

Numerics	shell configuration rules 3-3
	10-Gbps uplink cards
2.5-Gbps ITU trunk cards	architecture (figure) 1-27
optical loss 4-5	description 1-26
shelf configuration rules 3-2	shelf configuration rules 3-3
splitter protection support 2-5 to 2-6	
3R functions	A
support 1-5	A
4-port 1-Gbps/2-Gbps FC aggregation cards	amplification
description 1-11 to 1-14	description 5-1
Fibre Channel latency (table) 4-8	APS
protocol latencies 4-8	support for 1-3
protocol monitoring 1-13	ATM
8-port FC/GE aggregation cards	client equipment attenuation A-4
architecture (figure) 1-15, 1-19	transponder line card support 1-6
description 1-14 to 1-17	attenuation
Fibre Channel latency (table) 4-9	8-port multi-service muxponders 4-5
protocol latencies 4-9	ESCON and A-4
protocol monitoring 1-16	minimum for data channels 4-3
8-port multi-service muxponders	OADM modules 4-6, 4-7
description 1-17 to 1-20	transponder line cards 4-4
protocol latencies 4-9	types 5-6
protocol monitoring 1-20	Automatic Protection Switching. See APS
10-Gbps ITU trunk cards	
client based line card support 2-10, 2-11, 2-12	
data flow (figure) 1-4	В
description 1-20, 1-22, 1-24	bands
nonsplitter architecture (figure) 1-21, 1-23, 1-25	OADM modules and 1-28, 1-29
optical loss 4-6	OADM module support (table) 1-30
shelf configuration rules 3-3	bidirectional path switching
splitter architecture (figure) 1-22, 1-23, 1-26	description 2-23
splitter protection support 2-6 to 2-8	figure 2-23
10-Gbps ITU tunable trunk cards	bus topologies. See point-to-point topologies

С	D
cabling. See OADM cabling	data channels
carrier motherboards	maximum number supported 1-3
description 1-27	optical loss through OADM modules 4-6
channels. See bands; data channels; OSC	optical loss through PSMs 4-7
chassis	receiver sensitivity (table) 4-2
description 1-1	transmit power (table) 4-2
figure 1-2	dBms
chromatic dispersion	description 4-1
planning considerations 5-7	dBs
client based line card protection	description 4-1
considerations 2-10, 2-11, 2-12, 2-13	DCC
description 2-9	description 1-34
client interfaces	DCUs
transponder line cards 1-5	planning considerations 5-8
client protection	decibel milliwatts. See dBms
description 2-10, 2-11, 2-12	decibels. See dBs
implementation considerations 2-10, 2-11, 2-12, 2-13	dense wavelength division multiplexing. See DWDM
scheme (figure) 2-11, 2-12, 2-13	dispersion
client side interfaces	limits 5-8
transponder line cards 1-5	dispersion compensation units. See DCUs
collocated shelf topologies	documentation
description 6-33	related x
example (figure) 6-33	DS3
components	transponder line card support 1-8
description 1-4 to 1-33	DWDM
Coupling Facility links	interfaces 1-3
description A-3	
transponder line card support 1-7	
CPUs. See CPU switch modules	L
CPU switch modules	EDFAs
description 1-31	description 5-1
features 1-31	input power limits 5-7
switch fabrics 1-32	performance parameters 5-2
cross connect drawers	encapsulations. See protocol encapsulations
cabling rules 3-2	Enterprise Systems Connection. See ESCON 1-8
	equalization
	channel power 5-8

erbium-doped fiber amplifiers. See EDFAs	client equipment attenuation A-4
ESCON	description A-3
aggregation card support 1-9	protocol monitoring support 1-8
client equipment attenuation A-4	transponder line card support 1-7
client side attenuation A-4	
data rate as function of distance (figure) A-3	G
latency (table) 4-7	G
protocol monitoring support 1-8	GDPS
transponder line card support 1-7	description A-4
ESCON aggregation cards	environment (figure) A-1
architecture 1-3	Gigabit Ethernet
architecture (figure) 1-10	protocol monitoring support 1-8
data flow (figure) 1-4	transponder line card support 1-6
description 1-9	
latency (table) 4-7	H
optical loss (table) 4-7	п
protocol latencies 4-7	hubbed ring topologies
extended remote copy. See XRC	description 2-19
	example (figure) 2-19
F	
•	
Fast Ethernet	•
transponder line card support 1-6	IBM protocols
FDDI	attenuation requirements A-4
client equipment attenuation A-4	Coupling Facility links A-3
transponder line card support 1-6	
	FICON A-3
fiber	FICON A-3 optical power budget A-4
fiber testing 4-10	
	optical power budget A-4
testing 4-10	optical power budget A-4 PPRC A-4
testing 4-10 Fiber Connection. See FICON 1-8	optical power budget A-4 PPRC A-4 supported types A-2 to A-4
testing 4-10 Fiber Connection. See FICON 1-8 fiber failure	optical power budget A-4 PPRC A-4 supported types A-2 to A-4 Sysplex Timer A-3
testing 4-10 Fiber Connection. See FICON 1-8 fiber failure protection against 2-2	optical power budget A-4 PPRC A-4 supported types A-2 to A-4 Sysplex Timer A-3 XRC A-4
testing 4-10 Fiber Connection. See FICON 1-8 fiber failure protection against 2-2 fiber nonlinearity	optical power budget A-4 PPRC A-4 supported types A-2 to A-4 Sysplex Timer A-3 XRC A-4 in-band network channel
testing 4-10 Fiber Connection. See FICON 1-8 fiber failure protection against 2-2 fiber nonlinearity planning considerations 5-9	optical power budget A-4 PPRC A-4 supported types A-2 to A-4 Sysplex Timer A-3 XRC A-4 in-band network channel description 1-33
testing 4-10 Fiber Connection. See FICON 1-8 fiber failure protection against 2-2 fiber nonlinearity planning considerations 5-9 Fibre Channel	optical power budget A-4 PPRC A-4 supported types A-2 to A-4 Sysplex Timer A-3 XRC A-4 in-band network channel description 1-33 interfaces
testing 4-10 Fiber Connection. See FICON 1-8 fiber failure protection against 2-2 fiber nonlinearity planning considerations 5-9 Fibre Channel autonegotiation support 1-8	optical power budget A-4 PPRC A-4 supported types A-2 to A-4 Sysplex Timer A-3 XRC A-4 in-band network channel description 1-33 interfaces CPU switch module 1-31
testing 4-10 Fiber Connection. See FICON 1-8 fiber failure protection against 2-2 fiber nonlinearity planning considerations 5-9 Fibre Channel autonegotiation support 1-8 latency (table) 4-8, 4-9	optical power budget A-4 PPRC A-4 supported types A-2 to A-4 Sysplex Timer A-3 XRC A-4 in-band network channel description 1-33 interfaces CPU switch module 1-31 ISC compatibility

transponder line card support 1-7 ISC peer mode transponder line card support 1-7 ITU-T G.692	configurations 6-22 to 6-25 meshed ring topology examples 6-30 to 6-31 mux/demux modules. See OADM modules
laser grid 1-3	N
L linear topologies. See point-to-point topologies line card protected configurations 10-Gbps ITU trunk card example (figure) 6-11, 6-12 10-Gbps uplink card example (figure) 6-14 ESCON aggregation card example (figure) 6-11, 6-12, 6-14 transponder line card example (figure) 6-10, 6-14 line card protection client based 2-9 to 2-13	network management comparison (table) 1-35 DCC 1-34 description 1-33 in-band message channel 1-33 NME network management Ethernet See NME NME description 1-35
y-cable based 2-8 to 2-9	
link loss. See optical loss	O
link loss budgets. See optical power budgets logical mesh topologies. See meshed ring topologies	OADM cabling description 3-1 OADM modules
M	architecture (figure) 1-29 bands supported 1-29
meshed ring topologies description 2-20 example (figure) 2-20 examples 6-27 to 6-31 mixed shelf topologies description 6-32 example (figure) 6-32 mixed topologies configuration examples 6-32 MM fiber. See multimode fiber	configurations 1-30 description 1-28 optical loss protected ring configuration (figure) 1-30 ring configurations 1-30 shelf configuration rules 3-2 See also OADM cabling OC-1 transponder line card support 1-8 OC-24
multimode fiber common protocols 1-6 other supported client signal encapsulations 1-7 supported IBM storage protocols 1-7 multiple shelf nodes	transponder line card support 1-8 OFC protocol encapsulations supported 1-8 open fiber control. See OFC

optical loss	Optical Supervisory Channels. See OSCs
2.5-Gbps ITU trunk cards 4-5	OSC
8-port multi-service muxponders 4-5	description 1-27, 1-35
10-Gbps ITU trunk cards 4-6	information types 1-27
calculating 4-3	optical loss through OADM modules 4-7
data channels 4-6	receiver sensitivity (table) 4-2
description 4-2	transmit power (table) 4-2
OSC 4-6	OSC modules
transponder line cards 4-4	description 1-27
See also optical power budgets	shelf configuration rules 3-3
optical loss OADM modules	OSCs
optical mux/demux modules. See OADM modules	planning considerations 5-9
optical power budgets	OSNR
about 5-6	planning considerations 5-6
calculating 5-6	planning guidelines 5-7
line card protected 10-Gbps ITU trunk card example (figure) 6-12, 6-13	
line card protected transponder line card example (figure) 6-11, 6-15	Р
overall 4-2	path switching
splitter protect 10-Gbps ITU trunk card example	example (figure) 2-21
(figure) 6-8, 6-9	PB-OE modules
splitter protected transponder line card example (figure) 6-7, 6-10	description 5-3
switch fabric based protected 10-Gbps ITU trunk card example (figure) 6-16, 6-17	Peer-to-Peer Remote Copy. See PPRC point-to-point topologies
trunk fiber protected 2.5-Gbps transponder line card	description 2-17
example (figure) 6-18	examples 6-26 to 6-27
trunk fiber protected 8-port multi-service muxponder	protected 2-18
example (figure) 6-19	unprotected 2-17
trunk fiber protected 10-Gbps ITU trunk card example (figure) 6-20, 6-21	power supplies
unprotected 10-Gbps ITU trunk card configuration example (figure) 6-3, 6-4	description 1-1 PPRC
unprotected transponder line card example (figure) 6-2,	client interface support A-2
6-6	description A-4
See also optical loss	processors. See CPU switch modules
optical power loss. See optical loss	protected topologies
optical seams	meshed ring example (figure) 6-29
description 5-4 optical signal-to-noise ratio. See OSNR	meshed ring with multiple shelf nodes example (figure) 6-31
optical supervisory channel. See OSC	point-to-point example (figure) 6-26
- · · · · · · · · · · · · · · · · · · ·	

protection	security features
description 1-3, 2-1	overview 1-33
ring topologies 2-20	shelf configuration rules
types 2-2 to 2-17	OADM modules 3-1 to 3-2
See also APS; client protection; line card protection;	ring topologies 3-3
splitter protection; y-cable protection	shelf configurations
protection switch modules. See PSMs	line card protected 6-10 to 6-14
protocol encapsulations 1-6, 1-7	splitter protected 6-6 to 6-9
protocol monitoring	switch fabric based protection 6-15 to 6-17
4-port 1-Gbps/2-Gbps FC aggregation cards 1-13	trunk fiber based protection 6-18 to 6-21
8-port FC/GE aggregation cards 1-16	unprotected 6-1 to 6-5
8-port multi-service muxponders 1-20	shelf linking
transponder line cards 1-8	10-GE client uplink example (figure) 6-24
PSMs	DWDM linked example (figure) 6-23
description 1-30	ITU linked example (figure) 6-22
optical loss 4-7	single-mode fiber
receiver ranges 4-2	common protocols 1-6
transmit power 4-2	other supported client signal encapsulations 1-7
trunk fiber protection 2-16	supported IBM storage protocols 1-7
	SM fiber. See single-mode fiber
 R	SONET
	protocol monitoring support 1-8
receive power	transponder line card support 1-6
levels 5-7	splitter protected configurations
redundancy	10-Gbps ITU trunk card example (figure) 6-7, 6-8
CPU switch modules 1-32	ESCON aggregation card example (figure) 6-7, 6-8
ring topologies	transponder line card example (figure) 6-6, 6-9
description 2-19	splitter protection
protection in 2-20 to 2-23	10-Gbps ITU trunk cards (figure) 2-5, 2-7
shelf configuration rules 3-3	considerations 2-3, 2-4, 2-6, 2-7
See also hubbed ring topologies; meshed ring topologies	description 2-2 to 2-8
	scheme (figure) 2-5, 2-7
S	transponder line cards (figure) 2-2, 2-4
3	storage area networks. See SANs
SANs	switch fabric based protected configurations
IBM environment A-1	10-Gbps uplink card example (figure) 6-17
SDH	ESCON aggregation card example (figure) 6-17
protocol monitoring support 1-8	switch fabric based protection
transponder line card support 1-6	considerations 2-15

description 2-13 to 2-15	shelf configuration rules 3-2
switch fabric based protection configurations	splitter protection support 2-2 to 2-3, 2-3 to 2-4
ESCON aggregation card example (figure) 6-15, 6-16	y-cable protection support (figure) 2-8
switch fabric protection	trunk fiber protected configurations
considerations 2-15	2.5-Gbps transponder line card example (figure) 6-18
switch fabrics	8-port multi-service muxponder example (figure) 6-19
description 1-32	ESCON aggregation card example (figure) 6-20, 6-21
redundant (figure) 1-32	trunk fiber protection
Synchronous Digital Hierarchy. See SDH	considerations 2-16
Sysplex Timer	description 2-16
IBM storage environment and A-3	
transponder line card support 1-7	11
system	U
components 1-4 to 1-33	unidirectional path switching
functional description 1-3	description 2-22
system management	example (figure) 2-22
OSC and 1-27	unprotected configurations
	10-Gbps ITU trunk card example (figure) 6-3, 6-4
	10-Gbps uplink card example (figure) 6-5
1	ESCON aggregation card example (figure) 6-3, 6-4, 6-5
topologies	transponder line card example (figure) 6-2, 6-5
types 6-25 to 6-33	unprotected topologies
See also hubbed ring topologies; meshed ring topologies;	meshed ring example (figure) 6-28
point-to-point topologies	point-to-point example (figure) 6-26
transmitter laser power	
data channels 4-2	
OSC 4-2	V
transponder line cards	variable optical attenuation
architecture 1-3	description 5-2
client based line card protection support 2-10	VOA modules
client interface encapsulation types 1-5	description 5-2
client interfaces 1-5 to 1-8	•
data flow (figure) 1-3	
description 1-4	W
OFC support 1-8	WB-VOA modules
operation 1-4	description 5-5
optical loss (table) 4-5	
protocol encapsulations 1-5	
protocol monitoring 1-8	

X

XRC

```
client interface support A-2 description A-4
```

Υ

```
y-cable protection
considerations 2-9
description 2-8 to 2-9
figure 2-8
```