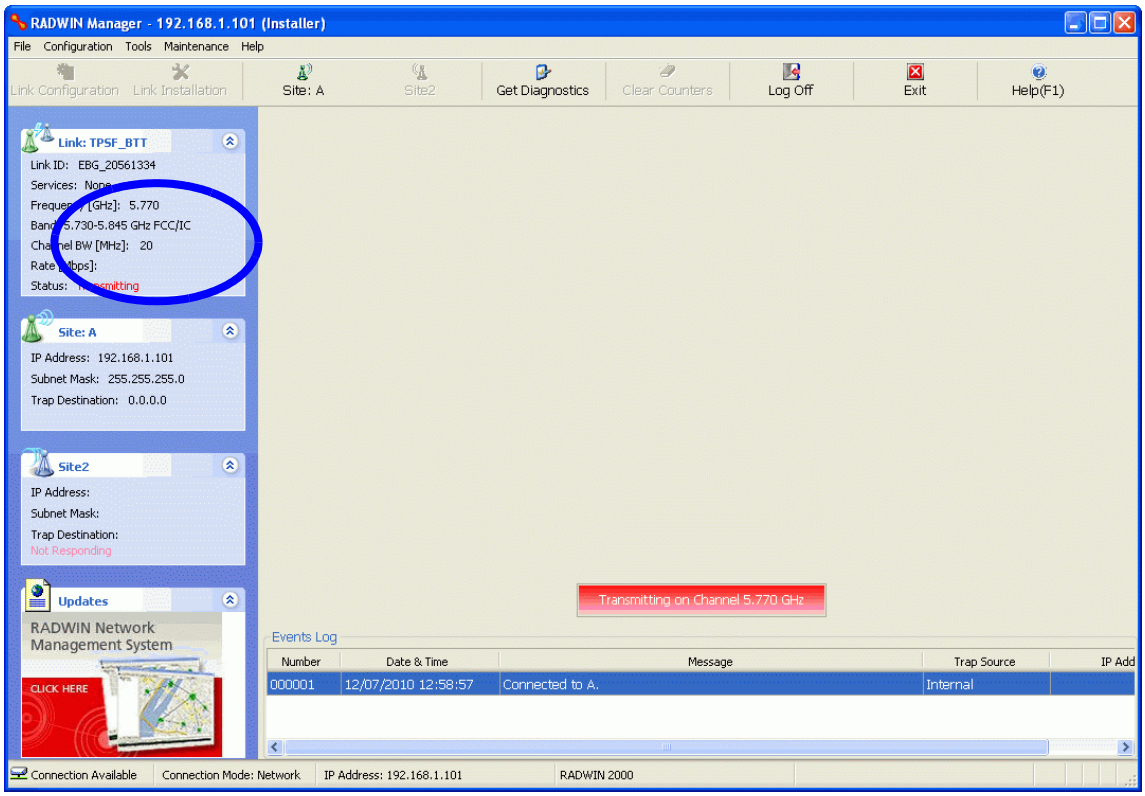


Figure 20-2: Opening RADWIN Manager window prior to band change (default circled)

7. Click **Tools | Change Band**. The following window appears:

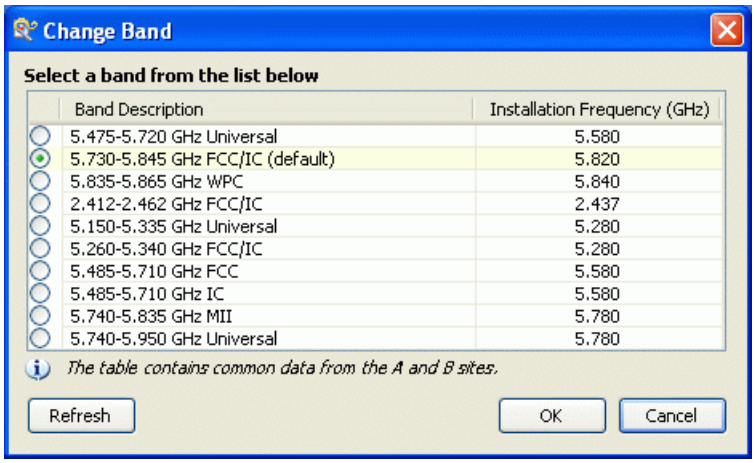


Figure 20-3: Change Band dialog

The bands appearing in **Figure 20-3** are product dependent. To see which bands are available for your product, check your product Inventory (see **Figure 8-8**) and then consult RADWIN Customer Support.

8. Click the band required:

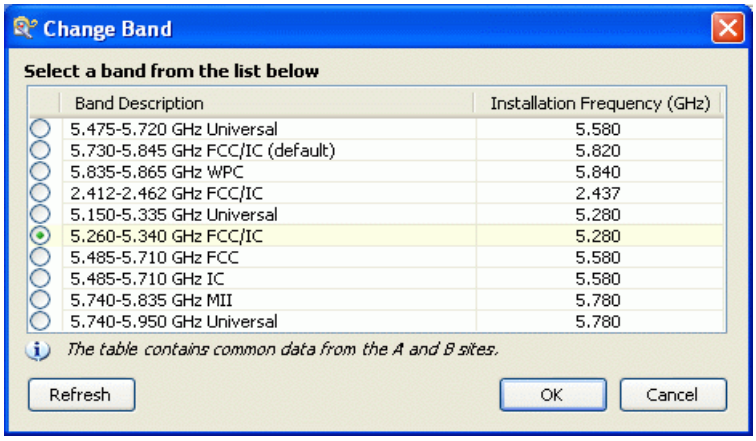


Figure 20-4: A different band selected

9. The Change Band warning is displayed. Click **Yes** to continue.

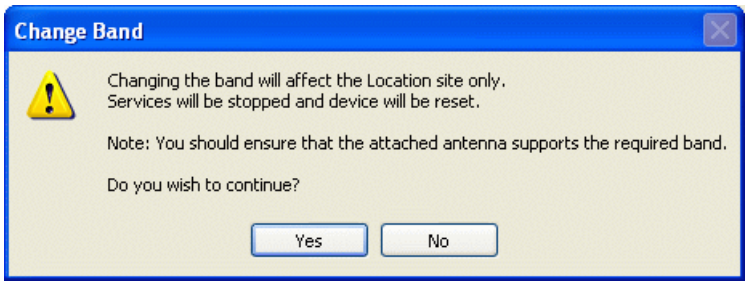
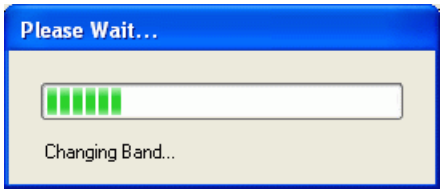


Figure 20-5: Change Band confirmation

The change, which may take some time, is carried out:



The result is reflected in the RADWIN Manager main window:

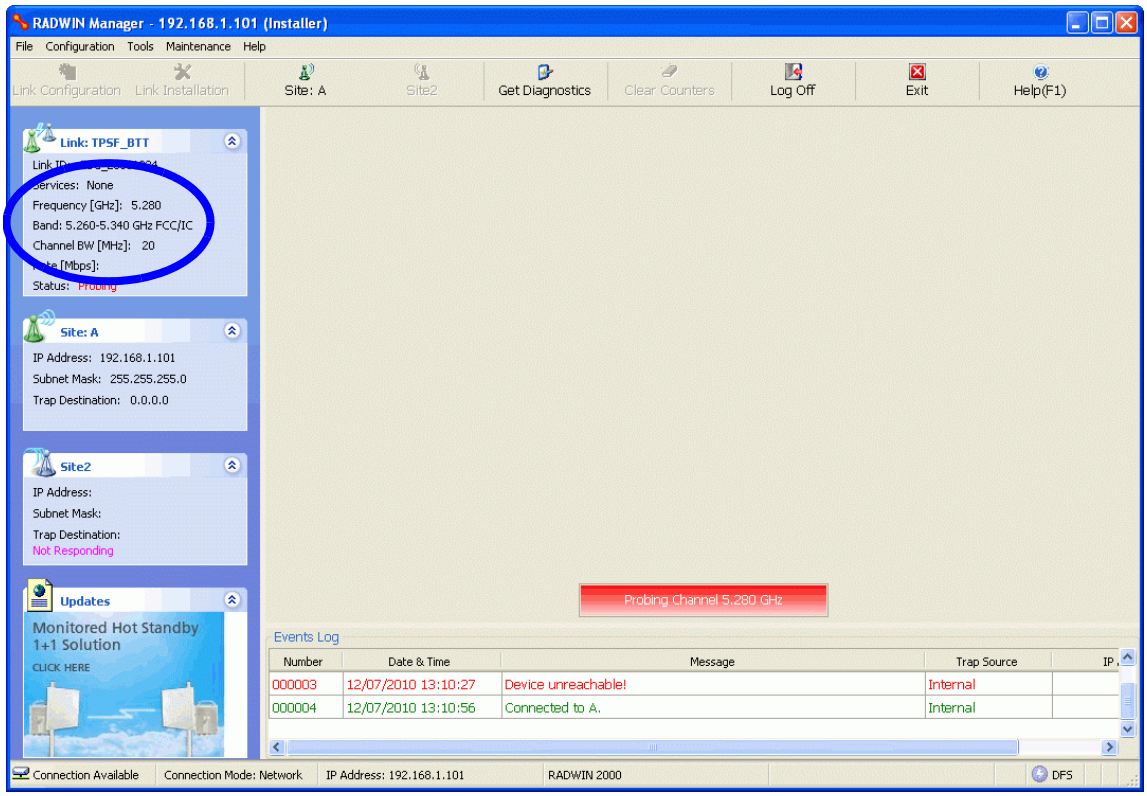


Figure 20-6: Main Window after band change - new band circled

If you carry out this operation on a link, the band is effective on both sites and you are placed in installation mode.

Changing Band for DFS

Changing to a DFS band is similar to the foregoing procedure.

As soon as you establish a link using a DFS band, you are offered Configuration only in the main menu. Installation mode is disabled.

Special Products or Features: Entering a License Key

If you go to the Operations window as Installer (**Figure 20-7**), you will see a provision for entering a license key. Should you ever require such a key, the procedure is as follows:

To enter a License key:

1. Log on as Installer (as for the previous procedure).
2. Click the **Site:Location** tool bar button from the main tool bar.

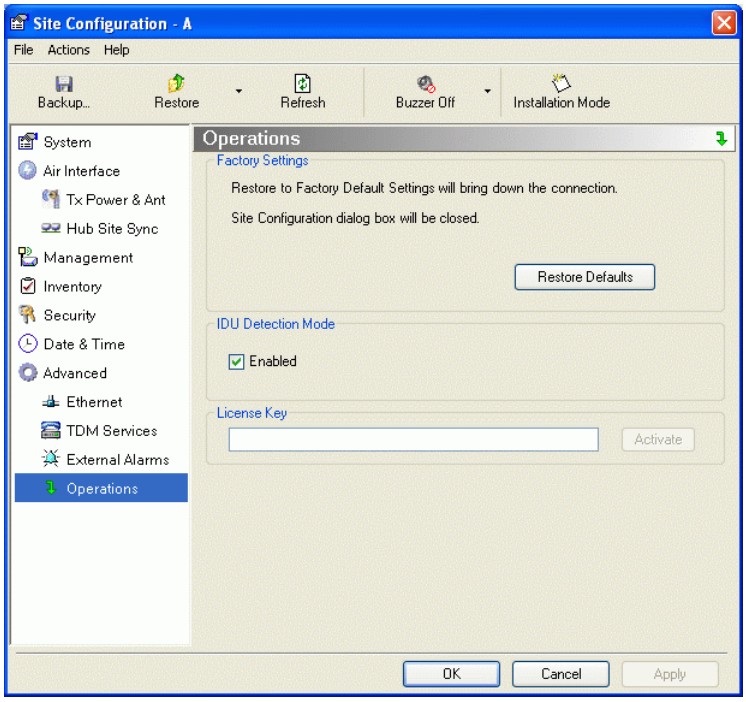


Figure 20-7: Using the Operations window to enter a license key

3. Enter your license key and click **Activate**.
4. When it is accepted, click **Cancel**.

Note

License keys, where appropriate, are obtainable from RADWIN Customer Support.

Provisions for Licensed 3.X and 2.5 GHz Bands

Overview

3.X Bands

The new RADWIN 2000 C and RADWIN 2000 X series add additional bands in the 3.X GHz range to those in Release 2.5.00. The new supported bands fall into two categories: The first category consists of those falling under the ubiquitous FCC, IC or ETSI regulation. The second category is referred to as RADWIN Universal bands. These bands are known to be regulated but the numerous combinations of regulation and location preclude specific support.

Release 2.5.40 introduces support for the band 3.3-3.8 GHz as follows:

- FCC part 90 subpart Z and IC RSS-197 supporting 3.650-3.700 GHz
  - 3.650 -3.675 GHz in Restricted mode
  - Hardware ready for the Unrestricted Mode band operating in all 50 MHz of the 3.650-3.700 GHz band
- IC RSS-192 supporting 3.475 – 3.650 GHz
- ETSI 3.4 -3.7 GHz split into three sub-bands, 3.650-3.675 GHz, 3.475-3.650 GHz and 3.590-3.710 GHz

- RADWIN Universal 3.300-3.800 GHz.

Integrated and connectorized products are available. All of them are multiple band with the default band being 3.650-3.675 GHz other than the ETSI 3.4 - 3.7 GHz models.

The new products may be operated under 5, 10 and 20 MHz channel bandwidths and are broadly compatible with the full feature set of RADWIN 2000.

To meet regulatory requirements, a somewhat different procedure is required to set up links using these bands.

2.5GHz Bands for BRS/EBS

The rationale for these bands and relevant details are described in **Chapter 24**. The installation method ids the same as for other licenced FCC bands as described below.

Terminology Recap

- **3.X Universal bands** refer to RADWIN Universal bands as described above
- **3.X or 3.X GHz** refers to the frequency range 3.300 – 3.800GHz
- A **3.X ODU** is an ODU pre configured to operate in the 3.X GHz licensed bands
- A **3.X Link** in a RADWIN 2000 link using a pair of 3.X ODUs
- **High Resolution Bands** - Channel minimum step is 250 KHz. Applies to 3.475 - 3.650 GHz IC RSS-192, 3.4 -3.7 GHz ETSI and the 3.3 - 3.8 GHz Universal band.
- **Low Resolution Bands** - Channel minimum step is 1 MHz. Applies to FCC regulations in the 3.650-3.675 GHz band.
- **Inactive Mode** - An ODU is powered up, in communication with a managing computer but not transmitting. It is required where regulation does not permit the use of RADWIN's default Installation Mode frequency and channel bandwidth. The ODU may transmit using the licensed or registered band, channel bandwidth and permitted Tx power.
- **Regular Mode** - The usual default Installation Mode

Regulatory Considerations for 3.650-3.675 GHz FCC/IC part 90 sub part Z

Restricted Mode

The band is supported in accordance with 3.650-3.675 FCC/IC part 90 subpart Z:

RADWIN Ltd. conforms to FCC DA 07-4605 (November 14, 2007) FCC-certified with FCC-ID: Q3KRW2030 and supporting the following equipment requirements:

"Restricted contention protocols can prevent interference only with other devices incorporating the same or similar protocols. Equipment using a restricted protocol can operate only on the lower 25 megahertz (3650-3675 MHz)."

Transmission power options

Table 20-1shows the extent of compliance by RADWIN 2000 C products to FCC/IC power limits, having regards to antenna type and transmission power options.

Table 20-1: FCC/IC compliance by antenna and transmission power

		Measured				
		Frequency		Power		
Antenna	Nominal CBW	Low Center Frequency Channel [MHz]	High Center Frequency Channel [MHz]	Max Conducted Tx Power per Pole [dBm]	Total Conducted Max Tx Power [dBm]	Max EIRP [dBm]
21dBi INT	5 MHz	3653	3672	11.14	14.14	35.14
	10 MHz	3655	3670	14.46	17.46	38.46
	20 MHz	3660	3665	17.36	20.36	41.36
21dBi EXT (22dBi-1dB feeder)	5 MHz	3653	3672	11.14	14.14	35.14
	10 MHz	3655	3670	14.46	17.46	38.46
	20 MHz	3660	3665	17.36	20.36	41.36
24dBi EXT (25 - 1dB feeder loss)	5 MHz	3653	3672	8.65	11.65	35.65
	10 MHz	3655	3670	11.36	14.36	38.36
	20 MHz	3660	3665	13.73	16.73	40.73

Higher Transmission Power Options and Restrictions:

Table 20-2 defines the maximum transmission power and EIRP limits for the specified frequency and channel bandwidths.

It specifies the power limits to be used by the operator when assigning center frequencies.

Table 20-2: Higher Transmission Power Limits

Nominal CBW	Low Center Frequency Channel [MHz]	High Center Frequency Channel [MHz]	Max Conducted Tx Power per Pole [dBm]	Total Conducted Max Tx Power [dBm]	Max EIRP [dBm]
5 MHz	3653	3672	15.60	18.60	35.60
10 MHz	3655	3670	18.69	21.69	38.69
	3656	3669	22.00	25.00	38.50
20 MHz	3660	3665	21.18	24.18	41.18
	3661	3664	22.60	25.60	39.10

Availability Summary for FCC/IC and Universal 3.X GHz

Table 20-3: Availability for FCC/IC and Universal 3.X GHz

Products series	Occupied Band GHz	Regulation	Mode	Channel Bandwidth MHz	Max Tx Power dBm	Frequency Step KHz
RADWIN 2000 C	3.650-3.675	FCC/IC	Regular	5, 10, 20	25	1000
	3.475-3.650	IC	Inactive			250
	3.300-3.800	Universal			Unlimited	
RADWIN 2000 X	3.650-3.675	FCC/IC	Regular	5	25	1000
	3.475-3.650	IC	Inactive			250
	3.300-3.800	Universal			Unlimited	

Band Splitting for ETSI 3.4 - 3.7GHz

The ETSI 3.4 - 3.7GHz band is split into three sub-bands reflecting the different Max Tx Power allowed in each one. The details are shown in below:

Table 20-4: Band split for ETSI 3.4-3.7GHz

Products series	Occupied Sub-Band GHz	Center Frequency GHz	Mode	Channel Bandwidth MHz	Max Tx Power dBm	Frequency Step KHz
RADWIN 2000 C	3.403-3.490	3.413-*3.480*	Inactive	5, 10, 20	16	250
	3.470-3.610	*3.480*-*3.600*			23(†)	
	3.590-3.710	*3.600*-3.700			25(‡)	
RADWIN 2000 X	3.403-3.490	3.413-*3.480*	Inactive	5	16	250
	3.470-3.610	*3.480*-*3.600*			23(†)	
	3.590-3.710	*3.600*-3.700			25(‡)	

Note

(†) The 3.480 GHz frequency is overlaped, occuring in two different bands as shown. If you wish to use the 3.480 GHz frequency, you should set Max TX Powerto 16 dBm.

(‡) The 3.600 GHz frequency is overlaped, occuring in two different bands as shown. If you wish to use the 3.600 GHz frequency, you should set Max TX Powerto 23 dBm.

Using he RADWIN Manager to set up a 3.X or BRS Link

Inactive and Active Mode

Low Resolution Band 3.X ODUs may be installed and configured in the usual way.

What follows applies to High Resolution Band ODUs.

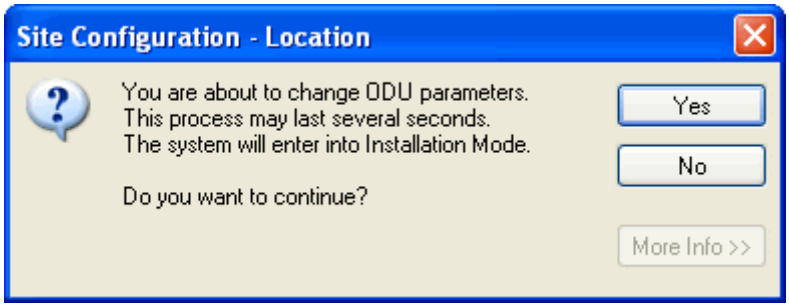
To ensure compliance with the relevant license, 3.X ODUs for IC, ETSI and Universal must be configured from an inactive mode where the ODU is powered up, in communication with a managing computer but not transmitting.

Setting up a link is a two stage procedure:

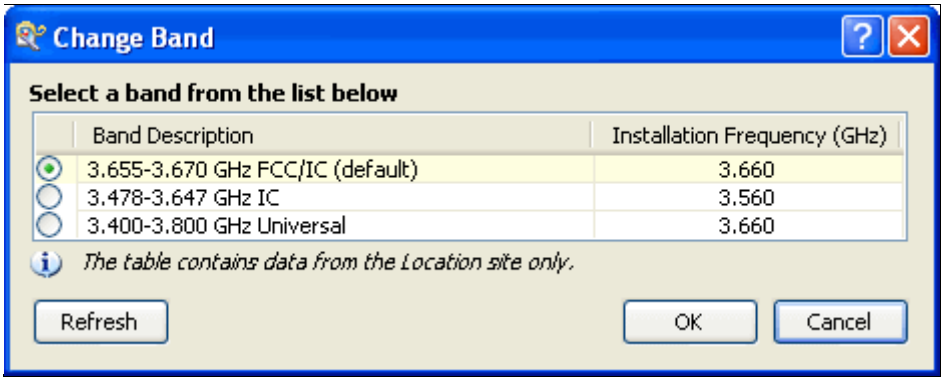
1. Activate the ODUs by individually by configuring the band, frequency and channel bandwidth for the license
2. Complete link configuration in the usual way

To set up a 3.X or BRS ODU:

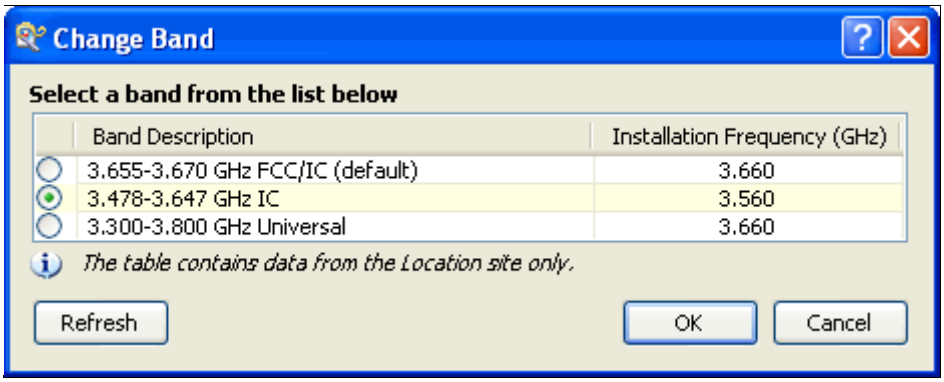
1. Log on to it as Installer (Operator sufficient for ETSI) and set the IP address as shown in **Chapter 19**.
2. Navigate to Site:Location|Air Interface and enter the Link ID for the ODU.
3. Click OK to dismiss the Site Configuration window. Answer Yes to the following popup message:



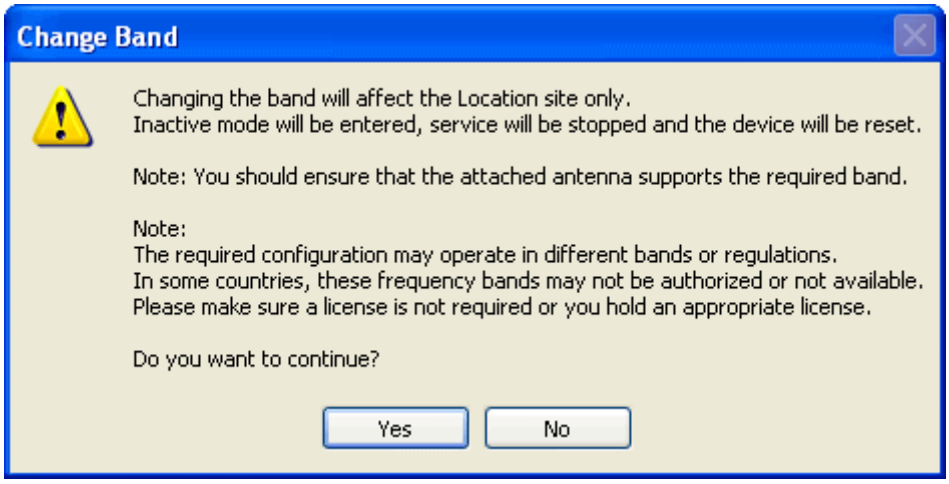
4. For ETSI models, skip to step 7 below. For all others, navigate to Tools|Change Band. The following window is displayed:



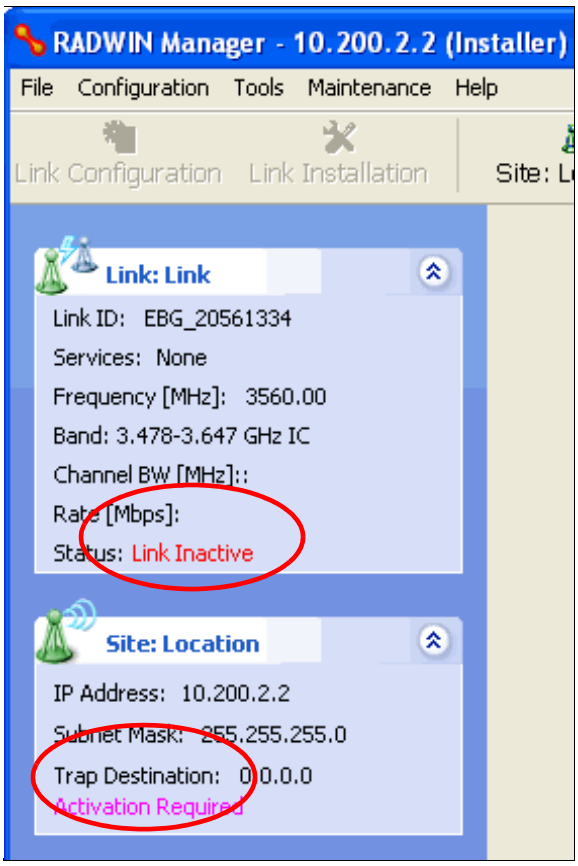
5. Choose the required band. For illustration, we will choose the IC band.



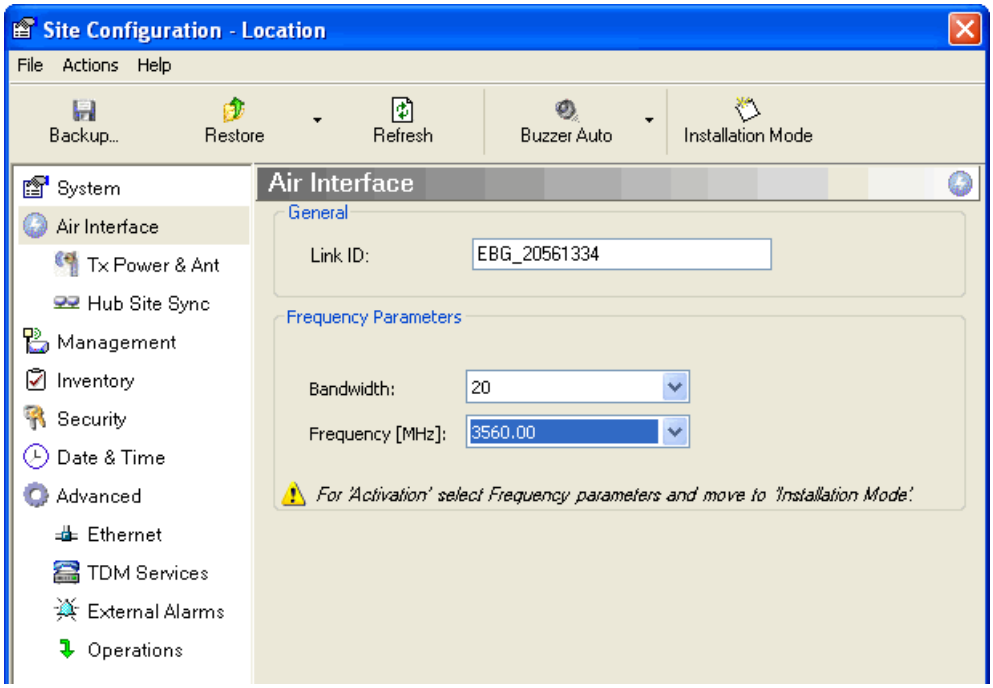
6. Click OK to continue and accept the notification message which appears:



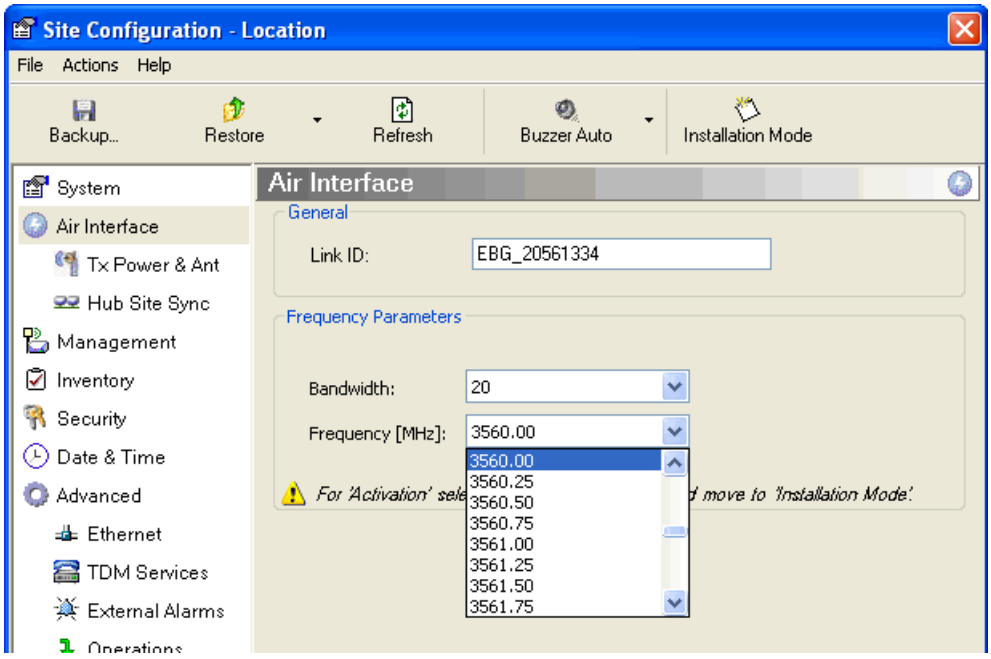
After a few seconds, the ODU goes into inactive mode:



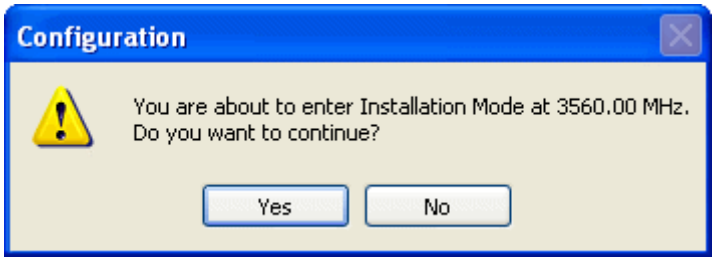
7. Activate the ODU by navigating to Site:Location|Air Interface:



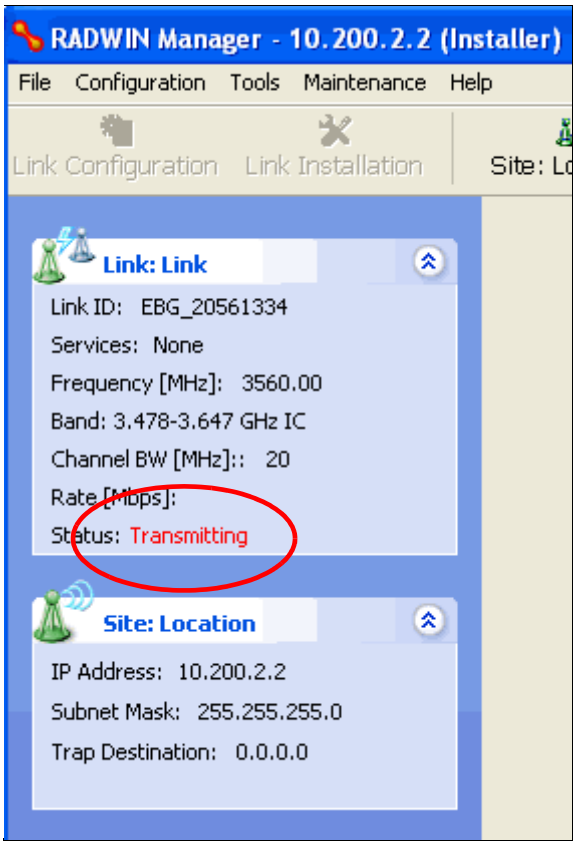
8. Choose a frequency from the drop down list:



9. Enter Installation Mode and confirm your choice:



10. After a few moments of processing, you may click OK to dismiss the Site Configuration window. The ODU is now in normal Installation Mode:



11. Repeat the above procedure for the second ODU in the link, ensuring that the Link ID is entered correctly and the same band is chosen.

12. From this point, you may install both ODUs in the field according to the procedures in this User Manual.

Chapter 21

Link Budget Calculator

Overview

The Link Budget Calculator is a utility for calculating the expected performance of the RADWIN 2000 wireless link and the possible configurations for a specific link range.

The utility allows you to calculate the expected RSS of the link, and find the type of services and their effective throughput as a function of the link range and deployment conditions.

User Input

You are required to enter or choose the following parameters. Depending on the product, some of the parameters have a default value that cannot be changed.

- Band, which determines frequency and regulation
- Channel Bandwidth
- Tx Power (maximum Tx power per modulation is validated)
- Antenna Type (cannot be changed for ODU with integrated antenna)
- Antenna Gain per site (cannot be changed for integrated antenna)
- Cable Loss per site (cannot be changed for integrated antenna)
- Required Fade Margin
- Rate (and Adaptive check box)
- Service Type
- Required Range

Link Budget Calculator Internal Data

For each product (or Regulation and Band) the calculator stores the following data required for link budget calculations:

- Maximum Transmit power (per modulation)
- Receiver Sensitivity (per modulation) for Ethernet service and for TDM services at various BER
- Maximum linear input power (used to calculate minimum distance)
- Antenna gain and cable loss for ODU with integrated antenna
- Available Channel Bandwidths

Calculations

EIRP

$$EIRP = TxPower + AntennaGain_{SiteA} - CableLoss_{SiteA}$$

Expected RSS and Fade Margin

$$ExpectedRSS = EIRP - PathLoss + AntennaGain_{SiteB} - CableLoss_{SiteB}$$

where:

Site A is the transmitting site

Site B is the receiving site

PathLoss is calculated according to the free space model,

$$PathLoss = 32.45 + 20 \times \log_{10}(frequency_{MHz}) + 20 \times \log_{10}(RequiredRange_{Km})$$

$$ExpectedFadeMargin = ExpectedRSS - Sensitivity$$

where Sensitivity is dependent on air-rate.

Min and Max Range

MinRange is the shortest range for which $ExpectedRSS \le MaxInputPower$ per air-rate.

MaxRange (with Adaptive checked) is the largest range for which $ExpectedRSS \ge Sensitivity$, at the highest air-rate for which this relationship is true. In a link with adaptive rate this will be the actual behavior.

MaxRange (for a given air-rate) is the largest range for which $ExpectedRSS \ge Sensitivity + RequiredFadeMargin$.

Service

The Ethernet and configured TDM trunks throughput is calculated according to internal product algorithms.

Availability

The Service Availability calculation is based on the Vigants Barnett method which predicts the downtime probability based on a climate factor (C factor).

$$Availability = 1 - 6 \times 10^{-7} \times Cfactor \times frequency_{GHz} \times (RequiredRange_{KM})^3 \times 10^{\frac{-ExpectedFadeMargin}{10}}$$

Antenna Height

The recommended antenna height required for line of sight is calculated as the sum the Fresnel zone height and the boresight height. See **About the Fresnel Zone** below. Using the notation of **Figure 21-1** below, splitting *ExpectedRange* into $d_1 + d_2$, the ***Fresnel zone height*** at distance d_1 from the left hand antenna, is given by

$$0.6 \times \sqrt{\frac{\frac{300}{frequency_{GHz}} \times d_1 \times d_2}{d_1 + d_2}}$$

For the most conservative setting, we take the mid-point between the antennas, setting

$$d_1 = d_2 = \frac{ExpectedRange}{2}$$

which gives $0.6 \times \sqrt{\frac{\frac{300}{frequency_{GHz}} \times \left[\frac{ExpectedRange}{2}\right]^2}{\frac{ExpectedRange}{2} + \frac{ExpectedRange}{2}}}$

simplifying to $0.52 \times \sqrt{\frac{ExpectedRange}{frequency_{GHz}}}$.

The ***boresight clearance height*** is calculated as: $\sqrt{R^2_{Mean} + \left[\frac{ExpectedRange}{2}\right]^2} - R_{Mean}$

where $R_{Mean} = 6367.4425Km$.

About the Fresnel Zone

The Fresnel zone (pronounced "frA-nel", with a silent “s”) is an elliptically shaped conical zone of electromagnetic energy that propagates from the transmitting antenna to the receiving antenna. It is always widest in the middle of the path between the two antennas.

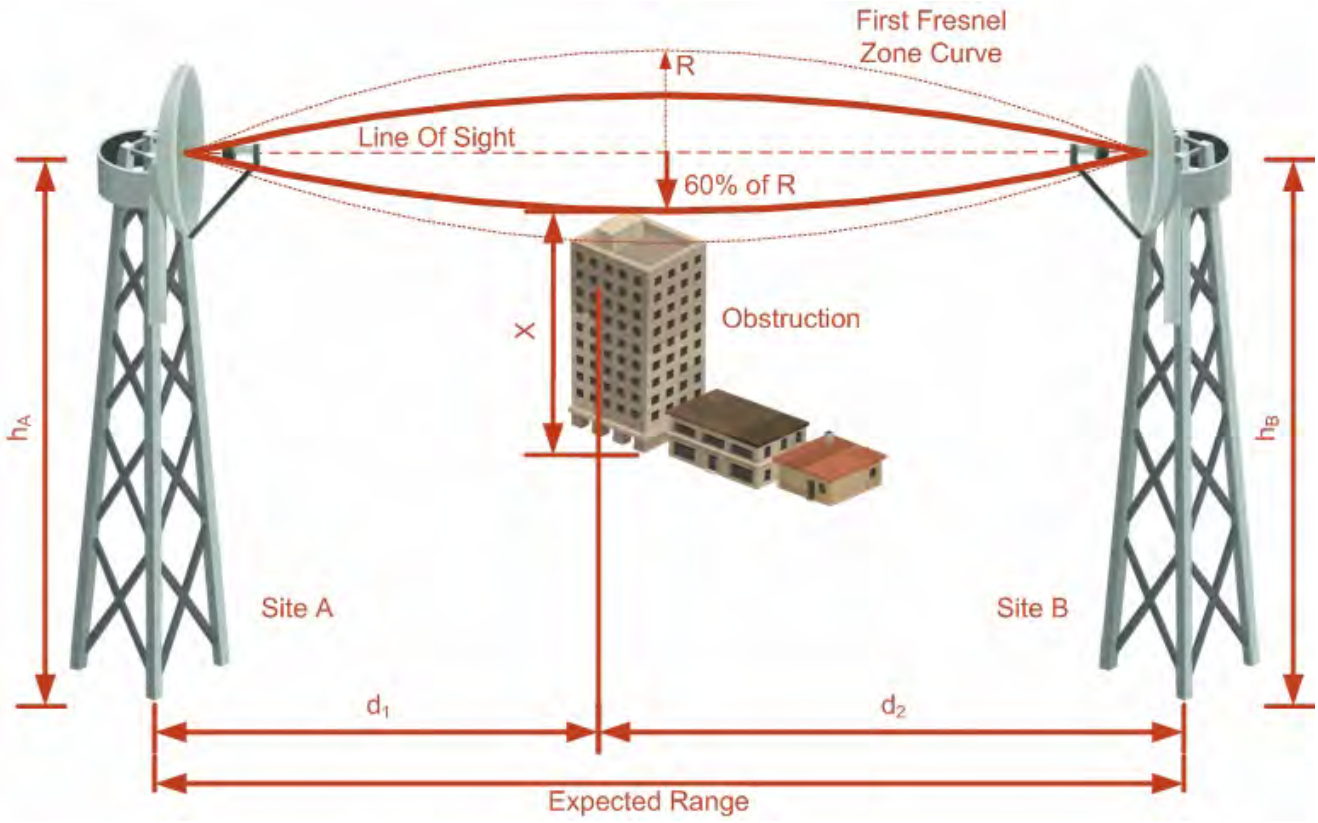


Figure 21-1: Fresnel zone

Fresnel loss is the path loss occurring from multi-path reflections from reflective surfaces such as water, and intervening obstacles such as buildings or mountain peaks within the Fresnel zone.

Radio links should be designed to accommodate obstructions and atmospheric conditions, weather conditions, large bodies of water, and other reflectors and absorbers of electromagnetic energy.

The Fresnel zone provides us with a way to calculate the amount of clearance that a wireless wave needs from an obstacle to ensure that the obstacle does not attenuate the signal.

There are infinitely many Fresnel zones located coaxially around the center of the direct wave. The outer boundary of the first Fresnel zone is defined as the combined path length of all paths, which are half wavelength (1/2 λ) of the frequency transmitted longer than the direct path. If the total path distance is one wavelength (1 λ) longer than the direct path, then the outer boundary is said to be two Fresnel zones. Odd number Fresnel zones reinforce the direct wave path signal; even number Fresnel zones cancel the direct wave path signal.

The amount of the Fresnel zone clearance is determined by the wavelength of the signal, the path length, and the distance to the obstacle. For reliability, point-to-point links are designed to have at least 60% of the first Fresnel zone clear to avoid significant attenuation.

The concept of the Fresnel zone is shown in **Figure 21-1** above. The top of the obstruction does not extend far into the Fresnel zone, leaving 60% of the Fresnel zone clear; therefore, the signal is not significantly attenuated.

For more about Fresnel zone, see **http://en.wikipedia.org/wiki/Fresnel_zone**.

Running the Link Budget Calculator

The Link Budget Calculator is supplied on the RADWIN Manager CD. It may be run stand-alone from the CD or from the RADWIN Manager application.

To run the Link Budget Calculator from the CD:

1. Insert the RADWIN Manager CD into the drive on the managing computer. In the window which opens, click the Link Budget Calculator option.
2. If the CD autorun application does not start by itself, then point your browser to

   Z:\RADWIN\Setup\DATA\Link Budget Calculator.htm

   where Z should be replaced with your own CD drive name.

To run the Link Budget Calculator from the RADWIN Manager:

- Choose **Help | Link Budget Calculator** from the main menu of the RADWIN Manager as in the following figure:

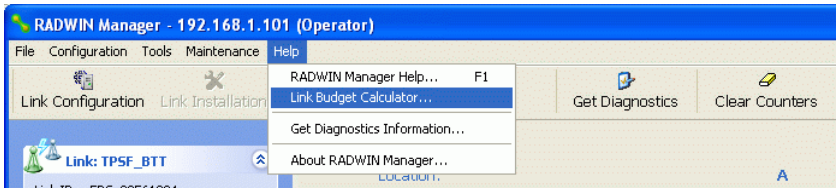
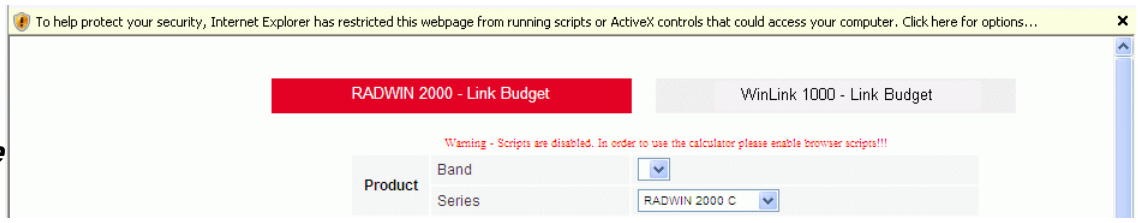


Figure 21-2: Accessing the Link Budget Calculator

However invoked, your browser displays the following page:

Figure 21-3: Link Budget window

- Microsoft Internet Explorer users may see a warning message like this:



- Click the yellow bar and follow the instructions to allow blocked content.

To use the Link Budget Calculator for RADWIN 2000:

1. Choose a band from the drop-down list.

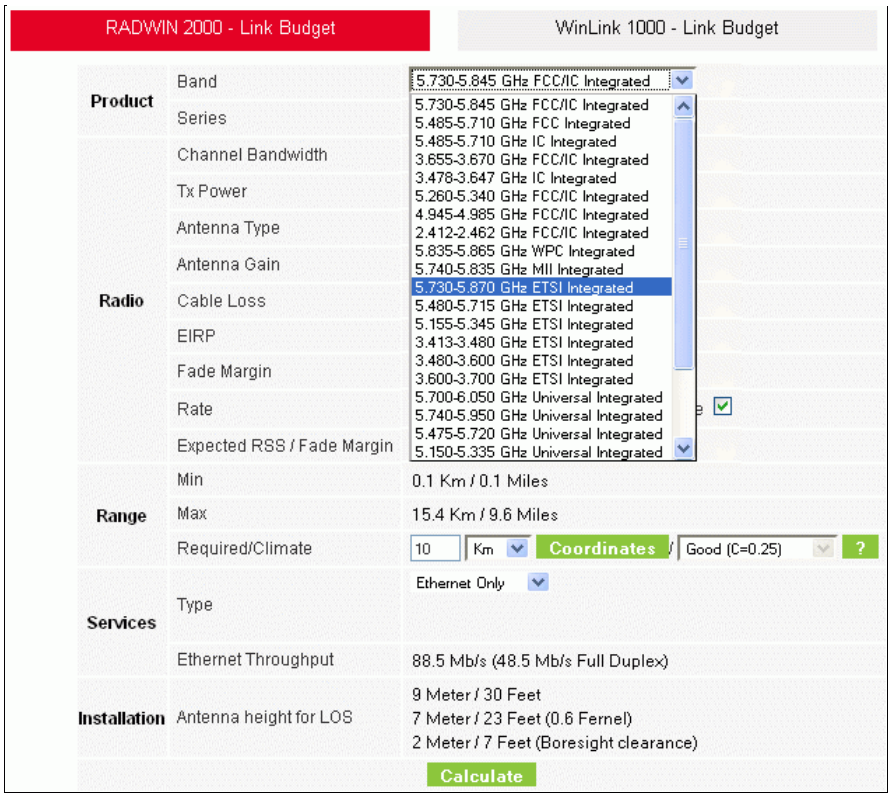


Figure 21-4: Band selector

2. Chose the relevant RADWIN 2000 series.

Figure 21-5: RADWIN 2000 series selector

3. Choose the Channel Bandwidth.

Figure 21-6: RADWIN 2000 Channel Bandwidth selector

4. For a collocated link choose the RFP. Use the Help button to the right of the RFP selection box for help:

Figure 21-7: RFP Selector

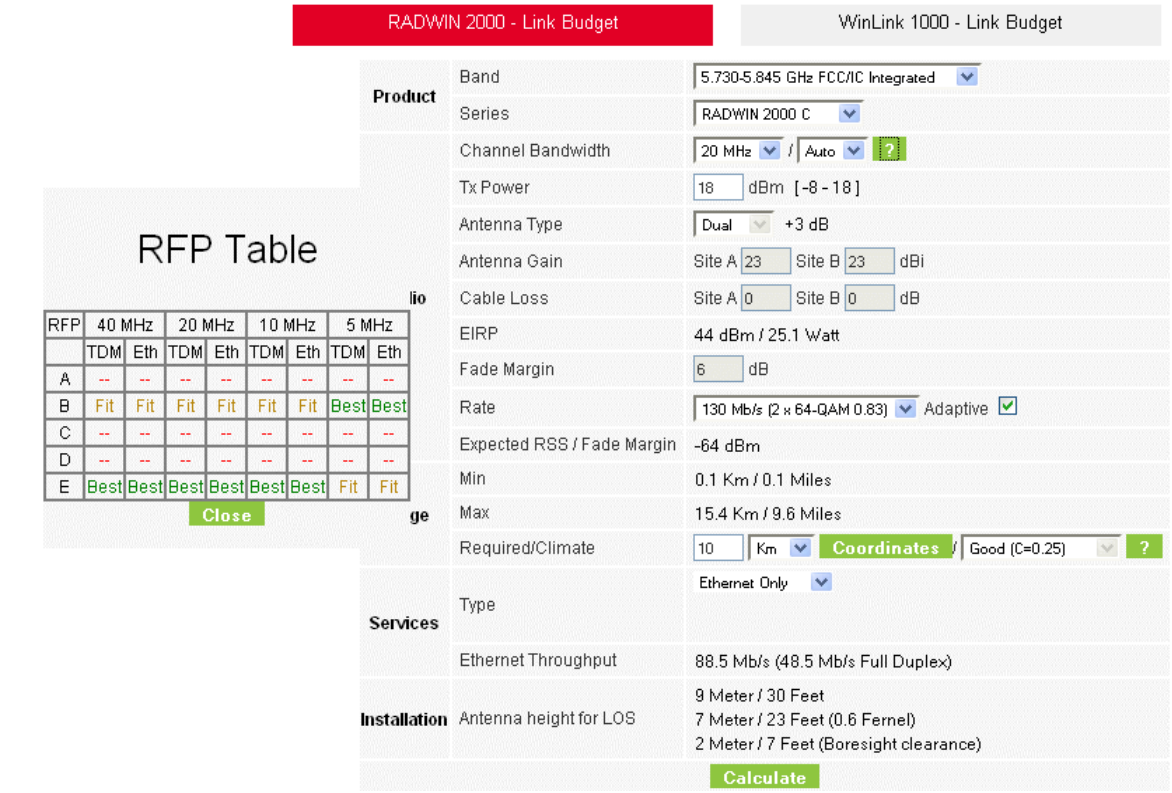


Figure 21-8: RFP Selection Guide

For collocated RADWIN 2000 products, you may only use RFP B or E.

5. Enter the radio details. Note that Rate is chosen from a drop-down list:

Figure 21-9: Rate selector

Note

If you choose Adaptive Rate, then the Rate list is unavailable as is the Climate factor list. Both of these quantities are calculated.

The **Rate** shown, defines the air-interface rate in Mbps. The system operates in TDD mode and has the overhead of the air-interface protoco.l Thus, the Ethernet actual throughput is provided by the **Ethernet Rate**.

Note

For a given air-rate, Ethernet throughput will decrease with increasing range due to propagation delay.

The Fade margin is the minimum required for line-o- sight (LOS) conditions. For degraded link conditions, a larger Fade margin should be used.

The EIRP is given in dBm and Watts.

6. If the required range between the two link sites is known, you may enter it directly. Alternatively, you may enter the latitude and longitude of each site in the link, in which case the distance between them will be calculated and displayed.

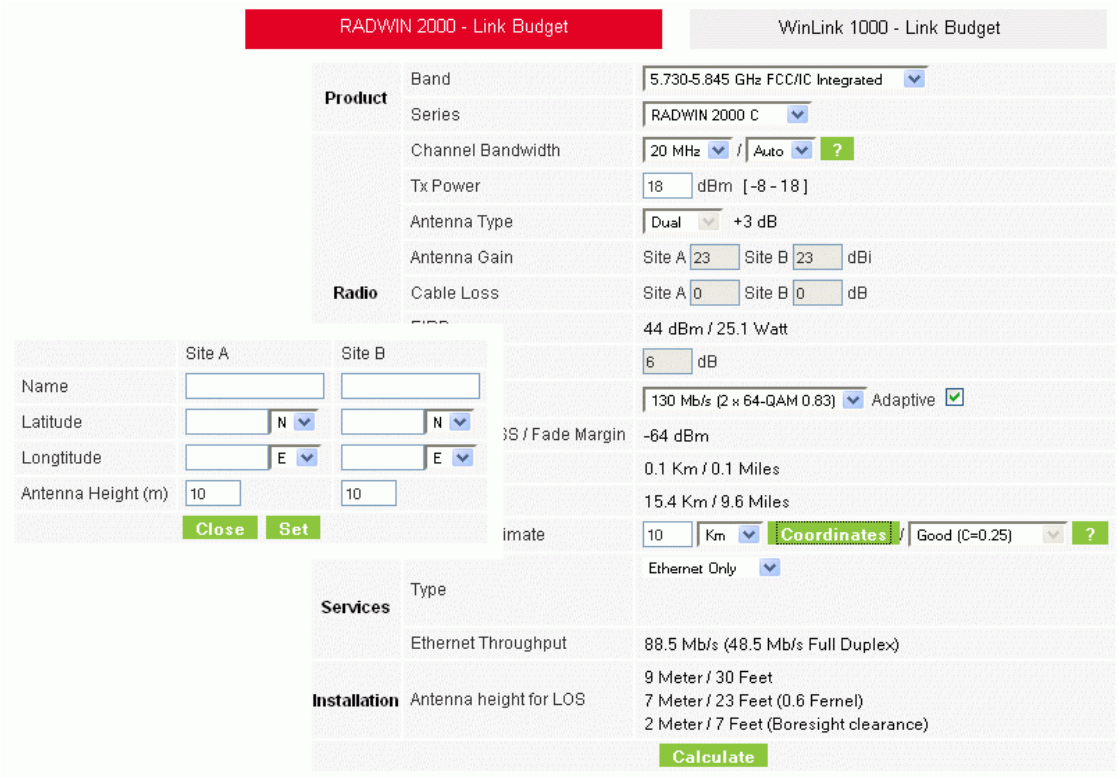
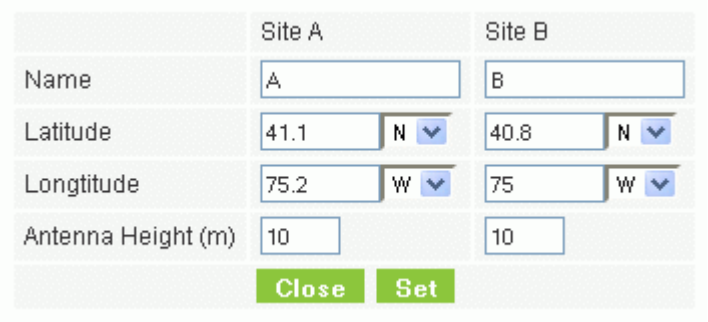
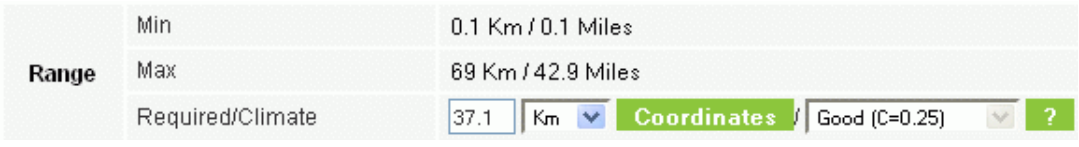


Figure 21-10: Calculation of distance from site coordinates

For example, if you enter the following coordinates and press **Set**,



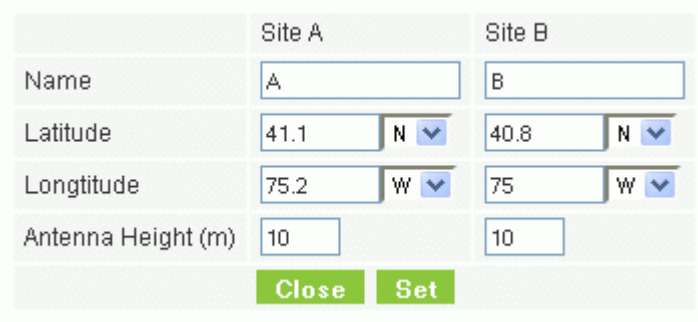
the range will be calculated and displayed:



If for example, we enter:

Site A: 41.1°N lat 74.2°W Long

Site B: 40.8°N lat 74.0°W Long



7. Click **Set**. The distance and link budget is calculated.
8. Located to the right of the green Coordinates button is a drop-down list of Climactic C Factor values. It is only available if you choose a non-adaptive rate.

Figure 21-11: Climactic C Factors

For help about what these mean, click the **?** button to the right of the list in **Figure 21-11**.

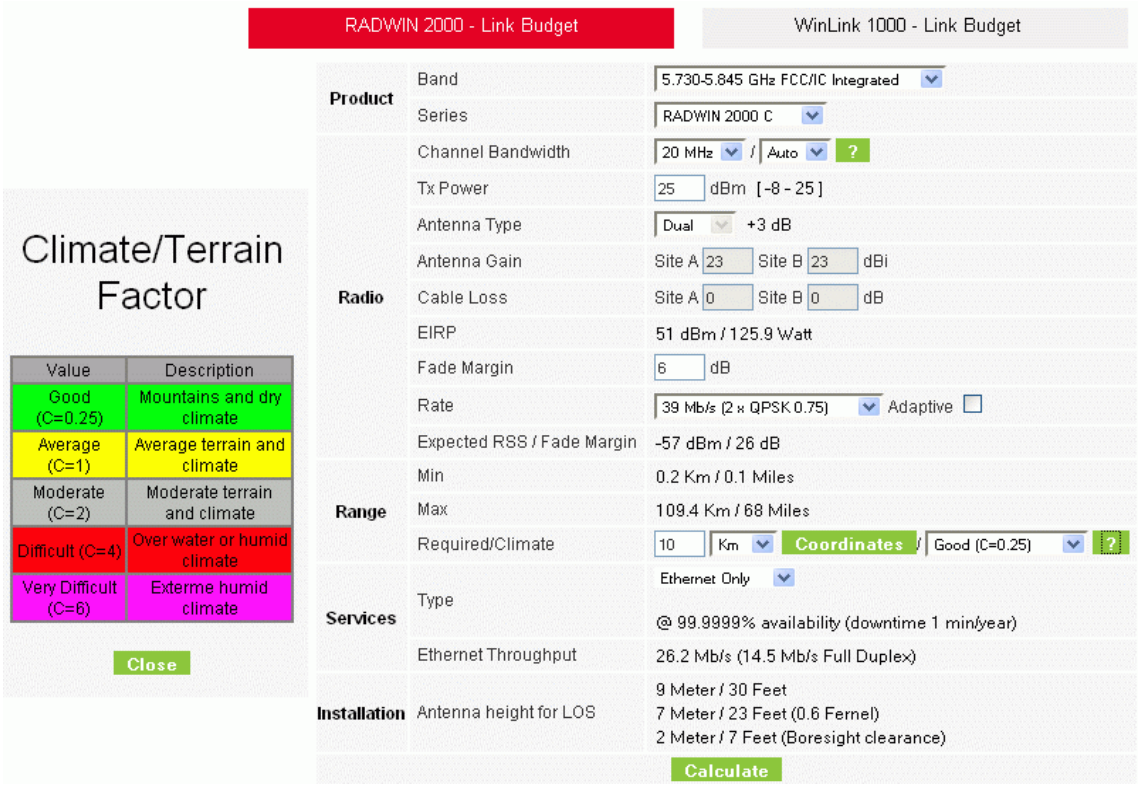


Figure 21-12: Climactic C Factor description

In **Figure 21-13** we display a map of the world showing C Factor contours:

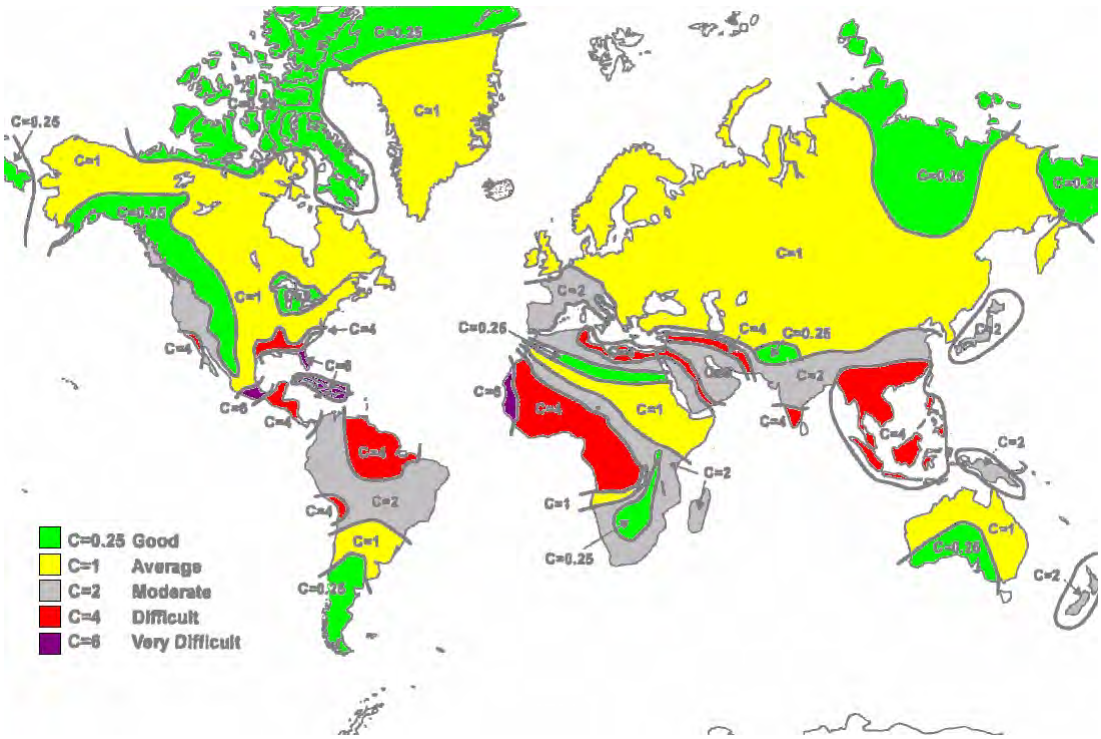


Figure 21-13: World map showing C Factor contours

9. Click **Calculate** to obtain the required performance estimate.

Note

Placing the cursor in any other calculated field will also update the calculated results.

Figure 21-14: LBC - Results section

The Expected Performance parameters are calculated and displayed:

- **Expected RSS** - the expected RSS that the RADWIN Manager shows when the RADWIN 2000 ODUs are optimally aligned
- **Services Type** - max number of T1 or E1 trunks if “Max Trunks” is selected
- **Ethernet Rate** - maximum throughput available for the chosen parameter combination
- **Antenna height for LOS** – the minimum antenna height required for line-of-sight operation. It is the sum of the height required for boresight clearance due to the earth’s curvature plus the height required to clear the Fresnel zone

If the expected performance is not suitable for your application, try different parameters and repeat the calculation.

Chapter 22

Quick Install Mode

Why this is Needed

It may be required to temporarily suspend service traffic over a link without losing the link connection. The simplest way to do this is to place the link in Installation mode but without changing any configured parameters. Quick Install Mode is a “one click” method for doing this. The method is completely generic, working identically for both WinLink 1000 and RADWIN 2000 products.

Enabling Quick Install

By default, this feature is disabled.

➢ **To enable Quick Install mode:**

1. Log on to the RADWIN Manager, navigate to **Tools | Preferences** and click the **Advanced** tab:

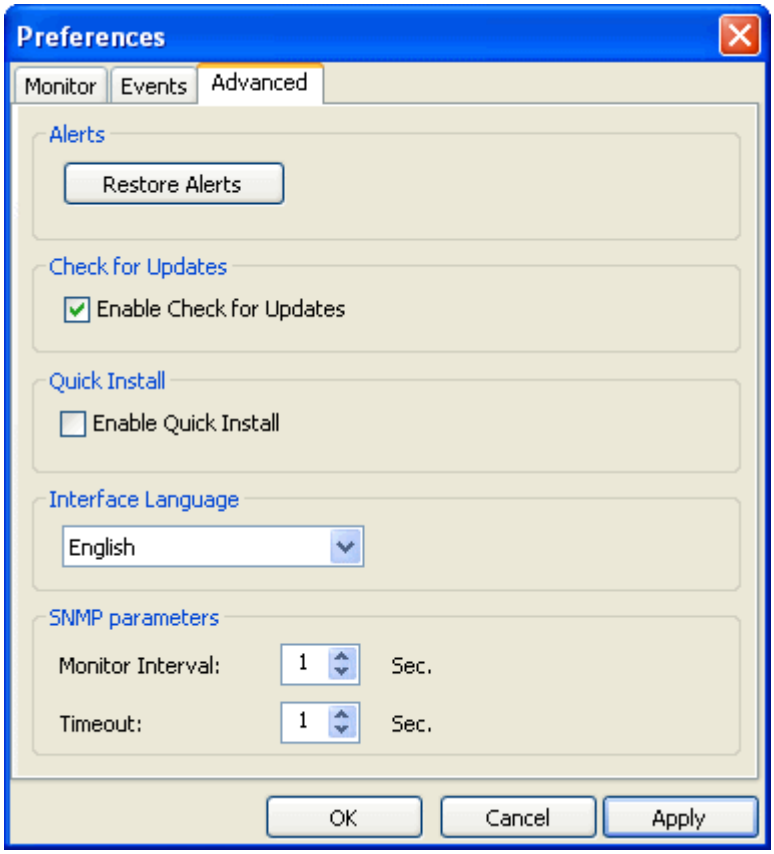


Figure 22-1: Preferences: Quick Install

2. Check the **Enable Quick Install** box and then OK. A new button is added to the main window toolbar:

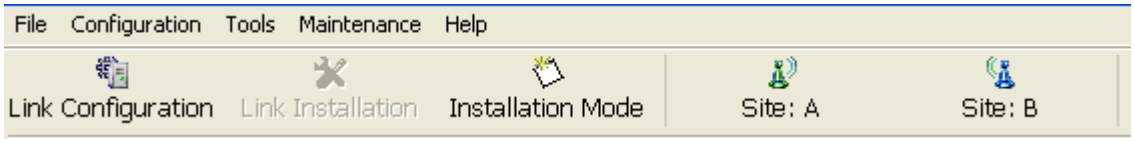


Figure 22-2: New Install Mode button for Quick Install mode

Quick Install mode may be disabled by unchecking the **Enable Quick Install** box.

Using Quick Install

➢ **To suspend service traffic and enter Installation mode:**

1. Click the Install mode button. You are offered a confirmatory message:

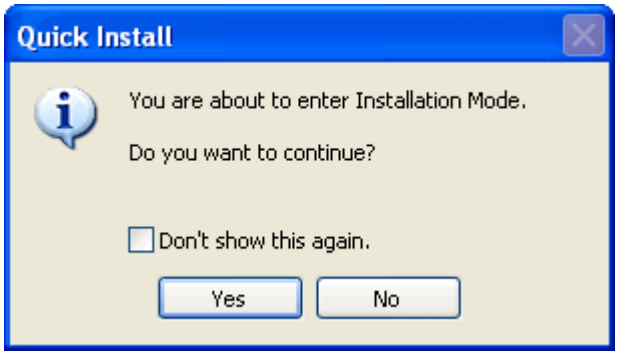


Figure 22-3: Change to Installation Mode cautionary message

2. Click **Yes** to continue. The link goes into Installation mode. The main window looks the same as if you had entered Installation mode in the usual way through one of the **Site** windows with the exception of the toolbar:

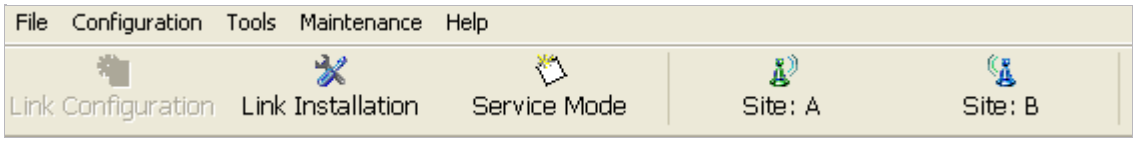


Figure 22-4: Service Mode button to resume link service traffic

3. When you are ready to resume normal service traffic, click the **Service Mode** button. The following cautionary message is displayed:

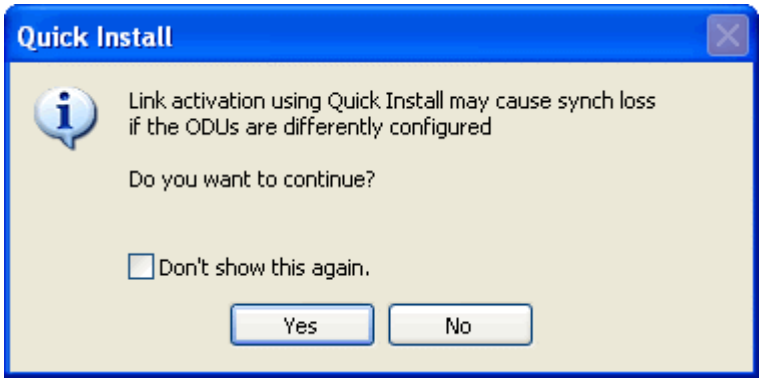


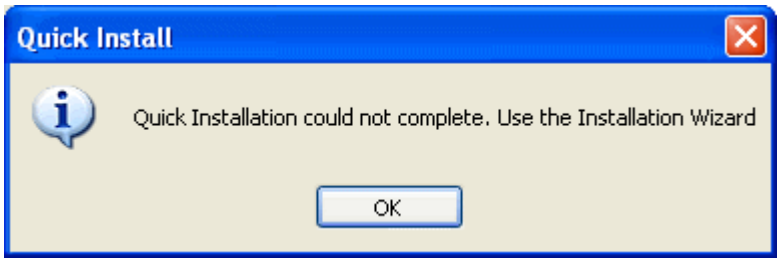
Figure 22-5: Resumption of services cautionary message

4. Click **Yes** to continue. The link will resume normal services with your last set configuration parameters provides that you did not change link parameters in a a way leading to sync loss.

It is also possible to change parameters in a way leading to service degradation. For example mis-configuring the number of antennas or transmission parameters at one side of the link may allow service to resume, but in a degraded fashion.

You may only enter Quick Install mode from a configured link. If you set both sites back to factory settings and chose Quick Install, you will not be able to continue:

Note



RADWIN

RADWIN 2000

Broadband Wireless Transmission System

USER MANUAL

RELEASE 2.5.40

Part 5: Product Dependent Features

UM 2000-2540/02.11

Chapter 23

Spectrum View

What is Spectrum View?

The RADWIN Manager Spectrum View utility is an RF survey tool designed to support the link installation prior to full link service activation. The tool provides comprehensive and clear spectral measurement information enabling easier, faster and better quality installations.

You can view real-time spectrum information, save the spectral information and view retrieved spectral information from historic spectrum scans.

RADWIN's spectrum measurement and estimation algorithms are designed to show accurate information while accommodating with variations in frequency, temperature and interference power while overcoming anomalies that tend to occur in high interference environments.

Running Spectrum View in Installation Mode

To launch Spectrum View, go to the RADWIN Manager main window menu and click **Tools | Spectrum View**.

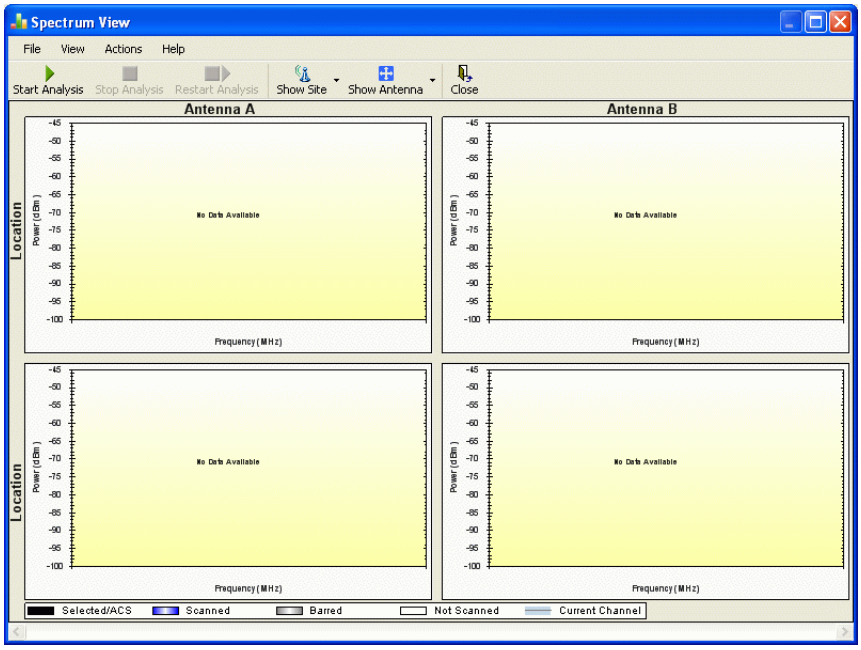
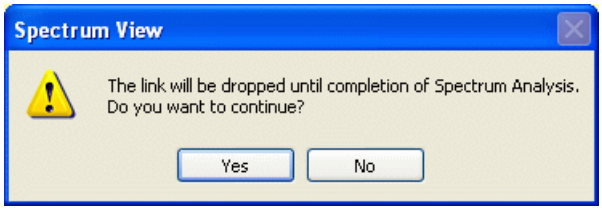


Figure 23-1: Starting the analysis

To obtain a spectrum analysis:

1. Click **Start Analysis**. You are asked for confirmation:



2. Click **Yes**. After a few moments, the first results for the managing site appear:

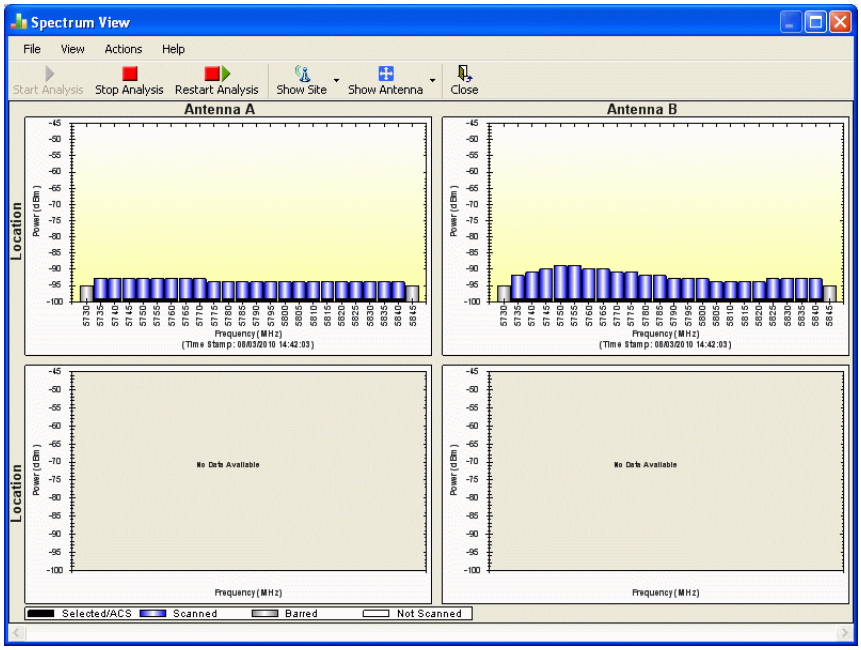


Figure 23-2: Site A (managing site) done

The over-the-air site takes a little longer:

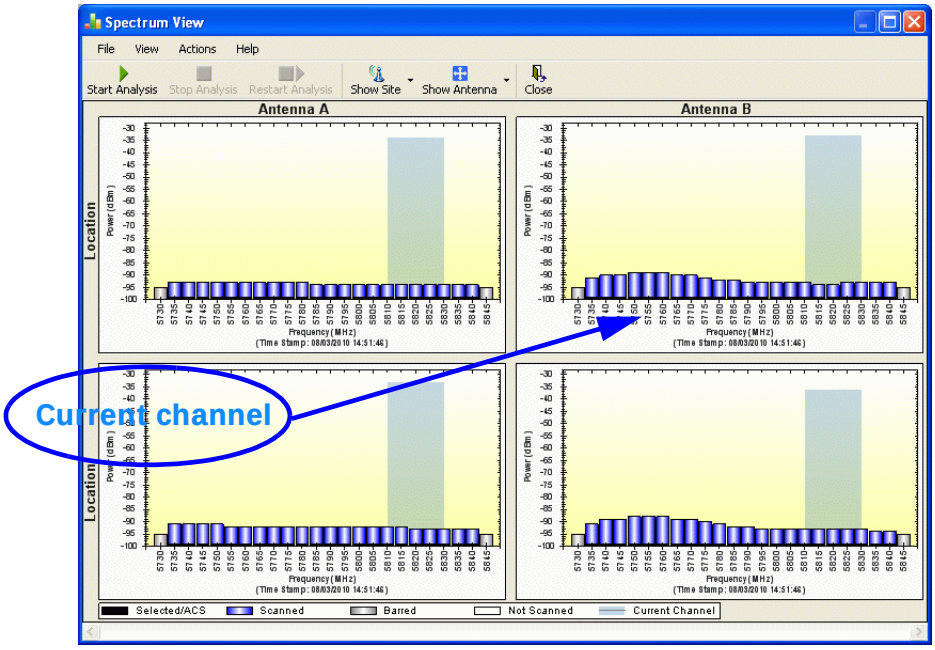


Figure 23-3: Site B (over- the-air site) done, showing current channel

The analysis complete when the Start Analysis button reverts to green. It never runs for longer than ten minutes and you may stop it any time by clicking the red **Stop Analysis** button.

The results for the over-the-air site are displayed after the link is re-established regardless whether the analysis completes by itself or is stopped.

Understanding the Spectrum View Display

Information Displayed

Figure 23-4 shows an annotated display taken from a live link.

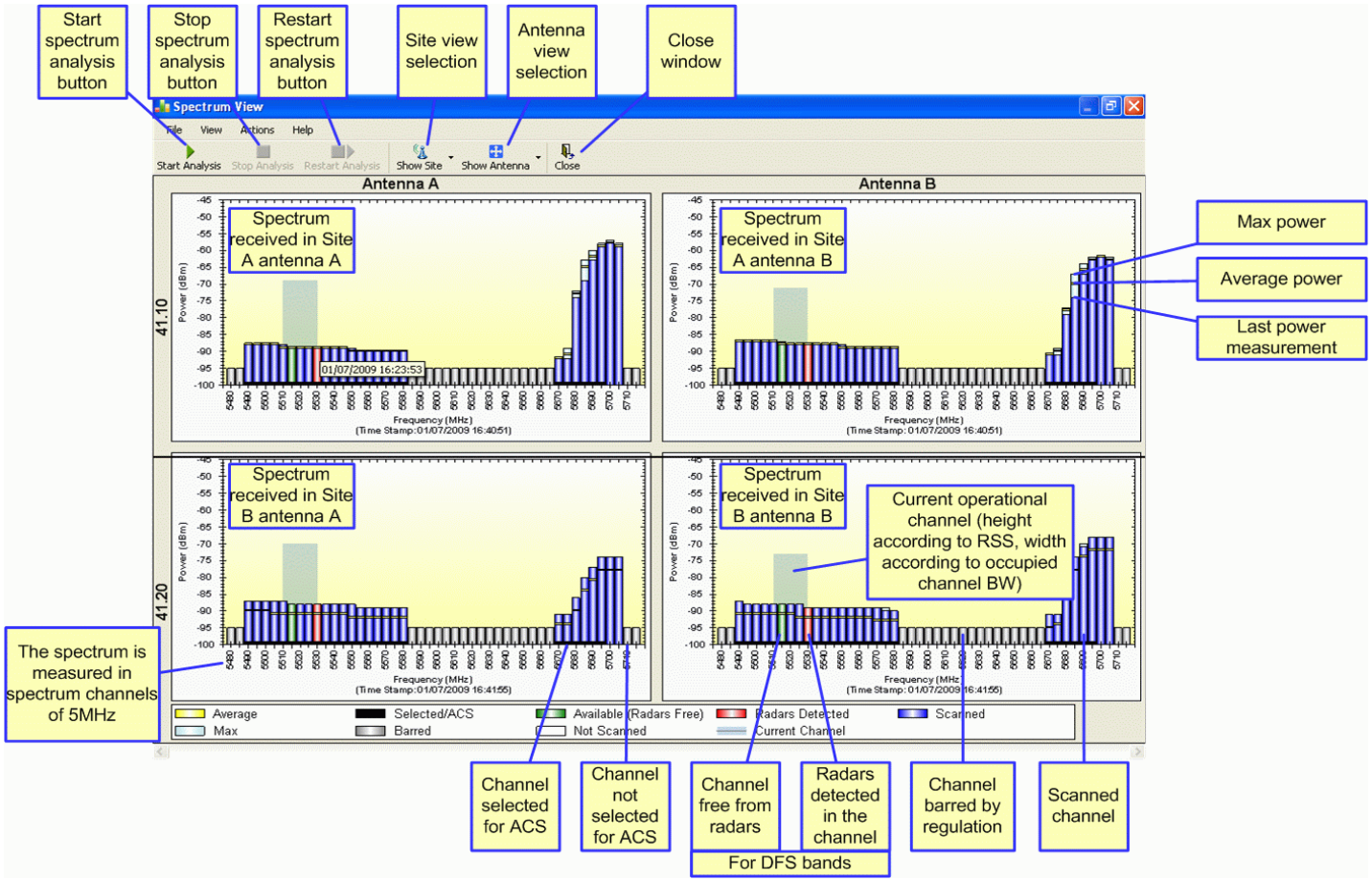


Figure 23-4: RADWIN 2000 Spectrum View - annotated display

From **Figure 23-4** above, you can see that the Spectrum View provides clear information including:

- Spectral measurement for each of the 4 receivers that make a RADWIN 2000 link (two sites x two antennas per site)
- Spectral power measurements in 5MHz channel granularity
- Current, average and maximum power per channel
- Indication of
  - channels free from radars
  - channels with radars detected
  - barred channels (for DFS bands)
- Indication of scanned and un-scanned channels
- Indication of channels selected for ACS
- Notation of the current operational channel of the RADWIN 2000 link
- Time stamp of the last spectrum scan
- Further, it supports zoom capability, selective view of antennas and sites constituting the link and selectable detail level

Changing the Display

Moving the mouse anywhere over one the display areas changes it to a cross hair. The mouse may then be used to select an area for zooming, or to enable a right-click System menu.

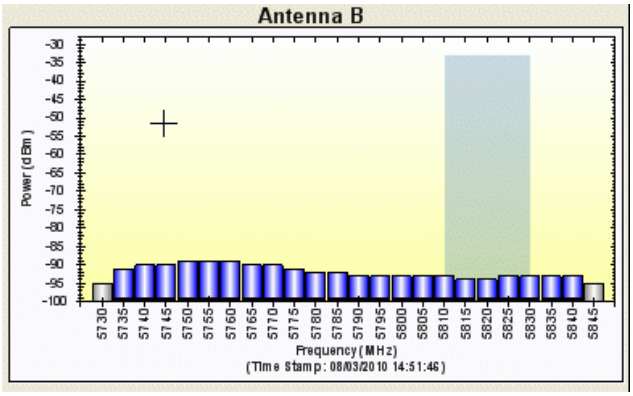


Figure 23-5: Mouse pointer active for zooming

Selecting a rectangle and clicking will zoom the channels below it to full panel width:

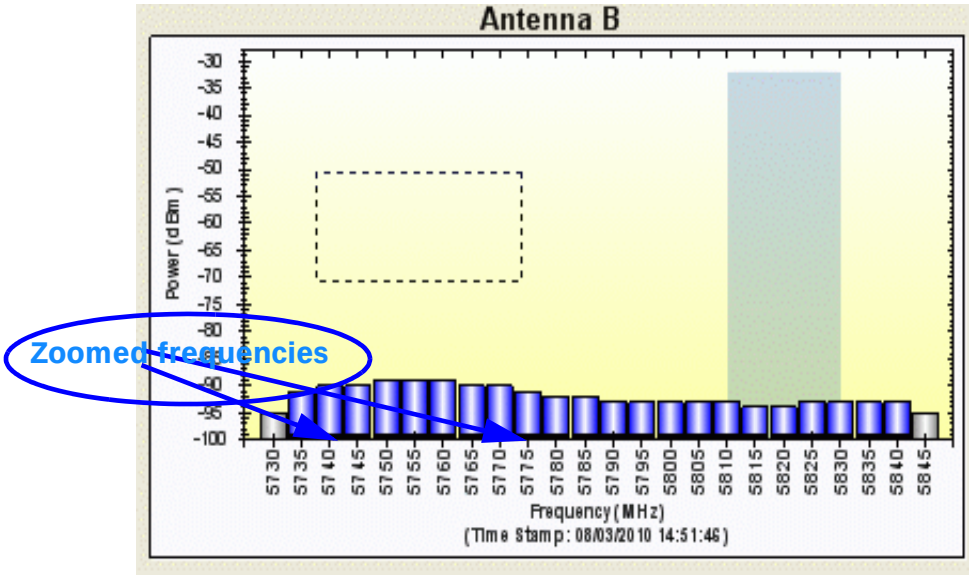


Figure 23-6: Selecting an area of interest to zoom with the right mouse button down

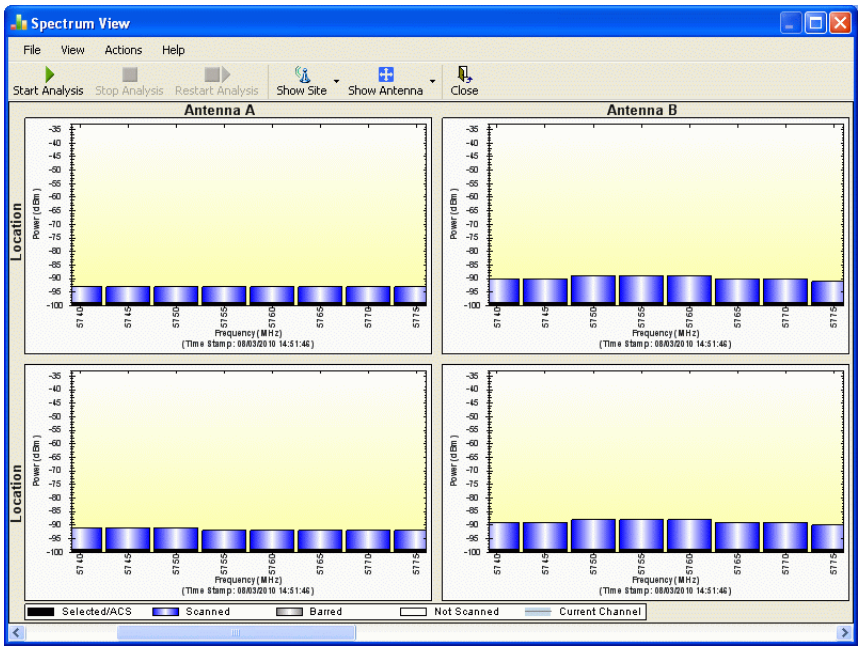


Figure 23-7: Requested section zoomed

The zoom can be reversed using the System menu obtained by right-clicking any of the Spectrum View display panels. It also offers display variations such as maximum, average and current power per channel.

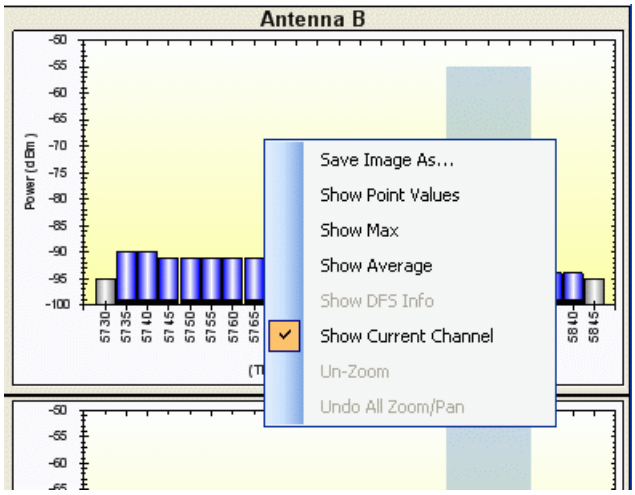


Figure 23-8: Spectrum View System menu

Here are two examples:

If you click **Show Max**, each panel will show the peak values recorded during the analysis:

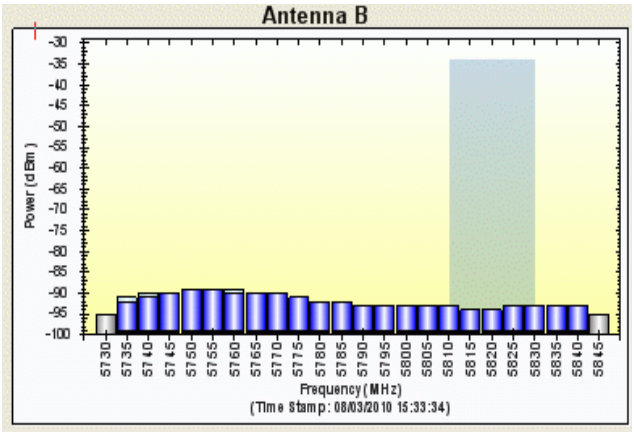


*Figure 23-9: Effect of setting **Show Max***

If you click **Show Average**, each panel will show the average values recorded during the analysis:

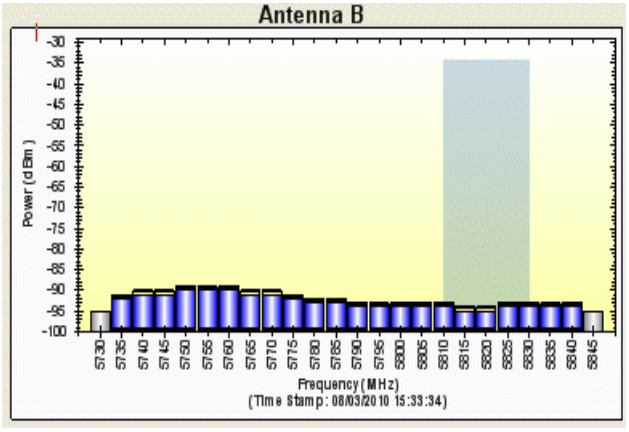


*Figure 23-10: Effect of setting **Show Average***

Restricting the Panels to be Displayed

Click **View** for further viewing options:

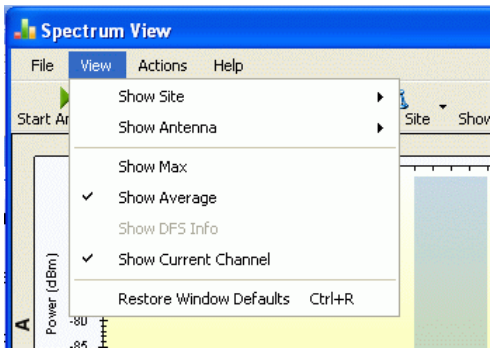


Figure 23-11: Further viewing options

If for example you want Antenna A only, the resulting display will look like this:

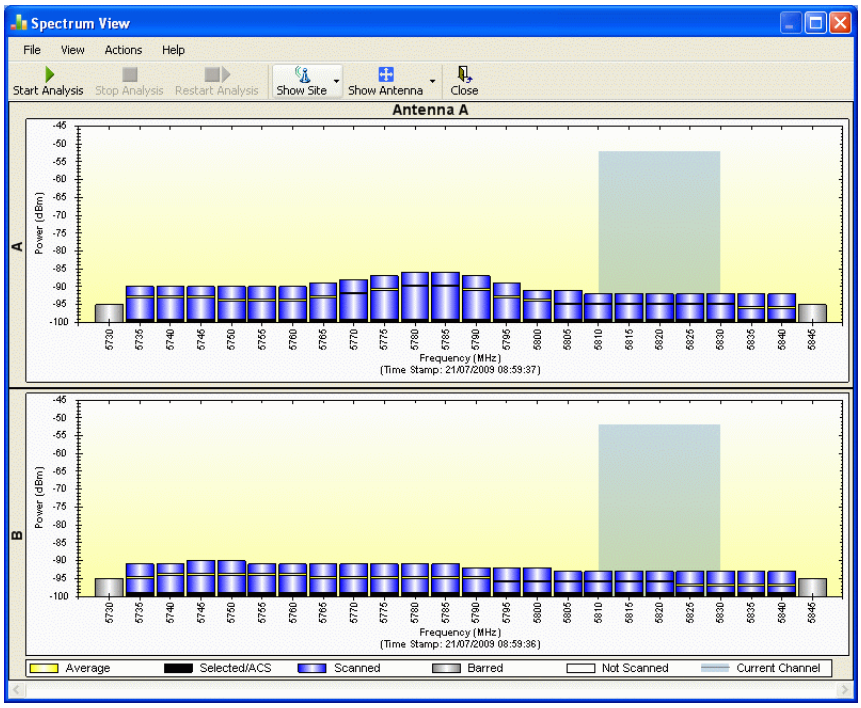
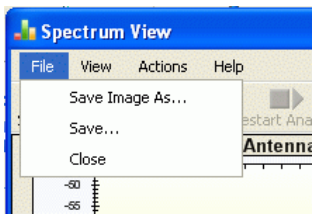


Figure 23-12: Antenna A selected

Saving a Spectrum Analysis

Your analysis can be saved in a CSV (comma separated values) text file. Use the **Files** menu item in the usual way:



The Spectrum View information is logged as part of the Diagnostics Information to improve link and system diagnostics and remote support. It can be retrieved from the RADWIN Manager menu using **Help | Get Diagnostic Information**.

Here is extract of a saved Spectrum View:

```
Spectrum View - Site: A
Frequencies Scanned,Last Scan Timestamp,Last NF-AntennaA,Last NF-AntennaB,Average NF-AntennaA,Average NF-Anten-
naB,Max NF-AntennaA,Max NF-AntennaB
5735,True,30/11/2009 08:20:52,-89,-90,-90,-91,-89,-90,
5740,True,30/11/2009 08:20:52,-89,-90,-90,-91,-89,-90,
5745,True,30/11/2009 08:20:52,-89,-90,-90,-91,-89,-90,
...
5830,True,30/11/2009 08:20:52,-92,-94,-93,-94,-92,-93,
5835,True,30/11/2009 08:20:52,-92,-94,-93,-95,-92,-94,
5840,True,30/11/2009 08:20:52,-92,-94,-93,-95,-92,-94,
Rx Power - AntennaA: -55
Rx Power - AntennaB: -55
Spectrum View - Site: B
Frequency,Is Scanned,Last Scan Timestamp,Last NF-AntennaA,Last NF-AntennaB,Average NF-AntennaA,Average NF-Anten-
naB,Max NF-AntennaA,Max NF-AntennaB
5735,True,30/11/2009 08:20:53,-91,-90,-92,-91,-91,-90,
5740,True,30/11/2009 08:20:53,-90,-89,-91,-90,-90,-89,
5745,True,30/11/2009 08:20:53,-90,-89,-91,-90,-90,-89,
...
5830,True,30/11/2009 08:20:53,-93,-94,-94,-94,-93,-93,
5835,True,30/11/2009 08:20:53,-93,-94,-94,-95,-93,-94,
5840,True,30/11/2009 08:20:53,-93,-94,-94,-95,-93,-94,
Rx Power - AntennaA: -57
Rx Power - AntennaB: -55
```

The column headings are wrapped around. The table values in dBm, are noise-floor (NF) relative.

The CSV file imports easily into most spreadsheet programs. Here is a MS Excel import:

	A	B	C	D	E	F	G	H	I	J
1	Spectrum View - Site: A									
2	Frequency	Is Scanned	Last Scan Timestamp	Last NF-AntennaA	Last NF-Antenna	Average NF-Antenn	Average NF-Antenn	Max NF-AntennaA	Max NF-AntennaB	
3	5735	TRUE	30/11/2009 08:20	-89	-90	-90	-91	-89	-90	
4	5740	TRUE	30/11/2009 08:20	-89	-90	-90	-91	-89	-90	
5	5745	TRUE	30/11/2009 08:20	-89	-90	-90	-91	-89	-90	
6	5750	TRUE	30/11/2009 08:20	-90	-91	-91	-91	-90	-90	
7	5755	TRUE	30/11/2009 08:20	-90	-91	-91	-92	-90	-91	
8	5760	TRUE	30/11/2009 08:20	-90	-91	-91	-92	-90	-91	
9	5765	TRUE	30/11/2009 08:20	-90	-91	-91	-92	-90	-91	
10	5770	TRUE	30/11/2009 08:20	-90	-91	-91	-92	-90	-91	
11	5775	TRUE	30/11/2009 08:20	-90	-92	-91	-92	-90	-91	
12	5780	TRUE	30/11/2009 08:20	-91	-92	-92	-93	-91	-92	
13	5785	TRUE	30/11/2009 08:20	-91	-92	-92	-92	-90	-91	
14	5790	TRUE	30/11/2009 08:20	-91	-92	-92	-93	-91	-92	
15	5795	TRUE	30/11/2009 08:20	-91	-92	-92	-93	-91	-92	
16	5800	TRUE	30/11/2009 08:20	-91	-93	-92	-93	-91	-92	
17	5805	TRUE	30/11/2009 08:20	-91	-93	-92	-94	-91	-93	
18	5810	TRUE	30/11/2009 08:20	-91	-93	-92	-94	-91	-93	
19	5815	TRUE	30/11/2009 08:20	-91	-93	-92	-94	-91	-93	
20	5820	TRUE	30/11/2009 08:20	-91	-93	-92	-94	-91	-93	
21	5825	TRUE	30/11/2009 08:20	-92	-93	-93	-94	-92	-93	
22	5830	TRUE	30/11/2009 08:20	-92	-94	-93	-94	-92	-93	
23	5835	TRUE	30/11/2009 08:20	-92	-94	-93	-95	-92	-94	
24	5840	TRUE	30/11/2009 08:20	-92	-94	-93	-95	-92	-94	
25	Rx Power - AntennaA: -55									
26	Rx Power - AntennaB: -55									
27	Spectrum View - Site: B									
28	Frequency	Is Scanned	Last Scan Timestamp	Last NF-AntennaA	Last NF-Antenna	Average NF-Antenn	Average NF-Antenn	Max NF-AntennaA	Max NF-AntennaB	
29	5735	TRUE	30/11/2009 08:20	-91	-90	-92	-91	-91	-90	
30	5740	TRUE	30/11/2009 08:20	-90	-89	-91	-90	-90	-89	
31	5745	TRUE	30/11/2009 08:20	-90	-89	-91	-90	-90	-89	
32	5750	TRUE	30/11/2009 08:20	-90	-89	-91	-90	-90	-89	
33	5755	TRUE	30/11/2009 08:20	-90	-89	-91	-90	-90	-89	
34	5760	TRUE	30/11/2009 08:20	-91	-89	-92	-90	-90	-87	
35	5765	TRUE	30/11/2009 08:20	-91	-90	-92	-91	-90	-88	
36	5770	TRUE	30/11/2009 08:20	-91	-90	-91	-90	-83	-81	
37	5775	TRUE	30/11/2009 08:20	-91	-90	-91	-90	-83	-81	
38	5780	TRUE	30/11/2009 08:20	-92	-91	-92	-90	-83	-81	
39	5785	TRUE	30/11/2009 08:20	-92	-91	-92	-91	-85	-82	
40	5790	TRUE	30/11/2009 08:20	-92	-92	-92	-92	-86	-83	
41	5795	TRUE	30/11/2009 08:20	-92	-92	-93	-93	-92	-92	
42	5800	TRUE	30/11/2009 08:20	-92	-93	-93	-94	-92	-92	
43	5805	TRUE	30/11/2009 08:20	-93	-93	-93	-94	-92	-93	
44	5810	TRUE	30/11/2009 08:20	-93	-93	-94	-94	-93	-93	
45	5815	TRUE	30/11/2009 08:20	-93	-93	-94	-94	-93	-93	
46	5820	TRUE	30/11/2009 08:20	-93	-93	-94	-94	-93	-93	
47	5825	TRUE	30/11/2009 08:20	-93	-94	-94	-94	-93	-93	
48	5830	TRUE	30/11/2009 08:20	-93	-94	-94	-94	-93	-93	
49	5835	TRUE	30/11/2009 08:20	-93	-94	-94	-95	-93	-94	
50	5840	TRUE	30/11/2009 08:20	-93	-94	-94	-95	-93	-94	
51	Rx Power - AntennaA: -57									
52	Rx Power - AntennaB: -55									
53										

Figure 23-13: Spectrum View CSV file imported into MS Excel

Management Integration

Spectrum view information is supported in RADWIN's MIB and can be used by external Network Management applications.

Chapter 24

BRS/EBS Considerations

What is BRS/EBS

The Broadband Radio Service (BRS), formerly known as the Multipoint Distribution Service (MDS)/Multichannel Multipoint Distribution Service (MMDS), is a US **FCC regulated** commercial service. **The relevant FCC rule is 47CFR part 27**.

In the past, it was generally used for the transmission of data and video programming to subscribers using high-powered wireless cable systems. However, over the years, it has evolved to include digital two-way systems capable of providing high-speed, high-capacity broadband service, including two-way Internet service via cellularized communication systems. Such services provide consumers integrated access to voice, high-speed data, video-on-demand, and interactive delivery services from a wireless device.

For further details see:

http://wireless.fcc.gov/services/index.htm?job=service_home&id=ebs_brs

This link (part of the FCC site) contains the Technical Rules covering matters such as:

- Operational scope
- Geographic service area
- Antenna registration

BRS/EBS Bands

The BRS/EBS band (post-transition) is illustrated in **Figure 24-1** below and in more detail in the three tables following.

Observe that the BRS/EBS spectrum is divided into small channels, mainly of 5.5 and 6 MHz. There are two small ranges of 0.333 MHz channels as well.

BRS/EBS user may lease blocks of up to four contiguous channels to achieve their required channel bandwidth. These are often referred to as single, double, triple or quad bands.

Post transition frequency assignments according to FCC CFR47 PART 27 section 27.5:2009

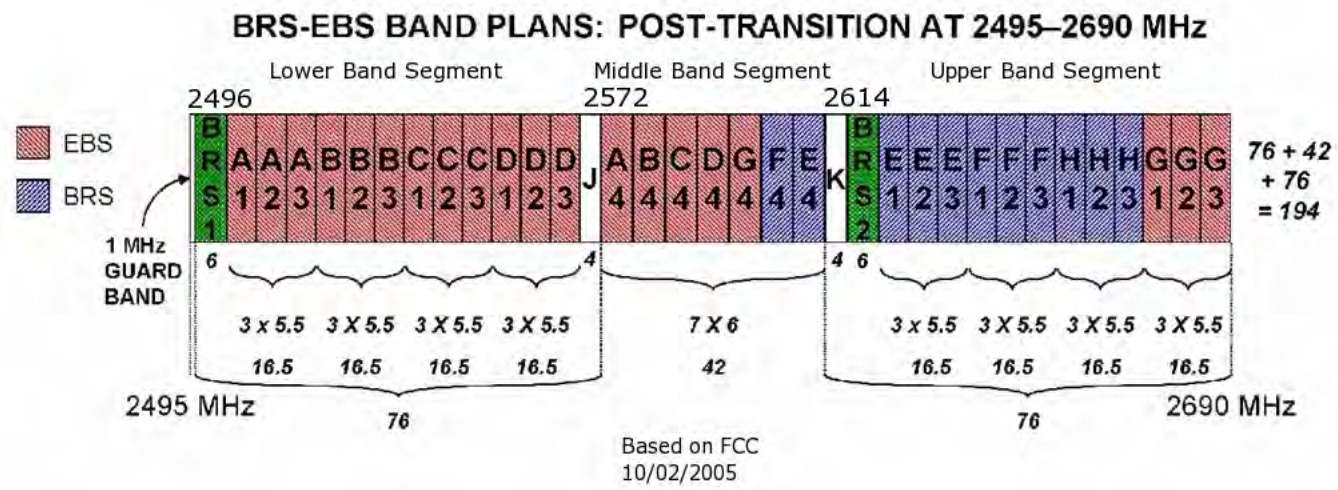


Figure 24-1: BRS/EBS Bands Schematic

The tables below provide a detailed view of the spectrum from 2.495 GHz to 2.690 GHz

The sections marked J and K are not detailed. since they are not supported by RADWIN products.

Table 24-1: BRS/EBS Lower Band Segment (LBS)

Channel type	Channel Tag	CBW MHz	Band MHz	
			From	To
BRS Guard	1	6	2496.0	2502.0
EBS	A1	5.5	2502.0	2507.5
	A2		2507.5	2513.0
	A3		2513.0	2518.5
	B1		2518.5	2524.0
	B2		2524.0	2529.5
	B3		2529.5	2535.0
	C1		2535.0	2540.5
	C2		2540.5	2546.0
	C3		2546.0	2551.5
	D1		2551.5	2557.0
	D2		2557.0	2562.5
	D3		2562.5	2568.0
EBS (not supported by RADWIN)	JA1	0.33333	2568.0	2572.0
	JA2			
	JA3			
	JB1			
	JB2			
	JB3			
	JC1			
	JC2			
	JC3			
	JD1			
	JD2			
	JD3			

Table 24-2: BRS/EBS Middle Band Segment (MBS)

Channel type	Channel Tag	CBW MHz	Band MHz	
			From	To
EBS	A4	6	2572	2578
	B4		2578	2584
	C4		2584	2590
	D4		2590	2596
	G4		2596	2602
BRS/EBS	F4		2602	2608
	E4		2608	2614

Table 24-3: BRS/EBS to RADWIN 2000 CBW mapping and Max Tx Power

BRS/EBS Band	Channel Type	Total CBW MHz	RADWIN 2000 CBW MHz	Max Tx Power dBm
LBS & HBS 5.5 MHz/slice	Single	5.5	5	22
	Double	11.0	10	23
	Triple	16.5	Don't use (‡)	
	Quad	22.0	20	24
MBS 6 MHz / slice	Single	6	5	22
	Double	12	10	23
	Triple	18	Don't use (‡)	
	Quad	24	20	24

(‡) Using a triple channel would be wasteful over a single link.

Table 24-4: BRS/EBS Upper Band Segment (UBS)

Channel type	Channel Tag	CBW MHz	Band MHz	
			From	To
EBS/EBS, mixed (not supported by RADWIN)	KH1	0.33333	2614.0	2618.0
	KH2			
	KH3			
	KG1			
	KG2			
	KG3			
	KF1			
	KF2			
	KF3			
	KE1			
	KE2			
	KE3			
BRS Guard	2	6	2618	2624
BRS/EBS	E1	5.5	2624.0	2629.5
	E2		2629.5	2635.0
	E3		2635.0	2640.5
	F1		2640.5	2646.0
	F2		2646.0	2651.5
	F3		2651.5	2657.0
BRS	H1		2657.0	2662.5
	H2		2662.5	2668.0
	H3		2668.0	2673.5
EBS	G1		2673.5	2679.0
	G2		2679.0	2684.5
	G3		2684.5	2690.0

Setting up a BRS/EBS link using RADWIN 2000 2.5GHz Band

The key issue in setting up a RADWIN 2000 2.5GHz Band BRS link is the choice of an appropriate channel bandwidth (CBW), which in turn depends on whether you are leasing a single, double, triple or quad band set.

RADWIN BRS radios operate with channel bandwidths selectable from 5, 10 and 20 MHz. Choose your channel bandwidth in accordance with **Table 24-3**.

RADWIN does not support the bands labeled J and K in **Figure 24-1**.

Chapter 25

Quality of Service

Availability

The Quality of Service (QoS) feature is available for links using RADWIN 2000 C radios. If you already have this model, you can access the feature by carrying out a Software Upgrade to the 2.5.40 release.

To use the facility you must be familiar with the use of VLAN (802.1p) or Diffserv.

QoS - Overview

QoS is a technique for prioritization of network traffic packets during congestion.

RADWIN 2000 C links support two classification criteria, VLAN based or Diffserv based. You may chose which of them to use.

Table 25-1: Default priorities an d allocation by VLAN ID and Diffserv

Quality queue	Priority		REDAT %
	Diffserv	VLAN	
Real time	48-63	6-7	15
Near real time (responsive applications)	32-47	4-5	20
Controlled load	16-31	2-3	25
Best effort	0-15	0-1	40

For REDAT (Remaining Ethernet Data - Ethernet throughput) measurement - see **Throughput Checking**. REDAT measures remaining Ethernet throughput after reduction of bandwidth used by TDM channels. Use the Link Budget Calculator to see how much remaining bandwidth is available for Ethernet.

Based upon the classification criterion chosen, received packets will be mapped into one of four quality groups: Real time, Near real time, Controlled load and Best effort.

You may partition the total link capacity across the four Quality queues. The default weights as percentages are shown in **Table 25-1**.

Further, you may also limit the maximum information rate (MIR) for each queue per site.

Setting up QoS

You may set up QoS from either the Installation or Configuration wizards. Before doing so, set up for VLAN (**Chapter 14**) or Diffserv, depending on which you intend to use.

➢ To define QoS settings for a link:

1. Using either the Installation or Configuration wizards, navigate to the Services window and chose the QoS tab.

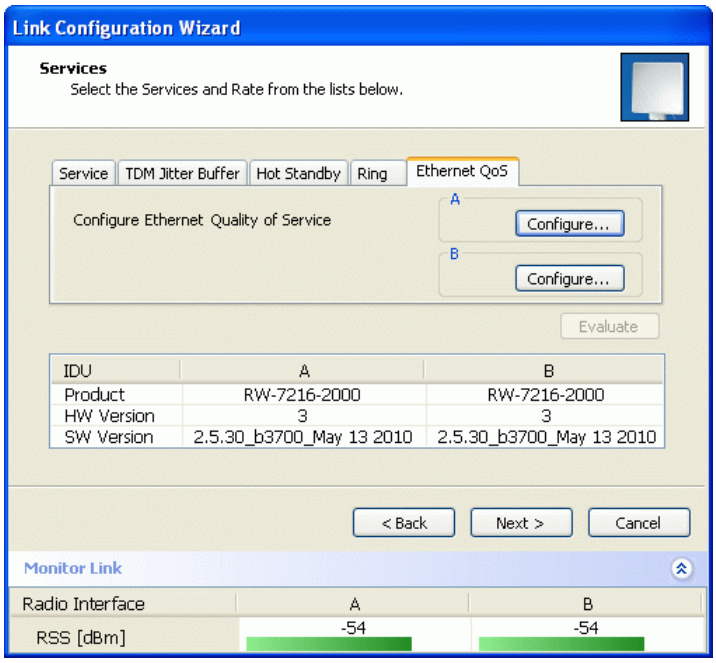


Figure 25-1: Services window with QoS selected

Although QoS is a link-oriented feature, each site may have its own separate parameters.

2. Click the **Configure** button for a site.

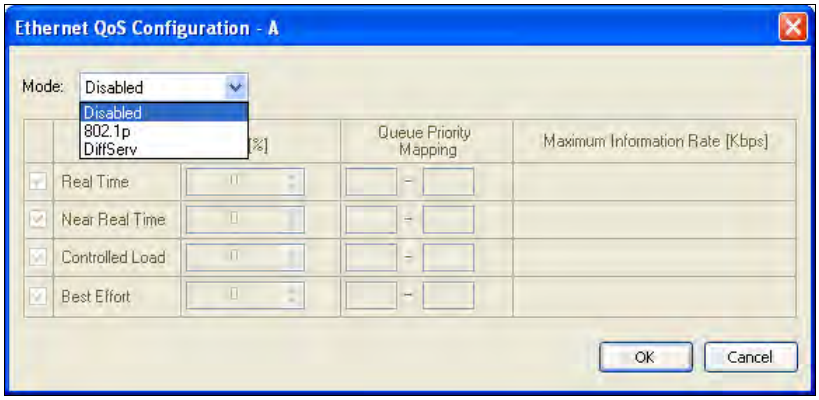


Figure 25-2: Ethernet QoS Configuration - Mode selection

3. Choose the required mode - 802.1p (VLAN) or Diffserv.

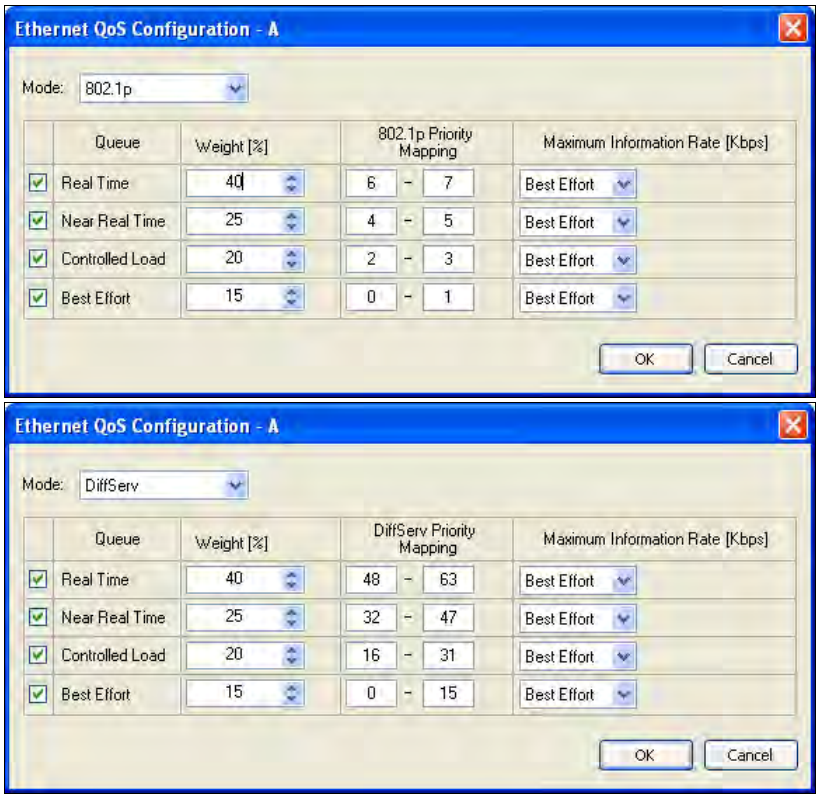
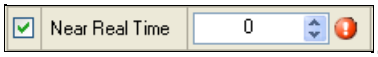


Figure 25-3: Top: VLAN allocation. Bottom: Diffserv allocation

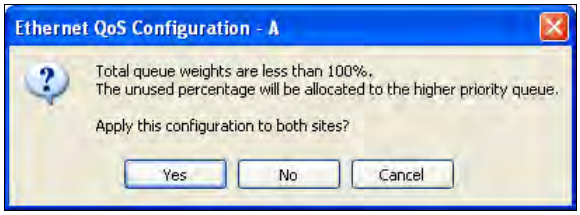
4. The entry fields in both cases are self evident. Upon clicking **OK**,

- If you over-book the Weight column, the last entered field will be reduced so that the total is 100%.
- No weight field may be left zero. If you do, you will not be able to proceed until it is set to something:

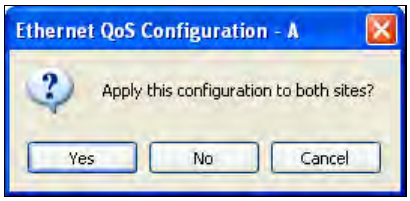


This reflects the implementation policy under which no checked queue may be completely starved. If you really do not want to use a queue under congestion, uncheck it.

- If you are under-booked, you will receive this notice:



- In any event, you may automatically apply the same settings to both link sites:



5. Priorities: You are completely responsible for the completeness and consistency of your VLAN or Diffserv priorities.
6. Choose a Maximum Information Rate for each queue:

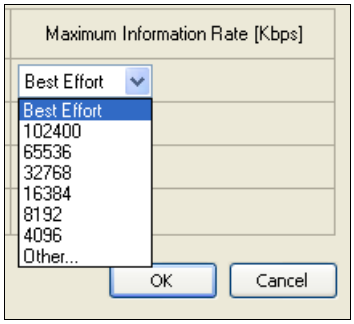


Figure 25-4: MIR choice - per queue

If you previously used **Site | Ethernet | Maximum Information Rate** (Chapter 8) to globally limit the site, then your choice in Figure 25-4 will also be limited.l

7. Click **OK** on the exit dialog to accept the settings. If you did not use these settings for the opposite site, you should configure it now.
8. Complete the wizard in the usual way.

Disabling QoS

In the dialog of Figure 25-2, choose the **Disabled** mode. The two sites may be enabled or disabled independently.

RADWIN

RADWIN 2000

Broadband Wireless Transmission System

USER MANUAL

RELEASE 2.5.40

Part 6: Product Reference

UM 2000-2540/02.11

Appendix A

Technical Specifications

Scope of these Specifications

This appendix contains technical specifications for the major link components appearing in this User Manual. They are correct at the date of publication, but are intended for general background only. The latest authoritative and most up to date technical specifications are available as Data Sheets obtainable from RADWIN Customer Service.

In any event, RADWIN reserves the right to change these specifications without notice.

ODU

Capacity	• RADWIN 2000 C: Up to 16 E1/T1 services and up to 100 Mbps capacity (net throughput, full duplex) • RADWIN 2000 X: Up to 3 E1 or 4 T1 services up to 10Mbps capacity (net throughput , full duplex) • RADWIN 2000 L: Up to 50 Mbps capacity (net throughput, full duplex) • RADWIN 2000 PDH: Up to 16 E1/T1 services and up to 10 Mbps capacity (net throughput, full duplex. Requires an IDU-C or E, no PoE support							
Range	Up to 120 km / 75 miles							
Radio Modulation	2x2 MIMO-OFDM (BPSK/QPSK/16QAM/64QAM)							
Adaptive Modulation & Coding	Supported							
Automatic Channel Selection	Supported							
Diversity	Supported							
Spectrum View	Supported							
Duplex Technology	TDD							
Error Correction	FEC k = 1/2, 2/3, 3/4, 5/6							
Rate – Dual Antenna [Mbps]	13	26	39	52	78	104	117	130
Rate – Single Antenna [Mbps]	6.5	13	19.5	26	39	52	58.5	65
Modulation	BPSK	QPSK		16QAM		64QAM		
FEC [k=]	1/2	1/2	3/4	1/2	3/4	2/3	3/4	5/6
Max Tx Power [dBm] for 4.8 – 6 GHz	25			24	21	19	18	
Max Tx Power [dBm] for 2.4 GHz	26			25	24	24	21	20
Max Tx Power [dBm] for 2.5 GHz (BRS)	See **Table 24-3**							

Sensitivity (dBm) @BER <10e-11 (20MHz)	-88	-86	-83	-81	-77	-72	-70	-67
Encryption	AES 128							

Band	Occupied Frequency range [GHz]	Compliance	Channel Bandwidth			
			5 MHz	10 MHz	20 MHz	40 MHz
FCC/IC 5.8	5.725 - 5.850	FCC 47CFR, Part 15, Subpart C and IC RSS-210	No	Yes	Yes	Yes
FCC 5.4	5.480 - 5.715	FCC 47CFR, Part 15, Subpart E	No	Yes	Yes	Yes
IC 5.4	5.480 – 5.590 5.660 – 5.715	IC RSS-210	No	Yes	Yes	Yes
FCC/IC 5.3	5.260 - 5.340	FCC 47CFR, Part 15, Subpart E and IC RSS-210	No	Yes	Yes	Yes
FCC/IC 4.9	4.940 - 4.990	FCC 47CFR, Part 90, Subpart Y and IC RSS-111	No	Yes	Yes	No
FCC/IC 2.4	2.402 - 2.472	FCC 47CFR, Part 15, Subpart C and IC RSS-210	No	Yes	Yes	No
FCC/IC 3.6(Lic)	3.650 - 3.675	FCC Part 90 Subpart Z and IC RSS-197 (Restricted)	Yes	Yes(‡)	Yes(‡)	No
FCC 2.5(*)	2.495 2.690	FCC CFR47 PART 27 section 27.5:2009 (BRS/EBS)	Yes	Yes	Yes	No
IC 3.4 (Lic)	3.475 – 3.650	IC RSS-192	Yes	Yes(‡)	Yes(‡)	No
WPC India 5.8	5.825 – 5.875	GSR-38	No	Yes	Yes	Yes
MII China 5.8	5.730 – 5.845	MII China	No	Yes	Yes	Yes
ETSI 5.8	5.735 – 5.865	ETSI EN 302 502	No	Yes	Yes	No
ETSI 5.4	5.480 – 5.715	ETSI EN 301 893	No	Yes	Yes	Yes
ETSI 5.3	5.160 – 5.340	ETSI EN 301 893	No	Yes	Yes	No
ETSI 3.4 (Lic)(†)	3.400 - 3.700	ETSI EN 302 326-2	Yes	Yes(‡)	Yes(‡)	No
Universal 6.0	5.690– 6.060	N/A	No	Yes	Yes	Yes
Universal 5.9	5.730 – 5.960		No	Yes	Yes	Yes
Universal 5.4	5.490 – 5.710		No	Yes	Yes	Yes
Universal 5.3	5.140 – 5.345		No	Yes	Yes	Yes
Universal 4.9	4.890 - 5.010		No	Yes	Yes	Yes
Universal 4.8	4.800 - 4.900		No	Yes	Yes	Yes
Universal 2.3	2.302 - 2.379		No	Yes	Yes	No
Universal 3.4	3.300 - 3.800		Yes	Yes(‡)	Yes(‡)	No

(‡)Not available for X series ODUs.

(†)Split into three sub-bands. See **page 20-9**.

(*) Split into many sub-bands. There are also Tx Power limitations. See **Chapter 24**, and in particular, tables **24-1** to **24-4**.

ODU with Integrated Antenna	37.1/14.84(W) x 37.1/14.84(H) x 9.00/3.6(D) cm/in; 3.5 kg / 7 lbs
ODU Connectorized	18.0/7.2(W) x 27.0/10.8(H) x 5.5/2.2(D) cm/in; 1.5 kg / 3.0 lbs

Power Feeding	Dual feeding, -20 to -60 VDC (AC/DC converter is available)
Power Consumption - alone	25W
Power Consumption with IDU	See IDU specifications, this Appendix

Architecture	ODU: Outdoor Unit with Integrated Antenna or Connectorized for External Antenna IDU: Indoor Unit for service interfaces or PoE device for Ethernet only
ODU to IDU/PoE Interface	Outdoor CAT-5e cable; Maximum cable length: 100 m

Management Application (per link)	RADWIN Manager
Protocol	SNMP and Telnet
NMS	RADWIN NMS

Operating Temperatures	ODU: -35°C to +60°C / -31°F to +140°F
Humidity	ODU: Up to 100% non-condensing, IP67

FCC/IC (cTUVus)	UL 60950-1, UL 60950-22, CAN/CSA C22.2 60950-1, CAN/CSA C22.2 60950-22
ETSI/IEC	EN/IEC 60950-1, EN/IEC 60950-22

FCC	47 CFR Class B, Part15, Subpart B
ETSI	EN 300 386, EN 301 489-1, EN 301 489-4
CAN/CSA	CISPR 22-04 Class B
AS/NZS	CISPR 22:2004 Class B

IDU

The following specifications are for most part, common to both IDU-C and new style IDU-E products. Differences are pointed out in the tables.

	IDU-C	**IDU-E**
Number of ports	16, 8, 4 ports or no TDM ports.	2 or no TDM port
Max ports usable by WinLink 1000	4	2
Max ports usable by RADWIN 2000	16	2
Type	E1/T1 configurable by RADWIN Manager	
Framing	Unframed (transparent)	
Timing	Independent timing per port, Tx and Rx	
Connector	RJ-45	
Standards Compliance	ITU-T G.703, G.826	
Line Code	E1: HDB3 @ 2.048 Mbps, T1: B8ZS/AMI @ 1.544 Mbps	
Latency	Configurable 5-20 msec	
Impedance	E1: 120Ω, balanced, T1: 100Ω, balanced	
Jitter & Wander	According to ITU-T G.823, G.824	

	IDU-C	IDU-E
Jitter Buffer	Jitter Buffer configuration enabling a latency from 5msec to 16msec for interference immunity confront	
Clock Recovery Resolution	0.05ppb	
Clock stability	20ppm as clock master (crucial for wander requirements of cellular operators)	

Ethernet ports	Ports: 2
	10/100BaseT with Auto-Negotiation (IEEE 802.3u)
	Framing/Coding IEEE 802.3
	Connector RJ-45
	Line Impedance 100 Ω
SFP port (IDU-C only)	1 port, Type: Fast Ethernet
VLAN Support	Transparent
Maximum Frame Size	2047 Bytes
Bridge	Layer 2, self-learning of up to 2047 MAC addresses (IEEE 802.1Q), hub/Bridge selectable mode
Latency	3 msec

Dry Contact Alarms	4 Inputs + 4 Outputs; Configurable by the RADWIN Manager
Monitored Hot Standby (IDU-C only)	Supported

	IDU-C	IDU-E
Style	1U 19” Rack mounted	Half 19” wall mounted or desktop
Dimensions	43.6cm(W) x 21cm(D) x 4.4cm(H)	22cm(W) x 17cm(D) x 4.4cm(H)
Weight	1.5 kg/3.3 lbs	0.5 kg/1.1 lbs

	IDU-C	IDU-E
Power Consumption		
With WinLink 1000 ODU	< 15W	< 15W
With RADWIN 2000 ODU	< 35W	< 35W
Alone	7W	3W
Power Feeding Options	Dual feeding, -20 to -60VDC	Single feeding, -20 to -60VDC

Operating Temperatures	0°C - 50°C / 32°F - 122°F
Humidity	90% non-condensing

FCC / IC (cTUVus)	UL 60950-1, CAN/CSA C22.2 60950-1
ETSI / IEC	EN/IEC 60950-1

FCC	CFR47 Class B, Part15, Subpart B
ETSI	EN 300 386, EN 301 489-4, EN 301 489-1
CAN/CSA-CEI/IEC	CISPR 22 Class B
AS/NZS	CISPR 22:2006 Class B

PoE Device - Indoor, AC

AC Input Voltage	100-240VAC nominal, 85-265VAC max range
Input Frequency	47-63Hz
Input Current	1.5A max at 90VAC, 0.75A max at 265VAC
Output Voltage and Current	55VDC, 0-1A Range 50-58VDC
Protection	Short circuit protection Auto recovery Over voltage protection
Indication	Green led for normal operation

Ethernet LAN interface type	RJ 45, 10/100BaseT Interface (Line Impedance -100Ω)
AC	Standard socket IEC320 C14 type
ODU (PoE Port)	RJ-45 connector

Case	Plastic
Dimensions	16cm(W) x 6.3cm(D) x 3.33cm(H)
Weight	250g

Operating Temperatures	0°C - 40°C
Humidity	90% non-condensing

UL	60950
C-UL	60950
TUV/GS	IEC/EN 60950

ESD	61000-4-2
RS	61000-4-3
EFT	61000-4-4
Surge	61000-4-5
CS	61000-4-6

DIPS	61000-4-11
EMI	FCC part 15 class B, CISPR Pub 22 class B

PoE Device - Outdoor, DC

Input voltage range	-20 to -60 VDC (single input)
Output voltage	48VDC / 0.6A
Power Consumption	0.5W (not including radio)
Protections	Differential - 15KW Common – 3KW

Ethernet LAN interface type	RJ 45, 10/100BaseT Interface (Line Impedance -100Ω)
DC input	2 pins connector
ODU (PoE Port)	RJ45

Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Enclosure	All weather cases
Operating Temperatures	-35°C - 60°C / -31°F - 140°F
Humidity	Up to 100% non-condensing
Standards	IEC 60721-3-4 Class 4M5 IP67

FCC/IEC/ CAN/CSA	60950-1, 60950-22

ETSI	EN 300 386 V1.3.2; EN 301 489-1 V1.4.1
FCC	CFR47 Class B, Part15, Subpart B
CAN/CSA	ICES-003:2004 Class B
AS/NZS	CISPR 22:2006 class B

GSU

Architecture	Outdoor Unit Connectorized for External GPS Antenna
GSU to PoE Interface	Outdoor CAT-5e cable; Maximum cable length: 100 m

Dimensions	24.5cm(H) x 13.5cm(W) x 4.0cm(D)
Weight	1.0kg/2.2lbs

Power Feeding	Power provided by PoE device
Max Power Dissipation	10Watt

Operating Temperature Range	-35°C to + 60°C / -13°F to 140°F
Humidity	Up to 100% non-condensing

EN / IEC	Designed to meet EN/IEC 60950-1, 60950-22

FCC	Designed to meet 47 CFR Class B, Part15, Subpart B
ETSI	Designed to meet EN 300 386 V1.3.3; EN 301 489-4 V1.3.1; EN 301 489-1
CAN / CSA-CEI / IEC	Designed to meet CISPR 22-02
AS / NZS	Designed to meet CISPR22: 2006 Class B

Antenna Characteristics

An antenna is the radiating and receiving element from which the radio signal, in the form of RF power, is radiated to its surroundings and vice versa. The transmission range is a function of the antenna gain and transmitting power. These factors are limited by country regulations.

The RADWIN 2000 may be operated with an integrated antenna attached to the ODU unit, or with an external antenna wired to the ODU via a N-type connectors. All cables and connections must be connected correctly to reduce losses. The required antenna impedance is 50Ω.

Appendix B

Wiring Specifications

ODU-IDU Cable

The ODU-IDU cable is shielded/outdoor class CAT-5e, 4 twisted-pair 24 AWG terminated with RJ-45 connectors on both ends. A cable gland on the ODU side provides hermetic sealing.

The following table shows the connector pinout:

Table B-1: ODU-IDU RJ-45 Connector Pinout

Function	Color	IDU	ODU
Ethernet (RxN)	White/Green	1	1
Ethernet (RxT)	Green	2	2
Ethernet (TxT)	White/Orange	3	3
Ethernet (TxN)	Orange	6	6
Power (+)	Blue	4	4
Power (+)	White/Blue	5	5
Power (–)	White/Brown	7	7
Power (–)	Brown	8	8

ODU/HSS Unit Connection Pinout

Table B-2: ODU/HSS Unit Connection Pinout

Color	ODU RJ-45	HSS UNIT RJ-45
White/Green	1	1
Green	Not connected	
White/Orange		
Orange	6	6
Blue	4	4
White/Blue	5	5

Table B-2: ODU/HSS Unit Connection Pinout (Continued)

Color	ODU RJ-45	HSS UNIT RJ-45
White/Brown	7	7
Brown	8	8

User Port Connectors

LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to **Table B-3**.

Table B-3: Fast Ethernet Connector Pinout

Function	Signal	Pin
Transmit Data (positive)	TD (+)	**1**
Transmit Data (negative)	TD (–)	**2**
Receive Data (positive)	RD (+)	**3**
Receive Data (negative)	RD (–)	**6**

Trunk Ports - E1/T1 RJ45 Connector

The E1/T1 interfaces terminate in 8-pin RJ-45 connectors, as shown in **Table B-4** below:

Table B-4: Trunk Ports - E1/T1 RJ45Pinout

Function	Signal	Pin
Transmit Data Tip	TxTip	**1**
Transmit Data Ring	TxRing	**2**
Receive Data Tip	RxTip	**4**
Receive Data Ring	RxRing	**5**

Hot Standby Port RJ-11

Table B-5: Hot Standby RJ-11 Port Pinout

Signal	Pin Side A	Pin Side B
HSB out	**1**	**2**
HSB in	**2**	**1**
Ground	**3**	**3**
Ground	**4**	**4**

IDU (all models) Alarm Connector

The IDU Alarm interface is a 25 pin D type female connector. Its pinout is listed in **Table B-6**.

Table B-6: IDU Alarm Connector (Dry-Contact)

I/O	Description	Pin
Input 1	Positive	14
Input 1	Negative	15
Input 2	Positive	16
Input 2	Negative	17
Input 3	Positive	18
Input 3	Negative	19
Input 4	Positive	20
Input 4	Negative	21
Output 1	Normally Open	1
Output 1	Common	2
Output 1	Normally Closed	3
Output 2	Normally Open	4
Output 2	Common	5
Output 2	Normally Closed	6
Output 3	Normally Open	7
Output 3	Common	8
Output 3	Normally Closed	9
Output 4	Normally Open	10
Output 4	Common	11
Output 4	Normally Closed	12

The figure below, shows how to connect external input and output alarms.

- Use an external current limit resistor to limit the current at the output relays to 1 Amp. Such resistor is not required if the equipment connected to the IDU supports current limiting to 1 Amp.
- The voltage of the input alarm must be within the range of -10 to -50 VDC.

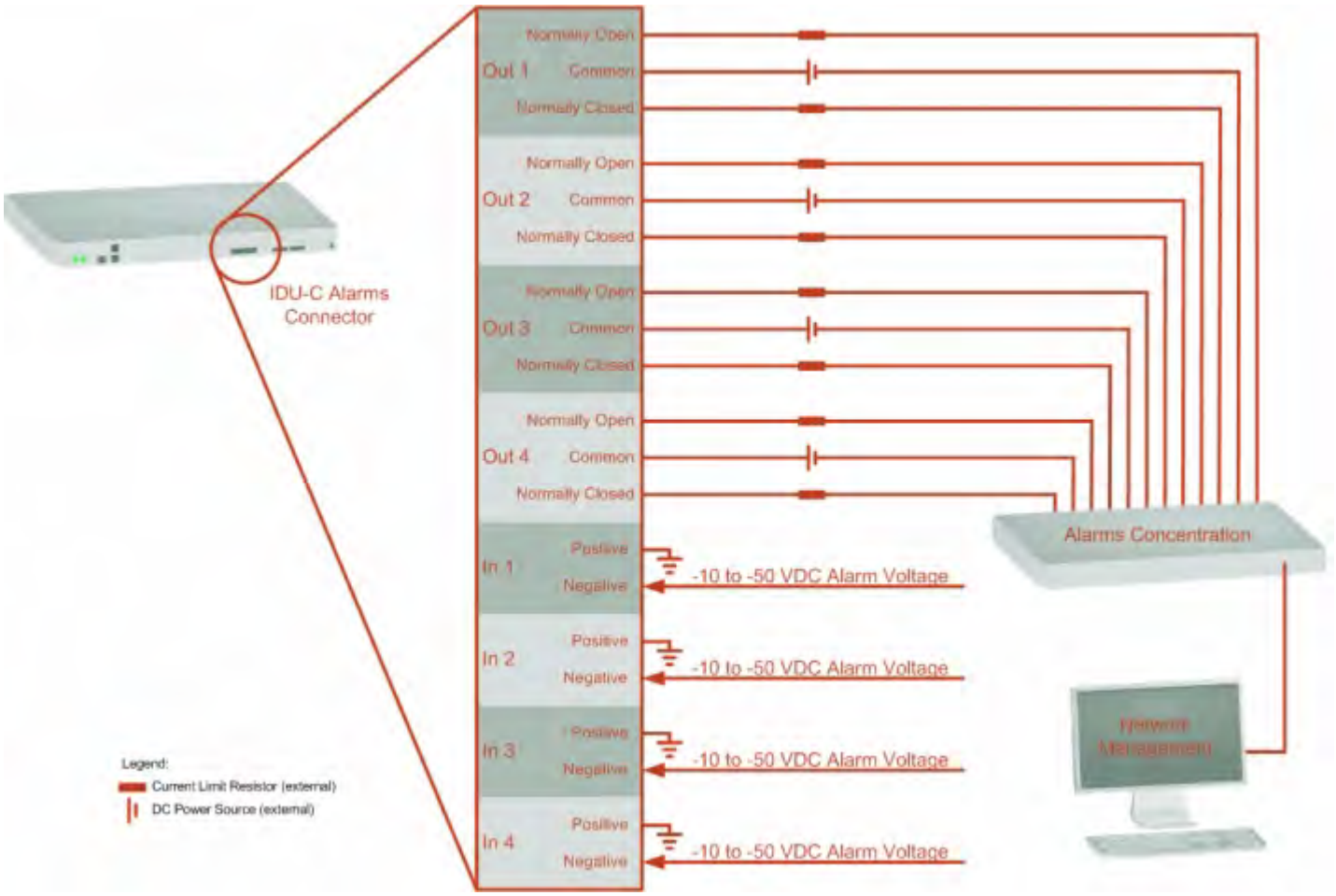


Figure B-1: Example for connecting the alarm connector

DC Power Terminals

IDU-C & E

Table B-7: Terminal Block 3-pin -48VDC

Function	Pin
+	Right
Chassis	Center
–	Left

DC PoE

Table B-8: Terminal Block 2-pin -48VDC

Function	Pin
+	Right
–	Left

Appendix C

Small Form-factor Pluggable Transceiver

IDU-C SFP Support

The Small Form-factor Pluggable (SFP) transceiver, is a compact, hot-pluggable transceiver used in communications applications.

The SFP transceiver technology allows almost any protocol converter implementation with seamless integration to a standard Ethernet switch.

The IDU-C supports SFP transceivers to provide and support several network applications.

Any standard Fast Ethernet (FE) SFP transceiver can be plugged into the IDU-C. These SFPs support various Ethernet interfaces. For example a fibre optic interface can be used to support long fibre distances.

In addition, System on SFP transceivers can be used, supporting a ***protocol converter*** concept. The main application for such SFP transceivers is ***TDM over Ethernet*** providing E1/T1 or E3/T3 over full duplex Ethernet Remote Bridge

The following table provides a few SFP types that can be used with the IDU-C:

Table C-1: SFP Type and Interface description

SFP Type	Interface Description
100baseT	100BaseT, IEEE 802.3, UTP CAT5
100baseFX	Multimode fiber-optic (MMF) link spans up to 2km long
100baseLX	Single-mode fiber optic (SMF) links pans up to 10km
100baseBX	SMF single-strand link spans up to 10 km or 40 km
E3T3/FE	E3/T3

Appendix D

MIB Reference

Introduction

About the MIB

The RADWIN MIB is a set of APIs that enables external applications to control RADWIN equipment.

The MIB is divided into public and a private API groups:

- **Public**: RFC-1213 (MIB II) variables, RFC-1214 (MIB II) System and Interfaces sections
- **Private**: Controlled by RADWIN and supplements the public group.

This appendix describes the public and private MIB used by RADWIN.

Terminology

The following terms are used in this appendix.

Term	Meaning
MIB	Management Information Base
API	Application Programming Interface
SNMP	Simple Network Management Protocol

In addition, the MIB uses internally, the older notions of **Local site** and **Remote site** where this manual would use site A and site B.

To avoid burdening the reader, this appendix will follow the MIB usage.

Interface API

Control Method

The RADWIN Manager application provides all the means to configure and monitor a RADWIN 2000 link, communicating with the SNMP agent in each ODU. Each SNMP agent contains data

on each of the IDUs and ODUs in the link. Both agents communicate with each other over the air using a proprietary protocol.

Each ODU has a single MAC address and a single IP address.

To control and configure the device using the MIB, you should adhere to the following rules:

- The connection for control and configuration is to the local site, over any SNMP/UDP/IP network.
- All Parameters should be consistent between both of the ODUs. Note that inconsistency of air parameters can break the air connection. To correct air parameters inconsistency you must reconfigure each of the ODUs.
- Common practice is to configure the remote site first and then to configure the local site.
- For some of the configuration parameters additional action must be taken before the new value is loaded. Please refer to the operation in the parameters description.
- Some of the MIB parameters values are product dependent. It is strongly recommend using the RADWIN Manager Application for changing these values. Setting wrong values may cause indeterminate results.

Community String

To control a link, all SNMP requests should go to the local site IP address.

See **Table 4-4** for default Community strings.

Private MIB Structure

The sections in the private RADWIN MIB and its location in the MIB tree are shown in **Figure D-1** below:

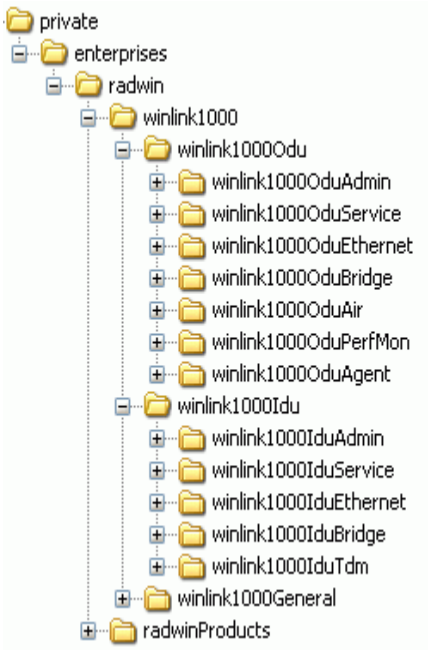


Figure D-1: Top Level Sections of the private MIB

The products MIB section contains the definition of the Object IDs for the two form factors of the ODU, Integrated Antenna and Connectorized (referred in the MIB as **external antenna)** and GSU (where applicable):

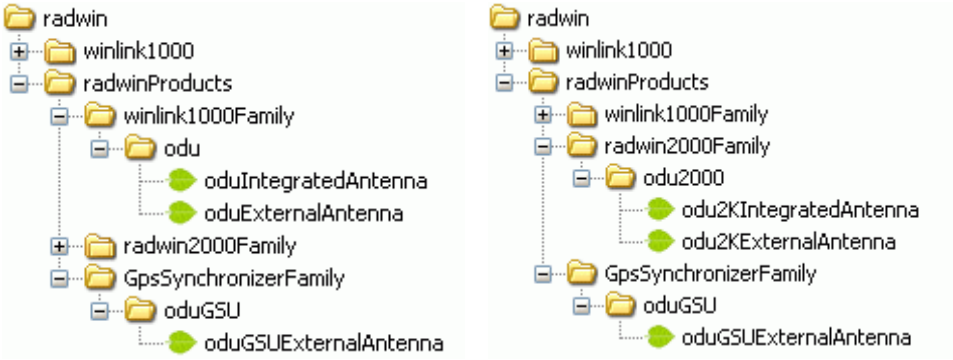


Figure D-2: Product MIB: Left WinLink 1000, Right RADWIN 2000

The ODU MIB contains the sections: Admin, Service, Ethernet, Bridge, Air, PerfMon and Agent.

The IDU MIB contains the sections: Admin, Service, Ethernet, Bridge and TDM.

The GpsSynchronizerFamily MIB defines the GSU.

The general MIB include a single generic parameter that is used by all traps as a trap description parameter.

MIB Parameters

The following section describes all of the MIB parameters. The MIB parameters follow the following naming convention:

<winlink1000><Section 1>...<Section n><Parameter Name>

For each of the configuration and control parameters (parameters with read-write access), the “Description” column describes when the new value is effective. It is recommended that you perform the appropriate action to make the values affective immediately after any change. Where a change is required on both sides of the link, it is recommended that you change both sides of the link first and then perform the action.

Supported Variables from the RFC 1213 MIB

Table D-1: Supported RFC 1213 Variables (Sheet 1 of 2)

Name	OID	Type	Access	Description
ifIndex	.1.3.6.1.2.1.2.2.1.1.x[a]	Integer	RO	A unique value for each interface.Its value ranges between 1 and the value of ifNumber.The value for each interface must remain constant at least from one re-initialization of the entity's network management system to the next re-initialization.
ifDescr	.1.3.6.1.2.1.2.2.1.2	DisplayString	RO	A textual string containing information about the interface.This string should include the name of the manufacturer, the product name and the version of the hardware interface.
ifType	.1.3.6.1.2.1.2.2.1.3	Integer	RO	The type of interface, distinguished according to the physical/link protocol(s) immediately `below' the network layer in the protocol stack.
ifSpeed	.1.3.6.1.2.1.2.2.1.5	Gauge	RO	An estimate of the interface's current bandwidth in bits per second.For interfaces which do not vary in bandwidth or for those where no accurate estimation can be made, this object should ontain the nominal bandwidth.
ifPhysAddress	.1.3.6.1.2.1.2.2.1.6	Phys-Address	RO	The interface's address at the protocol layer immediately `below' the network layer in the protocol stack. For interfaces which do not have such an address (e.g., a serial line), this object should contain an octet string of zero length.
ifAdminStatus	.1.3.6.1.2.1.2.2.1.7	Integer	RW	The desired state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifOperStatus	.1.3.6.1.2.1.2.2.1.8	Integer	RO	The current operational state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifInOctets	.1.3.6.1.2.1.2.2.1.10.x	Counter	RO	The total number of octets received on the interface, including framing characters.
ifInUcastPkts	.1.3.6.1.2.1.2.2.1.11.x	Counter	RO	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
ifInNUcastPkts	.1.3.6.1.2.1.2.2.1.12.x	Counter	RO	The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
ifInErrors	.1.3.6.1.2.1.2.2.1.14.x	Counter	RO	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifOutOctets	.1.3.6.1.2.1.2.2.1.16.x	Counter	RO	The total number of octets transmitted out of the interface, including framing characters.
ifOutUcastPkts	.1.3.6.1.2.1.2.2.1.17.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.

Table D-1: Supported RFC 1213 Variables (Sheet 2 of 2)

Name	OID	Type	Access	Description
ifOutNUcastPkts	.1.3.6.1.2.1.2.2.1.18.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a non-unicast (i.e., a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.

a. x is the interface ID

MIB Parameters

Table D-2: Private MIB Parameters (Sheet 1 of 18)

Name	OID	Type	Access	Description
winlink1000OduAdmProductType	1.3.6.1.4.1.4458.1000.1.1.1	DisplayString	RO	ODU configuration description.
winlink1000OduAdmHwRev	1.3.6.1.4.1.4458.1000.1.1.2	DisplayString	RO	ODU Hardware Version.
winlink1000OduAdmSwRev	1.3.6.1.4.1.4458.1000.1.1.3	DisplayString	RO	ODU Software Version.
winlink1000OduAdmLinkName	1.3.6.1.4.1.4458.1000.1.1.4	DisplayString	RW	Link Name. A change is effective immediately.
winlink1000OduAdmResetCmd	1.3.6.1.4.1.4458.1000.1.1.5	Integer	RW	Reset Command. A set command with a value of 3 will cause a device reset. The read value is always 0.
winlink1000OduAdmAddres	1.3.6.1.4.1.4458.1000.1.1.6	IpAddress	RW	ODU IP address. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmMask	1.3.6.1.4.1.4458.1000.1.1.7	IpAddress	RW	ODU Subnet Mask. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmGateway	1.3.6.1.4.1.4458.1000.1.1.8	IpAddress	RW	ODU default gateway. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: winlink1000OduAdmIpParamsCnfg is recommended.
winlink1000OduAdmBroadcast	1.3.6.1.4.1.4458.1000.1.1.10	Integer	RW	This parameter is reserved for the Manager application provided with the product.
winlink1000OduAdmHostsTable			N/A	Trap destinations table. Each trap destination is defined by an IP address and a UDP port. Up to 10 addresses can be configured.
winlink1000OduAdmHostsEntry			N/A	Trap destinations table entry. INDEX { winlink1000OduAdmHostsIndex }
winlink1000OduAdmHostsIndex			RO	Trap destinations table index.
winlink1000OduAdmHostsIp	1.3.6.1.4.1.4458.1000.1.1.12.1.2	IpAddress	RW	Trap destination IP address. A change is effective immediately.
winlink1000OduAdmHostsPort	1.3.6.1.4.1.4458.1000.1.1.12.1.3	Integer	RW	UDP port of the trap destination. A change is effective immediately.
winlink1000OduBuzzerAdminState	1.3.6.1.4.1.4458.1000.1.1.13	Integer	RW	This parameter controls the activation of the buzzer while the unit is in install mode. A change is effective immediately. The valid values are: disabled (0) enabledAuto (1) enabledConstantly(2).
winlink1000OduProductId	1.3.6.1.4.1.4458.1000.1.1.14	DisplayString	RO	This parameter is reserved for the Manager application provided with the product.
winlink1000OduReadCommunity	1.3.6.1.4.1.4458.1000.1.1.15	DisplayString	RW	Read Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read Community String. The SNMP agent accepts only encrypted values.
winlink1000OduReadWriteCommunity	1.3.6.1.4.1.4458.1000.1.1.16	DisplayString	RW	Read/Write Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read/Write Community String. The SNMP agent accepts only encrypted values.
winlink1000OduTrapCommunity	1.3.6.1.4.1.4458.1000.1.1.17	DisplayString	RW	Trap Community String. This parameter is used by the Manager application to change the Trap Community String. The SNMP agent accepts only encrypted values.

Table D-2: Private MIB Parameters (Sheet 2 of 18)

Name	OID	Type	Access	Description
winlink1000OduAdmSnmpAgentVersion	1.3.6.1.4.1.4458.1000.1.1.18	Integer	RO	Major version of the SNMP agent.
winlink1000OduAdmRemoteSiteName	1.3.6.1.4.1.4458.1000.1.1.19	DisplayString	RO	Remote site name. Returns the same value as sysLocation parameter of the remote site.
winlink1000OduAdmSnmpAgentMinorVersion	1.3.6.1.4.1.4458.1000.1.1.20	Integer	RO	Minor version of the SNMP agent.
winlink1000OduAdmLinkPassword	1.3.6.1.4.1.4458.1000.1.1.21	DisplayString	RW	Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password. The SNMP agent accepts only encrypted values.
winlink1000OduAdmSiteLinkPassword	1.3.6.1.4.1.4458.1000.1.1.22	DisplayString	RW	Site Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password of the site. The SNMP agent accepts only encrypted values.
winlink1000OduAdmDefaultPassword	1.3.6.1.4.1.4458.1000.1.1.23	Integer	RO	This parameter indicates if the current Link Password is the default password.
winlink1000OduAdmConnectionType	1.3.6.1.4.1.4458.1000.1.1.24	Integer	RO	This parameter indicates if the Manager application is connected to the local ODU or to the remote ODU over the air. A value of 'unknown' indicates community string mismatch.
winlink1000OduAdmBackToFactorySettingsCmd	1.3.6.1.4.1.4458.1000.1.1.25	Integer	RW	Back to factory settings Command. A change is effective after reset. The read value is always 0.
winlink1000OduAdmIpParamsCnfg	1.3.6.1.4.1.4458.1000.1.1.26	DisplayString	RW	ODU IP address Configuration. The format is: <IP_Address>|<Subnet_Mask>|<Default_Gateway>|
winlink1000OduAdmVlanID	1.3.6.1.4.1.4458.1000.1.1.27	Integer	RW	VLAN ID. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
winlink1000OduAdmVlanPriority	1.3.6.1.4.1.4458.1000.1.1.28	Integer	RW	VLAN Priority. 0 is lowest priority 7 is highest priority.
winlink1000OduAdmSN	1.3.6.1.4.1.4458.1000.1.1.29	DisplayString	RO	ODU Serial Number
winlink1000OduAdmProductName	1.3.6.1.4.1.4458.1000.1.1.30	DisplayString	RO	This is the product name as it exists at EC
winlink1000OduAdmActivationKey	1.3.6.1.4.1.4458.1000.1.1.31	DisplayString	RW	Activates a general key.
winlink1000OduAdmRmtPermittedOduType	1.3.6.1.4.1.4458.1000.1.1.32	DisplayString	RW	Mobile Application: permitted partner OduType.
winlink1000OduAdmCpuID	1.3.6.1.4.1.4458.1000.1.1.33	Integer	RO	CPU ID
winlink1000OduSrvMode	1.3.6.1.4.1.4458.1000.1.2.1	Integer	RW	System mode. The only values that can be set are installMode and slaveMode; normalMode reserved to the Manager application provided with the product. A change is effective after link re-synchronization.
winlink1000OduSrvBridging	1.3.6.1.4.1.4458.1000.1.2.3	Integer	RO	Bridging Mode. Valid values are: disabled (0) enabled (1).
winlink1000OduSrvRingLinkMode	1.3.6.1.4.1.4458.1000.1.2.4.1	Integer	RW	Mode of the link regarding ring topology.
winlink1000OduSrvRingTopologySupported	1.3.6.1.4.1.4458.1000.1.2.4.2	Integer	RO	Ring Topology options are: supported not supported
winlink1000OduSrvRingVlanIdTable			N/A	Ring VLAN IDs table.
winlink1000OduSrvRingVlanIdEntry			N/A	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware. INDEX { winlink1000OduSrvRingVlanIdIndex }
winlink1000OduSrvRingVlanIdIndex	1.3.6.1.4.1.4458.1000.1.2.4.3.1.1	Integer	RO	Index of VLAN ID of the internal ring messages.
winlink1000OduSrvRingVlanId	1.3.6.1.4.1.4458.1000.1.2.4.3.1.2	Integer	RW	VLAN ID of the internal ring messages. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
winlink1000OduSrvRingEthStatus	1.3.6.1.4.1.4458.1000.1.2.4.4	Integer	RO	Represents the Ethernet service blocking state of a Rings link

Table D-2: Private MIB Parameters (Sheet 3 of 18)

Name	OID	Type	Access	Description
winlink1000OduSrvRingMaxAllowedTimeFromLastRpm	1.3.6.1.4.1.4458.1000.1.2.4.5	Integer	RW	Defines the minimal time (in ms) required for determination of ring failure.
winlink1000OduSrvRingWTR	1.3.6.1.4.1.4458.1000.1.2.4.6	Integer	RW	Defines the minimal time (in ms) required for ring recovery.
winlink1000OduSrvQoSMode	1.3.6.1.4.1.4458.1000.1.2.5.1	Integer	RW	Mode of QoS feature.
winlink1000OduSrvQoSConfTable			N/A	QoS configuration table.
winlink1000OduSrvQoSConfEntry			N/A	QoS configuration table. INDEX { winlink1000OduSrvQoSConfIndex }
winlink1000OduSrvQoSConfIndex	1.3.6.1.4.1.4458.1000.1.2.5.2.1.1	Integer	RO	Index of QoS Configuration.
winlink1000OduSrvConfVlanQGroups	1.3.6.1.4.1.4458.1000.1.2.5.2.1.2	Integer	RO	Frames classification according to VLAN Priority IDs.
winlink1000OduSrvConfDiffservQGroups	1.3.6.1.4.1.4458.1000.1.2.5.2.1.3	Integer	RO	Frames classification according to Diffserv.
winlink1000OduSrvConfQueMir	1.3.6.1.4.1.4458.1000.1.2.5.2.1.4	Integer	RW	Desired Private MIR.
winlink1000OduSrvConfQueWeight	1.3.6.1.4.1.4458.1000.1.2.5.2.1.5	Integer	RW	QoS queueu's weights in percent.
winlink1000OduSrvQoSVlanQGroupsSetStr	1.3.6.1.4.1.4458.1000.1.2.5.3	DisplayString	RW	Frames classification according to VLAN IDs string for set.
winlink1000OduSrvQoSDiffservQGroupsSetStr	1.3.6.1.4.1.4458.1000.1.2.5.4	DisplayString	RW	Frames classification according to Diffserv IDs string for set.
winlink1000OduSrvQoSMaxRTQuePercent	1.3.6.1.4.1.4458.1000.1.2.5.5	Integer	RO	Maximal percent for RT & NRT queues.
winlink1000OduEthernetRemainingRate	1.3.6.1.4.1.4458.1000.1.3.1	Integer	RO	Current Ethernet bandwidth in bps.
winlink1000OduEthernetIfTable			N/A	ODU Ethernet Interface table.
winlink1000OduEthernetIfEntry			N/A	ODU Ethernet Interface table entry. INDEX { winlink1000OduEthernetIfIndex }
winlink1000OduEthernetIfIndex	1.3.6.1.4.1.4458.1000.1.3.2.1.1	Integer	RO	ODU Ethernet Interface Index.
winlink1000OduEthernetIfAddress	1.3.6.1.4.1.4458.1000.1.3.2.1.5	DisplayString	RO	ODU MAC address.
winlink1000OduEthernetIfAdminStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.6	Integer	RW	Required state of the interface.
winlink1000OduEthernetIfOperStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.7	Integer	RO	Current operational state of the interface.
winlink1000OduEthernetIfFailAction	1.3.6.1.4.1.4458.1000.1.3.2.1.8	Integer	RW	Failure action of the interface.
winlink1000OduEthernetNumOfPorts	1.3.6.1.4.1.4458.1000.1.3.3	Integer	RO	Number of ODU network interfaces.
winlink1000OduBridgeBasePortTable			N/A	ODU Bridge Ports table.
winlink1000OduBridgeBasePortEntry			N/A	ODU Bridge Ports table entry. INDEX { winlink1000OduBridgeBasePortIndex }
winlink1000OduBridgeBasePortIndex			RO	ODU Bridge Port Number.
winlink1000OduBridgeBaseIfIndex			RO	IfIndex corresponding to ODU Bridge port.
winlink1000OduBridgeTpMode	1.3.6.1.4.1.4458.1000.1.4.4.101	Integer	RW	ODU bridge mode. A change is effective after reset. Valid values: hubMode (0) bridgeMode (1).
winlink1000OduBridgeTpPortTable			N/A	ODU Transparent Bridge Ports table.
winlink1000OduBridgeTpPortEntry			N/A	ODU Transparent Bridge Ports table entry. INDEX { winlink1000OduBridgeTpPortIndex }
winlink1000OduBridgeTpPortIndex			RO	ODU Transparent Bridge Port Number.
winlink1000OduBridgeTpPortInFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.3	Counter	RO	Number of frames received by this port.
winlink1000OduBridgeTpPortOutFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.4	Counter	RO	Number of frames transmitted by this port.
winlink1000OduBridgeTpPortInBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.101	Counter	RO	Number of bytes received by this port.
winlink1000OduBridgeTpPortOutBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.102	Counter	RO	Number of bytes transmitted by this port.
winlink1000OduBridgeConfigMode	1.3.6.1.4.1.4458.1000.1.4.4.102	Integer	RO	ODU bridge configuration mode
winlink1000OduAirFreq	1.3.6.1.4.1.4458.1000.1.5.1	Integer	RW	Installation Center Frequency. Valid values are product dependent. A change is effective after link re-synchronization.

Table D-2: Private MIB Parameters (Sheet 4 of 18)

Name	OID	Type	Access	Description
winlink1000OduAirDesiredRate	1.3.6.1.4.1.4458.1000.1.5.2	Integer	RW	Deprecated parameter actual behavior is read-only. Required Air Rate. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
winlink1000OduAirSSID	1.3.6.1.4.1.4458.1000.1.5.3	DisplayString	RW	Reserved for the Manager application provided with the product.
winlink1000OduAirTxPower	1.3.6.1.4.1.4458.1000.1.5.4	Integer	RW	Required Transmit power in dBm . This is a nominal value while the actual transmit power includes additional attenuation. The min and max values are product specific. A change is effective immediately.
winlink1000OduAirSesState	1.3.6.1.4.1.4458.1000.1.5.5	Integer	RO	Current Link State. The value is active (3) during normal operation.
winlink1000OduAirMstrSlv	1.3.6.1.4.1.4458.1000.1.5.6	Integer	RO	This parameter indicates if the device was automatically selected into the radio link master or slave. The value is undefined if there is no link.
winlink1000OduAirResync	1.3.6.1.4.1.4458.1000.1.5.8	Integer	RW	Setting this parameter to 1 will cause the link to restart the synchronization process.
winlink1000OduAirRxPower	1.3.6.1.4.1.4458.1000.1.5.9.1	Integer	RO	Received Signal Strength in dBm.
winlink1000OduAirTotalFrames	1.3.6.1.4.1.4458.1000.1.5.9.2	Counter	RO	Total Number of received radio frames.
winlink1000OduAirBadFrames	1.3.6.1.4.1.4458.1000.1.5.9.3	Counter	RO	Total number of received radio frames with CRC error.
winlink1000OduAirCurrentRate	1.3.6.1.4.1.4458.1000.1.5.9.4	Integer	RO	Deprecated parameter. Actual rate of the air interface in Mbps. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
winlink1000OduAirCurrentRateIdx	1.3.6.1.4.1.4458.1000.1.5.9.5	Integer	RO	Index of current air rate.
winlink1000OduAirTxPower36	1.3.6.1.4.1.4458.1000.1.5.10	Integer	RW	Deprecated parameter. Actual behavior is read-only.
winlink1000OduAirTxPower48	1.3.6.1.4.1.4458.1000.1.5.11	Integer	RW	Deprecated parameter. Actual behavior is read-only.
winlink1000OduAirCurrentTxPower	1.3.6.1.4.1.4458.1000.1.5.12	Integer	RO	Current Transmit Power in dBm. This is a nominal value while the actual transmit power includes additional attenuation.
winlink1000OduAirMinFrequency	1.3.6.1.4.1.4458.1000.1.5.13	Integer	RO	Minimum center frequency in MHz.
winlink1000OduAirMaxFrequency	1.3.6.1.4.1.4458.1000.1.5.14	Integer	RO	Maximum center frequency in MHz.
winlink1000OduAirFreqResolution	1.3.6.1.4.1.4458.1000.1.5.15	Integer	RO	Center Frequency resolution. Measured in MHz if value < 100 otherwise in KHz.
winlink1000OduAirCurrentFreq	1.3.6.1.4.1.4458.1000.1.5.16	Integer	RO	Current Center Frequency. Measured in MHz if center frequency resolution value < 100 otherwise in KHz.
winlink1000OduAirNumberOfChannels	1.3.6.1.4.1.4458.1000.1.5.17	Integer	RO	Number of channels that can be used.
winlink1000OduAirChannelsTable			N/A	Table of channels used by automatic channels selection (ACS).
winlink1000OduAirChannelsEntry			N/A	ACS channels table entry. INDEX { winlink1000OduAirChannelsIndex }
winlink1000OduAirChannelsIndex	1.3.6.1.4.1.4458.1000.1.5.18.1.1	Integer	RO	Channel Index.
winlink1000OduAirChannelsFrequency	1.3.6.1.4.1.4458.1000.1.5.18.1.2	Integer	RO	Channel frequency in MHz.
winlink1000OduAirChannelsOperState	1.3.6.1.4.1.4458.1000.1.5.18.1.3	Integer	RW	Channel state. Can be set by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. A change is effective after link re-synchronization. Valid values: disabled (0) enabled (1).

Table D-2: Private MIB Parameters (Sheet 5 of 18)

Name	OID	Type	Access	Description
winlink1000OduAirChannelsAvail	1.3.6.1.4.1.4458.1000.1.5.18.1.4	Integer	RO	Channel state. Product specific and cannot be changed by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. Valid values: disabled (0) enabled (1).
winlink1000OduAirChannelsDefaultFreq	1.3.6.1.4.1.4458.1000.1.5.18.1.5	Integer	RO	Default channel's availability for all CBWs. The valid values are: forbidden (0) available (1).
winlink1000OduAirDfsState	1.3.6.1.4.1.4458.1000.1.5.19	Integer	RO	Radar detection state. Valid values: disabled (0) enabled (1).
winlink1000OduAirAutoChannelSelectionState	1.3.6.1.4.1.4458.1000.1.5.20	Integer	RO	Deprecated parameter. Indicating Automatic Channel Selection availability at current channel bandwidth. Valid values: disabled (0) enabled (1).
winlink1000OduAirEnableTxPower	1.3.6.1.4.1.4458.1000.1.5.21	Integer	RO	Indicating Transmit power configuration enabled or disabled.
winlink1000OduAirMinTxPower	1.3.6.1.4.1.4458.1000.1.5.22	Integer	RO	Minimum Transmit power in dBm.
winlink1000OduAirMaxTxPowerTable			N/A	Table of Maximum transmit power per air rate in dBm.
winlink1000OduAirMaxTxPowerEntry			N/A	Maximum Transmit power table entry. INDEX { winlink1000OduAirMaxTxPowerIndex }
winlink1000OduAirMaxTxPowerIndex	1.3.6.1.4.1.4458.1000.1.5.23.1.1	Integer	RO	Air interface rate index.
winlink1000OduAirMaxTxPower	1.3.6.1.4.1.4458.1000.1.5.23.1.2	Integer	RO	Maximum Transmit power in dBm.
winlink1000OduAirChannelBandwidth	1.3.6.1.4.1.4458.1000.1.5.24	Integer	RW	Channel bandwidth in KHz. A change is effective after reset.
winlink1000OduAirChannelBWTable			N/A	Channel Bandwidths table.
winlink1000OduAirChannelBWEntry			N/A	Channel Bandwidth table entry. INDEX { winlink1000OduAirChannelBWIndex }
winlink1000OduAirChannelBWIndex	1.3.6.1.4.1.4458.1000.1.5.25.1.1	Integer	RO	Channel Bandwidth index.
winlink1000OduAirChannelBWAvail	1.3.6.1.4.1.4458.1000.1.5.25.1.2	Integer	RO	Channel Bandwidth availability product specific. Options are: Not supported supported with manual channel selection supported with Automatic Channel Selection.
winlink1000OduAirChannelsAdminState	1.3.6.1.4.1.4458.1000.1.5.25.1.3	DisplayString	RO	Channels' availability per CBW.
winlink1000OduAirChannelBWHSSATDDConflictPerCBW	1.3.6.1.4.1.4458.1000.1.5.25.1.4	Integer	RO	Indication for possible Link drop per CBW due to conflict between HSS and ATDD.
winlink1000OduAirChannelBWMinRatioForSupporting	1.3.6.1.4.1.4458.1000.1.5.25.1.5	Integer	RO	Minimal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned CBW.
winlink1000OduAirChannelBWMaxRatioForSupporting	1.3.6.1.4.1.4458.1000.1.5.25.1.6	Integer	RO	Maximal TX ratio that may be used by the HSM and still enable proper operation of the aforementioned CBW.
winlink1000OduAirRFD	1.3.6.1.4.1.4458.1000.1.5.26	Integer	RO	Current radio frame duration in microseconds.
winlink1000OduAirRatesTable			N/A	Air Rate indexes table for current channel bandwidth.
winlink1000OduAirRatesEntry			N/A	Air Rate indexes table entry. INDEX { winlink1000OduAirRatesIndex }
winlink1000OduAirRatesIndex	1.3.6.1.4.1.4458.1000.1.5.27.1.1	Integer	RO	Air Rate index.
winlink1000OduAirRatesAvail	1.3.6.1.4.1.4458.1000.1.5.27.1.2	Integer	RO	Air Rate availability depending on air interface conditions.
winlink1000OduAirDesiredRateIdx	1.3.6.1.4.1.4458.1000.1.5.28	Integer	RW	Required Air Rate index. 0 reserved for Adaptive Rate. A change is effective immediately after Set operation to the master side while the link is up.

Table D-2: Private MIB Parameters (Sheet 6 of 18)

Name	OID	Type	Access	Description
winlink1000OduAirLinkDistance	1.3.6.1.4.1.4458.1000.1.5.29	Integer	RO	Link distance in meters. A value of -1 indicates an illegal value and is also used when a link is not established.
winlink1000OduAirLinkWorkingMode	1.3.6.1.4.1.4458.1000.1.5.30	Integer	RO	Link working mode as a result of comparing versions of both sides of the link. Possible modes are: Unknown - no link Normal - versions on both sides are identical with full compatibility with restricted compatibility or versions on both sides are different with software upgrade or versions incompatibility.
winlink1000OduAirMajorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.31	Integer	RO	Major link interface version
winlink1000OduAirMinorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.32	Integer	RO	Minor link interface version
winlink1000OduAirHssDesiredOpState	1.3.6.1.4.1.4458.1000.1.5.40.1	Integer	RW	Required Hub Site Synchronization operating state.
winlink1000OduAirHssCurrentOpState	1.3.6.1.4.1.4458.1000.1.5.40.2	Integer	RO	Current Hub Site Synchronization operating state.
winlink1000OduAirHssSyncStatus	1.3.6.1.4.1.4458.1000.1.5.40.3	Integer	RO	Hub Site Synchronization sync status.
winlink1000OduAirHssExtPulseStatus	1.3.6.1.4.1.4458.1000.1.5.40.4	Integer	RO	Hub Site Synchronization external pulse detection status. In GSS mode: if generating then 1PSP is auto generated by the GSS Unit. if generatingAndDetecting then 1PSP is generated by GPS satellites signal.
winlink1000OduAirHssExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.5	Integer	RO	Hub Site Synchronization external pulse type.
winlink1000OduAirHssDesiredExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.6	Integer	RW	Hub Site Synchronization required external pulse type. Valid values for read write: {typeA(2) typeB(3) typeC(4) typeD(5) typeE(6) typeF(7)}. Valid value for read only: {notApplicable(1)}.
winlink1000OduAirHssRfpTable			N/A	ODU Radio Frame Patterns (RFP) Table.
winlink1000OduAirHssRfpEntry			N/A	ODU RFP Table entry. INDEX { winlink1000OduAirHssRfpIndex }
winlink1000OduAirHssRfpIndex	1.3.6.1.4.1.4458.1000.1.5.40.7.1.1	Integer	RO	ODU RFP Table index. The index represent the Radio Frame Pattern: typeA(2) typeB(3) typeC(4) typeD(5) typeE(6).
winlink1000OduAirHssRfpEthChannelBW5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.2	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 5MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.3	Integer	RO	Represents the compatibility of TDM service under Channel BW of 5MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.4	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 10MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.5	Integer	RO	Represents the compatibility of TDM service under Channel BW of 10MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.6	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 20MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.7	Integer	RO	Represents the compatibility of TDM service under Channel BW of 20MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpEthChannelBW40MHz			RO	Represents the compatibility of Ethernet service under Channel BW of 40MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpTdmChannelBW40MHz			RO	Represents the compatibility of TDM service under Channel BW of 40MHz in the specific Radio Frame Pattern.
winlink1000OduAirHssRfpStr	1.3.6.1.4.1.4458.1000.1.5.40.8	DisplayString	RO	Hub Site Synchronization supported patterns

Table D-2: Private MIB Parameters (Sheet 7 of 18)

Name	OID	Type	Access	Description
winlink1000OduAirHSSHsmID	1.3.6.1.4.1.4458.1000.1.5.40.9	Integer	RO	A unique ID which is common to the HSM and all its collocated ODUs
winlink1000OduAirHssTime	1.3.6.1.4.1.4458.1000.1.5.40.10.0	DisplayString	RO	Hub Site Synchronization GPS time
winlink1000OduAirHssLatitude	1.3.6.1.4.1.4458.1000.1.5.40.11.0	DisplayString	RO	Hub Site Synchronization GPS Latitude
winlink1000OduAirHssNSIndicator	1.3.6.1.4.1.4458.1000.1.5.40.12.0	DisplayString	RO	Hub Site Synchronization GPS N/S Indicator
winlink1000OduAirHssLongitude	1.3.6.1.4.1.4458.1000.1.5.40.13.0	DisplayString	RO	Hub Site Synchronization GPS Longitude
winlink1000OduAirHssEWIndicator	1.3.6.1.4.1.4458.1000.1.5.40.14.0	DisplayString	RO	Hub Site Synchronization GPS E/W Indicator
winlink1000OduAirHssNumSatellites	1.3.6.1.4.1.4458.1000.1.5.40.15.0	DisplayString	RO	Hub Site Synchronization GPS Number of satellites
winlink1000OduAirHssAltitude	1.3.6.1.4.1.4458.1000.1.5.40.16.0	DisplayString	RO	Hub Site Synchronization GPS Altitude
winlink1000OduAirHssRfpPhase	1.3.6.1.4.1.4458.1000.1.5.40.17.0	Integer	RW	Hub Site Synchronization GPS RFP phase
winlink1000OduAirLockRemote	1.3.6.1.4.1.4458.1000.1.5.41	Integer	RW	This parameter enables locking the link with a specific ODU. The following values can be set: Unlock (default) - The ODU is not locked on a specific remote ODU. Unlock can only be performed when the link is not connected. Lock - The ODU is locked on a specific remote ODU. Lock can only be performed when the link is active.
winlink1000OduAirAntennaGain	1.3.6.1.4.1.4458.1000.1.5.42	Integer	RW	Current Antenna Gain in 0.1 dBi resolution. User defined value for external antenna. Legal range: MinAntennaGain<AntennaGain<MaxAntennaGain .
winlink1000OduAirFeederLoss	1.3.6.1.4.1.4458.1000.1.5.43	Integer	RW	Current Feeder Loss in 0.1 dBm resolution. User defined value for external antenna.
winlink1000OduAirMaxAntennaGain	1.3.6.1.4.1.4458.1000.1.5.44	Integer	RO	Maximum allowed Antenna Gain in 0.1 dBi resolution.
winlink1000OduAirMinAntennaGain	1.3.6.1.4.1.4458.1000.1.5.45	Integer	RO	Minimum allowed Antenna Gain in 0.1 dBi resolution.
winlink1000OduAirMaxEIRP	1.3.6.1.4.1.4458.1000.1.5.46	Integer	RO	Maximum EIRP value as defined by regulation in 0.1 dBm resolution.
winlink1000OduAirAntennaGainConfigSupport	1.3.6.1.4.1.4458.1000.1.5.47	Integer	RO	Antenna Gain Configurability options are product specific: supported not supported.
winlink1000OduAirAntennaType	1.3.6.1.4.1.4458.1000.1.5.48	Integer	RW	External Antenna Type: Monopolar or Bipolar.
winlink1000OduAirRssBalance	1.3.6.1.4.1.4458.1000.1.5.49	Integer	RO	RSS balance. Relation between RSS in radio 1 and RSS in radio 2.
winlink1000OduAirTotalTxPower	1.3.6.1.4.1.4458.1000.1.5.50	Integer	RO	Total Transmit Power in dBm. This is a nominal value While the actual transmit power includes additional attenuation.
winlink1000OduAirInstallFreqAndCBW	1.3.6.1.4.1.4458.1000.1.5.51	DisplayString	RW	Installation frequency Channel BW.
winlink1000OduAirDFStype	1.3.6.1.4.1.4458.1000.1.5.52	Integer	RO	DFS regulation type.
winlink1000OduAirComboSubBandTable			N/A	ODU Multi-band Sub Bands Table.
winlink1000OduAirComboSubBandEntry			N/A	ODU Multi-band Sub Bands Table entry. INDEX { winlink1000OduAirComboSubBandIndex }
winlink1000OduAirComboSubBandIndex	1.3.6.1.4.1.4458.1000.1.5.53.1.1.1	Integer	RO	ODU Multi-band sub bands table index.
winlink1000OduAirComboSubBandId	1.3.6.1.4.1.4458.1000.1.5.53.1.1.2	DisplayString	RO	Represents the Multi-band sub band ID.
winlink1000OduAirComboSubBandDescription	1.3.6.1.4.1.4458.1000.1.5.53.1.1.3	DisplayString	RO	Multi-band sub band description.
winlink1000OduAirComboSubBandInstallFreq	1.3.6.1.4.1.4458.1000.1.5.53.1.1.4	Integer	RO	Represents the Multi-band sub band installation frequency in KHz.
winlink1000OduAirComboSubBandAdminState	1.3.6.1.4.1.4458.1000.1.5.53.1.1.5	Integer	RO	Represents the Multi-band sub band administrative state.
winlink1000OduAirComboSubBandInstallationAllowed	1.3.6.1.4.1.4458.1000.1.5.53.1.1.6	Integer	RO	Reflects if the Multi-band sub band allowes installtion.
winlink1000OduAirComboFrequencyBandId	1.3.6.1.4.1.4458.1000.1.5.53.1.1.7	Integer	RO	Reflects the frequency band Id.

Table D-2: Private MIB Parameters (Sheet 8 of 18)

Name	OID	Type	Access	Description
winlink1000OduAirComboNumberOfSubBands	1.3.6.1.4.1.4458.1000.1.5.53.2	Integer	RO	Represents the number of Multi-band sub bands.
winlink1000OduAirComboSwitchSubBand	1.3.6.1.4.1.4458.1000.1.5.53.3	DisplayString	RW	Switch sub band operation with a given sub band ID. The get operation retrieves the current sub band ID.
winlink1000OduAirInternalMaxRate	1.3.6.1.4.1.4458.1000.1.5.54	Integer	RO	Max Ethernet throughput of the site (in Kpbs).
winlink1000OduAirCapacityDirection	1.3.6.1.4.1.4458.1000.1.5.55	Integer	RW	Capacity direction of the site.
winlink1000OduAirSpectrumAnalysisOperState	1.3.6.1.4.1.4458.1000.1.5.56.1	Integer	RW	Spectrum Analysis operation state. The configurable values are Spectrum Analysis Stop Start and Restart. Not Supported value indicates that the feature is not supported on the device. Not Supported is not a configurable state.
winlink1000OduAirRxPowerAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.2	Integer	RO	Received Signal Strength in dBm of Antenna A.
winlink1000OduAirRxPowerAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.3	Integer	RO	Received Signal Strength in dBm of Antenna B.
winlink1000OduAirNumberOfSpectrumChannels	1.3.6.1.4.1.4458.1000.1.5.56.4	Integer	RO	Represents the number of Spectrum Channels.
winlink1000OduAirSpectrumChannelTable			N/A	ODU Spectrum Analysis Channel Table.
winlink1000OduAirSpectrumChannelTableEntry			N/A	ODU Spectrum Analysis Channel Table entry. INDEX { winlink1000OduAirSpectrumChannelIndex }
winlink1000OduAirSpectrumChannelIndex	1.3.6.1.4.1.4458.1000.1.5.56.5.1.1	Integer	RO	ODU Spectrum Channel index.
winlink1000OduAirSpectrumChannelFrequency	1.3.6.1.4.1.4458.1000.1.5.56.5.1.2	Integer	RO	ODU Spectrum Channel frequency in MHz.
winlink1000OduAirSpectrumChannelScanned	1.3.6.1.4.1.4458.1000.1.5.56.5.1.3	Integer		read-only
winlink1000OduAirSpectrumChannelScanningTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.4	TimeTicks	RO	Channel last scan timestamp in hundredths of a second since device up time. If the channel was not scanned than the return value will be 0.
winlink1000OduAirSpectrumChannelLastNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.5	Integer	RO	Normalized Noise Floor value in dBm - of Antenna A - (including 2 neighbor frequencies).
winlink1000OduAirSpectrumChannelLastNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.6	Integer	RO	Normalized Noise Floor value in dBm - of Antenna B - (including 2 neighbor frequencies).
winlink1000OduAirSpectrumChannelAverageNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.7	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna A - over all dwells.
winlink1000OduAirSpectrumChannelAverageNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.8	Integer	RO	Average normalized Noise Floor value in dBm - of Antenna B - over all dwells.
winlink1000OduAirSpectrumChannelMaxNFAntennaA	1.3.6.1.4.1.4458.1000.1.5.56.5.1.9	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna A - over all dwells.
winlink1000OduAirSpectrumChannelMaxNFAntennaB	1.3.6.1.4.1.4458.1000.1.5.56.5.1.10	Integer	RO	Max normalized Noise Floor value in dBm - of Antenna B - over all dwells.
winlink1000OduAirSpectrumChannelCACPerformed	1.3.6.1.4.1.4458.1000.1.5.56.5.1.11	Integer	RO	read-only
winlink1000OduAirSpectrumChannelLastCACTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.12	TimeTicks	RO	Last CAC performed timestamp in hundredths of a second since device up time. If no CAC has performed on the channel the return value will be 0.
winlink1000OduAirSpectrumChannelRadarDetected	1.3.6.1.4.1.4458.1000.1.5.56.5.1.13	Integer	RO	read-only
winlink1000OduAirSpectrumChannelRadarDetectionTimestamp	1.3.6.1.4.1.4458.1000.1.5.56.5.1.14	TimeTicks	RO	Last Radar Detection timestamp in hundredths of a second since device up time. If no Radar has detected on the channel the return value will be 0.
winlink1000OduAirSpectrumChannelAvailable	1.3.6.1.4.1.4458.1000.1.5.56.5.1.15	Integer	RO	read-only
winlink1000OduAirAntConfAndRatesStatus	1.3.6.1.4.1.4458.1000.1.5.57	Integer	RO	Description: Antenna configuration and Rates status (1 = Single antenna with single data stream 2 = Dual antenna with single data stream 3 = Dual antenna with dual data stream).

Table D-2: Private MIB Parameters (Sheet 9 of 18)

Name	OID	Type	Access	Description
winlink1000OduAirDualAntTxMode	1.3.6.1.4.1.4458.1000.1.5.58	Integer	RW	Description: Transmission type when using Dual radios (MIMO or AdvancedDiversity using one stream of data).
winlink1000OduAirTxOperationMode	1.3.6.1.4.1.4458.1000.1.5.59	Integer	RW	This parameter controls the Operation mode of frames sent over the air. The Operation mode is either normal (1) for regular transmission where frame size is determined by the traffic or throughput test (2) when the user requests an actual over the air throughput estimation using full frames. The latter lasts no more than a predetermined interval (default 30 sec).
winlink1000OduAirDesiredNetMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.1	Integer	RW	This parameter is reserved to the element manager provided with the product.
winlink1000OduAirCurrentNetMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.2	Integer	RO	Represents the actual Net Master Tx RAtio.
winlink1000OduAirMinUsableMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.3	Integer	RO	Represents the minimal value the user can configure for Desired net mAster Tx Ratio.
winlink1000OduAirMaxUsableMasterTxRatio	1.3.6.1.4.1.4458.1000.1.5.60.4	Integer	RO	Represents the maximal value the user can configure for Desired net mAster Tx Ratio.
winlink1000OduAirAccumulatedUAS	1.3.6.1.4.1.4458.1000.1.5.61	Integer	RO	Accumulates the Unavailable seconds of the Air Interface.
winlink1000OduAirAccumulatedUAS	1.3.6.1.4.1.4458.1000.1.5.62	Integer	RO	Possibilities of the link according to RFP and CBW
winlink1000OduPerfMonCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
winlink1000OduPerfMonCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonCurrUAS	1.3.6.1.4.1.4458.1000.1.6.1.1.1	Gauge	RO	The current number of Unavailable Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrES	1.3.6.1.4.1.4458.1000.1.6.1.1.2	Gauge	RO	Current number of Errored Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrSES	1.3.6.1.4.1.4458.1000.1.6.1.1.3	Gauge	RO	Current number of Severely Errored Seconds starting from the present 15 minutes period.
winlink1000OduPerfMonCurrBBE	1.3.6.1.4.1.4458.1000.1.6.1.1.4	Gauge	RO	Current number of Background Block Errors starting from the present 15 minutes period.
winlink1000OduPerfMonCurrIntegrity	1.3.6.1.4.1.4458.1000.1.6.1.1.5	Integer	RO	Indicates the integrity of the entry.
winlink1000OduPerfMonIntervalTable			N/A	This table defines/keeps the counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonIntervalIdx }
winlink1000OduPerfMonIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonIntervalUAS			RO	The current number of Unavailable Seconds per interval.
winlink1000OduPerfMonIntervalES			RO	Current number of Errored Seconds per interval.
winlink1000OduPerfMonIntervalSES			RO	Current number of Severely Errored Seconds per interval.
winlink1000OduPerfMonIntervalBBE			RO	Current number of Background Block Errors per interval.
winlink1000OduPerfMonIntervalIntegrity			RO	Indicates the integrity of the entry per interval.
winlink1000OduPerfMonDayTable			N/A	This table defines/keeps the counters of the last month (in resolution of days).
winlink1000OduPerfMonDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonDayIdx }
winlink1000OduPerfMonDayIdx			RO	This table is indexed per interval number. Each interval is of 24 hours and the oldest is 30.

Table D-2: Private MIB Parameters (Sheet 10 of 18)

Name	OID	Type	Access	Description
winlink1000OduPerfMonDayUAS			RO	The current number of Unavailable Seconds per interval of 24 hours.
winlink1000OduPerfMonDayES			RO	Current number of Errored Seconds per interval of 24 hours.
winlink1000OduPerfMonDaySES			RO	Current number of Severely Errored Seconds per interval of 24 hours.
winlink1000OduPerfMonDayBBE			RO	Current number of Background Block Errors per interval of 24 hours.
winlink1000OduPerfMonDayIntegrity			RO	Indicates the integrity of the entry per interval of 24 hours.
winlink1000OduPerfMonAirCurrTable			N/A	This table defines/keeps the air counters of the current 15 min interval.
winlink1000OduPerfMonAirCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonAirCurrMinRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.1	Integer	RO	Current Min Received Level Reference starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrMaxRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.2	Integer	RO	Current Max Received Level Reference starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrRSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.3	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrRSLThresh2Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.4	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrMinTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.5	Integer	RO	Current Min Transmit Signal Level starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrMaxTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.6	Integer	RO	Current Max Transmit Signal Level starting from the present 15 minutes period.
winlink1000OduPerfMonAirCurrTSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.7	Gauge	RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirCurrBBERThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.8	Gauge	RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold in the last 15 minutes.
winlink1000OduPerfMonAirIntervalTable			N/A	This table defines/keeps the air counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonAirIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonAirIntervalIdx }
winlink1000OduPerfMonAirIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonAirIntervalMinRSL			RO	Current Min Received Level Reference per interval.
winlink1000OduPerfMonAirIntervalMaxRSL			RO	Current Max Received Level Reference per interval.
winlink1000OduPerfMonAirIntervalRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per interval.
winlink1000OduPerfMonAirIntervalRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold ACCESS read-only per interval.
winlink1000OduPerfMonAirIntervalMinTSL			RO	Current Min Transmit Signal Level per interval.
winlink1000OduPerfMonAirIntervalMaxTSL			RO	Current Max Transmit Signal Level per interval.
winlink1000OduPerfMonAirIntervalTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per interval.
winlink1000OduPerfMonAirIntervalBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per interval.

Table D-2: Private MIB Parameters (Sheet 11 of 18)

Name	OID	Type	Access	Description
winlink1000OduPerfMonAirDayTable			N/A	This table defines/keeps the air counters of the last month (in resolution of days).
winlink1000OduPerfMonAirDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonAirDayIdx }
winlink1000OduPerfMonAirDayIdx			RO	This table is indexed per Day number. Each Day is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonAirDayMinRSL			RO	Current Min Received Level Reference per Day.
winlink1000OduPerfMonAirDayMaxRSL			RO	Current Max Received Level Reference per Day.
winlink1000OduPerfMonAirDayRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per Day.
winlink1000OduPerfMonAirDayRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold per Day.
winlink1000OduPerfMonAirDayMinTSL			RO	Current Min Transmit Signal Level per Day.
winlink1000OduPerfMonAirDayMaxTSL			RO	Current Max Transmit Signal Level per Day.
winlink1000OduPerfMonAirDayTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per Day.
winlink1000OduPerfMonAirDayBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per Day.
winlink1000OduPerfMonEthCurrTable			N/A	This table defines/keeps the ethernet counters of the current 15 min interval.
winlink1000OduPerfMonEthCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonEthCurrRxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.1	Gauge	RO	Current RX Mega Bytes starting from the present 15 minutes period.
winlink1000OduPerfMonEthCurrTxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.2	Gauge	RO	Current Transmit Mega Bytes starting from the present 15 minutes period.
winlink1000OduPerfMonEthCurrEthCapacityThreshUnder	1.3.6.1.4.1.4458.1000.1.6.7.1.3	Gauge	RO	The number of times throughput was below threshold in the present 15 minutes period.
winlink1000OduPerfMonEthCurrHighTrafficThreshExceed	1.3.6.1.4.1.4458.1000.1.6.7.1.4	Gauge	RO	The number of times actual traffic was above threshold in the present 15 minutes period.
winlink1000OduPerfMonEthCurrActiveSeconds	1.3.6.1.4.1.4458.1000.1.6.7.1.5	Gauge	RO	The number of seconds in which RPL Ethernet swervice was not blocked in the present 15 minutes period.
winlink1000OduPerfMonEthIntervalTable			N/A	This table defines/keeps the ethernet counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonEthIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonEthIntervalIdx }
winlink1000OduPerfMonEthIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonEthIntervalRxMBytes			RO	Current RX Mega Bytes per interval.
winlink1000OduPerfMonEthIntervalTxMBytes			RO	Current Transmit Mega Bytes per interval.
winlink1000OduPerfMonEthIntervalEthCapacityThreshUnder			RO	The number of times throughput was below threshold in the each interval.
winlink1000OduPerfMonEthIntervalHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold in the each interval.
winlink1000OduPerfMonEthIntervalActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked in the each interval.
winlink1000OduPerfMonEthDayTable			N/A	This table defines/keeps the ethernet counters of the last month (in resolution of days).
winlink1000OduPerfMonEthDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonEthDayIdx }
winlink1000OduPerfMonEthDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonEthDayRxMBytes			RO	Current RX Mega Bytes per day.

Table D-2: Private MIB Parameters (Sheet 12 of 18)

Name	OID	Type	Access	Description
winlink1000OduPerfMonEthDayTxMBytes			RO	Current Transmit Mega Bytes per day.
winlink1000OduPerfMonEthDayEthCapacityThreshUnder			RO	The number of times throughput was below threshold each day.
winlink1000OduPerfMonEthDayHighTrafficThreshExceed			RO	The number of times actual traffic was above threshold each day.
winlink1000OduPerfMonEthDayActiveSeconds			RO	The number of seconds in which RPL Ethernet service was not blocked each day.
winlink1000OduPerfMonTdmCurrTable			N/A	This table defines/keeps the TDM counters of the current 15 min interval.
winlink1000OduPerfMonTdmCurrEntry			N/A	This is an entry in the Current Interval Table. INDEX {ifIndex }
winlink1000OduPerfMonTdmCurrActiveSeconds	1.3.6.1.4.1.4458.1000.1.6.10.1.1	Gauge	RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTdmIntervalTable			N/A	This table defines/keeps the TDM counters of the last day (in resolution of 15 min intervals).
winlink1000OduPerfMonTdmIntervalEntry			N/A	This is an entry in the Interval Table. INDEX {ifIndex winlink1000OduPerfMonTdmIntervalIdx }
winlink1000OduPerfMonTdmIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonTdmIntervalActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTdmDayTable			N/A	This table defines/keeps the TDM counters of the last month (in resolution of days).
winlink1000OduPerfMonTdmDayEntry			N/A	This is an entry in the Days Table. INDEX {ifIndex winlink1000OduPerfMonTdmDayIdx }
winlink1000OduPerfMonTdmDayIdx			RO	This table is indexed per Day number. Each interval is of 15 minutes and the oldest is 96.
winlink1000OduPerfMonTdmDayActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
winlink1000OduPerfMonTxThresh1	1.3.6.1.4.1.4458.1000.1.6.20	Integer	RW	When the Transmit power exceeds this threshold a performance monitoring TSL1 counter is incremented.
winlink1000OduPerfMonRxThresh1	1.3.6.1.4.1.4458.1000.1.6.21	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL1 counter is incremented.
winlink1000OduPerfMonRxThresh2	1.3.6.1.4.1.4458.1000.1.6.22	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL2 counter is incremented.
winlink1000OduPerfMonBBERThresh1	1.3.6.1.4.1.4458.1000.1.6.23	Integer	RW	When the BBER exceeds this threshold a performance monitoring BBER counter is incremented. The units are 1/10 of a percent.
winlink1000OduPerfMonEthCapacityThreshKbps	1.3.6.1.4.1.4458.1000.1.6.24	Integer	RW	When the current throughput is below this threshold the corresponding counter is incremented
winlink1000OduPerfMonHighTrafficThreshKbps	1.3.6.1.4.1.4458.1000.1.6.25	Integer	RW	When the current traffic is above this threshold then corresponding counter is incremented.
winlink1000OduAgnGenAddTrapExt	1.3.6.1.4.1.4458.1000.1.7.1.1	Integer	RW	If 'yes' is chosen the ifIndex Unit Severity Time_T and Alarm Id from the winlink1000OduAgnCurrAlarmTable will be bind to the end of each private trap.

Table D-2: Private MIB Parameters (Sheet 13 of 18)

Name	OID	Type	Access	Description
winlink1000OduAgnGenSetMode	1.3.6.1.4.1.4458.1000.1.7.1.2	Integer	RW	This parameter is reserved to the element manager provided with the product.
winlink1000OduAgnNTPCfgTimeServerIP	1.3.6.1.4.1.4458.1000.1.7.2.1	IpAddress	RW	IP address of the server from which the current time is loaded.
winlink1000OduAgnNTPCfgTimeOffsetFromUTC	1.3.6.1.4.1.4458.1000.1.7.2.2	Integer	RW	Offset from Coordinated Universal Time (minutes). Possible values: -1440..1440.
winlink1000OduAgnRealTimeAndDate	1.3.6.1.4.1.4458.1000.1.7.2.3	OctetString	RW	This parameter specifies the real time and date Format 'YYYY-MM-DD HH:MM:SS' (Hexadecimal). A date-time specification: field octets contents range ----- -- ---- -------- ----- 1 1-2 year 0..65536 2 3 month 1..12 3 4 day 1..31 4 5 hour 0..23 5 6 minutes 0..59 6 7 seconds 0..60 (use 60 for leap-second) 7 8 deci-seconds 0..9 For example Tuesday May 26 1992 at 1:30:15 PM EDT would be displayed as: 07 c8 05 1a 0d 1e 0f 00 (1992 -5 -26 13:30:15)
winlink1000OduAgnCurrAlarmLastChange	1.3.6.1.4.1.4458.1000.1.7.3.1	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each change in the winlink1000OduAgnCurrAlarmTable (either an addition or removal of an entry).
winlink1000OduAgnCurrAlarmTable			N/A	This table includes the currently active alarms. When a RAISED trap is sent an alarm entry is added to the table. When a CLEAR trap is sent the entry is removed.
winlink1000OduAgnCurrAlarmEntry			N/A	Entry containing the details of a currently RAISED trap. INDEX { winlink1000OduAgnCurrAlarmCounter }
winlink1000OduAgnCurrAlarmCounter	1.3.6.1.4.1.4458.1000.1.7.3.2.1.1	Integer	RO	A running counter of active alarms. The counter is incremented for every new RAISED trap. It is cleared after a device reset.
winlink1000OduAgnCurrAlarmSeverity	1.3.6.1.4.1.4458.1000.1.7.3.2.1.2	Integer	RO	Current Alarm severity.
winlink1000OduAgnCurrAlarmId	1.3.6.1.4.1.4458.1000.1.7.3.2.1.3	Integer	RO	Unique Alarm Identifier (combines alarm type and interface). The same AlarmId is used for RAISED and CLEARED alarms.
winlink1000OduAgnCurrAlarmIfIndex	1.3.6.1.4.1.4458.1000.1.7.3.2.1.4	Integer	RO	Interface Index where the alarm occurred. Alarms that are not associated with a specific interface will have the following value: 65535.
winlink1000OduAgnCurrAlarmUnit	1.3.6.1.4.1.4458.1000.1.7.3.2.1.5	Integer	RO	Unit associated with the alarm.
winlink1000OduAgnCurrAlarmTrapID	1.3.6.1.4.1.4458.1000.1.7.3.2.1.6	Integer	RO	ID of the raised trap that was sent when this alarm was raised.
winlink1000OduAgnCurrAlarmTimeT	1.3.6.1.4.1.4458.1000.1.7.3.2.1.7	Integer	RO	Timestamp of this alarm. This number is in seconds from Midnight January 1st 1970.
winlink1000OduAgnCurrAlarmText	1.3.6.1.4.1.4458.1000.1.7.3.2.1.8	DisplayString	RO	Alarm display text (same as the text in the sent trap).
winlink1000OduAgnLastEventsNumber	1.3.6.1.4.1.4458.1000.1.7.4.1	Integer	RO	This counter indicates the size of the winlink1000OduAgnLastEventsTable
winlink1000OduAgnLastEventsTable			N/A	This table includes the last events. When a trap is sent an event entry is added to the table.
winlink1000OduAgnLastEventsEntry			N/A	Entry containing the details of last traps. INDEX { winlink1000OduAgnLastEventsIndex }
winlink1000OduAgnLastEventsIndex	1.3.6.1.4.1.4458.1000.1.7.4.2.1.1	Integer	RO	The index of the table
winlink1000OduAgnLastEventsSeverity	1.3.6.1.4.1.4458.1000.1.7.4.2.1.2	Integer	RO	Current Trap severity.

Table D-2: Private MIB Parameters (Sheet 14 of 18)

Name	OID	Type	Access	Description
winlink1000OduAgnLastEventsIfIndex	1.3.6.1.4.1.4458.1000.1.7.4.2.1.3	Integer	RO	Interface Index where the event occurred. Traps that are not associated with a specific interface will have the following value: 65535.
winlink1000OduAgnLastEventsTimeT	1.3.6.1.4.1.4458.1000.1.7.4.2.1.4	Integer	RO	Timestamp of this trap. This number is in seconds from Midnight January 1st 1970.
winlink1000OduAgnLastEventsText	1.3.6.1.4.1.4458.1000.1.7.4.2.1.5	DisplayString	RO	Trap display text (same as the text in the sent trap).
winlink1000IduAdmProductType	1.3.6.1.4.1.4458.1000.2.1.1	DisplayString	RO	IDU configuration description.
winlink1000IduAdmHwRev	1.3.6.1.4.1.4458.1000.2.1.2	DisplayString	RO	IDU Hardware Revision.
winlink1000IduAdmSwRev	1.3.6.1.4.1.4458.1000.2.1.3	DisplayString	RO	IDU Software Revision.
winlink1000OduAdmNumOfExternalAlarmIn	1.3.6.1.4.1.4458.1000.2.1.4	Integer	RO	Indicates the number of currently available External Alarm Inputs.
winlink1000OduAdmExternAlarmInTable			N/A	This is the External Alarm Inputs table.
winlink1000OduAdmExternAlarmInEntry			N/A	Entry containing the elements of a single External Alarm Input. INDEX { winlink1000OduAdmExternAlarmInIndex}
winlink1000OduAdmExternAlarmInIndex	1.3.6.1.4.1.4458.1000.2.1.5.1.1	Integer	RO	This value indicates the index of the External Alarm Input entry.
winlink1000OduAdmExternAlarmInText	1.3.6.1.4.1.4458.1000.2.1.5.1.2	DisplayString	RW	This field describes the External Alarm Input. It is an optional string of no more than 64 characters which will be used in the event being sent as a result of a change in the status of the External Alarm Input. DEFVAL {Alarm Description}
winlink1000OduAdmExternAlarmInAdminState	1.3.6.1.4.1.4458.1000.2.1.5.1.3	Integer	RW	This value indicates if this External Alarm Input is enabled or disabled.
winlink1000OduAdmExternAlarmInStatus	1.3.6.1.4.1.4458.1000.2.1.5.1.4	Integer	RO	This value indicates the current status of the External Alarm Input.
winlink1000IduAdmSN	1.3.6.1.4.1.4458.1000.2.1.6	DisplayString	RO	IDU Serial Number
winlink1000IduAdmIduDetectionMode	1.3.6.1.4.1.4458.1000.2.1.7	Integer	RW	The parameter defines whether to send Ethernet frames to detect an IDU. The valid writable values are: userDisabled (3) userEnabled (4). A change requires a reset and is effective after reset.
winlink1000IduAdmMountedTrunks	1.3.6.1.4.1.4458.1000.2.1.8	Integer	RO	Number of mounted trunks in the IDU
winlink1000IduAdmLicensedTrunks	1.3.6.1.4.1.4458.1000.2.1.9	Integer	RO	Number of Licensed Trunks in the IDU
winlink1000IduAdmVlanSupported	1.3.6.1.4.1.4458.1000.2.1.10	Integer	RO	Identifies if the local IDU supports VLAN tag/untag
winlink1000IduAdmVlanEgressMode	1.3.6.1.4.1.4458.1000.2.1.11	DisplayString	RW	VLAN tag/untag egress values
winlink1000IduAdmVlanIngressMode	1.3.6.1.4.1.4458.1000.2.1.12	DisplayString	RW	VLAN tag/untag ingress values
winlink1000IduAdmVlanDefaultPortVIDs	1.3.6.1.4.1.4458.1000.2.1.13	DisplayString	RW	VLAN tag/untag default VLAN ids for each port - Right most digit is Vlan priority (0-6) other digits compose Vlan Id (1-4094)
winlink1000IduAdmVlanLan1UntaggedVIDs	1.3.6.1.4.1.4458.1000.2.1.14	DisplayString	RW	VLAN untagged VIDs for LAN1 port
winlink1000IduAdmVlanLan2UntaggedVIDs	1.3.6.1.4.1.4458.1000.2.1.15	DisplayString	RW	VLAN untagged VIDs for LAN2 port
winlink1000IduAdmVlanSfpUntaggedVIDs	1.3.6.1.4.1.4458.1000.2.1.16	DisplayString	RW	VLAN untagged VIDs for Sfp port
winlink1000IduAdmVlanLan1FilteredVIDs	1.3.6.1.4.1.4458.1000.2.1.17	DisplayString	RW	VLAN filtered VIDs for LAN1 port
winlink1000IduAdmVlanLan2FilteredVIDs	1.3.6.1.4.1.4458.1000.2.1.18	DisplayString	RW	VLAN filtered VIDs for LAN2 port
winlink1000IduAdmVlanSfpFilteredVIDs	1.3.6.1.4.1.4458.1000.2.1.19	DisplayString	RW	VLAN filtered VIDs for Sfp port
winlink1000IduSrvDesiredTrunks	1.3.6.1.4.1.4458.1000.2.2.2	Integer	RW	Required trunks bitmap. Note that the number of possible trunks that can be configured may vary based on the IDU hardware configuration the selected air interface rate and the range of the installation. The provided Manager application enables the user to select only available configurations. A change is effective immediately if applied to a master unit and the link is in service mode.

Table D-2: Private MIB Parameters (Sheet 15 of 18)

Name	OID	Type	Access	Description
winlink1000IduSrvServices	1.3.6.1.4.1.4458.1000.2.2.4	ObjectID	RO	This parameter is reserved to the Manager application provided with the product.
winlink1000IduSrvActiveTrunks	1.3.6.1.4.1.4458.1000.2.2.6	Integer	RO	A bitmap describing the currently open TDM trunks.
winlink1000IduSrvAvailableTrunks	1.3.6.1.4.1.4458.1000.2.2.8	Integer	RO	A bitmap describing the number of TDM trunks that can be opened in the current configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
winlink1000IduSrvPossibleServicesTable			N/A	IDU Possible Services table.
winlink1000IduSrvPossibleServicesEntry			N/A	IDU Services table entry. INDEX { winlink1000IduSrvPossibleServicesIndex }
winlink1000IduSrvPossibleServicesIndex	1.3.6.1.4.1.4458.1000.2.2.10.1.1	Integer	RO	Table index Rate index of the air interface.
winlink1000IduSrvPossibleTdmServices	1.3.6.1.4.1.4458.1000.2.2.10.1.2	Integer	RO	Deprecated parameter. A bitmap describing the TDM trunks that can be opened in the corresponding Air Rate.
winlink1000IduSrvPossibleEthServices	1.3.6.1.4.1.4458.1000.2.2.10.1.3	Integer	RO	Deprecated parameter. This parameter describes if the Ethernet Service can be opened in the corresponding Air Rate. The valid values are: disabled (0) enabled (1).
winlink1000IduSrvRemainingRate	1.3.6.1.4.1.4458.1000.2.2.10.1.4	Integer	RO	Current Ethernet bandwidth in bps per air rate.
winlink1000IduSrvTrunkCost	1.3.6.1.4.1.4458.1000.2.2.10.1.5	Integer	RO	Cost of the TDM Service in bps.
winlink1000IduSrvAvailServicesTable			N/A	ODU Possible TDM Services table.
winlink1000IduSrvAvailServicesEntry			N/A	ODU TDM Services table entry. INDEX { winlink1000IduSrvAvailServicesIndex }
winlink1000IduSrvAvailServicesIndex	1.3.6.1.4.1.4458.1000.2.2.11.1.1	Integer	RO	Table index. The index is the bit mask of the TDM service.
winlink1000IduSrvAvailServicesState	1.3.6.1.4.1.4458.1000.2.2.11.1.2	Integer	RO	Represents the TDM service availability.
winlink1000IduSrvAvailServicesMinRateIdx	1.3.6.1.4.1.4458.1000.2.2.11.1.3	Integer	RO	Minimum rate index of the air interface which make the service possible.
winlink1000IduSrvAvailServicesMaxRateIdx	1.3.6.1.4.1.4458.1000.2.2.11.1.4	Integer	RO	Maximum rate index of the air interface which make the service possible.
winlink1000IduSrvAvailServicesReason	1.3.6.1.4.1.4458.1000.2.2.11.1.5	Integer	RO	Information about the TDM Service availability. - Not Applicable if the service is available. The reasons for TDM Service unavailability: - The available throughput isn't sufficient for Service demands; - The IDU HW doesn't support the service; - A Link Password mismatch was detected; - The external pulse type detected is improper for TDM services; - A Software versions mismatch was detected. - A-Symetric TDD Mode Is Obligated.
winlink1000IduSrvEthActive	1.3.6.1.4.1.4458.1000.2.2.12	Integer	RO	Represents the Ethernet service activation state.
winlink1000IduSrvEthAvailable	1.3.6.1.4.1.4458.1000.2.2.13	Integer	RO	Represents the Ethernet service availability state.
winlink1000IduSrvEthThroughput	1.3.6.1.4.1.4458.1000.2.2.14	Gauge	RO	Current available Ethernet service throughput in bps.
winlink1000IduSrvEthMaxInfoRate	1.3.6.1.4.1.4458.1000.2.2.15	Integer	RW	Holds the maximum bandwidth (kbps) to be allocated for Ethernet service. Value of zero means that Ethernet service works as best effort. The maximum value is product specific. Refer to the user manual.
winlink1000IduSrvAvailableTrunksT1	1.3.6.1.4.1.4458.1000.2.2.16	Integer	RO	A bitmap describing the TDM trunks that can be opened under T1 configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
winlink1000IduEthernetIfTable			N/A	IDU Ethernet Interface table.

Table D-2: Private MIB Parameters (Sheet 16 of 18)

Name	OID	Type	Access	Description
winlink1000IduEthernetIfEntry			N/A	IDU Ethernet Interface table entry. INDEX { winlink1000IduEthernetIfIndex }
winlink1000IduEthernetIfIndex			RO	If Index corresponding to this Interface.
winlink1000IduEthernetIfAddress	1.3.6.1.4.1.4458.1000.2.3.1.1.5	DisplayString	RO	IDU MAC address.
winlink1000IduEthernetNumOfLanPorts	1.3.6.1.4.1.4458.1000.2.3.3	Integer	RO	Number of LAN interfaces in the IDU.
winlink1000IduEthernetNumOfSfpPorts	1.3.6.1.4.1.4458.1000.2.3.4	Integer	RO	The number of SFP interfaces in the IDU.
winlink1000IduEthernetSfpProperties	1.3.6.1.4.1.4458.1000.2.3.5	DisplayString	RO	SFP venfor properties : Vendor Name PN and Revision.
winlink1000IduBridgeTpAging	1.3.6.1.4.1.4458.1000.2.4.4.2	Integer	RW	Timeout in seconds for aging. Note that for this parameter to be effective the ODU must be configured to HUB mode. A change is effective immediately.
winlink1000IduTdmTxClockAvailStates	1.3.6.1.4.1.4458.1000.2.6.1.1	Integer	RO	Available states of the TDM Transmit Clock Control each input status is represented by a bit. When the state is available the bit value is 1. When the state is unavailable the bit value is 0. The available states are: bit 2 = Transparent bit 3 = Local Loop Timed bit 4 = Remote Loop Timed bit 5 = Local Internal bit 6 = Remote Internal
winlink1000IduTdmTxClockDesiredState	1.3.6.1.4.1.4458.1000.2.6.1.2	Integer	RW	Required state of the TDM Transmit Clock Control. A change is effective after re-activation of the TDM service.
winlink1000IduTdmTxClockActualState	1.3.6.1.4.1.4458.1000.2.6.1.3	Integer	RO	Actual state of the TDM Transmit Clock Control.
winlink1000IduTdmMasterClockAvailOptions	1.3.6.1.4.1.4458.1000.2.6.2.1	Integer	RO	Available options of the TDM Master Clock Control each input status is represented by a bit. When the option is available the bit value is 1. When the option is unavailable the bit value is 0. The available options are: bit 2 = Automatic bit 3 = Trunk #1 bit 4 = Trunk #2 bit 5 = Trunk #3 bit 6 = Trunk #4 When no options are available the returned value is: 1
winlink1000IduTdmMasterClockDesired	1.3.6.1.4.1.4458.1000.2.6.2.2	Integer	RW	Required TDM Master Clock. A change is effective after re-activation of the TDM service.
winlink1000IduTdmMasterClockActual	1.3.6.1.4.1.4458.1000.2.6.2.3	Integer	RO	Actual Trunk used for TDM Master Clock.
winlink1000IduTdmConfigTable			N/A	IDU TDM Links Configuration table.
winlink1000IduTdmConfigEntry			N/A	IDU TDM Links Configuration table entry. INDEX { winlink1000IduTdmConfigIndex }
winlink1000IduTdmConfigIndex			RO	Table index.
winlink1000IduTdmIfIndex			RO	Link index in the interface table.
winlink1000IduTdmLineCoding	1.3.6.1.4.1.4458.1000.2.6.6.1.6	Integer	RW	This parameter applies to T1 trunks only. The parameter controls the line coding. Setting the value to each of the indices applies to all. A change is effective after the next open of the TDM service.
winlink1000IduTdmLoopbackConfig	1.3.6.1.4.1.4458.1000.2.6.6.1.9	Integer	RW	Loop back configuration table. Each of the trunks can be set Normal Line loop back or Reverse line loop back. A change is effective immediately.
winlink1000IduTdmLineStatus	1.3.6.1.4.1.4458.1000.2.6.6.1.10	Integer	RO	Line status.
winlink1000IduTdmCurrentTable			N/A	IDU TDM Links Statistics table.
winlink1000IduTdmCurrentEntry			N/A	IDU TDM Links Statistics table entry. INDEX { winlink1000IduTdmCurrentIndex }
winlink1000IduTdmCurrentIndex			RO	Table index (Same as winlink1000IduTdmLineIndex).
winlink1000IduTdmCurrentBlocks	1.3.6.1.4.1.4458.1000.2.6.7.1.101	Counter	RO	Number of correct blocks transmitted to the line.
winlink1000IduTdmCurrentDrops	1.3.6.1.4.1.4458.1000.2.6.7.1.102	Counter	RO	Number of error blocks transmitted to the line.

Table D-2: Private MIB Parameters (Sheet 17 of 18)

Name	OID	Type	Access	Description
winlink1000IduTdmCurrentTxClock	1.3.6.1.4.1.4458.1000.2.6.7.1.103	Integer	RW	TDM Transmit Clock. A change is effective after re-activation of the TDM service.
winlink1000IduTdmCurrentBlocksHigh	1.3.6.1.4.1.4458.1000.2.6.7.1.104	Counter	RO	High part of the 64 bits counter Current Blocks
winlink1000IduTdmRemoteQual	1.3.6.1.4.1.4458.1000.2.6.8	Integer	RO	Estimated average interval between error second events. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
winlink1000IduTdmRemoteQualEval	1.3.6.1.4.1.4458.1000.2.6.9	Integer	RO	Estimated average interval between error second events during evaluation process. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
winlink1000IduTdmSrvEval	1.3.6.1.4.1.4458.1000.2.6.10	Integer	RW	Evaluated TDM service bit mask. Setting this parameter to value that is bigger than the activated TDM service bit mask will execute the evaluation process for 30 seconds. Setting this parameter to 0 will stop the evaluation process immediately.
winlink1000IduTdmBackupAvailableLinks	1.3.6.1.4.1.4458.1000.2.6.11	Integer	RO	Number of TDM backup trunks.
winlink1000IduTdmBackupTable			N/A	IDU TDM Links Statistics table.
winlink1000IduTdmBackupEntry			N/A	IDU TDM Links Statistics table entry. INDEX { winlink1000IduTdmBackupIndex }
winlink1000IduTdmBackupIndex	1.3.6.1.4.1.4458.1000.2.6.12.1.1	Integer	RO	Table index.
winlink1000IduTdmBackupMode	1.3.6.1.4.1.4458.1000.2.6.12.1.2	Integer	RW	TDM backup mode: Enable or Disable where the main link is the air link or the external link. Changes will be effective immediatly.
winlink1000IduTdmBackupCurrentActiveLink	1.3.6.1.4.1.4458.1000.2.6.12.1.3	Integer	RO	TDM backup current active link: N/A air link is active or external link is active.
winlink1000IduTdmJitterBufferSize	1.3.6.1.4.1.4458.1000.2.6.13	Integer	RW	TDM Jitter Buffer Size. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferDefaultSize	1.3.6.1.4.1.4458.1000.2.6.14	Integer	RO	TDM Jitter Buffer Default Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferMinSize	1.3.6.1.4.1.4458.1000.2.6.15	Integer	RO	TDM Jitter Buffer Minimum Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferMaxSize	1.3.6.1.4.1.4458.1000.2.6.16	Integer	RO	TDM Jitter Buffer Maximum Size. The units are 0.1 x millisecond.
winlink1000IduTdmJitterBufferSizeEval	1.3.6.1.4.1.4458.1000.2.6.17	Integer	RW	TDM Jitter Buffer Size for evaluation. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
winlink1000IduTdmType	1.3.6.1.4.1.4458.1000.2.6.18	Integer	RW	TDM Type (The value undefined is read-only).
winlink1000IduTdmTypeEval	1.3.6.1.4.1.4458.1000.2.6.19	Integer	RW	TDM Type for evaluation.
winlink1000IduTdmLineStatusStr	1.3.6.1.4.1.4458.1000.2.6.20	DisplayString	RO	Line status.
winlink1000IduTdmHotStandbySupport	1.3.6.1.4.1.4458.1000.2.6.21	Integer	RO	Indicates if Hot Standby is supported.
winlink1000IduTdmDesiredHotStandbyMode	1.3.6.1.4.1.4458.1000.2.6.22	Integer	RW	Desired Hot Standby Mode.
winlink1000IduTdmHotStandbyOperationStatus	1.3.6.1.4.1.4458.1000.2.6.23	Integer	RO	The Link Actual Status.
winlink1000IduTdmBackupLinkConfiguration	1.3.6.1.4.1.4458.1000.2.6.24	Integer	RW	The current configuration of the backup link.
winlink1000GeneralTrapDescription	1.3.6.1.4.1.4458.1000.100.1	DisplayString	RO	Trap's Description. Used for Trap parameters.
winlink1000GeneralTrapSeverity	1.3.6.1.4.1.4458.1000.100.2	Integer	RO	Trap's Severity. Used for Trap parameters.
winlink1000GeneralCookie	1.3.6.1.4.1.4458.1000.100.3	DisplayString	RW	Reserved for the Manager application provided with the product used for saving user preferences affecting ODU operation.
winlink1000GeneralEcChangesCounter	1.3.6.1.4.1.4458.1000.100.4	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each element constant write operation via SNMP or Telnet.

Table D-2: Private MIB Parameters (Sheet 18 of 18)

Name	OID	Type	Access	Description
winlink1000GeneralTelnetSupport	1.3.6.1.4.1.4458.1000.100.5	Integer	RW	Enable/Disable Telnet protocol.

MIB Traps

General

Each ODU can be configured with up to 10 different trap destinations. When the link is operational, each ODU sends traps originating from both Site A and Site B.

The source IP address of the trap is the sending ODU. The trap originator can be identified by the trap Community string or by the trap description text.

Each trap contains a trap description and additional relevant information such as alarm severity, interface index, time stamp and additional parameters.

Trap Parameters

Table D-3: MIB Traps (Sheet 1 of 5)

Name	ID	Severity	Description
trunkStateChanged	1	normal	Indicates a change in the state of one of the TDM trunks. Raised by both sides of the link. Contains 3 parameters: 1 - Description: TDM Interface %n - %x 2 - %n: Is the trunk number 3 - %x: Is the alarm type and can be one of the following: Normal AIS LOS Loopback
linkUp	2	normal	Indicates that the radio link is up. Contains a single parameter which is its description: 1 - Description: Radio Link - Sync on channel %n GHz. %n Is the channel frequency in GHz.
linkDown	3	critical	Indicates that the radio link is down. Contains a single parameter which is its description: 1 - Description: Radio Link - Out of Sync. The reason is: %s. %s Is the reason.
detectIDU	4	normal	Indicates that the IDU was detected. Raised by both sides of the link. Contains a single parameter which is its description: 1 - Description: IDU of Type %s was Detected. %s Is the type of the IDU.
disconnectIDU	5	major	Indicates that the IDU was disconnected. Raised by both sides of the link. Contains a single parameter which is its description: 1 - Description: IDU Disconnected.
mismatchIDU	6	major	Indicates a mismatch between the IDUs. Raised by the master only. Contains a single parameter which is its description: 1 - Description: IDUs Mismatch: One Side is %s and the Other is %s. %s Is the type of the IDU.
openedServices	7	normal	Indicates that services were opened. Raised by the master only. Contains 3 parameters: 1 - Description: %n2 out of %n1 Requested TDM Trunks have been Opened 2 - %n1: Is the requested number of TDM truncks 3 - %n2: Is the actual number of TDM trunks that were opened
closedServices	8	normal	Indicates that services were closed. Raised by the master only. Contains a single parameter which is its description: 1 - Description: TDM Service has been closed. The reason is: %s. %s Is the reason.
incompatibleODUs	9	critical	Indicates that the ODUs are incompatible. Contains a single parameter which is its description: 1 - Description: Incompatible ODUs.
incompatibleIDUs	10	major	Indicates that the IDUs are incompatible. Contains a single parameter which is its description: 1 - Description: Incompatible IDUs.
incompatibleOduIdu	11	major	Indicates that the ODU and IDU are incompatible. Contains a single parameter which is its description: 1 - Description: The IDU could not be loaded. The reason is: %s. %s Is the incompatibility type.
probingChannel	12	normal	Indicates that the ODU is monitoring radar activity. Contains a single parameter which is its description: 1 - Description: Monitoring for radar activity on channel %n GHz. %n is the channel frequency in GHz.
radarDetected	13	normal	Indicates that radar activity was detected. Contains a single parameter which is its description: 1 - Description: Radar activity was detected in %s on channel %n GHz. %s Is the site name. %n Is the channel frequency in GHz.
transmittingOnChannel	14	normal	Indicates that the ODU is transmitting on channel. Contains a single parameter which is its description: 1 - Description: Transmitting on channel %n GHz. %n Is the channel frequency in GHz.
scanningChannels	15	normal	Indicates that the ODU is scanning channels. Contains a single parameter which is its description: 1 - Description: Channel scanning in progress.
incompatiblePartner	16	critical	Indicates that configuration problem was detected and that link installation is required in order to fix it. Contains a single parameter which is its description: 1 - Description: Configuration problem detected. Link installation required.
timeClockSet	17	normal	Indicates that the ODU time clock was set. Contains a single parameter which is its description: 1 - Description: The time was set to: %p. %p Is the date and time.
configurationChanged	18	normal	Indicates that the ODU recovered from an error but there are configuration changes. Contains two parameters: 1 - Description: Configuration changed. Error code is: %n. 2 - %n number.

Table D-3: MIB Traps (Sheet 2 of 5)

Name	ID	Severity	Description
hssOpStateChangedToINU	19	normal	Indicates that the HSS operating state was changed to INU type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: INU.
hssOpStateChangedToHSM	20	normal	Indicates that the HSS operating state was changed to HSM type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSM.
hssOpStateChangedToHSC	21	normal	Indicates that the HSS operating state was changed to HSC type. Contains a single parameter which is its description: 1 - Description: HSS operating state was changed to: HSC_DT/HSC_CT.
vlanModeActive	22	normal	Indicates to non-VLAN PC that after 2 minutes the system will support only VLAN tag on management interface. Contains a single parameter which is its description: 1 - Description: VLAN Mode is active. Non-VLAN traffic will be blocked in 2 minutes.
spectrumAnalysis	23	normal	Indicates that the ODU is in Spectrum Analysis mode. Contains a single parameter which is its description: 1 - Description: Spectrum analysis in progress.
tdmServiceAlarm	100	major	Indicates that TDM Service is in alarm state. Contains a single parameter which is its description: 1 - Description: TDM Service - Alarm.
ethServiceClosed	101	major	Indicates that Ethernet Service is closed. Contains a single parameter which is its description: 1 - Description: Ethernet Service is closed.
ethServiceNotPermitted	102	major	Indicates that Ethernet Service is not permitted. Contains a single parameter which is its description: 1 - Description: A valid IDU could not be detected at %s. Please check your configuration. %s - Is the Local Site name or Remote Site name or both sides of the Link.
encryptionAlarm	103	major	Indicates an encryption key mismatch. Contains a single parameter which is its description: 1 - Description: Encryption Status - Failed. No Services are available.
changeLinkPasswordAlarm	104	major	Indicates that a failure has occurred while attempting to change the Link Password. Contains a single parameter which is its description: 1 - Description: Failed to change the Link Password at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.
externalAlarmInPort1Alarm	105	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #1. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm.
externalAlarmInPort2Alarm	106	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #2. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm.
bitFailedAlarm	107	major	The trap is sent if there is no way to recover from the situation.Contains two parameters: 1 - Description: ODU power up built in test failed. Error code is: %n 2 - %n number
wrongConfigurationLoadedAlarm	108	major	The trap is sent if there is a way to recover from the situation.Contains two parameters: 1 - Description: Wrong configuration loaded. Error code is: %n 2 - %n number
lanPort1DisconnectedAlarm	109	major	Indicates the LAN port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 1 status changed to disconnected.
lanPort2DisconnectedAlarm	110	major	Indicates the LAN port 2 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: LAN port 2 status changed to disconnected.
mngPortDisconnectedAlarm	111	major	Indicates the management port status changed to disconnected.Contains a single parameter which is its description: 1 - Description: Management port status changed to disconnected.
externalAlarmInPort3Alarm	112	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #3. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm.
externalAlarmInPort4Alarm	113	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #4. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm.

Table D-3: MIB Traps (Sheet 3 of 5)

Name	ID	Severity	Description
swVersionsMismatchFullCompatibilityAlarm	114	warning	The trap is sent if SW versions mismatch with full link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - full link functionality
swVersionsMismatchRestrictedCompatibilityAlarm	115	minor	The trap is sent if SW versions mismatch with restricted link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - restricted link functionality
swVersionsMismatchSoftwareUpgradeRequired	116	major	The trap is sent if SW versions mismatch and SW upgrade is required. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - Software upgrade required
swVersionsIncompatible	117	critical	The trap is sent if SW versions are incompatible. Contains a single parameter which is its description: 1 - Description: SW Versions incompatible
hssMultipleSourcesDetectedAlarm	118	major	Indicates that multiple sync pulse sources were detected. Contains a single parameter which is its description: 1 - Description: HSS multiple sync sources were detected.
hssSyncToProperSourceStoppedAlarm	119	major	Indicates that synchronization to a proper sync pulse source was stopped. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Down. The reason is: %s. %s - Is the reason for the sync down.
hssSyncPulseDetectedAlarm	120	major	Indicates that HSS additional sync pulse was detected. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was detected.
tdmBackupAlarm	121	major	Indicates that the TDM backup link was activated. Contains a single parameter which is its description: 1 - Description: TDM backup alarm - backup link was activated.
linkLockUnauthorizedRemoteODU	122	major	Indicates that the remote ODU is unauthorized. Contains a single parameter which is its description: 1 - Description: Unauthorized remote ODU connection rejected.
linkLockUnauthorizedODU	123	major	Indicates that the ODU is unauthorized. Contains a single parameter which is its description: 1 - Description: Unauthorized ODU connection rejected.
hotStandbyAlarm	124	major	Indicates that the hot standby secondary link was activated. Contains a single parameter which is its description: 1 - Description: Secondary Link Is Active.
sfpInsertion	126	normal	Indicates that a device was inserted to SFP Port
sfpPort1DisconnectedAlarm	127	major	Indicates the SFP port 1 status changed to disconnected.Contains a single parameter which is its description: 1 - Description: SFP port 1 status changed to disconnected.
desiredRatioCanNotBeAppliedAlarm	129	normal	Indicates Desired UL/DL RAtio Can Not Be Applied.
cbwMismatch	130	major	Indicates that a Channel Bandwidth mismatch was detected.Contains two parameters: 1 - Description: Channel Bandwidth Mismatch: one side is %n0 MHz and the other is %n1 MHz. %n0 is the local Channel Bandwidth value in MHz. %n1 is the remoet Channel Bandwidth value in MHz.
gpsNotSynchronized	131	major	Indicates that the GPS is not synchronized with satellites. Pulses are self generated.
pdTooHighDueCbwLimitations	132	major	Indicates that link cannot be established because link range is too large for channel bandwidth.
tdmServiceClear	200	major	Indicates that TDM Service fault is cleared. Contains a single parameter which is its description: 1 - Description: TDM Service - Normal.
ethServiceOpened	201	normal	Indicates that Ethernet Service has been opened. Contains a single parameter which is its description: 1 - Description: Ethernet Service has been opened.
encryptionClear	203	normal	Indicates that encryption is OK. Contains a single parameter which is its description: 1 - Description: Encryption Status - Normal.
changeLinkPasswordClear	204	normal	Indicates that the Link Password was changed successfully. Contains a single parameter which is its description: 1 - Description: Link Password has been changed at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.

Table D-3: MIB Traps (Sheet 4 of 5)

Name	ID	Severity	Description
externalAlarmInPort1Clear	205	normal	This Trap is sent every time an External Alarm Input fault of port # 1 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm Cleared.
externalAlarmInPort2Clear	206	normal	This Trap is sent every time an External Alarm Input fault of port # 2 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm Cleared.
lanPort1Clear	209	normal	Indicates the LAN port 1 status changed to connected. Contains two parameters: 1 - Description: LAN port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
lanPort2Clear	210	normal	Indicates the LAN port 2 status changed to connected. Contains two parameters: 1 - Description: LAN port 2 status changed to connected - %s. 2 - %s Is the Eth. mode (speed & duplex).
mngPortClear	211	normal	Indicates the management port status changed to connected. Contains two parameters: 1 - Description: Management port status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)
externalAlarmInPort3Clear	212	normal	This Trap is sent every time an External Alarm Input fault of port # 3 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm Cleared.
externalAlarmInPort4Clear	213	normal	This Trap is sent every time an External Alarm Input fault of port # 4 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm Cleared.
swVersionsMatchFullCompatibilityClear	214	normal	The trap is sent if SW versions match. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchRestrictedCompatibilityClear	215	normal	The trap is sent if SW versions match and link functionality is not restricted. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchSoftwareUpgradeRequiredClear	216	normal	The trap is sent if SW versions match and SW upgrade is successful. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsCompatibleClear	217	normal	The trap is sent if SW versions compatible Contains a single parameter which is its description: 1 - Description: Software Versions compatible
hssMultipleSourcesDisappearedClear	218	normal	Indicates that multiple sync pulse sources disappeared. Contains a single parameter which is its description: 1 - Description: HSS multiple sync pulse sources disappeared.
hssSyncToProperSourceAchievedClear	219	normal	Indicates that synchronization to a proper Sync source was achieved. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Up.
hssSyncPulseDisappearedClear	220	normal	Indicates that HSS additional sync pulse disappeared. Contains a single parameter which is its description: 1 - Description: HSS additional sync pulse was disappeared.
tdmBackupClear	221	normal	Indicates that the TDM main link was activated. Contains a single parameter which is its description: 1 - Description: TDM main link was activated.
linkLockAuthorizedRemoteODU	222	normal	Indicates that the remote ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized remote ODU connection accepted.
linkLockAuthorizedODU	223	normal	Indicates that the ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized ODU connection permitted.
linkAuthenticationDisabled	224	normal	Indicates that the Link Lock is disabled. Contains a single parameter which is its description: 1 - Description: Link Authentication has been disabled.
hotStandbyClear	225	normal	Indicates that the Primary Link Was Activated. Contains a single parameter which is its description: 1 - Description: Primary Link Is Active.
sfpExtraction	226	normal	Indicates that a device was extracted from SFP Port
sfpPort1Clear	227	normal	Indicates the SFP port 1 status changed to connected. Contains two parameters: 1 - Description: SFP port 1 status changed to connected - %s 2 - %s Is the Eth. mode (speed & duplex)

Table D-3: MIB Traps (Sheet 5 of 5)

Name	ID	Severity	Description
compatibleIdus	228	normal	Indicates that the ODU has identified compatible Idus on both sides of the link.
desiredRatioCanNotBeAppliedClear	229	normal	Indicates Current UL/DL Ratio Is Equal To Desired Ratio.
cbwMatch	230	normal	Indicates that a Channel Bandwidth match was detected. Contains a single parameter which is its description: 1 - Channel Bandwidth value in MHz.
switchCbwAndChannel	231	normal	Indicates that the system is switching Channel Bandwidth and channel frequency. Contains two parameters: 1 - Switching to Channel Bandwith %n0 MHz and to channel %n1 GHz.
ringRplStateIdle	232	normal	RPL state changed to Idle.
ringEthServiceStatus	233	normal	Indicates Ethernet service's state - blocked \ unblocked. Contains a single parameter: 1 - Description: Ethernet's state (blocked \ unblocked)
ringFirstRpmReceived	234	normal	Ring application: in non-RPL link indicates first from a specific RPL was received. Contains a single parameter: 1 - Description: RPM's VLAN ID
ringEthernetSrviceUnblockedTO	235	normal	Ring application: in non-RPL link Ethernet service is unblocked due to RPM timeout.
gpsSynchronized	236	normal	Indicates that the GPS is synchronized with satellites.

RADWIN Manager Traps

The RADWIN Manager application issues traps to indicate various events. These traps are shown in the RADWIN Managerr Events Log.

A list of Trap Messages as displayed by the RADWIN Manager is shown in **Table 9-5**.

Appendix E

External Alarms Specification

External Alarms Specification

The IDU-C and new style IDU-E support external input and output alarms through a standard DB25 pin female connector (see **page B-3** for pinout details).

Input alarms

The input alarms are raised by events from external equipment, such as a fire warning, door open or air conditioner failure. They are user defined.

Output alarms

Output alarms are generated through dry contact relays to indicate various system events such as sync loss or disconnection. An alarm is raised if at least one of the conditions in one of the tables below, is met.

IDU-C and new style IDU-E Alarms

Table E-1: IDU-C/E - Output Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 1	Air interface Alarm	• Link is down • Link in installation mode • Link authentication problem	Link is up or equipment alarm is ON
Output 2	Equipment Alarm	• Built in Test (BIT) error • No connection to the ODU	Both ODU and IDU are in operational state
Output 3	Service Alarm at Site B	N/A	Permanently off
Output 4	Power Failure at Site B	Link Loss due to Power Failure at Site B	Link is up or down without power failure indication within the last two seconds

Table E-2: IDU-C - Input Alarms Description

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Input 1	User Defined External Alarm	Voltage in range -10 to -50VDC	Voltage > 0VDC
Input 2			
Input 3			
Input 4			

Appendix F

RF Exposure

The antennas used for the following transmitters must be installed so as to provide a minimum separation distance from by-standers as specified in the following tables:

Table F-1: Safety Distances for RADWIN 2000 FCC and IC Products

Frequency Band [GHz]	FCC ID	IC ID	Antenna gain [dBi]	Min. Safety Distance [cm]
5.8	Q3KRW2058	5100A-RW2054	28	223
5.8	Q3KRW2058	5100A-RW2054	24	141
5.3/5.4	Q3KRW2054	5100A-RW2054	23.5 / 28	20
4.9	Q3KRW2049	5100A-RW2054	28	225
4.9	Q3KRW2049	5100A-RW2054	21	113
2.4	Q3KRW2024	5100A-RW2054	19	39
2.4	Q3KRW2024I	5100A-RW2024I	17.5	40
2.5	Q3KRW2025	N/a	24	104.6
3.5	N/A	5100A-RW2030	25	92
3.6/3.7	Q3KRW2030	5100A-RW2030	25	86

Table F-2: Safety Distances for RADWIN 2000 ETSI Products

Frequency Band [GHz]	Antenna gain [dBi]	Min. Safety Distance [cm]
5.8	24 / 28	20
5.4	23.5 / 28	20
5.3	23.5 / 28	20
2.4	19 / 17.5	20
3.5	25	200

Appendix G

Regional Notice: French Canadian

Procédures de sécurité

Généralités

Avant de manipuler du matériel connecté à des lignes électriques ou de télécommunications, il est conseillé de se défaire de bijoux ou de tout autre objet métallique qui pourrait entrer en contact avec les éléments sous tension.

Mise à la terre

Tous les produits RADWIN doivent être mis à la terre pendant l'usage courant. La mise à la terre est assurée en reliant la fiche d'alimentation à une prise de courant avec une protection de terre. En outre:

- La cosse de masse sur l'IDU-C doit être constamment connectée à la protection de terre, par un câble de diamètre de 18 AWG ou plus. Le matériel monté sur rack doit être installé seulement sur des racks ou armoires reliés à la terre
- Une ODU doit mise à la terre par un câble de diamètre de 12 AWG ou plus
- Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre

De plus:

- Il faut toujours connecter la terre en premier et la déconnecter en dernier
- Il ne faut jamais connecter les câbles de télécommunication à du matériel non à la terre
- Il faut s'assurer que tous les autres câbles sont déconnectés avant de déconnecter la terre

Protection contre la foudre

L'utilisation de dispositifs de protection contre la foudre dépend des exigences réglementaires et de l'utilisateur final. Toutes les unités extérieures RADWIN sont conçues avec des circuits de limitation de surtension afin de minimiser les risques de dommages dus à la foudre. RAD-

WIN conseille l'utilisation d'un dispositif de parafoudre supplémentaire afin de protéger le matériel de coups de foudre proches.

Matériel supplémentaire requis

L'équipement requis pour l'installation du matériel est le suivant:

- Pince à sertir RJ-45 (si un câble pré-assemblé ODU/IDU n'est pas utilisé)
- Perceuse (pour le montage sur mur seulement)
- Câbles de terre IDU et ODU
- Clef 13 mm (½″)
- Câble ODU - IDU si non commandé (type extérieur, CAT-5e, 4 paires torsadées, 24 AWG)
- Colliers de serrage
- Ordinateur portable avec Windows 2000 ou Windows XP.

Précautions de sécurité pendant le montage de ODU

Avant de connecter un câble à l'ODU, la borne protectrice de masse (visse) de l'ODU doit être connectée à un conducteur externe protecteur ou à un pylône relié à la terre. Il ne doit pas y avoir de fusibles ou d'interrupteurs sur la connection à la terre.

Seulement un personnel qualifié utilisant l'équipement de sécurité approprié doit pouvoir monter sur le pylône d'antenne. De même, l'installation ou le démontage de ODU ou de pylônes doit être effectuée seulement par des professionnels ayant suivi une formation.

Pour monter l'ODU:

1. Vérifier que les supports de fixation de l'ODU sont correctement mis à la terre.
2. Monter l'unité ODU sur le pylône ou sur le mur; se référer à la **Installation sur pylône et mur** au dessous.
3. Connecter la câble de terre au point de châssis sur l'ODU.
4. Relier le câble ODU-IDU au connecteur ODU RJ-45.
5. Visser les presses-étoupe de câbles pour assurer le scellement hermétique des unités ODU.
6. Attacher le *câble au pylône ou aux supports en utilisant des colliers class*és UV.
7. Répéter la procédure sur le site distant.

Prudence

Ne pas se placer en face d'une ODU sous tension.

Connecter la terre à IDU-C

Connecter un câble de terre de 18 AWG à la borne de masse de l'appareil. L'appareil doit être constamment connecté à la terre.

Installation sur pylône et mur

L' ODU ou l'O-PoE peuvent être montés sur un pylône ou un mur.

Prudence

- Les appareils sont prévus pour être installés par un personnel de service.
- Les appareils doivent être connectés à une prise de courant avec une protection de terre.
- Le courant CC du IDU-C doit être fourni par l'intermédiaire d'un disjoncteur bipolaire et le diamètre du câble doit être de 14 mm avec un conduit de 16 mm.

Contenu du kit de montage ODU

Le kit de montage ODU comprend les pièces suivantes:

- une grande clame (voir **Figure G-1**)
- une *petite clame* (voir **Figure G-2**)
- un bras (voir **Figure G-3**)
- quatre visses hex tête M8x40
- deux visses hex tête M8x70
- quatre rondelles plates M8
- trois rondelles élastiques M8
- deux écrous M8.

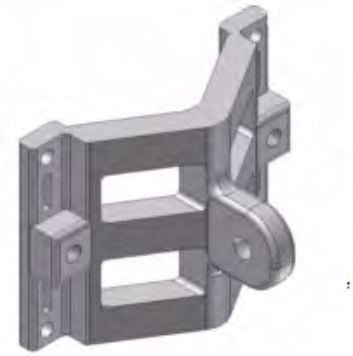


Figure G-1: grande clame

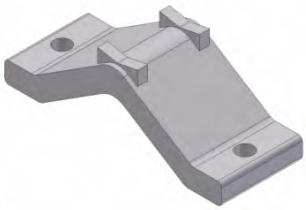
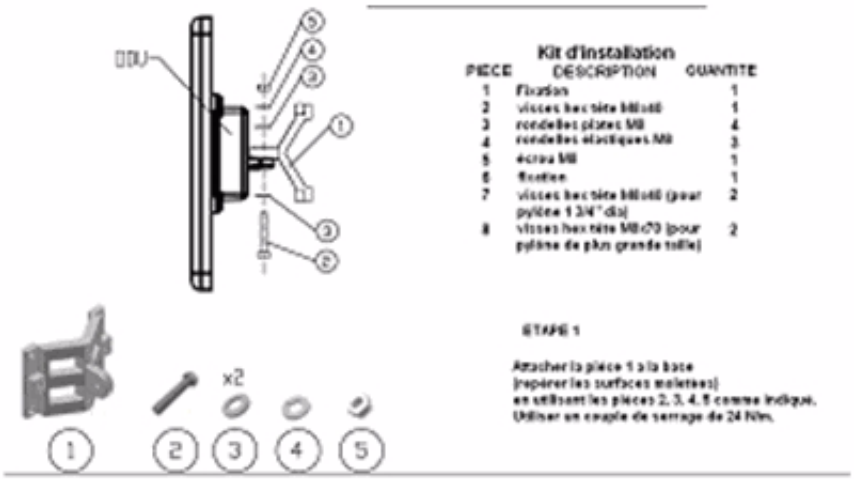


Figure G-2: petite clame

Figure G-3: bras

Montage sur un pylône



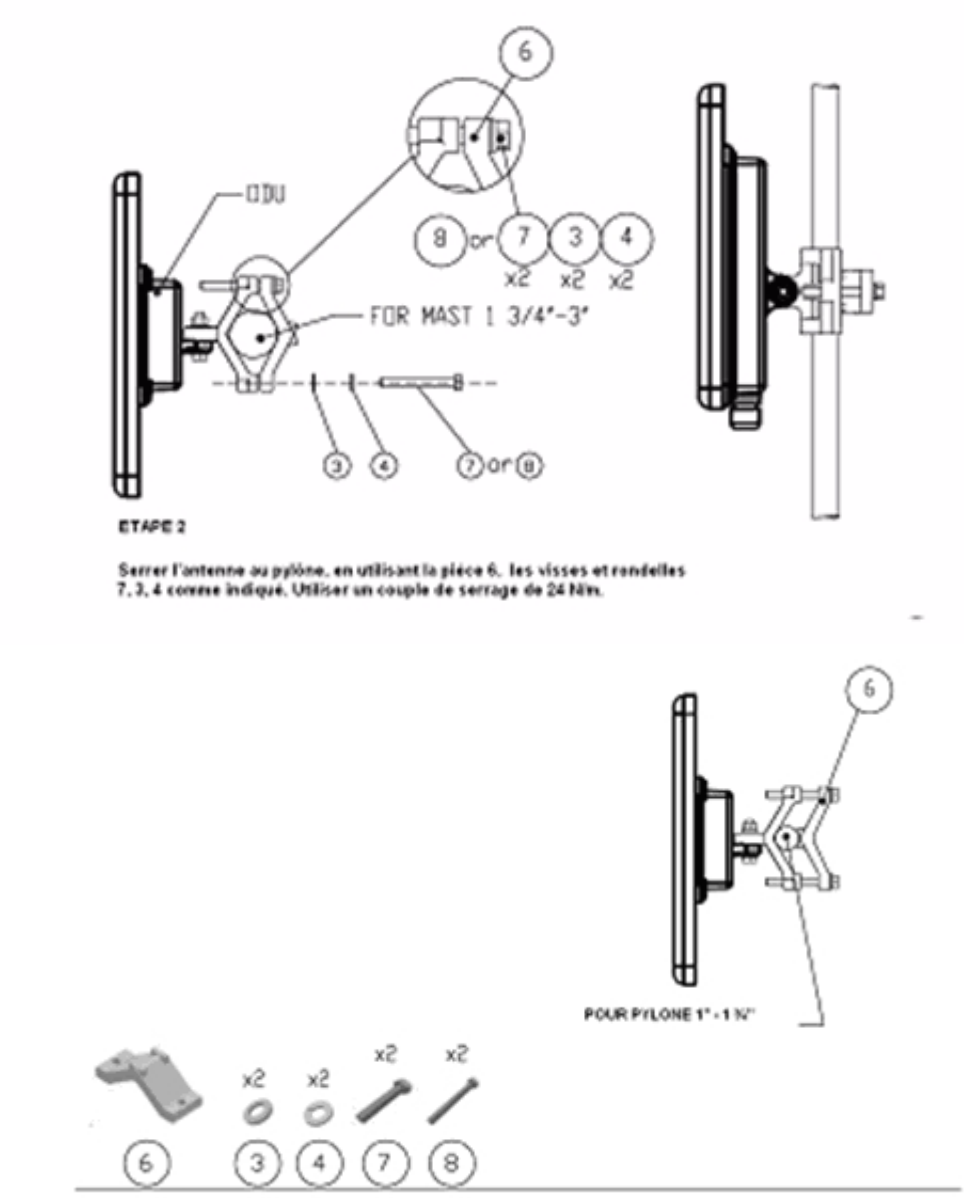


Figure G-4: Montage sur un pylône

Montage sur un mur

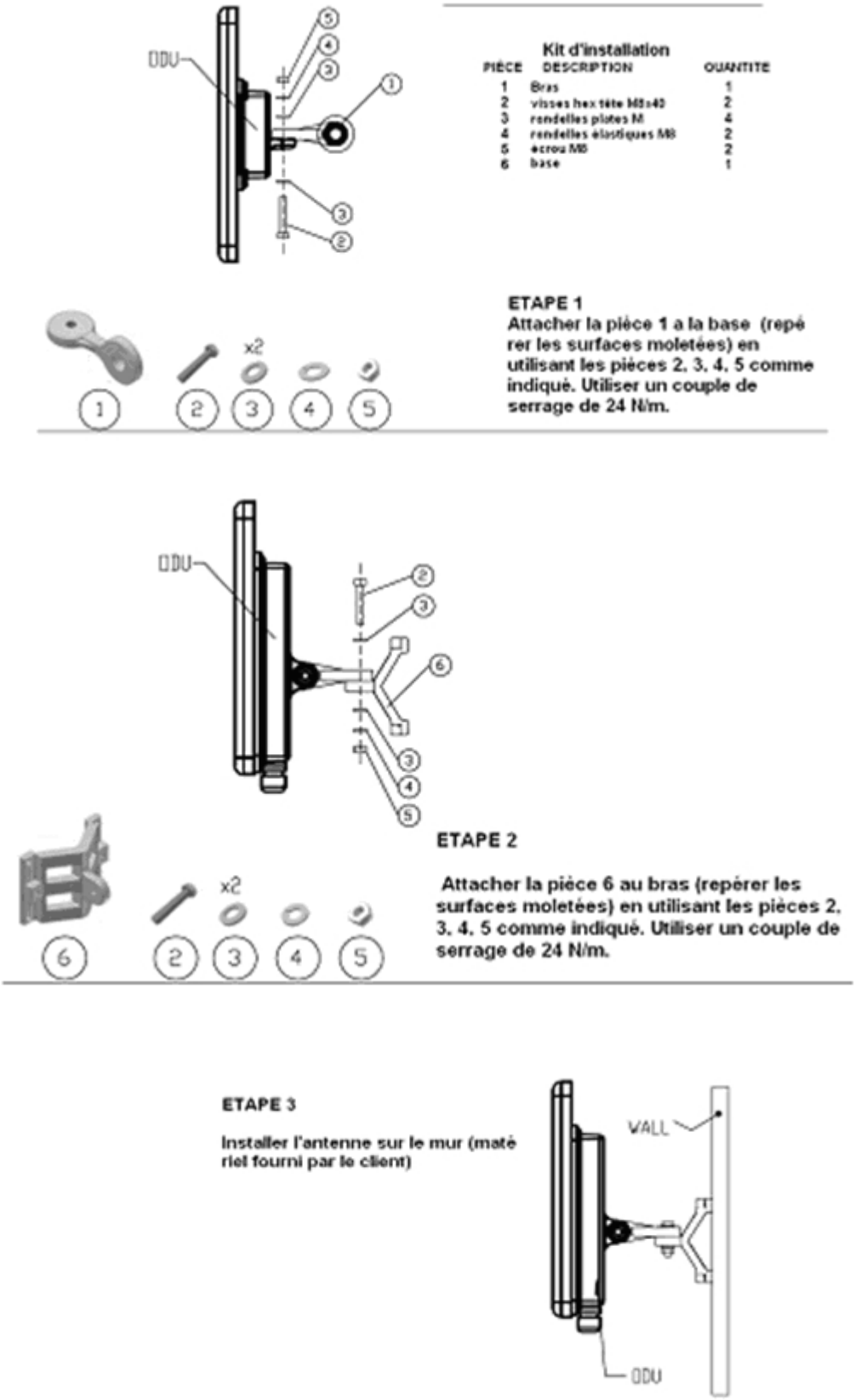


Figure G-5: Montage sur un mur

Montage d'une antenne externe

L'antenne externe optionnelle peut être montée sur un pylône.

Contenu du kit de montage d'une antenne externe

Le kit de montage d'une antenne externe comprend les pièces suivantes

- Douze rondelles plates
- Huit rondelles élastiques
- Huit écrous hex
- Quatre boulons
- Un support en U
- Un support à pivotement
- Deux courroies de fixation en métal

Pour installer une antenne externe sur un pylône:

1. Attacher le support en U à l'arrière de l'antenne en utilisant quatre rondelles plates, quatre rondelles élastiques et quatre écrous hex.
2. Attacher le support à pivotement au support en U en utilisant huit rondelles plates, quatre rondelles élastiques, quatre écrous hex et quatre boulons.
3. Passer les deux courroies de fixation par les fentes verticales dans le support à pivotement.
4. Attacher l'antenne au pylône en utilisant les deux courroies de fixation .

Ajuster l'inclinaison nécessaire en utilisant l'échelle angulaire et serrer tous les boulons et écrous à la position requise.

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