Apex Plus™ *DATASHEET*

6 - 40 GHz

Professional-Grade | Licensed | All-Outdoor

MICROWAVE BACKHAUL SYSTEM

PART OF

Plus™ Series

TRANGO SYSTEMS

Apex Plus™ Overview

Apex Plus offers network operators an easy means of migrating from TDM connectivity through STM-1, OC-3, T1 and E1 interfaces or hybrid mixed TDM/IP traffic to native IP (Ethernet) backhaul via GigE and fiber interfaces.

The point-to-point backhaul system includes PDH native T1/E1 connectivity to support base station synchronization requirements. Full duplex capacities from 100 Mbps to 750 Mbps FDX (with key and 2+0) can be achieved in licensed 6-40 GHz bands with robust features including excellent system gain, ACM (Adaptive Coding and Modulation), VLAN tagging, traffic shaping and advanced QOS with DSCP support.

Benefits

- High system gain for longer range and higher availability and smaller antennas
- Adaptive ACM power control increases transmit power driving ACM downshifts, increasing system gain by up to 6 dB
- Low cost of ownership fast ROI relative to fiber and other options
- No right-of-way issues, unlike fiber deployment
- All-Outdoor integrated design carries benefits of higher throughput speeds, greater system efficiency, simpler installation and operation, and significant cost savings
- Replace leased lines, eliminate recurring costs
- Rapid scalability, easily add bandwidth and extend reach

Easy Setup & Deployment

- Simplified installation and operation
- Easy alignment via real-time RSL voltage
- Minimal maintenance, “set and forget”
- Easily upgrade throughput as you need it, with no hardware replacements and no forklift upgrades

Applications

- LTE / WiMAX / 3G / 4G Backhaul
- Private / Enterprise
- Fixed Wireless / ISP
- Public Safety / Video Surveillance
- Broadcast

Features

Performance

- Capacity up to 750 Mbps (375 Mbps full duplex)
- Industry leading system gain over 6-40 GHz
- 3.5-80 MHz Channel Bandwidth
- Support for up to 4 Classes of Service (CoS)

Advanced Networking

- Hitless Adaptive Coding & Modulation (ACM) with adaptive ACM transmit power control
- 1+1 Hot Standby support for full link redundancy
- Supports ring/mesh/star topologies with Rapid Port Shutdown
- IBM with or without VLAN
- 802.1p VLAN (L2) and Diffserv (L3) QoS

Interface & Management

- GigE Copper and Fiber interfaces
- In-Band and Out-of-Band management

Security & Management

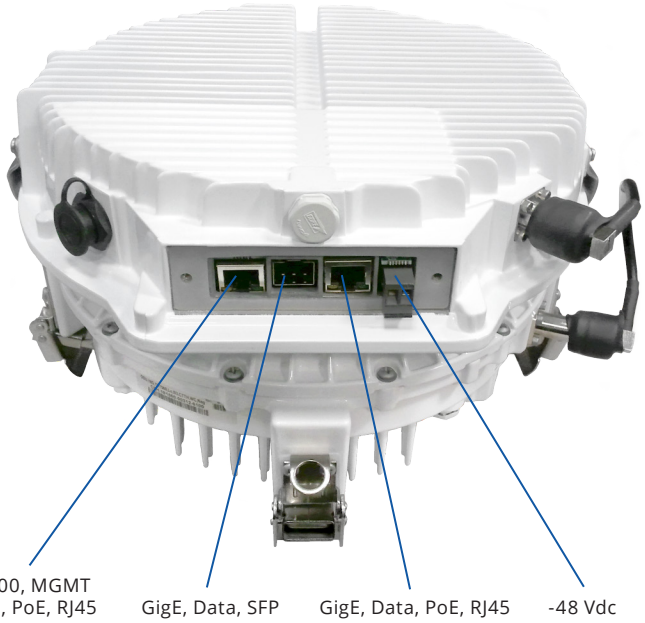
- Secure management via HTTPS, SSH, Telnet and SNMP

Synchronization

- T1/E1 support for TDM or synchronization

Mechanical

- Patent-pending all-outdoor form factor
- Power over Ethernet (PoE) or Direct Power, -48Vdc
- Industry’s highest temp spec - up to +65°C (149°F)
- FCC/ETSI, NEBS, NTIA Compliant
- Standard 1-Year Manufacturer’s Warranty



System Specifications

General Parameters			
Model Numbers	TLAPx (Full link consisting of two units), APx (Apex Plus individual unit)		
Frequency Support	6-40 GHz Frequency Division Duplex (FDD)		
Frequency Stability	± 7 ppm		
Channel Size ‡	3.5, 5, 7, 8, 10, 12.5, 13.75/14, 20, 25, 27.5/28, 30, 33, 40, 50, 55/56, 80 MHz		
Modulation Format	Selectable: QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, ACM & non-ACM		
Max Capacity *	375 Mbps full duplex – Varies by modulation and bandwidth selected		
Payload Latency	100 µs typical		
Payload Types	Ethernet (IPv4 and IPv6 compatible)		
Features	ATPC (Automatic Transmit Power Control) Hitless ACM (Adaptive Coding and Modulation) Adaptive ACM Transmit Power Control Forward Error Correction LDPC		
Regulatory Compliance ‡	FCC CFR47 Part 101 ETSI EN 302 217-1 ETSI EN 302 217-2 ETSI EN 301 489-1 EMC ETSI EN 301 489-4 EMC CANADA SRSP FCC/ANSI: FCC Part 15 Class A Unintentional Radiator RoHS	T1: ITU-T.G824 GR-499-CORE	E1: ITU-T G.703 G.823
Safety	EN60950-1, EN60950-22		
MTBF	> 18 years		

Ethernet Parameters	
Packet Size	64-9600 bytes
Quality of Service (QoS)	802.1p VLAN(L2) and Diffserv(L3) QoS with strict and weighted (WRR) modes Port mapping for traffic Support for up to 4 Classes of Service (CoS) Bandwidth shaping per port

Management	
Security / Authentication	2 level password (Read only, read/write)
Configuration & Management	Telnet, SSH, HTTPS, Serial Console (RS232-115200, N, 8, 1), SNMPv2
Remote Firmware Update	FTP client, TFTP server

Interfaces	
Indicators	Ethernet speed and activity for each port 1+1 Status LED 1 BNC-F for receive signal level voltage
Payload Interfaces	1x GigE RJ45 (10/100/1000BaseT), PoE capable 1x GigE Fiber/Copper SFP 1x T1/E1 RJ45 (Via PoE injector)
Out-of-Band Management	Ethernet port RJ45, PoE capable
1+1 Hot Standby	8 pin circular
Power Connector	2 Pin Terminal Block for direct power or PoE over GigE data or management port
Console	DB9 RS232-115200, N, 8, 1

Antenna	
Supported Types	High performance dish antenna - 1, 2, 3, 4 & 6 foot options
Interface	Direct slip-fit mount or remote mount using standard waveguide

Power	
Input	-45 to -72 Vdc direct, -43 to -50 Vdc using PoE
Power Consumption	48 to 72 Watts dependent on sub-band
Power Protection	Reverse polarity and transient suppression to 100 volts

* Based on purchasable capacity key. Contact sales for more information.
‡ Legal regulations for specific frequencies vary from region to region. Users are responsible for complying with their local regulations.

Mechanical & Environmental	
Enclosure	Cast Aluminum, PoE Injector: Polycarbonate
Dimensions (Height x Width x Length)	11 x 11 x 6 in. / 28 x 28 x 15.2 cm | PoE Injector: 3.25 x 5.125 x 8.5 in. / 8.25 x 13 x 21.6 cm
Weight	13.1 to 15.1 lbs / 5.9 to 6.8 kg dependent on sub-band
Temperature Range	-40° to 131° F / -40° to +55° C (Spec compliant) -40° to 149° F / -40° to +65° C (Operational)
Humidity	100% condensing
Antenna Connector	Slip-fit mount / Optional remote mount: for standard waveguide sizes

Link Capacity (Mbps) at Layer 2

BW (MHz)	QPSK	16 QAM	32 QAM	64 QAM	128 QAM	256 QAM
3.5	6	9	15	18	21	23
5	8	12	19	24	27	31
7	10	20	25	31	36	40
8.33	13	26	33	40	46	52
10	15	30	37	46	53	60
12.5	20	40	49	60	70	78
13.75/14	22	45	55	67	78	88
20	31	63	78	96	111	126
25	39	80	99	120	140	160
28	47	95	118	142	167	192
30	47	95	118	142	167	192
40	63	128	159	192	225	256
50	78	157	195	238	277	318
55/56	90	181	225	275	320	365
80	90	181	225	275	320	375

Max Tx Power by Frequency (dBm)

Mod	6, 7, 8 GHz	10 GHz	11 GHz		13, 15 GHz		18-26 GHz		28-40 GHz
QPSK	30	26.5	28		26		25		23
16QAM	28	22.5	26		22	25	22	23	21
32QAM	28	22.5	26		22	25	22	23	21
64QAM	25	20.5	22	25	21	24	20	22	17
128QAM	25	20.5	22	25	21	24	20	22	17
256QAM	24	18.5	21	24	20	23	19	21	16

Basic Package = 118 Mbps Max
License Key 1 = 225 Mbps Max*
License Key 2 = 375 Mbps Max*
License Key 3 = AP1 Models Only*

* Based on purchasable option key. Contact sales for more information.

Receive Sensitivity In dBm (6-26 GHz)

Channel Width (MHz)	QPSK	16 QAM	32 QAM	64 QAM	128 QAM	256 QAM
3.5	-96.6	-90.4	-86.4	-84.0	-80.9	-77.9
5	-94.4	-88.8	-84.8	-82.1	-79.0	-76.0
7	-93.3	-87.7	-83.7	-81.3	-78.2	-75.2
8.33	-92.7	-86.5	-82.5	-80.3	-77.5	-74.4
10	-92.2	-86.0	-82.0	-79.6	-76.5	-73.5
12.5	-91.3	-85.4	-81.1	-78.7	-75.4	-72.4
14	-90.5	-84.3	-80.3	-77.9	-74.8	-71.8
20	-89.0	-82.8	-78.8	-76.4	-73.3	-70.3
25	-88.1	-82.0	-78.0	-75.4	-72.3	-69.3
28/30	-87.3	-81.1	-77.1	-74.7	-71.6	-68.6
40	-86.0	-79.8	-75.8	-73.4	-70.3	-67.3
50	-85.1	-78.9	-74.9	-72.5	-69.4	-66.4
55/56	-84.5	-78.3	-74.3	-71.9	-68.8	-65.8
80	-84.5	-78.3	-74.3	-71.9	-68.8	-63.8

Receive Sensitivity In dBm (28-40 GHz)

Channel Width (MHz)	QPSK	16 QAM	32 QAM	64 QAM	128 QAM	256 QAM
3.5	-93.6	-87.4	-83.4	-81.0	-77.9	-74.9
5	-91.4	-85.8	-81.8	-79.1	-76.0	-73.0
7	-90.9	-84.7	-80.7	-78.3	-75.2	-72.2
8.33	-89.7	-83.5	-79.5	-77.3	-74.5	-71.4
10	-89.2	-83.0	-79.0	-76.6	-73.5	-70.5
12.5	-88.3	-82.4	-78.1	-75.7	-72.4	-69.4
14	-87.5	-81.3	-77.3	-74.9	-71.8	-68.8
20	-86.0	-79.8	-75.8	-73.4	-70.3	-67.3
25	-85.1	-79.0	-75.0	-72.4	-69.3	-66.3
28/30	-84.4	-78.1	-74.1	-71.7	-68.6	-65.6
40	-83.0	-76.8	-72.8	-70.4	-67.3	-64.3
50	-82.1	-75.9	-71.9	-69.5	-66.4	-63.4
55/56	-81.5	-75.3	-71.3	-68.9	-65.8	-62.8
80	-81.5	-75.3	-71.3	-68.9	-65.8	-60.8

ETSI System T/R Spacings

6 GHz	7 GHz	8 GHz	11 GHz	13 GHz	15 GHz
240, 252.04, 340	154, 160, 161, 168, 196, 245	119, 126, 151.614, 208, 266, 311.32	490, 500, 530	266	315, 420, 475, 490, 640, 644, 728

18 GHz	23 GHz	26 GHz	28 GHz	32 GHz	38 GHz
1010	1008, 1232	800, 1008	1008	812	700, 1260

ANSI System T/R Spacings

6 GHz	7 GHz	11 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
160, 170, 252.04, 340	150	490, 500	225	475, 640	1560	1200, 1232	700