4.9GHz Point to Point Wireless Backhaul Solution Overview
Motorola’s PTP 49400 Wireless Backhaul Solution is ideal for:

- Replacing T1 Links (reduce high monthly costs)
- Backhauling Video Surveillance Cameras or 4.9GHz
- Connecting Remote Locations (public safety locations not easily reachable via wired connections)
- Backhauling a 4.9GHz MOTOMESH hot-spot or coverage network

Based off the widely deployed, existing 5.7GHz products

Ship Date October 1st, 2006

Connectorized (Used when external antennas are required)

Integrated (14” integrated antenna)

Indoor unit provides power over Ethernet unit to outdoor units
PTP 49400 Strengths

Robust feature set
High availability & reliability
- Multiple-input Multiple-output (MIMO)
- Intelligent OFDM (i-OFDM)
- Adaptive Modulation
- Spatial Diversity capable
- Optional 128bit AES encryption

Easy to Deploy
Low CAPEX and OPEX
- Cat. 5 cable from IDU to ODU
- Audible tone for alignment
- Small footprint on tower and hut
- Native-IP
- SNMP & Browser management

“Best in Class OFDM Radio”
with industry’s Highest System Gain
Product Overview
Establish a wireless connection over hills, around buildings, through trees and over water!

Robust design capable of handling any of the following scenarios:

- **Line-of-sight (LOS)**: Up to 124 miles
- **near Line-of-sight (nLOS)**: Up to 25 miles
- **Non Line-of-sight (NLOS)**: Up to 6 miles

nLOS / NLOS & Long Range LOS enables connectivity to locations previously inaccessible. Enables placement of devices, such as video cameras or hotspots, in locations where they are most needed, regardless of obstructions or long distances.
Product Overview

Key Features

High Bandwidth
- 35 Mbps
- 17Mbps (license key only to upgrade to 35)

Secure
- Proprietary over-the-air interface
- Optional FIPS-197 compliant AES (license key enabled)

QoS
- VLAN tagging of high priority traffic (802.1p)

Interfaces
- Integrated Ethernet Interface (10/100baseT)
- T1 Interface via external T1 MUX

Specs
- Frequency Range 4945 – 4985 MHz
- 10MHz channel width

Rapid Deployment
- iDFS (intelligent Dynamic Frequency Selection) self selects clear channel
- Audio Alignment – beeps when optimal alignment is reached
- Precise & Easy to Use Link Estimate Tool
Case Study – Urban Non Line-of-Sight
Based on the 5.7GHz product

**Application:** Connecting Remote Locations in Downtown

**Site 1:** 25 story building

**Site 2:** 30 story building

**Obstacles:** 25 to 40 story building clusters & a river

**Range:** 2 miles NLOS

**Data Rate:** 28 Mbps @ 99.99% availability
Case Study – Long LOS over Water
Based on the 5.7GHz product

**Application:** Connecting VERY Remote Locations, 2 schools on different islands in the US Virgin Islands

**Site 1:** St. Thomas School

**Site 2:** St. Croix School

**Challenges:** Caribbean Sea

**Range:** 43 miles

**Data Rate:** 28 Mbps @ 99.999% availability
Other Case Studies

Video Surveillance for 2005 Presidential Inauguration & Top Secret Military Mission

• Used to backhaul security video equipment strategically placed on Pennsylvania Ave. to a security headquarters location outside Washington D.C.

• Many obstacles that prevented direct LOS to video camera were not an issue, allowing the customer to place cameras exactly where needed.
Temporary Installations

Optimum rapid field deployment in non-line of-sight environments
Robust

Hot

Cold

Corrosive
Pricing

Hardware Types
• Connectorized & Integrated are the same price

Ordering Options MSRP
• Full (33 Mbps) $11,995
• Lite (16.5 Mbps) $7,200 (license key to upgrade to 35)
• Both options include 2 radios & 2 indoor power units

Additional Items
• License key activated AES ~ $2,399
• External T1 MUX ~ $2,500

External Antennas
• Varying sized antennas ranging from $500 to $3,000 sold separately

Mgmt. Web Interface
• Each radio can be managed via an internal web interface (no additional cost)
• SNMP MIBs are also available for integration with NMS (no additional cost)
BACKUP SLIDES
## Detailed Specification

<table>
<thead>
<tr>
<th><strong>Radio Technology</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Frequency bands</td>
<td>4940-4990 MHz</td>
</tr>
<tr>
<td>Channel raster</td>
<td>4945, 50, 55, 60, 65, 70, 75, 80, 85 MHz</td>
</tr>
<tr>
<td>Channel bandwidth</td>
<td>10MHz</td>
</tr>
<tr>
<td>Data rate (ethernet)</td>
<td>Up to 35Mbit/s</td>
</tr>
<tr>
<td>Transmit power</td>
<td>Adaptive between -10 and 23 dBm</td>
</tr>
<tr>
<td>EIRP (integrated)</td>
<td>≤45dBm</td>
</tr>
<tr>
<td>Receive sensitivity</td>
<td>Between -97 and -74 dBm</td>
</tr>
<tr>
<td>System gain (integrated)</td>
<td>Between 164 and 137 dB</td>
</tr>
<tr>
<td>Modulation modes</td>
<td>Dynamic, 8 modes between BPSK and 64QAM 7/8</td>
</tr>
<tr>
<td>Max range</td>
<td>200km</td>
</tr>
<tr>
<td>Error correction</td>
<td>FEC, ARQ</td>
</tr>
<tr>
<td>Security and encryption</td>
<td>128bit AES, FIPS-197</td>
</tr>
</tbody>
</table>

### Ethernet Bridging & E1/T1

- **Protocol**: IEEE 802.3
- **Packet prioritisation**: 802.1p
- **Ethernet interface**: 10/100baseT auto MDI/MDIX
- **Latency**: 5ms typical
- **E1/T1**: Via external MUX

### Management and installation

- **LED indicators**: Power, Ethernet link status and activity
- **System management**: Web or SNMP
- **Installation**: Built-in audio assistance for link optimisation

### Physical

- **Power source**: 90-240VAC, 50-60Hz / 36-60VDC
- **Power consumption**: 40W typ.
- **Operating temperature**: -40 / +60 °C
- **Dimensions**:
  - ODU: 14.5” x 14.5” x 3.75”  | 12.1 lbs
  - PIDU: 9.75” x 1.5” x 3”  | 1.9 lbs

### Environmental & Regulatory

- **Protection and safety**: UL60950, IEC60950, EN60950, CSA-C22.2 No.60950
- **Radio**: FCC Part 90
Throughput & Reach
Integrated Antenna

Link Estimator should be used to plan every path before you deploy
Link Planning

Rapid download of path profile from website
Upload to OS Link Estimator
Quickly establish link performance
Easy selection of antenna, mast heights to meet operational needs
Known link performance when you install

Location can now be entered in a number of new formats in addition to the decimal format. These are:
- 'ddd:mm:ss.s' e.g. 50:53:00.4
- 'ddd mm ss.s' e.g. 50 35.3396, and
- 'ddd dd mm ss.s' e.g 50 055340N.

other d-degrees, minutes, seconds and D-Degree of Compass as one of the items ‘NorthEast’. The
geodetic reference for this data is the WGS84 EGF1996 grid.

Latitude and Longitude of the target local and remote locations can be found from many places on the web
including www.multimap.co.uk. However, the best method of determining the local and remote site
positions is using a GPS.

The Length units can be in Miles or Kilometers and the Height units can be in Meters or Feet. Once chosen
here, these values will be used in the Link Estimator. The Height of the Local and Remote antennas Above
Ground Level (AGL) can be specified here and modified in the Link Estimator. (Hover help is available for
many items on the form.)
4.9 Interference Avoidance / Reduction

To avoid interference between the 4.9 backhaul & 4.9 MOTOMESH networks, the following criteria should be followed:

10MHz Channel Separation
• Interference can be reduced when there can be a 10MHz unused channel separating the MOTOMESH & backhaul frequencies

Vertical Separation
• When the 4.9 backhaul transmission is in the LOS of the 4.9 MOTOMESH network...
  • Preliminary calculations have shown that a minimum of 50 feet vertically must be attained between the 4.9 backhaul radio and the 4.9 MOTOMESH IAP that it connects, when a 10MHz channel separation is used
  • When channel separation cannot be achieved, 165 feet vertical separation is required
Adaptive Modulation

Link continually optimized for varying RF path conditions

8 Modulation Schemes

Automatically adapts to best modulation

- BPSK 1/2 (3.0 Mbps)
- 64QAM 7/8 (42 Mbps)

Constantly monitor fading

1 to 6 dB margin used when shifting up or down

- Maximum Link Stability

Dependant on

- Link Loss
- Receive Power above Interference and Noise floor
- TDM Mode
Space Diversity

Traditionally only found in licensed radios
Combats fading due to atmospheric changes
Used for difficult paths:
  Over water (high multi-path reflections)
  Over very flat terrain (ducting)
  Deep NLoS applications
Provide a diverse redundant RF path
Security

Unique Advanced Air Interface
   Proprietary Data Scrambling and Encryption.
   Authentication – Nothing in the clear

Transparent Ethernet Bridge
   Enables complete end-to-end network security by virtual private networks (VPN).

AES Encryption (optional)
   128 BIT
   1.25 % overhead
   FIPS 197 certified