



**TEJAS**<sup>®</sup>  
**NETWORKS**

# TJ1400P Access Service Routers

Type A-DC



Type A-AC



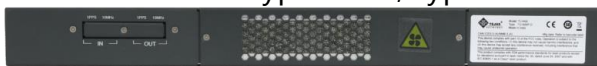
Type B-DC



Type B-AC



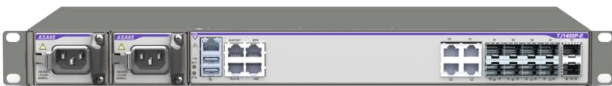
Rear View of Type A-DC, Type B-DC



Rear View of Type A-AC, Type B-AC



Type E with AC FRU



Type F with AC FRU



## Overview

The TJ1400P-SR series of Service Routers are compact 1RU nodes which deliver carrier-class Ethernet, MPLS and IP capabilities to realize edge devices in today's converged, multi-service Packet Networks. With a choice of Gigabit, electrical and optical, and Ten-gigabit interfaces along with AC and DC powering options it is a good fit for applications like Mobile Backhaul, Broadband, IPTV and Enterprise VPN services.

Carrier Ethernet capabilities by way of ERPS (G.8032) along with a comprehensive OAM suite comprising CFM and PM allow operators to provide native Layer2 services, E-LINE, E-LAN and E-TREE compliant to MEF CE2.0 specification.

Multi Protocol Label Switching (MPLS) is a scalable way of delivering services and the 1400P-SR supports both Signaling and Provisioning to setup the Label Switched Paths (LSPs) and the L2/L3 service constructs,

Pseudowires and VPNs. A wide variety of protocols is supported to interoperate with existing deployments. Traditional protocols like OSPF/IS-IS/BGP are supported along with newer techniques that use centralized control/provisioning (broadly called SDN) for fast convergence, DiffServ aware traffic-engineering in a cost effective and scalable manner.

Synchronization via Sync-E and 1588v2 allow these to be used in Mobile Backhaul and will be useful in upcoming 5G rollouts.

All models are 19" rack mountable with redundant Power Supply units that are field replaceable. Type A and Type B systems have separate models that can be ordered for AC and DC deployments. Type E and Type F are front-access with AC or DC power supply units that can be deployed in either slot for greater flexibility.

## Key Features and Benefits

### High Performance Hardware

State of art silicon powers the 1400P-SR family of products ensuring low power consumption. The Multi-layer hardware datapath capable of Layer2, Layer3 processing along with 3-levels of MPLS label stack allow for line-rate lookup and forwarding at all packet sizes from 64bytes to 9K bytes.

The software has a modular, micro-kernel architecture that allows for in-service upgrade and feature enhancements as the needs of the network evolve.

The SFP and SFP+ optical modules are MSA compliant and meet IEEE 802.3 specification and definition.

### Carrier Ethernet Switching

Comprehensive Layer2 feature set includes the ability to offer Ethernet services over double VLAN tagged frames (802.1ad) or MPLS constructs (LSP/Pseudowires/VBI) along with Ring protection using ERPS for 50ms switching capability.

Multicast snooping and forwarding are supported for efficient Video and multicast applications.

Service OAM is essential in the Service Provider realm and CFM (802.1ag) and PM capabilities (Y.1731) provide tools for SLA enforcement and low downtime.

### MPLS Framework

Multi Protocol Label Switching (MPLS) is a versatile networking technology on account of simple lookups and the ability to stack labels that can then provide different functionality. TJ1400P-SR supports setting up of MPLS constructs via a Signalling Protocols or via centralized Path Compute Engines embedded in NMS or SDN controllers. The former, signalled MPLS, leverages protocols to distribute network state and service requirements while the latter is aligned to the new paradigms of separation of Control Plane and Data Plane to achieve better scaling.

### IP Routing

Scalable implementation of IP routing is provided in the TJ1400P-SR platforms. These include Unicast and Multicast Routing protocols like RIP, OSPF, IS-IS and PIM. Both IPv4 and IPv6 route looks are supported in hardware. Border Gateway Protocol (BGP) is used for scalable IP routing as well as signaling service constructs in the context of VPN setup and newer techniques like Segment Routing. IP routing supports both IPv4 and IPv6 routing in a mixed environment.

### Traffic Engineering and QoS

Restoration of traffic on a network outage is achieved via Ethernet, MPLS and IP techniques. Similarly the setting up of paths to meet the service constraints can be done via provisioning or signalling, the former by the management APIs and the latter with DiffServ aware RSVP-TE and IP FRR.

Hierarchical Quality of Service (QoS) allows for flexibility in meeting various bandwidth requirements. Policing and Shaping can be done at flow, VLAN or port level. Additionally scheduling disciplines like Strict Priority, Weighted Round Robin (WRR) and congestion avoidance techniques like WRED are available.

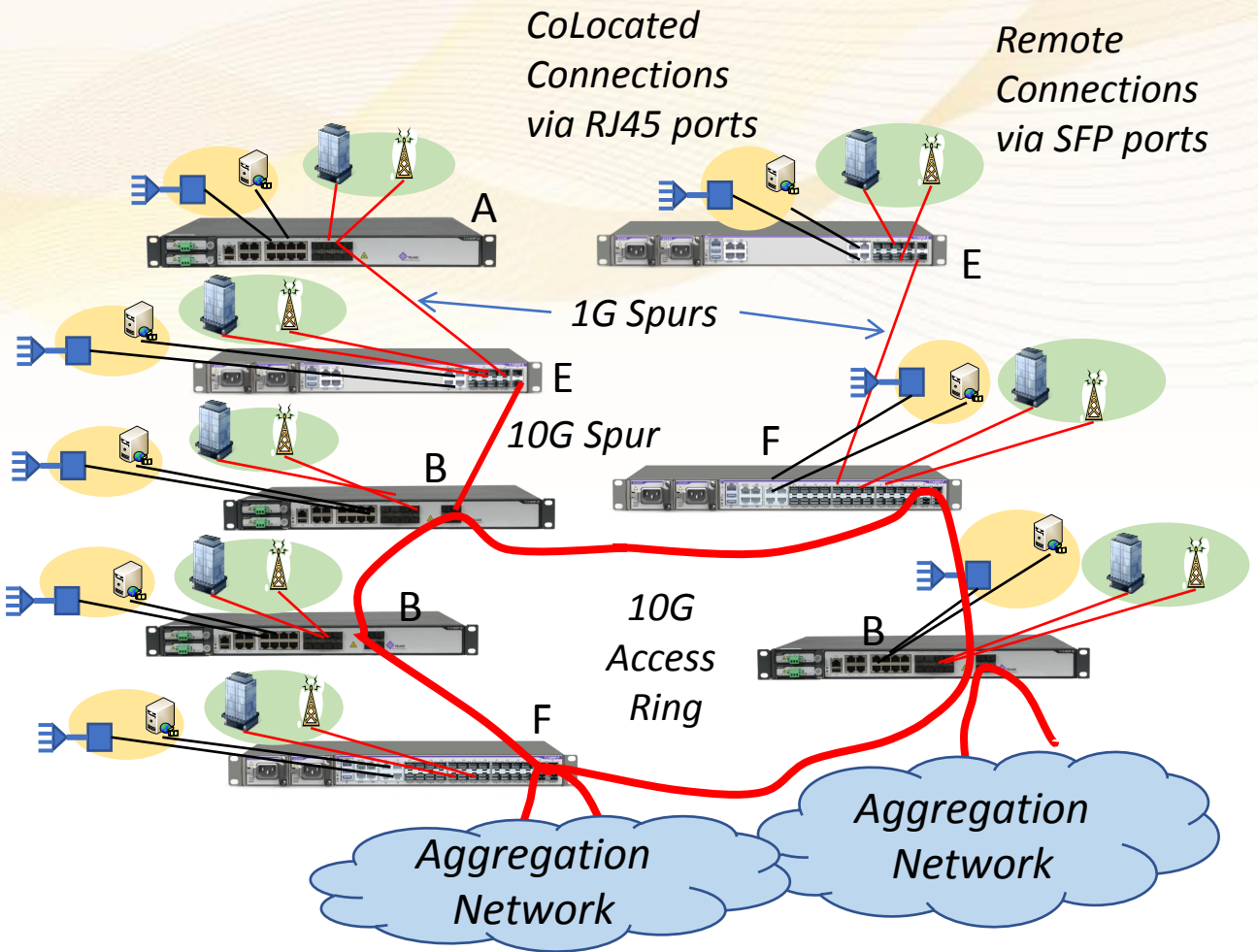
### Synchronization

IEEE 1588 and SyncE provide the required timing synchronization over Ethernet interfaces for carrying TDM applications.

### Management

Management of the nodes can be done locally using the console port or remotely using Secure access. Access to the switch via CLI commands, SNMP interface and Netconf is available for integration with EMS/NMS and SDN controllers. Commands can be authorized via RADIUS/TACACS+ that all operations are authorized and logged. The nodes have extensive logging that is available locally and can also be directed to syslog servers.

# Sample Deployment



## Port Configurations

The TJ1400P series of Switch Routers has flexible options to match deployment needs that can be spur, linear, rings or mesh topologies. All models are fully interoperable with the same software feature set called TejNOS (Tejas Network Operating System).

Product	1/10G SFP+	Gigabit SFP	Gigabit RJ45
TJ1400P-A	-	8	8
TJ1400P-B	4	8	8
TJ1400P-E	2	8	4
TJ1400P-F	4	24 (4 combo)	4 (Combo)

## Hardware Characteristics

Parameter	TJ1400P-A	TJ1400P-B	TJ1400-E	TJ1400-F
Management Ports	Console, NMS, USB ports in the Front			
Mounting	19" ETSI Rack Mountable			
WxHxD mm (DC)	482 x 44 x 298 mm			
DC PSU Config	Dual, Front FRU		Dual, Front FRU	
DC Voltage Rating	-36V to -72V			
WxHxD mm for AC	482 x 44 x 479			
AC PSU Config	Dual, Rear FRU		Dual, Front FRU	
AC Voltage Rating	100-240V, 50-60Hz			
Max Weight (AC )	8 Kg	8.2 Kg	6 Kg	6.4 Kg
Max Power (AC)	110W	120W	65W	85W
Thermal System (DC)	2 Internal Fans w/ speed control		Fans in PSU only	
Thermal System (AC)	2 FRU Fan Tray w/ speed control		Fans in PSU only	
Processor DRAM	1GB DRAM	1GB DRAM	2 GB DRAM	2 GB DRAM

## Environmental Range for All models

Operating Temperature	-10 degC to +65 degC
Storage Temperature	-40 degC to +85 degC
Operating Altitude	Up to 3000 meters
Humidity	5% to 90% non-condensing

## Certifications and Compliances for All models

Safety	CE Marking: LVD Directive 2014/35/EU IEC 60950-1 / EN 60950-1
EMI	CE Marking: EMC Directive 2014/30/EU FCC Part-15, Subpart B, Class-A ICES-003, Class-A CISPR-22/CISPR32 Class-A, EN55022/EN55032 Class-A
EMC	EN61000-4-2 for ESD : Electrostatic discharge EN61000-4-3 for RS : Radiated susceptibility EN61000-4-4 for EFT : Electrical Fast Transient EN61000-4-5 for Surge EN61000-4-6 for CS : Conducted susceptibility EN61000-4-8 for PFMF : Power frequency magnetic field EN61000-4-11 for Voltage dips, short interruptions and variations
Environmental	RoHS Directive 2011/65/EU

## Feature Scalability

Parameter	TJ1400P-A	TJ1400P-B	TJ1400P-E	TJ1400-F
Full Duplex Switching	16 Gbps	56 Gbps	32 Gbps	64Gbps
Forwarding Rate (64B)	24 Mpps	83 Mpps	48 Mpps	95 Mpps
Max Packet Buffer	Up to 192 MB		Up to 180 MB	
MAC Addresses	64K		32K	
VLANs (.1Q, .1ad)	4094		4094	
IPv4 / IPv6 Routes	12K / 6K	32K / 16K	4K / 1K	12K / 2K
Multicast Routes	4K	4K	4K	4K
Pseudowires	2K	4K	1K	2K
Label Stack	Up to 3 Labels		Up to 3 Labels	
VRF	128		128	
VFI	2K		1K	2K
Classification Rules	2K		2K	
H-QoS (Levels/Queues)	3 / 2K		3 / 2K	
Frame Size supported	64 to 9216 bytes			

## Overview of TejNOS software

The TJ1400P series of Switch Routers run the TejNOS (Tejas Network Operating System) software that provides scalable, feature-rich, high-availability software to ensure high network availability. TejNOS has a modular architecture with memory protection allowing software modules to be upgraded/restarted without rebooting the system and providing In-Service Software Upgrade (ISSU). Non Stop Forwarding (NSF) are supported to deal with controller failure scenarios.

TejNOS delivers traditional IP/MPLS capabilities based on distributed in-node control plane to interoperate with legacy deployments. The key differentiation of TejNOS is the addition of recent MPLS Transport Profile support that aligns with the modern network design approach of using a controller to provision the services in the network to provide agility, ease of deployment and upgrade of the network.

Leveraging the hardware support for fast-BFD (Bidirectional Forwarding Detection) along with bidirectional setup of LSPs makes TejNOS an ideal platform to migrate the network to SD-WAN (Software Defined Wide-area networking) and providing Traffic Engineering and the right amount of control plane on all the nodes of the network. A REST API using Netconf and YANG models is supported to create the service constructs (Pseudowires, L2VPN, L3VPN, MVPN) in addition to CLI and an HTTP-base management interface. Currently, the SD-WAN applications are provided as part of the TejNMS software.

As with any Network OS, secure remote management, in-service software upgrades, persistent configuration store, user authentication and command authorization using RADIUS/TACACS+, time synchronization and debug support using syslog and SNMP are available .



### Feature detail of TejNOS software

<b>Layer2 Switching</b>	
Flow Control	Supports flow control as per IEEE 802.3x
Layer2 Discovery	Supports 802.1ad to discover links to neighbouring devices
MAC Learning and Switching	<ul style="list-style-type: none"> <li>• Dynamic Learning of MAC addresses with configurable Aging Timers and Learning limits on every port</li> <li>• Static MAC addresses that are not subject to aging</li> <li>• Whitelisting of MAC addresses</li> </ul>
VLAN support	<ul style="list-style-type: none"> <li>• Supports 802.1Q and the ability to configure a port to receive packets that are untagged, tagged or both (Hybrid port)</li> <li>• 4K VLANs are supported</li> </ul>
Provider Bridging	<ul style="list-style-type: none"> <li>• Double VLANs tag (Q-in-Q, 802.1ad) allows S-VLAN to be added to distinguish different customer's traffic which could use the same CVLAN (.1Q tag)</li> <li>• 4K VLANs are supported</li> <li>• Tagging/Untagging/Swapping of VLAN tags is supported</li> <li>• Switching on outer tag is supported</li> </ul>
Link Aggregation	<ul style="list-style-type: none"> <li>• Multiple Links (up to 8) can be combined into a higher-capacity interface as per IEEE 802.3ad</li> <li>• Supports Static LAG as well as Dynamic LAG using LACP</li> </ul>
Spanning Tree	<p>In order to ensure loop-free Layer2 topology user can configure any of the following:</p> <ul style="list-style-type: none"> <li>• Standard Spanning Tree 802.1d</li> <li>• Rapid Spanning Tree (RSTP) 802.1w</li> <li>• Multiple Spanning Tree (MSTP) 802.1s</li> <li>• BPDU Filter, Root Guard, Loop Guard, BPDU Guard</li> </ul>
Ring Protection	50-ms Protection switching on a per VLAN basis is supported in accordance the ERPS specification of ITU-T G.8032
Ethernet Services	Ethernet services (E-Line, E-LAN, E-Tree) are supported as per the MEF CE2.0 specifications
Ethernet OAM	Connectivity Fault Management (CFM) as defined in IEEE 802.1ag allows for in-band Operation and Management (OAM) of the Ethernet Services.
Ethernet PM	Performance Monitoring (PM) as defined in ITU-T Y.1731 allows for the monitoring of the Packet Loss, Delay, Packet Delay Variation (Jitter) monitoring of the Ethernet Services. PM data is available for network monitoring and optimization
IGMP Snooping	Supports snooping of IGMP v2/v3 requests to deliver the bandwidth intensive IPv4 multicast traffic only to the requesters
MLD Snooping	Delivers IPv6 multicast packets only to the required receivers who have made IPv6 Multicast requests

<b>Synchronization</b>	
SyncE	Ethernet physical layer timing synchronization as per ITU-T standards G.8261/G.8262/G.8264 is supported to distribute accurate frequency reference for the network
PTP	Accurate timing to Precision Timing Protocol (PTP) grandmaster via IEEE 1588v2 is supported Boundary Clock (Client) and Transparent Clock (transit) modes
NTP	Time synchronization with NTP server as per RFC 5905 is supported for the Application level timing
Clock Stability	The node supports Stratum3 clock and in case of loss of timing reference the clock holdover is provided as per standard.
<b>Layer3 Switching Support</b>	
Routing Interfaces	The following are supported as routed interfaces <ul style="list-style-type: none"> <li>• Port</li> <li>• VLAN</li> <li>• Virtual Sub-interfaces (for VPNs)</li> <li>• Link Aggregation Groups</li> </ul>
VRRP	Virtual Router Redundancy Protocol is supported as per RFC 5798 for IPv4 and IPv6
Static Routes	<ul style="list-style-type: none"> <li>• IPv4 and IPv6 Static Routes can be defined and distributed via other Dynamic routing protocols.</li> <li>• Policy Based Routing (PBR) using Filter-based forwarding to direct or indirect next-hop or VRF based on IP Source / Destination, IP protocols and TCP/UDP Port Numbers</li> </ul>
RIP	<ul style="list-style-type: none"> <li>• Routing Information Protocol (RIP) as per RFC 2453 is supported along with Authentication as per RFC 4822.</li> <li>• IPv4 and IPv6 addresses are supported</li> </ul>
OSPFv2	<ul style="list-style-type: none"> <li>• Open Shortest Path First Version 2(OSPFv2) for IPv4 is supported as per RFC 1583 and RFC 2328</li> <li>• Stub Areas are supported along with NSSA option RFC 3101</li> <li>• Opaque LSA as per RFC 2371/RFC 5250 are supported</li> <li>• Graceful Restart of OSPF as per RFC 3623 is supported</li> <li>• MD5 based OSPF authentication as per RFC 2154</li> <li>• Traffic engineering (OSPF-TE) extensions as per RFC 3630</li> </ul>
OSPFv3	<ul style="list-style-type: none"> <li>• Open Shortest Path First Version 3 (OSPFv3) for IPv6 is supported as per RFC 2740 / RFC 5340</li> <li>• Supports Authentication and encryption of OSPFv3 via RFC 4552</li> <li>• Supports Graceful restart of OSPFv3</li> </ul>
IS-IS	Intermediate System to Intermediate System (IS-IS) Protocol as standardized in ISO/IEC 10589 Standard is supported

BFD	<ul style="list-style-type: none"> <li>• Support of Bidirectional Forwarding Detection (BFD) allows fast detection of network failures and aids convergence and is supported as per RFC 5880</li> <li>• Single hop BFD (RFC 5881), multi-hop BFD (RFC 5883), and LSP BFD (RFC 5884) are supported</li> <li>• BFD generation is supported in HW with timer as low as 3.3ms, 10ms, 100ms, etc.</li> <li>• BFD mechanism is used for triggering 50ms-protection switching in addition to fast protocol convergence</li> </ul>
BGP	<p>Border Gateway Protocol version 4 (BGP-4) as per RFC 4271 is supported. Multiple BGP sessions are supported with multiple peers and any session can be reset if desired. Both Interior and Exterior sessions can be established (iBGP/eBGP/MP-iBGP).</p> <p>BGP has many extensions which are used to carry information between routers to establish other functionality. Notable among these, and supported on TejNOS, are</p> <ul style="list-style-type: none"> <li>• Multi-protocol Extensions as per RFC 4760 (M-BGP)</li> <li>• Route Refresh capability as per RFC 2918</li> <li>• RFC 3107 for carrying MPLS Label information in BGP-4 for VPN setup including Inter-AS VPN</li> <li>• Capabilities Advertisement as per RFC 3392</li> <li>• Graceful Restart mechanism for BGP-4 as per RFC 4724</li> <li>• Outbound Route Filtering of Address prefixes as per RFC 5292</li> <li>• BGP-PIC (Prefix Independent Convergence) and Next hop tracking (NHT) for fast convergence</li> </ul>
Multicast Routing	<p>TejNOS supports the following</p> <ul style="list-style-type: none"> <li>• IGMPv2 as per RFC 2236</li> <li>• IGMPv3 as per RFC 3376</li> <li>• MLDv2 as per RFC 4604</li> <li>• Protocol Independent Multicast – Sparse Mode (PIM-SM)</li> <li>• PIM-SSM, Source-Specific Multicast</li> <li>• Multicast Routing for IPv6</li> <li>• MSDP (Multicast Source Discover Protocol) as per RFC 3618</li> </ul>
ECMP	<p>Equal Cost Multi-path for Load balancing/protection with traffic being distributed across multiple paths. ECMP is enabled in multiple protocols like OSPF and BGP</p>
IP Tunnelling	<p>Generic Routing Encapsulation (GRE) is supported as per RFC 2784 and RFC 2890 to support overlay networks, especially for Mobility. Both IPv4 and IPv6 packets can be payload. mGRE for multicast tunnels is also available.</p>
Segment Routing	<p>TejNOS supports Segment Routing along with Path Compute Engine (PCE) implemented in the Centralized controller. Link State import to PCE done through BGP-LS. Support for Traffic Engineering (SR-TE), Fast Reroute using Topology independent Loop Free Alternate (TI-LFA) is also available and IPv6 support will be added.</p>



<b>Multi Protocol Label Switching (MPLS)</b>	
MPLS Framework	TejNOS supports MPLS Architecture as per RFC 3031 and MPLS encoding as per RFC 3032
LDP	Label Distribution Protocol as per RFC 5036 is supported along with Graceful restart for LDP, RFC 3037. For Multicast traffic mLDP is used.
RSVP-TE	LSP setup with Traffic engineering is supported using RSVP-TE as per RFC 3209 and applicable extensions as per RFC 3210
MPLS Transport Profile	TejNOS supports the Transport Profile of MPLS (RFC 5921) to deliver OAM, Protection switching capability to deliver large MPLS networks with the appropriate level of control plane features
PseudoWire	<ul style="list-style-type: none"> <li>• PseudoWire Emulation Edge to Edge (PWE3) as per RFC 3916 and RFC 3985 is supported</li> <li>• Multi-Segment Pseudowire as per RFC 6073 is supported</li> <li>• Support for Pseudowire Redundancy as per RFC 6718</li> <li>• Pseudowires can be provisioned from the EMS/NMS</li> <li>• Pseudowire signalling via RFC 4447 is also supported</li> </ul>
Fast Reroute (FRR)	LDP based Fast reroute (LDP-FRR) as well as Remote-Loop free Alternate (R-LFA) FRR is supported
L2VPN	<ul style="list-style-type: none"> <li>• Signaled L2VPN via RFC 3107 is supported</li> <li>• VFI instances can also be provisioned over the appropriate PW constructs from the EMS/NMS</li> </ul>
L3VPN	<ul style="list-style-type: none"> <li>• Signaled L3VPN via RFC 3107 is supported</li> <li>• Inter-AS L3VPN is supported</li> <li>• VRF instances can also be provisioned over the appropriate PW constructs from the EMS/NMS</li> </ul>
IPv6 over MPLS	Support for IPv6 connectivity over an IPv4 MPLS network is provided, both at a port level (6PE as per RFC 4798) and at a VPN level (6VPE as per RFC 4659)

<b>Security</b>	
Secure Shell (SSH)	SSHv1 and SSHv2 are supported for secure remote access to the router
Secure Socket Layer (SSL)	The browser based access to the router is secured by encrypting the http traffic using SSL
802.1X	<ul style="list-style-type: none"> <li>• IEEE802.1X: RADIUS authentication, authorization and accounting, MD5 hash, guest VLAN, single/multiple host mode and single/multiple sessions</li> <li>• Supports IGMP-RADIUS based 802.1X</li> <li>• Dynamic VLAN assignment</li> </ul>
Port Security	Locks MAC addresses to ports
uRPF	Unicast Reverse Path Filtering as per RFC 2827 is supported as a form of protection from spoofed IP addresses
RADIUS/TACACS+	Per user AAA (Authentication, Authorization and Accounting)
Storm Control	Prevents traffic on a LAN from being disrupted by a broadcast, multicast, or unicast storm on a port
ACLs	Dynamic and Time-based rules for Drop, Rate Limit based on: <ul style="list-style-type: none"> <li>• Physical Port, VLAN,</li> <li>• Source-Destination MAC, IP address, Protocol Port</li> <li>• Differentiated services code point (DSCP) / IP precedence</li> <li>• Protocol Type (IP/TCP/ UDP0, 802.1p priority , Ethernet type</li> <li>• Internet Control Message Protocol (ICMP) packets, TCP flag</li> </ul>
DoS Mitigation	CPU bound traffic is shaped to prevent Denial of Service attacks
<b>Quality of Service</b>	
Queuing	8 Queues per Port Hierarchical Queue Management and Bandwidth profiles
Classification	Static and Time-based Queue assignment based on <ul style="list-style-type: none"> <li>• Physical Interface</li> <li>• 802.1p VLAN priority based</li> <li>• IPv4/IPv6 precedence / DSCP based</li> <li>• MPLS EXP bits</li> <li>• Differentiated Services (DiffServ)</li> <li>• Classification and re-marking ACLs</li> </ul>
Bandwidth Control	<ul style="list-style-type: none"> <li>• TrTCM Ingress Policer and marking (per port, and per Queue)</li> <li>• Egress Shaper and Rate Control (per port, and per Queue)</li> </ul>
Scheduling Disciplines	<ul style="list-style-type: none"> <li>• Strict Priority</li> <li>• Weighted Deficit Round Robin (WDRR) for Bandwidth profiles</li> <li>• Choice at each level of Queue Nesting</li> </ul>
Congestion Management	<ul style="list-style-type: none"> <li>• Weighted Random Early Discard (WRED)</li> </ul>

<b>Management</b>	
System Monitoring	Monitoring of system Temperature, Input Voltages, Power Modules, Fans, Memory utilization
Logging	Extensive capability and memory to log events and crash dumps to local file-system and to syslog servers
Port Mirroring	Traffic on a port can be mirrored to another port for analysis with a network analyzer or RMON probe.
Remote Monitoring	Embedded RMON agent supports 4 groups 1,2,3,9 (history, statistics, alarms, and events) for enhanced traffic management, monitoring and analysis
S-Flow	The switch allows traffic to be sampled in hardware and sent to a server for monitoring (RFC 3176).
Telemetry	Histograms, Thresholds, Flow recording to enable administrators to understand complex networks
SW Upgrades	Dual Images (independent primary and secondary) are supported along with validation of the image and rollback . Options to download image from local external Flash or over the network using various methods including SCP, TFTP.
User Management	Security and control of User accounts
Job Management	Ability to define and execute periodic jobs/scripts/commands
Firmware Upgrade	Firmware is upgradable via Web Browser or local console port
SNMP	SNMP version1, 2c and 3 with support for traps. For enhanced security, SNMP version 3 user-based security model (USM)
Syslog	The events generated by the switch can be selected to be sent to a syslog server for further analysis and persistent storage
CLI	An Industry standard (Cisco-like) Command Line Interface (CLI) is available to configure and operate the switches. Configuration rollback capability is also provided.
NTP	The switch has Network Time Protocol (NTP) Client to sync to network clock information
Optical Port Monitoring	The Optical characteristics of the Pluggable optical modules can be monitored and threshold crossing alarms can be defined
IPv6 Management	The Management interface and utilities are IPv6 compliant. The Node IP address can be IPv6 and the Management traffic can be IPv6 based. Management interface is Dual stack (IPv4 and IPv6)

## Standards Support

Ethernet	IEEE 802.3
Physical Layer	IEEE 802.3u, 802.3z, 802.3ab, 802.3ae
Flow Control	IEEE 802.3x
Framing/QoS	IEEE 802.1Q, 802.1ad, 802.1p, 802.1ac, 802.1v
Discovery	IEEE 802.1b
Bonding/Trunking	IEEE 802.1ad (LLDP)
STP	IEEE 802.1d, 802.1w, 802.1s, 802.1D-2004
Security	IEEE 802.1x
Carrier Ethernet	ITU-T G.8032 v2, IEEE 802.3ah, IEEE 802.1ag, ITU-T Y.1731 MEF CE 2.0 compliant Ethernet services
System Support	RFC 768 UDP            RFC 783 TFTP            RFC 791 IP RFC 792 ICMP        RFC 793 TCP            RFC 826 ARP RFC 903 RARP        RFC 854 Telnet        RFC 906 TFTP Bootstrap RFC 951, 1542 BootP   RFC 1027 Proxy ARP,   RFC 1519 CIDR RFC 1591 DNS        RFC 2131, 2132 DHCP RFC 1256 IPv4 ICMP Router Discovery (IRDP) IPv6 via RFC 2460, RFC 1981, RFC 4443, RFC 4861, RFC 4862 RFC 2068 HTTP server RFC 2030 SNTP, Simple Network Time Protocol RFC 2131 BOOTP/DHCP relay agent and DHCP server RFC 3315 and updates for DHCPv6 RFC 1492 TACACS+    RFC 2138 RADIUS Authentication RFC 2139 RADIUS Accounting RFC 3579 RADIUS EAP support for 802.1x RFC 5176 Dynamic Authorization Extensions to RADIUS
Security	The features of the router enable compliance to ISO 27001
Functional Spec	TEC GR No. TEC/GR/IT/TCP-006/01/AUG-16



## Ordering Information

TJ1400P-A-SR-DC	TJ1400P-A system with TejNOS and dual DC power supplies
TJ1400P-B-SR-DC	TJ1400P-B system with TejNOS and dual DC power supplies
TJ1400P-AB-DC-PSU	Spare DC Power supply for TJ1400P-A and TJ1400P-B DC configs
TJ1400P-A-SR-AC	TJ1400P-A system with TejNOS and dual AC power supplies
TJ1400P-B-SR-AC	TJ1400P-A system with TejNOS and dual AC power supplies
TJ1400P-AB-AC-PSU	Spare AC Power supply for TJ1400P-A and TJ1400P-B AC configs
TJ1400P-AB-FTU-F	Spare Front fan tray for the DC config of TJ1400P-A and TJ1400P-B
TJ1400P-AB-FTU-R	Spare Rear fan tray for the AC config of TJ1400P-A and TJ1400P-B
TJ1400P-E-SR	TJ1400P-E system with TejNos without any PSU units
TJ1400P-F-SR	TJ1400P-F system with TejNos without any PSU units
TJ1400P-EF-AC-PSU	AC Power supply to be used with TJ1400-E and TJ1400-F systems
TJ1400P-EF-DC-PSU	DC Power supply to be used with TJ1400-E and TJ1400-F systems

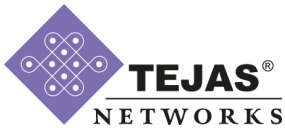
## Pluggable Interface Modules

The Interfaces that carry traffic can take Pluggable Optical modules that are compliant with IEEE and ITU Standards (for Ethernet and SDH respectively) and are compliant to the Multi Source Agreements (MSA) that ensure that modules from different sources are interchangeable.

Tejas recommends that the Optical modules be ordered from Tejas as this ensures that the modules have been tested for Quality and functionality in Tejas equipment and their operation and performance is guaranteed. When a customer sources and installs optics without the consent of Tejas Networks, any network failure is not supported by Tejas.

The following pluggable Interface modules may be ordered

TJ-SFP-1GE-T	IEEE 1000BASE-T, Cat 6 cable, RJ45
TJ-SFP-1GE-SX	IEEE 1000BASE-SX, 850nm, Multi-Mode OM3, 550m, 2xLC
TJ-SFP-1GE-LX	IEEE 1000BASE-LX, 1310nm, Single Mode, 10Km, 2xLC
TJ-SFP-1GE-LX-BI-U	IEEE 1000BASE-BX10, 1310nm-TX/1490nm-RX, 10Km, LC
TJ-SFP-1GE-LX-BI-D	IEEE 1000BASE-BX10, 1490nm-TX/1310nm-RX, 10Km, LC
TJ-SFP-1GE-LH	IEEE 1000BASE-LH, 1310nm, Single Mode, 40Km, 2xLC
TJ-SFP-1GE-ZX	IEEE 1000BASE-ZX, 1550nm, Single Mode, 80Km, 2xLC
TJ-SFP-10GE-SX	IEEE 10GBASE-SR, Multi-Mode OM3, 300m, 2xLC
TJ-SFP-10GE-LX	IEEE 10GBASE-LR, Single Mode, 10Km, 2xLC
TJ-SFP-10GE-LH	IEEE 10GBASE-ER, Single Mode, 40Km, 2xLC
TJ-XFP-10GE-LR	IEEE 10GBASE-SR, Multi-Mode OM3, 300m, 2xLC
TJ-XFP-10GE-ER	IEEE 10GBASE-LR, Single Mode, 10Km, 2xLC
TJ-XFP-10GE-ZR	IEEE 10GBASE-ER, Single Mode, 40Km, 2xLC



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