PTP 59600 reference information

This section contains reference information that is specific to the PTP 59600 frequency variant.

PTP 59600 examples of regulatory limits

Table 4-57 shows how the regulatory limits currently apply in specific countries. Operators should note that regulations are subject to change.

Table 4-57 PTP 59600 examples of regulatory limits

Region	Examples of Regulatory Limits at 5.9 GHz
Russia	Operation of this product is only allowed with a License Key for Region 16 (no power limit)
India	Operation of this product is only allowed with a License Key for Regions 17 or 19 (36 dBm or 4W EIRP at 30 MHz, 15 MHz and 10 MHz; and 33 dBm or 2 W EIRP at 5 MHz channel bandwidth).

PTP 59600 licenses and region codes

PTP 59600 units may be operated in any of the regions listed in Table 4-58. When shipped, PTP 59600 units are configured with a license key for region code 16. An alternative license key is provided in the *PTP 600 Installation Guide* for region code 17. For any other permitted region, obtain a new license key from the reseller or distributor.

Table 4-58 PTP 59600 licenses and region codes

Region code	License / Regulation	Frequencies	DFS	Channel Bandwidth	Max Power
15	Unrestricted	5825 - 5925 MHz		5, 10, 15, 30 MHz	25 dBm
16	Russia	5825 - 5925 MHz		5, 10, 15, 30 MHz	25 dBm
17	India	5875 - 5925 MHz		10, 15, 30 MHz	36 dBm EIRP
				5 MHz	33 dBm EIRP
19	India	5825 - 5875 MHz		10, 15, 30 MHz	36 dBm EIRP
				5 MHz	33 dBm EIRP

NOTE

The 5.8 GHz license for India is addressed using both PTP 58600 and PTP 59600 frequency variants.

PTP 59600 regulatory compliance

Russia

This system has been tested for type approval in Russia of fixed link equipment under the heading of BPD TZS 12.

Сертификат соответствия	Срок действия
ОС-1-РД-0241	с 28 октября 2008 г.

PTP 59600 radio system specifications

Table 4-59 contains radio system specifications for the PTP 59600.

Table 4-59 PTP 59600 RF specifications

Radio Technology	Specification
RF Band	5.825-5.925GHz
Channel Selection	By dynamic frequency control and manual intervention Automatic detection on start-up and continual adaptation to avoid interference.
Dynamic Frequency Control	Initial capture 10-15 sec. Out of service on interference 100 ms.
Channel size	5, 10, 15 and 30 MHz
Manual Power Control	Maximum power can be controlled lower than the power limits shown above in order to control interference to other users of the band.
Receiver Noise Figure	Typically 6 dB
Antenna Type	Integrated flat plate antenna
Antenna Gain	23 dBi typical
Antenna Beamwidth	8 Degrees

Radio Technology	Specification
Max Path Loss (5 MHz Channel)	166 dB
Duplex Scheme	Symmetric fixed, asymmetric fixed or adaptive TDD
Range	125 miles (200km) optical line-of-sight 6 miles (10km) non-line-of-sight
Over-the-Air Encryption	Proprietary scrambling mechanism.
Weather Sensitivity	Sensitivity at higher modes may be reduced during high winds through trees due to Adaptive Modulation Threshold changes
Error Correction	FEC

PTP 59600 available spectrum settings

The available spectrum settings for the PTP 59600 are illustrated in this section.

Adjustment of the lower centre frequency allows the operator to slide the available frequency settings up and down the 5.9 GHz band in steps of 2 MHz.

In the 30 MHz channel bandwidth (Figure 4-26) the PTP 59600 variant operates on a 10 MHz channel raster. In the 15 MHz (Figure 4-27), 10 MHz (Figure 4-28) and 5 MHz (Figure 4-29) channel bandwidths, the PTP 59600 variant operates on a 6 MHz channel raster. The channel raster is set to even centre frequencies.

NOTE

These tables contain data for one typical region code. The specified channel centre frequencies may not be available in other region codes.

The PTP 59600 product variant does not apply any band edge power reduction.

Figure 4-26 PTP 59600 available spectrum in 30 MHz channel bandwidth

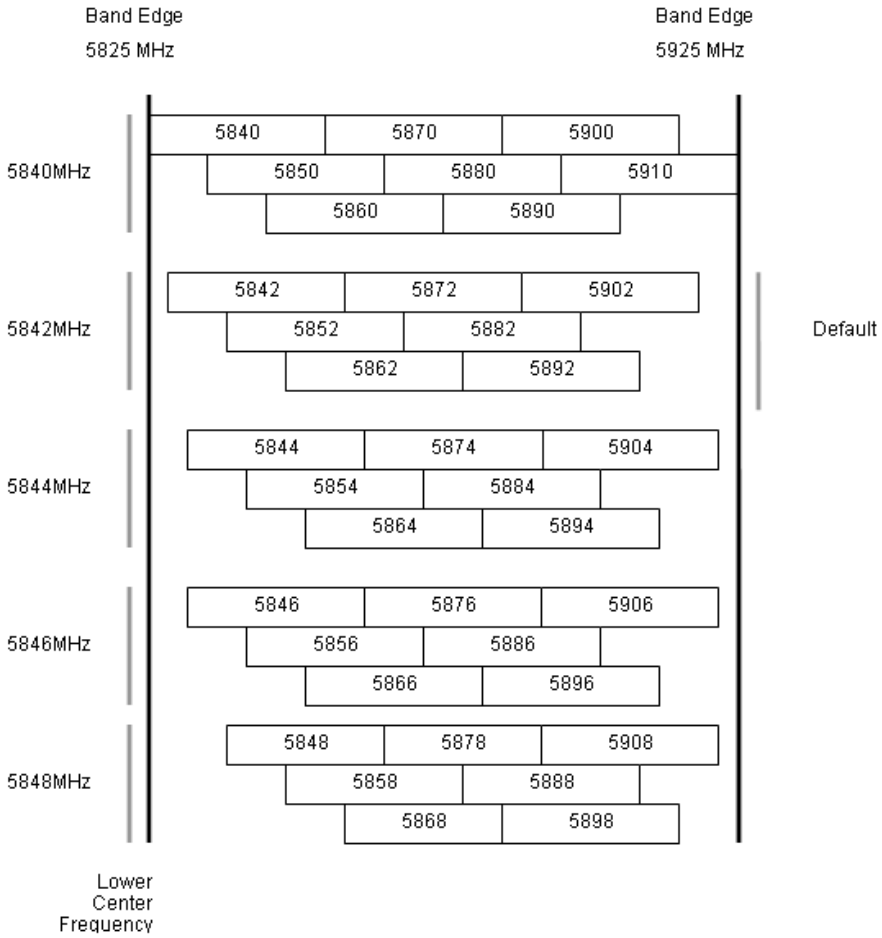


Figure 4-27 PTP 59600 available spectrum in 15 MHz channel bandwidth

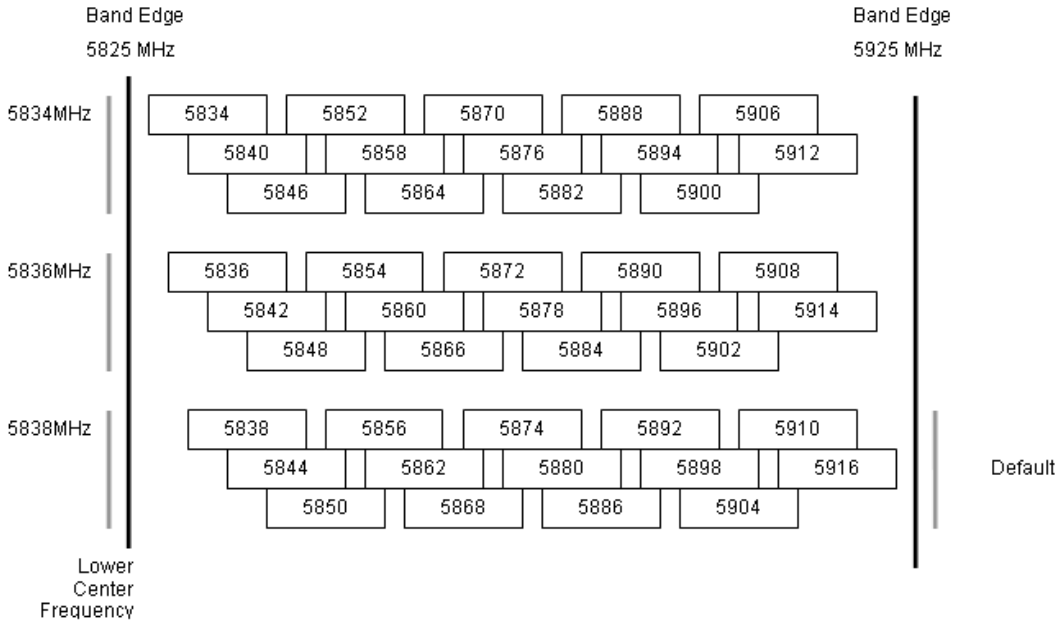


Figure 4-28 PTP 59600 available spectrum in 10 MHz channel bandwidth

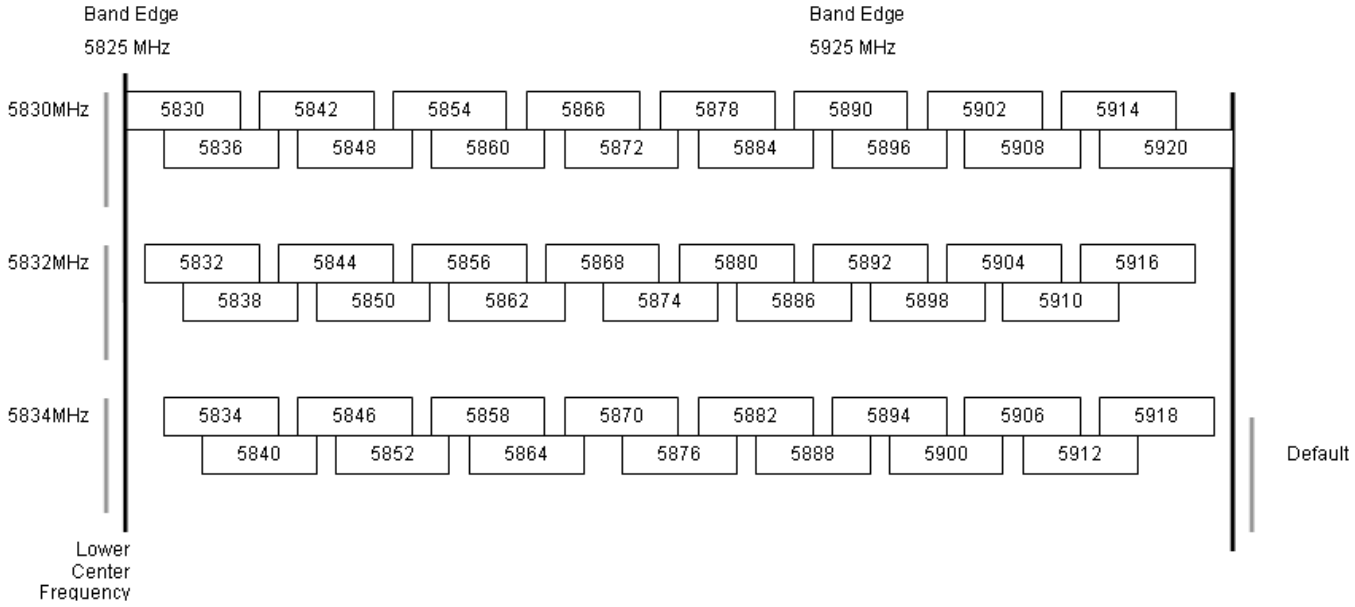


Figure 4-29 PTP 59600 available spectrum in 5 MHz channel bandwidth

PTP 59600 system threshold, output power and link loss

PTP 59600 system threshold figures are given in Table 4-60 (IP mode) and Table 4-61 (TDM mode). These figures assume that antenna gain is 23 dBi.

Table 4-60 PTP 59600 - IP mode - threshold, power and loss per modulation mode

	Threshold Value (dBm)				Output Power (dBm)	Maximum Link Loss (dB)			
Channel Bandwidth / Modulation Mode	5 MHz	10 MHz	15 MHz	30 MHz	All Bands	5 MHz	10 MHz	15 MHz	30 MHz
BPSK 0.63 single	-97.1	-94.1	-92.0	-88.7	+25.0	168.1	165.1	163.0	159.7
QPSK 0.63 single	-90.7	-88.1	-87.1	-82.5	+24.0	160.7	158.1	157.1	152.5
QPSK 0.87 single	-87.2	-84.4	-83.5	-79.3	+23.0	156.2	153.4	152.5	148.3
16QAM 0.63 single	-85.0	-81.9	-81.2	-77.1	+22.0	153.0	149.9	149.2	145.1
16QAM 0.63 dual	-81.9	-78.8	-77.5	-73.5	+22.0	149.9	146.8	145.5	141.5
16QAM 0.87 single	-80.9	-78.0	-76.7	-72.9	+20.0	146.9	143.9	142.7	138.9
16QAM 0.87 dual	-76.5	-73.9	-73.2	-70.0	+20.0	142.5	139.9	139.2	136.0
64QAM 0.75 single	-77.0	-74.6	-73.6	-70.3	+18.0	141.0	138.6	137.6	134.3
64QAM 0.75 dual	-73.1	-71.0	-70.4	-67.5	+18.0	137.1	135.0	134.4	131.5
64QAM 0.92 single	-72.1	-71.0	-68.9	-65.7	+18.0	136.1	135.0	132.9	129.7
64 QAM 0.92 dual	-70.2	-67.2	-66.1	-62.1	+18.0	134.2	131.1	130.1	126.1
256QAM 0.81 single	N/A	N/A	N/A	-63.9	+18.0	N/A	N/A	N/A	127.9
256QAM 0.81 dual	N/A	N/A	N/A	-59.9	+18.0	N/A	N/A	N/A	123.9

Table 4-61 PTP 59600 - TDM mode - threshold, power and loss per modulation mode

	Threshold Value (dBm)				Output Power (dBm)	Maximum Link Loss (dB)			
Channel Bandwidth / Modulation Mode	5 MHz	10 MHz	15 MHz	30 MHz	All Bands	5 MHz	10 MHz	15 MHz	30 MHz
BPSK 0.63 single	-97.1	-94.1	-92.0	-88.7	+25.0	168.1	165.1	163.0	159.7
QPSK 0.63 single	-88.5	-86.1	-84.4	-79.4	+24.0	158.5	156.1	154.4	149.4
QPSK 0.87 single	-84.6	-81.9	-80.1	-76.0	+23.0	153.6	150.9	149.1	145.0
16QAM 0.63 single	-82.5	-79.6	-77.8	-73.7	+22.0	150.4	147.6	145.8	141.7
16QAM 0.63 dual	-78.8	-76.0	-74.1	-70.4	+22.0	146.8	144.0	142.1	138.4
16QAM 0.87 single	-78.3	-75.1	-73.7	-70.2	+20.0	144.3	141.1	139.7	136.2
16QAM 0.87 dual	-74.2	-71.6	-70.2	-66.9	+20.0	140.2	137.6	134.2	132.9
64QAM 0.75 single	-74.7	-71.4	-70.2	-67.3	+18.0	138.7	135.4	134.2	131.3
64QAM 0.75 dual	-70.9	-68.3	-66.8	-63.6	+18.0	134.8	132.2	130.8	127.6
64QAM 0.92 single	-71.2	-68.1	-67.0	-63.3	+18.0	135.2	132.0	131.0	127.3
64 QAM 0.92 dual	-66.7	-64.2	-62.7	-58.7	+18.0	130.7	128.2	126.7	122.7
256QAM 0.81 single	N/A	N/A	N/A	-63.3	+18.0	N/A	N/A	N/A	127.3
256QAM 0.81 dual	N/A	N/A	N/A	-58.7	+18.0	N/A	N/A	N/A	122.7

Data rate calculations

This section provides instructions, tables and graphs to allow calculation of the data rate capacity that can be provided by alternative PTP 600 configurations.

The following topics are described in this section:

Data rate defined

The data rate capacity of a PTP link is defined as the maximum end-to-end Ethernet throughput (including Ethernet headers) that it can support. It is assumed that Ethernet frames are 1500 octet. Data rate capacity is determined by the following factors:

- Product variant (PTP 600 Full or Lite)
- Link Symmetry
- Link Mode Optimization (IP or TDM)
- Modulation Mode
- Channel Bandwidth
- Link Range

Calculation procedure and example

Procedure

To calculate the data rate capacity of a PTP 600 link, perform Procedure 4-1.

Procedure 4-1 Calculating data rate capacity

1	Use the tables in Data throughput capacity on page 4-102 to look up the data throughput capacity rates (Tx, Rx and Both) for the required combination of: • Link Symmetry • Link Mode Optimization • Modulation Mode • Channel Bandwidth
2	The tables contain data rates for PTP 600 Full only. If the ODUs are PTP 600 Lite, divide the data rates by 2.
3	The tables contain data rates for links of zero range. Use the curves in Range adjustment curves on page 4-113 to look up the Throughput Factor that must be applied to adjust the data rates for the actual range of the link.
4	Multiply the data rates by the Throughput Factor to give the throughput capacity of the link.

NOTE

There is a small difference between the rates for IP and TDM because there is fragmentation in TDM (for low priority traffic) which causes the throughput to be reduced buy approximately 1% compared to the IP mode.

Example

Suppose that the link characteristics are:

- Product variant = PTP 600 Lite
- Link Symmetry = 1:1
- Link Mode Optimization = TDM
- Modulation Mode = 64QAM 0.92 Dual
- Channel Bandwidth = 10 MHz
- Link Range = 60 km

The calculation procedure for this example is described in Procedure 4-2.

Procedure 4-2 Example of data rate capacity calculation

1	Use Table 4-63 to look up the data throughput capacity rates: • Tx = 41.41 Mbits/s • Rx = 41.41 Mbits/s • Both = 82.81 Mbits/s
2	Divide these rates by 2 to give PTP 600 Lite rates: • Tx = 20.70 Mbits/s • Rx = 20.70 Mbits/s • Both = 41.40 Mbits/s
3	Use Figure 4-38 to look up the Throughput Factor for 1:1, TDM and Link Range 60 km. The factor is 0.86.
4	Multiply the rates from Step 2 by the Throughput Factor from Step 3 to give the throughput capacity of the link: • Tx = 17.80 Mbits/s • Rx = 17.80 Mbits/s • Both = 35.60 Mbits/s

Data throughput capacity

Table 4-62, Table 4-63, Table 4-64, Table 4-65 and Table 4-66 show the data throughput rates (Mbits/s) that are achieved when two PTP 600 Full ODUs are linked and the link distance (range) is 0 km. Use the curves in Range adjustment curves on page 4-113 to adjust these figures to allow for link range.

NOTE

When using these tables, be aware of the factors that affect data throughput, as listed below.

Data throughput capacity is restricted by the following factors:

- PTP 600 Lite data rates are half the PTP 600 Full rates given in this section.
- Modulation Mode “256QAM 0.81 dual” is not available in all product variants and channel bandwidths.
- Throughput for Link Symmetry 2:1 is the same as that for 1:2, but the Tx and Rx data rates are swapped.
- The data rates for Adaptive symmetry apply to the most asymmetric case where the link has significant offered traffic in one direction only. The data rates for Adaptive symmetry with bidirectional offered traffic are the same as those for Link Symmetry = 1:1 with Link Optimization = IP.

Table 4-62 Throughput for PTP 600 Full, link symmetry 1:1, link optimization IP

Modulation Mode	30 MHz			20 MHz			15 MHz		
	Tx	Rx	Both	Tx	Rx	Both	Tx	Rx	Both
256QAM 0.81 dual	150.01	150.01	300.02	100.06	100.06	200.12	75.37	75.37	150.74
64QAM 0.92 dual	126.39	126.39	252.78	84.30	84.30	168.61	63.50	63.50	127.01
64QAM 0.75 dual	103.28	103.28	206.57	68.89	68.89	137.78	51.89	51.89	103.79
16QAM 0.87 dual	80.35	80.35	160.70	53.60	53.60	107.19	40.37	40.37	80.74
16QAM 0.63 dual	57.76	57.76	115.52	38.53	38.53	77.06	29.02	29.02	58.04
256QAM 0.81 single	75.00	75.00	150.01	50.03	50.03	100.06	37.69	37.69	75.37
64QAM 0.92 single	63.19	63.19	126.39	42.15	42.15	84.30	31.75	31.75	63.50
64QAM 0.75 single	51.64	51.64	103.28	34.45	34.45	68.89	25.95	25.95	51.89
16QAM 0.87 single	40.17	40.17	80.35	26.80	26.80	53.59	20.18	20.18	40.37
16QAM 0.63 single	28.88	28.88	57.76	19.26	19.26	38.53	14.51	14.51	29.02
QPSK 0.87 single	20.09	20.09	40.17	13.40	13.40	26.79	10.09	10.09	20.18
QPSK 0.63 single	14.44	14.44	28.88	9.63	9.63	19.26	7.25	7.25	14.51
BPSK 0.63 single	7.22	7.22	14.44	4.81	4.81	9.63	3.63	3.63	7.25

At zero range. All rates are in Mbit/s.

Table 4-62 **Throughput for PTP 600 Full, link symmetry 1:1, link optimization IP** (continued)

Modulation Mode	10 MHz			5 MHz		
	Tx	**Rx**	**Both**	**Tx**	**Rx**	**Both**
256QAM 0.81 dual	50.11	50.11	100.21	24.22	24.22	48.43
64QAM 0.92 dual	42.22	42.22	84.43	20.40	20.40	40.80
64QAM 0.75 dual	34.50	34.50	69.00	16.67	16.67	33.34
16QAM 0.87 dual	26.84	26.84	53.68	12.97	12.97	25.94
16QAM 0.63 dual	19.29	19.29	38.59	9.32	9.32	18.65
256QAM 0.81 single	25.05	25.05	50.11	12.11	12.11	24.21
64QAM 0.92 single	21.11	21.11	42.21	10.20	10.20	20.40
64QAM 0.75 single	17.25	17.25	34.50	8.34	8.34	16.67
16QAM 0.87 single	13.42	13.42	26.84	6.48	6.48	12.97
16QAM 0.63 single	9.65	9.65	19.29	4.66	4.66	9.32
QPSK 0.87 single	6.71	6.71	13.42	3.24	3.24	6.48
QPSK 0.63 single	4.82	4.82	9.64	2.33	2.33	4.66
BPSK 0.63 single	2.41	2.41	4.82	1.16	1.16	2.33

Table 4-63 Throughput for PTP 600 Full, link symmetry 1:1, link optimization TDM

Modulation Mode	30 MHz			20 MHz			15 MHz		
	Tx	Rx	Both	Tx	Rx	Both	Tx	Rx	Both
256QAM 0.81 dual	140.87	140.87	281.74	96.01	96.01	192.02	72.92	72.92	145.83
64QAM 0.92 dual	118.69	118.69	237.38	80.89	80.89	161.78	61.43	61.43	122.87
64QAM 0.75 dual	96.99	96.99	193.98	66.10	66.10	132.21	50.20	50.20	100.41
16QAM 0.87 dual	75.45	75.45	150.91	51.43	51.43	102.85	39.06	39.06	78.11
16QAM 0.63 dual	54.24	54.24	108.48	36.97	36.97	73.94	28.08	28.08	56.15
256QAM 0.81 single	70.43	70.43	140.87	48.00	48.00	96.01	36.46	36.46	72.91
64QAM 0.92 single	59.34	59.34	118.69	40.44	40.44	80.89	30.72	30.72	61.43
64QAM 0.75 single	48.49	48.49	96.99	33.05	33.05	66.10	25.10	25.10	50.20
16QAM 0.87 single	37.73	37.73	75.45	25.71	25.71	51.42	19.53	19.53	39.05
16QAM 0.63 single	27.12	27.12	54.24	18.48	18.48	36.97	14.04	14.04	28.07
QPSK 0.87 single	18.86	18.86	37.72	12.85	12.85	25.71	9.76	9.76	19.52
QPSK 0.63 single	13.56	13.56	27.12	9.24	9.24	18.48	7.02	7.02	14.03
BPSK 0.63 single	6.78	6.78	13.56	4.62	4.62	9.24	3.51	3.51	7.02

At zero range. All rates are in Mbit/s.

Table 4-63 **Throughput for PTP 600 Full, link symmetry 1:1, link optimization TDM** (continued)

Modulation Mode	10 MHz			5 MHz		
	Tx	**Rx**	**Both**	**Tx**	**Rx**	**Both**
256QAM 0.81 dual	49.14	49.14	98.29	24.22	24.22	48.43
64QAM 0.92 dual	41.41	41.41	82.81	20.40	20.40	40.80
64QAM 0.75 dual	33.84	33.84	67.67	16.67	16.67	33.34
16QAM 0.87 dual	26.32	26.32	52.64	12.97	12.97	25.94
16QAM 0.63 dual	18.92	18.92	37.84	9.32	9.32	18.65
256QAM 0.81 single	24.57	24.57	49.14	12.11	12.11	24.21
64QAM 0.92 single	20.70	20.70	41.40	10.20	10.20	20.40
64QAM 0.75 single	16.92	16.92	33.83	8.34	8.34	16.67
16QAM 0.87 single	13.16	13.16	26.32	6.48	6.48	12.97
16QAM 0.63 single	9.46	9.46	18.92	4.66	4.66	9.32
QPSK 0.87 single	6.58	6.58	13.16	3.24	3.24	6.48
QPSK 0.63 single	4.73	4.73	9.46	2.33	2.33	4.66
BPSK 0.63 single	2.36	2.36	4.73	1.16	1.16	2.33

Table 4-64 Throughput for PTP 600 Full, link symmetry 2:1, link optimization = IP

Modulation Mode	30 MHz			20 MHz			15 MHz		
	Tx	Rx	Both	Tx	Rx	Both	Tx	Rx	Both
256QAM 0.81 dual	198.58	99.29	297.88	133.42	66.71	200.12	100.50	50.25	150.74
64QAM 0.92 dual	167.31	83.66	250.97	112.41	56.20	168.61	84.67	42.33	127.01
64QAM 0.75 dual	136.73	68.36	205.09	91.86	45.93	137.78	69.19	34.59	103.79
16QAM 0.87 dual	106.37	53.18	159.55	71.46	35.73	107.19	53.83	26.91	80.74
16QAM 0.63 dual	76.47	38.23	114.70	51.37	25.68	77.06	38.70	19.35	58.04
256QAM 0.81 single	99.29	49.64	148.94	66.71	33.35	100.06	50.25	25.12	75.37
64QAM 0.92 single	83.66	41.83	125.48	56.20	28.10	84.30	42.33	21.17	63.50
64QAM 0.75 single	68.36	34.18	102.54	45.93	22.96	68.89	34.59	17.30	51.89
16QAM 0.87 single	53.18	26.59	79.77	35.73	17.86	53.59	26.91	13.46	40.37
16QAM 0.63 single	38.23	19.11	57.35	25.68	12.84	38.53	19.35	9.67	29.02
QPSK 0.87 single	26.59	13.29	39.88	17.86	8.93	26.79	13.46	6.73	20.18
QPSK 0.63 single	19.11	9.56	28.67	12.84	6.42	19.26	9.67	4.84	14.51
BPSK 0.63 single	9.56	4.78	14.33	6.42	3.21	9.63	4.84	2.42	7.25

At zero range. All rates are in Mbit/s.

Table 4-64 **Throughput for PTP 600 Full, link symmetry 2:1, link optimization = IP** (continued)

Modulation Mode	10 MHz		
	Tx	Rx	Both
256QAM 0.81 dual	66.38	33.19	99.56
64QAM 0.92 dual	55.92	27.96	83.88
64QAM 0.75 dual	45.70	22.85	68.55
16QAM 0.87 dual	35.55	17.78	53.33
16QAM 0.63 dual	25.56	12.78	38.34
256QAM 0.81 single	33.19	16.59	49.78
64QAM 0.92 single	27.96	13.98	41.94
64QAM 0.75 single	22.85	11.42	34.27
16QAM 0.87 single	17.78	8.89	26.66
16QAM 0.63 single	12.78	6.39	19.17
QPSK 0.87 single	8.89	4.44	13.33
QPSK 0.63 single	6.39	3.19	9.58
BPSK 0.63 single	3.19	1.60	4.79

This combination is not available with Channel Bandwidth 5 MHz.

Table 4-65 Throughput for PTP 600 Full, link symmetry 2:1, link optimization = TDM

Modulation Mode	30 MHz			20 MHz			15 MHz		
	Tx	Rx	Both	Tx	Rx	Both	Tx	Rx	Both
256QAM 0.81 dual	193.06	96.53	289.58	130.66	65.33	195.99	98.83	49.42	148.25
64QAM 0.92 dual	162.66	81.33	243.98	110.08	55.04	165.13	83.27	41.63	124.90
64QAM 0.75 dual	132.92	66.46	199.38	89.96	44.98	134.94	68.05	34.02	102.07
16QAM 0.87 dual	103.41	51.70	155.11	69.98	34.99	104.98	52.94	26.47	79.40
16QAM 0.63 dual	74.34	37.17	111.50	50.31	25.15	75.46	38.05	19.03	57.08
256QAM 0.81 single	96.53	48.26	144.79	65.33	32.66	97.99	49.42	24.71	74.12
64QAM 0.92 single	81.33	40.66	121.99	55.04	27.52	82.56	41.63	20.82	62.45
64QAM 0.75 single	66.46	33.23	99.69	44.98	22.49	67.47	34.02	17.01	51.03
16QAM 0.87 single	51.70	25.85	77.55	34.99	17.49	52.49	26.47	13.23	39.70
16QAM 0.63 single	37.17	18.58	55.75	25.15	12.58	37.73	19.03	9.51	28.54
QPSK 0.87 single	25.85	12.92	38.77	17.49	8.75	26.24	13.23	6.62	19.85
QPSK 0.63 single	18.58	9.29	27.87	12.58	6.29	18.86	9.51	4.76	14.27
BPSK 0.63 single	9.29	4.64	13.93	6.29	3.14	9.43	4.76	2.38	7.13

At zero range. All rates are in Mbit/s.

Table 4-65 **Throughput for PTP 600 Full, link symmetry 2:1, link optimization = TDM**

(continued)

Modulation Mode	10 MHz		
	Tx	Rx	Both
256QAM 0.81 dual	66.38	33.19	99.56
64QAM 0.92 dual	55.92	27.96	83.88
64QAM 0.75 dual	45.70	22.85	68.55
16QAM 0.87 dual	35.55	17.78	53.33
16QAM 0.63 dual	25.56	12.78	38.34
256QAM 0.81 single	33.19	16.59	49.78
64QAM 0.92 single	27.96	13.98	41.94
64QAM 0.75 single	22.85	11.42	34.27
16QAM 0.87 single	17.78	8.89	26.66
16QAM 0.63 single	12.78	6.39	19.17
QPSK 0.87 single	8.89	4.44	13.33
QPSK 0.63 single	6.39	3.19	9.58
BPSK 0.63 single	3.19	1.60	4.79

This combination is not available with Channel Bandwidth 5 MHz.

Table 4-66 Throughput for PTP 600 Full, link symmetry Adaptive, link optimization = IP

Modulation Mode	30 MHz			20 MHz			15 MHz		
	Tx	Rx	Both	Tx	Rx	Both	Tx	Rx	Both
256QAM 0.81 dual	236.95	59.23	296.18	148.53	49.51	198.03	112.12	37.37	149.49
64QAM 0.92 dual	199.63	49.91	249.54	125.14	41.71	166.85	94.46	31.49	125.95
64QAM 0.75 dual	163.14	40.78	203.92	102.26	34.09	136.35	77.19	25.73	102.92
16QAM 0.87 dual	126.91	31.73	158.64	79.55	26.52	106.07	60.05	20.02	80.07
16QAM 0.63 dual	91.24	22.81	114.04	57.19	19.06	76.25	43.17	14.39	57.56
256QAM 0.81 single	118.47	29.62	148.09	74.26	24.75	99.02	56.06	18.68	74.74
64QAM 0.92 single	99.82	24.95	124.77	62.57	20.85	83.42	47.23	15.74	62.97
64QAM 0.75 single	81.57	20.39	101.96	51.13	17.04	68.17	38.59	12.86	51.46
16QAM 0.87 single	63.46	15.86	79.32	39.78	13.26	53.03	30.02	10.01	40.03
16QAM 0.63 single	45.62	11.40	57.02	28.59	9.53	38.12	21.58	7.19	28.78
QPSK 0.87 single	31.73	7.93	39.66	19.89	6.63	26.51	15.01	5.00	20.01
QPSK 0.63 single	22.81	5.70	28.51	14.30	4.76	19.06	10.79	3.60	14.39
BPSK 0.63 single	11.40	2.85	14.25	7.15	2.38	9.53	5.39	1.80	7.19

At zero range. All rates are in Mbit/s.

Table 4-66 Throughput for PTP 600 Full, link symmetry Adaptive, link optimization = IP (continued)

Modulation Mode	10 MHz		
	Tx	Rx	Both
256QAM 0.81 dual	66.38	33.19	99.56
64QAM 0.92 dual	55.92	27.96	83.88
64QAM 0.75 dual	45.70	22.85	68.55
16QAM 0.87 dual	35.55	17.78	53.33
16QAM 0.63 dual	25.56	12.78	38.34
256QAM 0.81 single	33.19	16.59	49.78
64QAM 0.92 single	27.96	13.98	41.94
64QAM 0.75 single	22.85	11.42	34.27
16QAM 0.87 single	17.78	8.89	26.66
16QAM 0.63 single	12.78	6.39	19.17
QPSK 0.87 single	8.89	4.44	13.33
QPSK 0.63 single	6.39	3.19	9.58
BPSK 0.63 single	3.19	1.60	4.79

This combination is not available with Channel Bandwidth 5 MHz.

Range adjustment curves

Use these curves to look up the link Range and find the Throughput Factor that must be applied to adjust the 0 km data throughput rates for the required combination of Channel Bandwidth, Link Symmetry, Link Optimization, DFS and Link Range (km).

Table 4-67 Range adjustment characteristics

Channel Band-width	Link Sym-metry	Link Optimis-ation	DFS	Range Adjustment Curve	See Figure
30 MHz	1:1	IP		A	Figure 4-30
		TDM		B	Figure 4-31
	2:1	IP		C	Figure 4-32
		TDM		D	Figure 4-33
	Adaptive	IP		E	Figure 4-34
20 MHz	1:1	IP		L	Figure 4-39
		TDM		N	Figure 4-40
	2:1	IP		L	Figure 4-39
		TDM		O	Figure 4-41
	Adaptive	IP		C	Figure 4-32
15 MHz	1:1	IP		F	Figure 4-35
		TDM		G	Figure 4-36
	2:1	IP	None	F	Figure 4-35
			FCC or ETSI	C	Figure 4-32

Channel Band-width	Link Sym-metry	Link Optimis-ation	DFS	Range Adjustment Curve	See Figure
		TDM	None	H	Figure 4-37
			FCC or ETSI	C	Figure 4-32
	Adaptive	IP		A	Figure 4-30
10 MHz	1:1	IP		F	Figure 4-35
		TDM		K	Figure 4-38
	2:1	IP		L	Figure 4-39
		TDM		L	Figure 4-39
	Adaptive	IP		L	Figure 4-39
5 MHz	1:1	IP, TDM		C	Figure 4-32

Figure 4-30 PTP 600 range adjustment for data rates, curve A

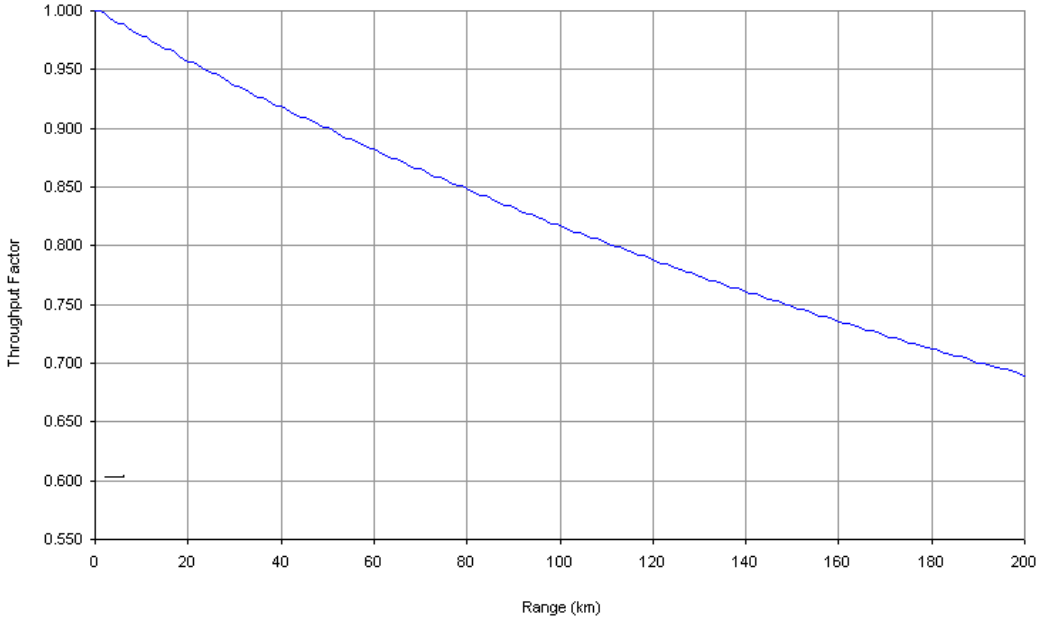


Figure 4-31 PTP 600 range adjustment for data rates, curve B

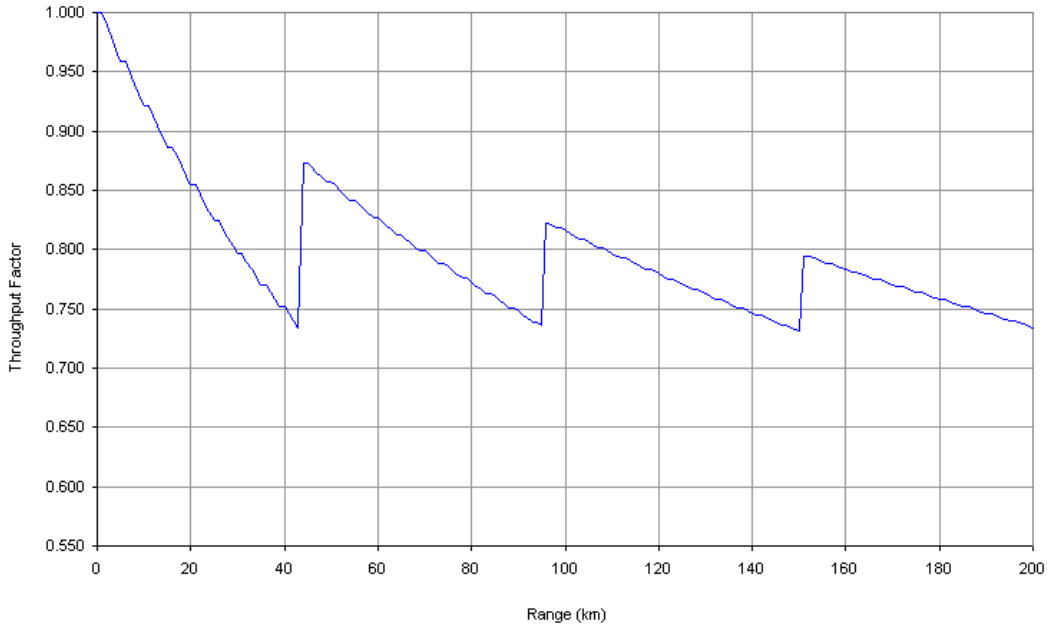


Figure 4-32 PTP 600 range adjustment for data rates, curve C

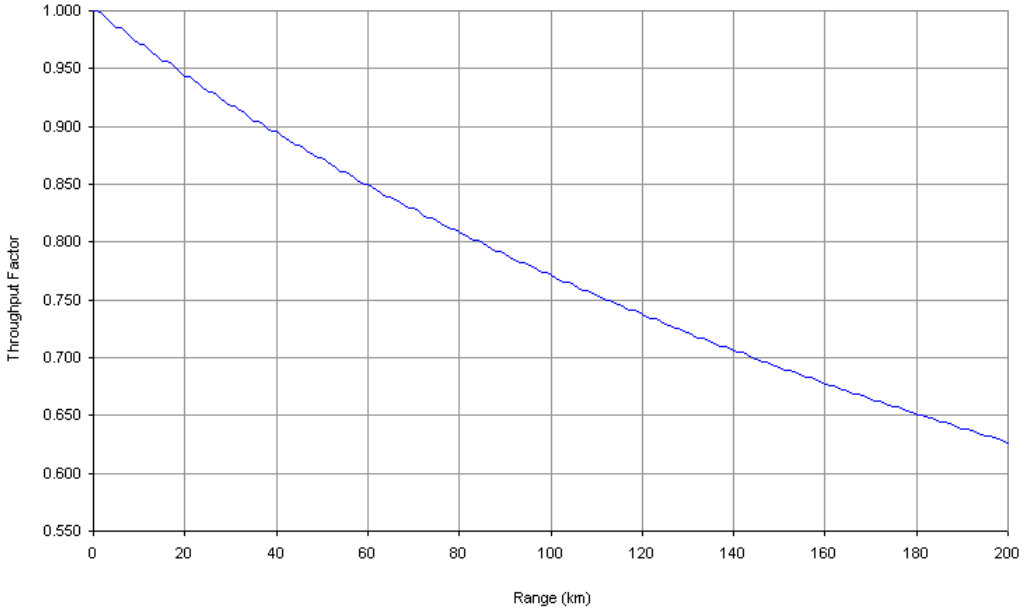


Figure 4-33 PTP 600 range adjustment for data rates, curve D

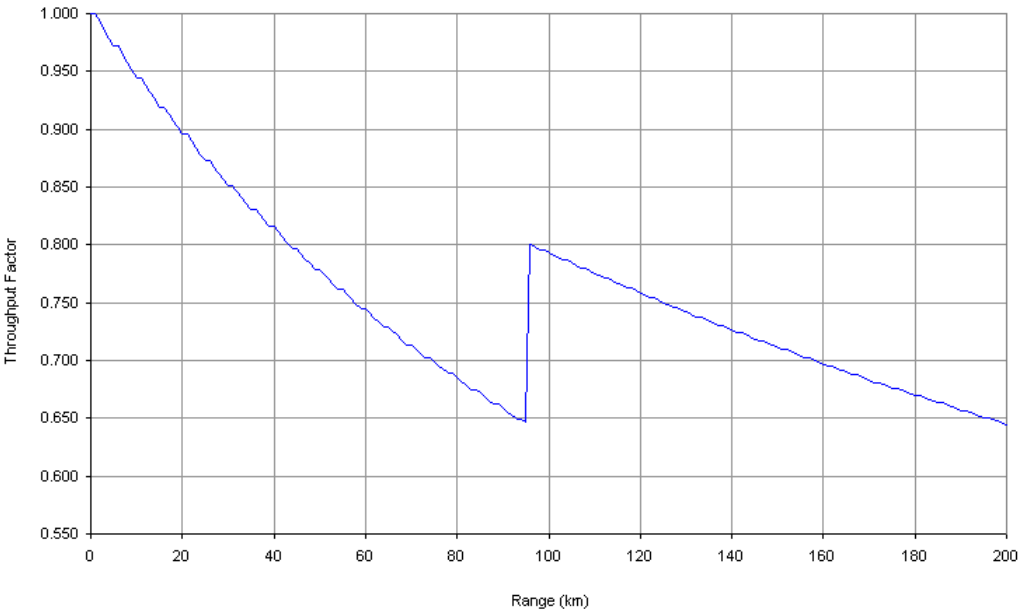


Figure 4-34 PTP 600 range adjustment for data rates, curve E

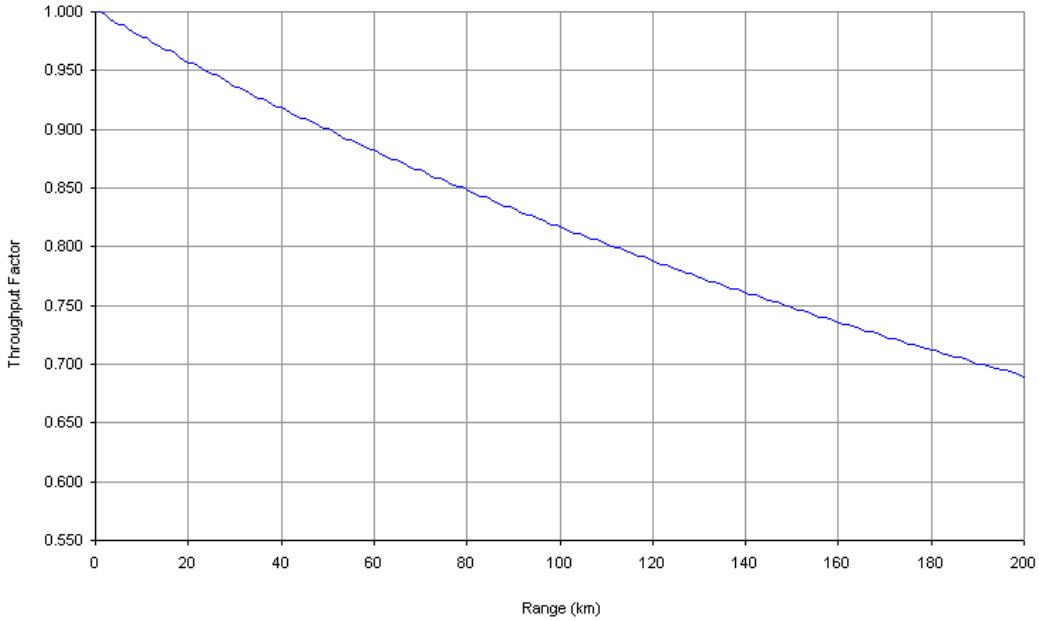


Figure 4-35 PTP 600 range adjustment for data rates, curve F

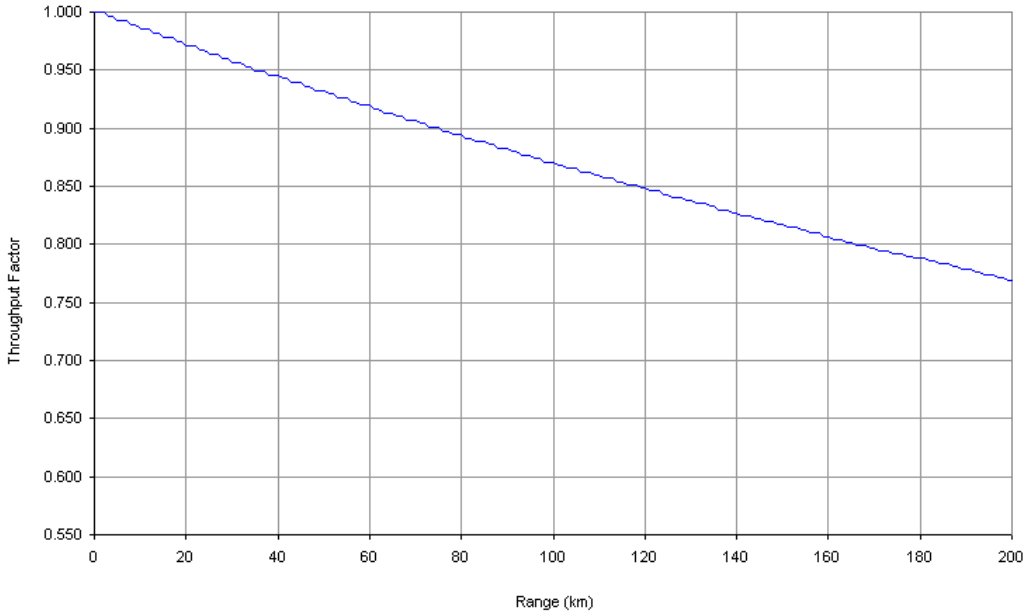


Figure 4-36 PTP 600 range adjustment for data rates, curve G

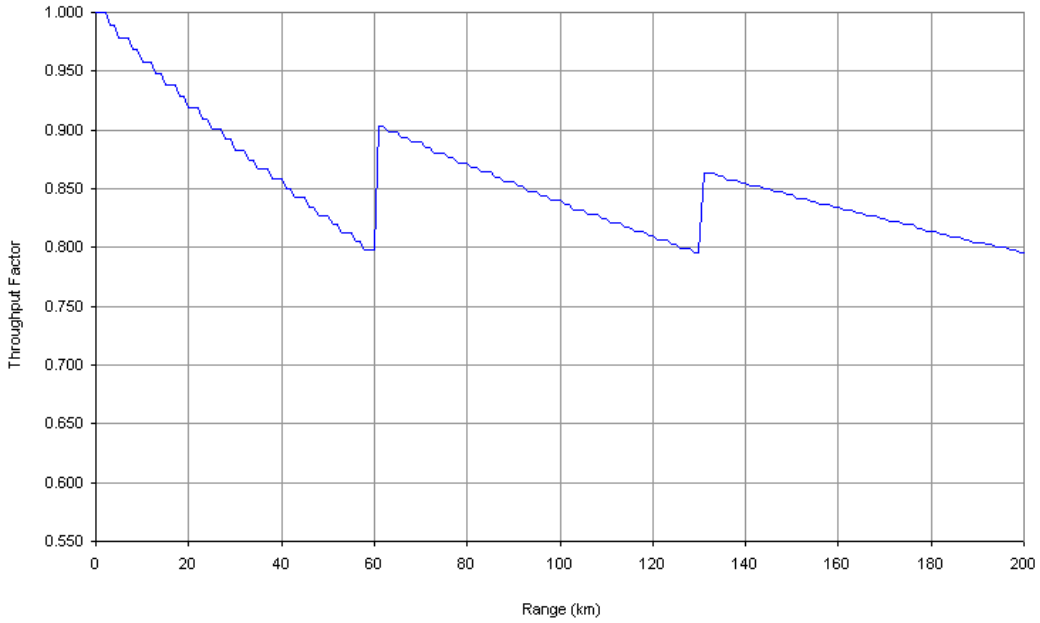


Figure 4-37 PTP 600 range adjustment for data rates, curve H

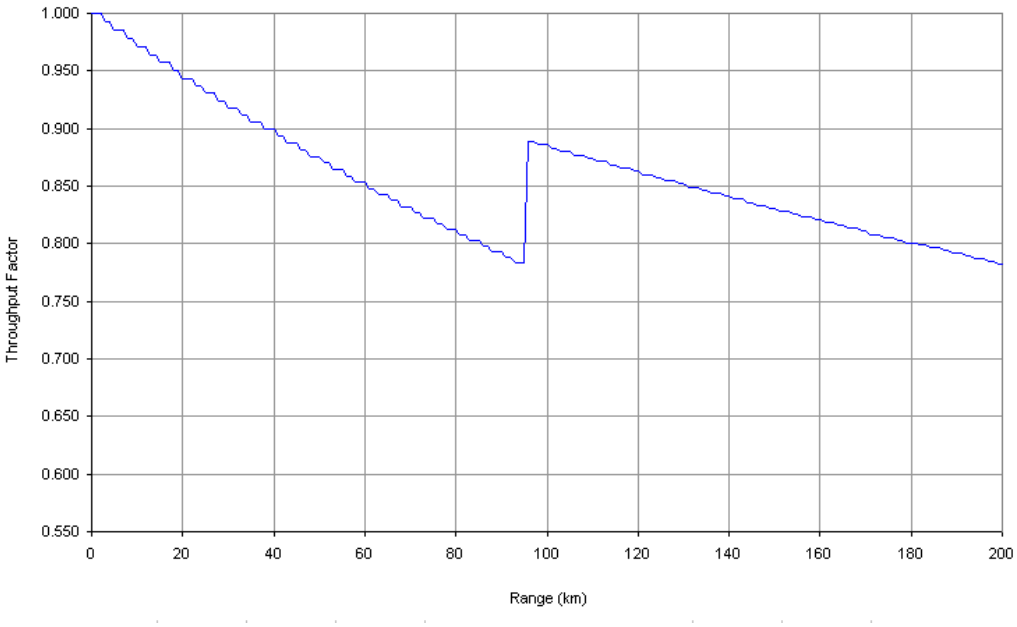


Figure 4-38 PTP 600 range adjustment for data rates, curve K

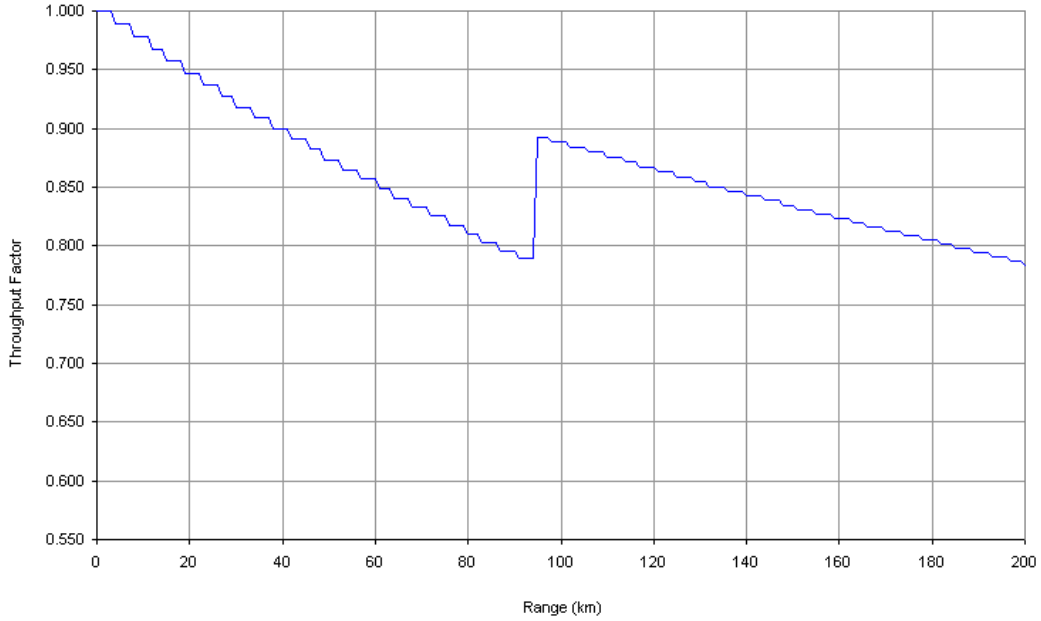


Figure 4-39 PTP 600 range adjustment for data rates, curve L

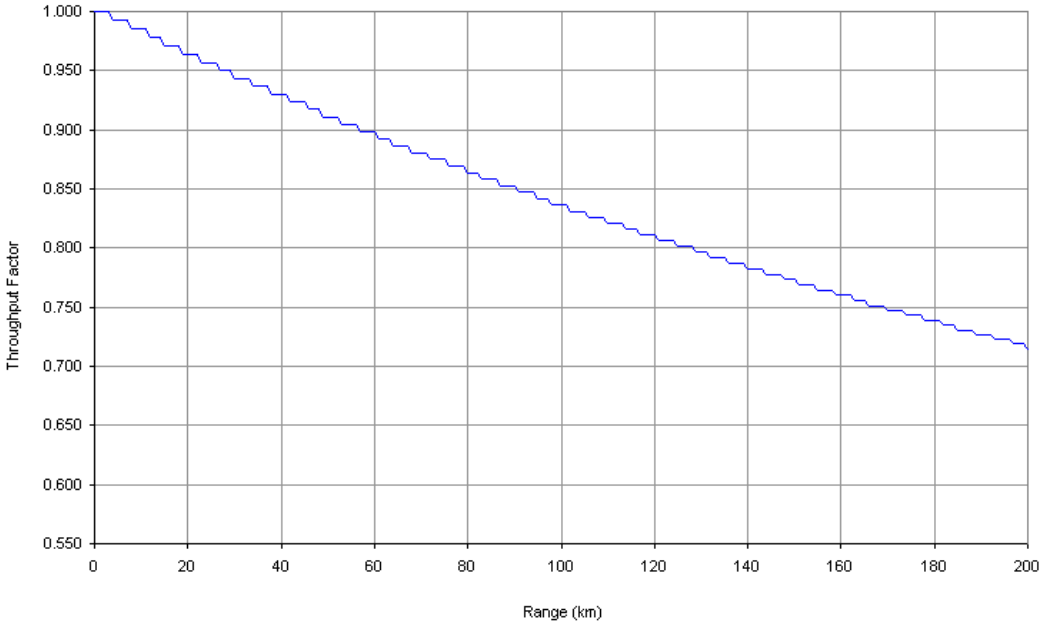


Figure 4-40 PTP 600 range adjustment for data rates, curve N

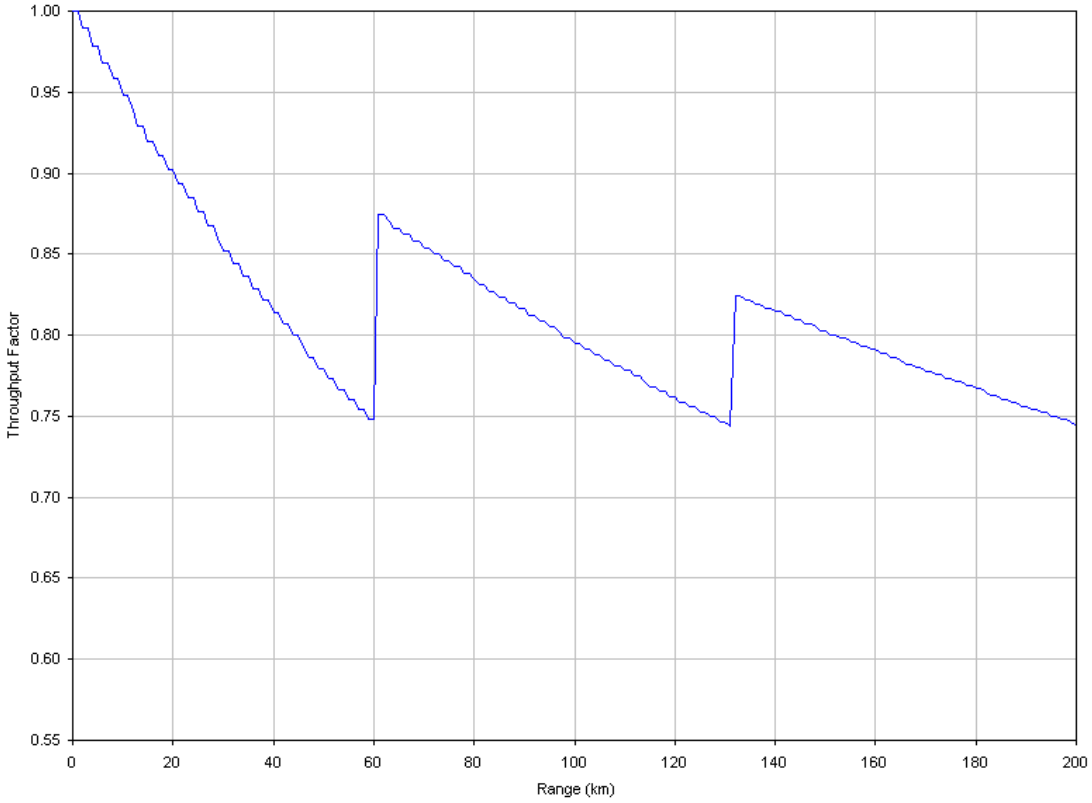
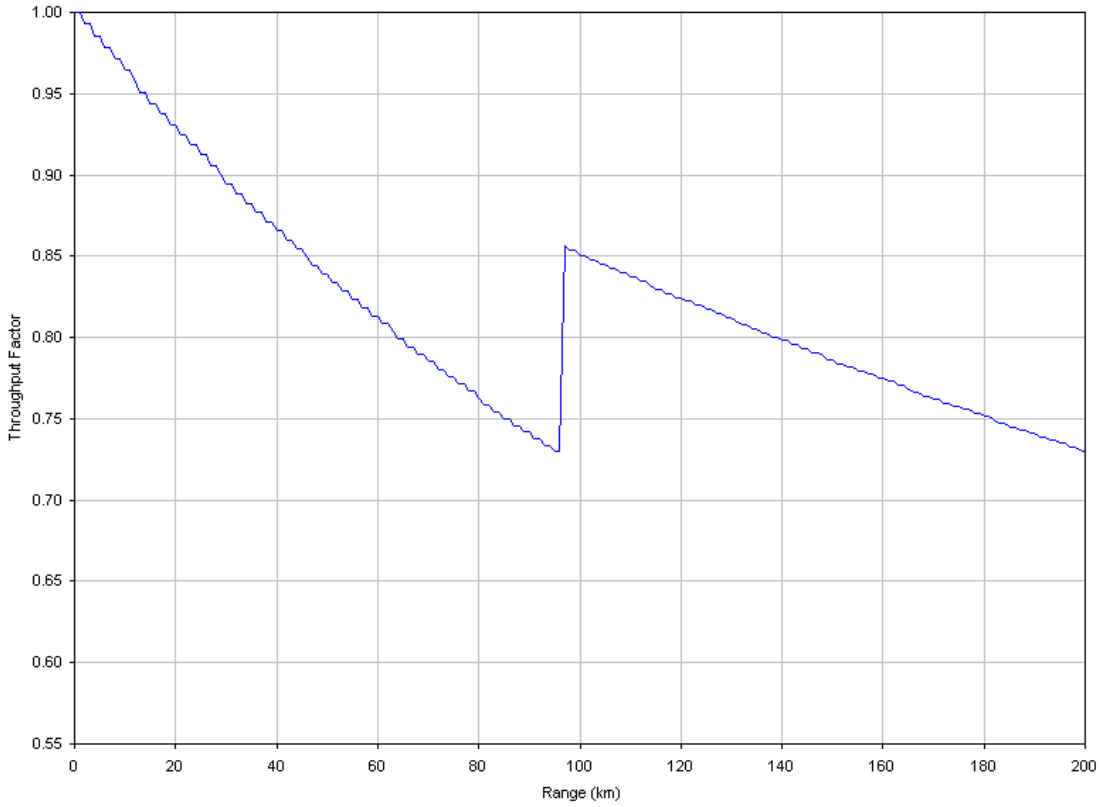


Figure 4-41 PTP 600 range adjustment for data rates, curve O



Chapter 5 Installation

This chapter provides instructions for installing a PTP 600 link.

⚠ CAUTION

Motorola recommends that only qualified personnel undertake the installation of a PTP 600 Series solution.

Motorola recommends that the practices and procedures detailed in manual *R56 STANDARDS AND GUIDELINES FOR COMMUNICATION SITES (68P81089E50)* should be applied to all new site build activities. This manual is provided on the PTP 600 CD-ROM.

The PTP 600 Series installation procedure consists of the following tasks:

If a connectorized PTP 600 variant is to be installed, see Chapter 8 Connectorized PTP 600 series.

Legal disclaimer

IN NO EVENT SHALL MOTOROLA, INC. BE LIABLE FOR ANY INJURY TO ANY PERSONS OR ANY DAMAGE CAUSED DURING THE INSTALLATION OF THE MOTOROLA PTP 600 SERIES PRODUCT.

Checking the configuration

This section describes how to configure the management PC, power up the unit, connect it to the PC and check the factory configuration. Motorola recommends that these tasks should be performed before site installation.

IP addresses of the Master and Slave units

The PTP 600 is supplied as a pair of matched units, a Master and a Slave. The usual default IP addresses are:

- Master: 169.254.1.2
- Slave: 169.254.1.1

However, some units may have been configured with different IP addresses:

- Master: 10.10.10.11
- Slave: 10.10.10.10

Configuring the IP interface on the PC

Before powering up the unit, set up the IP configuration of the management PC.

If the default IP addresses of the Master and Slave units are 169.254.1.2 and 169.254.1.1, then set up the IP configuration of the PC as follows:

- Enter an IP address of 169.254.1.n, where n is any value between 3 and 254. Do not use 169.254.1.1 or 169.254.1.2.
- Enter a subnet mask of 255.255.0.0.

If the default IP addresses of the Master and Slave units are 10.10.10.11 and 10.10.10.10, then set up the IP configuration of the PC as follows:

- Enter an IP address of 10.10.10.n, where n is between 2 and 254. Do not use 10.10.10.10 or 10.10.10.11.
- Enter a subnet mask of 255.255.0.0.

Powering up and connecting the PIDU Plus

When the management PC has been configured with the correct IP address and subnet mask, the PIDU can be powered up and connected to the management PC. To power up the PIDU and connect it to the PC, proceed as follows:

Procedure 5-1 Power up and connect the PIDU Plus

1	Apply mains or battery power to the PIDU Plus. The green Power LED should illuminate continuously.
2	After 45 seconds, the orange Ethernet LED should be observed starting with 10 slow flashes.
3	Connect the CAT5e cable from the LAN port of the PIDU Plus to the management PC (either via the network or directly using a standard CAT5 patch cable). The Ethernet LED should blink randomly as traffic passes through. 
4	If the Power and Ethernet LEDs do not illuminate correctly, refer to Test link end hardware on page 7-2.

Opening the web interface

When the unit has been powered up and connected to the management PC, the web interface can be opened. To open the PTP 600 web interface on the management PC, proceed as follows:

Procedure 5-2 Open the web interface

1	Start the web browser.
2	Type the IP address of the unit into the address frame, for example: 169.254.1.2.
3	Press ENTER. The login page (Figure 6-7) is displayed.
4	Leave the Password blank and select **Login**. The web interface menu (Figure 6-1) and System Summary page (Figure 6-2) are displayed.

Checking LAN configuration

The unit must be configured to be compatible with the network. It is particularly important to avoid IP address conflicts. To check the LAN configuration, proceed as follows:

Procedure 5-3 Check LAN configuration

1	Design the desired configuration of the network to be installed, noting the required IP Address, Subnet Mask and Gateway IP Address of the Master and Slave units.
2	Select **LAN Configuration** from the menu. The LAN Configuration page (Figure 6-20) is displayed.
3	Compare the required IP Address, Subnet Mask and Gateway IP Address to current settings.
4	If the current settings are different, update them as described in Configuring the IP and Ethernet interfaces on page 6-42.

Checking software version

The software version installed on the unit may not be the latest one available from Motorola. To check and update the software version, proceed as follows:

Procedure 5-4 Check software configuration

1	Select **Status** from the menu. The System Status page (Figure 6-4) is displayed.
2	Check that the Software Version attribute in the System Status page is the same as the latest PTP 600 software version in http://www.motorola.com/ptp/support.
3	If it is not the latest, upgrade it as described in Upgrading PTP 600 software on page 6-84.

Checking region code

The unit is supplied with two alternative license keys, one of which is factory configured. To check that the configured license key is for the required Region Code, proceed as follows:

Procedure 5-5 Check region code

1	Select **Status** from the menu. The System Status page (Figure 6-4) is displayed.
2	Check that the required Region Code attribute is in the System Status page.
3	If it is not, replace the license key of the unit with the supplied alternative license key, as described in Entering a license key on page 6-80.

Checking wireless configuration

To check that the factory wireless configuration meets network requirements, proceed as follows:

Procedure 5-6 Check wireless configuration

1	Select **Installation** from the menu. The Current Installation Summary page(Figure 6-27)is displayed.
2	Confirm that the Target MAC Address, Master Slave Mode, Tx Max Power, Link Symmetry and Target Range attributes meet network requirements.
3	If they do not, update them as described in Installation pages on page 6-51.

Preparing for site installation

Checks

Before proceeding with the installation, perform the following checks:

- Plan the link, as described in Chapter 2 Planning considerations.
- Check the configuration of the Master and Slave units, as described in Checking the configuration on page 5-2.
- Check the contents of all packages against the parts lists shown in the packing list.
- Ensure that qualified installers are available to undertake the work.
- Ensure that the correct safety precautions are observed.

Tools required

The following specific tools are required to install a PTP 600 Series, in addition to general tools:

- 13mm wrench and 22 mm wrench for use with the glands
- RJ45 crimp tool (it must be the correct tool for the type of RJ45 being used)
- Personal Computer (PC) with 10, 100 or 1000 BaseT Ethernet
- Either Internet Explorer version 6 or higher, or FireFox 2.0 or higher are recommended.
- Ethernet patch cables
- Motorola PTP LINKPlanner report for this link

Cable connection procedures

This section describes three procedures that may be performed repeatedly in the course of site installation:

- Preparing the supported Superior Essex cable.
- Installing a cable grounding kit.
- Installing a lightning protection unit (LPU)

Preparing the supported Superior Essex cable

The maximum cable length between the ODU and the user's network equipment is 100m (330 ft). Cable lengths up to 300m (984 ft) can be used where the PIDU Plus to ODU cable is supplying power only, that is, when using the PTP 600 Series optical interface.

For details of recommended cables and connectors, refer to Cables and connectors on page 1-15.

⚠ WARNING

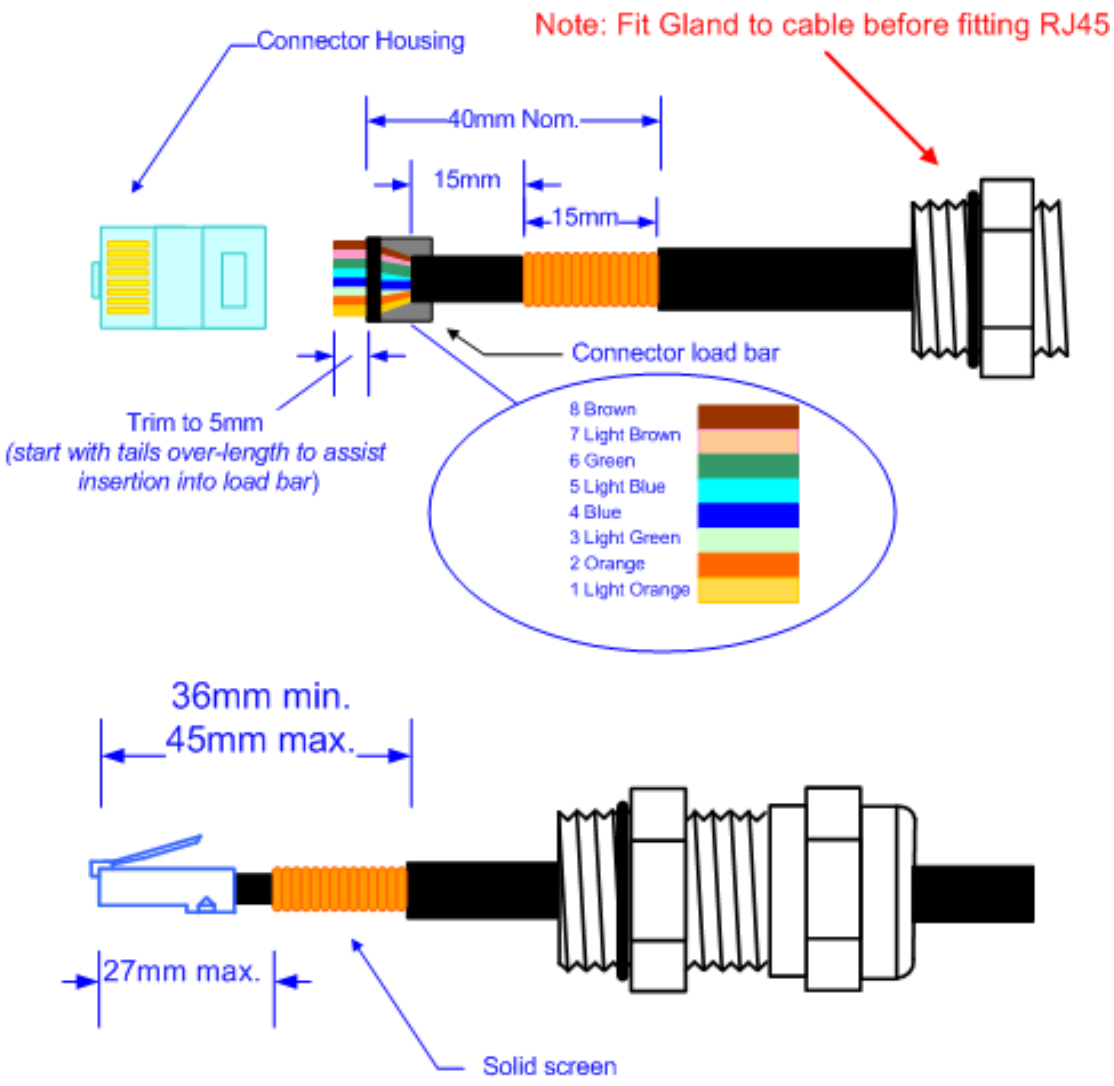
The copper screen of the supported Superior Essex cable is very sharp and may cause personal injury. When preparing the Superior Essex cable, take the following safety precautions:

- ALWAYS wear cut resistant gloves (check the label to ensure they are cut resistant).
- ALWAYS wear protective eyewear.
- ALWAYS use a rotary blade tool to strip the cable (DO NOT use a bladed knife). To use the rotary blade tool, fit it around the outer cable sheaf and rotate the cutter around the cable once or twice. The stripped outer section can then be removed.

Cable assembly

The supported Superior Essex cable should be assembled as shown in Figure 5-1:

Figure 5-1 Correct cable preparation for the supported Superior Essex cable



Cable Type;	Superior Essex, BBDGE CAT5e
Connector Type;	Tyco (AMP), 5-569278
Crimp Tool;	Tyco (AMP), 2-231652; Die set 1-853400-0
Gland;	Motorola WB1811

CAUTION

Check that the crimp tool matches the RJ45 connector being used, otherwise the cable or connector may be damaged.

NOTE

The cable inner sheaf must be located correctly under the connector housing tang. If this is not done correctly, there is no strain relief on the cable terminations.

Both ends of the ODU cable are terminated in the same way. The above procedure should be repeated for the PIDU Plus end of the cable when the cable routing process is complete. This assumes that the installation uses PTP LPUs. If not, then the PIDU Plus end of the cable does not require a Gland, but just the RJ45.

NOTE

The PIDU Plus end of the cable does not employ a cable gland.

Figure 5-2 shows a completed ODU to PIDU Plus cable.

Figure 5-2 Completed ODU connector

Grounding the drop cable to a metal tower or mast

For installations where the ODU or GPS receiver (if installed) are fitted to a metal tower or mast, the screen of the supported Superior Essex cable must be ground bonded to the tower or mast.

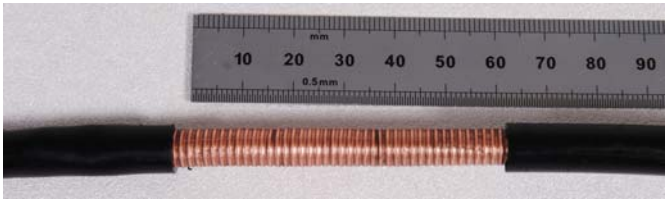
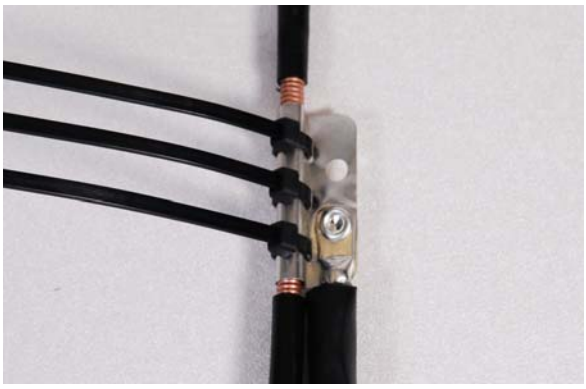
The cable grounding kit for 1/4” and 3/8” cable (Figure 5-3) contains the following components:

- 1 x grounding cable with grounding 2 hole lug fitted (M10)
- 1 x self Amalgamating tape
- 1 x PVC tape
- 3 x tie wraps
- 2 x bolt, washer and nut

Figure 5-3 Cable grounding kit for 1/4” and 3/8” cable

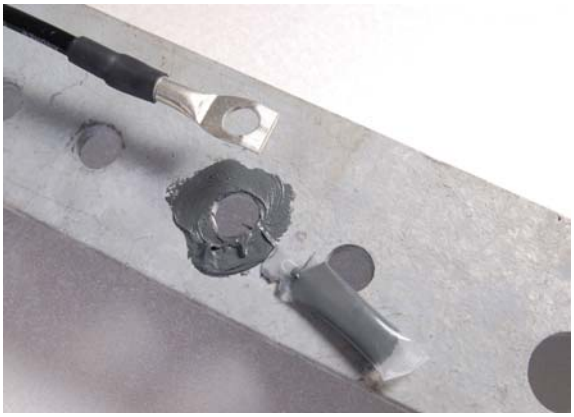
To ground the supported Superior Essex cable to a metal tower or mast, proceed as follows:

Procedure 5-7 Ground the drop cable

1	Remove 60mm (2.5inches) of the drop cable outer jacket. 
2	Cut 38mm (1.5 inches) of rubber tape (self amalgamating) and fit to the ground cable lug. Wrap the tape completely around the lug and cable. 
3	Fold the ground wire strap around the drop cable screen. Fit cable ties and tighten with pliers. 

4	Cut the surplus from the cable ties. Cut a 38mm (1.5 inches) section of self-amalgamating tape and fit to the ground cable lug. Wrap the self-amalgamating tape completely around the lug and cable. 
5	Use the remainder of the self-amalgamating tape to wrap the complete assembly. Press the tape edges together so that there are no gaps. 

6	Wrap a layer of PVC tape, starting from 25mm (1 inch) above the outer jacket and finishing 25mm (1 inch) below the self-amalgating tape, over lapping at half width. 
7	Repeat with a further **four** layers of PVC tape. Start the second layer 25mm (1 inch) above the first layer tape, start the third layer below the finish of the second layer. Continue until five layers have been applied, always over lapping at half width. 

8	If a single hole tag is required at the mast end, modify the two hole tag as shown. 
9	Apply the anti-oxidant compound liberally applied between the two metals. If paint is present, remove it to provide a good electrical contact. 

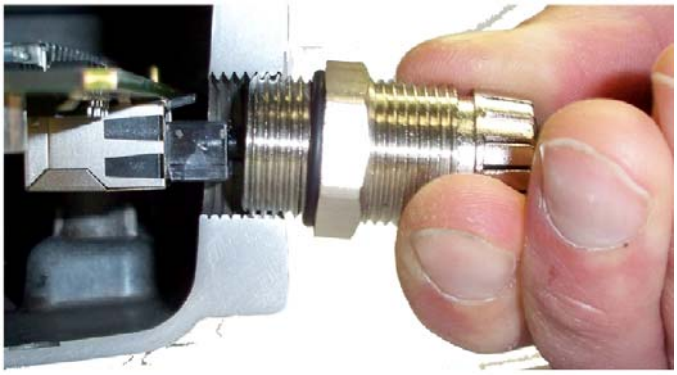
Connecting the drop cable to an ODU or LPU

NOTE

This procedure contains illustrations of an ODU, but it applies in principle to both the ODU and the LPU.

To connect the supported Superior Essex cable with a gland to a unit (LPU or ODU), proceed as follows:

Procedure 5-8 Connect the drop cable with a gland to a unit (LPU or ODU)

1	Insert the RJ45 plug into the socket in the unit, making sure that the locking tab snaps home. 
2	Support the drop cable and gently hand screw the gland body into the unit until the O ring seal is flush to the unit body.  **NOTE** Do not fit the back shell prior to securing the gland body.

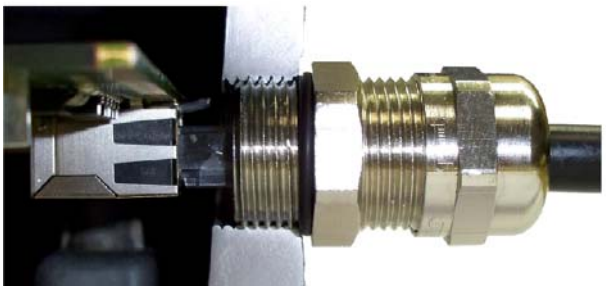
3	Once the gland is fully hand screwed into the unit, tighten it with a spanner to torque 10 Nm (7.37 ftlbs). 
4	When the gland body has been fitted, tighten the gland back shell.  **⚠ CAUTION** Do not over-tighten the gland back shell, as the internal seal and structure may be damaged. Figure 5-4 shows correctly tightened and over-tightened gland back shells.

Figure 5-4 Correct and incorrect tightening of cable gland back shell

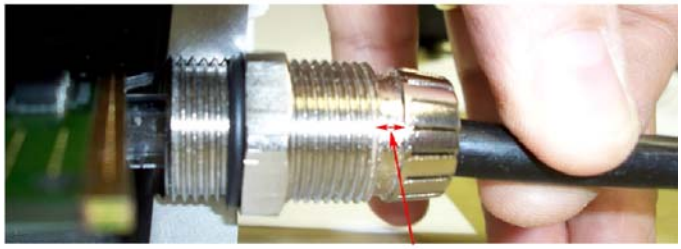
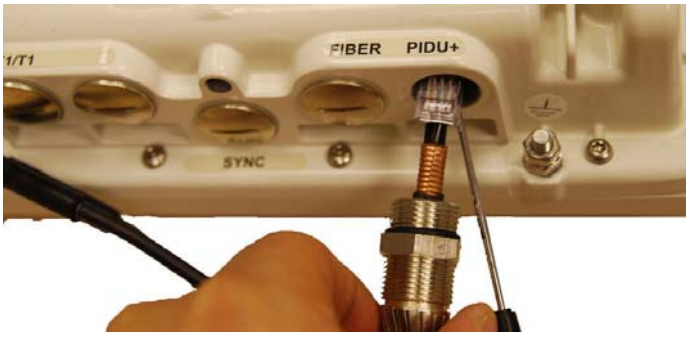
Disconnecting the drop cable from an ODU or LPU

NOTE

This procedure contains illustrations of an ODU, but it applies in principle to both the ODU and the LPU.

To disconnect the supported Superior Essex cable with a gland from a unit (LPU or ODU), proceed as follows:

Procedure 5-9 Disconnect the drop cable with a gland from a unit (LPU or ODU)

1	Remove the gland back shell.
2	Wiggle the drop cable to release the tension of the gland body.  When the tension in the glad body is released, a gap opens at the point shown in red in the above photograph.
3	Unscrew the gland body.
4	Use a small screwdriver to depress the RJ45 locking cap 
5	Unplug the RJ45.

Mounting the ODUs

Mounting bracket

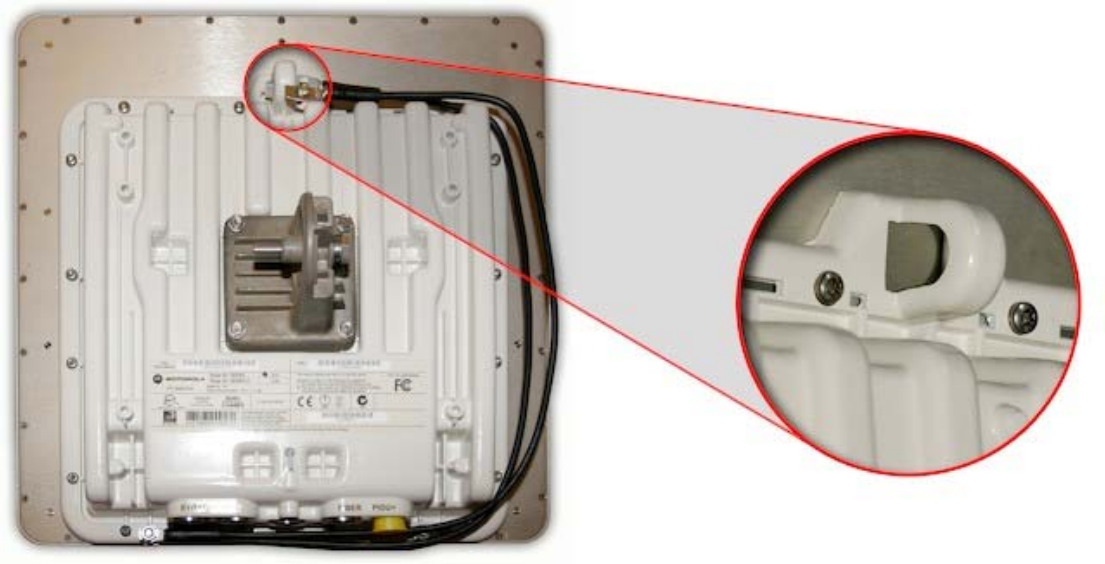
The ODU is pre-fitted with a mounting bracket (designed to ease installation) and with earth bonding leads (Figure 5-5).

Figure 5-5 ODU with mounting bracket and earth bonding leads

Hoist and safety loop

Use the integral safety loop (Figure 5-6) for hoisting the ODU up a mast, tower or building. When the ODU is in position, use the safety loop as a fixing point to secure a permanent lanyard from the mast, tower or building to the ODU, as a precaution against mounting failure.

Figure 5-6 Integral safety loop



⚠ WARNING

Observe the following safety precautions before hoisting the ODU:

- The safety lanyard must not exceed 1m (approx 3 ft) in length. The lanyard must be made from a material that does not degrade in an outdoor environment.
- The safety lanyard must be fixed to a separate fixing point that is not part of the direct mounting system for the ODU.
- If the safety loop or its fixing is damaged in any way or has been exposed to a shock loading due to a fall, replace it with a new one before undertaking any further operations.

ODU mounting procedure

⚠ WARNING

To prevent failure of the assembly, observe the following precautions when mounting the ODU:

- Do not remove the pre-fitted mounting bracket from the ODU.
- Do not mount the ODU on poles with diameter less than 50mm (2”) or greater than 75mm (3”). The ODU mounting bracket is designed to work only with poles with diameter in the 50 mm (2”) to 75 mm (3”) range.
- Do not over-tighten the bolts.

The ODU must be mounted using the following steps, ensuring that the cable entry is at the bottom:

Procedure 5-10 Mounting the ODU

1	Attach the bracket strap to the pole using M8 x 70 mm bolts, M8 flat washers and M8 coil washers. Tighten to ensure the assembly grips but can be adjusted. 
2	Offer the ODU (with pre-fitted mounting bracket) to the bracket strap and affix using the captive M8 bolt. Tighten to ensure the assembly grips, but can be adjusted on the pole. 

3	Adjust the elevation and azimuth of the unit before tightening to the required torque settings of 14 Nm (11 lb ft) for both bolts. 

⚠ CAUTION

Attach the free end of one earth bonding lead (large tag M10) to the tower metal work. On no account must this be attached to the mounting bracket bolts.

The enclosure and mounting brackets of the PTP 600 Series product range are capable of withstanding wind speeds up to 151mph (242kph). The installer should ensure that the structure the bridge is fixed to is also capable of withstanding the prevalent wind speeds and loads.

Installing the UltraSync GPS receiver

Recommended kit

The UltraSync installation kit includes the following:

- GPS synchronization unit from MemoryLink (see Figure 5-7), with three attached terminated Ethernet and sync cables and cable glands (2) which connect directly to a PTP 600 Series ODU.
- Mounting bracket and mounting bracket bolts
- Outdoor rated UV resistant cable tie
- UltraSync user manual.

In addition to the hardware mentioned above, Motorola recommends the installation of appropriate lightning protection with PTP LPUs, as described in Lightning protection and E1/T1 on page 5-57.

NOTE

Refer to the UltraSync user manual for details on the lengths of cables used to connect the UltraSync to the ODU and PTP LPU.

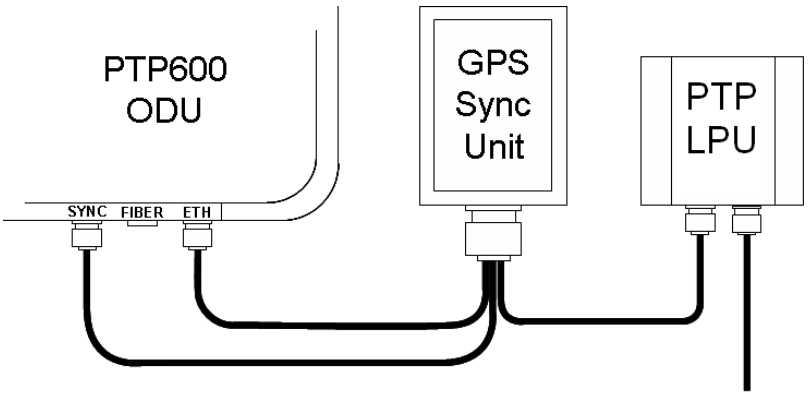
Figure 5-7 UltraSync unit

UltraSync unit connections

Figure 5-8 shows the inside of the UltraSync unit and Figure 5-9 is a diagram that shows how to connect the UltraSync unit to the ODU and the LPU.

Figure 5-8 UltraSync unit connections

Figure 5-9 UltraSync - PTP600 deployment diagram



Complete UltraSync unit installation

Figure 5-10 shows an example of mast installation using lightning protection and an UltraSync unit.

Figure 5-10 UltraSync unit complete installation

Installing the GPS receiver for PTP-SYNC

If the chosen TDD synchronization method requires a GPS timing reference source (see TDD synchronization configuration options on page 2-12), then a GPS receiver must be installed. Motorola recommends that the Trimble GPS receiver should be used. This section describes the installation procedure for the Trimble GPS receiver.

⚠ CAUTION

Prior to power-up of equipment, ensure that all cables are connected to the correct interfaces of the PTP-SYNC unit and the GPS receiver module. Failure to do so may result in damage to the equipment.

Recommended kit

Trimble GPS receiver

One Trimble GPS receiver is required.

Cables and connectors

The drop cable connecting the GPS receiver to the LPU must be of the supported Superior Essex cable type. The drop cable must have a Trimble 12-pin connector at the GPS end, and an RJ45 connector and gland at the LPU end. For more information, refer to Outdoor connections on page 1-15.

LPU

One LPU kit (Figure 2-10) is required.

Cable grounding kit

If the GPS receiver is mounted on a metal tower or mast, one or more cable grounding kits (Figure 5-3) are required to ground bond the drop cable at the correct grounding points (Figure 2-21).

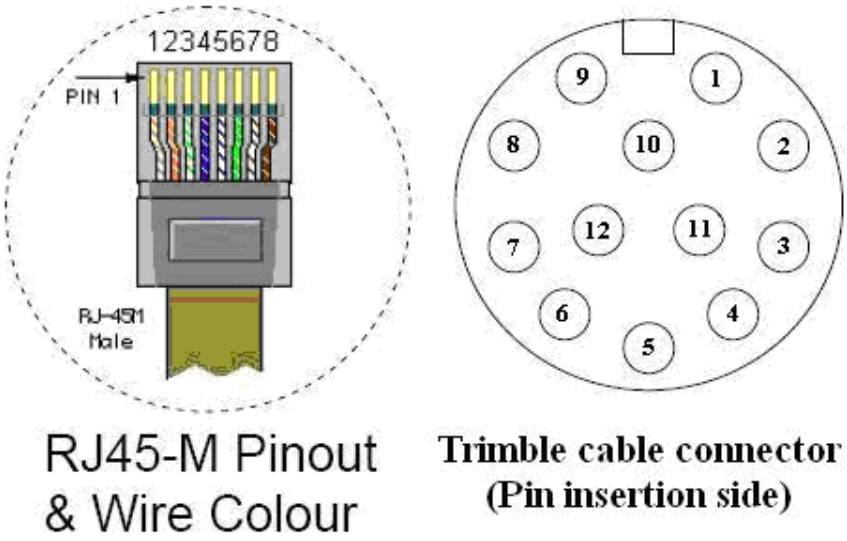
Trimble GPS connector pin definition

Table 5-1 shows how the Trimble connector pins (at the GPS end of the drop cable) map to the RJ45 connector pins (at the LPU end). Figure 5-11 shows the positions of the pins in each type of connector.

Table 5-1 Trimble connector to RJ45 pin mappings

Trimble 12-pin conn	Function	RJ45 wire colour		PTP-SYNC (J10) RJ45 pin
		Conventional	Superior Essex	
1	DC Pwr (12V)	Orange/White	Light Orange	1
2	RxB-	Brown	Brown	8
3	RxB+	Brown/White	Light Brown	7
4	TxB-	Blue	Blue	4
5	TxB+	Blue/White	Light Blue	5
6	RxA-	N.C	N.C	---
7	RxA+	N.C	N.C	---
8	TxA-	N.C	N.C	---
9	DC Ground	Orange	Orange	2
10	TxA+	N.C	N.C	---
11	Tx1PPS+	Green/White	Light Green	3
12	Tx1PPS-	Green	Green	6

Figure 5-11 RJ45 and Trimble connector pins



Mounting the GPS receiver

Mount the GPS receiver (following manufacturer's instructions) upon either an external wall or a metal tower or mast. Motorola recommends that the receiver is wall mounted. For more information on these options, refer to Protection of the GPS receiver for PTP-SYNC on page 2-36.

Connecting the GPS receiver to the drop cable

The drop cable must be connected the GPS receiver using the Trimble connector provided.

⚠ CAUTION

The supported Superior Essex cable has solid copper conductors. There is a limited number of times each conductor can be bent before it fatigues and fails.

To fit the Trimble 12-pin connector to the drop cable, proceed as follows:

Procedure 5-11 Connect drop cable to Trimble GPS receiver

1	Prepare the drop cable end as follows: Bare back the cable outer and copper screen to 50mm. Bare back the cable inner to 17mm. Un-twist the cable pairs. Strip the individual conductors to 5mm. 
2	Fit the adaptor outer, associated boot, and boot insert. 

3	Connect the socket contacts using either of the following techniques: **Crimp** Crimp the socket contacts onto each of the conductors using the correct crimp tool and positioner, setting the wire size selector to '3' for 24AWG wire.  **Solder** When soldering the socket contacts onto each of the conductors, ensure that there is no solder or flux residue on the outside of the contact. Care should also be taken that the individual conductor insulation does not peel back with the soldering heat, allowing possible shorts when assembled into the connector shell.
4	Fit four contacts into the unused locations, to provide strength and sealing. Pin insert side: Connector mating side:  

5	Insert the eight contacts into the connector body in accordance with Table 5-1. It is easiest to insert the pins from the inside out, in the order 12, 11, 9, 5, 4, 3, 2, 1. Push the contacts in so that the shoulder on the contact fits into the hole in the connector shell. When all contacts have been fitted, pushed them in further to engage with the locking mechanism in the connector shell. This can be done by applying pressure to the contact with a small diameter stiff object, such as tweezers. If a contact is pushed in to the point where the locking mechanism engages before all of the contacts have been inserted it will limit the amount of room available to fit the remaining contacts, requiring harder bends to be applied. 
6	Fit the adaptor to the connector shell. The plastic ring fits inside the rubber boot and ensures a tight fit when the adaptor body is clipped onto the connector shell. Be aware that the adaptor body is a hard push fit onto the connector shell. 
7	Fit the strain relief clip. 
8	Connect the adapter to the GPS, then wrap a layer of self-amalgamating tape, starting 25mm below the bared back outer of the cable and finishing at the GPS housing.

9	Wrap a layer of PVC tape, starting just below the start of the self-amalgamating tape and finishing at the GPS housing, overlapping at half width. Repeat with a further four layers of PVC tape alternating the start and finish ends. 

Grounding the GPS receiver drop cable

Wall installation

For installations where the GPS receiver module is fitted to an external wall, it is not necessary to ground bond the GPS cable.

Metal tower or mast installation

For installations where the GPS receiver module is fitted to a metal tower or mast, the screen of the GPS cable MUST be ground bonded to the metal tower or mast.

To identify the required grounding points, refer to Mounting the GPS receiver module on a metal tower or mast on page 2-37.

To ground the cable, follow the procedure described in Grounding the drop cable to a metal tower or mast on page 5-11.

Mounting the LPU and connecting the GPS receiver

To mount the LPU and connect it to the drop cable from the GPS receiver, proceed as follows:

Procedure 5-12 Mount LPU and connect to GPS receiver

1	Check the contents of the LPU box (Figure 2-10).
2	Mount the LPU (following manufacturer's instructions) at the point where the drop cable from the GPS receiver enters the building (Figure 2-20 or Figure 2-21). Mount the LPU vertically with cable glands facing downwards.
3	Prepare the LPU end of the GPS receiver drop cable as described in Preparing the supported Superior Essex cable on page 5-8.
4	Connect the cable gland of the GPS receiver drop cable to the LPU as described in Connecting the drop cable to an ODU or LPU on page 5-16.
5	Make an unscreened CAT5e cable to connect the LPU to the 'GPS/SYNC IN' interface of the PTP-SYNC unit.

Installing PTP-SYNC

Recommended kit

PTP-SYNC kit

The PTP-SYNC kit (Figure 5-12) contains the following components:

- 1 x PTP-SYNC unit
- 1 x M4 pan screw
- 2 x M4 washers
- 2 x M3 (6mm) torx drive screws
- 1 x lug for unit earth (cable not supplied)

Figure 5-12 PTP-SYNC kit

GPS timing kit

The GPS receiver module is an optional item that must be purchased separately, if the chosen PTP-SYNC system configuration includes GPS.

Rack mount installation kit

The PTP800 CMU / PTP-SYNC 19” rack mount installation kit (Figure 5-13) is an optional item that must be purchased separately, if required. This kit contains the following components:

- 1 x rack bracket
- 8 x M3 washers
- 8 x M3 screws
- 1 x rack mount blank plate
- 8 x M5 nuts
- 8 x M5 washers
- 2 x rack handles

Figure 5-13 PTP800 CMU / PTP-SYNC 19” rack mount installation kit

NOTE

Ethernet cables are not provided as part of the PTP-SYNC product or as part of the GPS Module Kit.

PTP-SYNC unit rack or wall mounting

The PTP-SYNC unit can either be rack mounted indoors or wall mounted indoors.

Rack mounted

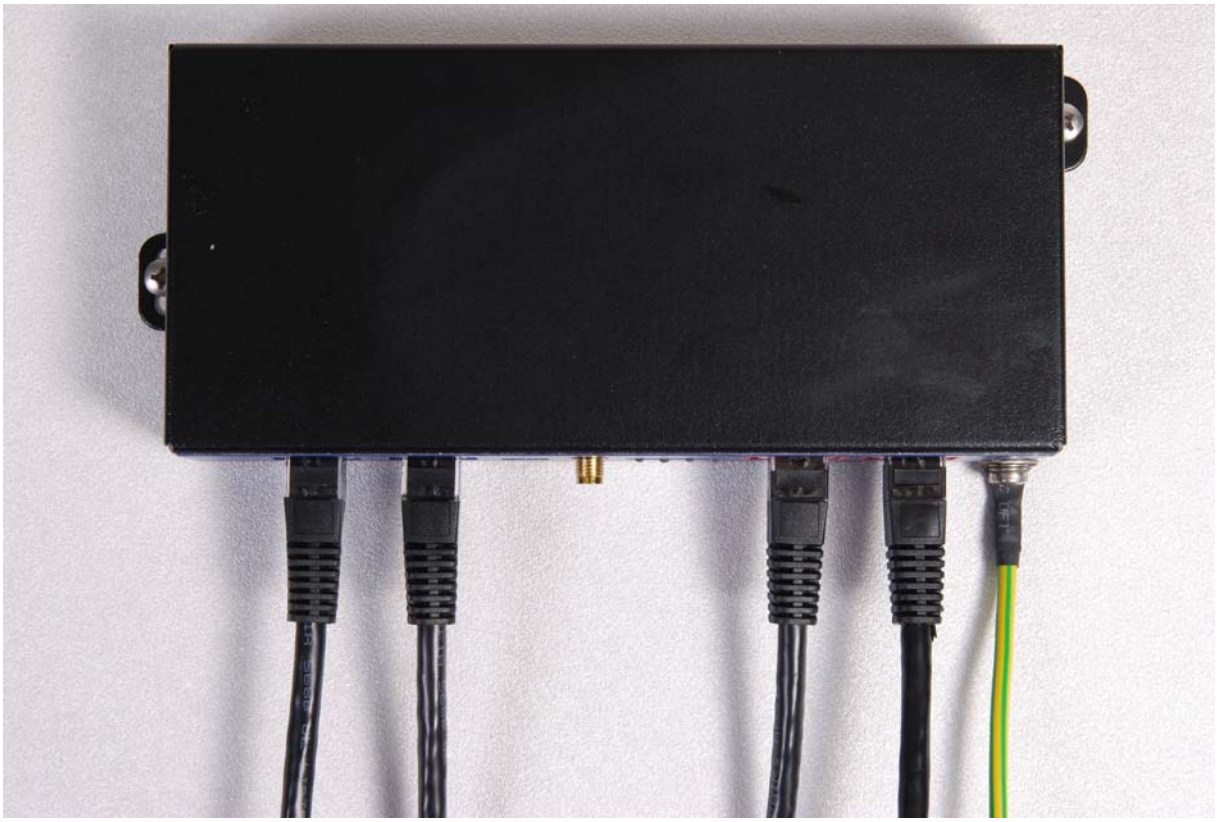
Securing screws for PTP-SYNC within the rack mount are fitted to the underside (Figure 5-14).

Figure 5-14 Rack mount securing screws for PTP-SYNC

Wall mounted

If the PTP-SYNC is to be wall-mounted, the unit must be fitted vertically with unit interfaces and cabling facing downwards (Figure 5-15).

Figure 5-15 PTP-SYNC mounted on wall



Connecting up PTP-SYNC

To connect the PTP-SYNC to the PIDU, ODU, GPS receiver (if fitted), and LPU (if fitted), proceed as follows:

Procedure 5-13 Weather-proof the GPS receiver module cable

1	Use a one meter un-screened CAT5e Ethernet cable (refer to Cables and connectors on page 1-15) and connect the PIDU to the PTP-SYNC. 
2	If using a GPS timing reference, install the GPS unit as described in Installing the GPS receiver for PTP-SYNC on page 5-28) The GPS receiver unit can either be wall mounted or mounted on a metal tower or mast.
3	Use the supported Superior Essex cable. Connect the cable to the GPS receiver unit.
4	Connect the GPS receiver module via an LPU, or the chosen 1PPS timing source, to the PTP-SYNC. 

5	Use the supported Superior Essex cable (refer to Cables and connectors on page 1-15) to connect the cable between the PTP-SYNC and the LPU or ODU. 
6	This is a setup for clustered PTP-SYNC units (single GPS timing source with multiple PTP-SYNC units or ODU systems). Use an un-screened CAT5e Ethernet cable and connect the cable between PTP-SYNC units. 

Power-up, testing and fault finding

The correct operation is as follows

- Ensure that all cables are connected to the correct interfaces of the PTP-SYNC unit and the GPS receiver module. Failure to do so may result in damage to the equipment.
- Connect mains power to the PIDU unit.
- Within 90 seconds the 'STATUS' LED should blink once every second to show that satellite lock has been achieved.
- If the system does not operate correctly, refer to the fault finding guide below.

Fault Finding Guide

LEDs do not illuminate

Ensure that there is a cable connection between the PIDU 'ODU' interface and the 'PIDU IN' interface of the PTP-SYNC unit.

A 1PPS synchronisation pulse does not appear to be detected by the PTP-SYNC unit (no satellite lock)

Failure of the 'STATUS' LED to illuminate or blink.

Depending on configuration:

1) System using a GPS receiver module - Ensure that there is a cable connection between the PTP-SYNC 'GPS/SYNC IN' interface and the LPU, also that there is a cable connection between the LPU and the GPS receiver module. Check that the GPS receiver module has an uninterrupted view of the sky.

2) System using an alternative 1PPS timing source - Ensure that there is a cable connection between the PTP-SYNC 'GPS/SYNC IN' or '1PPS IN' interface and the 1PPS timing source.

No communications between clustered PTP-SYNC units

Ensure that there is a cable connection between the ‘SYNC OUT’ interface of the first PTP-SYNC unit and ‘GPS/SYNC IN’ interface of the second PTP-SYNC unit.

No communications between PTP-SYNC and ODU

Failure of the ‘ODU’ LED to illuminate within 90 seconds of power-up.

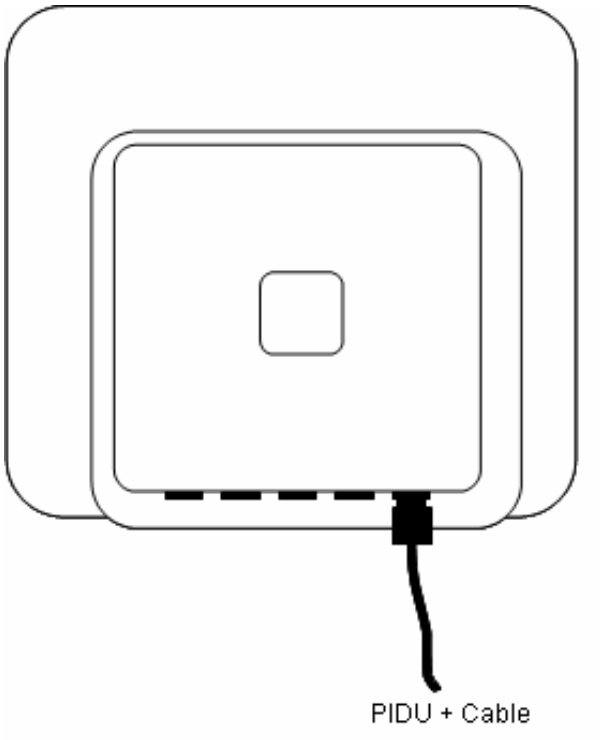
Ensure that there is a cable connection between the PTP-SYNC ‘ ODU OUT’ interface and the either the ODU or the LPU unit leading to the ODU.

Connecting the ODU, PIDU and LPUs

Locating the PIDU port on the ODU

Looking at the back of the unit with the cable entry at the bottom, the PIDU Plus connection is the first hole on the right (Figure 5-16) and is labeled “PIDU +”.

Figure 5-16 ODU PIDU Plus connection



Connecting the ODU to the PIDU cable

Perform this task to connect the ODU to the drop cable from the PIDU. It is often easier to carry out this procedure on the ground or a suitable surface prior to mounting the ODU.

⚠ CAUTION

To prevent damage to the ODU while making or breaking the connection, ensure that power is removed from the system at the PIDU Plus.

To connect the PIDU Plus port of the ODU to the drop cable, proceed as follows:

Procedure 5-14 Connect the PIDU Plus to the ODU

1	Prepare the ODU end of the drop cable as described in Preparing the supported Superior Essex cable on page 5-8.
2	Connect the cable gland of the drop cable to the PIDU Plus port of the ODU as described in Connecting the drop cable to an ODU or LPU on page 5-16. 

NOTE

If it is necessary to disconnect the drop cable from the ODU, refer to Disconnecting the drop cable from an ODU or LPU on page 5-18.

Routing the cable

After connecting the cable to the ODU it can be routed and secured using standard cable routing and securing techniques. When the cable is in place it can then be cut to the desired length at the PIDU Plus prior to connection to the PIDU Plus.

Fitting lightning protection units

Depending upon the chosen site configuation, it may be necessary to fit two or more lightning protection units (LPUs). For more information, refer to Site installation diagrams on page 2-26.

To mount an LPU and connect it to the input and output drop cables, proceed as follows:

Procedure 5-15 Mount LPU and connect to GPS receiver

1	Check the contents of the LPU box (Figure 2-9 or Figure 2-10).
2	Mount the LPU (following manufacturer's instructions) at the required point. Mount the LPU vertically with cable glands facing downwards.
3	Prepare the input and output drop cable as described in Preparing the supported Superior Essex cable on page 5-8.
4	Connect the cable gland of the input and output drop cable to the LPU as described in Connecting the drop cable to an ODU or LPU on page 5-16.

NOTE

If it is necessary to disconnect a CAT5e cable from an LPU, refer to Disconnecting the drop cable from an ODU or LPU on page 5-18.

Grounding the installation

Install the equipment in accordance with Section 810 of the National Electric Code, ANSI/NFPA No.70-1984 or Section 54 of the National Electrical Code in the country of installation. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit, size of grounding conductors and connection requirements for grounding electrodes. Motorola recommends that installation of the outdoor unit be contracted to a professional installer.

Grounding the ODU

The Outdoor Unit (ODU) must be properly grounded to protect against power surges.

Additional grounding points

If the ODU is installed on a metal mast or tower, the screen of the supported Superior Essex cable must be bonded to the tower at the top and bottom ends. Additional grounding at intermediate points of the cable may be required if the cable is longer than 15m (50 feet).

To ground the cable, follow the procedure described in Grounding the drop cable to a metal tower or mast on page 5-11.

Connecting the PIDU to the ODU cable

Perform this task to connect the PIDU to the drop cable from the ODU.

The drop cable from the ODU is connected to the PIDU Plus by means of a concealed RJ45 socket. The RJ45 socket has been placed inside the PIDU Plus hinged cover to prevent the user from inadvertently plugging other equipment into the ODU RJ45 socket.

⚠ CAUTION

Plugging other equipment into the ODU RJ45 socket may damage the equipment due to the non-standard techniques employed to inject DC power into the 1000BaseT connection between the PIDU Plus and the ODU. Plugging the ODU into other equipment may damage the ODU and/or the other equipment.

To connect the PIDU Plus port of the ODU to the drop cable, proceed as follows:

Procedure 5-16 Connecting the ODU to the PIDU Plus

1	Undo the retaining screw and hinge back the cover. 
2	Plug in the ODU into the PIDU Plus Cable ensuring that it snaps home. 
3	Replace the cover and secure with the retaining screw. 

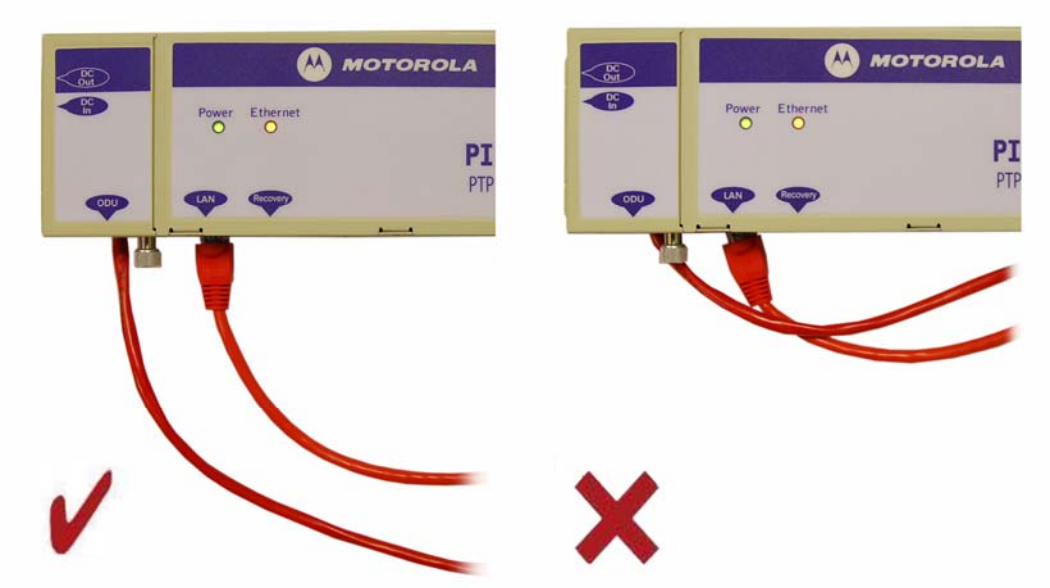
Mounting the PIDU Plus

Mount the PIDU Plus on a wall or other suitable mounting surface, using the lugs provided. This prevents the unit from being knocked or kicked and can help maintain link availability. Ensure that the Recovery switch can be accessed when mounting the unit.

⚠ CAUTION

Do not dress the PIDU cables too tightly, as this may make the connections unreliable. Figure 5-17 shoes the correct and incorrect ways to dress the cables.

Figure 5-17 Correct and incorrect PIDU cable dressing



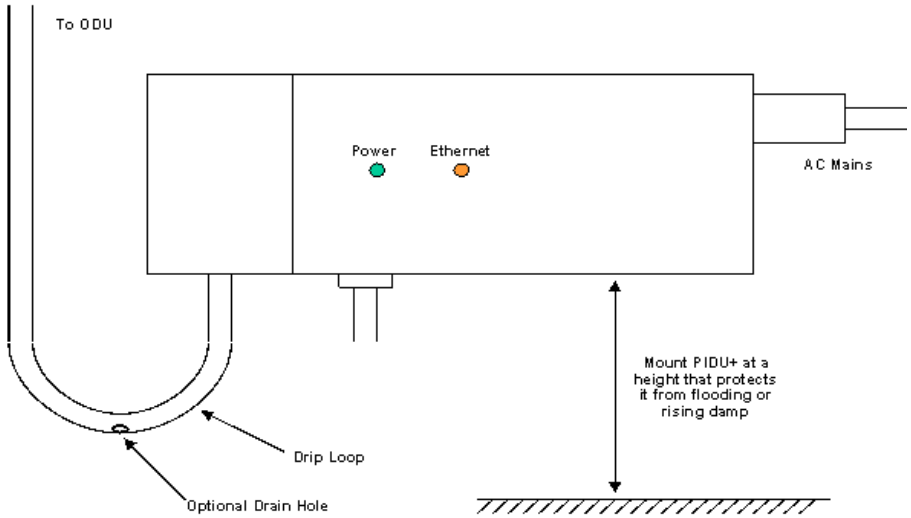
⚠ CAUTION

The PIDU Plus is not waterproof and should be mounted away from sources of moisture. If mounted outdoors, the unit should be mounted in a rain proof enclosure, preferably ventilated.

Drip loop

Fit a drip loop on the PIDU Plus to ODU cable to ensure that any moisture that runs down the cable into the cabinet or enclosure cannot enter the PIDU Plus. This is shown in Figure 5-18. The network connection and mains cable should be treated in the same way if there is a risk that they can carry moisture to the PIDU Plus.

Figure 5-18 PIDU Plus drip loop configuration



⚠ CAUTION

It is possible for moisture to enter the cable due to damage to the outer protective layer. This moisture can track down the inside of the cable, filling up the drip loop and eventually finding its way into the PIDU Plus. To protect against this the outer protective layer of the cable can be opened up at the bottom of the drip loop to allow this moisture to escape.

Installing E1 and T1

This section describes the installation and configuration of the E1/T1 interface.

NOTE

The maximum cable length between the ODU and the customers terminating equipment is 200m (656 feet) for E1/T1.

E1 / T1 connection diagrams

The E1/T1 cable should be assembled as described in Cables and connectors on page 1-15. This procedure applies to the ODU termination, but it must be repeated for the customer equipment end of the cable when the cable is terminated with an RJ45.

T568B color coding

The T568B color coding used in RJ45 E1/T1 cables is illustrated in Figure 5-19 and Figure 5-20. The telecoms connection pin outs are specified in Table 5-2.

Figure 5-19 RJ45 pin connection (T568B color coding)

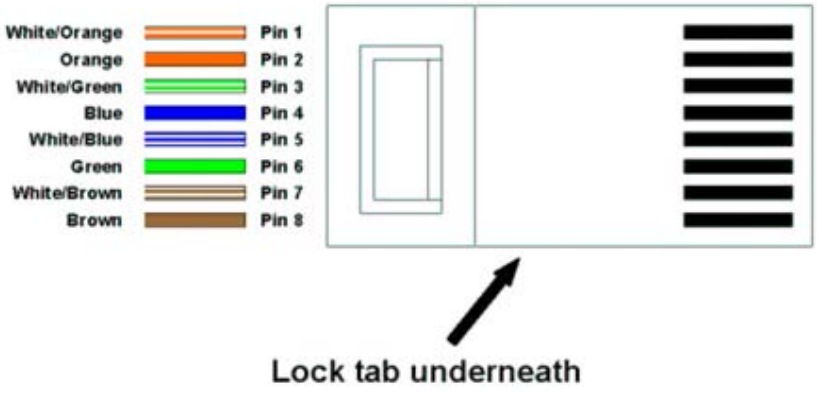


Figure 5-20 Cable connection diagram (T568B color coding)

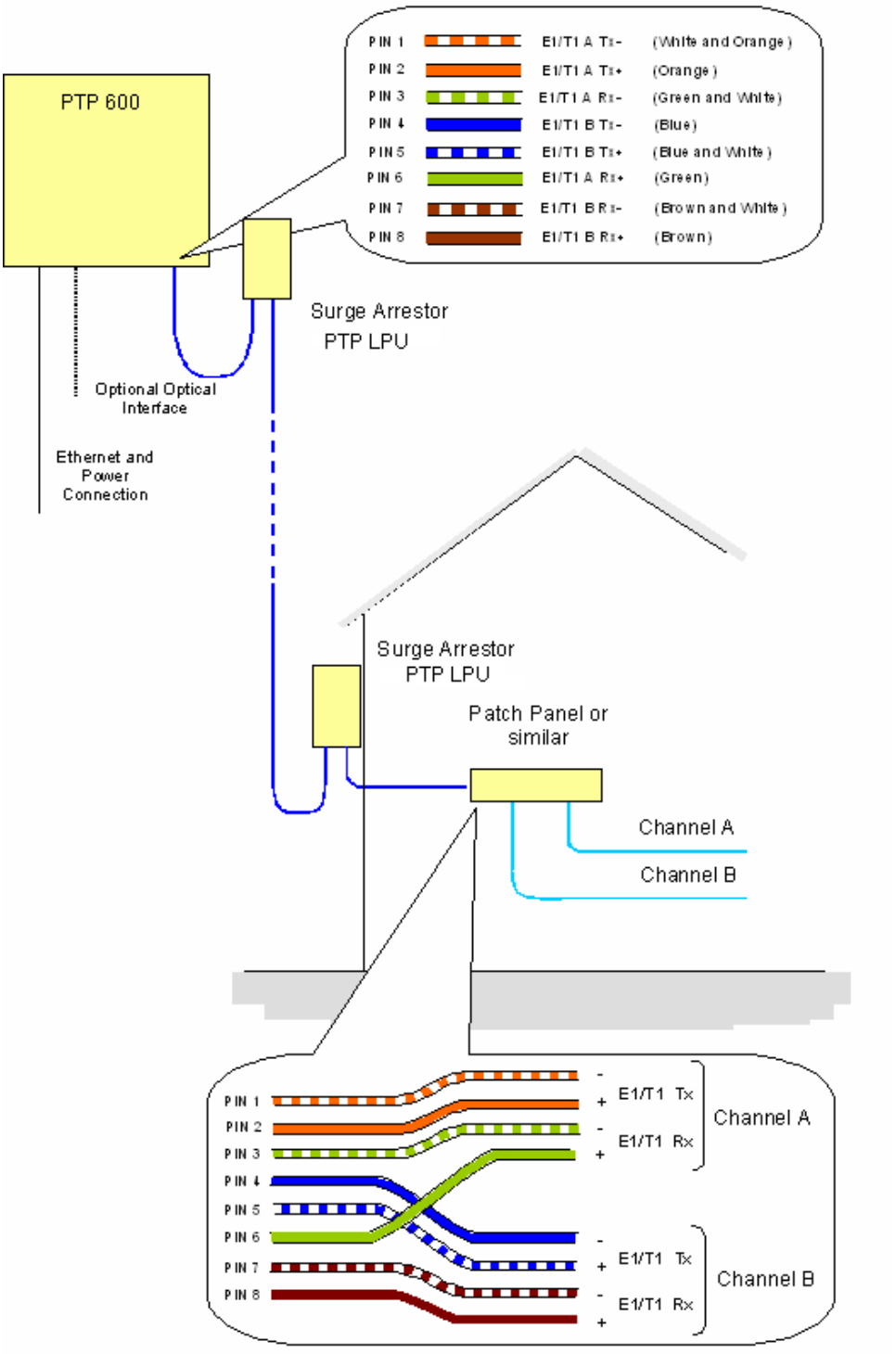
Table 5-2 Telecoms connection pin out

Telecoms	Connector Pinout Signal Name
Pin 1	E1T1A_TX-
Pin 2	E1T1A_TX+
Pin 3	E1T1A_RX-
Pin 4	E1T1B_TX-
Pin 5	E1T1B_TX+
Pin 6	E1T1A_RX+
Pin 7	E1T1B_RX-
Pin 8	E1T1B_RX+

Connections at the ODU and patch panel

The E1/T1 connections at the ODU and patch panel are illustrated in Figure 5-21.

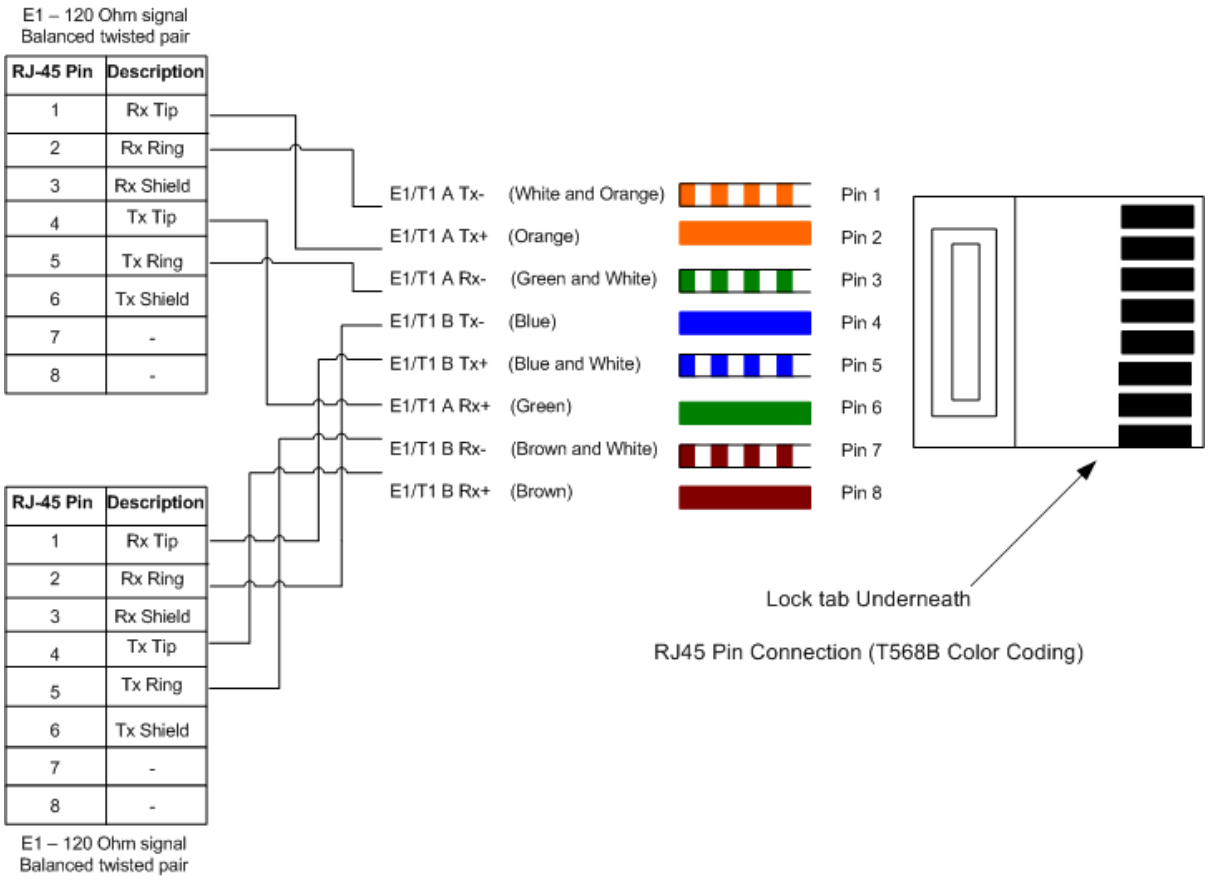
Figure 5-21 E1-T1 connections at the ODU and patch panel



Balancing signals

The balancing of E1/T1 120 Ohm signals is illustrated in Figure 5-22.

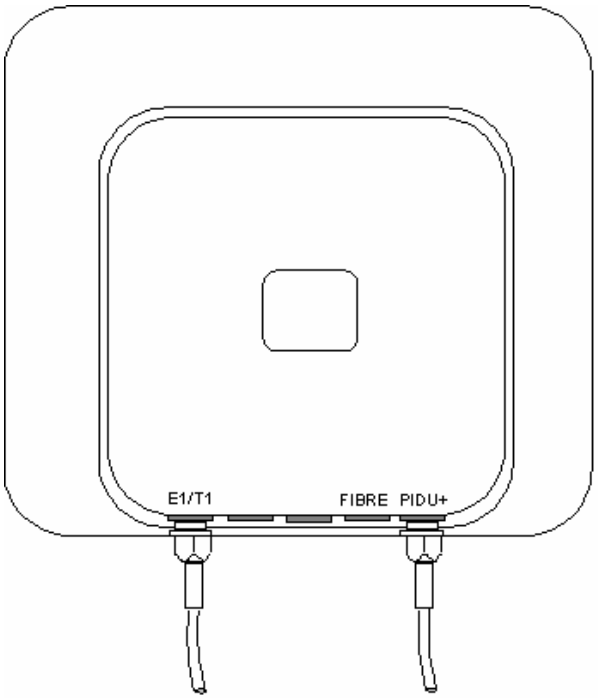
Figure 5-22 Two E1-T1-120 ohms signal balanced to PTP600 interface



Locating the E1/T1 port on the ODU

Looking at the back of the unit with the cable entry at the bottom, the PTP 600 Series E1/T1 connection is the first hole on the left (Figure 5-23) and is labeled E1/T1.

Figure 5-23 PIDU Plus and E1/T1 connection



Connecting the ODU to the E1 / T1 cable

Perform this task to connect the ODU to the E1/T1 cable. It is often easier to carry out this procedure on the ground or a suitable surface prior to mounting the ODU.

CAUTION

To prevent damage to the ODU while making or breaking the connection, ensure that power is removed from the system at the PIDU Plus.

To connect the E1/T1 port of the ODU to the E1/T1 cable, proceed as follows:

Procedure 5-17 Connect the E1/T1 cable to the ODU

1	Prepare the ODU end of the E1/T1 cable as described in Preparing the supported Superior Essex cable on page 5-8.
2	Connect the cable gland of the E1/T1 cable to the E1/T1 port of the ODU as described in Connecting the drop cable to an ODU or LPU on page 5-16. 

NOTE

If it is necessary to disconnect the E1/T1 cable from the ODU, refer to Disconnecting the drop cable from an ODU or LPU on page 5-18.

Routing the cable

After connecting the cable to the ODU it can be routed and secured using standard cable routing and securing techniques. When the cable is in place it can then be cut to the desired length.

Customer cable termination

The two channels can be separated by means of a patch panel which may include Baluns for transmission over 75 Ohm co-axial unbalanced lines. Such equipment should conform to the requirements of C.C.I.T.T. G703. An example of a Balun is shown below. It allows the transmit and receive data carried over a 75 Ohm cable to be converted to a balanced form for transmission over a 120 Ohm signal balanced twisted pair.

Figure 5-24 Example of a Balun

Lightning protection and E1 / T1

Lightning protection on page 2-18 contains the basic requirements for the Motorola PTP 600 Series deployment. For E1/T1, an extra grounding cable is supplied to connect the other PTP-LPU to the ODU ground. This section details the additional requirements for the deployment of E1/T1.

Recommended components for E1 / T1 installation

For a description of Zone A and Zone B refer to Lightning protection zones on page 2-19.

Table 5-3 Protection requirements

Component	Zone A	Zone B
Earth ODU	Mandatory	Mandatory
Screen Cable	Mandatory	Mandatory
Lightning Protection Unit PTP LPU at ODU	Mandatory	Mandatory
Earth Cable at Building Entry	Mandatory	Mandatory
Lightning Protection Unit PTP LPU at Building Entry	Mandatory	Mandatory

Refer to Site installation diagrams on page 2-26 to see how the components of PTP 600 sites with E1/T1 are installed and connected. This section also lists the recommended components for each type of installation.

Testing the E1/T1 installation

If you have opted to fit a Lightning Protection Unit, it should be tested as described in LPU installation wiring on page 2-24.

Test the telecoms links by performing loopback connections as described in Configuring the telecoms circuits on page 6-49.

Pre-power testing

Before connecting your E1/T1 source, check the following resistances:

- Check the cable resistance between pins 3 & 6 (Green/White & Green) and 7 & 8 (Brown/White & Brown). Check against Table 5-4 column 2.
- Check the cable resistance between pins 1 & 2 (Orange/White & Orange) and 4 & 5 (Blue & Blue/White). Check against Table 5-4 column 3.

Table 5-4 Resistance referenced to the E1/T1 source

CAT-5 Length (Meters)	Resistance between pins 3 & 6 and pins 7 & 8 (ohms)	Resistance between pins 1 & 2 and pins 4 & 5 (ohms)
0	0.8	1.3
10	2.5	3.0
20	4.2	4.7
30	5.9	6.4
40	7.6	8.2
50	9.3	9.8
60	11.0	11.5
70	12.7	13.2
80	14.4	14.9
90	16.1	18.2
100	17.8	18.3

Establishing a radio link

This section describes how to establish a radio link between the two units forming the bridge and align the units for the best signal strength.

Before performing these tasks, connect the PIDU Plus to the network, power up the unit and open the web interface. For more information, refer to:

- Powering up and connecting the PIDU Plus on page 5-3.
- Opening the web interface on page 5-4.

Using the ODU installation tones

The PTP 600 ODU emits audible tones during installation to assist with alignment. The pitch of the alignment tone is proportional to the received power of the wireless signals. Adjust the alignment of the unit in both azimuth and elevation until the highest pitch tone is achieved. The tones and their meanings are described in Table 5-5. In each of the states detailed in the table, align the unit to give the highest pitch tone.

Table 5-5 ODU installation tones

State Name	Tone Description	State Description	Pitch Indication
Free Channel Search	Regular beep	Executing band scan	N/A
Scanning	Slow broken tone	Not demodulating the wanted signal	Rx Power
Synchronized	Fast broken tone	Demodulating the wanted signal	Rx Power
Registered	Solid tone	Both Master and Slave units exchanging Radio layer MAC management messages	Rx Power
Alarm	Fast broken dual tone	A fatal error has occurred.	

The term ‘wanted signal’ refers to that of the peer unit being installed.

CAUTION

If, when in the Synchronized or Registered state, the tone varies wildly, there may be interference or a fast fading link. Installing in this situation may not give a reliable link. Investigate the cause of the problem.

Aligning the units

To align the units, proceed as follows:

Procedure 5-18 Align Master and Slave

1	Adjust the elevation and azimuth of the Master unit to achieve an approximate visual alignment with the site of the Slave unit.
2	Adjust the elevation and azimuth of the Slave unit to achieve an approximate visual alignment with the site of the Master unit.
3	Without moving the Master unit, adjust the elevation and azimuth of the Slave unit to achieve the highest pitch installation tone.
4	Without moving the Slave unit, adjust the elevation and azimuth of the Master unit to achieve the highest pitch installation tone.
5	Repeat steps 3 and 4 as necessary to fine tune the alignment.

NOTE

To achieve best results, make small incremental changes to elevation and azimuth.

There is a graphical installation screen (see Graphical install on page 6-75) available in the web interface that displays the state of the link during the alignment process (up = green, down = red).

Behaviour during alignment

When the units are powered up and alignment begins, the following behavior may be observed:

Band scan

When first started up and from time to time, the Master unit will carry out a band scan to determine which channels are not in use. During this time, between 10 and 15 seconds, the Master unit will not transmit and as a consequence of this neither will the Slave unit. During this time the installation tone on the master unit will drop back to the band scan state, and the Slave unit will drop back to the Scanning state with the pitch of the tone set to the background noise level. Alignment of the unit should cease during this time.

Radar detection

If the unit is operating where mandatory radar avoidance algorithms are implemented, the ranging behaviour for the PTP 600 Series may be affected. The Master has to monitor the initially chosen channel for 60 seconds to make sure it is clear of radar signals before transmitting. If a radar is detected during any of the installation phases, a further compulsory 60 seconds channel scan will take place as the master unit attempts to locate a new channel that is free of radar interference.

Ranging

The Master unit can take up to 60 seconds in 0-40 km (0-25 miles) mode, 90 seconds in 0-130 km (0-81 miles) mode and 120 seconds in 0-200 km (0-124 miles) mode to determine the range of the link being installed. The Master unit will remain in the Scanning state until the range of the link has been established. The Master unit will only move to the Synchronized state when the range of the link has been established.

The Slave unit does not have a ranging process. The slave unit will change to the Synchronized state as soon as the wanted signal is demodulated.

Retrying same channel

If, at the end of the ranging period, the Registered state is not achieved due to interference or other reasons, the Master unit will retry twice more on the same channel before moving to another available channel. Should this occur it might take a number of minutes to establish a link in the Registered state.

Adjusting power settings

The transmit power levels of the installed units must be adjusted to ensure they are not too high. Excessive power levels may cause saturation of the receivers or false radar detection (in radar enabled regions), leading to degradation of link performance and link failure.

To adjust power levels, proceed as follows:

Procedure 5-19 Adjust power levels

1	Consult the report generated by the LINKPlanner tool and note the Transmit power recommended levels.
2	Set the local unit power equal to the “LOCAL - Max Transmit Power setting while pointing” value from the LINKPlanner report.
3	Set the remote unit power equal to the “REMOTE - Max Transmit Power setting while pointing” value from the LINKPlanner report.
4	Access each unit separately.
5	Align the units.
6	Repeat Step 2 and 3 using the values “LOCAL - Max Transmit Power setting before disarm” and “REMOTE - Max Transmit Power setting before disarm” , if different than the corresponding “while pointing” values.
7	Reboot the local unit then reboot the remote unit.
8	Disarm the units.

Disarm on completion

When the alignment process is complete, disarm both units in the link, as described in Installation pages on page 6-51. This is necessary in order to:

- Turn off the audible alignment aid (see Disarm installationon page 6-72)
- Enable Adaptive Modulation
- Fully enable Advanced Spectrum Management with i-DFS
- Clear unwanted installation information from the various systems statistics
- Store the link range for fast link acquisition on link drop
- Enable higher data rates

NOTE

After 24 hours, the units will be disarmed automatically, provided that they are armed and that the link is up.

Chapter 6 Operation

This chapter describes the PTP 600 web user interface and provides instructions for operators.

The following topics are described in this chapter:

NOTE

The web pages are best viewed using a screen resolution of at least 1024 x 768 pixels on a PC using Microsoft Internet Explorer Version 6 or 7.

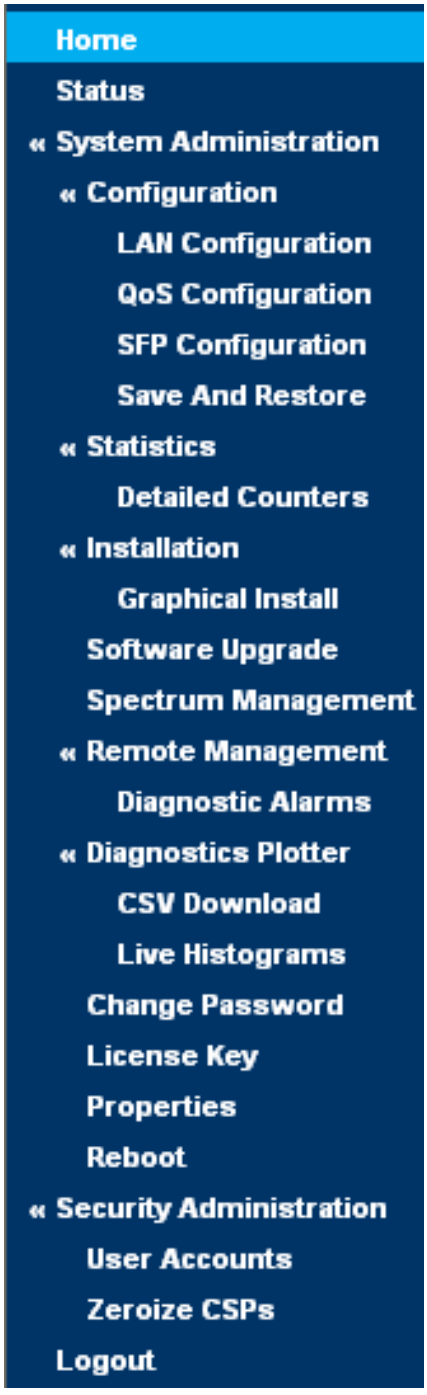
The web pages have also been tested with Firefox 2.0.0.12. Other browsers have not been tested.

Web-based management

Menu navigation bar

The navigation bar on the left hand side of the web page is used to move between the various management pages. The currently selected page is always highlighted with a light blue background. The menu is hierarchical. Selecting a menu item which has associated submenu options will automatically display all sub options. A sample web page with the navigation menu is shown in Figure 6-1.

Figure 6-1 Menu navigation bar



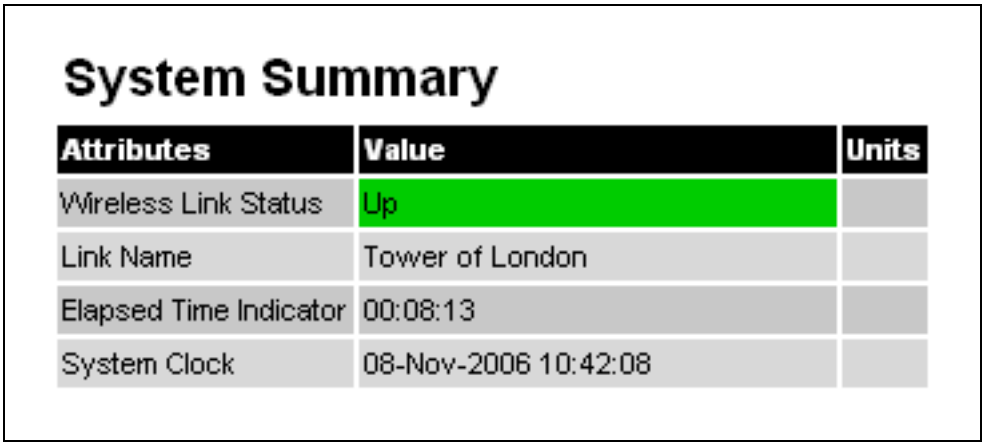
The web user interface menu has three main options.

- **Home:** This presents to the operator a high level summary of the PTP 600 Series point-to-point wireless link.
- **Status:** This presents a more detailed set of system parameters describing the performance of the wireless link together with other key system performance metrics.
- **System Administration**: This section is password protected and allows the system administrator to perform all the day-to-day administrative procedures, for example software upgrade and configuration changes.

Home (system summary)

The home page for the PTP 600 Series (Figure 6-2) displays a high level summary of the status of the wireless link and associated equipment.

Figure 6-2 System Summary page



The home page normally displays four key system attributes:

Wireless Link Status

The Wireless Link Status attribute displays the current status of the PTP 600 Series wireless link. A state of ‘Up’ on a green background indicates that a point-to-point link is established. A state of ‘Down’ on a red background indicates that the wireless link is not established. If the link is down for an unknown reason the system administrator should first consult the status web page for a more detailed summary of up to date system diagnostics.

Link Name

The link name attribute is a name and/or handle allocated by the system administrator to aid the identification of the unit, network or building.

Elapsed Time Indicator

The elapsed time indicator attribute presents the total time in days, hours, minutes and seconds since the last system restart. The system can restart for several reasons, for example, commanded reboot from the system reboot webpage, or a power cycle of the equipment.

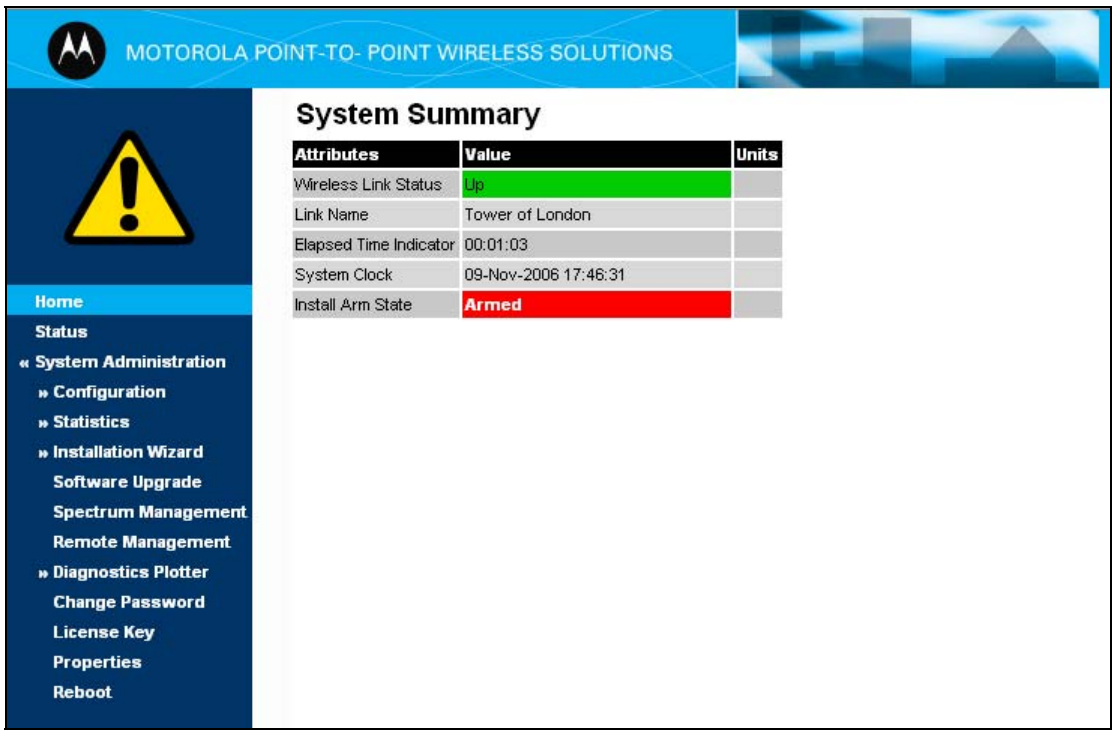
System Clock

If SNTP (Simple Network Time Protocol) is enabled, or the clock has been set, then a system clock attribute is displayed giving the date and time of the last page refresh. Section SNTP (Simple Network Time Protocol) on page 6-117 explains how to enable SNTP and Section Setting the clock on page 6-118 explains how to set the clock.

Home page alarm display

The home page is also used to display all outstanding major system alarms. Whenever system alarms are asserted, a yellow warning triangle is displayed on web page navigation bar. The warning triangle will be visible from all web pages. Clicking the warning triangle will cause the web page to jump back to the system homepage. Figure 6-3 shows a sample alarm screen.

Figure 6-3 Alarm warning triangle



System alarms

The following system alarms are defined:

Region code

The region code prohibits the wireless unit from operating outside the regulated limits. An invalid region code indicates a corrupted license key. Note that a change of state may generate an SNMP trap and/or SMTP email alert.

Install Status

A non-OK value indicates that signaling was received with the wrong MAC address. Note that it is very unusual to detect this, because units with wrongly configured Target MAC Address will normally fail to establish a wireless link. However, rare circumstances may establish a partial wireless link and detect this situation. NB: A non-OK value on start-up, or a change of value during operation, may generate an SNMP trap and/or SMTP email alert.

Install Arm State

This alarm warns when a wireless unit is in installation mode. After installation the wireless unit should be disarmed. This will increase the wireless link's data-carrying capacity and stop the installation tone generator. The wireless link is disarmed from the 'Installation' process see Disarm installation on page 6-72. A change of state may generate an SNMP trap and/or SMTP email alert.

Unit Out Of Calibration

The unit is out of calibration and must be returned to the factory using the RMA process for re-calibration.

Incompatible Region Codes

The PTP 600 Series uses region codes to comply with local regulatory requirements governing the transmission of wireless signals in the frequency bands in which it operates. Region codes can only be changed by obtaining a new PTP 600 Series license key. If this alarm is encountered, the appropriate license keys from the country of operation should be obtained from your distributor. Applying license keys containing the same region codes to both ends of the link will remove the alarm. A change of state may generate an SNMP trap and/or SMTP email alert.

Incompatible Master and Slave

A non-zero value indicates that the master and slave ends of the wireless link are different hardware products, or have different software versions. Note that it is very unusual to detect this because incompatible units will normally fail to establish a wireless link. However, some combinations may establish a partial wireless link and detect this situation. Note that a non-zero value may generate an SNMP trap and/or SMTP email alert.

Ethernet Configuration Mismatch

The detection of Ethernet fragments (runt packets) when the link is in full duplex is an indication of an auto-negotiation or forced configuration mismatch. Note that a change of state may generate an SNMP trap and/or SMTP email alert.

No Wireless Channel Available

Spectrum Management was unable to locate a suitable wireless channel to operate on. Note that a change of state may generate an SNMP trap and/or SMTP email alert.

SNTP Synchronization failed

This warning indicates that SNTP has been enabled but that the unit is unable to synchronize with the specified SNTP server. Section SNTP (Simple Network Time Protocol) on page 6-117 explains how to configure SNTP. Note that a change of state may generate an SNMP trap and/or SMTP email alert.

Wireless Link Disabled Warning

This warning is displayed if the Wireless link has been administratively disabled via the SNMP Interface (see Managing faults on page 6-112). The Wireless Interface MIB-II ifAdminStatus attribute has been set to DOWN. To enable the Ethernet interface, set the ifAdminStatus attribute to UP. Note that a change of state may generate an SNMP trap and/or SMTP email alert.

Ethernet Link Disabled Warning

This warning is displayed if the Ethernet link has been administratively disabled via the SNMP Interface (see Managing faults on page 6-112). The Ethernet Interface MIB-II ifAdminStatus attribute has been set to DOWN. To enable the Ethernet interface, set the ifAdminStatus attribute to UP. Note that a change of state may generate an SNMP trap and/or SMTP email alert.

Ethernet Link Status

Current status of the Ethernet link. If there are any problems with the Ethernet interface, this alarm will be asserted. This alarm will most likely be seen if the unit has no Ethernet cable plugged into its Ethernet socket. Note that a change of state may generate an SNMP trap and/or SMTP email alert.

Fiber Link Status

If the fiber link is not OK, there are two possible causes: Either the fiber link has been installed but disabled (because the license key does not include fiber support), or the link could not be established even though an optical carrier was detected (due perhaps to a broken TX fiber, or the link is disabled at the fiber link partner). Note that a change of status may generate an SNMP trap and/or SMTP email alert.

Telecoms Channel A/B Status

Indicates one of the following alarm conditions on a telecoms channel:

Alarm Condition	Meaning
No Signal (Local)	There is no telecoms signal present at the connection to the ODU at the local end.
No Signal (Remote)	There is an absence of telecoms data across the wireless link.
No Signal (Local and Remote)	The above two alarm conditions occur concurrently.
Remote Timing	There is insufficient wireless capacity available to carry telecoms data. Under these conditions telecoms timing information is still sent to keep the telecoms clocks synchronized.
No Signal (Local) and Remote Timing	Indicates both no local signal and remote timing.

In remote timing mode the ODU will transmit an Alarm Indication Signal (AIS), consisting of all-ones, from the associated telecoms interface. A change of state may generate an SNMP trap and/or SMTP email alert.

See Telecoms interface on page 6-57 for a description of the Telecoms Interface.

Telecoms Channel A/B Loopback

The loopback status of telecoms channel A and B. These are intended for installation testing and should be set to 'None' for normal operation. The wire connections to a unit can be tested by applying a 'Copper' loopback to the local unit. The wireless connection to the remote unit can be tested by applying a 'Wireless' loopback to the remote unit with no loopback on the local unit.

A change of state may generate an SNMP trap and/or SMTP email alert. The loopback can be disabled from the telecoms configuration sub menu (see Configuring the telecoms circuits on page 6-49).

See Telecoms interface on page 6-57 for a description of the Telecoms Interface.

TDD Synchronization Alarm

Indicates the current status of the TDD Synchronization (OK, Timing System Failure, Not Synchronized). Note that a change of state may generate an SNMP trap and/or SMTP email alert.

Link Mode Optimization Mismatch

The Master and Slave ODUs are configured to use different link mode optimization methods (one is set to IP and the other TDM).

System status

The status page (Figure 6-4) gives the system administrator a detailed view of the operation of the PTP 600 Series from both the wireless and network perspectives.

Figure 6-4 System Status page

System Status - Master

Equipment

Attributes	Value	Units
Link Name		
Site Name		
Software Version	45600-B1710+ wdog	
Hardware Version	D06-R01-C	
Region Code	Region Code 23	
Elapsed Time Indicator	00:51:15	
Ethernet / Internet		
Ethernet Link Status	Copper Link Up	
Ethernet Speed And Duplex	1000 Mbps Full Duplex	
Group ID	82	
MAC Address	00:04:56:88:00:12	
Remote MAC Address	00:04:56:88:00:48	
Remote IP Address	1.1.100.12	
Telecoms		
Channel A	Disabled	
Channel B	Disabled	
TDD Synchronization		
TDD Synchronization Inactive	TDD Sync Disabled	
Status Page Refresh Period	3600	Seconds

Wireless

Attributes	Value	Units
Wireless Link Status	Up	
Maximum Transmit Power	20	dBm
Remote Maximum Transmit Power	12	dBm
Transmit Power	20.0, 19.9, -15.0, 20.0	dBm
Receive Power	-43.1, -49.7, -110.0, -49.2	dBm
Vector Error	7.2, -29.0, -36.8, -29.5	dB
Link Loss	103.6, 98.8, 0.0, 100.2	dB
Transmit Data Rate	150.01, 147.55, 0.00, 150.01	Mbps
Receive Data Rate	150.01, 147.86, 0.00, 150.01	Mbps
Link Capacity	300.02	Mbps
Transmit Modulation Mode	256QAM 0.81 (Dual) (30 MHz)	
Receive Modulation Mode	256QAM 0.81 (Dual) (30 MHz)	
Dual Payload	Enabled	
Link Symmetry	1 to 1	
Receive Modulation Mode Detail	Running At Maximum Receive Mode	
Range	0.1	km

Update Page Refresh Period | Reset form

The page is subdivided into five categories:

- **Equipment**: This contains the unit's inventory and identification information.
- **Wireless**: This presents the key wireless metrics, which are displayed as a series of measurements.
- **Ethernet/Internet**: This describes the unit's network identity and connectivity.
- **Telecoms**: This describes the unit's E1/T1 telecoms interface parameters.
- **TDD Synchronization**: This shows the status of TDD synchronization.

The status page can be configured to refresh itself at an operator defined rate (if the user is logged in as system administrator). The refresh period defaults to 3600 seconds and can easily be changed to refresh at any period between 2 seconds and 3600 seconds. Pressing the 'Update Page Refresh Period' button causes a new page refresh period to be adopted by the system. The page refresh mechanism uses a HTML Meta refresh command. Therefore the refresh is always initiated by the local browser and not by the PTP 600 Series at this interval.

The two PTP 600 Series units are arranged in a master and slave relationship. The roles of the units in this relationship are displayed in the page title. The master unit will always have the title '- Master', and the slave will always have '- Slave' appended to the 'Systems Status' page title.

The following attributes are displayed on the status page:

Link Name

The link name is allocated by the system administrator and is used to identify the equipment on the network. The link name attribute is limited to a maximum size of 63 ASCII characters.

Site Name

The site name is allocated by the system administrator and can be used as a generic scratch pad to describe the location of the equipment or any other equipment related notes. The site name attribute is limited to a maximum size of 63 ASCII characters.

Software Version

The attribute describes the version of software installed on the equipment. The format of the attributes is *FFSSS*-XX-*YY* where *FF* is the frequency variant (2.5, 4.5, 5.4, 5.8 or 5.9 GHz), *SSS* is the System Release, *XX* is the major release version and *YY* is the minor release version.

Hardware Version

The hardware version attribute contains all the combined hardware version information. The attribute is formatted as D*XX*-R*YY*-*Z* where D*XX* contain the version of the digital card, R*YY* contains the version of the RF (radio frequency) card and *Z* describes the antenna type which can be I (integrated) or C (connectorized).

Region Code

The region code is used by the system to constrain the wireless to operate within regulatory regime of the particular country. The region code is encoded in the product license key. If the operator wishes to change region code, a new license key must be obtained from Motorola or the local point-to-point distributor or system integrator.

Elapsed Time Indicator

The elapsed time indicator attribute presents the total time in years, days, hours, minutes and seconds since the last system restart. The system can restart for several reasons, for example commanded reboot from the system reboot web page, or a power cycle of the equipment.

Ethernet Link Status:

This indicates the current status of the Ethernet link. A state of ‘Up’ with a green background indicates that an Ethernet link is established. A state of ‘Down’ with a red background indicates that the Ethernet link is not established.

Ethernet Speed and Duplex

The negotiated speed and duplex setting of the Ethernet interface. The speed setting is specified in Mbps.

Full Duplex data transmission means that data can be transmitted in both directions on a signal carrier at the same time. For example, on a local area network with a technology that has full duplex transmission; one workstation can be sending data on the line while another workstation is receiving data.

Half Duplex data transmission means that data can be transmitted in both directions on a signal carrier, but not at the same time. For example, on a local area network using a technology that has half duplex transmission, one workstation can send data on the line and then immediately receive data on the line from the same direction in which data was just transmitted.

Remote IP Address

Hyperlink to the other side of the Link. The IP address of the peer link is displayed if the Link is UP, otherwise “unavailable” is displayed.

Telecoms Channel A and B

Indicate the current status of the telecoms channels. Channels which are disabled during installation are marked as such. Correctly operating channels display "Up" on a green background, but alarm conditions (described in Section Home page alarm display on page 6-6) have a red background.

The Telecoms Latency value, displayed in microseconds, is determined when the wireless link starts and will remain the same for a given wireless configuration. Section Telecoms circuits on page 1-36 describes methods for reducing telecoms latency on links which support high data rate modulation modes.

Under normal circumstances the unit will freely transition between modulation modes to suit the wireless conditions. The "Single Payload Lock" indicates that the ODU will prevent transitions from Single Payload modes to the higher Dual Payload modes in order to avoid loss of telecoms data. This field appears where such a transition would pass through modes which cannot carry telecoms data. This may be because, in order to control latency, the lowest modulation mode has been set to a higher Single Payload mode.

In the absence of the Single Payload Lock the wireless will transition to the faster Dual Payload modes as soon as the conditions are appropriate. With the lock enabled, the wireless will dwell in slower Single Payload modes whenever there are operational telecoms links (operational links are shown as "Up" in the telecoms channel field described above). When the lock is actively preventing transitions, the value displayed changes from "Enabled" to "Applied".

TDD Synchronization

Displays the TDD Synchronization status for the link. For more information, refer to TDD synchronization status on page 6-16.

Refresh Page Period

The Status page refreshes automatically according to the setting entered here (in seconds). This attribute is only displayed when the user is logged on as System Administrator.

Wireless Link Status

As the attribute name suggests it displays the current status of the wireless link. A state of ‘Up’ on a green background indicates that a point-to-point link is established. A state of ‘Down’ on a red background indicates that the wireless link is not established.

Maximum Transmit Power

The maximum transmit power that the local wireless unit is permitted to use to sustain a link.

Remote Maximum Transmit Power

The maximum transmit power that the remote wireless unit is permitted to use to sustain a link.

Transmit Power

Transmit power histogram is expressed in dBm and presented as: max, mean, min, and latest. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. See Histogram data on page 6-18.

Receive Power

Receive power histogram is expressed in dBm and presented as: max, mean, min, and latest. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. See Histogram data on page 6-18.

Vector Error

The vector error measurement compares the received signal's In phase / Quadrature (IQ) modulation characteristics to an ideal signal to determine the composite error vector magnitude. The results are stored in an histogram and expressed in dB and presented as: max, mean, min and latest. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. The expected range for Vector Error would be approximately -2dB (NLOS link operating at sensitivity limit on BPSK 0.67) to –33dB (short LOS link running 256 QAM 0.83). See Histogram data on page 6-18.

Link Loss

The link loss is the total attenuation of the wireless signal between the two point-to-point units. See Histogram data on page 6-18.

The link loss calculation presented below:

Equation 6-1 Link loss

$$P_{ll} = P_{T_x} - P_{R_x} + g_{T_x} + g_{R_x}$$

Where	is
P_{ll}	Link Loss (dB)
P_{T_x}	Transmit power of the remote wireless unit (dBm)
P_{R_x}	Received signal power at the local unit (dBm)
g_{T_x}, g_{R_x}	Antenna gain at the remote and local units respectively (dBi). The antenna gain of the PTP 600 Series (23.5 dBi) is used unless one or both of the units is a Connectorized version.

Transmit Data Rate

The data rate in the transmit direction, expressed in Mbps and presented as: max, mean, min, and latest in an histogram format. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. Expected data rates can be found in Data rate calculations on page 4-99.

Receive Data Rate

The data rate in the receive direction, expressed in Mbps and presented as: max, mean, min, and latest in an histogram format. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. Expected data rates can be found in Data rate calculations on page 4-99.

Link Capacity

The maximum aggregate data rate capacity available for user traffic, assuming the units have been connected using Gigabit Ethernet. The link capacity is variable and depends of the prevailing wireless conditions as well as the distance (range) between the two wireless units.

Transmit Modulation Mode

The modulation mode currently being used on the transmit channel. A list of all the modulation modes can be found in Data rate calculations on page 4-99, where data rate calculations plots are given for each available modulation mode.

Receive Modulation Mode

The modulation mode currently being used on the receive channel. A list of all the modulation modes can be found in Data rate calculations on page 4-99, where data rate calculations plots are given for each available modulation mode.

Link Symmetry

A ratio that expresses the division between transmit and receive time in the TDD frame. The first number in the ratio represents the time allowed for the transmit direction and the second number represents the time allowed for the receive direction.

NOTE

Link Symmetry is configured at the master ODU only. The appropriate matching Link Symmetry is set at the slave ODU automatically. For example, if Link Symmetry is configured as “2 to 1” at the master ODU, then the slave ODU will be set automatically as “1 to 2”. In this example, the master-slave direction has double the capacity of the slave-master direction.

Receive Modulation Mode Detail

This supplies the user with information regarding the receive modulation mode in use. Possible values are:

- “Running at maximum receive mode”
- “Running at user-configured Max Modulation Mode”
- “Restricted due to byte errors on the wireless link or local Ethernet Tx Fifo Drops”
- “Restricted because a DFS channel change is in progress”
- “Restricted due to telecoms acquisition mode”
- “Restricted due to the low Ethernet link speed”
- “Limited by the wireless conditions”

Range

The range between the PTP 600 Series ODUs. This is displayed in km by default, but can be changed to miles by updating the ‘Distance Units’ attribute to imperial, as described in Properties on page 6-131.

TDD synchronization status

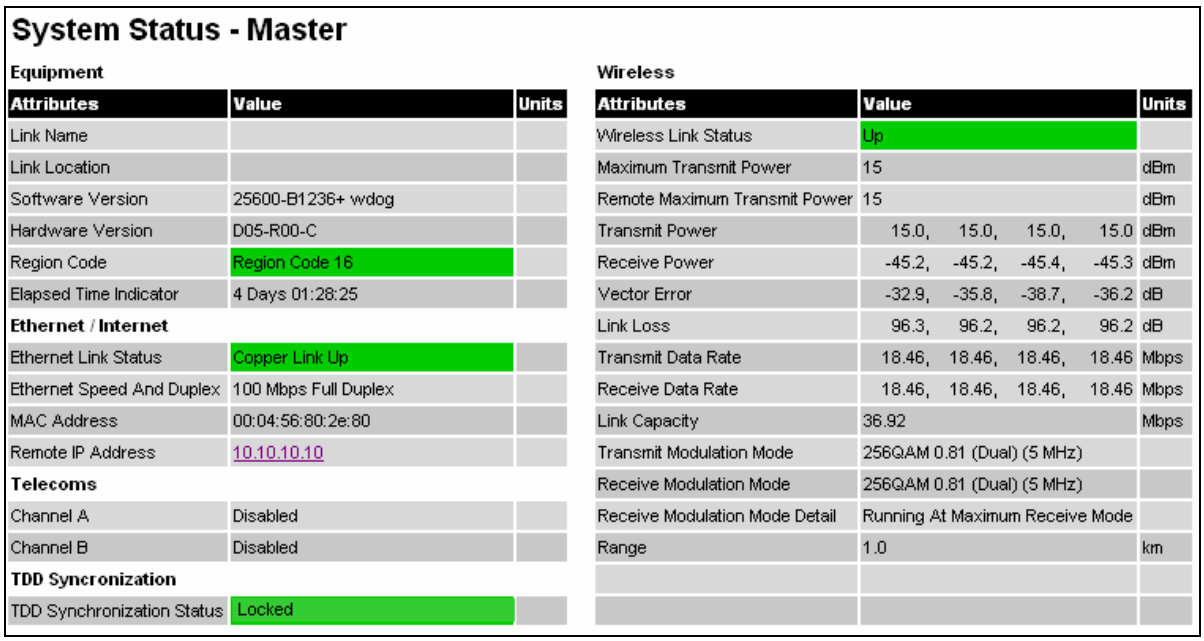
The Status Page displays the TDD Synchronization status for the link.

If TDD Synchronization is not enabled, the Attribute is set to “TDD Synchronization Inactive” and the Value is set to “Timing System Not Connected”.

If TDD Synchronization is enabled and the installation is rebooted, the Attribute is set to “TDD Synchronization Status” and the Value is set to one of the following:

- Locked: (Figure 6-5)
- Holdover:
- Holdover (Not Connected)
- Acquiring Lock
- No Timing Reference
- Timing System Not Connected (Figure 6-6)
- Initialising

Figure 6-5 Status page - TDD enabled and synchronized



System Status - Master

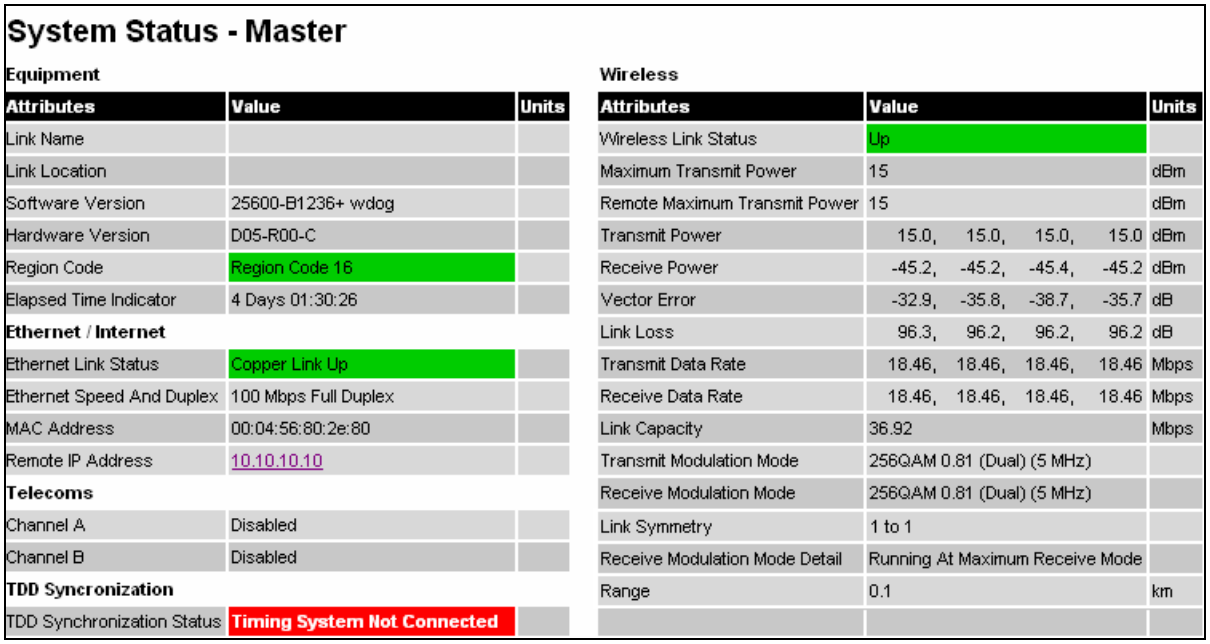
Equipment

Attributes	Value	Units
Link Name		
Link Location		
Software Version	25600-B1236+ wdog	
Hardware Version	D05-R00-C	
Region Code	Region Code 16	
Elapsed Time Indicator	4 Days 01:28:25	
Ethernet / Internet		
Ethernet Link Status	Copper Link Up	
Ethernet Speed And Duplex	100 Mbps Full Duplex	
MAC Address	00:04:56:80:2e:80	
Remote IP Address	10.10.10.10	
Telecoms		
Channel A	Disabled	
Channel B	Disabled	
TDD Syncronization		
TDD Synchronization Status	Locked	

Wireless

Attributes	Value	Units
Wireless Link Status	Up	
Maximum Transmit Power	15	dBm
Remote Maximum Transmit Power	15	dBm
Transmit Power	15.0, 15.0, 15.0, 15.0	dBm
Receive Power	-45.2, -45.2, -45.4, -45.3	dBm
Vector Error	-32.9, -35.8, -38.7, -36.2	dB
Link Loss	96.3, 96.2, 96.2, 96.2	dB
Transmit Data Rate	18.46, 18.46, 18.46, 18.46	Mbps
Receive Data Rate	18.46, 18.46, 18.46, 18.46	Mbps
Link Capacity	36.92	Mbps
Transmit Modulation Mode	256QAM 0.81 (Dual) (5 MHz)	
Receive Modulation Mode	256QAM 0.81 (Dual) (5 MHz)	
Receive Modulation Mode Detail	Running At Maximum Receive Mode	
Range	1.0	km

Figure 6-6 Status page - TDD enabled and not synchronized



System Status - Master

Equipment

Attributes	Value	Units
Link Name		
Link Location		
Software Version	25600-B1236+ wdog	
Hardware Version	D05-R00-C	
Region Code	Region Code 16	
Elapsed Time Indicator	4 Days 01:30:26	
Ethernet / Internet		
Ethernet Link Status	Copper Link Up	
Ethernet Speed And Duplex	100 Mbps Full Duplex	
MAC Address	00:04:56:80:2e:80	
Remote IP Address	10.10.10.10	
Telecoms		
Channel A	Disabled	
Channel B	Disabled	
TDD Syncronization		
TDD Synchronization Status	Timing System Not Connected	

Wireless

Attributes	Value	Units
Wireless Link Status	Up	
Maximum Transmit Power	15	dBm
Remote Maximum Transmit Power	15	dBm
Transmit Power	15.0, 15.0, 15.0, 15.0	dBm
Receive Power	-45.2, -45.2, -45.4, -45.2	dBm
Vector Error	-32.9, -35.8, -38.7, -35.7	dB
Link Loss	96.3, 96.2, 96.2, 96.2	dB
Transmit Data Rate	18.46, 18.46, 18.46, 18.46	Mbps
Receive Data Rate	18.46, 18.46, 18.46, 18.46	Mbps
Link Capacity	36.92	Mbps
Transmit Modulation Mode	256QAM 0.81 (Dual) (5 MHz)	
Receive Modulation Mode	256QAM 0.81 (Dual) (5 MHz)	
Link Symmetry	1 to 1	
Receive Modulation Mode Detail	Running At Maximum Receive Mode	
Range	0.1	km

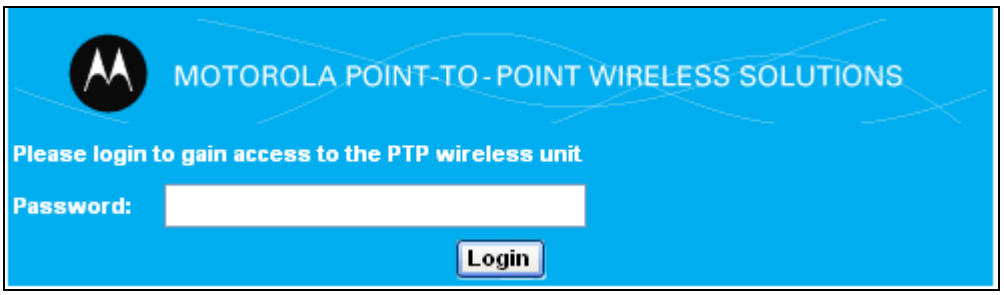
Histogram data

The histogram is calculated over a one hour period. If the equipment has been running for less than one hour, then the histogram is calculated over the current elapsed time. The data used to compute the histogram statistics can be downloaded in an ASCII comma separated value (CSV) format via the diagnostics CSV Download page, see CSV download on page 6-130.

System administration

Figure 6-7 shows the system administration login page. By default a system administrator password is not set.

Figure 6-7 System administration login page



The menu options that are available to the system administrator are:

- Configuration
- Statistics
- Installation
- Software Upgrade
- Spectrum Management
- Remote management
- Diagnostics Plotter
- Change Password
- License Key
- Properties
- Reboot

Configuring the PTP 600

The configuration of the PTP 600 Series is organized into the following sections:

- System configuration
- LAN configuration
- QoS Configuration
- Telecoms Configuration
- Save and Restore

The general configuration allows modification of high level administrative (descriptive) attributes and high level wireless configuration.

The LAN configuration sub menu allows the system administrator to modify the Ethernet and IP configuration of the PTP 600 Series.

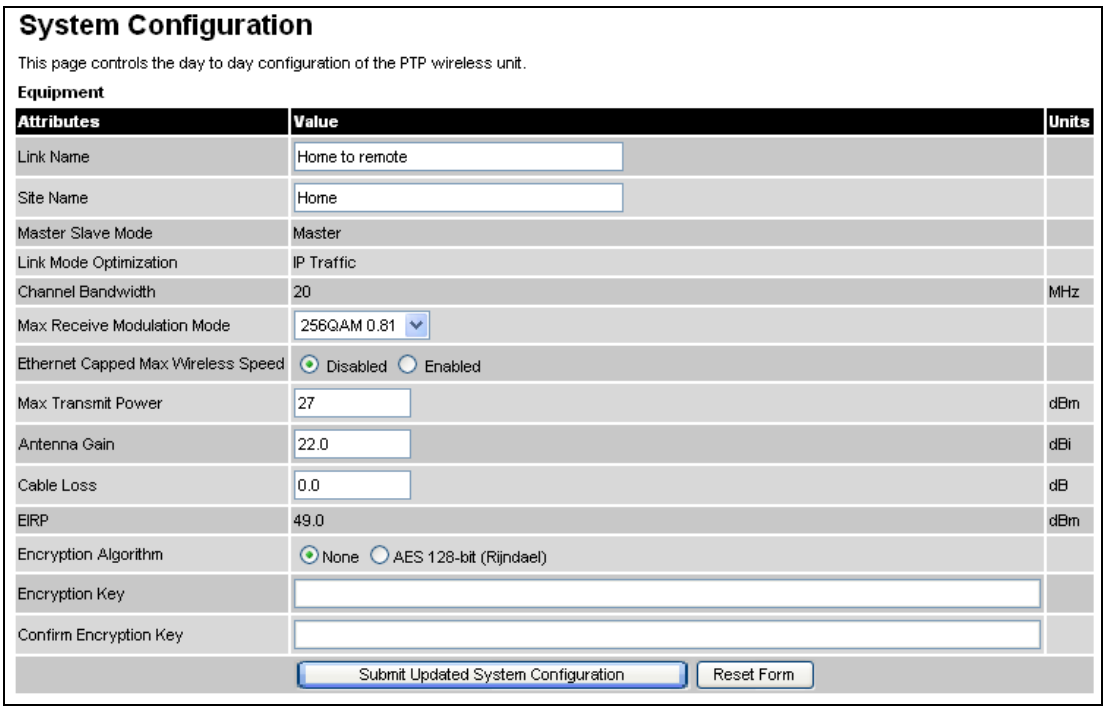
The telecoms submenu displays the current status of the telecoms interface and allows the configuration of interface loopbacks.

The save and restore submenu allows the system administrator to backup and restore the bridge configuration. It is recommended after a unit has been successfully installed; a copy of the active configuration is taken and archived by the system administrator.

System configuration

The system configuration page (Figure 6-8) is used by the system administrator to configure the PTP 600 Series's high level administrative (descriptive) attributes and high level wireless configuration.

Figure 6-8 System Configuration Page



While the majority of the system configuration is entered during installation and should never require changing, this page offers the system administrator the ability to change the basic system parameters for both the wireless and Ethernet components.

The System Configuration page contains the following attributes:

Link Name

User defined identity for the unit (max 63 characters).

Site Name

User defined name for the site, with additional notes (if required).

Master Slave Mode

Current settings is displayed This can be modified using the Installation pages, as described in Installation pages on page 6-51.

Link Mode Optimization

Current settings is displayed This can be modified using the Installation pages, as described in Installation pages on page 6-51.

Channel Bandwidth

Current settings is displayed This can be modified using the Installation pages, as described in Installation pages on page 6-51.

Max Receive Modulation Mode

This is the maximum mode the unit will use as its adaptive modulation. By default the Max Receive Modulation Mode is the highest mode available.

For minimum error rates, set the maximum modulation mode to the minimum necessary to carry the required traffic.

Ethernet Capped Max Wireless Speed

When enabled, this option will cap the wireless speed to a mode that the connected Ethernet connection can sustain.

Maximum Transmit Power

This specifies the maximum transmit power in dBm of the system. It is country dependent and although the user can change this in 1dB steps, it will be limited to that country's regulations.

NOTE

UK requirement: In the UK there is a legal requirement to provide a minimum of 19 dB of transmit power control range. When the equipment is operating with a UK License Key, an additional facility is provided on the configuration page that allows the transmitted power to be reduced by 19 dB compared to the maximum allowed with a simple single step control..

Why Reduce Transmit Power? If the link losses are low and the link data rate and availability targets are being easily achieved, the transmitted power level may be reduced with a consequent benefit to other users of the band, such as fixed satellite links.

Antenna Gain, Cable Loss and EIRP

Only displayed when Platform Variant is set to "Connectorized" in the Installation pages. For more information about the configuration of connectorized PTP 600 units, refer to Software and features on page 8-3.

Encryption Algorithm, Encryption Key and Confirm Encryption Key

Only displayed when AES encryption is enabled by license key. For more information, refer to Enabling AES encryption at the wireless interface on page 6-96.

Spectrum management

Spectrum Management Selection is the PTP 600 Series feature that monitors the available wireless spectrum and directs both ends of the wireless link to operate on a channel with a minimum level of co-channel and adjacent channel interference.

Wireless channels

The PTP 600 Series operates using a set of predefined overlapping channels. There are a different number of channels, depending on the raster mode selected. Each channel occupies 30 MHz, 20 MHz, 15 MHz, 10 MHz or 5 MHz of wireless spectrum and is offset in center frequency from its neighboring channel by 10 MHz or 6 MHz. It is important to note that adjacent channels on the Spectrum management display have a 10 MHz or 6 MHz overlap to the adjacent channel.

The default channelization can be modified by varying the lower center frequency attribute in the installation wizard, as described in Installation step 2 - wireless configuration on page 6-59.

Spectrum management measurements

The PTP 600 Series performs two mean signal measurements per TDD cycle, per channel. This mean measurement represents the mean received signal power for the 40 microseconds measurement period.

The Spectrum Management algorithm collects measurements equally from all channels. This process is called the Channel Availability Check (hereafter referred to by the acronym CAC). The CAC uses a round-robin channel selection process to collect an equal amount of measurements from each channel. It is important to note that the CAC measurement process is not altered by the channel barring process. Measurements are still collected for all channels irrespective of the number of barred channels.

Measurement analysis

Spectrum Management uses statistical analysis to process the received peak and mean measurement. The statistical analysis is based on a fixed, one minute, measurement quantization period. Spectrum Management collects data for the specified quantization period and only at the end of the period is the statistical analysis performed.

The analysis produces three key metrics for each channel:

Peak of Means

This is the largest mean interference measurement encountered during the quantization period. The peak of means is similar to the peak of peaks and is useful for detecting slightly longer duration spikes in the interference environment.

99.9% Percentile of the Means

This is the value of mean interference measurement which 99.9% of all mean measurements fall below, during the quantization period. The 99.9% percentile metric is useful for detecting short duration repetitive interference that by its very nature has a minimal effect of the mean of means.

Mean of Means

This is the arithmetic mean of the measured means during a quantization period. The mean of means is a coarse measure of signal interference and gives an indication of the average interference level measured during the quantization period. The metric is not very good at predicting intermittent interference and is included to show the spread between the mean of means, the 99.9% percentile and the peak of means.

NOTE

The arithmetic mean is the true power mean and not the mean of the values expressed in dBm.

Spectrum Management uses the 99.9% percentile as the prime interference measurement. All subsequent references to interference level refer to this percentile measurement.

Statistical summary

The display of statistical measurement on the spectrum management page always shows a statistical summary of all channel measurement. The statistical summary is controlled by the Statistics Window attribute. This attribute defaults to a value of twenty minutes, which means that the mean and percentile values displayed for each channel are calculated over the 20 minute period. All channel decisions are made using the values computed over the statistics window period.

The spectrum management master / slave relationship

The Spectrum Management operates in a master / slave relationship. The master is assumed to be the link master configured during installation. All Spectrum Management configuration changes MUST be performed from the master. To enforce this, the Spectrum Management web page has a different appearance depending if you are viewing the data from the master or slave.

All configuration changes are applied at the master only. These changes are then messaged from the master to the slave. Any Spectrum Management configuration messages received at the slave are stored in non-volatile memory. This enables both master and slave to keep identical copies of Spectrum Management configuration data in their non-volatile memories. It is therefore possible to swap master and slave roles on an active Point-to-Point link without modifying Spectrum Management configuration.

Figure 6-9 shows an example Spectrum Management webpage as seen from the master.

Figure 6-10 shows an example Spectrum Management webpage as seen from the slave. It should be noted that the key configuration attributes are not available on the slave web page.

NOTE

These examples are for 15 MHz operation; other channel bandwidths are similar. The width of the vertical green bar represents the channel width.

Figure 6-9 Spectrum Management as seen from the Master

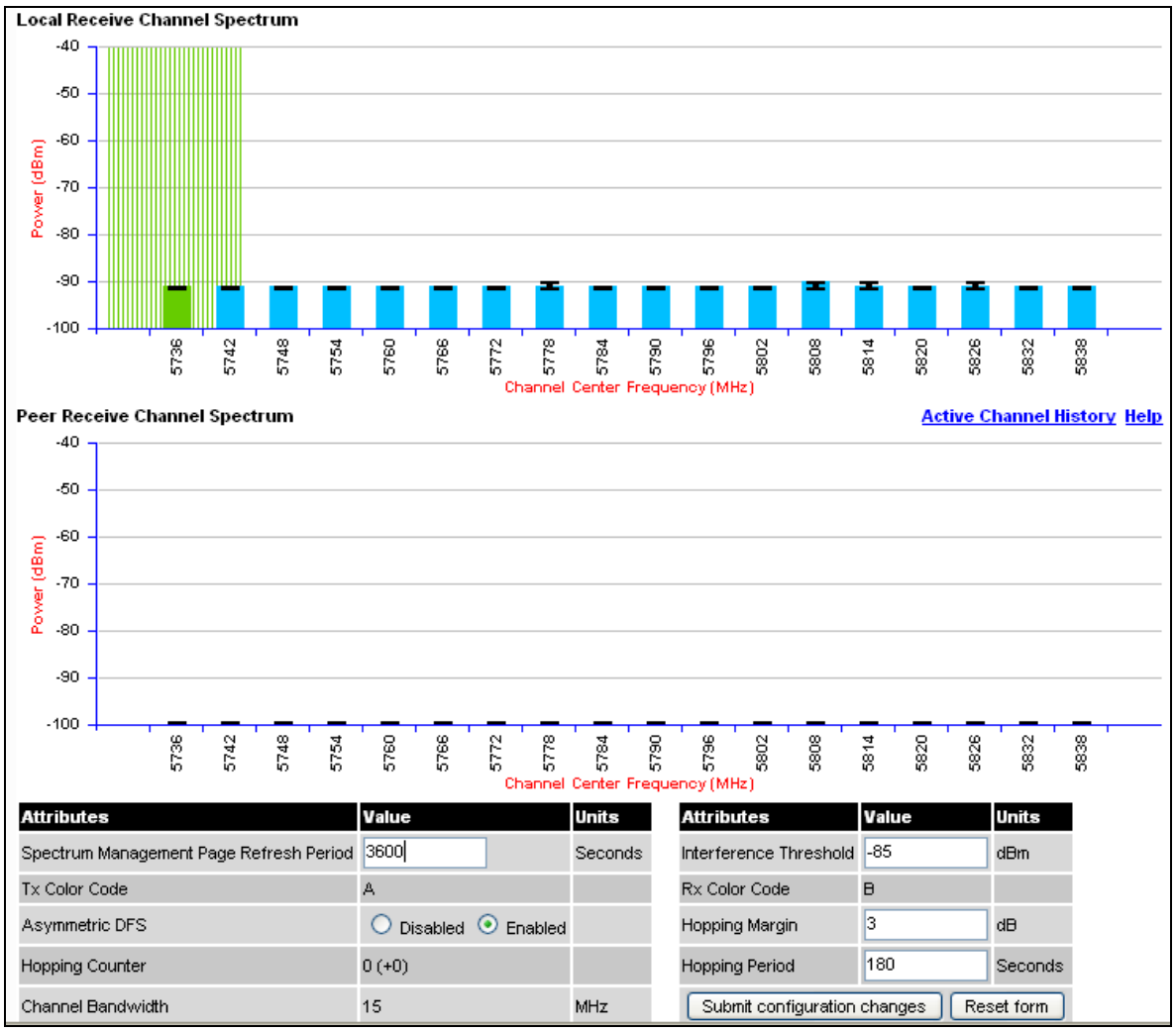
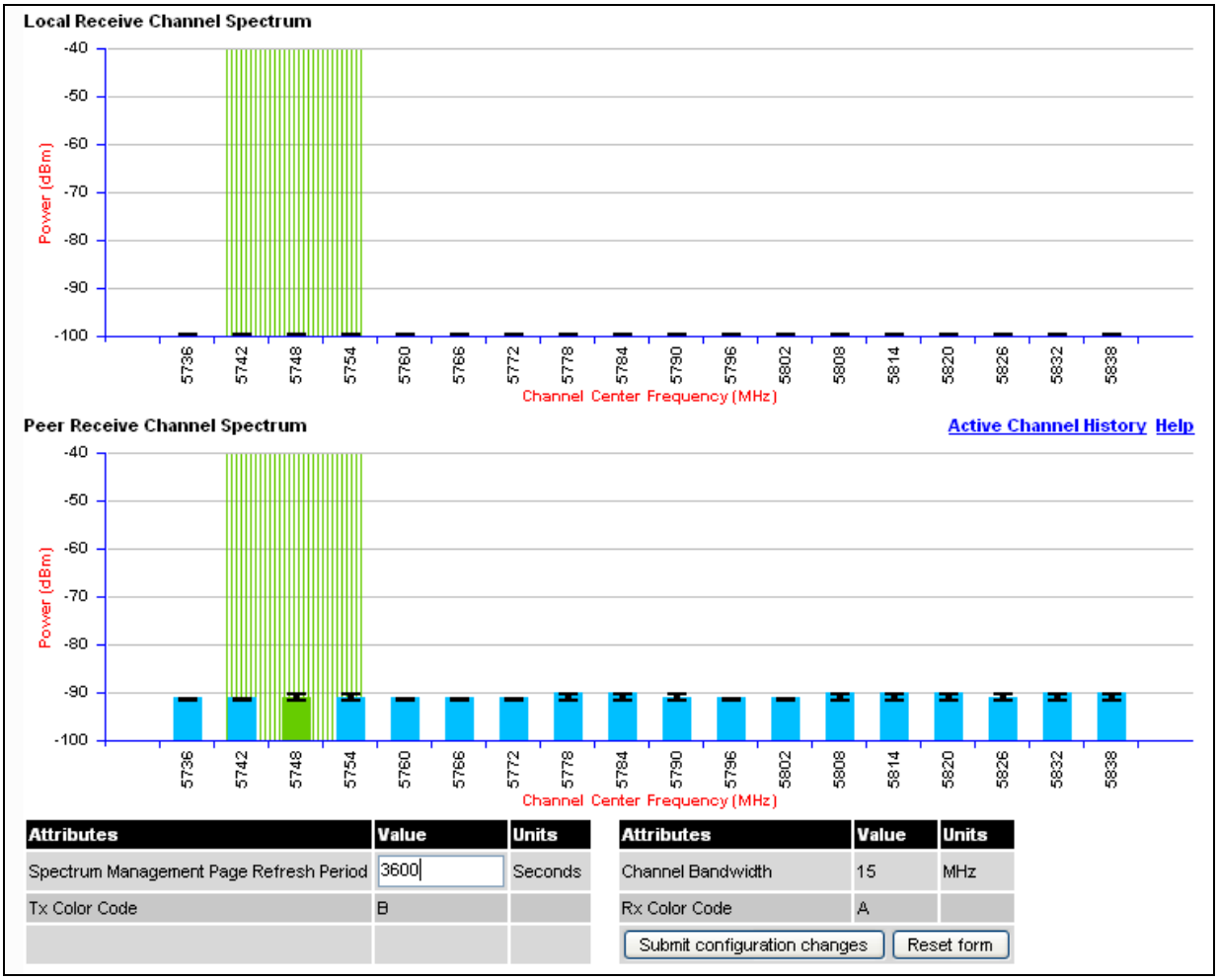


Figure 6-10 Spectrum Management as seen from the Slave



Spectrum management configuration

The following section describes the user modifiable configuration accessible from the Spectrum Management webpage (Figure 6-9). It is recommended that the default values are maintained. If the user believes that the performance of the Spectrum Management algorithm requires some modifications this should only be done after consulting the Motorola Point-to-Point distributor or one of the system field support engineers.

The Spectrum Management page contains the following fields:

Page Refresh Period

The page refreshes automatically according to the setting entered here (in seconds).

Hopping Margin

Spectrum Management uses this margin when making a channel hop decision. If the interference level of the target channel is lower than that of the active channel by at least the Hopping Margin, the link will hop to the target channel. The default setting is 3 dB in non-radar regions, or 10 dB in radar regions.

Asymmetric DFS

Only displayed in non-radar regions when i-DFS is enabled. The default configuration of symmetric operation constrains the link to operate symmetrically, using the same transmit and receive channels. When in symmetric mode the slave unit will always follow the master. If the master moves to a new channel the slave will hop to the same channel. When the Point-to-Point link is configured as an asymmetric link both the master and slave are free to select the best channel from their own set of local interference metrics.

Spectrum Management Control

Only displayed in radar regions. The options are “DFS” and “DFS with i-DFS”

Hopping Period (not configurable)

The Spectrum Management algorithm evaluates the metrics every ‘Hopping Period’ seconds (180 seconds by default) looking for a channel with lower levels of interference. If a better channel is located, Spectrum Management performs an automated channel hop. If SNMP or SMTP alerts are enabled an SNMP TRAP or an email alert is sent warning the system administrator of the channel change.

Hopping Counter

This is used to record the number of channel hops. The number in the "(+)" brackets indicates the number of channel changes since the last screen refresh.

Interference Threshold

Spectrum Management uses the interference threshold to perform instantaneous channel hops. If the measured interference on a channel exceeds the specified threshold, then i-DFS will instruct the wireless to immediately move to a better channel. If a better channel cannot be found the PTP 600 Series will continue to use the current active channel. (Default –85 dBm).

Channel Bandwidth (not configurable)

This shows the value of the variable channel bandwidth selected.

Barring channels

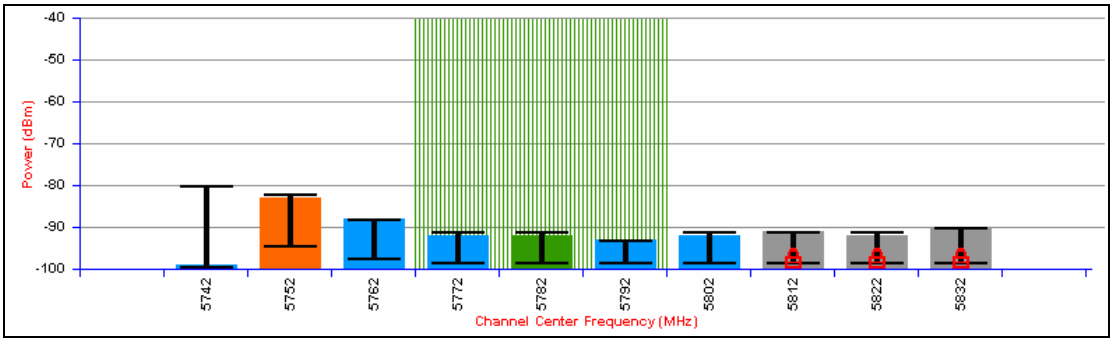
Channels can only be barred / unbarred by the system administrator from the master Spectrum Management web page. The barring / unbarring operations are disabled on the slave web page. If an attempt to bar / unbar a channel is made at the slave, a warning dialog is generated.

Barring/Unbarring of channels is performed by clicking the appropriate channel on the local or peer channel spectrum plots on the master web page. Each bar / unbar attempt will be proceeded by a confirmation dialog. It should be noted that the channel bar will take effect immediately and is not related to the measurement quantization period.

Master and slave channel spectrum graphics

Spectrum Management presents its computed statistical measurements in a graphical display on both the master and slave Spectrum Management web page.

Figure 6-11 Example spectrum management graphic



The X-axis shows a stylized view of the 9 or 10 selectable wireless channels. It is important to note that adjacent channels on the display have a 10 MHz overlap. The display separates the display of channels to help the clarity of the resultant display. The axis is labeled using the channel center frequencies in MHz.

The Y-axis shows the interference power levels from –100 to –40 dBm.

The active channel (channel 5 in Figure 6-11) is always marked using hatched green and white lines. The width of the hatching is directly proportional the channel bandwidth spectral occupancy of the channel.

The individual channel metrics are displayed using a colored bar and an 'I' bar.

The colored bar represents the following channel state:

Table 6-1 Spectrum management change state key

Green	Active	The channel is currently in use, hosting the Point-to-Point wireless link
Orange	Interference	The channel has interference above the interference threshold
Blue	Available	The channel has an interference level below the interference threshold and is considered by the Spectrum Management algorithm suitable for hosting the Point-to-Point link
Grey	Barred	The system administrator has barred this channel from use. For improved visibility, an additional red 'lock' symbol is used to indicate that a channel is barred.

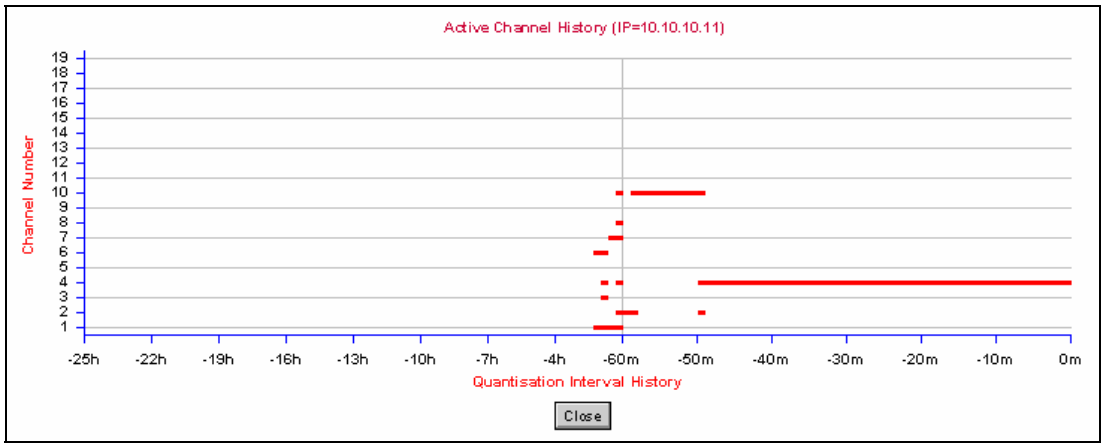
The top of the colored bar represents the 99.9% percentile metric for specific channel.

The 'I' Bar is used to display the mean of means and peak of means metrics. The lower horizontal bar represents the mean of means and the upper horizontal bar represents the peak of means. The vertical bar is used as a visual cue to highlight the statistical spread between the peak and the mean of the statistical distribution.

Active channel history

The active channel history is a time series display of the channels used by the PTP 600 Series over the last 25 hours. The active channel history is activated from the main Spectrum Management page using the ‘Active Channel History’ hyperlink. An example of the active channel history display is shown in Figure 6-12. Where there are parallel entries on the display this signifies that the wireless link occupied this channel during the measurement period. The measurement periods are one minute (from zero to sixty minutes) and twenty minutes from (60 minutes to twenty five hours).

Figure 6-12 Active channel history screen



Viewing historic spectrum management metrics

Spectrum Management allows the system administrator to view the results of previous measurement quantization periods. Holding down the shift key and clicking the appropriate channel on the local channel spectrum plots activates this feature. This feature is available on both the master and slave web page.

Figure 6-13 Spectrum management time series plot

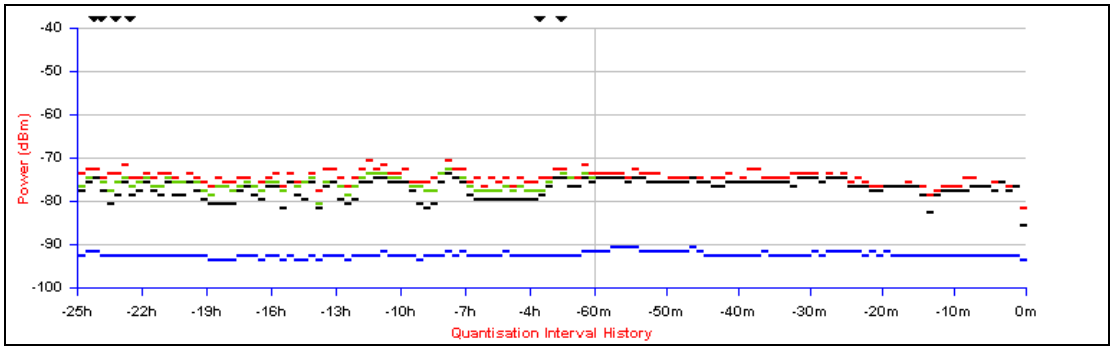


Figure 6-13 shows an example time series plot. A time series plot displays the previous 132 measurement quantization periods. If the PTP 600 Series has not been running for 132 quantization periods then only the number of measurement quantization periods that are available are displayed.

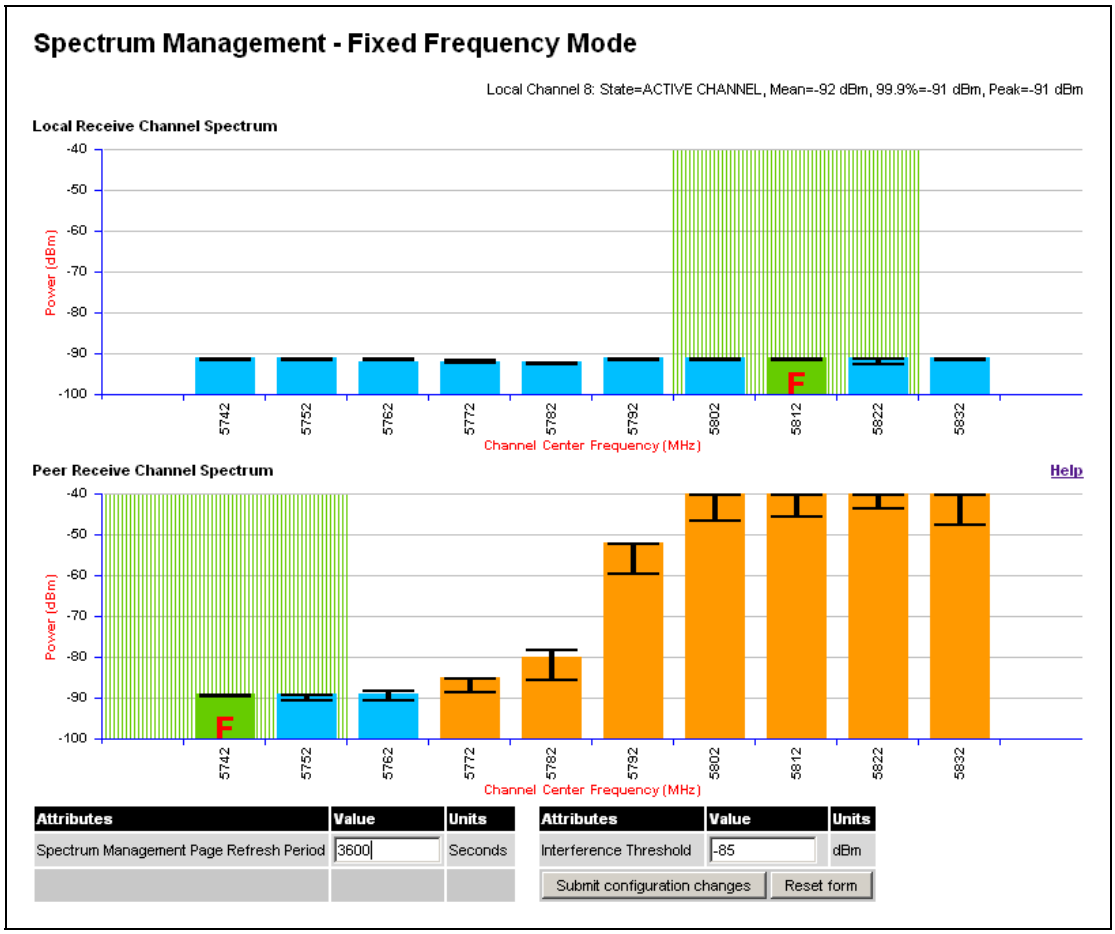
Table 6-2 Spectrum management time series key

GREEN	Peak of Means interference measurement
BLACK	99.9% percentile of means interference measurement
BLUE	Mean of Means interference measurement

Spectrum management (fixed frequency)

The PTP 600 Series software allows a user to optionally fix transmit and receive frequencies for a wireless link. Once configured, the spectrum management software will not attempt to move the wireless link to a channel with lower co and adjacent channel interference. Therefore this mode of operation is only recommended for deployments where the installer has a good understanding the prevailing interference environment. (See Installation step 2 - wireless configuration on page 6-59). Care must also be taken to ensure that the frequency allocations at each end of the link are compatible. To help the user when identifying the mode of operation Spectrum Management uses two visual cues. See Figure 6-14. The main page title identifies the mode of operation using the “Fixed Frequency Mode” postfix and the selected channels are identified by a red capital ‘F’.

Figure 6-14 Spectrum Management Fixed Frequency Mode page

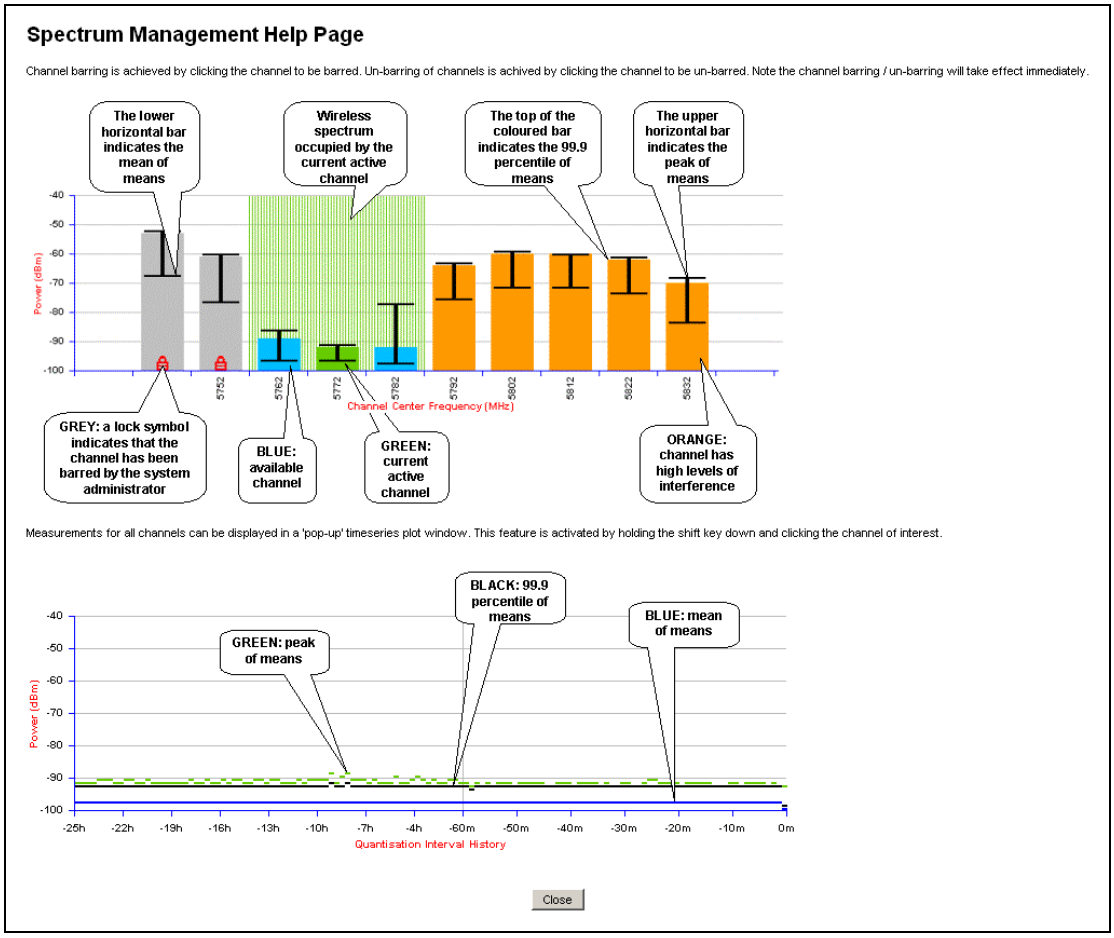


Channel barring is disabled in fixed frequency mode; it is not required as dynamic channel hopping is prohibited in this mode.

The only controls available to the master are the Statistics Window and Interference Threshold attributes. They will have no effect on the operation of the wireless link and will only effect the generation of the channel spectrum graphics.

The active channel history menu is removed in this mode of operation as channel hopping is prohibited.

Figure 6-15 Spectrum Management Help Page (fixed frequency)



Spectrum management control with radar avoidance

When operating with Radar Avoidance enabled the following variances in operation apply:

- The words “Radar Avoidance” are appended to the “Spectrum Management” title at the top of the screen. See Figure 6-16 and Figure 6-17.
- The only controls available to the master are the Interference Threshold attribute. This has no effect on the operation of the wireless link and will only affect the generation of the channel spectrum graphics. See Figure 6-16.
- Extra color coding of the interference histogram is provided. See Table 6-3.

When operating with RTTT (Road transport and Traffic Telematics) Avoidance enabled or other regulatory restrictions on channel usage the following variances apply:

- All channels marked with a ‘no entry’ symbol with their associated statistics colored black are the prohibited channels. See Figure 6-16 and Figure 6-17. These channels are never used to host the wireless link, but CAC measurements are still taken so that adjacent channel biases can be calculated correctly and so the user can see if other equipment is in use.

Figure 6-16 Spectrum Management Radar Avoidance page - Master

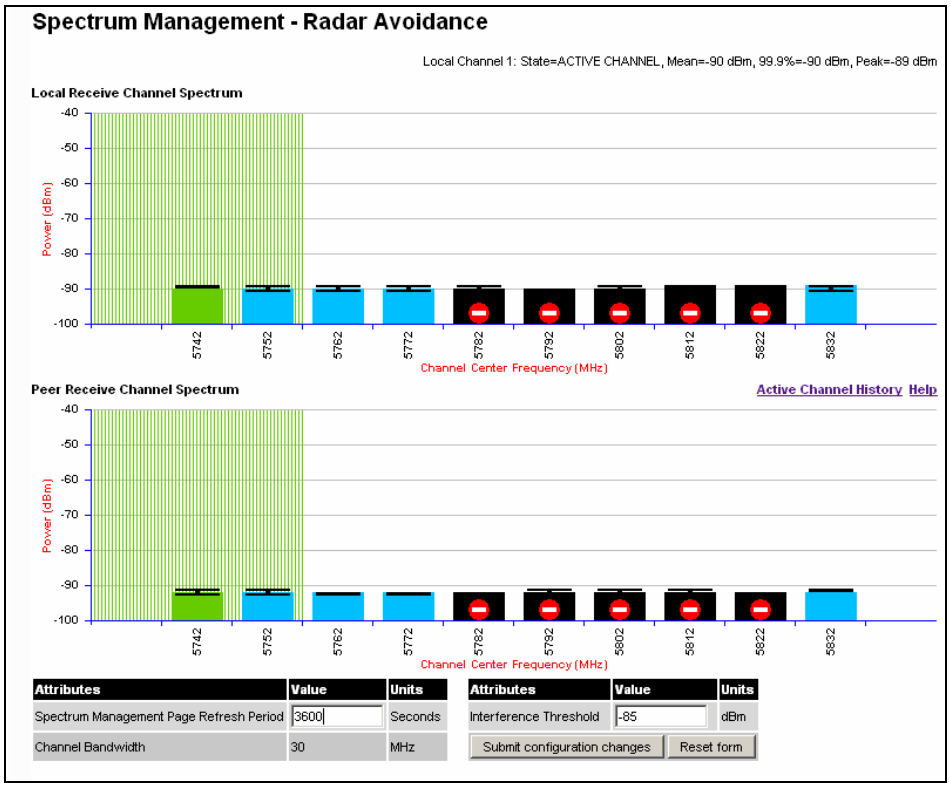
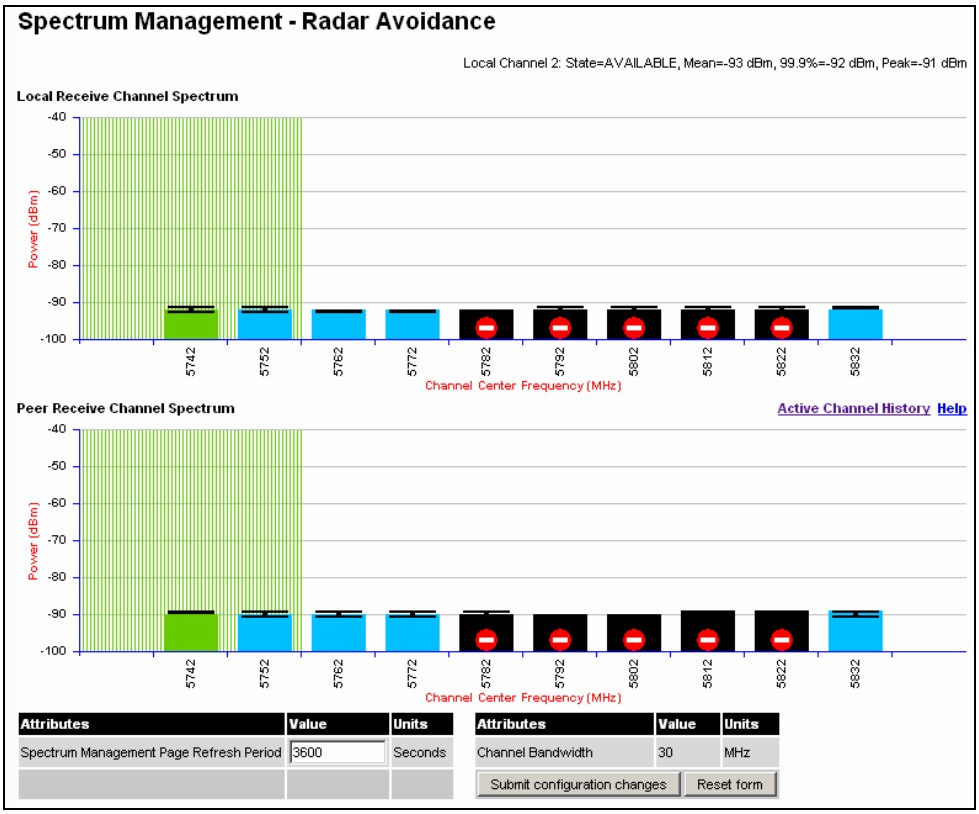


Figure 6-17 Spectrum Management Radar Avoidance page - Slave



The colored bar represents the following channel state:

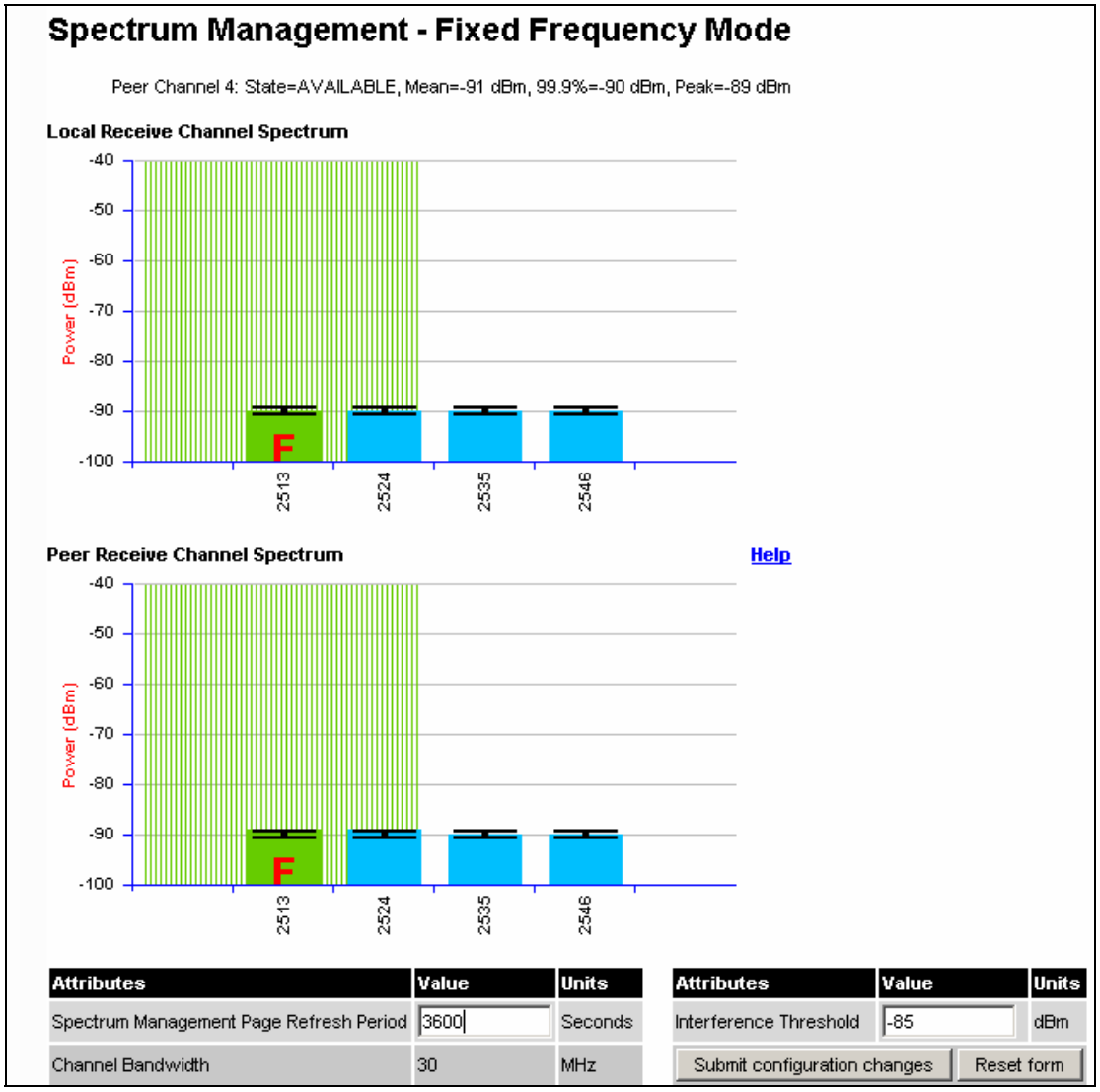
Table 6-3 Spectrum management change state key with operational restrictions

Green	Active	The channel is currently in use hosting the Point-to-Point wireless link
Orange	Interference	The channel has interference above the interference threshold
Blue	Available	The channel has an interference level below the interference threshold and is considered by the Spectrum Management algorithm suitable for hosting the Point-to-Point link
Grey	Barred	The system administrator has barred this channel from use. Because the low signal levels encountered when a unit is powered up in a laboratory environment prior to installation (which makes the grey of the channel bar difficult to see). An additional red 'lock' symbol is used to indicate that a channel is barred.
Red	Radar Detected	Impulsive Radar Interference has been detected on this channel and the channel is unavailable for 30 minutes. At the end of the 30 minute period a Channel Availability Check is required to demonstrate no radar signals remain on this channel before it can be used for the radio link.
Region Bar	Region Bar	This channel has been barred from use by the local region regulator

PTP 25600 spectrum management example

As described in Section PTP 25600 available spectrum settings on page 4-21, the PTP 25600 frequency variant can operate in three frequency bands. Figure 6-18 shows an example of a Lower Band with a 30 MHz channel bandwidth.

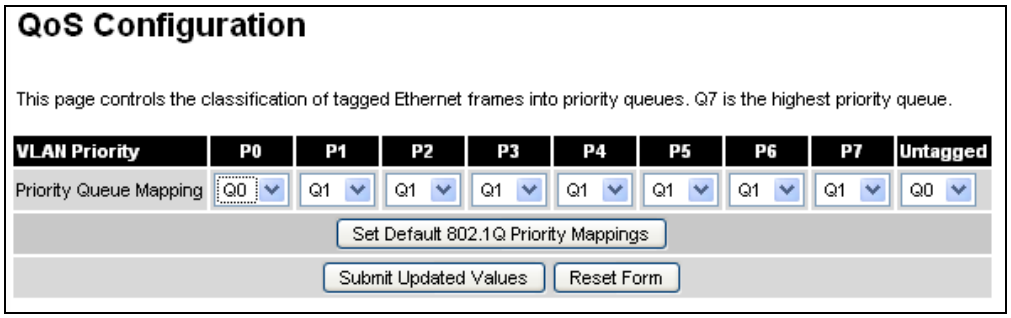
Figure 6-18 PTP 25600 example of Spectrum Management page



QoS configuration

The QoS configuration page (Figure 6-19) allows the system administrator to configure the classification of priority encoded Ethernet frames into up to eight traffic classes.

Figure 6-19 QoS Configuration page



The QoS Configuration page contains the following attributes:

Priority Queue Mapping

Specifies the VLAN priority flag to packet queue mapping. The higher the queue number the greater its priority.

Quality of Service Default Settings

The default classification rules are as shown in Table 6-4.

Table 6-4 QoS default settings

Link Layer Priority	Traffic Class
0	Q0
1	Q1
2	Q1
3	Q1
4	Q1
5	Q1
6	Q1
7	Q1
Untagged	Q0

In the case where the ODU is upgraded from an earlier release that supports only two traffic classes, the classification rules will be determined by the stored value of "VLAN High Priority Traffic Threshold". For example, if the existing threshold was set to "VLAN User Priority 4 and Above" then the classification rules would be initialized as shown in Table 6-5.

Table 6-5 Classification rules upgrade example

Link Layer Priority	Traffic Class
0	Q0
1	Q0
2	Q0
3	Q0
4	Q1
5	Q1
6	Q1

Link Layer Priority	Traffic Class
7	Q1
Untagged	Q0

The user interface also allows configuration of IEEE802.1Q classification rules as shown in Table 6-6 using the button ‘Set Default 802.1Q Priority Mappings’.

Table 6-6 IEEE802.1Q classification rules

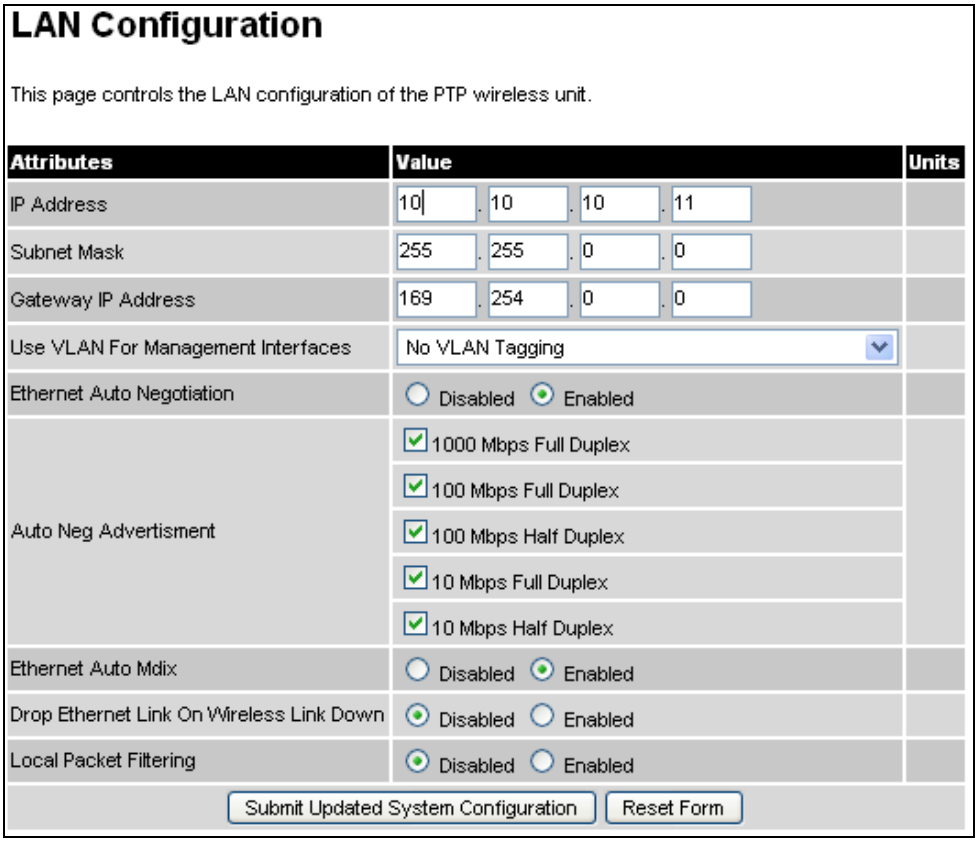
Link Layer Priority	Traffic Class
0	Q1
1	Q0
2	Q2
3	Q3
4	Q4
5	Q5
6	Q6
7	Q7
Untagged	Q1

Configuring the IP and Ethernet interfaces

LAN configuration

The LAN configuration page (Figure 6-20) is used by the system administrator to configure the PTP 600 Series LAN interface.

Figure 6-20 LAN Configuration page



All of the LAN Configuration attributes are non-volatile, so once set, they will be used by the unit even after a power on reboot. The LAN Configuration page contains the following fields:

IP Address

Internet protocol (IP) address. This address is used by the family of Internet protocols to uniquely identify this unit on a network.

Subnet Mask

A subnet allows the flow of network traffic between hosts to be segregated based on a network configuration.

Gateway IP Address

The IP address of a computer / router on the current network that acts as a gateway.

Use VLAN For Management Interfaces

This controls use of VLAN tags at the management interfaces (WWW/SNMP/SMTP/SNTP). See LAN configuration page for VLAN on page 6-45.

Ethernet Auto Negotiation

This enables the Ethernet configuration to be forced rather than auto negotiated.

⚠ CAUTION

The IEEE802.3 specification recommends enabling Auto Negotiation. The configuration should only be forced if you are having problems with auto negotiation. You must ensure that you configure both this unit and the Ethernet port to which it is connected identically. If you force a fixed Ethernet Configuration on the PTP 600 Series then you MUST also force the same fixed configuration on the equipment to which it is connected. If you fail to force the configuration of the connected equipment, its automatic configuration mechanisms will normally cause a duplex mismatch, and you will receive greatly reduced throughput!

When Ethernet Auto Negotiation is Disabled, the format of the LAN configuration page changes see LAN Configuration Page – Manual Ethernet Configuration on page 6-48.

Auto Neg Advertisement

This controls the rates that the auto negotiation mechanism will advertise as available.

⚠ CAUTION

Over the air throughput will be capped to the rate of the Ethernet interface at the receiving end of the link.

Ethernet Auto Mdix

This enables/disables the Auto Medium Dependent Interface (MDI)/Medium Dependent Interface Crossover (MDIX) capability. Default is “Enabled”.

Drop Ethernet Link On Wireless Link Down

When this option is enabled the Ethernet link is momentarily dropped when the wireless link goes down. This feature is used to indicate to the connected network equipment that this Ethernet link is no longer available, thus causing STP (Spanning Tree Protocol) to re-route packets through an alternative link.

Local Packet Filtering

When Local Packet Filtering is “Enabled”, the bridge learns the source MAC addresses of devices transmitting Ethernet packets on the local Ethernet network, and only bridges packets to the remote unit if the destination MAC address has not been learned as a 'local' device.

When Local Packet Filtering is ‘Disabled’ the bridge does not learn the source MAC addresses of devices transmitting Ethernet packets on the local Ethernet network, and bridges ALL Ethernet packets received to the remote unit. Local Packet Filtering should be disabled when external Ethernet switching hardware or a router is present. The default setting for Local Packet Filtering is disabled.

Reboot verification

A number of attributes, such as IP Address, Subnet Mask and Gateway IP Address and VLAN settings will require a reboot before they are used. If any of these attributes are changed a reboot screen appears asking the user to verify the reboot (Figure 6-21 or Figure 6-22).

Figure 6-21 Configuration Reboot page

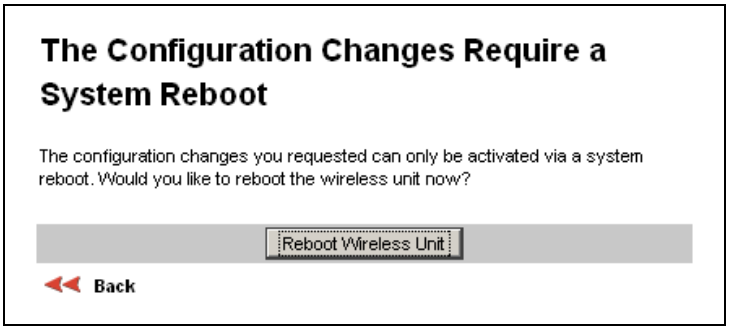
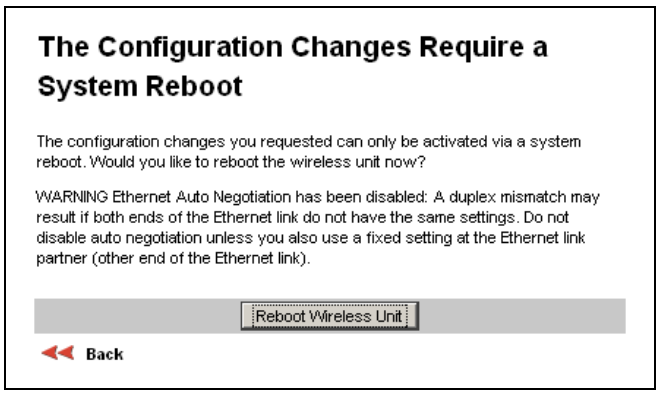


Figure 6-22 Configuration Reboot page - Ethernet auto negotiation disabled



This will be followed by a pop-up dialogue box asking to confirm the action.

NOTE

At this point you will lose connection to the unit. If you have just changed the IP Address, you now have to reconnect to the unit using the address just set.

LAN configuration page for VLAN

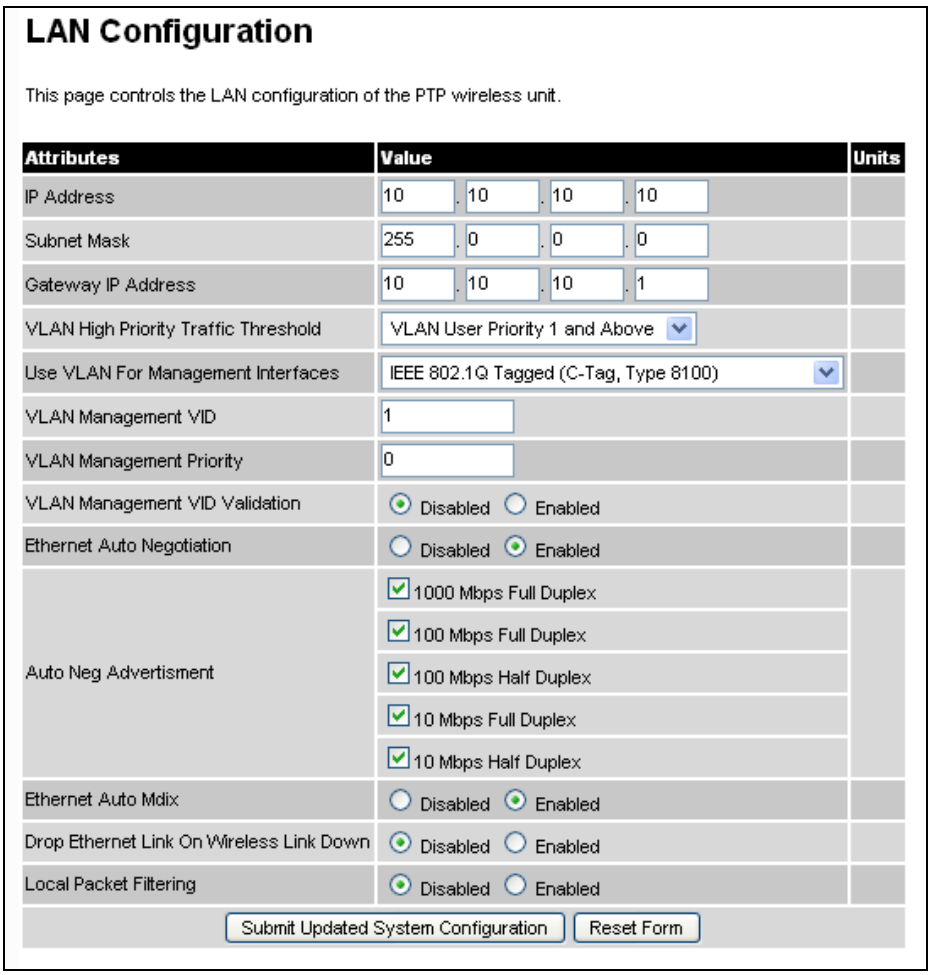
The layout of the LAN Configuration page changes if this attribute is enabled in order to allow the VLAN VID and VLAN Priority to be set, see Figure 6-23. The VLAN settings are applied only after the unit is rebooted.

CAUTION

You must ensure that you can access the VLAN which you configure here, otherwise you will be unable to access the unit following the next reboot.

The PTP 600 management function is only compatible with single VLAN tagged packets. Any management packet with two or more packets will be ignored.

Figure 6-23 LAN Configuration page with VLAN fields



When VLAN is enabled, the LAN Configuration page contains the following extra fields:

Use VLAN For Management Interfaces

This control can be configured with one of the following three values:

- No VLAN Tagging
- IEEE 802.1Q Tagged (C-Tag, Type 8100)
- IEEE 802.1ad Tagged (S-Tag or B-Tag, Type 88a8)

VLAN Management VID

This 802.1Q or 802.1ad VLAN ID (VID) will be included in packets generated by the management interfaces. Valid settings are in the range 0 to 4094.

VLAN Management Priority

This 802.1Q or 802.1ad VLAN Priority will be included in packets generated by the management interfaces. Valid settings are in the range 0 to 7.

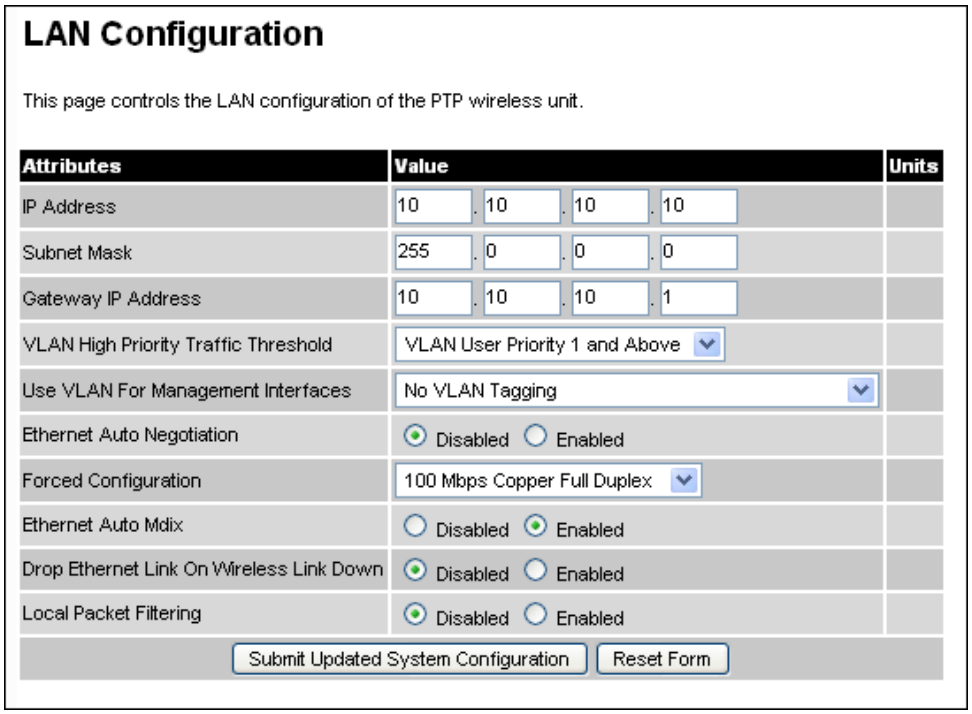
VLAN Management VID Validation

If enabled, the management interfaces will only respond to Ethernet packets tagged with the configured Management VID; otherwise packets with any VID will be accepted.

LAN configuration page for manual ethernet configuration

The layout of the LAN Configuration page changes if Ethernet Auto Negotiation is Disabled, see Figure 6-24.

Figure 6-24 LAN Configuration page for manual Ethernet configuration



When Ethernet Auto Negotiation is Disabled, the LAN Configuration page contains the following extra field:

Force Configuration

This option allows the user to force the speed and duplex setting of the Ethernet interface. Over the air throughput will be capped to the rate of the Ethernet interface at the receiving end of the link.

NOTE

Instead of forcing configuration, the IEEE802.3 specification recommends enabling Auto Negotiation with only the specific ability or abilities advertised.

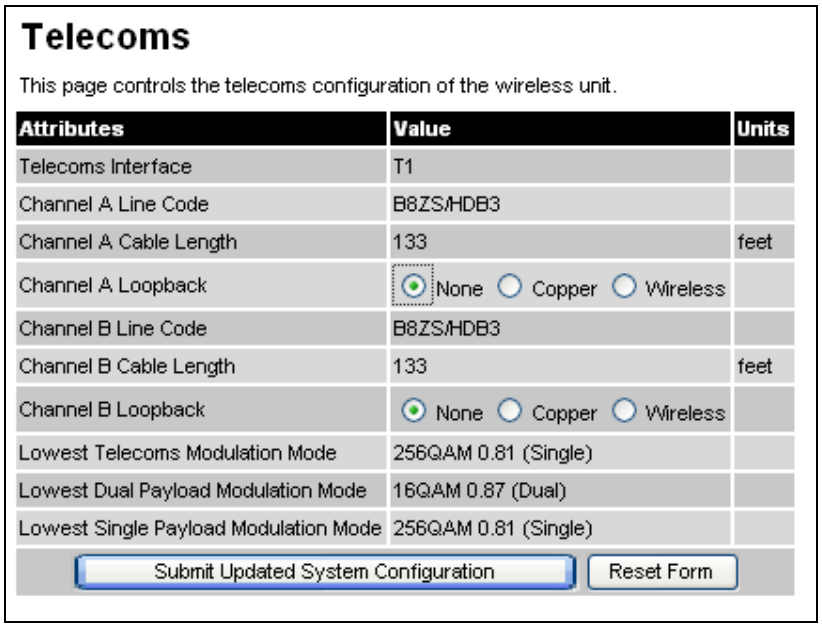
Configuring the telecoms circuits

The Telecoms page (Figure 6-25) is available when the Telecoms Interface has been set to either T1 or E1 in the Installation Wizard.

The unit displays the interface setting and line code for the available telecoms channels. The PTP 600 Series is able to support two T1 or E1 channels. These channels are referred to as "Channel A" and "Channel B".

The "Channel B" configuration and controls will be displayed only when the second channel is enabled.

Figure 6-25 Telecoms page



The Telecoms page contains the following fields:

Telecoms Interface

May be either T1 or E1, reflecting the Installation Wizard setting.

Line Code

Displays the Line Code setting for each channel. The Line Code configuration must match the configuration of the connected equipment and may be set using the Installation Wizard.

Cable Length

The Cable Length setting is applicable in T1 mode only and shows the cable length specified in the installation wizard.

Loopback

Allows the T1 or E1 data stream to be looped back at the copper or wireless interface. During normal operation the loopback must be set to "None". It may be helpful during installation to test the telecoms links by performing loopback connections.

A "Copper" loopback connects the received data on a given telecoms interface to the transmit interface. A "Copper" loopback may be used, in conjunction with a Bit Error Rate Tester, to confirm that the correct connections have been made to the ODU. This mode cannot be used for resistance tests as it is only capable of looping back valid telecoms signals.

A "Wireless" loopback sends the telecoms data received across the wireless link back across the link on the same Telecom channel. The link may be checked using, for example, a Bit Error Rate Tester to ensure that no errors are detected.

A typical T1 or E1 installation might include a "Copper" loopback on the local unit followed by a "Wireless" loopback on the remote unit.

It is important to remove all loopbacks on channels for normal operation. Alarms on the Home Page indicate the presence of loopbacks on either channel.

Lowest Telecoms Modulation Mode

The user defined lowest modulation mode at which telecoms data can be sent. If the link cannot sustain telecoms data in this mode then the effective lowest modulation mode may differ

Lowest Dual Payload Modulation Mode; Lowest Single Payload Modulation Mode

Indicate the effective lowest modulation mode at which telecoms data can be sent, subject to wireless capacity and latency limitations. Under some circumstances, these settings may differ from the user defined Lowest Telecoms Modulation Mode described above.

Installation pages

There follows a description of the installation pages along with their use during the installation configuration process. The actual installation process is described in Manual configuration on page 6-52.

NOTE

This section assumes that the integrated PTP 600 is being installed. If the connectorized variant is being installed, refer to Software and features on page 8-3 for details of the additional functionality that must be configured.

Factory configuration

All wireless links are shipped as paired units. They are pre-configured at the factory so that they can be installed without the user supplying any configuration. Each wireless link is shipped with the *PTP 600 Installation Guide*. Attached to this guide is a summary of the pre-configured configuration data. Table 6-7 shows a sample link configuration. The values in red type have been committed to the wireless unit's non-volatile storage.

Table 6-7 Factory configuration values

Example PTP 600 Series Configuration Data	
For your convenience these two units have been pre-configured as a link	
Units:	
ODU serial number	ODU serial number
016780000FFF	016780000FC7
Ethernet MAC address	Ethernet MAC address
00:04:56:80:0F:FF	00:04:56:80:0F:C7
Configured as:	
Master	Slave
Target MAC address	Target MAC address
00:04:56:80:0F:C7	00:04:56:80:0F:FF

License Key	License Key
A471-FE88-428D-E1F3	534F-4F54-D1B0-E2DA
IP Address	IP Address
169.254.1.2	169.254.1.1

CAUTION

The factory default configuration is limited in range to 40 Km (25 miles). If you wish to install a wireless link with a range of > 40 Km (> 25 miles) and < 200 Km (< 124 miles) or < 5 Km (< 3 miles) you must follow Manual configuration on page 6-52.

The factory default configuration is set to Region 1. Region 1 allows the PTP 600 Series a maximum transmit power of 25 dBm. If the local regulatory regime limits the maximum transmit power (EIRP) to less than 25 dBm, you should obtain a new license key containing the correct region code from your local distributor or direct from Motorola. Alternatively in the short term, you should reduce the maximum transmit power by following the procedures in Manual configuration on page 6-52.

Manual configuration

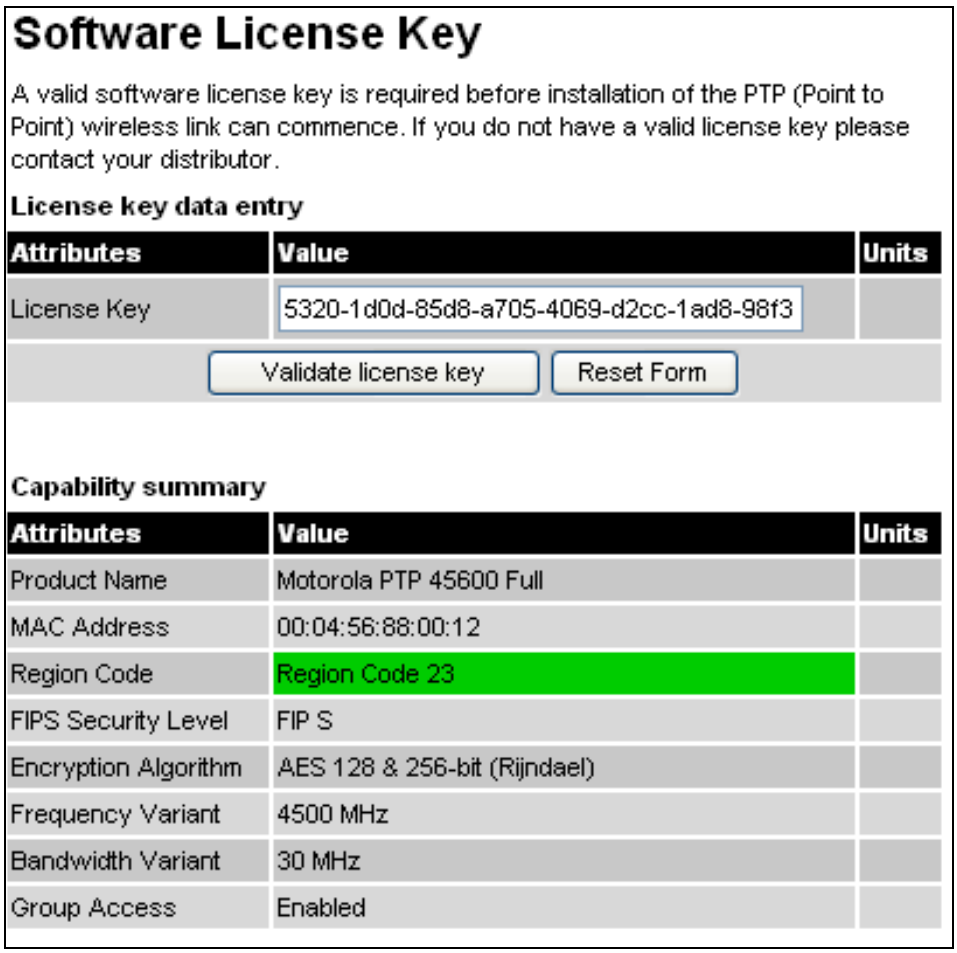
If the installer / system administrator wishes, they may modify the default installation configuration. If only the IP addresses (network configuration) are incorrect it is recommended that the values are changed via the configuration menu, as described in LAN configuration on page 6-42.

NOTE

If any other parameters (for example region code) require modification, then it is recommended that the system administrator use the Installation Wizard.

The PTP 600 Series operational software requires a license key (Figure 6-26) to enable the wireless bridging capability and programs region code specific parameters in to the unit.

Figure 6-26 Software License Key page



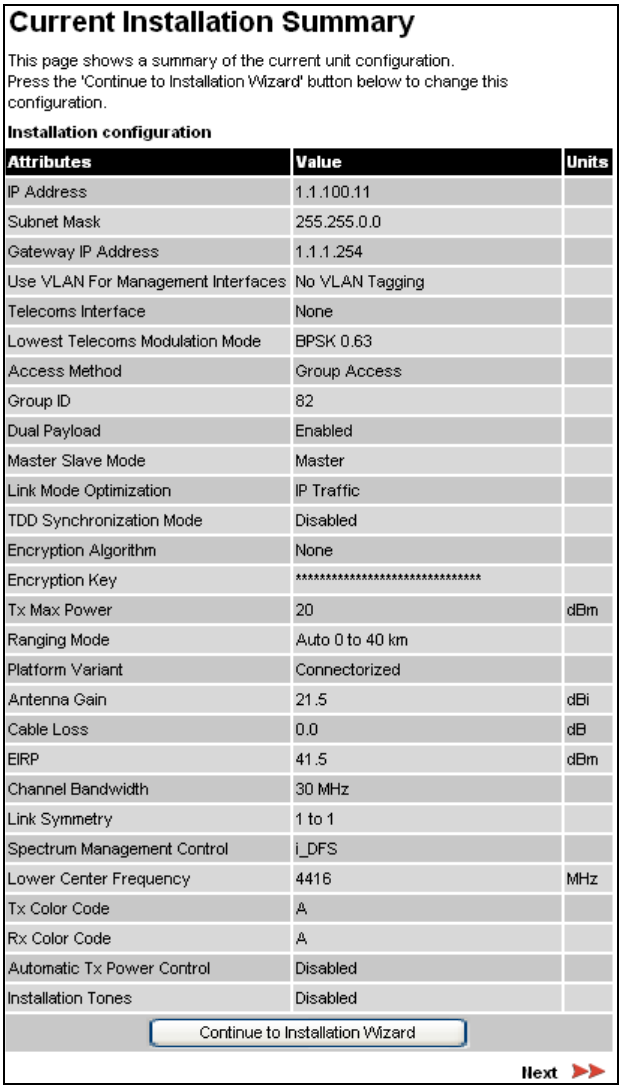
A license key is programmed into each unit during production and can be found written on the Configuration Data Summary Label which is attached to the Quick Install Guide. If subsequently the license key has been mislaid, replacement keys can be applied for online or via your distributor.

If a valid license key is not detected in the unit's non-volatile memory then the user is prompted to enter a valid key. It should be noted that 600 Series units are shipped as link pairs and, as such, valid license keys are entered during the production process. To enter a license key simply type or paste the license key into the data entry box (Figure 6-26) and click the 'validate license key' button.

Current installation summary

When **Installation** is selected from the menu navigation bar, the Current Installation Summary page is displayed (Figure 6-27). Review the current configuration attributes. If any attributes require changing, select **Continue to Installation Wizard**.

Figure 6-27 Current installation summary page



Current Installation Summary

This page shows a summary of the current unit configuration.
Press the 'Continue to Installation Wizard' button below to change this configuration.

Installation configuration

Attributes	Value	Units
IP Address	1.1.100.11	
Subnet Mask	255.255.0.0	
Gateway IP Address	1.1.1.254	
Use VLAN For Management Interfaces	No VLAN Tagging	
Telecoms Interface	None	
Lowest Telecoms Modulation Mode	BPSK 0.63	
Access Method	Group Access	
Group ID	82	
Dual Payload	Enabled	
Master Slave Mode	Master	
Link Mode Optimization	IP Traffic	
TDD Synchronization Mode	Disabled	
Encryption Algorithm	None	
Encryption Key	**********	
Tx Max Power	20	dBm
Ranging Mode	Auto 0 to 40 km	
Platform Variant	Connectorized	
Antenna Gain	21.5	dBi
Cable Loss	0.0	dB
EIRP	41.5	dBm
Channel Bandwidth	30 MHz	
Link Symmetry	1 to 1	
Spectrum Management Control	i_DFS	
Lower Center Frequency	4416	MHz
Tx Color Code	A	
Rx Color Code	A	
Automatic Tx Power Control	Disabled	
Installation Tones	Disabled	

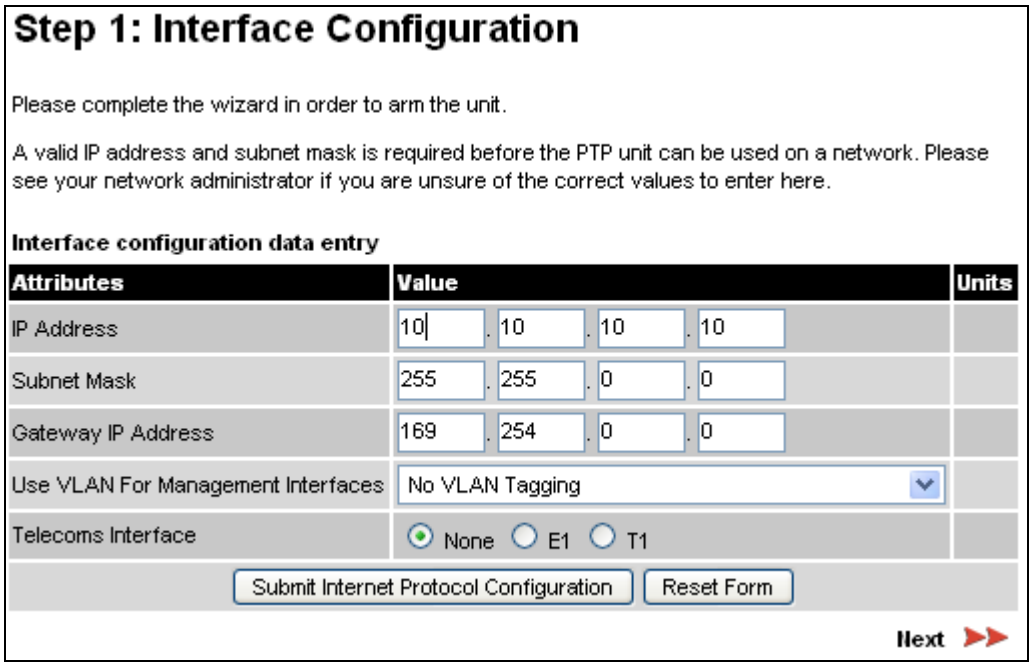
Continue to Installation Wizard

Next

Installation step 1 - interface configuration

Step 1 of the installation process requires the installer to enter the Internet Protocol (IP) configuration (Figure 6-28).

Figure 6-28 Step 1: Interface Configuration page



The Interface Configuration page contains the following fields:

IP Address

Internet protocol (IP) address. This address is used by the family of Internet protocols to uniquely identify this unit on a network.

Subnet Mask

A subnet allows the flow of network traffic between hosts to be segregated based on a network configuration. By organizing hosts into logical groups, a subnet can improve network security and performance.

Gateway IP Address

The IP address of a computer / router on the current network that acts as a gateway. A gateway acts as an entrance / exit to packets from / to other networks.

Use VLAN Management Interface

Controls whether the management interfaces (HTTP/SNMP/SMTP/SNTP) use a VLAN. Selecting this option presents the user with extra fields in which to enter the Management VLAN ID, Priority and whether to validate the VLAN ID. If the user modifies this control, a warning dialog is displayed see Figure 6-29.

Telecoms Interface

This allows the activation of the PTP 600 Series telecoms interface. The selection options are None, E1 or T1. Mixed T1/E1 configurations are not permitted.

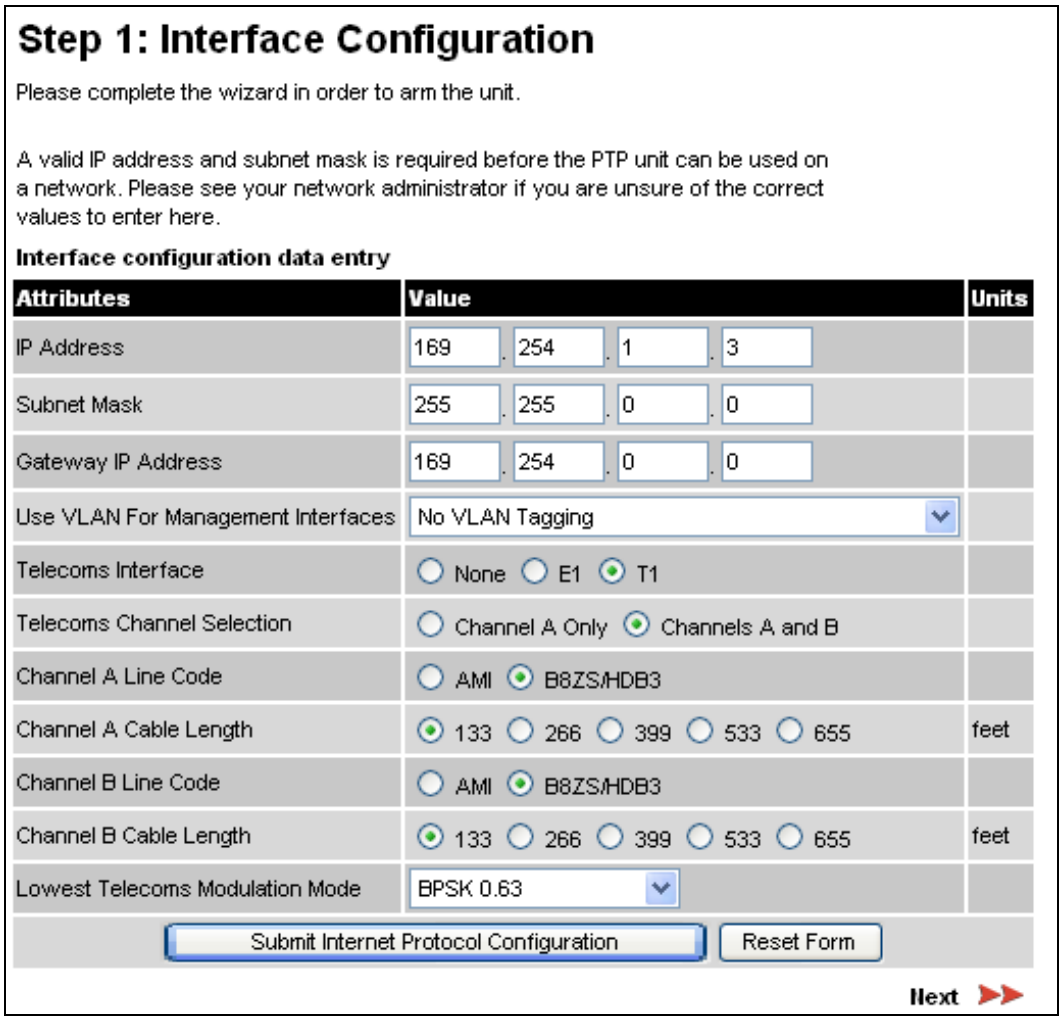
Figure 6-29 VLAN Warning

Once complete, click the ‘Submit Internet Protocol Configuration’ button or the ‘Next’ link.

Telecoms interface

If the telecoms interface is configured to either T1 or E1 then Step 1 of the installation process contains additional configuration fields (Figure 6-30).

Figure 6-30 Step 1: Interface Configuration page for telecoms



The additional E1 or T1 fields are:

Telecoms Channel Selection

This allows the user to configure one or two interfaces (Channel A or Channel A and B).

Channel A Line Code

The line code setting of the telecoms interface. This must match the setting of the device connected to this interface.

Channel B Line Code

The line code setting of the telecoms interface. This must match the setting of the device connected to this interface.

NOTE

If a copper loopback is used to test the E1/T1 link, ensure that the test set is configured manually. If the test set is allowed to configure automatically, neither it nor the ODU send a signal until they receive one, so the test appears to fail.

Channel A/B Cable Length

This field is applicable to the T1 operating mode only. It configures the T1 transceiver to output a signal suitable for driving a cable of the specified length. This should be set to reflect the length of cable between the wireless unit and the connected equipment.

Lowest Telecoms Modulation Mode

The lowest modulation mode at which telecoms data will be sent, if there is sufficient link capacity.

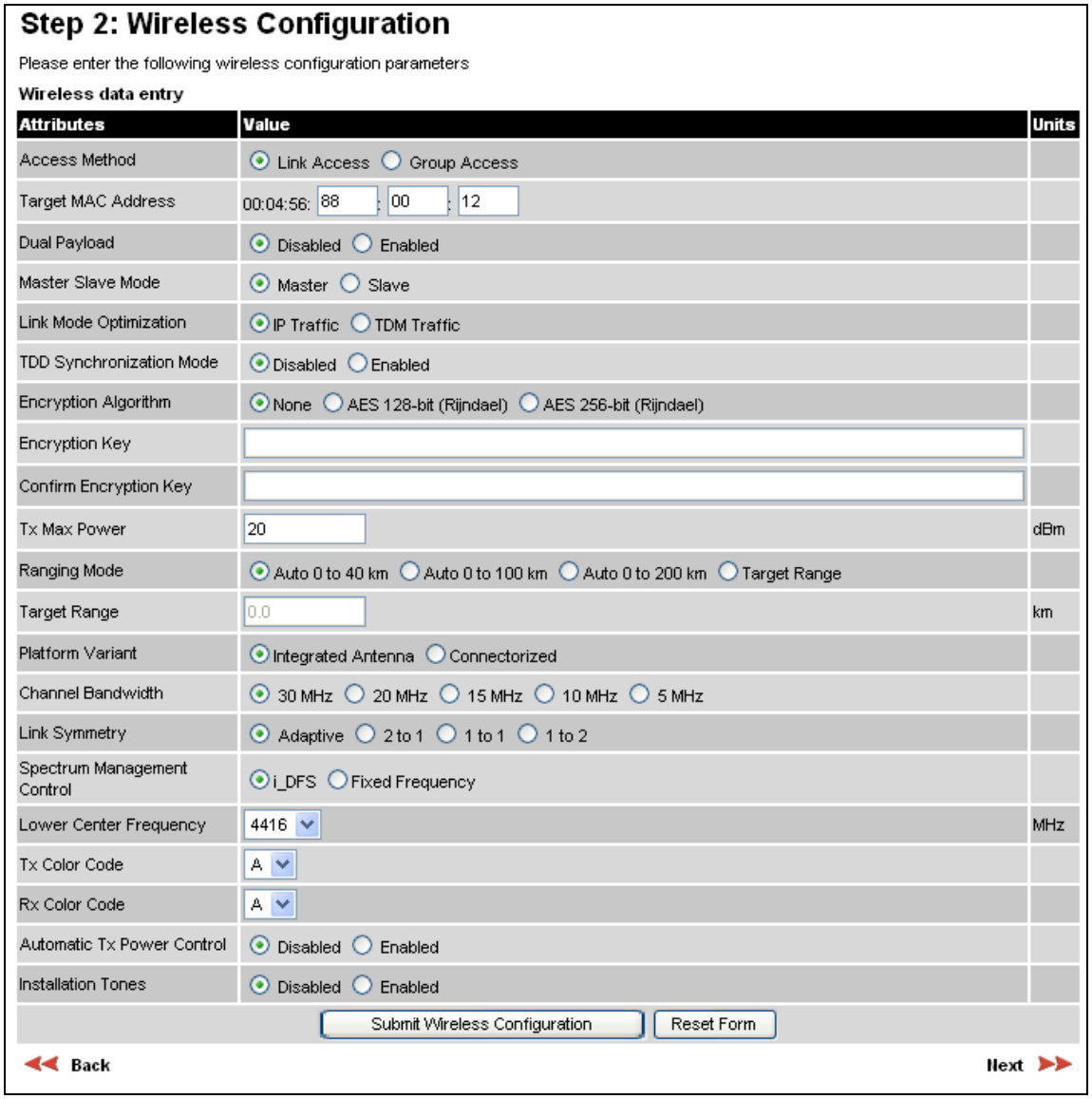
In conjunction with the LINKPlanner tool, this setting may be used to optimize the latency for links which operate in consistently high modulation modes. High data rate links are able to support lower latencies.

The lowest telecoms modulation mode is selected from a rate ordered drop-down list. If this selected mode has insufficient capacity to support the telecoms data then the effective lowest modulation mode, determined when the wireless link starts, will be higher. The effective lowest modulation mode is displayed on the Telecoms Configuration page.

Installation step 2 - wireless configuration

Step 2 of the installation process requires the installer to enter the wireless configuration parameters. Figure 6-31 is an example of the Wireless Configuration screen.

Figure 6-31 Step 2: Wireless Configuration page



The contents of the Wireless Configuration screen vary depending upon the frequency variant as follows:

- PTP 25600: Frequency Band field is also displayed.
- Channel Bandwidth options vary depending upon frequency variant and region. For more information, see Table 1-1.
- PTP 49600: Lower Center Frequency is not displayed.

Screen contents also vary depending upon the options selected as follows:

- If Access Method is set to “Group Access”, the Target MAC Address field is replaced by Group ID.
- If Spectrum Management Control is set to “Fixed Frequency”, the Lower Center Frequency field is replaced by Fixed Tx Frequency and Fixed Rx Frequency.
- If Platform Variant is set to “Connectorized”, Antenna Gain and Cable Loss are also displayed. For more information about the configuration of connectorized PTP 600 units, refer to Software and features on page 8-3.

The Wireless Configuration page contains the following fields:

Access Method

This controls whether the link can be established between a pre-paired Master and Slave only (‘Link Access’) or between Master and Slave belonging to the same group (‘Group Access’).

Target MAC Address

This is only displayed when Access Method is set to ‘Link Access’. This is the MAC Address of the peer unit that will be at the other end of the wireless link. This is used by the system to ensure the unit establishes a wireless link to the correct peer. The MAC Address can be found embedded within the serial number of the unit. The last six characters of the serial number are the last three bytes of the unit’s MAC address.

NOTE

A PTP 600 Series system is shipped as a pair of units with pre-loaded correct MAC addresses. Target MAC addresses will only need to be entered if an existing unit has to be replaced in the field or the units configuration has been erased.

Group ID

This is only displayed when Access Method is set to ‘Group Access’. It identifies all units belonging to the same group.

Dual Payload

This controls whether the link takes advantage of the channel condition to increase the link throughput. If set to ‘Disable’, the robustness of the link is improved. The default value is ‘Enabled’.

This control is automatically set to ‘Enabled’ if either E1 or T1 is enabled and Lowest Telecoms Modulation Mode is set to a Dual Payload modulation.

Master Slave Mode

At this point it is necessary to decide which end will designate a Master. The Master unit is the controlling unit with respect to the point-to-point link and its maintenance. The master transmits until the link is made, while the Slave listens for its peer and only transmits when the peer has been identified.

Link Mode Optimization

Optimizes the link behavior according to the type of traffic that will be bridged. There are two modes to choose from: IP and TDM. For more information, see Link mode optimization on page 1-20.

TDD Synchronization Mode

Enables the TDD synchronization feature. See Time division duplex synchronization on page 1-25 for basic description and TDD synchronization configuration on page 6-66 for installation and configuration details.

Encryption Algorithm

This is only displayed when encruption is enabled by license key. The same algorithm must be used at both ends of the link. For more information, see Enabling AES encryption at the wireless interface on page 6-96.

Encryption Key

This is only displayed when encryption is enabled by license key. The same key must be used at both ends of the link. For more information, see Enabling AES encryption at the wireless interface on page 6-96. When identity based user accounts are enabled, only the Security Officer can change the encryption key.

Confirm Encryption Key

This is only displayed when encryption is enabled by license key. Must contain the same value as Encryption Key.

Tx Max Power

This attribute controls the maximum transmit power the unit is permitted to use when installing and executing the wireless link. The maximum setting for a particular region or country is controlled by the License Key.

Ranging Mode

During installation, the wireless units perform “Automatic Ranging”. The ranging mode allows the installer to control the behavior of the system’s automatic ranging algorithms. The default value is 0 to 40 km (0 to 25 miles). If the installer is required to install a link of greater than 40 km (25 miles) then the ranging mode attribute MUST be configured to ‘0 to 100km’ (0 to 62 miles) or ‘0 to 200km’ (0 to 124 miles) mode depending on the range of the link.

NOTE

If preferred, range functions can be configured to operate in miles, as described in Properties on page 6-131.

Target Range

Installers that know the range between the two wireless units to within ± 1 km can use the target range mode. The main advantage of the target range mode is that it reduces the time taken by the units to range. To use the target range mode the installer MUST select Target Range as the ranging mode and enter the approximate range in km in the Target range data entry field at both ends of the link.

Platform Variant

Chooses between an integrated unit or a connectorized unit that requires an external antenna.

Frequency Band

Only displayed for the PTP 25600 frequency variant, which operates in one of three bands as described in Variable channel bandwidth operation on page 2-5:

- Lower: 2496 MHz to 2568 MHz
- Middle: 2572 MHz to 2614 MHz
- Upper: 2624 MHz to 2690 MHz

Channel Bandwidth

Users can choose a variable channel bandwidth for the available spectrum. The selection depends upon the frequency variant and region. For more information, see Table 1-1.

Link Symmetry

(Master only) Values of "Adaptive", "2 to 1", "1 to 1" and "1 to 2" can be selected. The adaptive setting allows link symmetry to vary dynamically in response to offered traffic load. The remaining values select three options for fixed division between transmit and receive time in the TDD frame of the master ODU. The first number in the ratio represents the time allowed for the transmit direction and the second number represents the time allowed for the receive direction.

The appropriate matching Link Symmetry is set at the slave ODU automatically. For example, if Link Symmetry is configured as “2 to 1” at the master ODU, then the slave ODU will be set automatically as “1 to 2”. In this example, the master-slave direction has double the capacity of the slave-master direction.

NOTE

Link Symmetry is subject to the following restrictions:

- "Adaptive" is not supported in regions where radar avoidance is in use.
- "Adaptive" is not supported when link optimization is set to "TDM".
- "Adaptive" is not supported in 5 MHz channel bandwidth.
- "2 to 1" and "1 to 2" are not supported in 5 MHz channel bandwidth.
- “2 to 1” and “1 to 2” are not supported when E1/T1 services are enabled.

Spectrum Management Control

Is used to configure the PTP 600 Series Spectrum Management features, see Spectrum management on page 6-22 for more details. In regions that do not mandate DFS (Radar Detection), the Spectrum Management Control options are “i-DFS” and “Fixed Frequency”. In regions that mandate DFS (Radar Detection), the Spectrum Management Control options are “DFS” and “DFS with i-DFS”.

The Spectrum Management Control is disabled if the regulatory requirement is fixed frequency only (for example if the frequency variant is PTP 25600).

Lower Center Frequency

Not displayed for the PTP 49600. Not displayed when Spectrum Management Control is set to “Fixed Frequency”. The software for the PTP 600 Series allows a user to optionally adjust the channel center frequencies. Changing the Lower Center Frequency attribute causes all channel center frequencies to be offset. It effectively slides the channelization up or down.

NOTE

Because the 4.9 GHz spectrum is restricted by license, the Lower Center Frequency is fixed for the PTP 49600 and is therefore not displayed.

CAUTION

The lower center frequency attribute must be configured to the same value for both the master and slave. Failure to do so will cause the wireless link to fail reestablishment. The only way to recover from this situation is to modify the Lower Center Frequency attribute so that they are identical on both the master and slave unit.

Default Raster

This is only displayed when Spectrum Management Control is set to “Fixed Frequency”. If this is set to “On”, the list of options presented in the fixed Tx frequency box is limited by the default raster.

Fixed Tx Frequency, Fixed Rx Frequency

This is only displayed when Spectrum Management Control is set to “Fixed Frequency”. The software for the PTP 600 Series allows a user to optionally fix the Transmit and the Receive frequencies for a wireless link. The settings must be compatible at each end of the link. Once configured, the spectrum management software will not attempt to move the wireless link to a channel with lower co-channel or adjacent channel interference. Therefore this mode of operation is only recommended for deployments where the installer has a good understanding of the prevailing interference environment.

Figure 6-32 shows an example of the fixed frequency configuration for a 30 MHz channel bandwidth. In this example, the Fixed Transmit Frequency is set to 4436 MHz and the Fixed Receive Frequency is set to 4436 MHz. Care must be taken when configuring the Fixed Transmit and Receive Frequencies to ensure that both frequencies are on the same channel raster as the Lower Center Frequency. For example, if the channel raster is 10 MHz, both the Fixed Transmit and Receive Frequencies must be a multiple of 10 MHz from the Lower Center Frequency (4426 = 4416 + 10 MHz) and (4486 = 4416 + 10 MHz × 7).

NOTE

A raster limits the selection of the Rx frequency based upon the setting of the Tx frequency.

Tx Color Code, Rx Color Code

The Tx Color Code and Rx Color Code attributes need only be considered when the unit is installed in a dense network of synchronized PTP 600 units and where some of the PTP 600 units are operating on the same frequency. In this case, the value would normally be derived by a network radio planner. In all other cases, it is strongly recommended that this attribute is left at the default value of "A".

NOTE

The value of Tx Color Code MUST always match the value of Rx Color Code at the other end of the link.

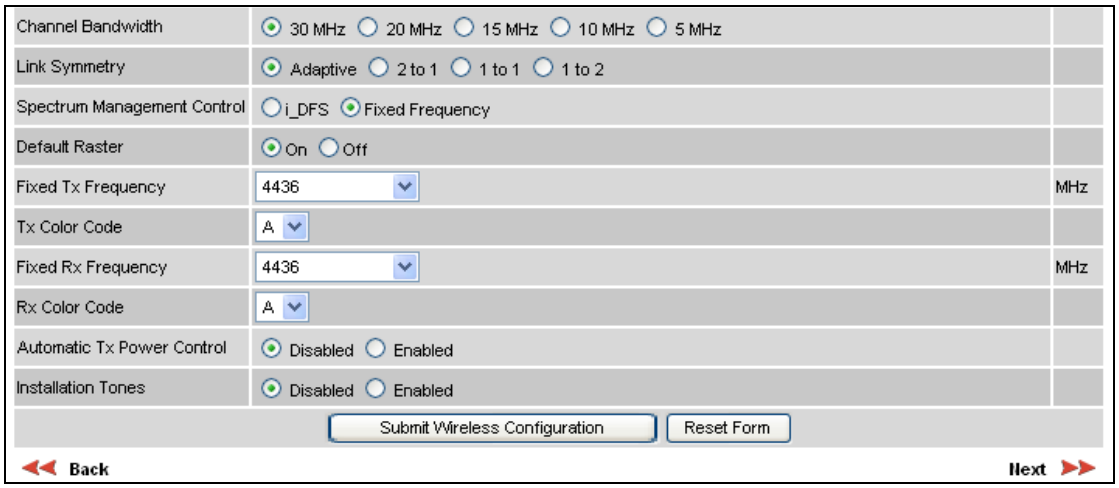
Automatic Tx Power Control

Leave this attribute at the default setting ‘Disabled’.

Installation Tones

Where the use of audio installation tones is not required, this control allows the installer to optionally disable the tone generator during the installation process.

Figure 6-32 Step 2: Wireless Configuration page (extract) for fixed frequency



Submit wireless configuration

Once the installer is satisfied with the wireless configuration options then the **Submit Wireless Configuration** button or the **Next** link should be clicked.

TDD synchronization configuration

TDD synchronization is enabled and configured using the install wizard during the installation process of the link.

TDD synchronization enable

To enable TDD Synchronization, set the TDD Synchronization Mode attribute to 'Enabled' (Figure 6-31).

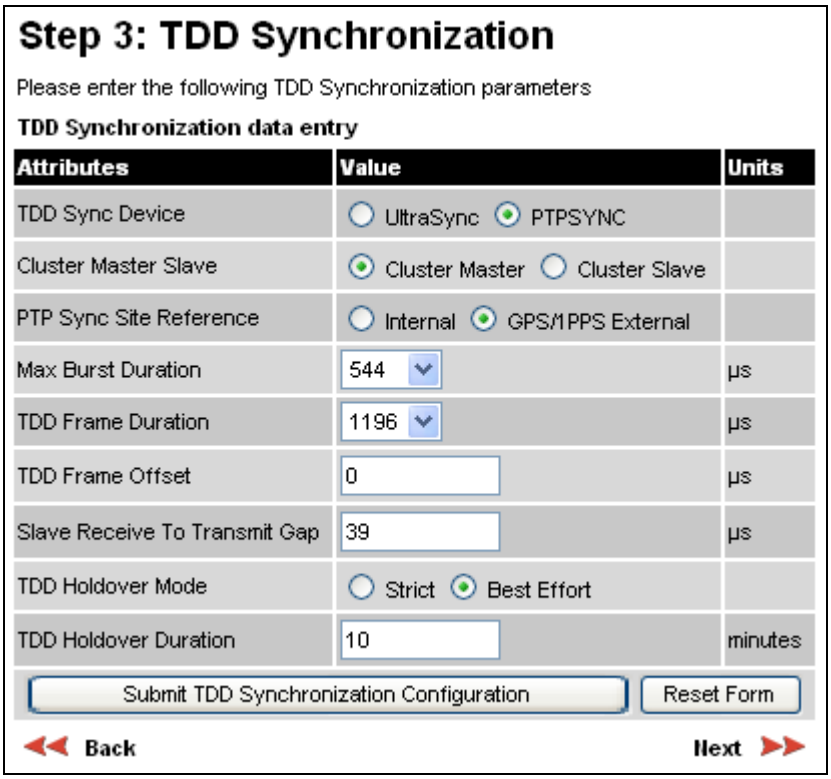
When TDD Synchronization is enabled, the following restrictions apply:

- Ranging Mode and Target Range are disabled.
- Link Symmetry is forced to '1:1' operation only.

TDD synchronization configuration

When TDD Synchronization is enabled, there is an extra installation screen ("TDD Synchronization", Figure 6-33).

Figure 6-33 Step 3: TDD Synchronization page



The data required to populate this screen is available in PTP LINKPlanner v1.4.

The TDD Synchronization screen provides the following controls:

TDD Sync Device

Select the timing device that is to be used for TDD synchronization.

Cluster Master Slave

Only displayed when TDD Sync Device is set to ‘PTPSYNC’.

Select the position that this ODU will occupy in the TDD synchronization cluster. ‘Cluster Master’ is the first ODU in the synchronization chain. ‘Cluster Slave’ is the second or subsequent ODU in the chain.

PTP Sync Site Reference

Only displayed when TDD Sync Device is set to ‘PTPSYNC’.

Select the timing reference source for PTP-SYNC. ‘Internal’ means standalone operation with no external timing reference. ‘GPS/1PPS External means that an external GPS receiver will provide a 1 pps timing reference.

Max Burst Duration

The maximum duration of the burst opportunity. Select a value in the range 726 to 2176 microseconds.

TDD Frame Duration

Select a value in the range 1730 to 6410 microseconds.

TDD Frame Offset

The delay of the start of the TDD frame from the epoch of the external timing reference. This permits the design of synchronized networks in which the phase of the TDD frame is independent from the fundamental master/slave function. This change allows more flexibility in selecting the location of master ODUs. Enter a value in the range from zero to one microsecond less than the TDD Frame Duration.

Slave Receive To Transmit Gap

The duration of the gap between receive and transmit at the slave ODU.

TDD Holdover Mode

(Master only). Two values: “Strict” and “Best Effort”. If a PTP 600 master ODU is configured for a TDD Holdover Mode set to “Strict”, then it will not transmit when synchronization is lost. On the other hand, a link configured for TDD Holdover Mode set to “Best Effort” will synchronize when a reference signal is available, but will otherwise use best efforts to operate in unsynchronized fashion.

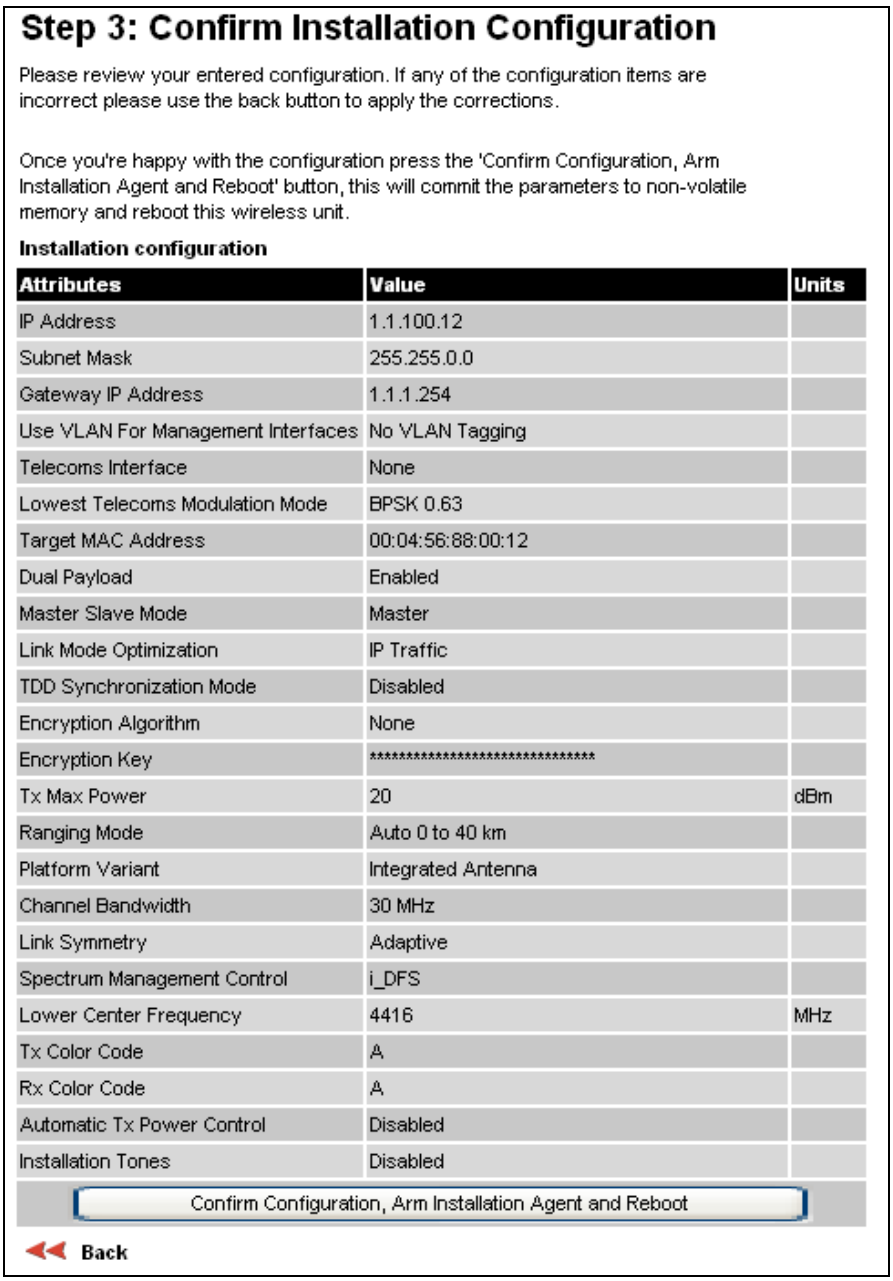
TDD Holdover Duration

(Master only). Default value 10 minutes, maximum 60 minutes. Specifies duration of holdover period following loss of the external timing reference for TDD synchronization.

Installation step 3 - confirm configuration

Step 3 of the installation process requires the installer to confirm the wireless configuration parameters. Figure 6-34 is an example of the Confirm Configuration screen. The screen contents vary depending upon the product variant and configuration options selected.

Figure 6-34 Step 3: Confirm Installation Configuration page



Step 3: Confirm Installation Configuration

Please review your entered configuration. If any of the configuration items are incorrect please use the back button to apply the corrections.

Once you're happy with the configuration press the 'Confirm Configuration, Arm Installation Agent and Reboot' button, this will commit the parameters to non-volatile memory and reboot this wireless unit.

Installation configuration

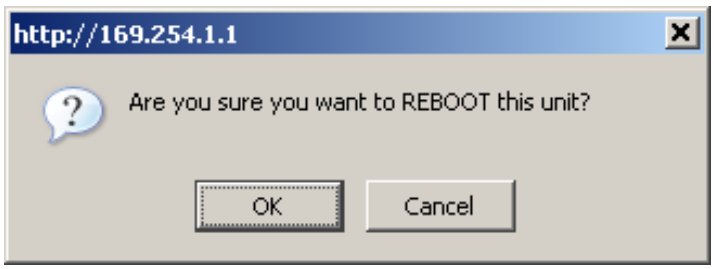
Attributes	Value	Units
IP Address	1.1.100.12	
Subnet Mask	255.255.0.0	
Gateway IP Address	1.1.1.254	
Use VLAN For Management Interfaces	No VLAN Tagging	
Telecoms Interface	None	
Lowest Telecoms Modulation Mode	BPSK 0.63	
Target MAC Address	00:04:56:88:00:12	
Dual Payload	Enabled	
Master Slave Mode	Master	
Link Mode Optimization	IP Traffic	
TDD Synchronization Mode	Disabled	
Encryption Algorithm	None	
Encryption Key	**********	
Tx Max Power	20	dBm
Ranging Mode	Auto 0 to 40 km	
Platform Variant	Integrated Antenna	
Channel Bandwidth	30 MHz	
Link Symmetry	Adaptive	
Spectrum Management Control	i_DFS	
Lower Center Frequency	4416	MHz
Tx Color Code	A	
Rx Color Code	A	
Automatic Tx Power Control	Disabled	
Installation Tones	Disabled	

Confirm Configuration, Arm Installation Agent and Reboot

Back

If the settings are correct and appropriate, click the **Confirm Configuration, Arm Installation and Reboot** button. The user will now be prompted to confirm the action (Figure 6-35).

Figure 6-35 Reboot confirmation pop up



All the attributes are committed to non-volatile memory. Immediately following the write to non-volatile memory the unit is reset.

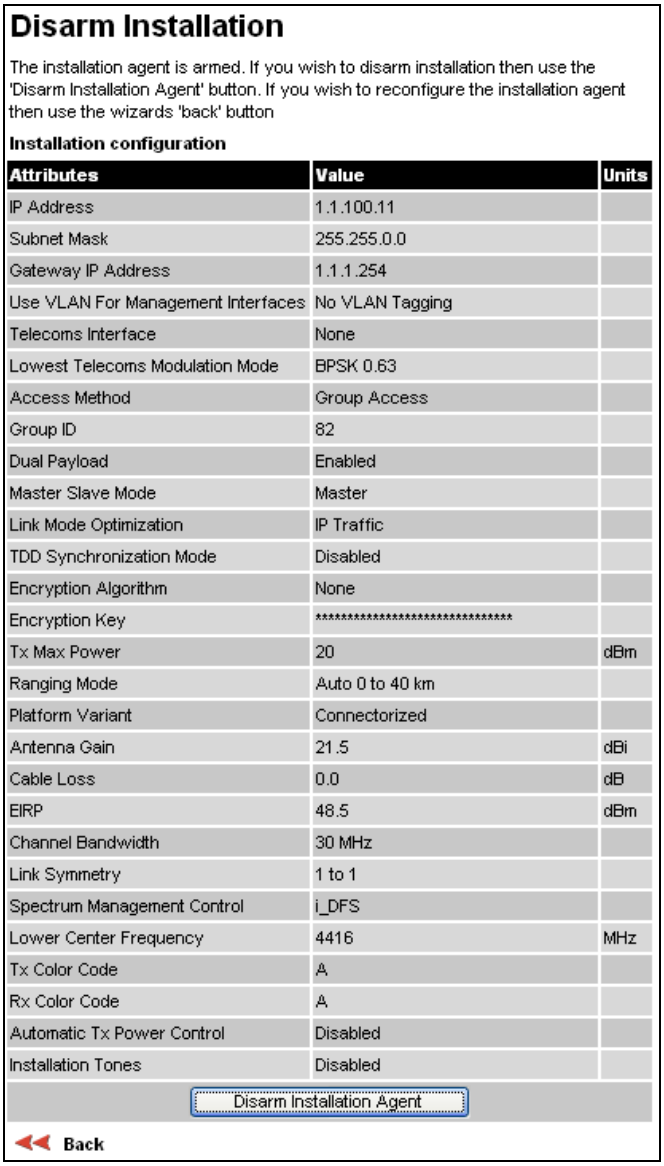
NOTE

If you have changed the Ethernet parameters you must reconnect using the correct network and address settings.

Disarm installation

Figure 6-36 is an example of the Disarm Installation screen. The screen contents vary depending upon the product variant and configuration options selected.

Figure 6-36 Disarm Installation page



Disarm Installation

The installation agent is armed. If you wish to disarm installation then use the 'Disarm Installation Agent' button. If you wish to reconfigure the installation agent then use the wizards 'back' button

Installation configuration

Attributes	Value	Units
IP Address	1.1.100.11	
Subnet Mask	255.255.0.0	
Gateway IP Address	1.1.1.254	
Use VLAN For Management Interfaces	No VLAN Tagging	
Telecoms Interface	None	
Lowest Telecoms Modulation Mode	BPSK 0.63	
Access Method	Group Access	
Group ID	82	
Dual Payload	Enabled	
Master Slave Mode	Master	
Link Mode Optimization	IP Traffic	
TDD Synchronization Mode	Disabled	
Encryption Algorithm	None	
Encryption Key	**********	
Tx Max Power	20	dBm
Ranging Mode	Auto 0 to 40 km	
Platform Variant	Connectorized	
Antenna Gain	21.5	dBi
Cable Loss	0.0	dB
EIRP	48.5	dBm
Channel Bandwidth	30 MHz	
Link Symmetry	1 to 1	
Spectrum Management Control	i_DFS	
Lower Center Frequency	4416	MHz
Tx Color Code	A	
Rx Color Code	A	
Automatic Tx Power Control	Disabled	
Installation Tones	Disabled	

Disarm Installation Agent

Back

When Section Installation step 3 - confirm configuration on page 6-69 is complete, the installation is armed and rebooted. Pressing the “Disarm Installation Agent” button completes the installation process and the audible installation tone will be switched off. If the installer wishes to modify the installation configuration then the ‘Back’ link can be used to access the installation wizard steps described above.

The installation process is completed when both ends of the link are ‘disarmed’.

After disarming the wireless link the user is presented with one of two possible configuration pages, see Figure 6-37 and Figure 6-38. The screen presents hyperlinks to the main configuration and spectrum management pages.

Figure 6-37 Optional post disarm configuration 1

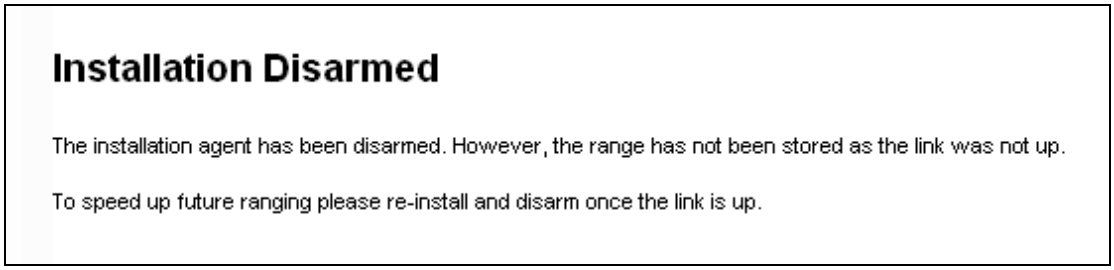
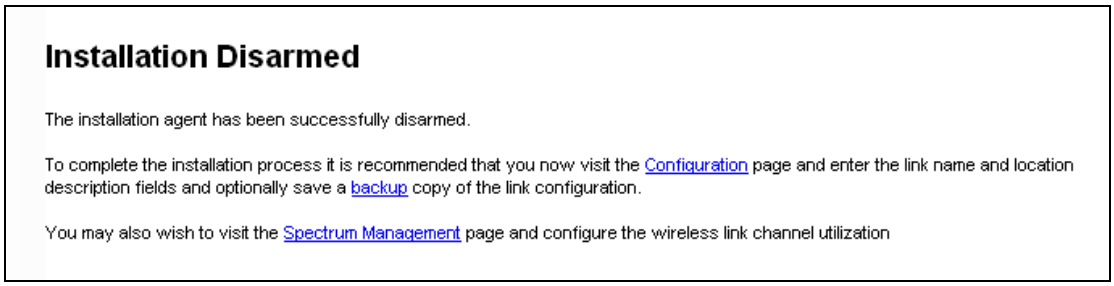


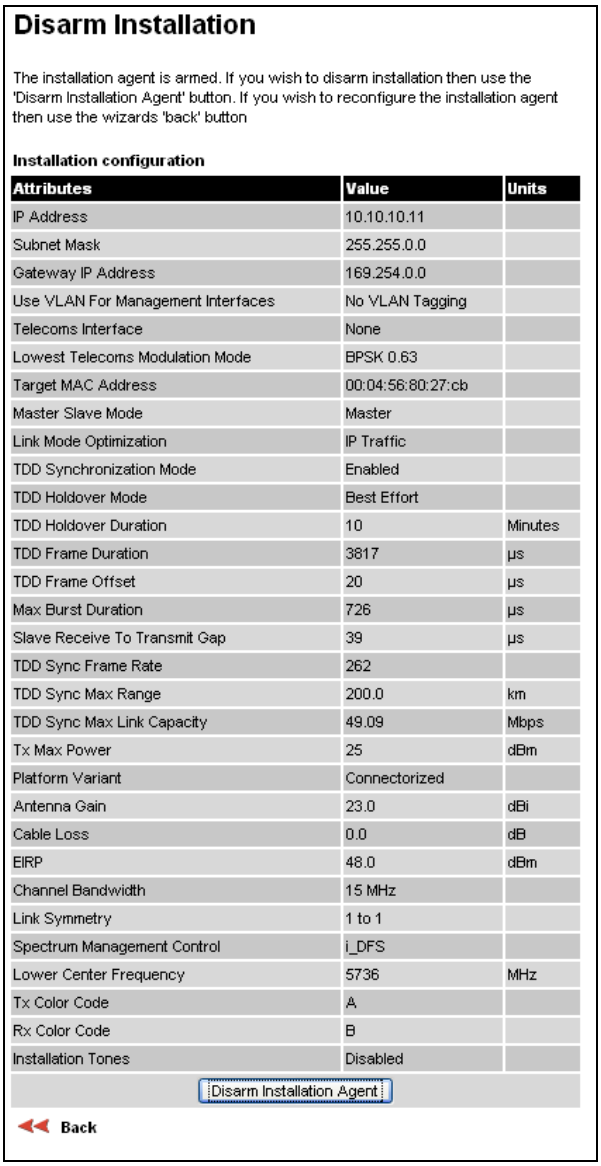
Figure 6-38 Optional post disarm configuration 2



After installation the system administrator may wish to modify the wireless units descriptive configuration (link name and link location). In addition the system administrator may wish to change the spectrum management configuration of the wireless unit, or look at the analysis of the 5.8 GHz spectrum to see if the automatic channel selection is appropriate for the system administrator’s network. It is also recommended that a backup copy of the wireless units configuration is taken. Hyperlinks are provided on the post disarm page for ease of use.

Disarm ODU following TDD synchronization configuration

Figure 6-39 Disarm following TDD synchronization



Disarm Installation

The installation agent is armed. If you wish to disarm installation then use the 'Disarm Installation Agent' button. If you wish to reconfigure the installation agent then use the wizards 'back' button

Installation configuration

Attributes	Value	Units
IP Address	10.10.10.11	
Subnet Mask	255.255.0.0	
Gateway IP Address	169.254.0.0	
Use VLAN For Management Interfaces	No VLAN Tagging	
Telecoms Interface	None	
Lowest Telecoms Modulation Mode	BPSK 0.63	
Target MAC Address	00:04:56:80:27:cb	
Master Slave Mode	Master	
Link Mode Optimization	IP Traffic	
TDD Synchronization Mode	Enabled	
TDD Holdover Mode	Best Effort	
TDD Holdover Duration	10	Minutes
TDD Frame Duration	3817	µs
TDD Frame Offset	20	µs
Max Burst Duration	726	µs
Slave Receive To Transmit Gap	39	µs
TDD Sync Frame Rate	262	
TDD Sync Max Range	200.0	km
TDD Sync Max Link Capacity	49.09	Mbps
Tx Max Power	25	dBm
Platform Variant	Connectorized	
Antenna Gain	23.0	dBi
Cable Loss	0.0	dB
EIRP	48.0	dBm
Channel Bandwidth	15 MHz	
Link Symmetry	1 to 1	
Spectrum Management Control	i_DFS	
Lower Center Frequency	5736	MHz
Tx Color Code	A	
Rx Color Code	B	
Installation Tones	Disabled	

Disarm Installation Agent

Back

⚠ CAUTION

In a synchronized network, links MUST be configured separately before bringing the whole network up.

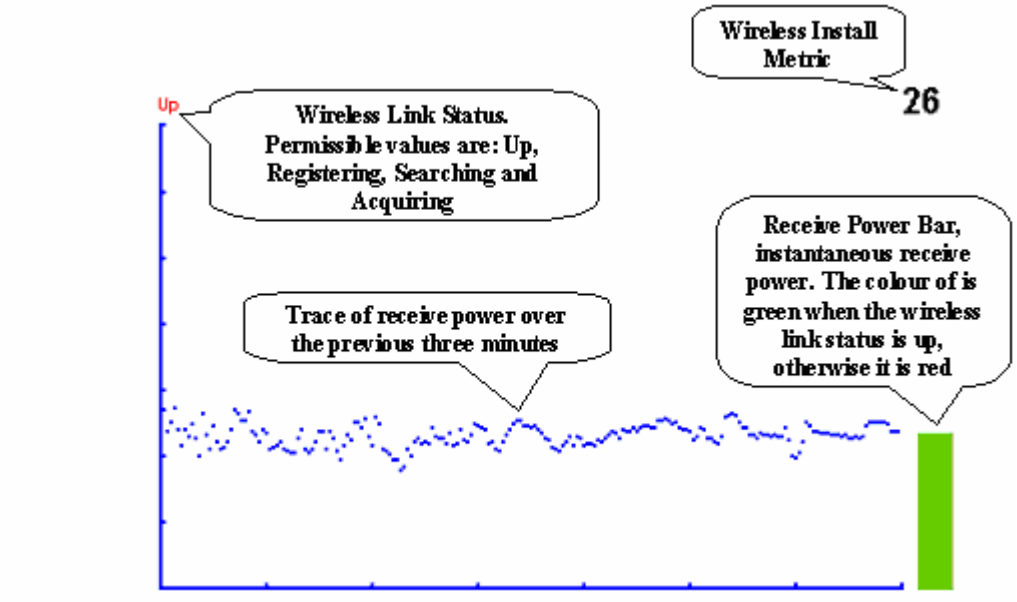
Graphical install

To aid the installation of wireless links two graphical installation aids have been introduced in this 600 Series system version.

- A PDA installation screen
- A larger installation screen available from the main HTTP management interface.

The design of the installation screen has been deliberately kept simple and uncluttered. An example of the installation screen is shown in Figure 6-40. Both the PDA and the large format installation screen have the same content and only differ in size. The PDA installation screen is 232 by 220 pixels to be compatible with the typical size of a PDA screen.

Figure 6-40 Graphical installation screen



The screen displays the receive power over the last three minutes. This will allow the installer to slowly sweep the antenna during installation and monitor the variation in signal strength with angular position. The screen automatically refreshes every three seconds.

The screen also displays the current state of the wireless link in two ways. First, the actual state of the wireless link is written in the top left corner of the screen. The instantaneous receive power bar also encodes the state of the wireless link using green to signify that the wireless link is up and red for all other states.

For the more technically, aware the installation metric is simply the instantaneous receive power in dBm + 100.

The PDA installation tool is accessed via a hidden URL http://<ip-address>/pda.cgi. It should be noted that this link is only available after the user has logged in as system administrator.

The large screen version of the graphical user interface is available as a submenu option of the installation wizard.

Upgrading the PTP 600

Checking capability summary

Perform this task to check that the currently licensed capabilities (security level, encryption and group access) of the PTP 600 meet the operator's requirements.

To check the capability summary, proceed as follows:

Procedure 6-1 Check capability summary

1	From the left hand menu, select **License Key.** The Software License Key page is displayed (Figure 6-41).
2	Check the attributes in the Capability summary section (Table 6-8).
3	If the current capabilities do not meet the operator's requirements, then determine the new requirements.

Figure 6-41 Software License Key page

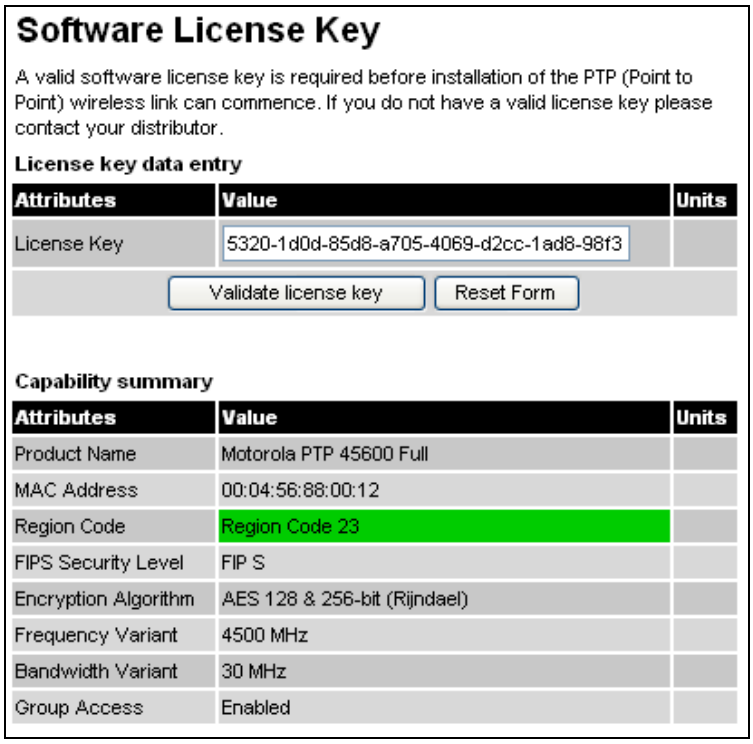


Table 6-8 Capability summary attributes

Attribute	Meaning
Product Name	The name of the PTP 600 product variant.
MAC Address	The MAC address of the PTP 600.
Region Code	The region code prohibits the wireless unit from operating outside the regulated limits. An invalid region code indicates a corrupted license key.
FIPS Security Level	The maximum configurable security level.
Encryption Algorithm	The encryption algorithms available for use at the wireless interface of the ODU. Encryption algorithm and keys must be the same at BOTH ends of the link for it to function correctly. This attribute is only displayed if the current license key permits encryption.
Frequency Variant	Frequency variant of the wireless unit.
Bandwidth Variant	Bandwidth variant of the wireless unit.
Group Access	Indicates whether or not group access is enabled.

Using access keys to generate a new license key

The PTP 600 is supplied with a factory default license key. Perform this task to generate a new license key to activate new licensed capabilities (security level, encryption or group access).

Before starting this task, perform Checking capability summary on page 6-77.

To generate a new license key, proceed as follows:

Procedure 6-2 Use an access key to generate a license key

1	Purchase the required new capabilities from the Motorola authorized Point-To-Point dealer who supplied the PTP 600 link. The dealer will supply one or more access keys.
2	Go to the PTP web support page at http://www.motorola.com/ptp/support and select **Key Generator**. The PTP License Key Generator form should be displayed.
3	Enter the required details, including the access keys supplied by the dealer.
4	Submit the web form. The PTP License Key Generator will respond with the new license key.

Entering a license key

Perform this task to enter a new license key (when upgrading licensed capabilities).

Before starting this task, ensure that the license key is available. If it is necessary to upgrade the licensed capabilities of an existing unit, then perform the following tasks first:

- Checking capability summary on page 6-77
- Using access keys to generate a new license key on page 6-79

To upgrade the unit to a new license key, proceed as follows:

Procedure 6-3 Upgrade unit to a new license key

1	From the left hand menu, select **License Key**. The Software License Key page is displayed (Figure 6-41).
2	Enter the new License Key.
3	Select **Validate license key**. If the license key is valid, the Reboot Wireless Unit dialog is displayed (Figure 6-42).
4	Select **Reboot Wireless Unit**. The Reboot Confirmation dialog is displayed (Figure 6-43).
5	Select **OK**. The reboot progress message is displayed. On completion, the unit restarts with the new license key.

Figure 6-42 Reboot Wireless Unit dialog

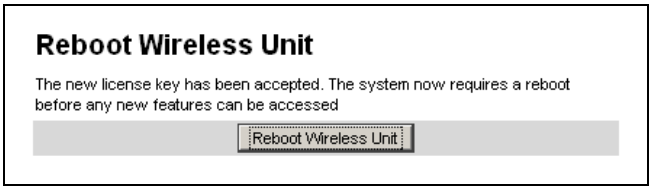
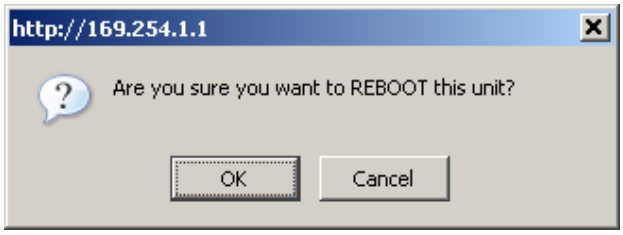


Figure 6-43 Reboot Confirmation dialog



Saving and restoring system configuration

The save and restore feature allows the system administrator to save and restore the operational configuration of the units. Motorola recommends that the configuration should be saved immediately after a successful link installation and immediately before a software upgrade. In the unlikely event that a unit has to be replaced in the field, the replacement unit can be reconfigured by restoring the saved configuration file.

Saving the configuration file

Perform this task to save the operational configuration of the units.

To save the configuration file, proceed as follows:

Procedure 6-4 Save configuration file

1	From the left hand menu, select **Configuration**, **Save And Restore**. The Save & Restore Configuration page is displayed (Figure 6-44).
2	Select **Save Configuration File**.
3	Save the configuration file to a PC hard drive.

The configuration file format is:

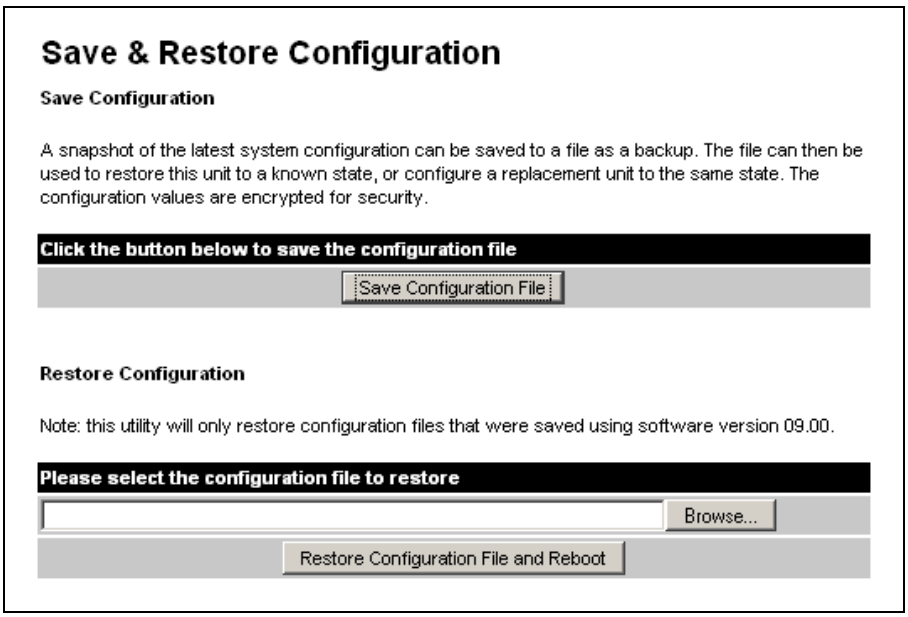
MAC-mm-mm-mm_IP-iii-iii-iii-iii.cfg

Where:	**Is:**
mm-mm-mm	MAC address of unit
iii-iii-iii-iii	IP address of unit.

NOTE

Internet Explorer inspects the content of any downloadable file and decides whether to treat the file as ASCII or binary. As a result of this feature, Internet Explorer always treats the configuration file as ASCII and attempts to display it instead of downloading it. Firefox makes no such assumption.

Figure 6-44 Save & Restore Configuration page



Restoring the configuration file

Perform this task to restore the operational configuration of the unit.

Before starting this task, ensure that:

- The configuration file of the old (faulty) unit has been saved.
- The new (replacement) unit has been installed.
- The license key of the old unit has been entered in the new unit.

To restore the configuration file, proceed as follows:

Procedure 6-5 Restore configuration file

1	From the left hand menu, select **Configuration**, **Save And Restore**. The Save & Restore Configuration page is displayed (Figure 6-44).
2	Select **Browse** and navigate to the PC folder containing the saved configuration file (.cfg).
3	Select **Restore Configuration File and Reboot**.
4	Select **OK** to confirm the restore. The configuration file is uploaded and used to reconfigure the new unit to the same state as the old unit. On completion, the unit reboots.

Upgrading PTP 600 software

Perform this task to upgrade the units to a new version of PTP 600 operational software.

CAUTION

Ensure that the remote end of the link is upgraded first using the wireless connection, and then the local end can be upgraded. Otherwise, the remote end may not be accessible.

CAUTION

Ensure that the correct units are upgraded, as units cannot be downgraded afterwards.

NOTE

Before performing a software upgrade, save the configuration as described in Saving and restoring system configuration on page 6-81. In the unlikely event that a unit has to be replaced in the field, the replacement unit can be reconfigured by restoring the saved configuration file.

To upgrade the software, proceed as follows:

Procedure 6-6 Upgrade software

1	Download and save the new software image (PTP 600-nn-mm.dld2) from http://www.motorola.com/ptp/support.
2	From the left hand menu, select **Software Upgrade**. The Software Upgrade page is displayed (Figure 6-45).
3	Select **Browse**. Navigate to the folder containing the downloaded software image and select **Open**.
4	Select **Upload Software Image**. The Software Upgrade Confirmation page is displayed (Figure 6-46). If the upgrade is taking the ODU into or out of FIPS mode, an additional warning is displayed stating that the upgrade will cause automatic erasure of the critical security parameters (CSPs).

5	Select **Program Software Image into Non-Volatile Memory**. The Progress Tracker page is displayed (Figure 6-47). The upgrade process should not be interrupted, as this can result in a corrupt main software image, which will result in the recovery image been booted at the next reset cycle. On completion, the Software Upgrade Complete page is displayed (Figure 6-48).
6	Select **Reboot Wireless Unit**. Select **OK** to confirm (Figure 6-49). The unit reboots with the new software installed. The reboot process will take up to 120 seconds. During this time it will not be possible to communicate with the unit.
7	After the reboot, check that the required software image is loaded and running.

NOTE

If communication with the unit is not restored after 120 seconds , this could indicate a problem with the memory update process. If this happens, enter “Recovery Mode” as described in Using recovery mode on page 7-20.

Figure 6-45 Software Upgrade page

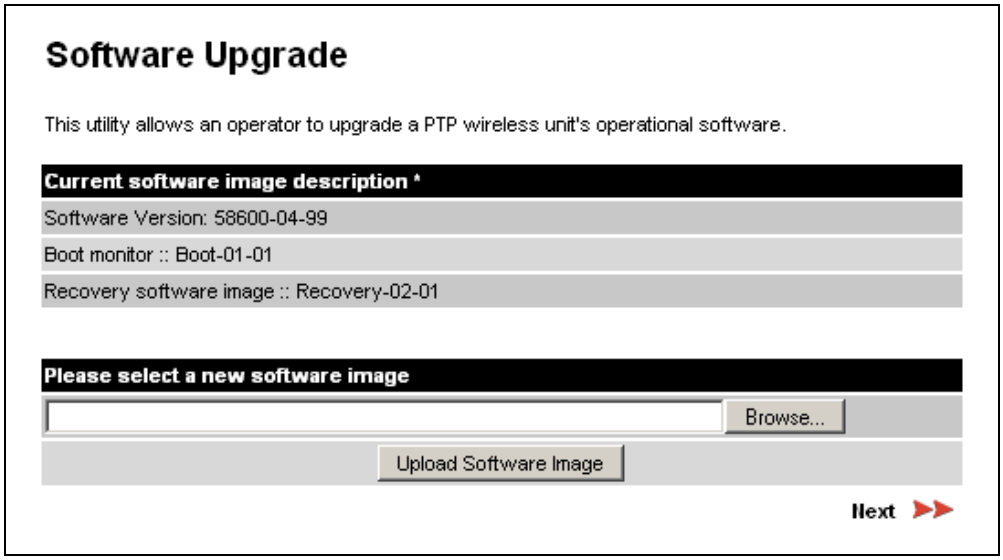


Figure 6-46 Software Upgrade Confirmation page

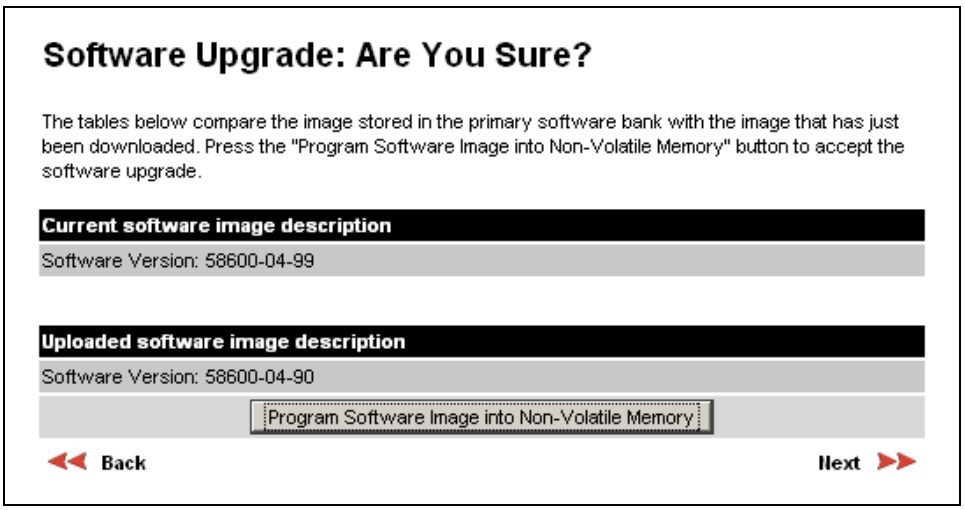


Figure 6-47 Upgrade Progress Tracker

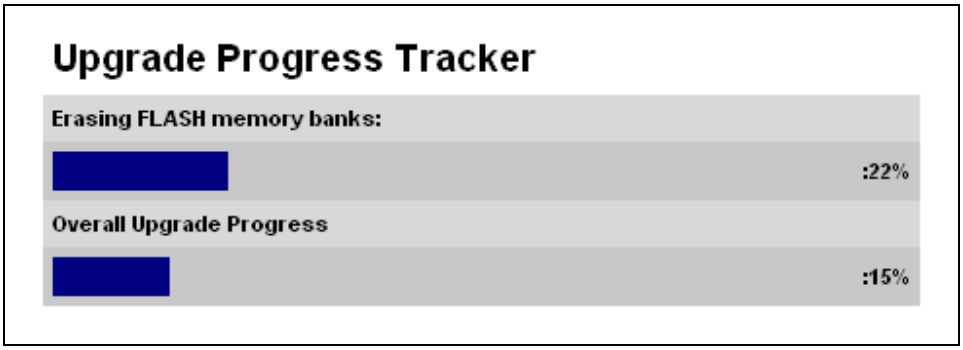


Figure 6-48 Software Upgrade Complete page

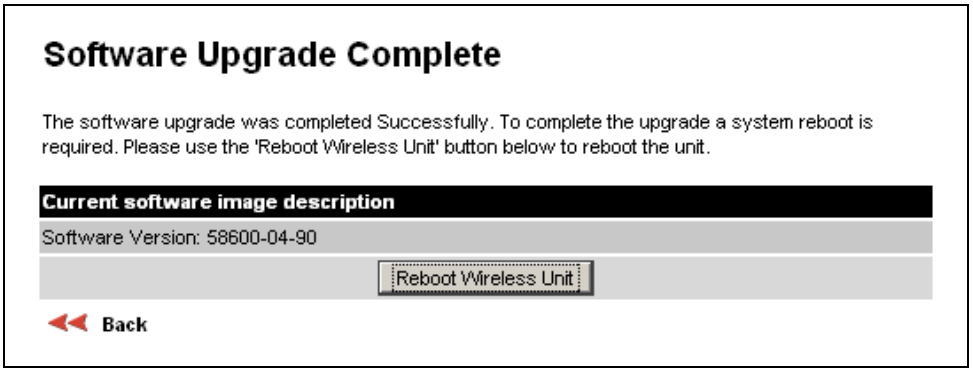
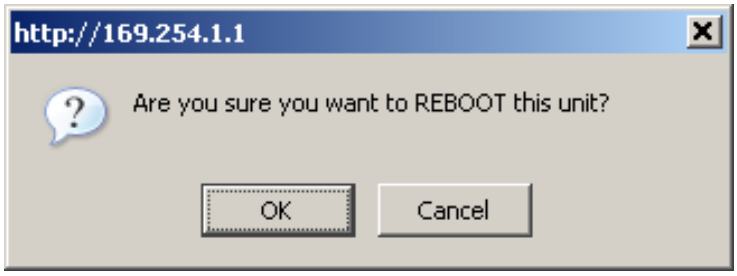


Figure 6-49 Reboot confirmation pop up



File name style for FIPS validated software

FIPS validated software images are indicated by a `FIPS-` prefix to the file name, for example: `FIPS-PTP600-08-50.DLD2`.

Remote software upgrade by TFTP

This section describes how to upgrade the PTP 600 software remotely using Trivial FTP (TFTP) triggered by SNMP.

To perform a remote software upgrade, follow this procedure:

1. Set tFTP attibutes as described in Setting tFTP attributes on page 6-88.
2. Monitor tFTP attributes as described in Monitoring tFTP attributes on page 6-89.
3. When the upgrade is complete, reboot the ODU to run the newly loaded software image as described in Reboot on page 7-27.

Setting tFTP attributes

Set the following tFTP attributes:

tFTPServerIPAddress

This is the IP address of the TFTP server from which the TFTP software upgrade file Name will be retrieved.

For example, to set the TFTP server IP address for unit 10.10.10.10 to 10.10.10.1, enter this command:

```
snmpset_d.exe -v 2c -c public 10.10.10.10 .iso.3.6.1.4.1.17713.1.9.5.0 a
10.10.10.1
```

tFTPServerPortNumber

This setting is optional. The port number of the TFTP server from which the TFTP software upgrade file name will be retrieved (default=69).

tFTPSoftwareUpgradeFileName

This is the filename of the software upgrade to be loaded from the TFTP server.

For example, to set the TFTP software upgrade filename on 10.10.10.10 to "B1095.dld", enter this command:

```
snmpset_d.exe -v 2c -c public 10.10.10.10 .iso.3.6.1.4.1.17713.1.9.7.0 s
B1095.dld
```

tFTPStartSoftwareUpgrade

Write '1' to this attribute to start the TFTP software upgrade process. The attribute will be reset to 0 when the upgrade process has finished.

For example, enter this command:

```
snmpset_d.exe -v 2c -c public 10.10.10.10 .iso.3.6.1.4.1.17713.1.9.8.0 i
1
```

Monitoring tFTP attributes

Monitor the values of the following tFTP attributes:

tFTPSoftwareUpgradeStatus

This is the current status of the TFTP software upgrade process. Values:

- idle(0)
- uploadinprogress(1)
- uploadsuccessfulprogrammingFLASH(2)
- upgradesuccessfulreboottorunthenewsoftwareimage(3)
- upgradefailed(4).

For example, enter this command:

```
snmpget_d.exe -v 2c -c public 10.10.10.10 .iso.3.6.1.4.1.17713.1.9.9.0
```

tFTPSoftwareUpgradeStatusText

This describes the status of the TFTP software upgrade process, including any error details.

For example, enter this command:

```
snmpget_d.exe -v 2c -c public 10.10.10.10 .iso.3.6.1.4.1.17713.1.9.10.0
```

tFTPSoftwareUpgradeStatusAdditionalText

This is used if tFTPSoftwareUpgradeStatusText is full and there are more than 255 characters to report. It contains additional text describing the status of the TFTP software upgrade process, including any error details.

For example, enter this command:

```
snmpget_d.exe -v 2c -c public 10.10.10.10 .iso.3.6.1.4.1.17713.1.9.11.0
```

Managing security

Configuring user accounts

Perform this task to ensure that user access to the ODU is controlled in accordance with the network operator's security policy. The following user account options may be configured:

- Best practice passwords.
- Auto logout period.
- Maximum number of login attempts.
- Login attempt lockout period.
- Password expiry period.
- Minimum password change period.
- Identity-based user accounts.

NOTE

To ensure that the ODU is compliant with the security requirements of FIPS 140-2, the above options must all be enabled. For more information, refer to Configuring FIPS 140-2 mode on page 6-108.

If identity-based user accounts are enabled, this task may only be performed by a Security Officer.

To set these options, proceed as follows:

Procedure 6-7 Configure user accounts

1	From the left hand menu, select **User Accounts**. The User Accounts page is displayed (Figure 6-50).
2	Review and update the user accounts attributes (Table 6-9).
3	If any attributes have been updated, select **Submit User Account Updates**.

Figure 6-50 User Accounts page

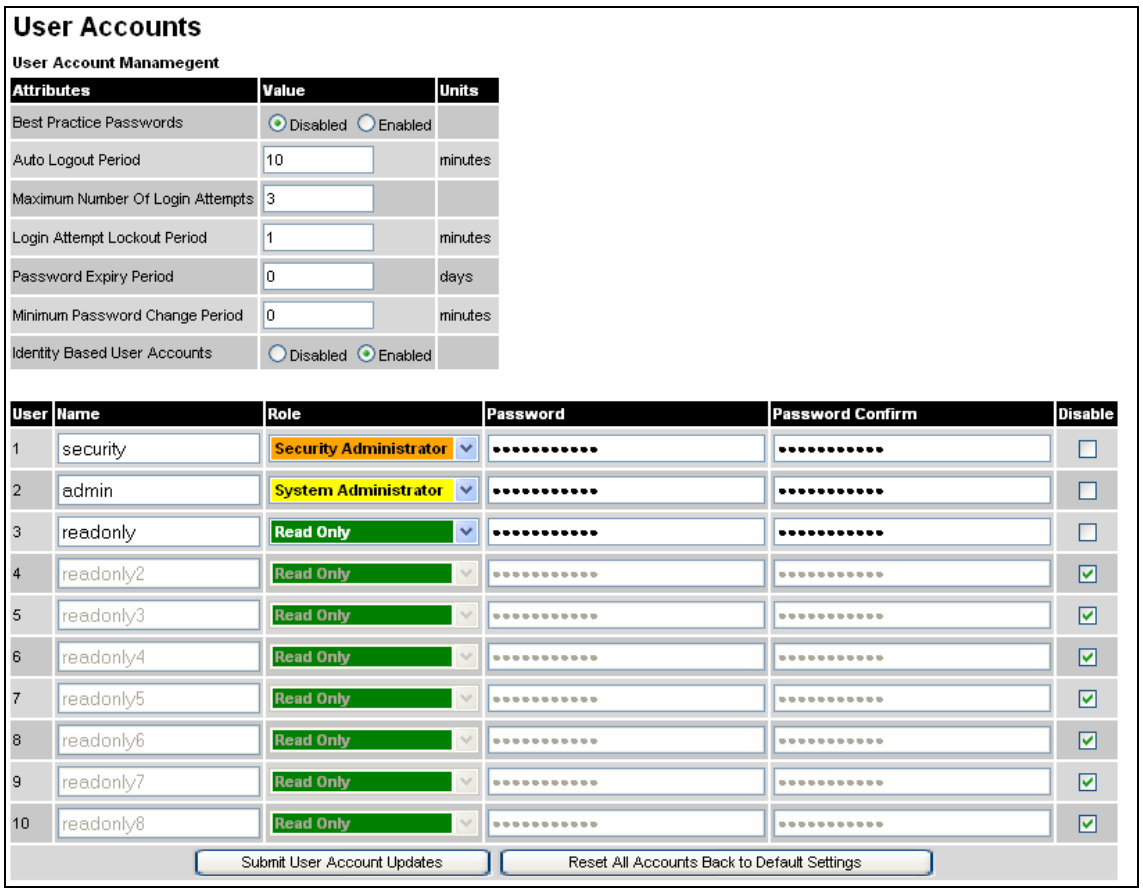


Table 6-9 User accounts attributes

Attribute	Meaning
Best Practice Passwords	Disable or enable best practice password rules. When this is enabled, the following rules are applied to all passwords: Passwords are case sensitive. Password must contain at least eight characters. Passwords must contain at least: • One uppercase letter. • One lowercase letter. • One numeral. • One special character: !\"#$%&'()*+,-./:;<=>?@[\]^_`{|}~
Auto Logout Period	The time without user activity that elapses before a user is automatically logged out (minutes).
Maximum Number of Login Attempts	The maximum number of login attempts (with incorrect password) that are allowed before a user is locked out.
Login Attempt Lockout Period	The time that elapses before a locked out user is allowed to log in again (minutes).
Password Expiry Period	The time that elapses before a password expires (days). When a password has expired, the user is forced to change it.
Minimum Password Change Period	The minimum time that elapses before a user is allowed to change a password (minutes).
Identity Based User Accounts	Enable or disable identity-based user accounts. When this is disabled, access to the web interface is controlled by a single system administration password, and the user account data entry table is disabled. When this is enabled, the user account data entry table is enabled. For more information, refer to Creating or updating identity-based users on page 6-93.

Creating or updating identity-based users

Perform this task to allow multiple users (from one to ten) to access the ODU with different levels of access. There are three defined levels of access: Security Officer, System Administrator and Read Only.

NOTE

To ensure that the ODU is compliant with the security requirements of FIPS 140-2, identity-based user accounts must be enabled. For more information, refer to Configuring FIPS 140-2 mode on page 6-108.

If identity-based user accounts are already enabled, this task may only be performed by a user with role set to Security Officer.

To create or update identity-based user accounts, proceed as follows:

Procedure 6-8 Configure user accounts

1	From the left hand menu, select **User Accounts**. The User Accounts page is displayed (Figure 6-50).
2	Set the Identity Based User Accounts attribute to “Enabled” (if it is not already set).
3	Create or update up to 10 user accounts (Table 6-10).
4	If any accounts have been created or updated, select **Submit User Account Updates**.

Table 6-10 Identity-based user accounts attributes

Attribute	Meaning
Name	Enter a user name.
Role	Select a role from the list: Security Officer System Administrator Read Only **NOTE** At least one user must be assigned the Security Officer role.
Password	Enter a password for the user. If Best Practice Passwords are enabled, all passwords must obey the rules (Table 6-9).
Password Confirm	Retype the password to confirm.
Disable	Tick the box to disable a user account.

Changing own user password

Perform this task to change a user password.

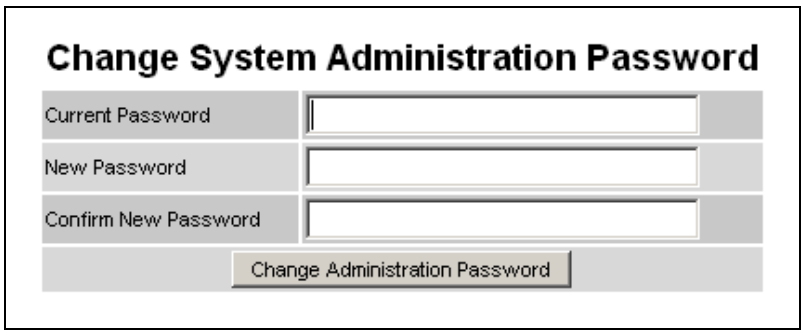
NOTE

This method is used for any user to change his/her own password. The title of the page changes between 'Change System Administrator Password', 'Change Security Officer Password', or 'Change Read Only Password'.

A security officer can change the passwords of other users using the User Accounts page, as described in Creating or updating identity-based users on page 6-93.

From the left hand menu, select **Change Password**. The **Change Password** page is displayed (Figure 6-51). Enter and confirm the new password (the factory default is blank). If Best Practice Passwords are enabled, the new password must obey the rules (Table 6-9).

Figure 6-51 Change Password page (System Administration example)



The password may contain any combination of characters, up to 31 characters in length.

Controlling access to the HTTP interface

The attribute **HTTP Access Enabled** allows a user to stop any access to a unit via HTTP at the HTTP web interface. The default value for this control is set to 'Yes', which means that the unit can be accessed using the HTTP web interface. If the option 'No' is selected, then a warning is displayed as shown in Figure 6-65.

The HTTP interface should be disabled if the HTTPS interface is configured. See Configuring HTTPS/TLS using the Security Wizard on page 6-98.

⚠ CAUTION

If the HTTP, HTTPS, Telnet and SNMP interfaces are all disabled, then it will be necessary to use the Recovery image to reset IP & Ethernet Configuration back to factory defaults to re-enable the interfaces.

Controlling access to the Telnet interface

The attribute **Telnet Access Enabled** allows a user to stop any access to a unit via the telnet interface. The default value for this control is set to 'Yes', which means that the unit can be accessed using the telnet interface.

Enabling AES encryption at the wireless interface

AES link encryption is only available to users who have purchased an appropriate license key. When the license key has been entered, AES link encryption can be configured via one of the following pages:

- Step 2 of the Installation pages (Figure 6-31).
- Step 5 of the Security Wizard (Figure 6-59).
- The System Configuration page (Figure 6-8).

⚠ CAUTION

Configuring link encryption will necessitate a PTP 600 service outage. Therefore it is recommended that the configuration process be scheduled during an appropriate period of low link utilization.

To configure AES link encryption from the Step 2: Wireless Configuration page, proceed as follows:

Procedure 6-9 Configuring AES link encryption

1	Open two browsers, one for each end of the link.
2	Navigate to the Step 2: Wireless Configuration page for each end of the link (Figure 6-31).
3	At both ends of the link select the same Encryption Algorithm, either 'AES 128-bit (Rijndael)' or 'AES 256-bit (Rijndael)' (Figure 6-52).
4	At both ends of the link enter and confirm the same encryption key. The key consists of 32 or 64 case insensitive hexadecimal characters. The same key must be entered at both ends of the link. Failure to enter the same key will cause the link to fail.
5	Submit configuration on both ends of the link, but do not reboot.
6	Reboot both ends of the link (Figure 6-53). The software is designed to allow five seconds so that a user can command both ends of the link to reboot before the wireless link drops.

Figure 6-52 Step 2: Wireless Configuration page AES attributes

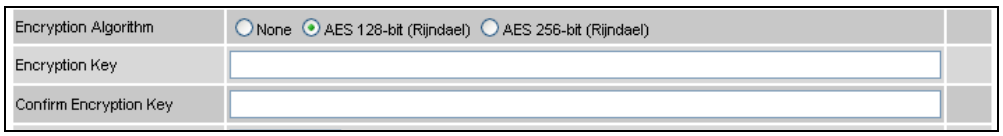
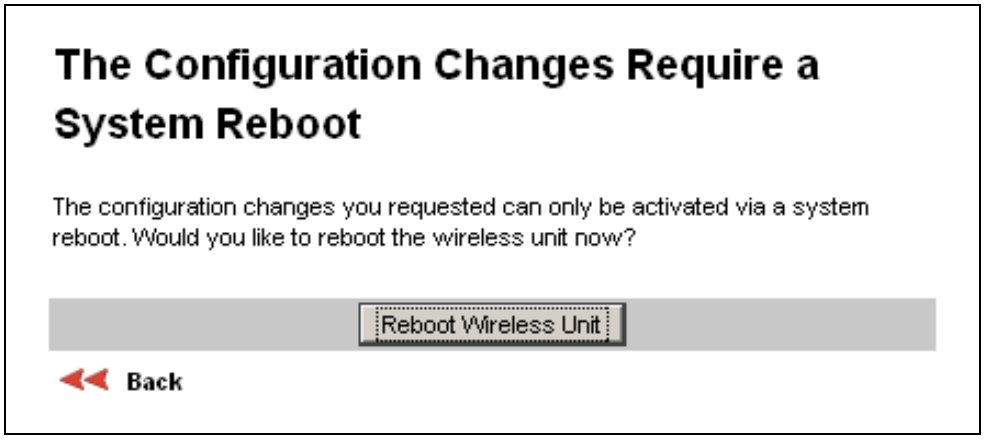


Figure 6-53 Configuration reboot screen



Configuring HTTPS/TLS using the Security Wizard

Perform this task to review and configure HTTPS/TLS security related parameters.

Current security summary

To review HTTPS/TLS security related parameters, proceed as follows:

Procedure 6-10 HTTPS/TLS using the Security Wizard

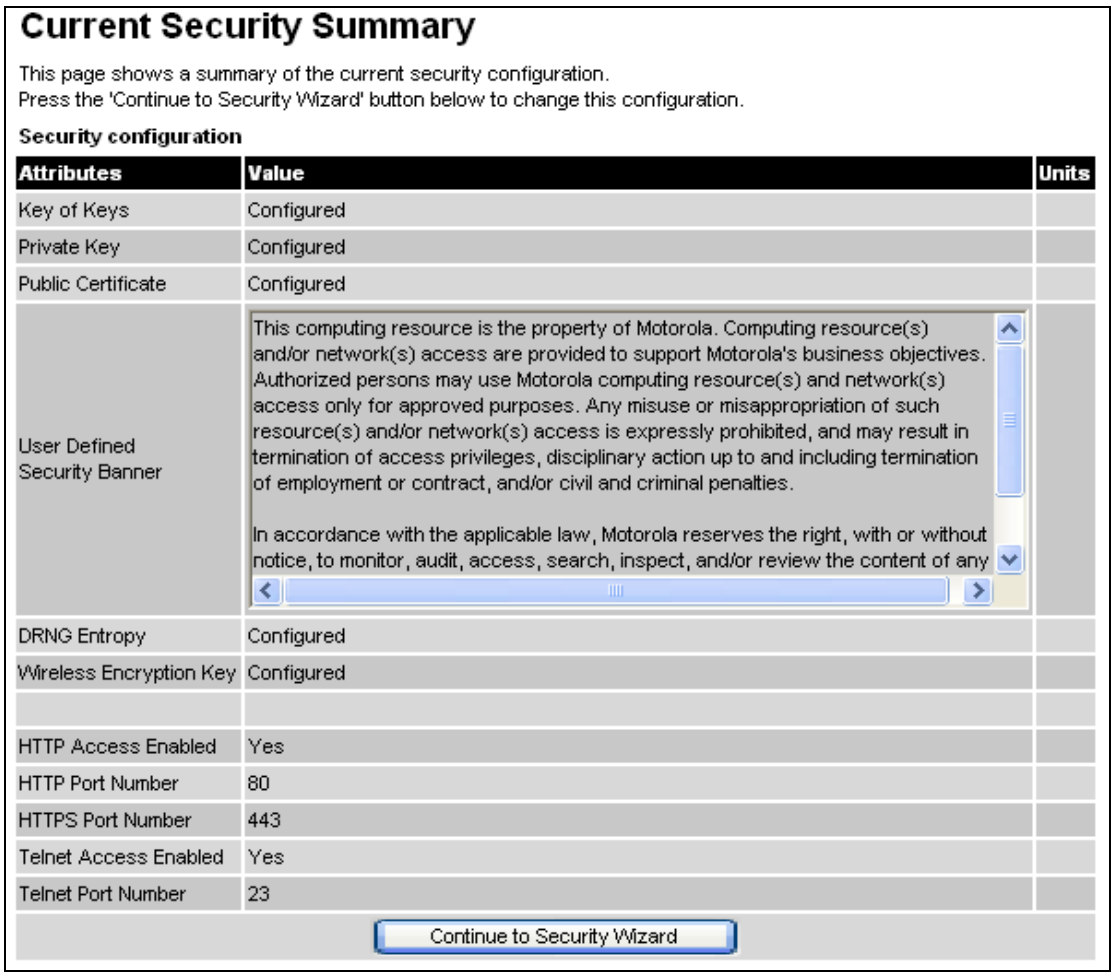
1	From the left hand menu, select **Security Administration**. The Current Security Summary page is displayed (Figure 6-54).
2	Review the summary.
3	If any updates are required, select **Continue to Security Wizard**.

The Security Wizard is only available when both of the following conditions are true:

- Identity-based user accounts are disabled, or identity-based user accounts are enabled and the user's role is Security Officer.
- The wireless unit has a licence key with either 128-bit or 256-bit AES link encryption enabled.

If these conditions are not both true, the Current Security Summary page prevents execution of the wizard.

Figure 6-54 Current Security Summary page



Current Security Summary

This page shows a summary of the current security configuration.
Press the 'Continue to Security Wizard' button below to change this configuration.

Security configuration

Attributes	Value	Units
Key of Keys	Configured	
Private Key	Configured	
Public Certificate	Configured	
User Defined Security Banner	This computing resource is the property of Motorola. Computing resource(s) and/or network(s) access are provided to support Motorola's business objectives. Authorized persons may use Motorola computing resource(s) and network(s) access only for approved purposes. Any misuse or misappropriation of such resource(s) and/or network(s) access is expressly prohibited, and may result in termination of access privileges, disciplinary action up to and including termination of employment or contract, and/or civil and criminal penalties. In accordance with the applicable law, Motorola reserves the right, with or without notice, to monitor, audit, access, search, inspect, and/or review the content of any	
DRNG Entropy	Configured	
Wireless Encryption Key	Configured	
HTTP Access Enabled	Yes	
HTTP Port Number	80	
HTTPS Port Number	443	
Telnet Access Enabled	Yes	
Telnet Port Number	23	

Continue to Security Wizard

Step 1: Enter key of keys

The PTP600 uses a key of keys approach to encrypt all critical security parameters (CSPs). Erasing of the keys of keys will render all CSPs inaccessible.

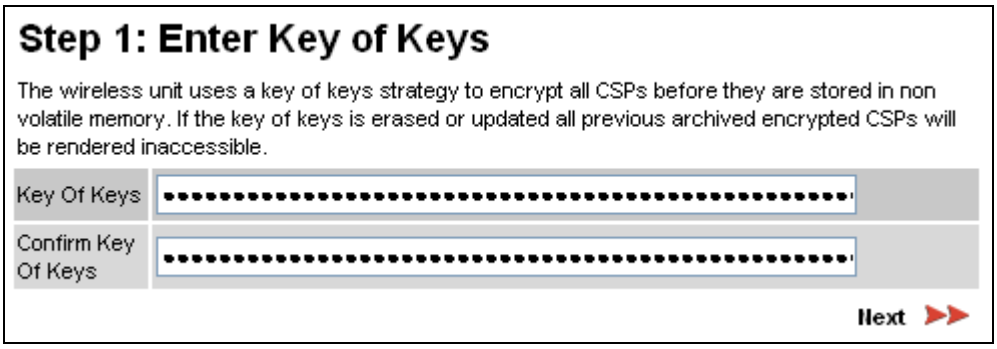
Generate a key of keys encryption key using a FIPS approved key generator. The key length is dictated by the prevailing licence key. Licence keys with AES-128 will require a key of keys of 128-bits. Licence keys with AES-256 will require a key of keys of 256-bits. The key output should be in ASCII hexadecimal characters.

To enter the key of keys via the Security Wizard, proceed as follows:

Procedure 6-11 Enter the key of keys

1	The Step 1: Enter Key of Keys page is displayed (Figure 6-55).
2	Enter the generated key of keys in both the Key Of Keys and Confirm Key Of Keys fields. If the two values are not identical, an error message is displayed.
3	Select **Next**.

Figure 6-55 Step 1: Enter Key of Keys page



Step 2: TLS private key and public certificate

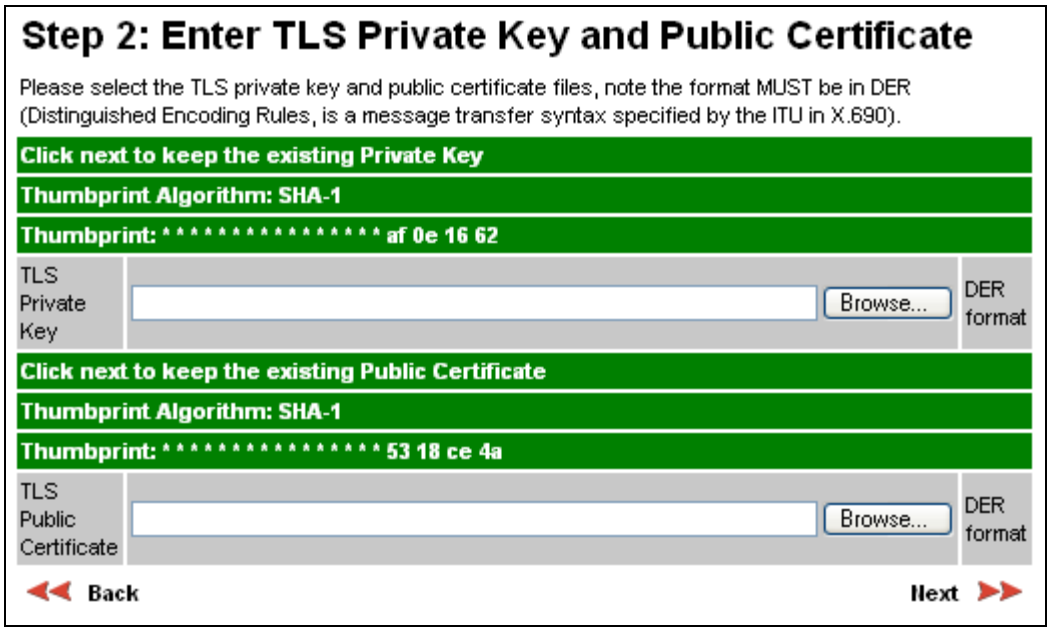
Generate the TLS private key and public certificate in either PKCS#1 or PKCS#5 format. The key pair payload MUST not be encrypted. The certificates must be encoded in ASN.1 DER format. Supported private key sizes are 1024.

To enter the TLS private key and public certificate via the Security Wizard, proceed as follows:

Procedure 6-12 Enter TLS private key and public certificate

1	The Step 2: TLS Private Key and Public Certificate page is displayed (Figure 6-56).
2	If a valid TLS private key exists, then an SHA-1 thumbprint of the key is displayed. If this key is correct, then take no action. Otherwise, select **Browse** and select the generated private key file (.der).
3	If a valid TLS public certificate exists, then an SHA-1 thumbprint of the certificate is displayed. If this certificate is correct, then take no action. Otherwise, select **Browse** and select the generated certificate file (.der).
4	Select **Next**.

Figure 6-56 Step 2: TLS Private Key and Public Certificate page



Step 3: User security banner

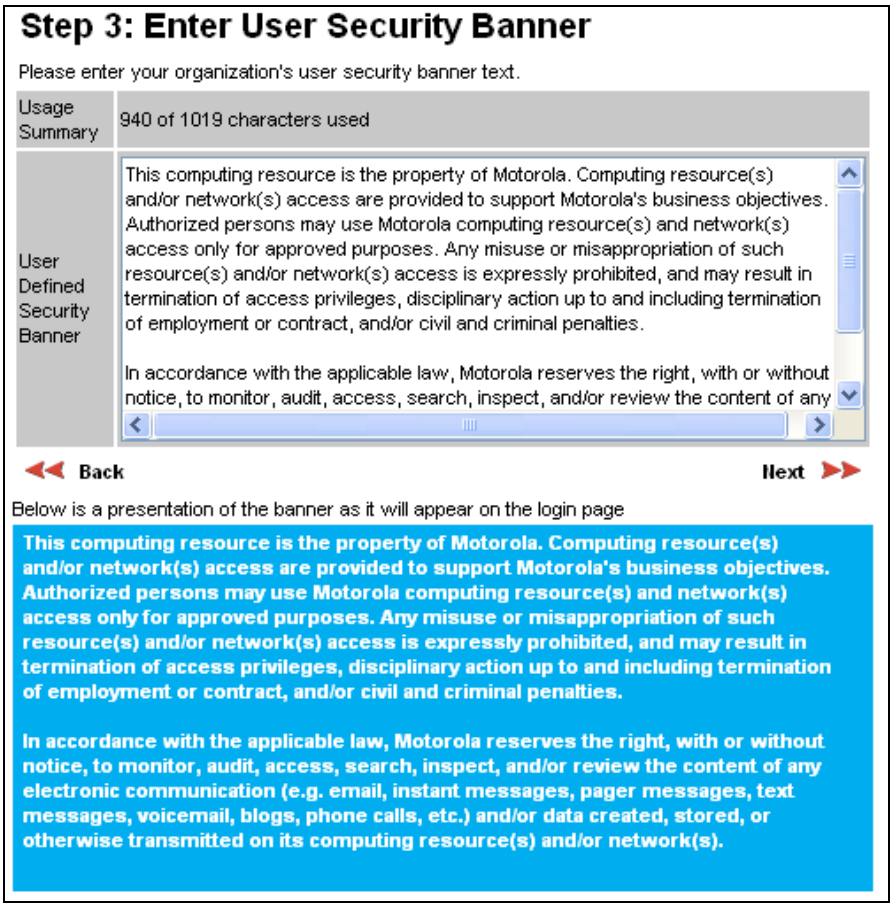
The user security banner is displayed every time a user attempts to login to the wireless unit. Specify the contents of the banner as per the operator's network security policy.

To enter the user security banner via the Security Wizard, proceed as follows:

Procedure 6-13 Enter user security banner

1	The Step 3: User Security Banner page is displayed (Figure 6-57).
2	Update the User Defined Security Banner field.
3	Select **Next**.

Figure 6-57 Step 3: User Security Banner page



Step 4: Random number entropy input

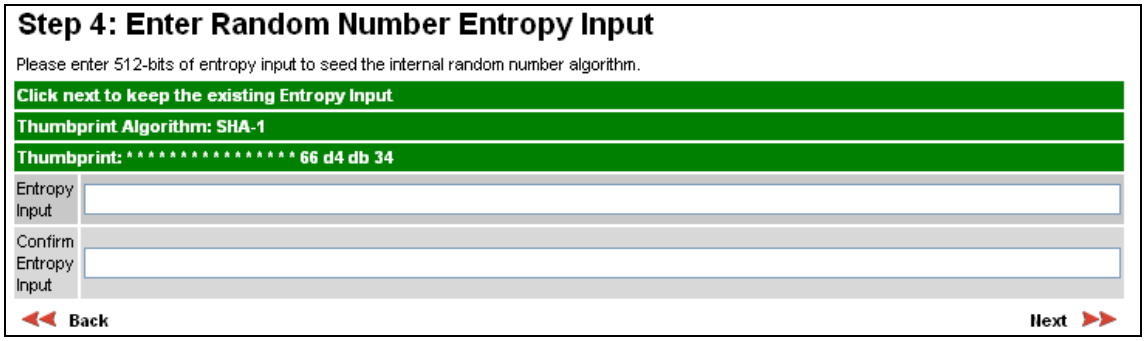
The entropy input is used to seed the TLS random number generator . Generate the entropy input using a random number generator.

To enter the entropy input via the Security Wizard, proceed as follows:

Procedure 6-14 Enter random number entropy input

1	The Step 4: Random Number Entropy Input page is displayed (Figure 6-58).
2	If valid entropy input exists, then an SHA-1 thumbprint of the input is displayed. If this input is correct, then take no action. Otherwise, enter the generated input in the Entropy Input and Confirm Entropy Input fields. If the two values are not identical, an error message is displayed.
3	Select **Next**.

Figure 6-58 Step 4: Random Number Entropy Input page



Step 5: Enter the wireless link encryption key

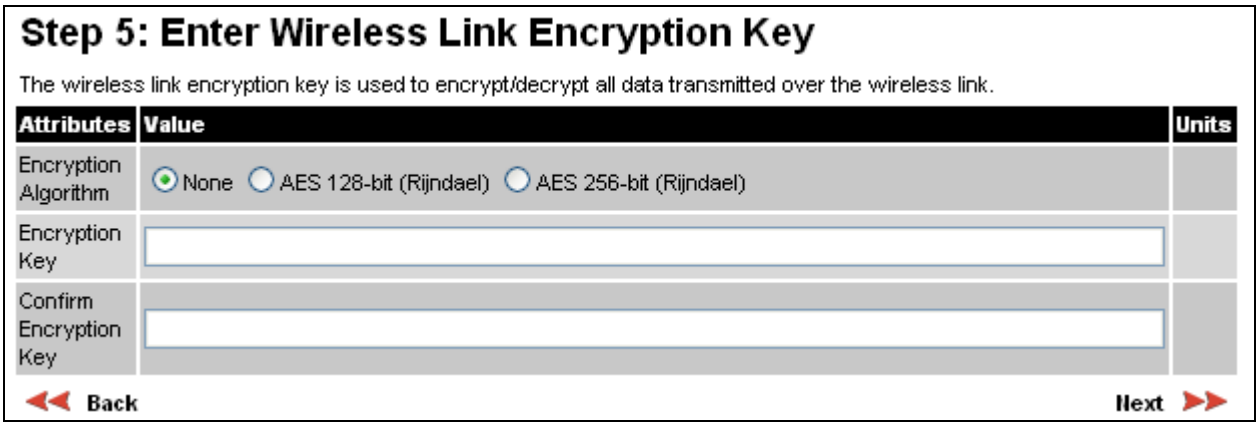
The wireless link encryption key is used to encrypt all traffic over the PTP600 wireless link.

To enter the wireless link encryption key via the Security Wizard, proceed as follows:

Procedure 6-15 Enter wireless link encryption key

1	The Step 5: Enter The Wireless Link Encryption Key page is displayed (Figure 6-59).
2	Select the applicable value in the Encryption Algorithm field.
3	If a valid encryption key exists, then an SHA-1 thumbprint of the key is displayed. If this key is correct, then take no action. Otherwise, enter the generated key in the Wireless Link Encryption Key and Confirm Wireless Link Encryption Key fields. If the two values are not identical, an error message is displayed.
4	Select **Next**.

Figure 6-59 Step 5: Enter The Wireless Link Encryption Key page



Step 6: HTTP and Telnet settings

The PTP 600 can be remotely managed in four ways: HTTPS, HTTP, Telnet or SNMP. HTTP is the most common and user-friendly. HTTP and Telnet are enabled and disabled in Step 6 of the Security Wizard. SNMP is configured via the Remote Management page, and is disabled by default.

To configure HTTP and Telnet via the Security Wizard, proceed as follows:

Procedure 6-16 Configure HTTP and Telnet

1	The Step 6: HTTP and Telnet Settings page is displayed (Figure 6-60).
2	Review and update the HTTP and Telnet attributes (Table 6-11).
3	Select **Next**.

Figure 6-60 Step 6: HTTP and Telnet Settings page

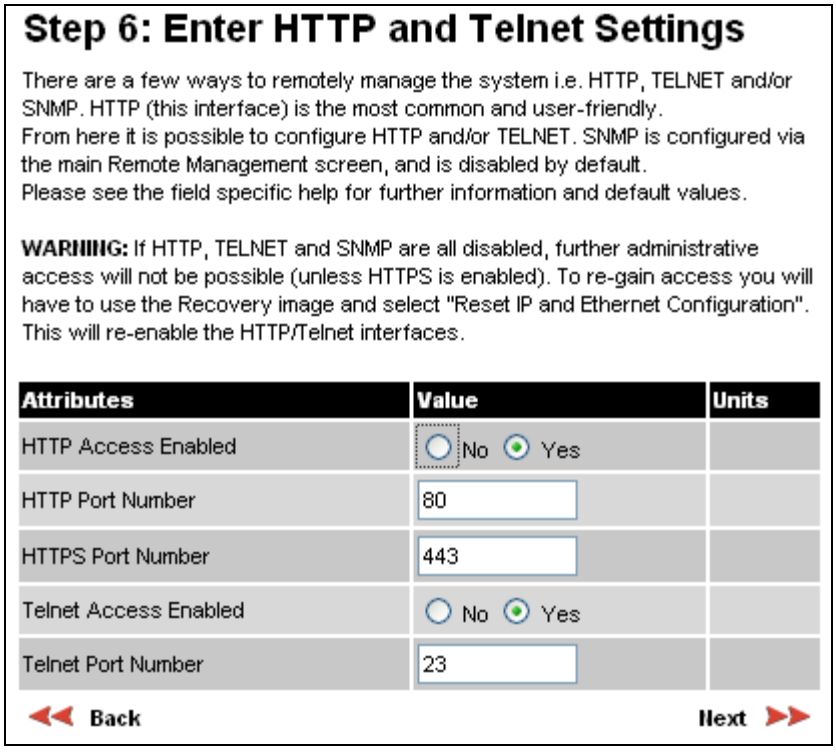


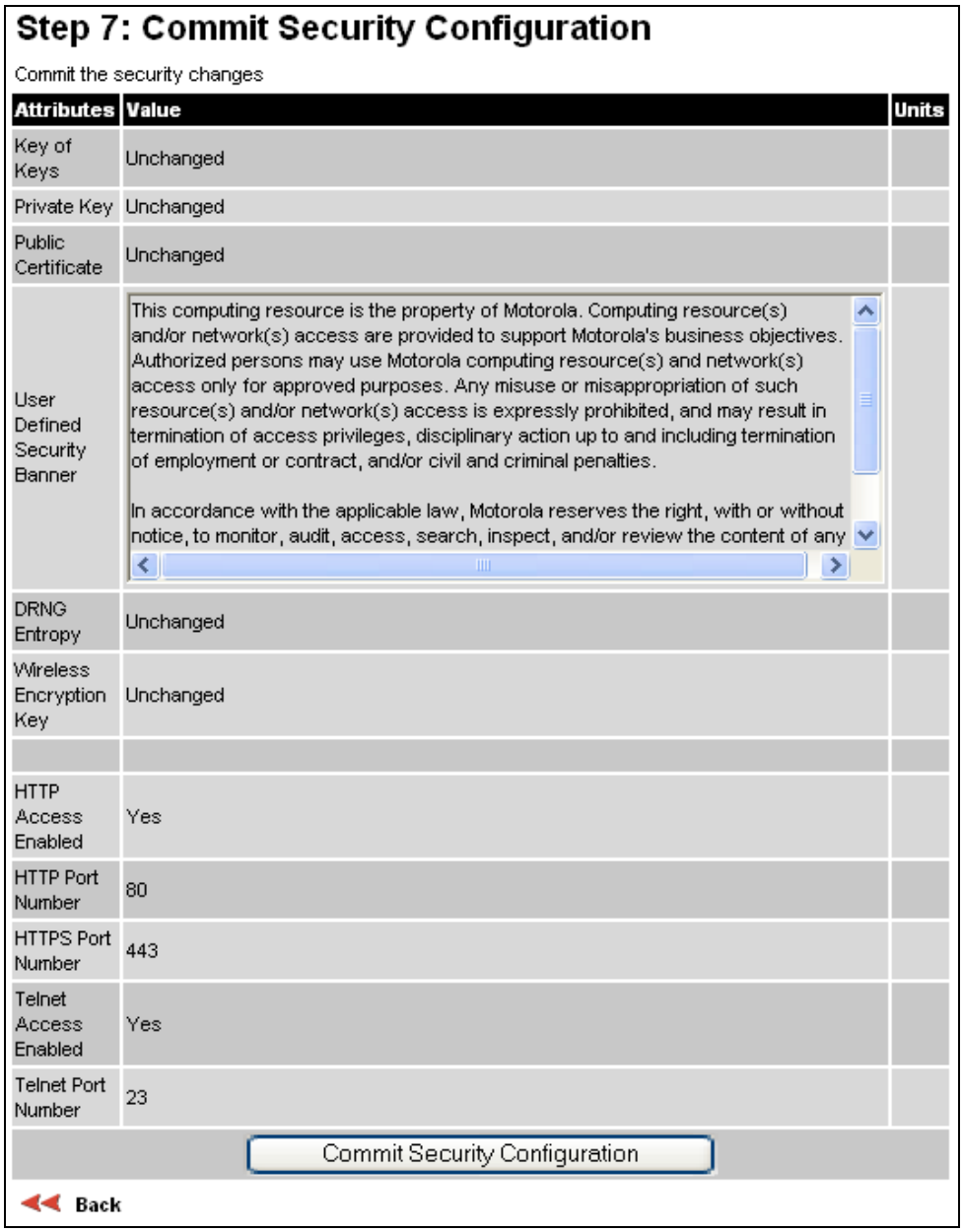
Table 6-11 HTTP and Telnet attributes

Attribute	Meaning
HTTP Access Enabled	When this is set to ‘No’, the unit will not respond to any requests on the HTTP port. When this is set to ‘Yes’, the unit will repond to requests on the HTTP port. Remote management via HTTPS is not affected by this setting.
HTTP Port Number	The port number for HTTP access. A value of zero means the wireless unit uses the default port.
HTTPS Port Number	The port number for HTTPS access. A value of zero means the wireless unit uses the default port. **NOTE** HTTPS access is controlled by license key.
Telnet Access Enabled	When this is set to ‘No’, the unit will not respond to any requests on the Telnet port. When this is set to ‘Yes’, the unit will repond to requests on the Telnet port.
Telnet Port Number	The port number for Telnet access. A value of zero means the wireless unit uses the default port.

Step 7: Commit security configuration

Review all changes that have been made in the Security Wizard (Figure 6-61). To ensure that the changes take effect, select **Commit Security Configuration**.

Figure 6-61 Step 7: Commit Security Configuration page



Configuring FIPS 140-2 mode

Perform this task to place a PTP 600 wireless unit into FIPS 140-2 secure mode. For more information on FIPS 140-2, refer to FIPS 140-2 on page 1-52.

Before starting this task, ensure that the following resources are available:

- A FIPS approved cryptographic key generator.
- A FIPS approved X509 RSA public / private key pair generator. The required output format is DER. For more information on DER format, refer to *ITU-T, OSI networking and system aspects – Abstract Syntax Notation One (ASN.1), 07/2002*.
- A FIPS approved random number generator.
- An HTTPS enabled web browser supporting FIPS approved cipher specifications.

To configure the ODU to work in FIPS 140-2 mode, proceed as follows:

Procedure 6-17 Configure FIPS 140-2 operation

1	Inspect the ODU to confirm that silver tamper evident labels are attached (Figure 6-62 and Figure 6-63). If these labels are not present, do not proceed with FIPS 140-2 configuration.
2	Upgrade the ODU software to the latest image containing the FIPS 140-2 security features (system release 600-08-50 or later). Refer to Upgrading PTP 600 software on page 6-84.
3	Check the capability summary in the Software License Key page to ensure that the current license key supports FIPS 140-2. Refer to Checking capability summary on page 6-77.
4	If the current license key does not support FIPS 140-2: Obtain an access key and generate a new license key to support FIPS 140-2. Refer to Using access keys to generate a new license key on page 6-79. Enter the new license key. Refer to Entering a license key on page 6-80.
5	Configure user accounts to ensure that the ODU is compliant with the security requirements of FIPS 140-2. Refer to Configuring user accounts on page 6-90.
6	Create at least three identity-based used accounts. Refer to Creating or updating identity-based users on page 6-93.
7	Log into the web interface as a security administrator user.
8	Run the Security Wizard. Refer to Configuring HTTPS/TLS using the Security Wizard on page 6-98. The ODU reboots at the end of Security Wizard.
9	The secure web server is now the main management tool for the ODU web interface. To enter the web interface, use the URL https://169.254.1.1.
10	Go back to the Security Wizard and disabled HTTP and Telnet (if not already disabled). Refer to Step 6: HTTP and Telnet settings on page 6-105.

The FIPS 140-2 mode is indicated by a distinctive symbol displayed at the top of the navigation bar in the web-based interface, as shown in Figure 1-17.

Figure 6-62 Tamper evident label on side edge of ODU

Figure 6-63 Tamper evident label on top edge of ODU

Zeroising critical security parameters

Critical security parameters (CSPs) are as follows:

- Key of keys.
- AES encryption keys for the wireless interface.
- Private key for the HTTPS/TLS interface.
- Entropy value for the HTTPS/TLS interface.
- User account passwords for the web-based interface.

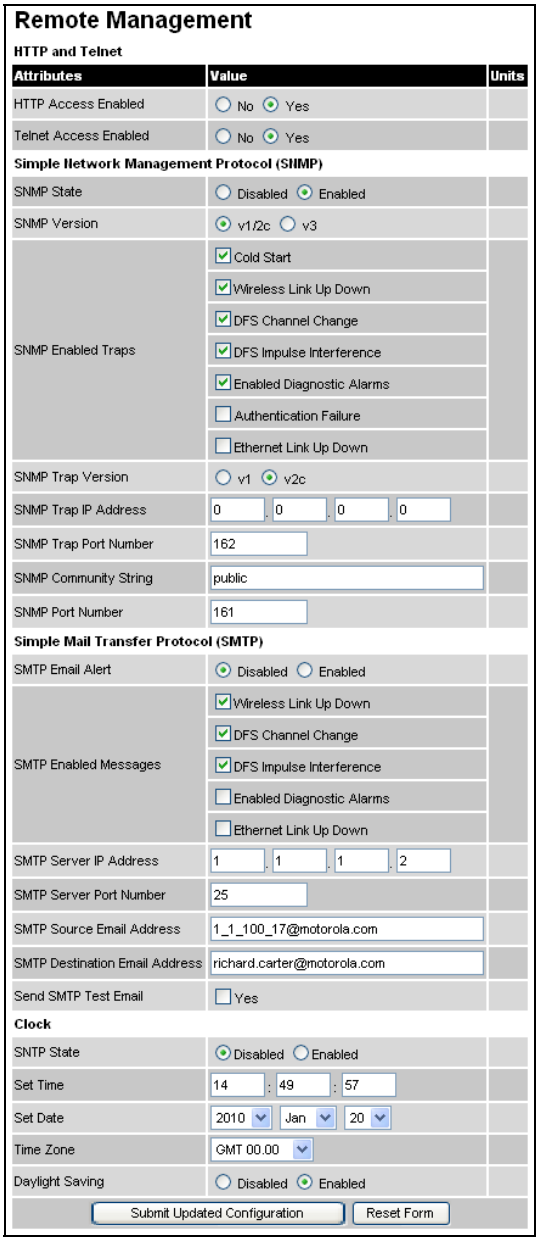
To zeroize the CSPs, select **Zeroize CSPs** from the menu and then **Select Zeroize CSPs and Reboot Wireless Unit**. Confirm the reboot.

Alternatively, select the **Zeroise CSPs** option in Recovery mode.

Managing faults

The Remote Management page (Figure 6-64) allows the system administrator to configure the remote management of the PTP 600 Series.

Figure 6-64 Remote Management page



Supported Management Information Bases (MIBs)

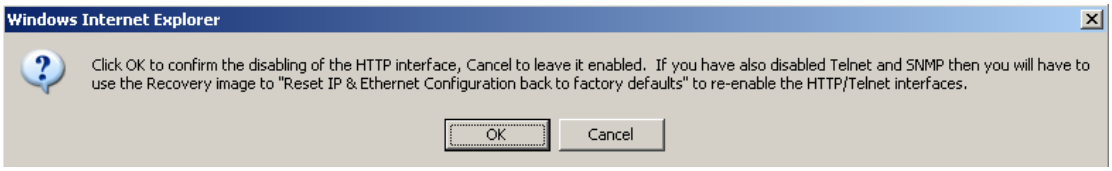
The PTP 600 Series SNMP stack currently supports the following MIBs:

- MIB-II, RFC-1213, The PTP 600 Series supports the ‘System Group’ and ‘Interfaces Group’.
- Bridge MIB, RFC-1493, The PTP 600 Series supports the ‘dot1dBase Group’ and the ‘dot1dBasePortTable Group’.
- PTP 600 Series proprietary MIB
- RFC-2233 (High capacity counter) MIB
- WiMAX MIB

SNMP TRAPs supported:

- Cold Start
- Link Up
- Link Down
- DFS Channel Change
- DFS Impulsive Interference

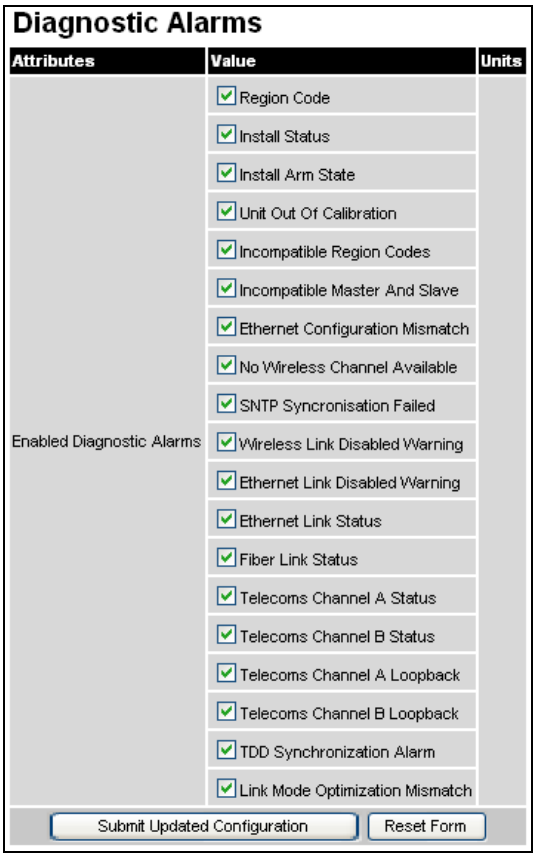
Figure 6-65 Warning when disabling HTTP interface



Diagnostics alarms

A number of diagnostics alarms have been added to allow SNMP agents to receive traps and emails if required. These alarms are described in Home page alarm display on page 6-6. Checking the control “Enabled Diagnostic Alarms” in SNMP and/or SNTP selects all the alarms shown in Figure 6-66. Users can access the sub-menu “Diagnostic Alarms” to modify the alarms selected.

Figure 6-66 Diagnostic Alarms page



For a copy of the Motorola proprietary version 1 and version 2 MIB RFCs please consult the installation CD.

Configuring SNMP notifications

Perform this task to enable the PTP 600 to generate Simple Network Management Protocol (SNMP) traps.

If SNMP is enabled, then the PTP 600 generates SNMP traps when certain events occur, and sends the traps to the network SNMP management agent, which notifies the system administrator.

To configure SNMP notifications, proceed as follows:

Procedure 6-18 Select the SNMP version

1	From the left hand menu, select **Remote Management**. The Remote Management page is displayed (Figure 6-64).
2	Update the SNMP attributes (Table 6-12).
3	Select **Submit Updated Configuration**. The Configuration Change Reboot dialog is displayed.
4	Select **Reboot Wireless Unit**. The Reboot Confirmation dialog is displayed
5	Select **OK**. The reboot progress message is displayed. On completion, the unit restarts.

Table 6-12 SNMP attributes in the Remote Management page

Attribute	Meaning
SNMP State	'Disabled' means that SNMP traps are not generated. 'Enabled' means that SNMP traps will be generated in response to selected events, and sent to the network management system.
SNMP Version	Select the SNMP protocol version to be used for SNMP traps. If 'v1/2c' is selected, the SNMP Trap Version, Trap IP Address, Trap Port Number and Community String attributes are displayed. If 'v3' is selected, these attributes are hidden.
SNMP Enabled Traps	Select the events that will generate SNMP traps.
SNMP Trap Version	Select protocol version v1 or v2c.

Attribute	Meaning
SNMP Trap IP Address	Enter the IP address that will receive all SNMP traps. This will normally be the network management system, but it may be a separate trap receiver. To disable trap generation, enter 0.0.0.0 in the IP Address.
SNMP Trap Port Number	Enter the port number of either the networked SNMP manager or trap receiver. By convention, the default port number is 162.
SNMP Community String	The SNMP community string acts like a password between the network management system and the distributed SNMP clients (PTP 800 CMUs). Only if the community string is configured correctly on all SNMP entities can the flow of management information take place. By convention the default value is set to 'public'.
SNMP Port Number	Enter the port that the SNMP agent is listening to for commands from a management system. By convention, the default port number is 161.
WiMAX Control	Enables and Disables the WiMAX (802.16) MIB. This control is only displayed when 'Fixed Frequency' is selected during installation.

SMTP (Simple Mail Transport Protocol)

The SMTP client is an alternative method for the PTP 600 Series to alert a system administrator when there are or have been system errors:

SMTP Email Alert

This attribute controls the activation of the SMTP client.

SMTP Enabled Messages

The SMTP Enabled Messages attribute controls which email alerts the unit will send.

SMTP IP Address

The IP address of the networked SMTP server.

SMTP Port Number

The SMTP Port Number is the port number used by the networked SMTP server. By convention the default value for the port number is 25.

SMTP Source Email Address

The email address used by the PTP 600 Series to log into the SMTP server. This must be a valid email address that will be accepted by your SMTP Server.

SMTP Destination Email Address

The email address to which the PTP 600 Series will send the alert messages.

SNTP (Simple Network Time Protocol)

The SNTP client allows the PTP 600 Series to obtain accurate date and time updates from a networked timeserver. The system time is used for SNMP and event logging.

SNTP State

When enabled, the Remote Management web page permits the following attributes to be set:

SNTP IP Address

The IP address of the networked SNTP server.

SNTP Port Number

The port number of the networked SNTP server. By convention the default value for the port number is 123.

SNTP Poll Interval

The period at which the SNTP client polls the server for time correction updates. Default 1 hour. If for any reason an SNTP poll fails, the client will automatically perform 3 retries before waiting for the user defined poll period.

Time Zone

The time zone is a fixed offset from GMT that is added to the SNTP time to allow the expression of time in all geographic time zones.

Daylight Saving

Allows a fixed offset of one hour to be added to the SNTP time in order to reflect the local daylight saving time.

Setting the clock

The PTP 600 Series has a system clock which can be used to supply accurate date and time information in the absence of a SNTP server. The system clock is battery backed and will continue to operate for several days if the PTP 600 Series has been switched off.

SNTP State

If the SNTP State is set to “Disabled”, see Figure 6-64, then the Remote Management web page allows the following attributes to be set:

Set Time

Shows the current time in 24 hour mode. The three editable fields display hours minutes and seconds.

Set Date

Displays the current date. The year, month and day can be set using the drop-down selection boxes.

Time Zone

See Setting the clock on page 6-118.

Daylight Saving

See Setting the clock on page 6-118.

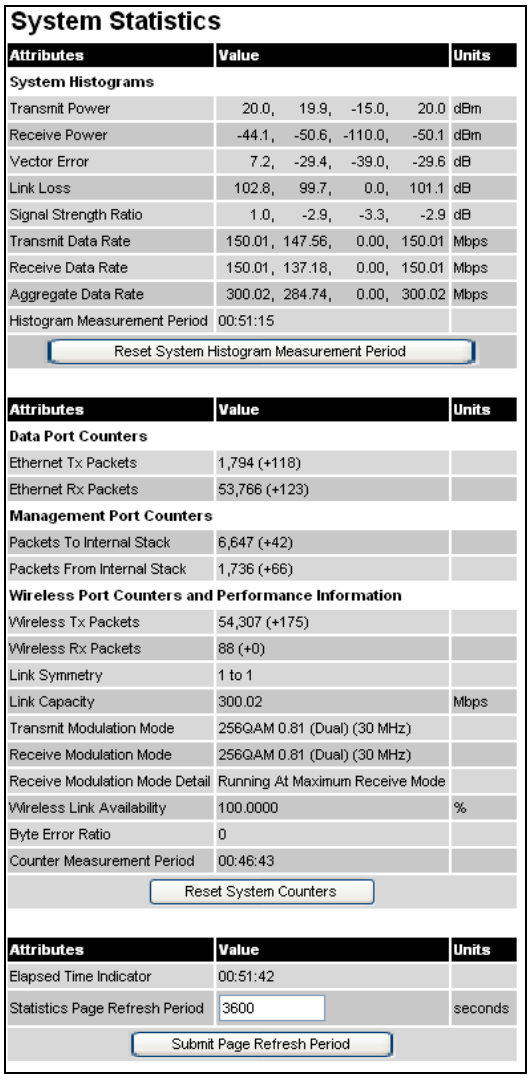
Managing performance

Statistics

The System Statistics page (Figure 6-67) displays some key statistics of the Ethernet Bridge and the underlying wireless performance.

The numbers in brackets display the number of packets received since the last page refresh.

Figure 6-67 System Statistics page



System Statistics

Attributes	Value	Units
System Histograms		
Transmit Power	20.0, 19.9, -15.0, 20.0	dBm
Receive Power	-44.1, -50.6, -110.0, -50.1	dBm
Vector Error	7.2, -29.4, -39.0, -29.6	dB
Link Loss	102.8, 99.7, 0.0, 101.1	dB
Signal Strength Ratio	1.0, -2.9, -3.3, -2.9	dB
Transmit Data Rate	150.01, 147.56, 0.00, 150.01	Mbps
Receive Data Rate	150.01, 137.18, 0.00, 150.01	Mbps
Aggregate Data Rate	300.02, 284.74, 0.00, 300.02	Mbps
Histogram Measurement Period	00:51:15	

Reset System Histogram Measurement Period

Attributes	Value	Units
Data Port Counters		
Ethernet Tx Packets	1,794 (+118)	
Ethernet Rx Packets	53,766 (+123)	
Management Port Counters		
Packets To Internal Stack	6,647 (+42)	
Packets From Internal Stack	1,736 (+66)	
Wireless Port Counters and Performance Information		
Wireless Tx Packets	54,307 (+175)	
Wireless Rx Packets	88 (+0)	
Link Symmetry	1 to 1	
Link Capacity	300.02	Mbps
Transmit Modulation Mode	256QAM 0.81 (Dual) (30 MHz)	
Receive Modulation Mode	256QAM 0.81 (Dual) (30 MHz)	
Receive Modulation Mode Detail	Running At Maximum Receive Mode	
Wireless Link Availability	100.0000	%
Byte Error Ratio	0	
Counter Measurement Period	00:46:43	

Reset System Counters

Attributes	Value	Units
Elapsed Time Indicator	00:51:42	
Statistics Page Refresh Period	3600	seconds

Submit Page Refresh Period

System histograms

The System Statistics page contains the following fields under **System Histograms**:

Transmit Power

Receive Power

Vector Error

Link Loss

Signal Strength Ratio

The Signal Strength Ratio is the ratio of the power received by the Vertical / Horizontal receivers and presented as: max, mean, min, and latest in an histogram format. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. See Histogram data on page 6-18.

Transmit Data Rate

The data rate in the transmit direction, expressed in Mbps and presented as: max, mean, min, and latest in an histogram format. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. Expected data rates can be found in Data rate calculations on page 4-99.

Receive Data Rate

The data rate in the receive direction, expressed in Mbps and presented as: max, mean, min, and latest in an histogram format. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. Expected data rates can be found in Data rate calculations on page 4-99.

Aggregate Data Rate

The sum of the data rate in the directions expressed in Mbps and presented as: max, mean, min, and latest in an histogram format. The max, min and latest are true instantaneous measurements; the mean is the mean of a set of one second means. Expected data rates can be found in Data rate calculations on page 4-99.

Histogram Measurement Period

The time over which the system histograms were collected.

NOTE

To reset all histograms and restart the measurement period, select **Reset System Histograms and Measurement Period**.

Data port counters

The System Statistics page contains the following fields under **Data Port Counters**:

Ethernet Tx Packets

This displays the total number of good packets the bridge has sent for transmission by the local Ethernet interface.

Ethernet Rx Packets

This displays the total number of good packets the bridge has received from the local Ethernet interface.

Management port counters

The System Statistics page contains the following fields under **Management Port Counters**:

Packets To Internal Stack

This displays the total number of good packets the bridge has transmitted to the internal stack (for example, ARP requests, PING requests, HTTP requests).

Packets From Internal Stack

This displays the total number of good packets the bridge has received from the internal stack (for example ARP responses, PING replies, HTTP responses).

Wireless port counters and performance information

The System Statistics page contains the following fields under **Wireless Port Counters and Performance Information**:

Wireless Tx Packets

This displays the total number of good packets the bridge has sent for transmission by the wireless interface.

Wireless Rx Packets

This displays the total number of good packets the bridge has received from the wireless interface.

Link Symmetry

Link Symmetry: A ratio that expresses the division between transmit and receive time in the TDD frame. The first number in the ratio represents the time allowed for the transmit direction and the second number represents the time allowed for the receive direction.

Link Capacity

The maximum aggregate data capacity available for user traffic under the current radio link conditions, assuming the units have been connected using Gigabit Ethernet. The sum of the displayed Transmit and Receive data rates may be lower than this figure if the link isn't fully loaded by the current traffic profile.

Transmit Modulation Mode

The modulation mode currently being used on the transmit channel. The number in brackets after the modulation mode and coding rate string is the effective data rate available to all MAC layer protocols. List of all the modulation modes can be found in Data rate calculations on page 4-99, where data rate calculations plots are given for each available modulation mode.

Receive Modulation Mode

The modulation mode currently being used on the receive channel. The number in brackets after the modulation mode and coding rate string is the effective data rate available to all MAC layer protocols. List of all the modulation modes can be found in Data rate calculations on page 4-99, where data rate calculations plots are given for each available modulation mode.

Receive Modulation Mode Detail

This supplies the user with information regarding the receive modulation mode in use. Possible values are:

- “Running at maximum receive mode”
- “Running at user-configured Target Modulation Mode”
- “Restricted because Installation is armed”
- “Restricted because of byte errors on the wireless link”
- “Restricted because a DFS channel change is in progress”
- “Restricted due to the low Ethernet link speed”
- “Limited by the radio conditions”

Wireless Link Availability

Expresses the link availability as a percentage of time since the first successful registration after a system restart, expressed as a percentage to four decimal places.

Byte Error Ratio

The ratio of detected Byte errors to the total number of bytes since the last system reboot. This is a true measure of link quality as this measurement is made continually using null frames when there is no user data to transport.

Counter Measurement Period

The time over which the system counters were collected.

NOTE

To reset all system counters to zero, select **Reset System Counters**.

Other attributes

The System Statistics page contains the following other fields:

Elapsed Time Indicator

Elapsed time since the last system reboot.

Statistics Page Refresh Period

The statistics page refreshes automatically according to the setting entered here (in seconds).

NOTE

After updating the Statistics Page Refresh Period field, select **Submit Page Refresh Period**.

Detailed counters

The Detailed Counters page (Figure 6-68) displays detailed statistics of the Ethernet Bridge and the underlying wireless performance.

Figure 6-68 Detailed Counters page

Detailed Counters

Ethernet			Wireless		
Attributes	**Value**	**Units**	**Attributes**	**Value**	**Units**
Ethernet Rx Octets	0 (+0)		Wireless Rx Octets	55,012 (+55,012)	
Ethernet Tx Octets	0 (+0)		Wireless Tx Octets	349,490 (+349,490)	
Ethernet Rx Drops	0 (+0)		Wireless Rx Drops	0 (+0)	
Ethernet Rx Packets	0 (+0)		Wireless Rx Packets	598 (+153)	
Ethernet Rx Broadcasts	0 (+0)		Wireless Rx Broadcasts	106 (+106)	
Ethernet Rx Multicasts	0 (+0)		Wireless Rx Multicasts	0 (+0)	
Ethernet Rx Crc And Align	0 (+0)		Wireless Rx Crc And Align	0 (+0)	
Ethernet Rx Undersize	0 (+0)		Wireless Rx Undersize	0 (+0)	
Ethernet Rx Oversize	0 (+0)		Wireless Rx Oversize	0 (+0)	
Ethernet Rx Fragments	0 (+0)		Wireless Rx Fragments	0 (+0)	
Ethernet Rx Jabbers	0 (+0)		Wireless Rx Jabbers	0 (+0)	
Ethernet Rx 64 Bytes	0 (+0)		Wireless Rx 64 Bytes	524 (+524)	
Ethernet Rx 65 To 127 Bytes	0 (+0)		Wireless Rx 65 To 127 Bytes	46 (+46)	
Ethernet Rx 128 To 255 Bytes	0 (+0)		Wireless Rx 128 To 255 Bytes	1 (+1)	
Ethernet Rx 256 To 511 Bytes	0 (+0)		Wireless Rx 256 To 511 Bytes	28 (+28)	
Ethernet Rx 512 To 1023 Bytes	0 (+0)		Wireless Rx 512 To 1023 Bytes	16 (+16)	
Ethernet Rx 1024 To Max Bytes	0 (+0)		Wireless Rx 1024 To Max Bytes	0 (+0)	
Ethernet Tx Drops	803 (+803)		Wireless Tx Drops	1 (+1)	
Ethernet Tx Packets	0 (+0)		Wireless Tx Packets	803 (+285)	
Ethernet Tx Broadcasts	0 (+0)		Wireless Tx Broadcasts	0 (+0)	
Ethernet Tx Multicasts	0 (+0)		Wireless Tx Multicasts	0 (+0)	
Ethernet Tx Collisions	0 (+0)		Wireless Tx Collisions	0 (+0)	
Ethernet Tx 64 Bytes	0 (+0)		Wireless Tx 64 Bytes	254 (+254)	
Ethernet Tx 65 To 127 Bytes	0 (+0)		Wireless Tx 65 To 127 Bytes	153 (+153)	
Ethernet Tx 128 To 255 Bytes	0 (+0)		Wireless Tx 128 To 255 Bytes	92 (+92)	
Ethernet Tx 256 To 511 Bytes	0 (+0)		Wireless Tx 256 To 511 Bytes	37 (+37)	
Ethernet Tx 512 To 1023 Bytes	0 (+0)		Wireless Tx 512 To 1023 Bytes	98 (+98)	
Ethernet Tx 1024 To Max Bytes	0 (+0)		Wireless Tx 1024 To Max Bytes	194 (+194)	
Ethernet Tx Fifo Drops	0 (+0)		Wireless Tx Fifo Drops	0 (+0)	
Ethernet Rx Pause Frames	0 (+0)		Wireless Rx Pause Frames	0 (+0)	
Ethernet Tx Pause Frames	0 (+0)		Wireless Tx Pause Frames	0 (+0)	
Ethernet Rx Classified Drops	0 (+0)		Wireless Rx Classified Drops	0 (+0)	
Ethernet Rx Frames Q0	0 (+0)		Wireless Tx Frames Q0	0 (+0)	
Ethernet Rx Frames Q1	822 (+822)		Wireless Tx Frames Q1	822 (+822)	
Ethernet Rx Frames Q2	0 (+0)		Wireless Tx Frames Q2	0 (+0)	
Ethernet Rx Frames Q3	0 (+0)		Wireless Tx Frames Q3	0 (+0)	
Ethernet Rx Frames Q4	0 (+0)		Wireless Tx Frames Q4	0 (+0)	
Ethernet Rx Frames Q5	0 (+0)		Wireless Tx Frames Q5	0 (+0)	
Ethernet Rx Frames Q6	0 (+0)		Wireless Tx Frames Q6	0 (+0)	
Ethernet Rx Frames Q7	0 (+0)		Wireless Tx Frames Q7	0 (+0)	
Ethernet Tx Frames Q0	655 (+655)		Wireless Rx Frames Q0	655 (+655)	
Ethernet Tx Frames Q1	0 (+0)		Wireless Rx Frames Q1	0 (+0)	
Ethernet Tx Frames Q2	0 (+0)		Wireless Rx Frames Q2	0 (+0)	
Ethernet Tx Frames Q3	0 (+0)		Wireless Rx Frames Q3	0 (+0)	
Ethernet Tx Frames Q4	0 (+0)		Wireless Rx Frames Q4	0 (+0)	
Ethernet Tx Frames Q5	0 (+0)		Wireless Rx Frames Q5	0 (+0)	
Ethernet Tx Frames Q6	0 (+0)		Wireless Rx Frames Q6	0 (+0)	
Ethernet Tx Frames Q7	0 (+0)		Wireless Rx Frames Q7	0 (+0)	
Internal Stack					
Packets To Internal Stack	676 (+230)				
Packets From Internal Stack	898 (+366)				
Packets Ignored By Internal Stack	0 (+0)				
Detailed Counters Page Refresh Period	3600	Seconds	Update Page Refresh Period	Reset System Counters	

The Detailed Counters page is subdivided into two columns. Column one presents the detailed statistics for the bridge's Ethernet interface. Column two relates to the wireless interface.

The Counters have the following definitions:

Tx & Rx Octets

Total number of octets (bytes) transmitted or received over the interface.

Rx Drops

Total number of frames dropped due to the lack of sufficient capacity in the receive buffer.

Rx Packets

Total number of packets received by the interface. This includes both good and bad packets.

Rx Broadcasts

Total number of good broadcast packets.

Rx Multicasts

Total number of good multicast packets.

Rx CRC and Align

Total number of packets with CRC or frame alignment errors.

Rx Undersize

Total number of packets received that are less than 64 bytes and have a valid CRC.

Rx Oversize

Total number of packets received that are greater than the maximum number of bytes with a valid CRC.

Rx Fragments

Total number of packets that are less than 64 bytes with an invalid CRC (these packet types are also known as runts).

Rx Jabbers

Total number of packets received that are greater than the maximum number of bytes with an invalid CRC.

Rx 64 Bytes

Total number 64 byte frames received

Rx 65 to 127 Bytes

Total number of frames received in the size range 65 to 127 bytes.

Rx 128 to 255 Bytes

Total number of frames received in the size range 128 to 255 bytes.

Rx 256 to 511 Bytes

Total number of frames received in the size range 256 to 511 bytes.

Rx 512 to 1023 Bytes

Total number of frames received in the size range 512 to 1023 bytes.

Rx 1024 to Max

Total number of frames received in the size range 1024 to Maximum bytes.

Tx Drops

Total number of frames dropped due excessive collisions, late collision and frame ageing.

Tx Packets

Total number of packets received by the interface. This includes both good and bad packets.

Tx Broadcasts

Total number of good broadcast packets.

Tx Multicasts

Total number of good multicast packets.

Tx Collisions

Total number frames experiencing collisions.

Tx 64 Bytes

Total number 64 byte frames transmitted

Tx 65 to 127 Bytes

Total number frames transmitted in the size range 65 to 127 bytes.

Tx 128 to 255 Bytes

Total number frames transmitted in the size range 128 to 255 bytes.

Tx 256 to 511 Bytes

Total number frames transmitted in the size range 256 to 511 bytes.

Tx 512 to 1023 Bytes

Total number frames transmitted in the size range 512 to 1023 bytes.

Tx 1024 to Max

Total number frames transmitted in the size range 1024 to Maximum bytes.

Tx FIFO Drops

Total number frames dropped due to lack of capacity in the transmit buffer, for example when the PTP 600 Series is connected to the local Ethernet at a connection speed of less than 1 Gbps.

Rx & Tx Frames Q0...Q7

Total number of received or transmitted frames for each Traffic Class (Q0 to Q7).

Rx & Tx Pause Frames

Total number of received or transmitted pause frames (Ethernet interface only).

Packets To Internal Stack

The total number of good packets the bridge has transmitted to the internal stack.

Packets From Internal Stack

The total number of good packets the bridge has received from the internal stack

Packets Ignored By Internal Stack

The total number of bad packets the bridge has transmitted to the internal stack.

Rx Classifier Drops

Total number of received frames dropped due to the application of classifier rules.

Detailed Counters Page Refresh Period

The statistics page refreshes automatically according to the setting entered here (in seconds).

Diagnostics plotter

To further enhance the diagnostic capabilities of the PTP 600 Series, the storage of link performance histograms has been extended to 31. To optimize RAM (volatile memory) usage a cascading histogram approach has been adopted. The root histogram is identical to the histograms in earlier releases of the software, that is data is stored for one hour at a resolution of one second. Previously, the histograms were simple cyclic buffers which never stored more that the last one hour of data. The new cascading histogram approach daisy chains multiple histograms together. When the first histogram fills up the overflow from the first is used as an input to the next histogram in line. To optimize memory utilization, a statistical analysis is performed on the overflow to reduce the amount of data to be stored. In the case of the PTP 600 Series the cascading histograms are defined as:

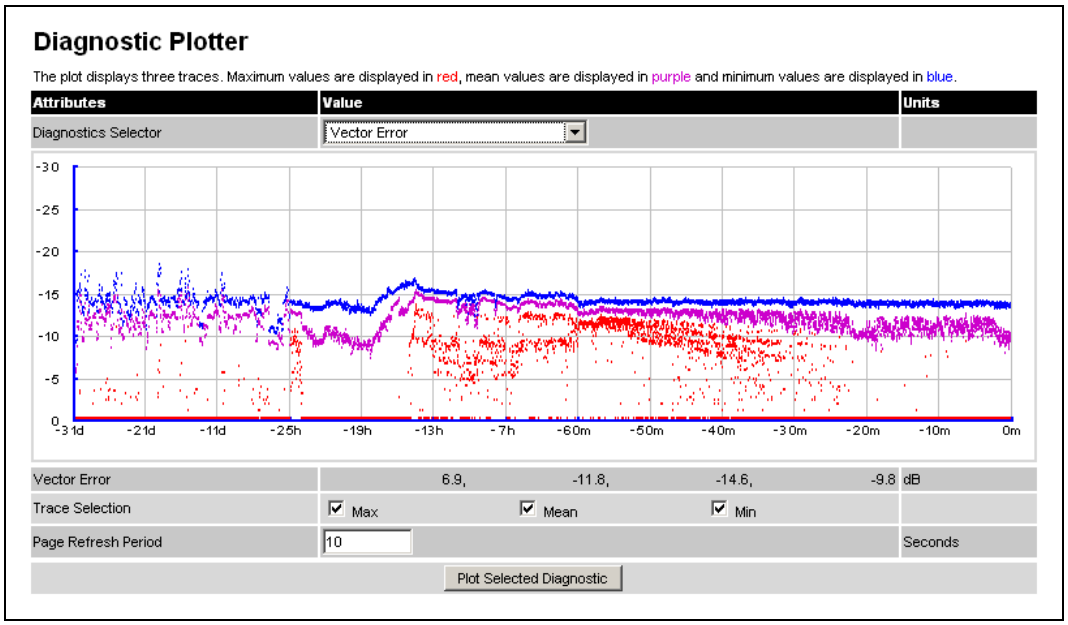
- Histogram 1: 1 hour at a resolution of 1 second
- Histogram 2: 24 hours at a resolution of 1 minute
- Histogram 3: 30 Days at a resolution of 1 hour

For example, when histogram 1 fills up and starts to overflow the first minute of overflow is analyzed and the maximum, minimum and mean over that minute are computed and inserted into histogram 2. When histogram 2 fills up and starts to overflow the first hour of overflow is analyzed and the maximum, minimum and mean over that hour is computed and inserted into histogram 3. When histogram 3 starts to overflow, the overflow data is simply discarded.

Diagnostic plotter page

New for the PTP 600 Series is the system administration diagnostic plotter facility see Figure 6-69.

Figure 6-69 Diagnostic Plotter page



The diagnostic plotter allows the system administrator to view the cascading histogram data in an easily accessible graphical form. The plot always displays three traces, maximum, minimum and mean by default. The diagnostic selector allows the user to select the various categories of histogram.

The histograms that are available are:

- Vector Error
- Rx Power
- Tx Power
- Signal Strength Ratio
- Link Loss
- Rx Data Rate
- Tx Data Rate
- Aggregate Data Rate

The diagnostic plotter uses a novel time representation in the x-axis which compresses the timeline of the plot without sacrificing resolution.

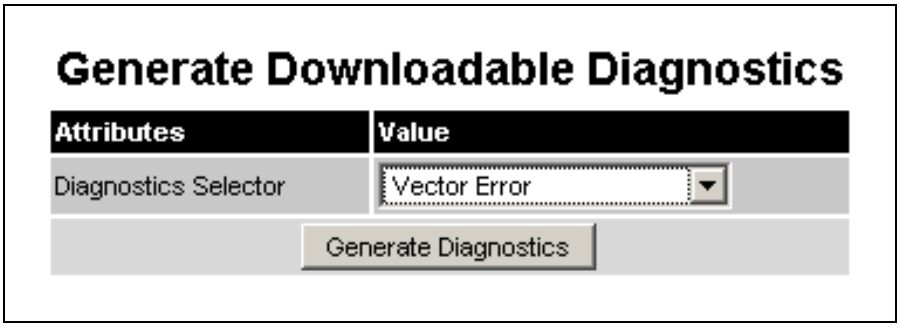
The trace selection allows the user to control which traces are plotted.

As with other management pages the page refresh period can be used to interactively monitor the wireless link.

CSV download

The diagnostics Download page allows the system administrator to download snapshots of system diagnostics.

Figure 6-70 Generate Downloadable Diagnostics page



The following diagnostics are available:

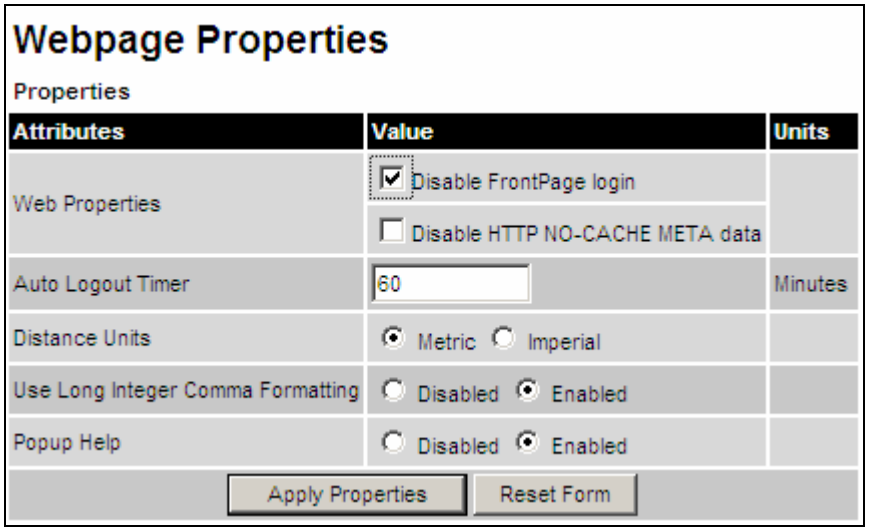
- Vector Error
- Rx Power
- Tx Power
- Signal Strength Ratio V/H
- Link Loss
- Rx Data Rate
- Tx Data Rate
- Aggregate Data Rate
- Receive SNR
- Rx Gain

All diagnostics are extracted from the associated status and statistics web page histograms. They are translated in a CSV file containing at most 5784 entries. These 5784 entries comprise 3600 entries for the first hour, 1440 entries for the next 24 hours and 744 entries for the next 31 days.

Properties

The web page properties screen allows the user to configure the web page interface (Figure 6-71).

Figure 6-71 Webpage Properties page



The Properties page contains the following fields:

WEB Properties: Disable Front Page Login

Allows access to homepage and status page web pages without forcing a login as the system administrator.

WEB Properties: Disable HTTP NO-CACHE META data

Removes the HTTP NO-CACHE META clause from all dynamically created web pages.

Auto Logout Timer

Configures the time, in minutes, when the system administrator is automatically logged out if no web page activity is detected.

Distance Units

Swaps the default metric display of distance in to imperial units, for example km to Miles.

Use Long Integer Comma Formatting

Changes the format of long integers from 1000000 to 1,000,000.

Reboot

The reboot page allows the system administrator to perform commanded reboots of the wireless unit. The reboot page also allows the system administrator to view a list of past reboot reasons. The “Previous Reasons For Reset/Reboot” field has been implemented as a drop down selection box, where the latest reason for reboot is located at the top of the list.

If the SNTP service from the remote management section above is active, or the system time has been set, then the command reboot reason will be accompanied by the date and time at which the reboot occurred.

Figure 6-72 Reboot Wireless Unit page

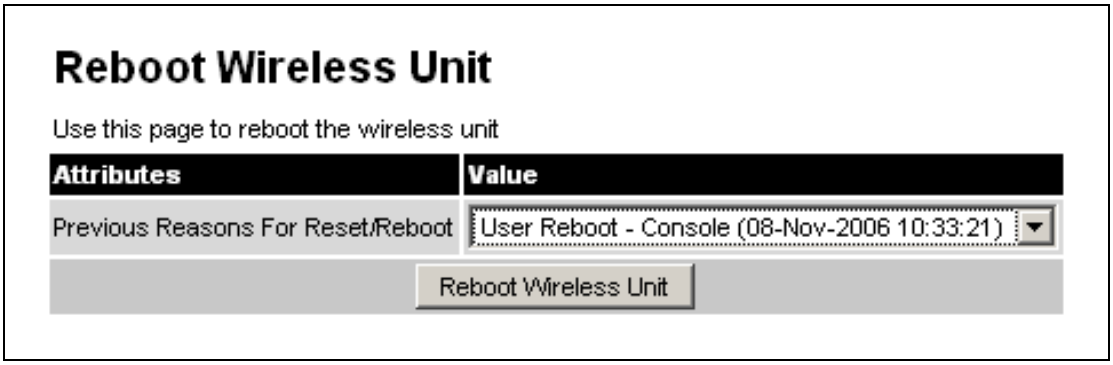
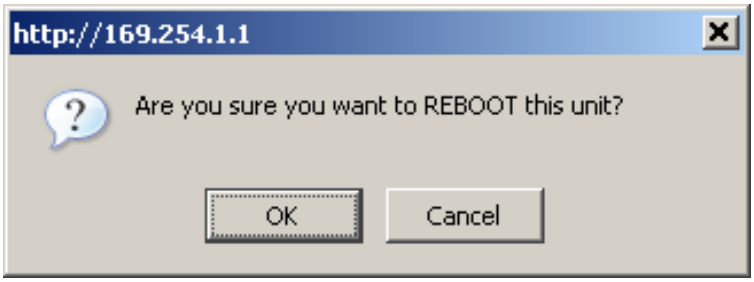


Figure 6-73 Reboot confirmation pop up



Chapter 7 Troubleshooting

This section provides instructions for identifying and correcting faults in a PTP 600 link.

Perform the following procedures either on a newly installed link, or on an operational link if communication is lost:

Procedure 7-1 Troubleshooting (fault finding)

1	Test the hardware at one end of the link, as described in Test link end hardware on page 7-2.
2	Test the hardware at the other end of the link, as described in Test link end hardware on page 7-2.
3	Test the radio link, as described in Test radio link on page 7-17.
4	If an installation has been struck by lightning, see Lightning strike on page 7-19.
5	If an ODU has entered recovery mode, see Using recovery mode on page 7-20.

Test link end hardware

Before testing link end hardware, confirm that all outdoor drop cables, that is those that connect the ODU or GPS receiver (if installed) to equipment inside the building, are of the supported Superior Essex cable type, as defined in Outdoor connections on page 1-15.

When the link end hardware (PIDU Plus, LPU, ODU and cabling) has been installed, test it by following this procedure:

Procedure 7-2 Testing link end hardware

1	Apply mains or battery power to the PIDU Plus. The green Power LED should illuminate continuously.
2	After 45 seconds, the orange Ethernet LED should be observed starting with 10 slow flashes.
3	Connect the CAT5e cable from the LAN port of the PIDU Plus to the network. The Ethernet LED should blink randomly as traffic passes through.
4	If the Power and Ethernet LEDs do not illuminate correctly, test the link end as described in the flowchart (Figure 7-1) and detailed test procedures that follow.
5	If a UltraSync GPS synchronization unit has been installed, but one or more of its status LEDs are not illuminated, refer to Test UltraSync GPS receiver on page 7-16.

Figure 7-1 Link end hardware test flowchart #1

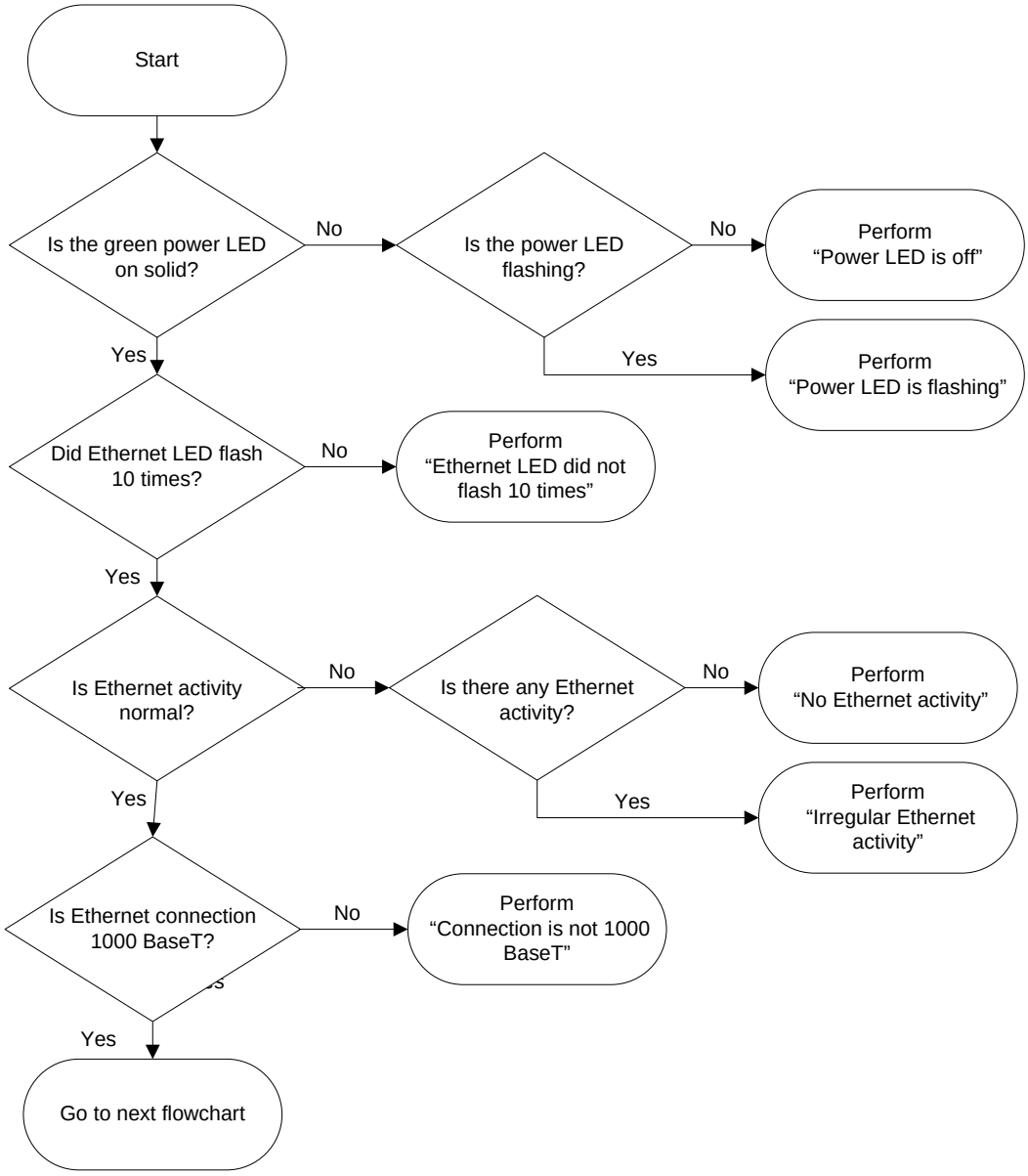
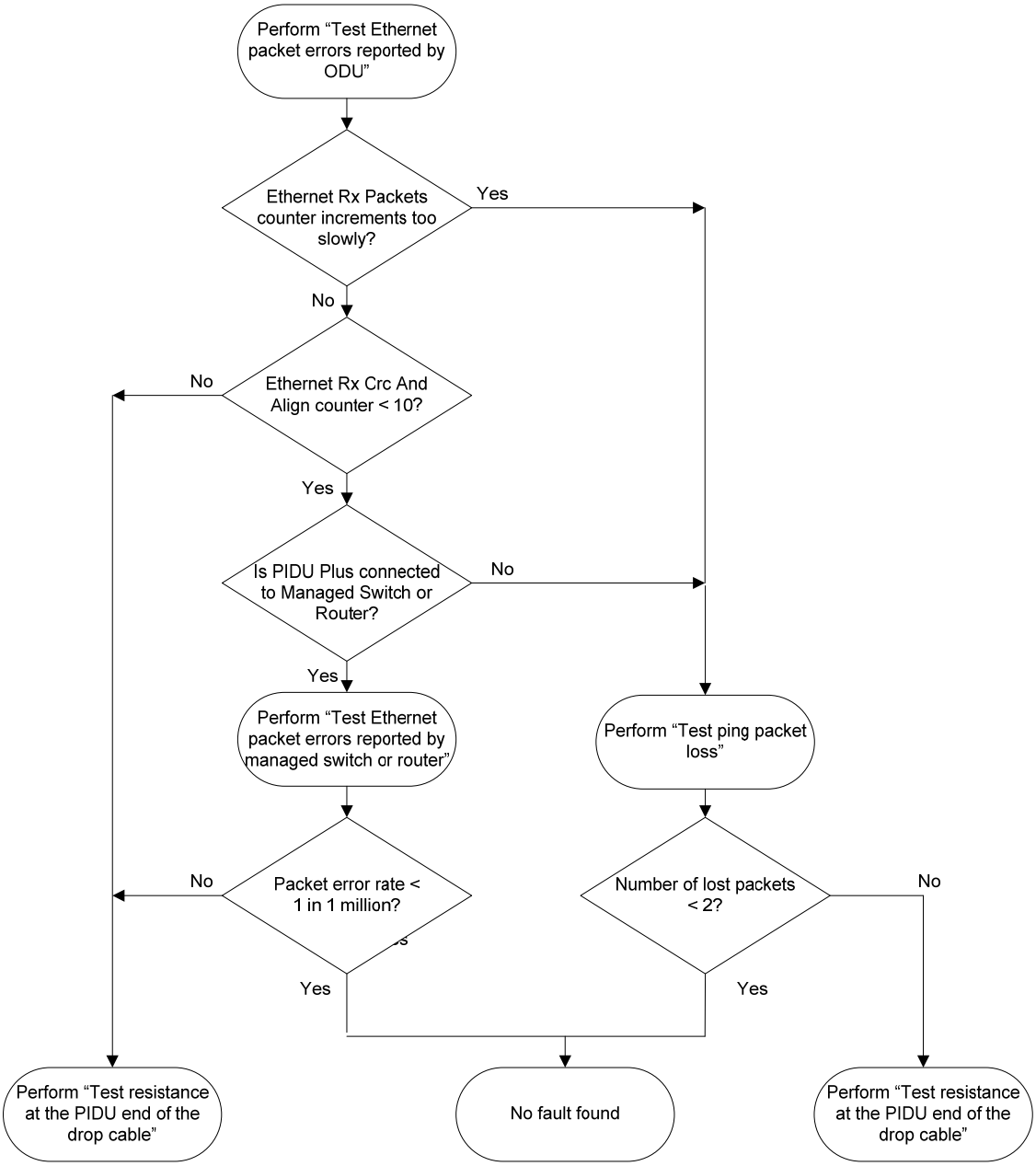


Figure 7-2 Link end hardware test flowchart #2



Power LED is off

If the Power LED is not on solid or flashing, proceed as follows:

Procedure 7-3 Test the power supply

1	Remove the power lead from the PIDU Plus.
2	Test that the power supply (mains or 56 V battery) is working.
3	If the power supply is not working, investigate the cause.

If the power supply is working, proceed as follows:

Procedure 7-4 Remove ODU cable from PIDU Plus

1	Open the flap on the left hand side of the PIDU Plus.
2	Remove the ODU cable from the PIDU Plus.
3	Observe the effect on the Power LED; does it illuminate?

If the Power LED does not illuminate when the ODU cable is removed, proceed as follows:

Procedure 7-5 Power LED does not illuminate when ODU cable is removed

1	Measure the voltage across the +55 V and 0 V pads inside the PIDU Plus flap. If the voltage is incorrect, it indicates that the PIDU Plus is short-circuited. Report a suspected PIDU Plus fault to Motorola.
2	Measure the impedance across the Power connector. If the impedance is incorrect, it indicates that the PIDU Plus is short-circuited. Report a suspected PIDU Plus fault to Motorola.
3	If both of the above tests produce correct readings, it is likely that the PIDU Plus Power LED is faulty. Report a suspected PIDU Plus fault to Motorola.

If the Power LED does illuminate when the ODU cable is removed, proceed as follows:

Procedure 7-6 Power LED does illuminate when ODU cable is removed

1	Remove the jumper (J905) found inside the PIDU Plus flap.
2	Measure the current with an ammeter placed across the two jumper pins. It should be 10 mA with the ODU disconnected. If the ammeter reading is incorrect, report a suspected PIDU Plus fault to Motorola.

If all tests so far have succeeded, proceed as follows:

Procedure 7-7 Other power tests

1	Reconnect the ODU cable to the PIDU Plus.
2	Measure the current with an ammeter placed across the two jumper pins. It should be in the range 300 mA to 1 A with the ODU connected.
3	If the ammeter reading is too high, the ODU may be drawing too much power, or the ODU may be short-circuited. Report a suspected ODU fault to Motorola.
4	If the ammeter reading is too low, the PIDU Plus may be supplying too little power. Report a suspected PIDU Plus fault to Motorola.

Power LED is flashing

If the green Power LED is flashing, proceed as follows:

Procedure 7-8 Power LED is flashing

1	Remove and examine the cable that connects the PIDU Plus to the LPU or ODU.
2	Check that pins 4&5 and 7&8 are not crossed with pins 1&2 and 3&6.
3	Check that the resistance between pins 1&8 is greater than 100K ohms.
4	If either check fails, replace or repair the cable that connects the PIDU Plus to the LPU or ODU.

Ethernet LED did not flash 10 times

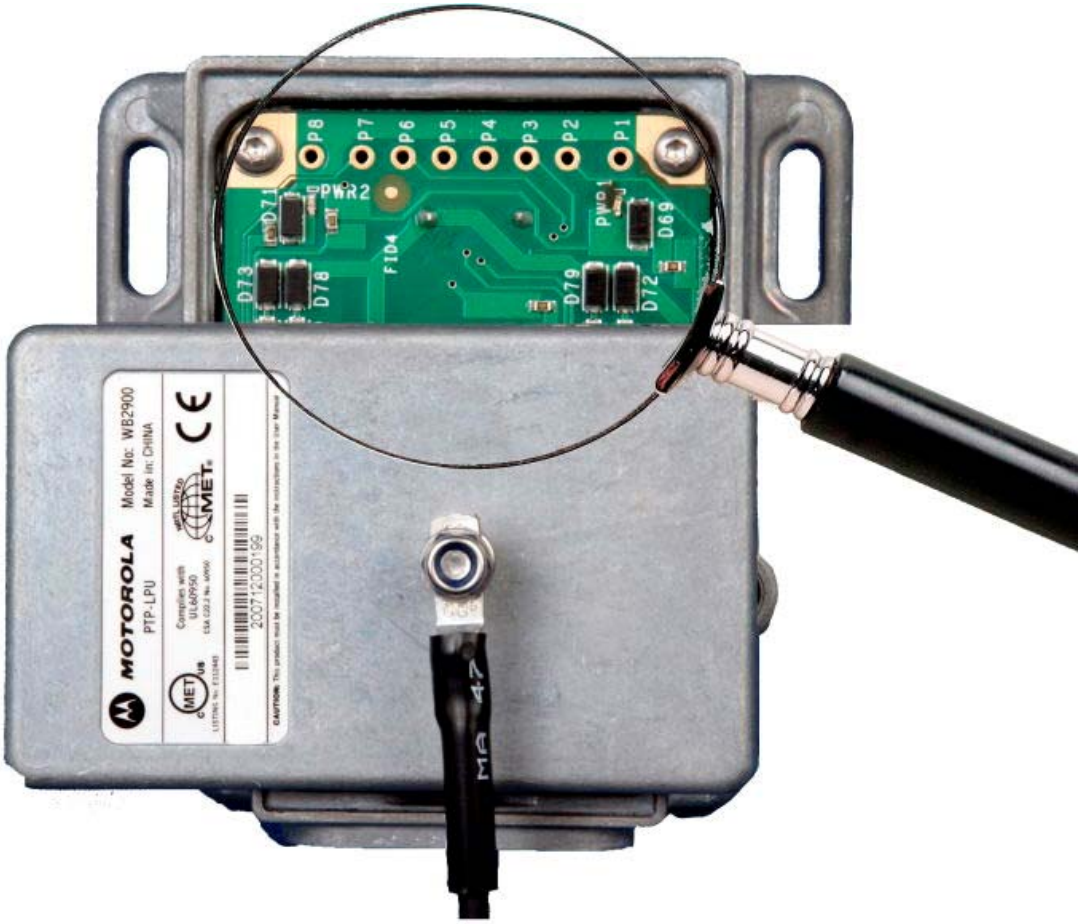
When the PIDU Plus is connected to the power supply and the green Power LED illuminates, there should be a 45 second delay, following which the yellow Ethernet LED should flash 10 times.

If the Ethernet LED did not flash 10 times, proceed as follows:

Procedure 7-9 Ethernet LED did not flash 10 times

1	Remove and examine the cable that connects the PIDU Plus to the LPU or ODU.
2	Check that the wiring to pins 4&5 and 7&8 is correct. For example, the wiring to pins 4 and 7 may be crossed.
3	If an LPU is installed, it can be used to check that power is available on the cable to the ODU. The connections can be accessed by rotating the LPU lid as shown in Figure 7-3. The Lid nut only needs to be slacken, do not remove. Test that point P1 on the LPU PCB corresponds to pin 1 on the RJ45. Repeat for points P2 to P8. An indication of power on the Ethernet cable is also provided inside the LPU: the LED PWR1 should illuminate but LED PWR2 should not.
4	If either test fails, replace or repair the cable that connects the PIDU Plus to the LPU or ODU.

Figure 7-3 PTP LPU test points



No Ethernet activity

If the Ethernet LED did flash 10 times but then went off, proceed as follows:

Procedure 7-10 Ethernet LED flashed 10 times then went out

1	Check that the RJ45 connection from the LAN port of the PIDU Plus to the PC is working.
2	If the PC connection is working, remove and examine the cable that connects the PIDU Plus to the LPU or ODU.
3	Check that the wiring to pins 1&2 and 4&6 is correct. For example, the wiring to pins 1 and 4 may be crossed.
4	If this test fails, replace or repair the cable that connects the PIDU Plus to the LPU or ODU.

Irregular Ethernet activity

The yellow Ethernet LED should blink randomly as normal traffic passes through. If the Ethernet LED flashes irregularly, for example there is a short flash followed by a long flash, this indicates that the ODU has booted in recovery mode. The causes may be installation wiring or a corrupt ODU software load. For more information, see Using recovery mode on page 7-20.

Connection is not 1000 BaseT

If the Ethernet connection to the network is only 10/100 BaseT, when 1000 BaseT is expected, proceed as follows:

Procedure 7-11 Connection is not 1000 BaseT

1	Remove and examine the cable that connects the PIDU Plus to the LPU or ODU.
2	Check that the wiring to pins 4&5 and 7&8 is correct. For example, the wiring to pins 4 and 7 may be crossed.
3	If this test fails, replace or repair the cable that connects the PIDU Plus to the LPU or ODU.

Test Ethernet packet errors reported by ODU

To test for Ethernet packet errors, proceed as follows:

Procedure 7-12 Test for Ethernet packet errors

1	Log in to the ODU and select **Administration**, **Statistics**, **Detailed Counters**.
2	Select **Reset System Counters** at the bottom of the page and wait until the Ethernet Rx Packets counter has reached 10 million. **NOTE** The count will only update when the page is refreshed.
3	If the counter does not increment or increments too slowly, because for example the PTP 600 is newly installed and there is no offered Ethernet traffic, then abandon this procedure and consider using the procedure Test ping packet loss on page 7-11.
4	Check the Ethernet Rx Crc And Align counter. The test has passed if this is less than 10.

Test Ethernet packet errors reported by managed switch or router

If the PTP 600 is connected directly to a managed LAN device, for example an Ethernet switch or router, it should be possible to carry out a check on the rate of errored Ethernet packets monitored by the managed device. Please refer to the user guide of the managed LAN device.

The test has passed if the rate of packet errors reported by the LAN device is less than 1 in 1 million packets.

Test ping packet loss

It is possible to generate and monitor for lost packets by using a computer. This can be achieved using the Command Prompt application which is supplied as standard with Windows and MAC operating systems.

To test ping packet loss, proceed as follows:

Procedure 7-13 Test ping packet loss

1	Ensure that the IP address of the computer is configured appropriately for connection to the PTP 600 under test.
2	Ensure that the IP address of the computer does not clash with other devices connected to the network.
3	If the PIDU Plus is connected to an Ethernet Switch or Router then connect the computer to a spare port, if available.
4	If it is not possible to connect the computer to a spare port of the networking equipment, then the PIDU Plus will need to be disconnected from the network in order to execute this test. **⚠ CAUTION** The following steps will disrupt network traffic carried by the PTP 600 under test. Disconnect the PIDU Plus from the network. Connect the computer directly to the LAN port of the PIDU Plus.
5	On the computer, open the Command Prompt application.

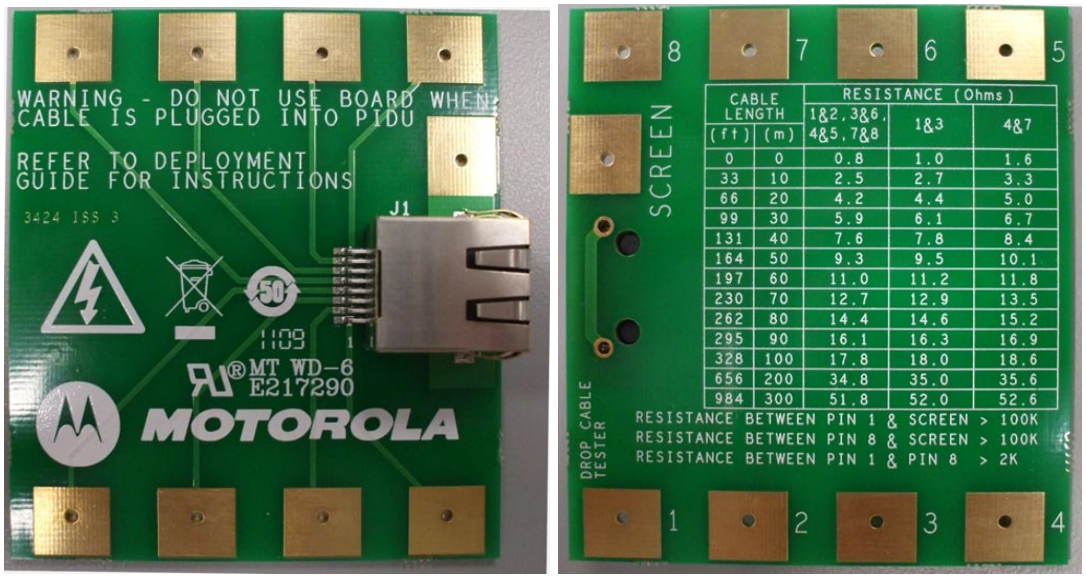
6	Send 1000 ping packets of length 1500 bytes. The process will take 1000 seconds, which is approximately 17 minutes. If the computer is running a Windows operating system, this is achieved by typing: **`ping –n 900 –l 1500 <ipaddress>`** where <ipaddress> is the IP address of the PTP 600 ODU under test. If the computer is running a MAC operating system, this is achieved by typing: **`ping –c 900 –s 1492 <ipaddress>`** where <ipaddress> is the IP address of the PTP 600 ODU under test.
7	Record how many Ping packets have been lost. This is reported by Command Prompt on completion of the test. The test has passed if the number of lost packets is less than 2.

Test resistance at the PIDU end of the drop cable

If the above procedures fail to diagnose the issue, there may be a fault in the wiring of the drop cable that connects the ODU (or LPU) to the PIDU Plus. Perform this task to test the resistances between the RJ45 pins.

Use the PTP drop cable tester (Figure 7-4) to make tesing easier. This can be ordered from http://www.motorola.com/ptp/support by selecting **Order Cable Tester** and completing the order form.

Figure 7-4 Drop cable tester (front and back views)



To test RJ45 resistance, proceed as follows:

Procedure 7-14 Test RJ45 resistance

1	Unplug the cable that connects the PIDU Plus to the LPU or ODU from the PIDU Plus.
2	Measure the cable resistances at the RJ45 between the pairs of pins specified in Table 7-1. The measured resistances should be less than those quoted for the applicable drop cable length.
3	Measure the resistance between pin 1 and the screen (ODU ground). It should be greater than 100K ohms for all cable lengths.
4	Measure the resistance between pin 8 and the screen (ODU ground). It should be greater than 100K ohms for all cable lengths.
5	Measure the resistance between pin 1 and pin 8. If UltraSync GPS is not fitted, it should be greater than 100K ohms all cable lengths. If UltraSync GPS is fitted, it should be greater than 2K ohms all cable lengths.

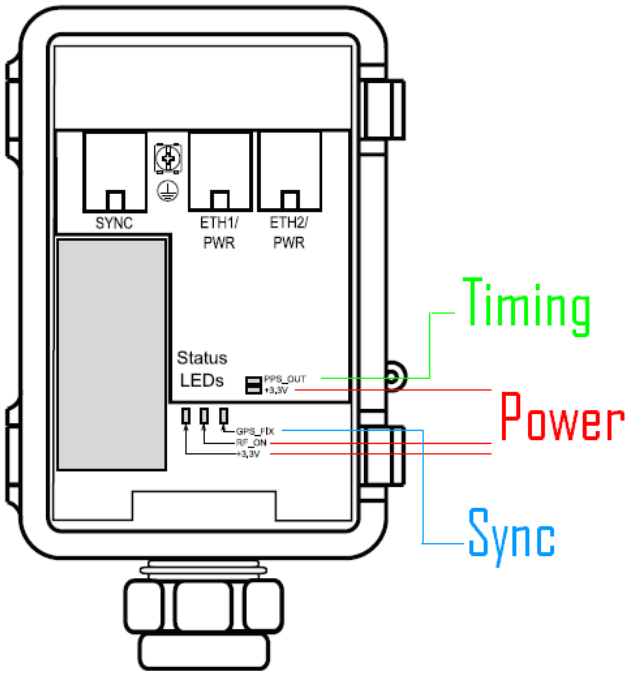
Table 7-1 Expected RJ45 cable resistances at the PIDU Plus

Drop cable length (meters)	Between pins 1&2, 3&6 , 4&5 and 7&8 (ohms)	Between pins 1&3 (ohms)	Between pins 4&7 (ohms)
0	0.8	1.0	1.6
10	2.5	2.7	3.3
20	4.2	4.4	5.0
30	5.9	6.1	6.7
40	7.6	7.8	8.4
50	9.3	9.5	10.1
60	11.0	11.2	11.8
70	12.7	12.9	13.5
80	14.4	14.6	15.2
90	16.1	16.3	16.9
100	17.8	18.0	18.6
200	34.8	35.0	35.6
300	51.8	52.0	52.6

Test UltraSync GPS receiver

The UltraSync GPS synchronization unit, if installed, is located between the ODU and the LPU (Figure 2-17 and Figure 2-18). Use the status LEDs (Figure 7-5) to test the GPS unit.

Figure 7-5 GPS synchronization unit



To troubleshoot the GPS synchronization unit, perform the following test procedure:

Power supply: Check that the **+3.3V** and **RF_ON** LEDs are lit, indicating that the GPS is receiving power. If they are not lit, confirm that all link end hardware (PIDU Plus, LPU, ODU and cabling) tests have been performed.

Synchronization: Approximately 2 minutes after powering on, the **GPS_FIX** LED should be lit. If it is not, ensure the GPS is at a height of at least 1.8m above the ground, where there is an unobstructed path to the sky.

Timing: When the GPS_FIX LED lights up, the **PPS_OUT** LED should begin blinking faintly at one pulse per second, indicating that sync is being generated. If does not, replace or repair the GPS synchronization unit.

Test radio link

If the radio link is not working, or it is unreliable, or the data throughput rate is too low, perform the tests specified in this section. It may be necessary to test the ODUs at both ends of the link.

No activity

If there is no wireless activity, perform Procedure 7-15.

Procedure 7-15 Testing an inactive radio link

1	Check for Alarm conditions on Home page.
2	Check that the software at each end of the link is the same version.
3	Check that the Target Mac address is correctly configured at each end of the link.
4	Check Range.
5	Check Tx Power.
6	Check License keys to ensure that both units are the same product variant.
7	Check Master/Slave status for each unit and ensure that one unit is Master and the other unit is slave.
8	Check that the link is not obstructed or the ODU misaligned.
9	Check the DFS page at each end of the link and establish that there is a quiet wireless channel to use.
10	If there are no faults found in the configuration and there is absolutely no wireless signal, retry the installation procedure.
11	If this does not work then report a suspected ODU fault to Motorola.

Some activity

If there is some activity but the link is unreliable or does not achieve the data rates required, perform Procedure 7-16.

Procedure 7-16 Testing a slow or unreliable radio link

1	Check that the interference has not increased using the i-DFS measurements.
2	If a quieter channel is available check that it is not barred.
3	Check that the path loss is low enough for the communication rates required.
4	Check that the ODU has not become misaligned.

Lightning strike

If a link end installation is struck by lightning, perform Procedure 7-17.

Procedure 7-17 Testing a link end after lightning strike

1	Perform the tests specified in Test link end hardware on page 7-2.
2	Ensure that the PIDU Plus is working and that the resistances are correct as specified in Test resistance at the PIDU on page 7-12.
3	If the ODU is not working, power off the ODU and both LPUs and return them to Motorola.
4	If the ODU is working but there is suspicion of damage to the LPU, then take the LPUs down and take the covers off, inspect for damage, test the big diode for short circuit and test all other diodes for forward voltage.

Using recovery mode

This section provides instructions to allow users to recover a PTP 600 link.

The Motorola PTP 600 point-to-point wireless Ethernet bridges have a special mode of operation that allows the user to recover a unit from configuration errors or software image corruption.

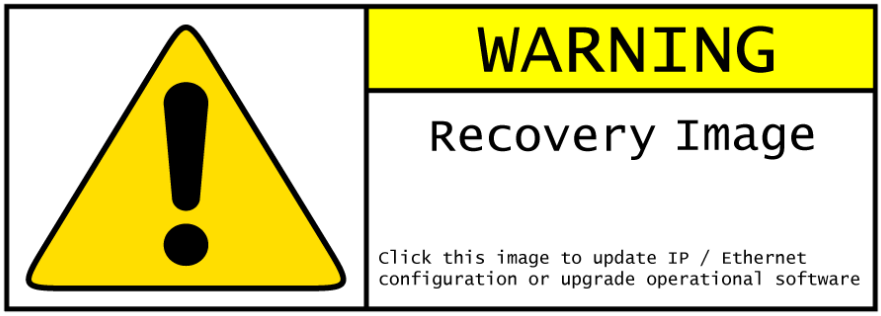
The following topics are described in this section:

Entering recovery mode

Recovery mode is entered by depressing the Recovery Switch located on the underside of the PIDU Plus while applying mains power, as shown in PIDU Plus PTP 300/500/600 Series on page 1-9. The Recovery Switch should be held in the depressed state for between 10 and 20 seconds after the application of mains power. The Ethernet LED will flash with 10 double flashes at power up (following the release of the Recovery switch).

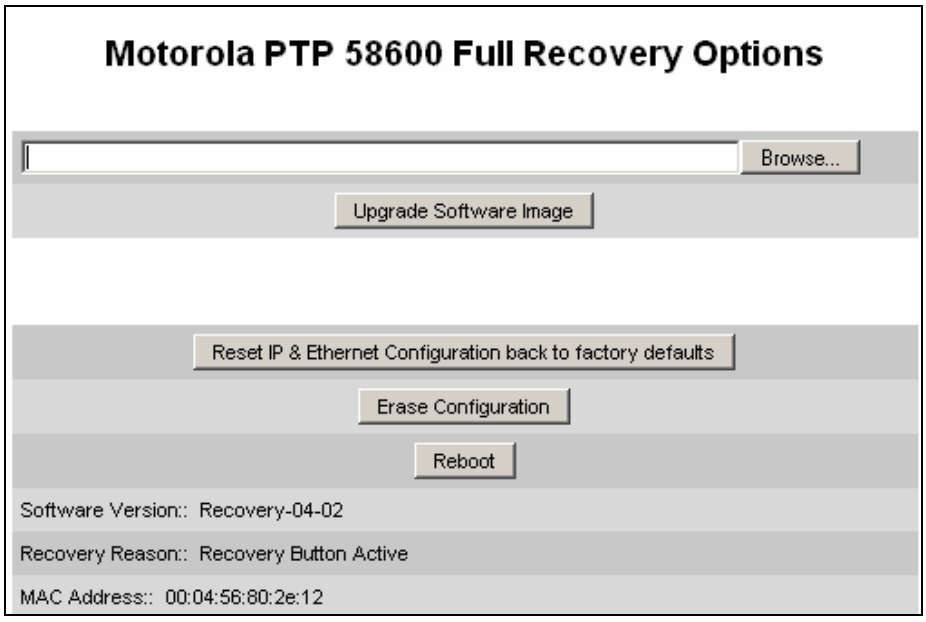
When in recovery mode the user will be able to access the unit via the Ethernet interface. The Ethernet interface will have its IP address set to 169.254.1.1 (or 10.10.10.10). On connection to a unit in recovery mode the following screen is displayed (Figure 7-6):

Figure 7-6 Recovery Image Warning page



Clicking on the warning page image will take the user on to the Recovery Option Page (Figure 7-7).

Figure 7-7 Recovery Options page



The recovery options available are:

Upgrade Software Image

This allows the user to reload a software image. This may be the original image if software corruption is suspected or a step back to an old image if an incorrect image has just been loaded.

Reset IP & Ethernet Configuration back to factory defaults

This allows the user to reset the unit back to the factory defaults:

- IP Address 169.254.1.1 (or 10.10.10.10)
- Netmask 255.255.0.0
- Gateway 169.254.1.0
- Ethernet Interface Auto-negotiate, Auto-MDI/MDIX

Erase Configuration

This allows the user to erase the unit's entire configuration. Executing this option will also erase factory settings such as target MAC address, range setting, license key, etc.

Reboot

This allows the user to reboot the unit. This option must be executed after resetting the IP & Ethernet configuration or erasing the configuration detailed above.

Software Version

This is the software version of the recovery operating system permanently installed during manufacture.

Recovery Reason

Indicates the reason the unit is operating in Recovery mode. Possible reasons are “Recovery button active” or “Invalid or corrupt image”

MAC Address

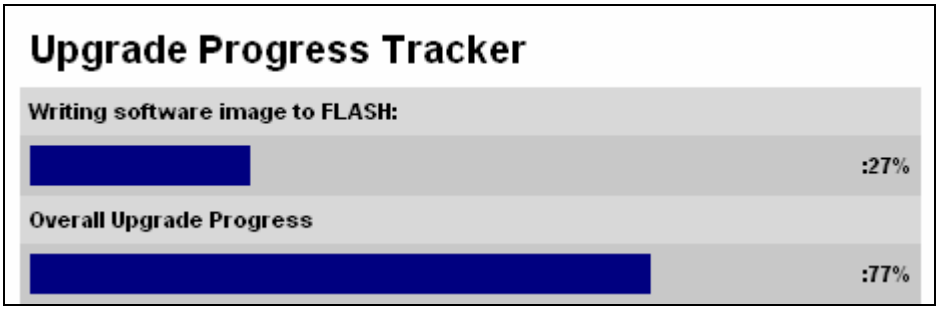
The MAC address shown here is the MAC address of the unit programmed during manufacture.

Upgrade software image

The first step (Figure 7-7) is to use the ‘Browse’ button to locate the software image to be downloaded. Once located the user should press the “Upgrade Software Image” button to start the software download process.

During software download, progress is indicated by a pair of progress bars (Figure 7-8).

Figure 7-8 Upgrade Progress Tracker page

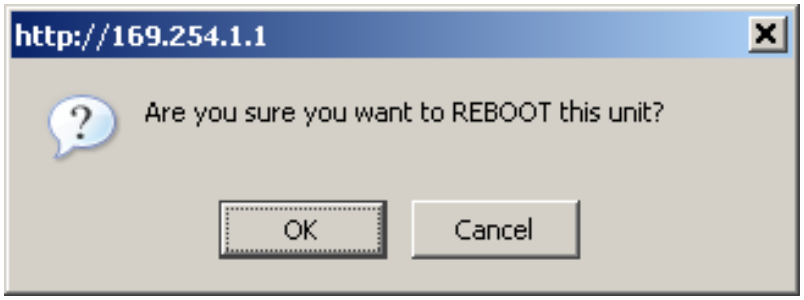


When the download is complete a page is displayed indicating the status of the software download (Figure 7-9).

Figure 7-9 Software Upgrade Complete page

After carefully checking that correct image has been downloaded the user should reboot the unit by pressing the “Reboot Wireless Unit” button. The user will then be presented with a pop up box asking them to confirm the action (Figure 7-10).

Figure 7-10 Reboot confirmation pop up

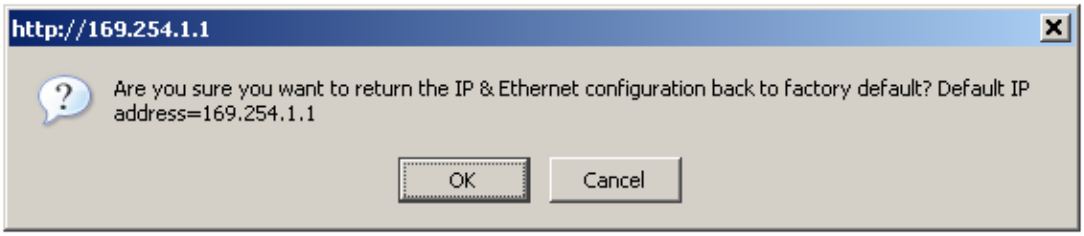


The unit will now reboot. Providing the unit configuration is still intact the unit should restart in normal operational mode and the link should recover. If the unit or link fails to recover, refer to Test link end hardware on page 7-2.

Reset IP & Ethernet configuration

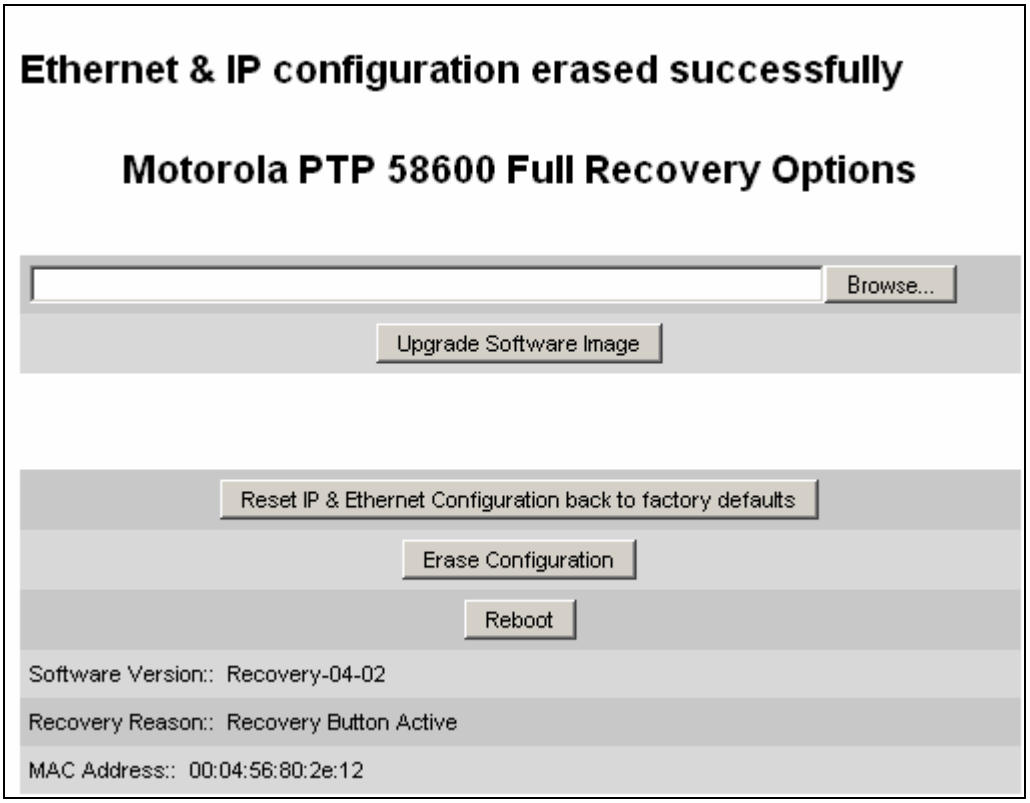
To reset IP & Ethernet configuration back to factory defaults the user should press the “Reset IP & Ethernet Configuration back to factory defaults” button on the “Recovery Options” page (Figure 7-7). The user will now be presented with a pop up box asking them to confirm the action (Figure 7-11).

Figure 7-11 Confirm reset to factory default pop up



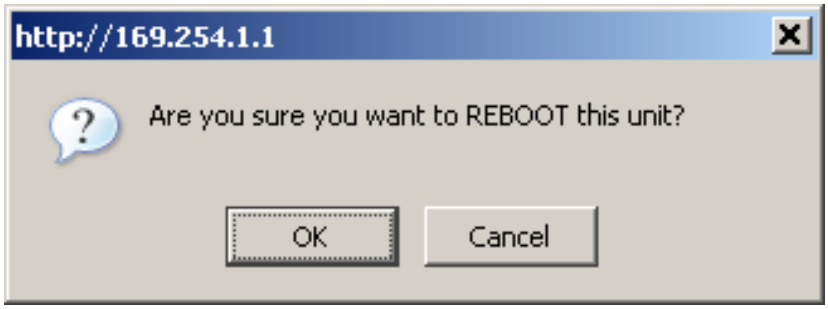
On confirmation the following page will be displayed (Figure 7-12). The user should now reboot the unit by pressing the “Reboot” button.

Figure 7-12 Ethernet & IP configuration erased successfully page



The user will now be presented with a pop up box asking them to confirm the action (Figure 7-13).

Figure 7-13 Reboot confirmation pop up

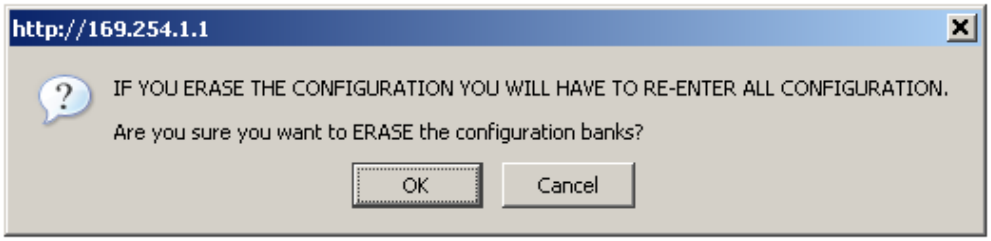


The unit will now reboot. The unit should now start up in normal mode but with the IP address set to 169.254.1.1 and the Ethernet interface set to auto-negotiate and auto-MDI/MDIX. If the unit fails to recover, refer to Test link end hardware on page 7-2.

Erase configuration

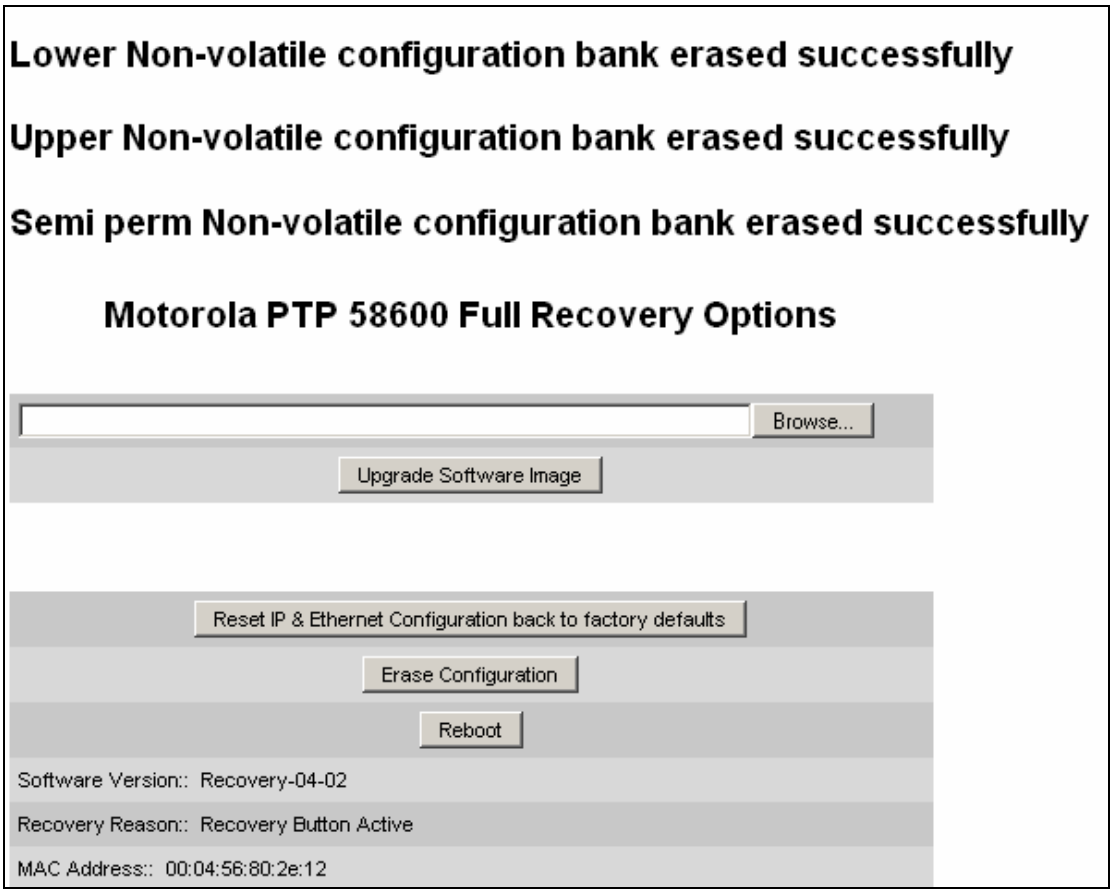
To erase the unit's configuration the user should press the "Erase Configuration" button on the "Recovery Options" page (Figure 7-7). The user will now be presented with a pop up box asking them to confirm the action (Figure 7-14).

Figure 7-14 Confirm erase configuration pop up



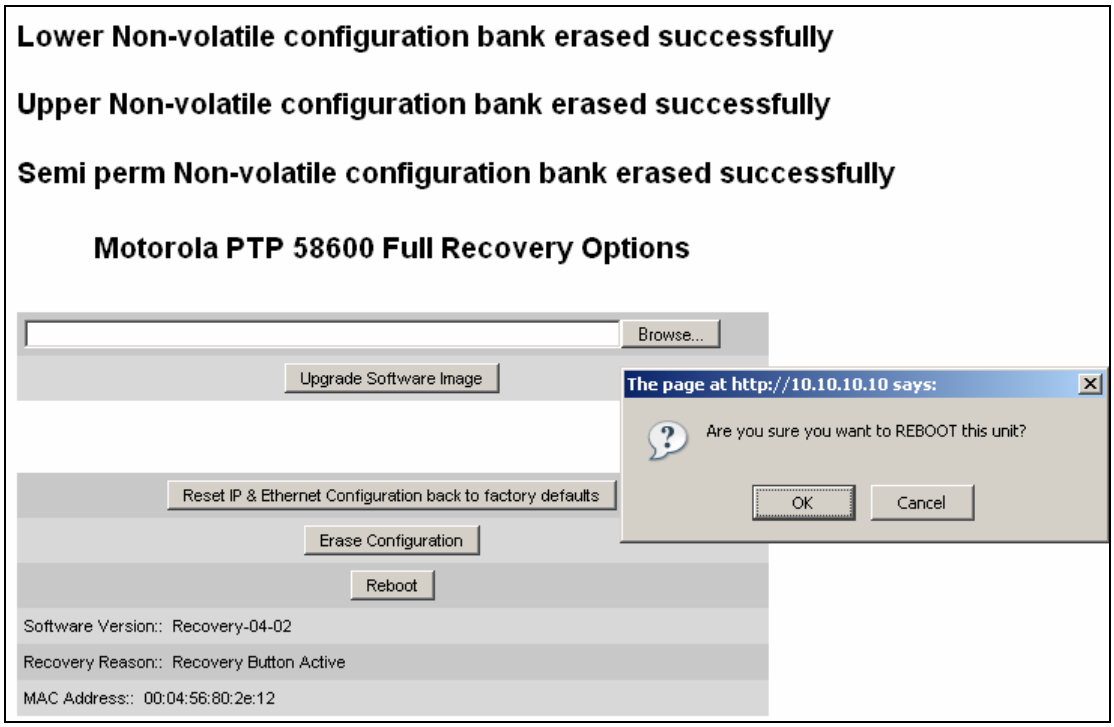
On confirmation the following page will be displayed (Figure 7-15). The user should now reboot the unit by pressing the “Reboot” button.

Figure 7-15 Erase configuration successful page



The user will now be presented with a pop up box asking them to confirm the action (Figure 7-16)

Figure 7-16 Erase configuration - reboot confirmation pop up

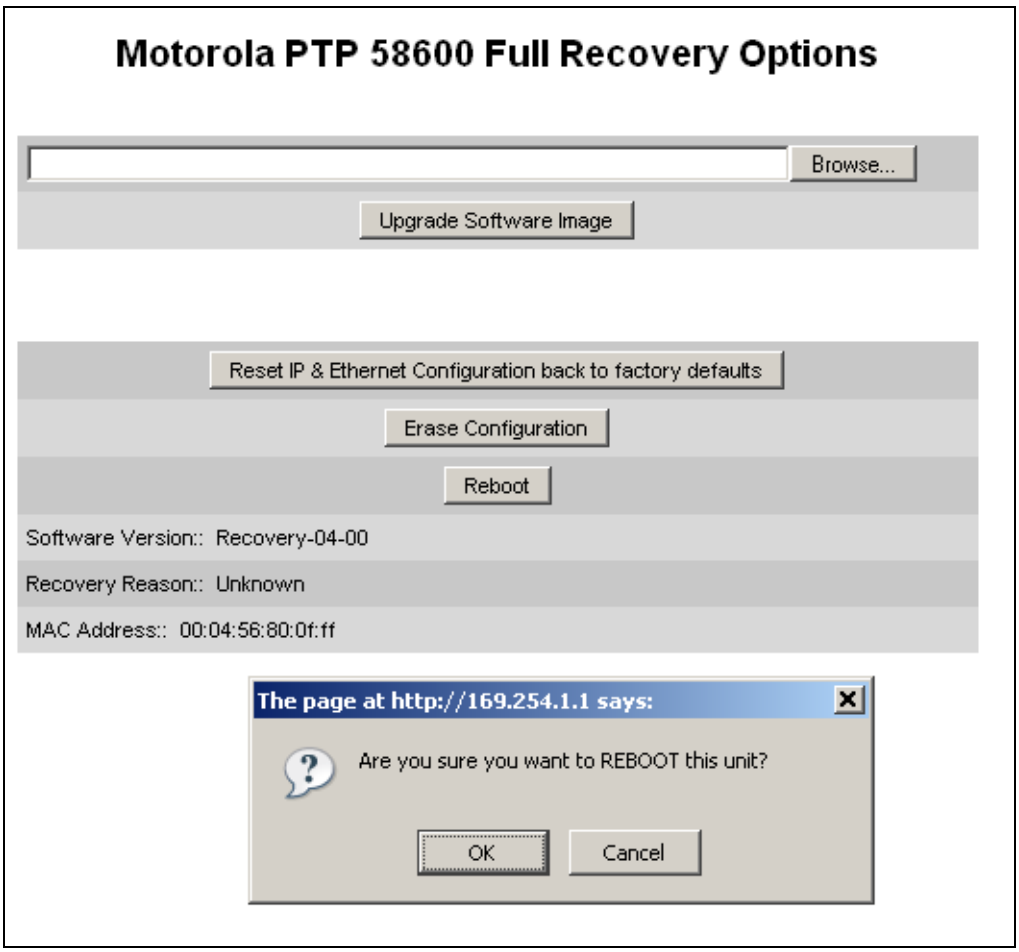


The unit will now reboot. The unit should now start up in normal mode but with all configuration erased. If the unit fails to start up, refer to Test link end hardware on page 7-2.

Reboot

This option can be used to reboot the unit. The user will now be presented with a pop up box asking them to confirm the action (Figure 7-17).

Figure 7-17 Recovery - reboot confirmation pop up



The unit will now reboot. The unit should now start up in normal operational mode. If the unit fails to start up, refer to Test link end hardware on page 7-2.

Chapter 8 Connectorized PTP 600 series

This section details the changes and additional features relevant to the connectorized version of the PTP 600 Series products.

The following topics are described in this section:

Product description

Hardware

The Connectorized PTP 600 Series is a variant designed to provide the system integrator and installer with the ability to provide extra capability to cope with very difficult radio links compared to the PTP 600 Series Integrated model. The variant allows the use of a variety of externally mounted antennas, either Flat Plate or Dish, which have higher gains than provided by the integrated antenna that is normally used.

Figure 8-1 Connectorized PTP 600 Series outdoor unit

Antenna

The antenna choices for the Connectorized PTP 58600 and 54600 are described in Antenna choices on page 8-13.

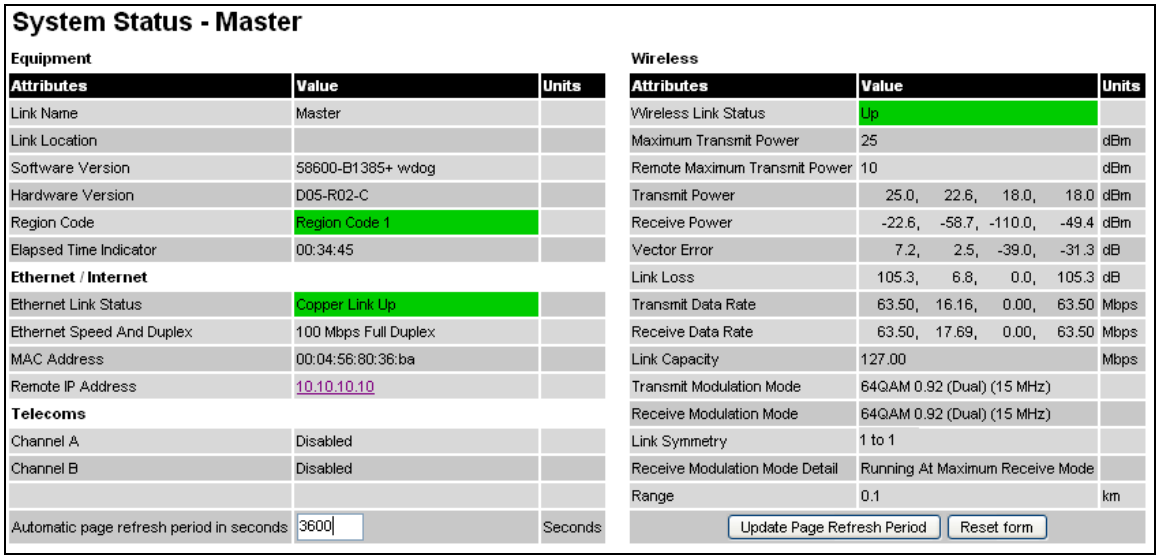
Software and features

This section only describes the areas where functionality is modified for the connectorized variant. For details of the functionality that is common to the integrated and connectorized variants, see Chapter 6 Operation.

Status page

The link loss calculation presented on the Status Page of the management interface has to be modified to allow for the increased antenna gains at each end of the link. The manufacturing process of the Connectorized 600 Series configures the standard hardware of the unit for use with external antennas. The installer is prompted, as part of the installation process, to enter the gain of the external antenna(s) and cable losses at each end of the link. Peer-to-peer messaging is used to pass the effective antenna gain to each end of the link so that the link loss calculations can be correctly computed.

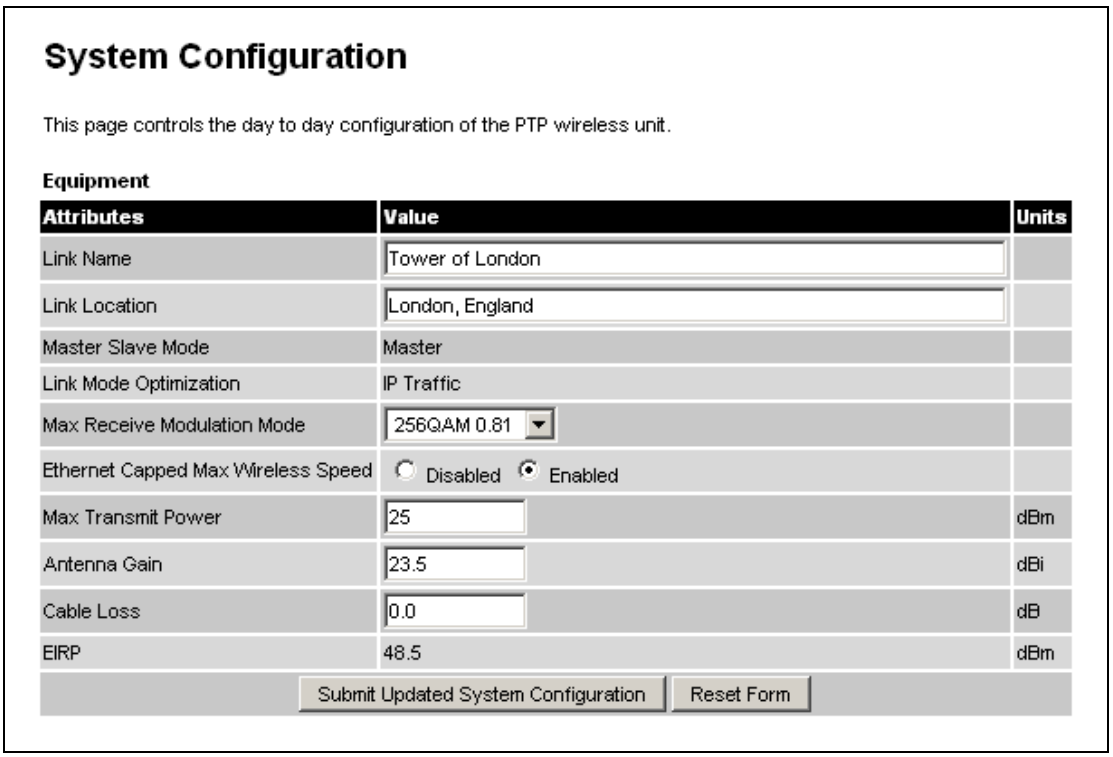
Figure 8-2 Connectorized PTP 600 Series Status page



Configuration pages

The Configuration web page for the connectorized variant is shown in Figure 8-3. The parameters Antenna Gain, Cable Loss and EIRP are specific to the connectorized variant.

Figure 8-3 Connectorized PTP 600 Series System Configuration page



System Configuration

This page controls the day to day configuration of the PTP wireless unit.

Equipment

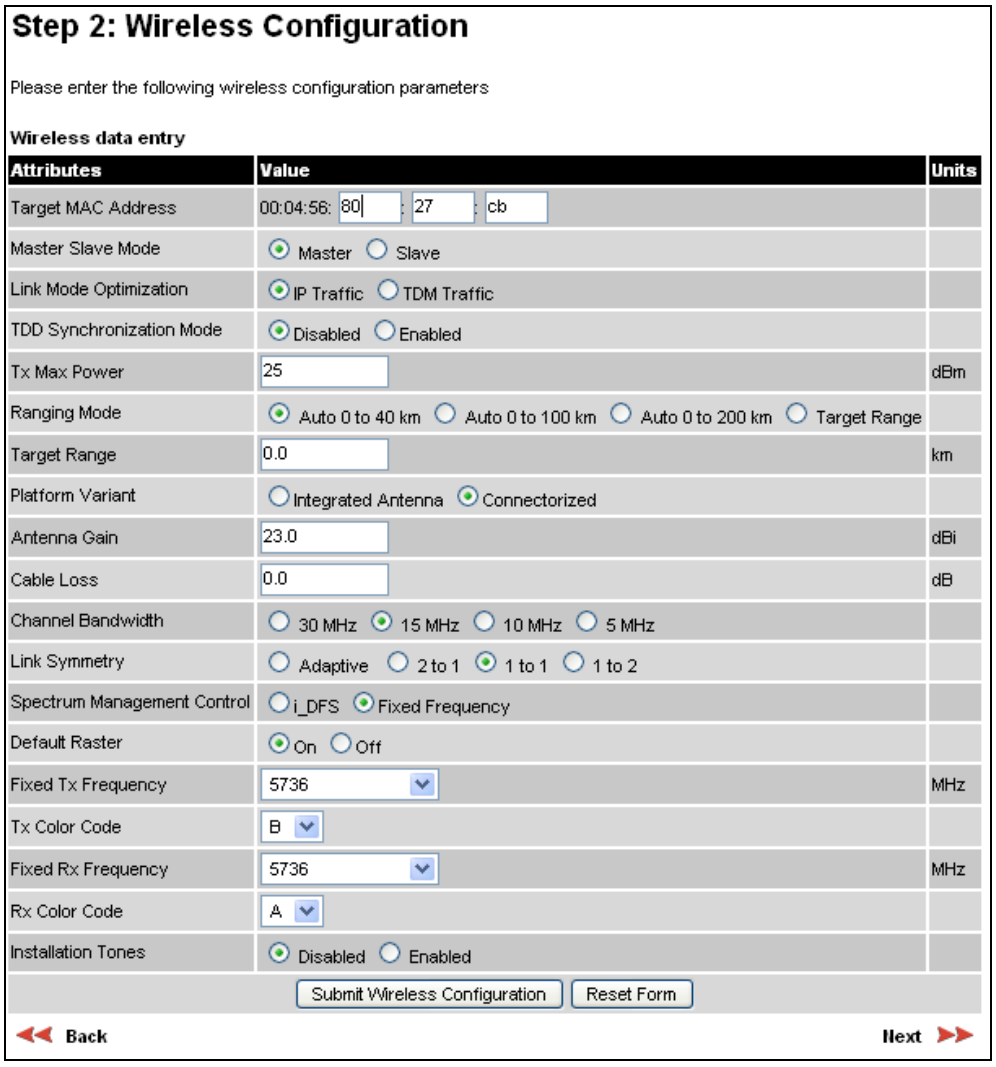
Attributes	Value	Units
Link Name	Tower of London	
Link Location	London, England	
Master Slave Mode	Master	
Link Mode Optimization	IP Traffic	
Max Receive Modulation Mode	256QAM 0.81	
Ethernet Capped Max Wireless Speed	Disabled / Enabled	
Max Transmit Power	25	dBm
Antenna Gain	23.5	dBi
Cable Loss	0.0	dB
EIRP	48.5	dBm

Submit Updated System Configuration | Reset Form

Installation pages

The installer is prompted to enter the Antenna Gain and Cable Loss (Connectorized PTP 600 Series to antenna) at each end of the link. The Installation Pages for the connectorized version are shown as Figure 8-4 to Figure 8-6.

Figure 8-4 Connectorized PTP 600 Series Wireless Configuration page



The following fields are relevant to connectorized ODUs:

Antenna Gain

Gain of the antenna you are connecting to the unit, see Antenna choices on page 8-13.

Cable Loss

Loss in the cable between the ODU and the antenna.

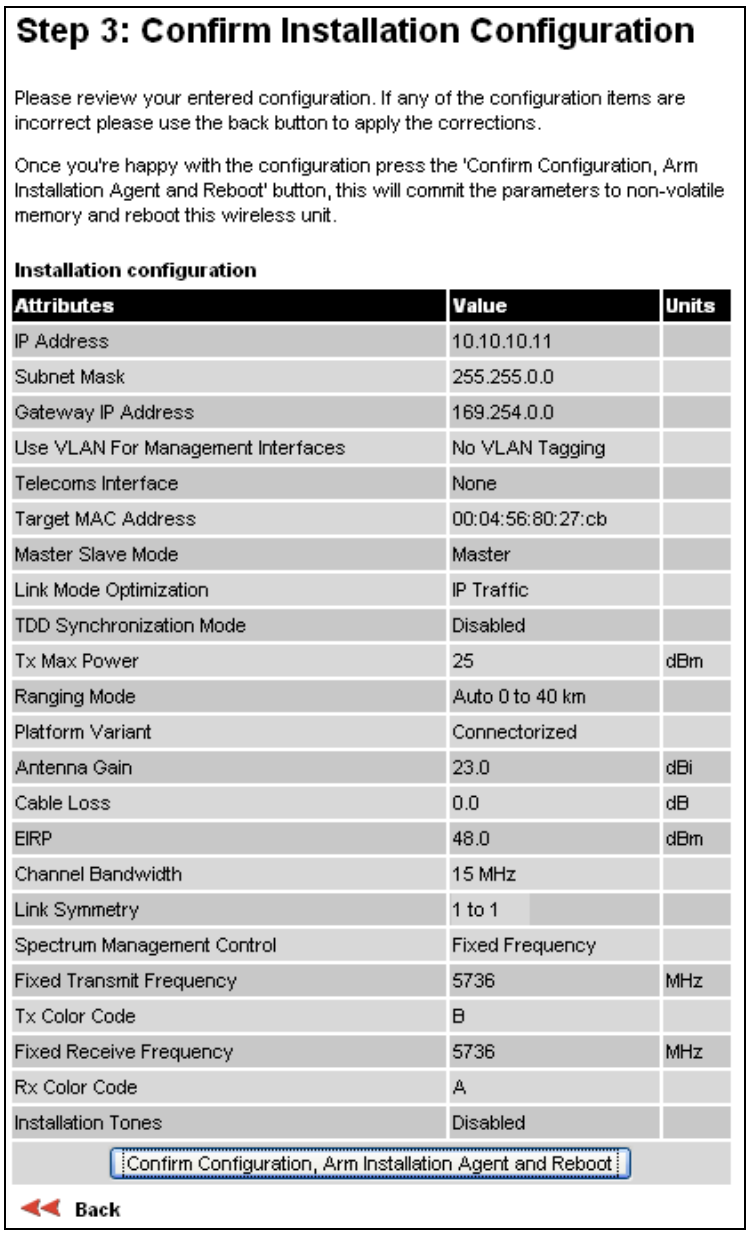
NOTE

If there is a significant difference in length of the antenna cables for the two antenna ports, then the average value should be entered.

Spectrum Management Control

Is used to configure the PTP 600 Series Spectrum Management features, see Spectrum management on page 6-22 for more details. i-DFS is the abbreviation for intelligent Dynamic Frequency Selection, which continually monitors the spectrum looking for the channel with the lowest level of on channel and co-channel interference. Fixed frequency mode allows the installer to fix the Transmit and receive frequencies on the units. The frequencies may be configured symmetrically or asymmetrically.

Figure 8-5 Connectorized PTP 600 Series Confirm Installation page



Step 3: Confirm Installation Configuration

Please review your entered configuration. If any of the configuration items are incorrect please use the back button to apply the corrections.

Once you're happy with the configuration press the 'Confirm Configuration, Arm Installation Agent and Reboot' button, this will commit the parameters to non-volatile memory and reboot this wireless unit.

Installation configuration

Attributes	Value	Units
IP Address	10.10.10.11	
Subnet Mask	255.255.0.0	
Gateway IP Address	169.254.0.0	
Use VLAN For Management Interfaces	No VLAN Tagging	
Telecoms Interface	None	
Target MAC Address	00:04:56:80:27:cb	
Master Slave Mode	Master	
Link Mode Optimization	IP Traffic	
TDD Synchronization Mode	Disabled	
Tx Max Power	25	dBm
Ranging Mode	Auto 0 to 40 km	
Platform Variant	Connectorized	
Antenna Gain	23.0	dBi
Cable Loss	0.0	dB
EIRP	48.0	dBm
Channel Bandwidth	15 MHz	
Link Symmetry	1 to 1	
Spectrum Management Control	Fixed Frequency	
Fixed Transmit Frequency	5736	MHz
Tx Color Code	B	
Fixed Receive Frequency	5736	MHz
Rx Color Code	A	
Installation Tones	Disabled	

Confirm Configuration, Arm Installation Agent and Reboot

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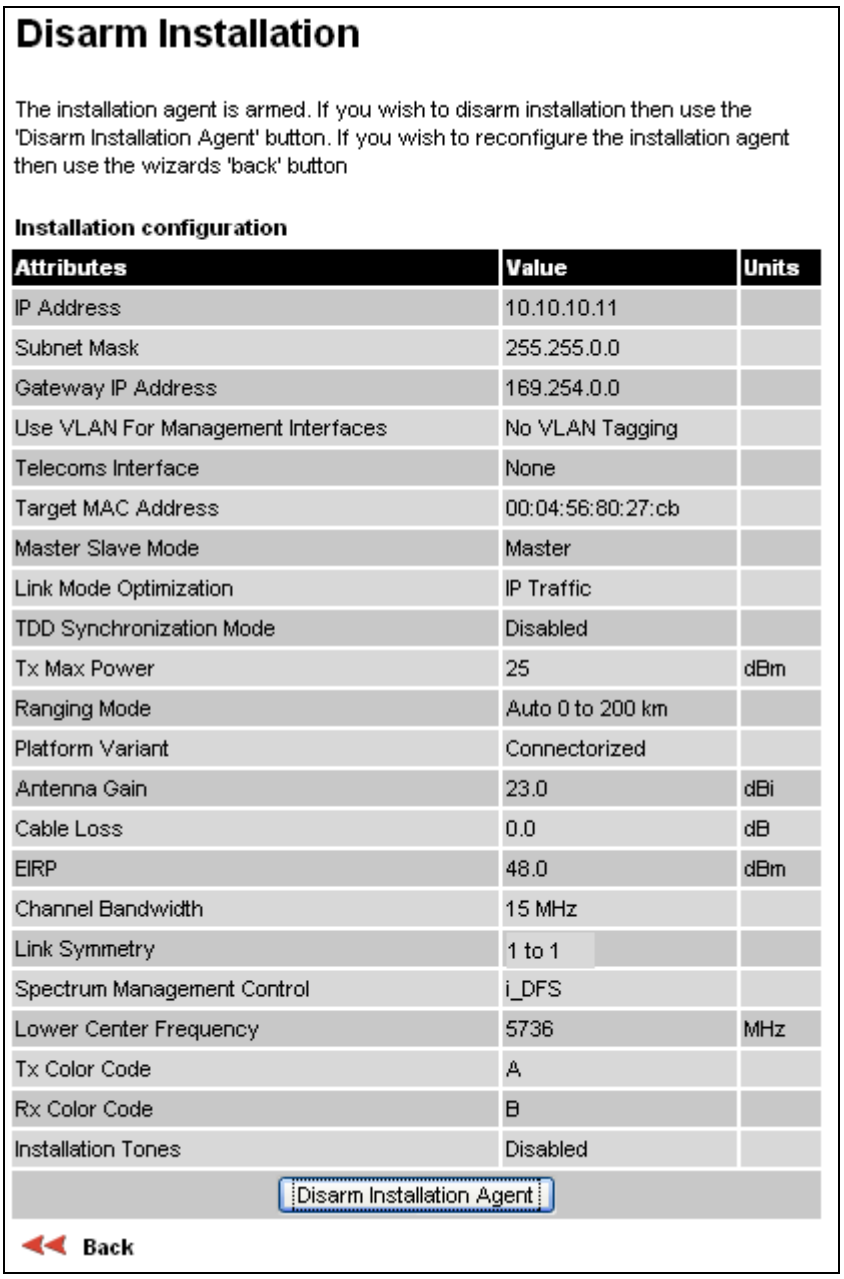
EIRP

The Confirm Installation Page displays the EIRP (Effective Isotropic Radiated Power), which describes the strength of the radio signal leaving the wireless unit. This allows the operator to verify that their link configuration (Max Transmit Power, Antenna Gain and Cable Loss) do not cause the link to exceed any applicable regulatory limit.

Figure 8-6 Connectorized PTP 600 Series Disarm Installation page



Disarm Installation

The installation agent is armed. If you wish to disarm installation then use the 'Disarm Installation Agent' button. If you wish to reconfigure the installation agent then use the wizards 'back' button

Installation configuration

Attributes	Value	Units
IP Address	10.10.10.11	
Subnet Mask	255.255.0.0	
Gateway IP Address	169.254.0.0	
Use VLAN For Management Interfaces	No VLAN Tagging	
Telecoms Interface	None	
Target MAC Address	00:04:56:80:27:cb	
Master Slave Mode	Master	
Link Mode Optimization	IP Traffic	
TDD Synchronization Mode	Disabled	
Tx Max Power	25	dBm
Ranging Mode	Auto 0 to 200 km	
Platform Variant	Connectorized	
Antenna Gain	23.0	dBi
Cable Loss	0.0	dB
EIRP	48.0	dBm
Channel Bandwidth	15 MHz	
Link Symmetry	1 to 1	
Spectrum Management Control	i_DFS	
Lower Center Frequency	5736	MHz
Tx Color Code	A	
Rx Color Code	B	
Installation Tones	Disabled	

Disarm Installation Agent

Back

Deployment considerations

When to use external antennas

The majority of radio links can be successfully deployed with the PTP 600 Series. It should only be necessary to use external antennas where the LINKPlanner indicates marginal performance for a specific link – for example when the link is heavily obscured by dense woodland on an NLOS link or extremely long LOS links (>80km or >50 miles) over water.

The external antennas can be either dual-polarization (as the integrated antenna) or two single polarized antennas can be used in a spatially diverse configuration. It is expected that the dual-polarization antennas would normally be used to simplify the installation process; spatially diverse antennas may provide additional fade margin on very long LOS links where there is evidence of correlation of the fading characteristics on Vertical and Horizontal polarizations.

Link budget

An estimate of the link budget for a specific application can be obtained by using the Motorola LINKPlanner tool. For more information see the Motorola web site.

Regulatory issues with connectorized units

Maximum EIRP

Normal EIRP limits

In most regions (including USA, Canada, Europe and Australia) operation of products in the band 5470 MHz to 5725 MHz is constrained by an EIRP limit. The constraint is that the EIRP must not exceed (17 + 10 x Log Bandwidth) dBm.

In some regions (including Europe) operation of products in the band 5725 MHz to 5850/5875 MHz is constrained by an EIRP limit. The constraint is that the EIRP must not exceed (23 + 10 x Log Bandwidth) dBm.

As the PTP 600 has an operating bandwidth from approximately 5 MHz to approximately 30 MHz, then the maximum allowed EIRP depends on the operating bandwidth of the radio as shown in Table 8-1.

Table 8-1 Normal EIRP limits with operating channel bandwidth

Operating bandwidth (MHz)	Allowed EIRP (dBm) at 5.4 GHz	Allowed EIRP (dBm) at 5.8 GHz
5	24	30
10	27	33
15	28.8	34.8
30	30	36

Calculating EIRP

When operating with external antennas, the installer or operator has to set the maximum transmit power to ensure that the EIRP limit is not exceeded. The EIRP may be calculated from:

Allowed EIRP(dBm) = Max_Transmit_Power (dBm) + Antenna Gain (dBi) – Feeder Losses (dB)

and hence:

Max_Transmit_Power (dBm) = Allowed EIRP(dBm) – Antenna Gain (dBi) + Feeder Losses (dB)

The Set_Max_Transmit_Power parameter

As the actual maximum transmit power can only be adjusted in 1 dB steps, then the installer or operator must configure the PTP 600 to have a Set_Max_Transmit_Power parameter as calculated below:

Set_Max_Transmit_Power = [Max_Transmit_Power] rounded down to nearest lower dB step

In order to simplify matters, the settings to be used for regions with the EIRP limits in Table 8-1 (assuming short feeder cables) are shown in Table 8-2.

NOTE

Table 8-2 has been calculated on the basis of 0.5 dB cable loss and the highest gain antennas per size of which we are aware. At these operating frequencies, feeder losses even with short cables are unlikely ever to be below 0.5 dB for practical installations and cable diameters.

Table 8-2 Setting maximum transmit power to meet general EIRP limits

Antenna size	Maximum available antenna gain (dBi)	Operating bandwidth (MHz)	Set_Max_Transmit_Power parameter setting (dBm)	
			5.4 GHz	5.8 GHz
2ft dish	29.4	5	-6	0
		10	-3	3
		15	-2	4
		30	1	7
2.5ft dish	31.2	5	Not allowed	-2
		10	-5	1
		15	-3	3
		30	0	6
3ft dish	33.4	5	Not allowed	-4
		10	-7	-1
		15	-5	0
		30	-2	3

Antenna size	Maximum available antenna gain (dBi)	Operating bandwidth (MHz)	Set_Max_Transmit_Power parameter setting (dBm)	
			5.4 GHz	5.8 GHz
4ft dish	34.8	5	Not allowed	-6
		10	Not allowed	-3
		15	-7	-1
		30	-4	2

Cable losses (FCC regions only)

The FCC approval for the product is based on tests with a cable loss between the units of not less than 1.2 dB at 5.8 GHz. The use of lower cable losses would result in the installation being outside the FCC rules. As an indication, 1.2 dB of cable loss corresponds to the following cable lengths excluding connector losses (source: Times Microwave).

Table 8-3 Cable losses per length

Cable	Length for 1.2dB Cable Loss at 5.8 GHz	
	(ft)	(m)
LMR100	1.9	0.6
LMR200	4.6	1.4
LMR300	7.25	2.2
LMR400	11.1	3.4
LMR600	16.5	5.0

Antenna choices

Antenna selection criteria

The main selection criterion is the required antenna gain. The secondary criterion is the ease of mounting and alignment. For example, the Radio Waves Parabolic dishes are supplied with a mount that allows adjustment for alignment independent of the actual antenna mounting. This type of antenna is much easier to align than those that have to be rotated around the mounting pole for alignment.

Non-FCC regions

In non-FCC regions, antenna choice is not restricted, but any region specific EIRP limit must be obeyed by reducing the maximum Transmit power, see Licenses and region codes on page 2-3.

FCC regions

In FCC regions, antenna choice is restricted as described in PTP 54600 FCC antenna restrictions on page 4-64 and PTP 58600 FCC antenna restrictions on page 4-85.

The maximum permitted antenna gain depends upon product variant and channel bandwidth, as specified in PTP 49600 radio system specifications on page 4-47 and Regulatory issues with connectorized units on page 8-10.

Installing connectorized bridges

The section covers the generic installation instructions for the Connectorized versions of the PTP 600 Series point-to-point wireless Ethernet bridges. The actual installation procedure will depend on antenna choice, cable choice, required antenna separation etc.

PTP 54600 FCC antenna restrictions on page 4-64 and PTP 58600 FCC antenna restrictions on page 4-85 show a wide variety of antennas that can be used with the Connectorized PTP 600 Series.

Cables and connectors

Cables should be selected using the above criteria. However it should be noted that a cable of a type similar to LMR400 is a lot more difficult to handle and route than a cable of a type similar to LMR100.

Motorola recommends the use of weatherproof connectors, preferably ones that come supplied with adhesive lined heat shrink sleeve that is fitted over the cable/connector interface.

The connectors required at the Connectorized PTP 600 Series end of the antenna cables are N-Type Male.

The connectors required at the antenna end of the antenna cables is dependant on the antenna type chosen.

Tools

The tools required for mounting a Connectorized PTP 600 Series unit are the same as those required for an Integrated 600 Series detailed in Preparing for site installation on page 5-7. The tools required for mounting the antennas are specific to the antenna chosen. The installer should refer to the antenna manufacturer’s instructions.

Miscellaneous supplies

The following miscellaneous supplies will be required:

- Cable ties, cable cleats – for securing cables
- Self-amalgamating tape – to weatherproof the RF connectors
- PVC tape – for additional protection of the RF connectors and securing cables

Mounting the connectorized PTP 600

A Connectorized PTP 600 Series is shipped with the same bracket as supplied with an Integrated unit. Details on the use of this bracket can be found in Mounting brackets on page 1-7. The PTP 600 Series should be mounted in a position that gives it maximum protection from the elements, but still allows easy access for making off the various connections and applying the recommended weatherproofing.

When using dual polar antennas the Connectorized PTP 600 Series should be mounted in such a position as to minimize the cable length, keeping losses to a minimum, taking into account the minimum cable lengths required by the FCC regulations, see PTP 58600 FCC antenna restrictions on page 4-85.

When using separate antennas the Connectorized PTP 600 Series should be mounted in such a position as to minimize both cable runs between the unit and the antennas. It is not necessary to mount the Connectorized PTP 600 Series at the mid point between the antennas.

Mounting the antennas

The Antennas should be mounted according to the manufacturer’s instructions. Actual antenna position will depend on the available mounting positions and link requirements. It may be necessary to mount the antennas 20m apart or at a certain distance from the ground to get the desired results.

Alignment process

When aligning antennas deployed with a Connectorized PTP 600 Series unit it may not be possible to hear the alignment tone emanating from the unit. In this case it may be necessary for a second installer to assist in the operation. Alternatively, it may be possible to extend the tube on the supplied stethoscope to give a longer reach.

NOTE

Fine antenna alignment can sometimes be achieved by tightening and loosening the bolts on either side of the antenna mounting bracket, rather than trying to turn the whole bracket on the mounting pole.

Aligning dual polar antennas

The process for aligning a dual polar antenna is the same as aligning an Integrated unit with an integrated antenna. This procedure is detailed in Using the ODU installation tones on page 5-59.

Aligning separate antennas

When using separate antennas to achieve spatial diversity, one should be mounted with Horizontal polarization and the other with Vertical polarization. Follow Procedure 8-1

Procedure 8-1 Aligning separate antennas

1	Mount the Antennas.
2	Mount the connectorized version of the PTP 600 ODU.
3	Route and make off the ends of the Antenna cables.
4	Connect the antenna cables at the antennas.
5	Connect one of the antenna cables at the Connectorized version of the PTP 600 Series unit.
6	Connect the Connectorized PTP 600 Series ODU to PIDU Plus cable and configure the unit as described in Connecting the ODU, PIDU and LPUs on page 5-43.
7	Align the connected antenna using the tones as described in Using the ODU installation tones on page 5-59.
8	Connect the other antenna to the ODU.
9	Disconnect the cable to the already aligned antenna.
10	Align the second antenna using the tones as described in Using the ODU installation tones on page 5-59.
11	Re-connect the second antenna to the Connectorized PTP 600 Series. The tone pitch should increase due to the additional received signal.
12	Use the relevant status web pages to check that the planned link performance is achieved.

Completing the installation

The installation should be completed by checking all mounting nuts bolts and screws, securing all cables and weatherproofing the installation.

⚠ CAUTION

Finally tightening the antenna mountings may cause the antenna alignment to be altered, due to distortion in the mounting bracket caused by action of tightening. It is recommended that the installation tone be left turned on (armed) during this process so that any movement can be noticed and counteracted by tightening the other side of the bracket.

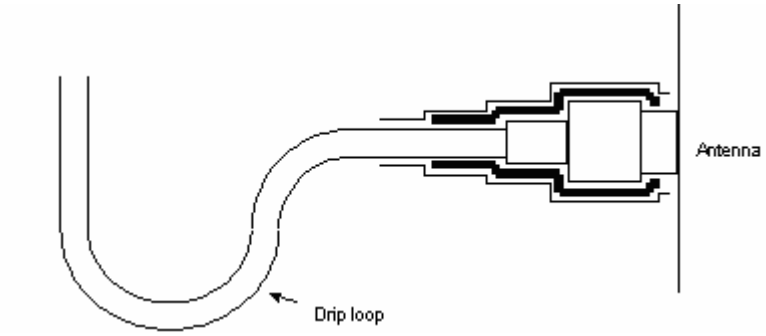
Antenna cable fixing

Cables should be secured in place using cable ties, cleats or PVC tape. Care should be taken to ensure that no undue strain is placed on the connectors on both the Connectorized PTP 600 Series and the Antennas and also to ensure that the cables do not flap in the wind. Flapping cables are prone to damage and induce unwanted vibrations in the mast to which the units are attached.

Antenna connection weatherproofing

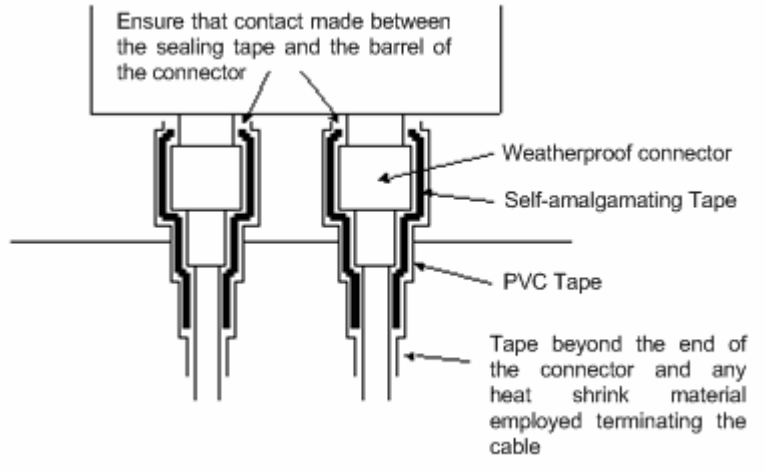
Where a cable connects to an antenna or unit from above, a drip loop should be left to ensure that water is not constantly channeled towards the connector.

Figure 8-7 Forming a drip loop



All joints should be weatherproofed using self-amalgamating tape. It is recommended that a layer of PVC tape be placed over the self-amalgamating tape to protect the joint while the self-amalgamating tape cures and gives additional protection. Figure 8-8 shows this diagrammatically for the PTP 600 Series end of the antenna cables. If the antenna manufacturer has not supplied guidance on this matter, the same technique should be employed at the antenna end of the cable.

Figure 8-8 Weatherproofing the antenna connections



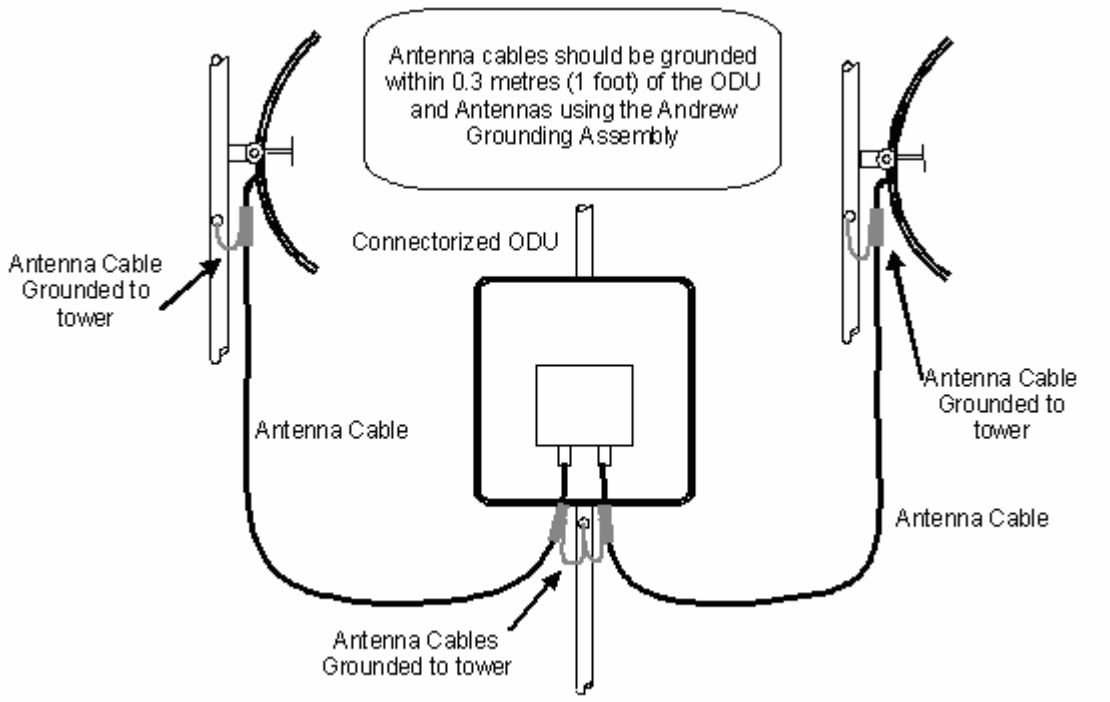
Additional lightning protection

The following guidelines should be applied in addition to those described in Lightning protection on page 2-18.

ODU mounted outdoors

Where the ODU is mounted outdoors and is mounted some distance from the antenna, it is advisable to add additional grounding by utilizing Andrew Assemblies (such as Andrew Type 223158 www.andrew.com) as shown in Figure 8-9.

Figure 8-9 Additional grounding when using connectorized units



NOTE

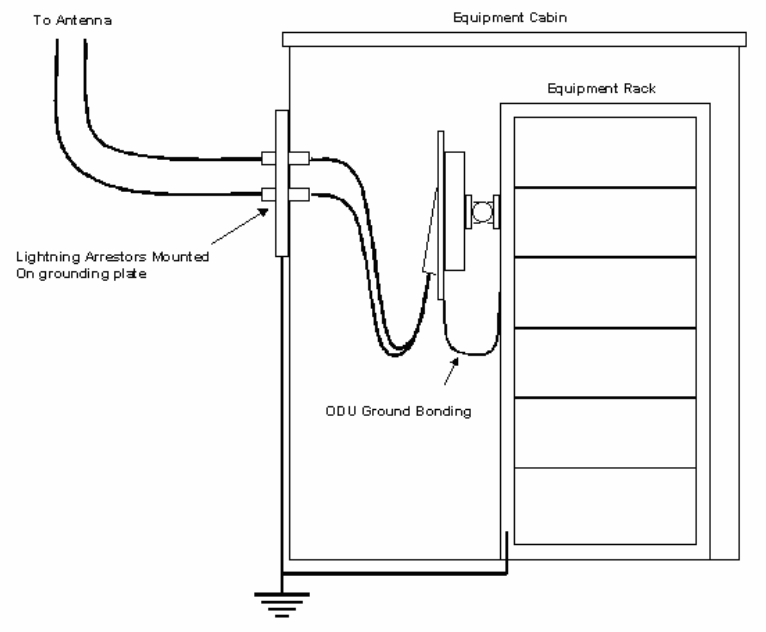
Refer to instructions contained in the Andrew grounding kit for correct installation, or if instructions are missing, refer to:

http://awapps.commscope.com/catalog/product_details.aspx?id=15832&tab=2

ODU mounted indoors

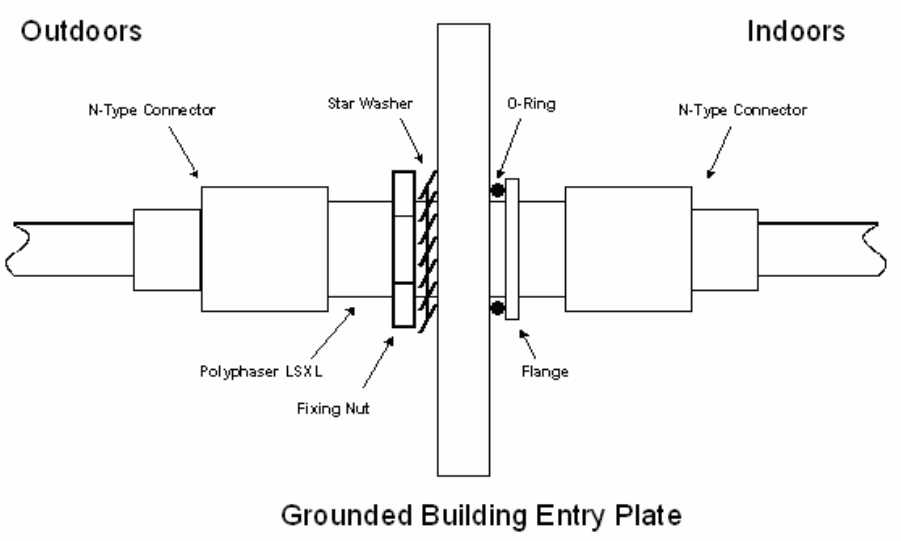
Where the ODU is mounted indoors, lightning arrestors should be deployed where the antenna cables enter the building as shown in Figure 8-10.

Figure 8-10 Lightning arrestor mounting



The lighting arrestors should be ground bonded to the building ground at the point of entry. Motorola recommends Polyphaser LSXL-ME or LSXL lighting arrestors. These should be assembled as show in Figure 8-11.

Figure 8-11 Polyphaser assembly



Chapter 9 FAQs

This chapter contains answers to frequently asked questions (FAQs) about the PTP 600.

General FAQs

Can I source and use my own PoE adaptor with the PTP 600 Series? No. The PTP 600 Series uses a non-standard PoE configuration. Failure to use the Motorola supplied Power Indoor Unit could result in equipment damage and will invalidate the safety certification and may cause a safety hazard.

Why has Motorola launched the PTP 600 Series? The PTP 600 Series is the first product to feature Multiple-Input Multiple-Output (MIMO). The PTP 600 Series solutions allow wireless connections of up to 200km (124 miles) in near line-of-sight conditions and up to 10km (6 miles) in deep non-line-of-sight conditions.

What is Multiple-Input Multiple-Output (MIMO)? The PTP 600 Series radiates multiple beams from the antenna - the effect of which is to significantly protect against fading and to radically increase the probability that the receiver will decode a usable signal. When the effects of MIMO are combined with those of OFDM techniques and a best in class link budget, there is a significant improvement to the probability of a robust connection over a non-line-of-sight path.

What do you mean by “non-line-of-sight”? A wireless connection between two points without optical line-of-sight, that is, with obstructions between the antennas the transmitted signal is still able to reach the receiver and produce a good quality link.

What else is special about the PTP 600 Series ? There are many special features built-in to the hardware of the PTP 600 Series. The product offers the highest system gain in its class through high sensitivity antennas for improved signal recovery. It also features a radio system that operates on ultra fast digital signal processors but is controlled by firmware giving the ability to download new firmware when enhancements become available. The PTP 600 Series has a built-in web server for advanced management capabilities including detailed radio signal diagnosis.

In which frequency bands does the PTP 600 Series operate? The Motorola point-to-point 600 Series operates in the licensed bands 2.5 GHz, 4.5 GHz, 4.8 GHz and 4.9 GHz, and in the unlicensed bands 5.4 GHz (ETSI Band B), 5.8 GHz (ETSI Band C and FCC ISM band) and 5.9 GHz. Users must ensure that the PTP 600 Series complies with local operating regulations.

Why does the PTP 600 Series operate in the 5GHz band? The 5 GHz band offers the dual benefits of high data throughput and good radio propagation characteristics. The wide band of spectrum available is subdivided into several channels such that multiple systems can operate in the vicinity without causing interference to one another.

Is the PTP 600 Series an 802.11a device? No, although similar, the PTP 600 Series uses different encoding and radio transmission systems from 802.11a. In areas where 802.11a systems are operating, the PTP 600 Series will detect the 802.11a radio signals and choose a clear channel away from any interference.

How much power does the PTP 600 Series transmit? At all times the PTP 600 Series operates within country / region specific regulations for radio power emissions. In addition, the PTP 600 Series uses a technique known as Transmit Power Control (TPC) to ensure that it only transmits sufficient radio power such that the other antenna can receive a high quality signal.

How does the PTP 600 Series avoid interference from other devices nearby? At initialization, the PTP 600 Series monitors the available frequency channels to find a channel that is clear of interference. In operation 600 Series continuously monitors the spectrum to ensure it is operating on the cleanest channel.

How does the PTP 600 Series integrate into my data network? The PTP 600 Series acts as a transparent bridge between two segments of your network. In this sense, it can be treated like a virtual wired connection between the two buildings. The PTP 600 Series forwards 802.3 Ethernet packets destined for the other part of the network and filters packets it does not need to forward. The system is transparent to higher-level management systems such as VLANs and Spanning Tree.

How does the PTP 600 Series provide security for data traffic? The PTP 600 Series has a range of security features. At installation time each link must be programmed with the serial ID of its partner. The two ends of the link will only communicate with one another, eliminating any chance of "man in the middle" attacks. Over the air security is achieved through a proprietary scrambling mechanism that cannot be disabled, spoofed or snooped by commercial tools.

Can I use Apple Macintosh OS X to control and monitor my 600 Series? Yes, but there are some restrictions. Mozilla 1.6 or higher is recommended.

Link encryption FAQs

Encryption data entry fields are not available

Check that the correct license key has been inserted into the unit. The current license key is displayed on the ‘License Key’ data entry page.

Link fails to bridge packets after enabling link encryption

If the wireless link status on the status web page indicates that the link is ‘Searching’, and you can browse to the local end of the link but not to the remote end, then check that the same encryption algorithm and key have been entered at both ends of the link. Failure to enter the same algorithm and key will result in received packets not being decrypted correctly.

Loss of AES following downgrade

When downgrading (using Recovery software image 05-01 onwards) to an earlier version of software that does not support AES, the unit will indicate that the region code is invalid. The user will be required to re-install correct software (supplied when AES key was activated) and reboot the unit.

Glossary

Term	Definition
ARP	Address Resolution Protocol
BPSK	Binary Phase Shift Keying
CSP	Critical Security Parameter
DC	Direct Current
DER	Distinguished Encoding Rules
DFS	Dynamic Frequency Selection
EIRP	Equivalent Isotropic Radiated Power
ETSI	European Telecommunications Standards Institute
FAQ	Frequently Asked Question
FIPS	Federal Information Processing Standard
GPS	Global Positioning System
HTTP	Hypertext Transfer Protocol
ID	Identity
IEEE	Institute of Electrical and Electronic Engineers
IP	Internet Protocol
IQ	In phase / Quadrature
ISM	Industrial Scientific and Medical
ITU	International Telecommunications Union
LAN	Local Area Network
LOS	Line-of-Sight (clear line-of-sight, and Fresnel zone is clear)
LPU	Lightning Protection Unit
MAC	Medium Access Control Layer

Term	Definition
MDI	Medium Dependent Interface
MDIX	Medium Dependent Interface Crossover
NLOS	Non-Line-of-Sight
ODU	Outdoor Unit
OFDM	Orthogonal Frequency Division Multiplex
PC	IBM Compatible Personal Compute
PIDU Plus	Power Indoor Unit Plus
PING	Packet Internet Groper
PTP	Point-to-Point
QAM	Quadrature Amplitude Modulation
RAM	Random Access Memory
RF	Radio Frequency
RSSI	Received Signal Strength Indication
SMTP	Simple Mail Transport Protocol
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
STP	Shielded Twisted Pair
STP	Spanning Tree Protocol
TCP	Transmission Control Protocol
TLS	Transport Layer Security
TPC	Transmit Power Control
URL	Universal Resource Location
USA	United States of America
UTP	Unshielded Twisted Pair
UV	Ultraviolet
VLAN	Virtual Local Area Network

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