



TJ1400 (Type-7SR) R1.6

Hardware Description Guide

Document ID: 142-DOC000023-E

Release: Standard Release

Version: 1.1

Copyright Notice

Copyright © 2000-2013. Tejas Networks Ltd. All rights reserved. No part of this book or manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without the express written permission from Tejas Networks Ltd.

Warning and Disclaimer

While every effort has been made to make this document as complete and as accurate as possible, Tejas Networks does not accept any responsibility for poorly designed or malfunctioning networks. The information provided in this document is on an “as is” basis and is subject to change without prior notice. The author, Tejas Networks, shall have neither liability nor responsibility to any person or entity with respect to any loss or damage arising from the information contained in this document or from the use of equipment or software that might accompany it. The opinions expressed in this document are not necessarily those of Tejas Networks.

Trademark Acknowledgments

All terms mentioned in this book that are known trademarks or service marks have been appropriately capitalized. All trademarks duly acknowledged. Tejas Networks cannot attest to the accuracy of third-party information. Use of a term in this document should not be regarded as affecting the validity of any trademark or service mark.

Technical Support Information

Tejas customers can contact Tejas Support Center (TSC) 24x7x365 for any assistance through helpline, fax or email.

- Phone(s): +91 80 41719090, +91 80 26591082, +91 80 26591080

- Fax: +91 80 26591079

- Email: support@india.tejasnetworks.com

- Skype: tscsupport123

- Web: www.tejasnetworks.com

Revision History

Version	Date	Modifications Made
1.0	27 February 2013	Standard Release
1.1	09 May 2013	Updated the Card population Rules for Telecom Bus Allocation

Your Feedback is valuable to us!

Your opinion is of great value and will help us improve the quality of our product documentation and offer better services to you. Please take few moments to provide us your opinion of this document. Send your comments to docs@tejasnetworks.com

Your evaluation of this document	Presentation: (Introductions, Procedures, Illustrations, Completeness, Level of Detail, Organization, Appearance)					
	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Average	<input type="checkbox"/> Poor	<input type="checkbox"/> Bad	<input type="checkbox"/> N/A
	Intelligibility: (Language, Vocabulary, Readability and Clarity, Technical Accuracy, Content)					
	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Average	<input type="checkbox"/> Poor	<input type="checkbox"/> Bad	<input type="checkbox"/> N/A
	Accessibility: (Contents, Index, Headings, Numbering, Glossary)					
Your suggestions for improving this document	<input type="checkbox"/> Improve the overview/introduction	<input type="checkbox"/> Make it more concise/brief		<input type="checkbox"/> Improve the Contents		
	<input type="checkbox"/> Add more step-by-step procedures/ tutorials	<input type="checkbox"/> Improve the organization		<input type="checkbox"/> Add more troubleshooting information		
	<input type="checkbox"/> Include more figures	<input type="checkbox"/> Make it less technical		<input type="checkbox"/> Add more examples		
	<input type="checkbox"/> Add more/better quick reference aids	<input type="checkbox"/> Add more detail		<input type="checkbox"/> Improve the index		
	Other Suggestions:					
	If you wish to be contacted regarding your comments, please provide your contact details:					
Name:			Company:			
Postcode:			Address:			
Telephone:			Email:			

Table of Contents

Using This Guide	11
Who This Guide Is For	11
What This Guide Covers	11
What You Should Already Know	11
Safety Signs Conventions	12
Typographical Conventions	13
Mouse Operation Conventions	13
Chapter Organization	14
Using Tejas Product Documentation	14
Related Documents	15
TJ1400 (Type-7SR) Overview	17
Front Panel	17
Physical Dimension Details	17
Regulatory Standard Compliance	18
Cards Overview	19
Card Population Rule	21
Telecom bus allocation details	21
Slot Allotment	23
Power Supply Unit	25
Power Supply Unit- DPU8	26
<i>Front Panel</i>	27
<i>Operating parameters</i>	27
<i>Functional Description</i>	27
<i>Protection</i>	27
<i>Operational specifications</i>	28
Power Supply Unit- DPU18	30
<i>Front Panel</i>	30
<i>Operating parameters</i>	31
<i>Functional Description</i>	31
<i>Protection</i>	31
<i>Operational Specifications</i>	32
FTU20 - Fan Tray Unit and OAM Card	35
FTU20 - Fan Tray Unit and OAM Functions	36

<i>Front Panel</i>	36
<i>Power Specifications</i>	37
<i>Functional Description</i>	37
<i>OAM Visual Indicator Details</i>	37
<i>BITS Interface</i>	39
<i>External Alarms Interface</i>	39
<i>MGN Interface</i>	40
<i>NMS Interface</i>	40
<i>EOW Interface</i>	40

Cross-connect Cards **41**

Cross Connect Card - XA14ET	41
<i>Front Panel</i>	41
<i>Power Specifications</i>	42
<i>Visual Indicator Details</i>	42
<i>Functional Description</i>	43
Cross Connect Card - XA14OT5.....	44
<i>Front Panel</i>	44
<i>Power Specifications</i>	45
<i>Visual Indicator Details</i>	45
<i>Functional Description</i>	46
Cross Connect Card - XA10G.....	47
<i>Front Panel</i>	47
<i>Power Specifications</i>	48
<i>Visual Indicator Details</i>	48
<i>Functional Description</i>	49
Cross Connect Card - XA20G.....	50
<i>Front Panel</i>	50
<i>Power Specifications</i>	51
<i>Visual Indicator Details</i>	51
<i>Functional Description</i>	52
Cross Connect Card - XA60G.....	53
<i>Front Panel</i>	53
<i>Power Specifications</i>	53
<i>Visual Indicator Details</i>	54
<i>Functional Description</i>	55

PDH Tributary Cards **57**

E1/DS1 Tributary Card – ST63E1.....	57
<i>Front Panel</i>	57
<i>Power Specifications</i>	58
<i>Visual Indicator Details</i>	58
<i>Functional Description</i>	58
<i>Functional Description</i>	58
E3/DS3 Tributary Card – ST6E3.....	59
<i>Front Panel</i>	59
<i>Power Specifications</i>	60

<i>Visual Indicator Details</i>	<i>60</i>
<i>Interfaces</i>	<i>60</i>
<i>Functional Description</i>	<i>60</i>
Optical Tributary Card	61
Optical Tributary Card - SOT18	61
<i>Front Panel.....</i>	<i>61</i>
<i>Power Specifications.....</i>	<i>62</i>
<i>Visual Indicator Details</i>	<i>62</i>
<i>Card Configuration</i>	<i>62</i>
<i>Functional Description</i>	<i>63</i>
Ethernet Cards	65
Ethernet Transport Card - CEL-1	65
<i>Front Panel.....</i>	<i>65</i>
<i>Power Specifications.....</i>	<i>65</i>
<i>Visual Indicator Details</i>	<i>66</i>
<i>Ethernet Interface (Optical).....</i>	<i>66</i>
<i>Ethernet Interface (Electrical).....</i>	<i>67</i>
<i>Functional Description</i>	<i>67</i>
Ethernet Switching Card - CEF-1	68
<i>Front Panel.....</i>	<i>68</i>
<i>Power Specifications.....</i>	<i>68</i>
<i>Visual Indicator Details</i>	<i>69</i>
<i>Ethernet Interface (GE- Optical)</i>	<i>69</i>
<i>Ethernet Interface (4 × 10/ 100 Base-Tx/ 1000 Base-T)</i>	<i>69</i>
<i>Functional Description</i>	<i>70</i>
TJ1400 (Type-5SEP) Expansion Chassis	71
Introduction.....	71
<i>Slot ID Diagram.....</i>	<i>72</i>
<i>Physical Dimensions.....</i>	<i>72</i>
<i>Cards Overview.....</i>	<i>72</i>
Power Supply Unit- DPU8.....	73
<i>Front Panel.....</i>	<i>74</i>
<i>Operating parameters</i>	<i>74</i>
<i>Functional Description</i>	<i>74</i>
<i>Protection</i>	<i>74</i>
<i>Operational specifications.....</i>	<i>75</i>
Fan Tray Unit-FTU30P	77
<i>Front Panel.....</i>	<i>77</i>
<i>Power Specifications.....</i>	<i>78</i>
<i>Visual Indicator details.....</i>	<i>78</i>
<i>Functional Description</i>	<i>78</i>
PDH Tributary Card - S63EWP.....	79
<i>Front Panel.....</i>	<i>79</i>
<i>Power Specifications.....</i>	<i>79</i>

<i>Visual Indicator Details</i>	80
<i>Functional Description</i>	80
Protection IO Card - S63EIO	81
<i>Front Panel</i>	81
<i>Power Specifications</i>	81
<i>Visual Indicator Details</i>	81
<i>E1/DS1 Interface</i>	82
<i>Functional Description</i>	82
PDH Tributary Card - S12E3WP	83
<i>Front Panel</i>	83
<i>Power Specifications</i>	84
<i>Visual Indicator Details</i>	84
<i>Functional Description</i>	84
Protection IO Card - S12E3IO	85
<i>Front Panel</i>	85
<i>Power Specifications</i>	86
<i>Visual Indicator Details</i>	86
<i>E3/DS3 Interface</i>	86
<i>Functional Description</i>	86
Optical Interface Specifications	87
STM-1/OC-3 Optical interface specifications	87
STM-4/OC-12 Optical interface specifications	87
STM-16/OC-48 Optical interface specifications	88
STM-64/OC-192/10GE Optical interface specifications	88
Glossary of Terms	89

List of Figures

Figure 1: Front Panel- TJ1400 (Type-7SR) System.....	17
Figure 2: XA14ET card population rule.....	21
Figure 3: XA14OT5 card population rule	21
Figure 4: XA10G card population rule	22
Figure 5: XA20G card population rule	22
Figure 6: XA60G card population rule	22
Figure 7: Slot allotment	23
Figure 8: Front Panel- DPU8	27
Figure 9: Front Panel - DPU18.....	30
Figure 10: FTU20+OAM.....	36
Figure 11: Front Panel - XA14ET Card	41
Figure 12: Front Panel- XA14OT5	44
Figure 13: Front Panel - XA10G	47
Figure 14: XA20G - Front Panel.....	50
Figure 15: Front Panel- XA60G	53
Figure 16: Front Panel- E1/DS1	57
Figure 17: Front Panel- ST6E3	59
Figure 18: Front Panel - SOT18 Card.....	61
Figure 19: Front Panel- CEL-1	65
Figure 20: Front Panel- CEF- 1	68
Figure 21: Expansion Chassis.....	71
Figure 22: Slot ID for TJ1400 (TYPE 5SEP)	72
Figure 23: Front Panel- DPU8.....	74
Figure 24: Front Panel- FTU30P	77
Figure 25: S63EWP.....	79
Figure 26: Front Panel- S63EIO.....	81
Figure 27: S12E3WP.....	83
Figure 28: S12E3IO	85

List of Tables

Table 1:	Safety Sign Convention.....	12
Table 2:	Typographical Conventions	13
Table 3:	Mouse Operation.....	13
Table 4:	Physical dimensions of TJ1400 (Type-7SR) network element.....	17
Table 5:	Regulatory standards compliance.....	18
Table 6:	Overview of the cards supported in TJ1400 (Type-7SR).....	19
Table 7:	Operating parameters.....	27
Table 8:	Operational specifications- DPU8	28
Table 9:	Operating parameters.....	31
Table 10:	Operational specifications- DPU18.....	32
Table 11:	Power Specifications- FTU20.....	37
Table 12:	LED status and their significance- OAM	37
Table 13:	Alarm LED status and their significance- OAM.....	38
Table 14:	LED status and their significance- OAM(NMS)	40
Table 15:	Power Specifications- XA14ET	42
Table 16:	LED status and their significance- XA14ET	42
Table 17:	Transmit and Receive Laser status- XA14ET	42
Table 18:	Power Specifications- XA140T5	45
Table 19:	LED status and their significance - XA140T5.....	45
Table 20:	Transmit and Receive Laser status- XA140T5.....	45
Table 21:	Power Specifications- XA10G.....	48
Table 22:	LED status and their significance- XA10G.....	48
Table 23:	Transmit and Receive Laser status- XA10G	48
Table 24:	Power Specifications- XA20G.....	51
Table 25:	LED status and their significance- XA20G.....	51
Table 26:	Transmit and Receive Laser status- XA20G	51
Table 27:	Power Specifications- XA60G.....	53
Table 28:	LED status and their significance- XA60G.....	54
Table 29:	SFP Port Transmitter (Tx) and Receiver (Rx) LED Status- XA60G	54
Table 30:	Power Specifications- ST63E1	58
Table 31:	LED status and their significance- ST63E1	58
Table 32:	Power Specifications- ST6E3	60
Table 33:	LED status and their significance- ST6E3	60
Table 34:	Power Specifications- SOT18.....	62
Table 35:	LED status and their significance- SOT18.....	62
Table 36:	SFP Port Transmitter (Tx) and Receiver (Rx) LED Status- SOT18	63
Table 37:	Power Specifications- CEL-1.....	65
Table 38:	LED status and their significance-CEL-1	66
Table 39:	SFP port LED status- CEL-1	66
Table 40:	Ethernet interface LED status- CEL-1	67
Table 41:	Power Specifications- CEF-1.....	68
Table 42:	LED status and their significance- CEF-1.....	69
Table 43:	SFP Port LED Status- CEF-1	69

Table 44: Ethernet interface LED status- CEF-1	70
Table 45: Physical dimensions details of TJ1400 (TYPE-5SEP)	72
Table 46: Cards Overview of TJ1400 (TYPE-5SEP)	72
Table 47: Operating parameters.....	74
Table 48: Operational specifications- DPU8	75
Table 49: Power Specifications- FTU30P	78
Table 50: LED indications and their status- FTU30P.....	78
Table 51: Power Specifications for S63EWP.....	79
Table 52: LED status and their significance- S63EWP.....	80
Table 53: Power Specifications- S63IO	81
Table 54: LED indications and their status- S63IO	81
Table 55: Power Specifications for S12E3WP	84
Table 56: LED status and their significance- S12E3WP.....	84
Table 57: Power Specifications- S12E3IO	86
Table 58: LED indications and their status- S63IO	86
Table 59: STM-1/OC-3 optical interface specifications for the SFP used	87
Table 60: STM-4/OC-12 optical interface specifications for the SFP used	87
Table 61: STM-16/OC-48 optical interface specifications for the SFP used	88
Table 62: STM-64/OC-192/10GE Optical interface specifications for the XFP	88

Chapter 1

Using This Guide

This section describes who should read this guide, how it is organized, and what conventions are used in the document.

IN THIS CHAPTER

Who This Guide Is For	11
What This Guide Covers.....	11
What You Should Already Know	11
Safety Signs Conventions	12
Typographical Conventions.....	13
Mouse Operation Conventions.....	13
Chapter Organization	14
Using Tejas Product Documentation.....	14
Related Documents	15

Who This Guide Is For

This document is intended for Network Operators and System Engineers to help them understand the hardware of the system.

What This Guide Covers

This document provides information on hardware configuration, functions, capabilities, limitations, and physical characteristics of the product.








What You Should Already Know

Before you read this guide you need to be familiar with the general operating principles and procedures associated with the product. You must be fully trained to handle the equipment under minimum supervision.

Safety Signs Conventions

To prevent personal injury, equipment damage, and service interruptions, you must follow all precautionary messages given in the document in addition to all the local safety standards required by your company. The following symbols inserted in the document at various places represent important situations.

Table 1: Safety Sign Convention

Symbols	Meaning	Represents
	Caution	Situations that could result in equipment damage or loss of data.
	Danger	Situation that could cause bodily injury. Failure to observe this precaution may result in personal injury, death, or equipment damage.
	Hot Surface	Situation that could result in bodily burns.
	Optical Safety	Staring directly into the optical connector output beam may cause irreparable damage to your eyes and even leading to loss of eye sight.
	Electric Shock Risk	Failure to observe this precaution may result in personal injury, death, or equipment damage.
	Static Discharge Warning	Handle the equipment wearing a grounding wrist strap to discharge the static buildup. Failure to observe this precaution may result in equipment damage.
	Rotating Part	Keep fingers, screwdrivers, and other objects away from the openings in the fan tray assembly. The fans might still be turning when you remove the fan assembly from the chassis.

Typographical Conventions

Before you start using this guide, it is important to understand the terms and typographical conventions used in the document. The following kinds of formatting in the text identify special information.

Table 2: Typographical Conventions

Formatting Convention	Type of Information
► Procedures	Step-by-step procedures. You can follow these instructions to complete a specific task.
Special Bold	Items you must select, such as menu options, command buttons, or items in a list.
<i>Emphasis</i>	Use to emphasize the importance of a point or for variable expressions such as parameters.
CAPITALS	Names of keys on the keyboard, for example, SHIFT, CTRL, or ALT.
KEY+KEY	Key combinations for which the user must press and hold down one key and then press another, for example, CTRL+P, or ALT+F4.
NOTE:	Means <i>reader take note</i> . Notes contain helpful suggestions or references to materials not contained in this manual.

Mouse Operation Conventions

Table 3: Mouse Operation

Convention	Description
Click	Refers to pressing and releasing a mouse button to select a screen object.
Double-click	Refers to pressing and releasing a mouse button twice in succession while the cursor is positioned over an object on-screen.
Drag	Refers to the function of the mouse by which an element on the screen of a monitor is moved with the cursor, while holding down the mouse button and moving the mouse.
Right-click	Refers to pressing the right button on a two-button mouse.
Wheel button	Refers to the third (middle) button on the mouse.

Chapter Organization

This document is organized as follows:

Chapter	Scope
<i>TJ1400 (Type-7SR) Overview</i> on page 17	This chapter provides the basic introduction of TJ1400 (Type-7SR).
<i>Card Population Rule</i> on page 21	This chapter provides the card population rule used in TJ1400 (Type-7SR).
<i>Power Supply Unit</i> on page 25	This chapter describes the Power Supply Unit used in TJ1400 (Type-7SR).
<i>FTU20 - Fan Tray Unit and OAM Card</i> on page 35	This chapter describes the Fan Tray Unit and OAM card used in TJ1400 (Type-7SR).
<i>Cross-connect Cards</i> on page 41	This chapter describes the Cross connect cards used in TJ1400 (Type-7SR).
<i>PDH Tributary Cards</i> on page 57	This chapter describes the PDH Tributary cards used in TJ1400 (Type-7SR).
<i>Optical Tributary Card</i> on page 61	This chapter describes the Optical tributary cards used in TJ1400 (Type-7SR).
<i>Ethernet Cards</i> on page 65	This chapter describes the Ethernet transport and switching cards used in TJ1400 (Type-7SR).
<i>TJ1400 (Type-5SEP) Expansion Chassis</i> on page 71	This chapter describes TJ1400 (Type-5SEP) extended chassis used in TJ1400 (Type-7SR).

Using Tejas Product Documentation

The following Tejas product documentation set helps you to use the range of Tejas products:

- ▶ The *Hardware Description Guide* explains hardware configuration, functions, capabilities, limitations, and physical characteristics of the product.
- ▶ The *Installation and Commissioning Guide* provides information on installing the product and to initially configuring it to the point of verifying its proper operation in the network.
- ▶ The *User Interface Guide* introduces and orients service providers to the content, function, and organization of the user interface that support the network elements.
- ▶ The *L2 Services User Interface Guide* provides information about provisioning L2 switching features supported by the switching cards.

All documents for the shelf are referred to as Tejas technical publications. Each document has a unique thirteen-digit identification number called Tejas Part Number (TPN). This number is used to identify each document, and assist in cross-referencing from one document TPN to another.

Related Documents

This document needs to be used in conjunction with the following documents

Document Name	Tejas Part Number	Description
TJ1400 R1.6 Installation and Commissioning Guide	142-DOC000024-E	This document provides information to install the product and to initially configure the product to the point of verifying proper operation of the product in the network.
TJ1400 R1.6 User Interface Guide	142-DOC000026-E	This document introduces and orients service providers to the content, function, and organization of the user interface that support the network elements.
TJ1400 R1.6 L2 Services User Interface Guide	142-DOC000027-E	This document explains the L2 switching features of the CEF-1 switching card.

Chapter 2

TJ1400 (Type-7SR) Overview

This chapter introduces TJ1400 (Type-7SR) product and provides details of the applicable cards.

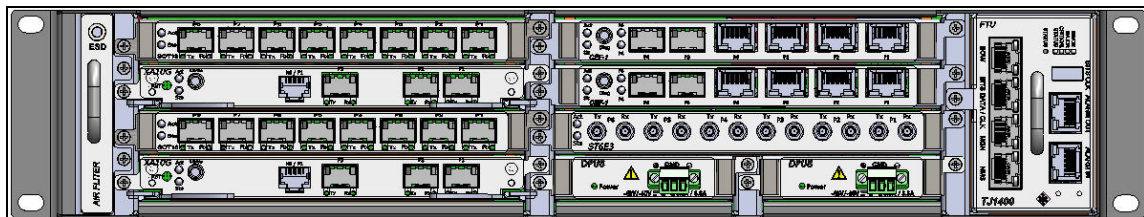
IN THIS CHAPTER

Front Panel	17
Physical Dimension Details	17
Regulatory Standard Compliance.....	18
Cards Overview	19

Front Panel

TJ1400 (TYPE-7SR) is a 2 unit base chassis supporting redundant cross-connect fabric, timing/synchronization subsystem and control processor subsystem and east/west aggregate ports on separate circuit packs. It also has redundant power supply modules enabling power supply redundancy.

Figure 1: Front Panel- TJ1400 (Type-7SR) System



Physical Dimension Details

Table 4: Physical dimensions of TJ1400 (Type-7SR) network element

Dimension	Values
Height	88 mm
Width	433 mm
Depth	204 mm

Regulatory Standard Compliance

Table 5: Regulatory standards compliance

Specification	Standard
EMI/EMC	<ul style="list-style-type: none"> ▶ FCC Part-15, Subpart B, Class-A ▶ ICES-003, Class-A ▶ EN 300386 ▶ EN 55022 Class-A / CISPR-22 Class-A ▶ EN 55024 / CISPR-24 ▶ EN 61000-3-2 and EN 61000-3-3 (applicable to AC power supply model only)
Safety	<ul style="list-style-type: none"> ▶ Certified for CB – Scheme ▶ IEC 60950-1 / EN 60950-1 ▶ UL 60950-1 ▶ CAN/CSA-C22.2 No. 60950-1
Laser Safety	<ul style="list-style-type: none"> ▶ IEC 60825-1 / EN 60825-1 ▶ IEC 60825-2 / EN 60825-2 ▶ 21 Code of Federal Regulations (CFR)1040

Cards Overview

Table 6: Overview of the cards supported in TJ1400 (Type-7SR)

Cards	Features
DPU18	<ul style="list-style-type: none"> Delivers 325 W power output and 12 V output voltage Supports Redundancy
XA14ET	<ul style="list-style-type: none"> Provides 2xSTM-1 or 1xSTM-4 aggregate interface and 32 E1 interfaces Supports an uplink capacity of 2.5G Supports only SDH mode
XA14OT5	<ul style="list-style-type: none"> Provides 2xSTM-1+2xSTM-4 or 4xSTM-1 aggregate interfaces Supports an uplink capacity of 5G Supports only SDH mode
XA10G	<ul style="list-style-type: none"> Provides 1xSTM-16/OC-48+2x STM-1/OC-3 interface Supports uplink capacity of 10G
XA20G	<ul style="list-style-type: none"> Provides 1xSTM-16+1xSTM-4+2xSTM-1 interface Supports uplink capacity of 16G Supports only SDH mode
XA60G	<ul style="list-style-type: none"> Supports 1xSTM-64/OC-192, and 2xSTM-4/16/OC-12/48, and 2xSTM-1/4/OC-3/12 interfaces Supports uplink capacity of 60G
SOT18	Provides 8xSTM-1/OC-3, 2xSTM-4/OC-12 and 1xSTM-16/OC-48 line interfaces
ST63E1	Provides sixty three E1/DS1 interfaces
ST6E3	Provides six E3/DS3 interfaces
CEF-1	<ul style="list-style-type: none"> Supports 4 FE Electrical (10/100Base-Tx) and 2 GE Optical (1000Base-X) ports Supports switching capacity of 5G Supports STM-4/8/16/OC-12/48/192 uplink bandwidth
CEL-1	<ul style="list-style-type: none"> Supports 2xGE (Optical, 1000Mbps) + 1xGE (Electrical, 10/100/1000 Mbps) + 3xFE (Electrical, 10/100 Mbps) ports Supports STM-16/OC-48 uplink bandwidth
FTU20+OAM	<ul style="list-style-type: none"> FTU20 is included as a part of the OAM card Supports six fans <p>OAM Features</p> <ul style="list-style-type: none"> Provides 10/100BaseT LAN interface Provides NMS, Alarm IN, Alarm Out, BITS clock, BITS data+clock and EOW interfaces

Chapter 3

Card Population Rule

This chapter provides details regarding the card population rules to be followed while using TJ1400 (Type-7SR) system.

IN THIS CHAPTER

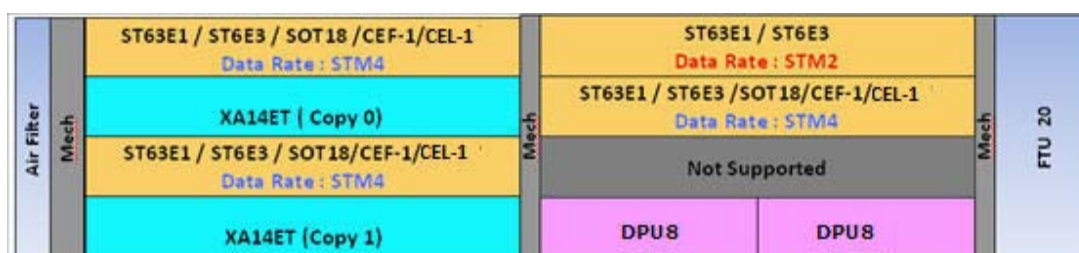
Telecom bus allocation details.....	21
Slot Allotment.....	23

Telecom bus allocation details

The system supports telecom bus with STM-1 capacity for the tributary card slots. This portion describes the card population rule of the TJ1400 (TYPE-7SR) equipment.

XA14ET

Figure 2: XA14ET card population rule

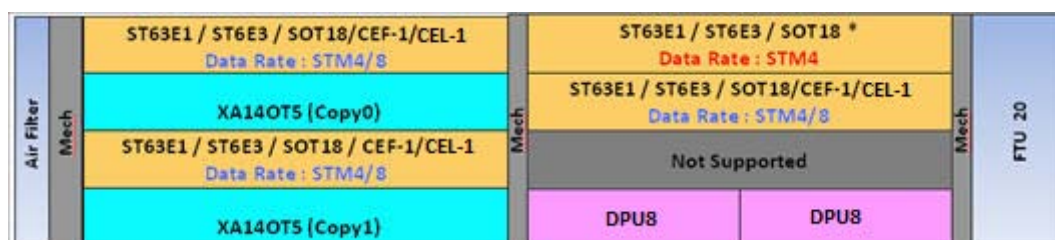


TJ1400(TYPE 7SR) with XA14ET,

- ▶ Supports maximum of four services slots with ST63E1/ ST6E3/ SOT18/CEF-1/CEL-1 cards.
- ▶ CEF-1/CEL-1 card will be supported with reduced bandwidth of STM-4.

XA14OT5

Figure 3: XA14OT5 card population rule

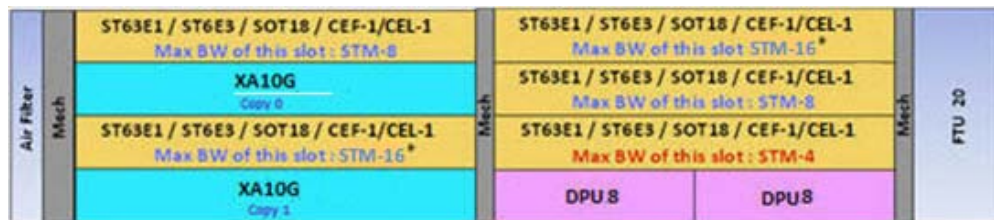


TJ1400(TYPE 7SR) with XA14OT5,

- ▶ Supports maximum of four services slots with ST63E1/ ST6E3/ SOT18/CEF-1/CEL-1 cards.
- ▶ CEF-1/CEL-1 card will be supported only in slots where bandwidth is STM8.

XA10G

Figure 4: XA10G card population rule

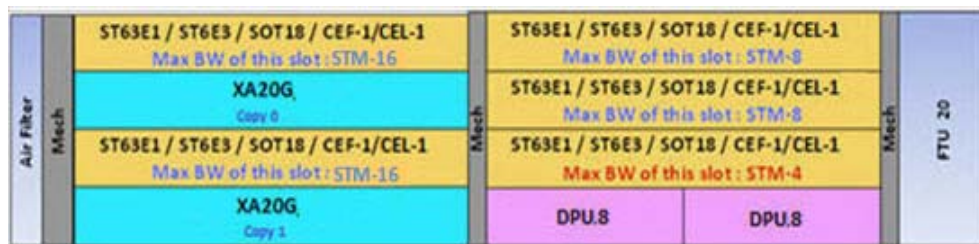


TJ1400(TYPE 7SR) with XA10G,

- ▶ Supports maximum of 5 service slots apart from the service ports on the XC.
- ▶ Supports maximum of 5 service slots on the expansion chassis.
- ▶ Supports STM-16 capacity in Slot 3 (provided Slot 1 is empty) and Slot 5 (provided Slot 6 is empty).

XA20G

Figure 5: XA20G card population rule

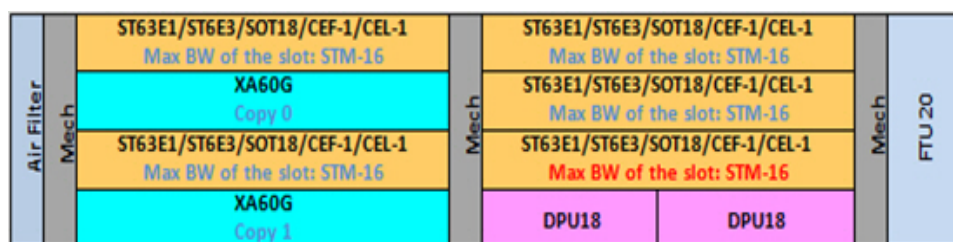


TJ1400(TYPE 7SR) with XA20G,

- ▶ Supports maximum of 5 service slots apart from the service ports on the XC.
- ▶ Supports maximum of 5 service slots on the expansion chassis.

XA60G

Figure 6: XA60G card population rule



TJ1400(TYPE 7SR) with XA60G,

- ▶ Supports maximum of 5 service slots apart from the service ports on the XC.
- ▶ Supports maximum of 5 service slots on the expansion chassis.

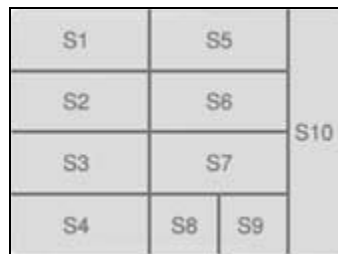
Slot Allotment

- ▶ Slots 8 and 9 for Power supply modules
- ▶ Slots 1, 3, 5, 6 and 7 for Tributary cards
- ▶ Slots 2 and 4 for Cross-connect cards
- ▶ Slot 10 for Fan tray unit

The following table represents the slot allotment in tabular form

Slot Number	1	2	3	4	5	6	7	8	9	10
Card Type	Tributary	Cross Connect	Tributary	Cross Connect	Tributary	Tributary	Tributary	PSU	PSU	FTU

Figure 7: Slot allotment



Note: When XA14ET and XA14OT5 cards are used, slot S7 is not supported. Therefore S7 should be installed with tributary/crossconnect filler.

NOTE: When XA10G/XA20G/XA60G card is used, slot S7 is supported.

Chapter 4

Power Supply Unit

This chapter describes the Power Supply Unit.

IN THIS CHAPTER

Power Supply Unit- DPU8	26
Power Supply Unit- DPU18	29

Power Supply Unit- DPU8

The DC Power Supply Unit (DPU8) is a part of the common unit of TJ1400 network element. The DPU8 supports load sharing on redundancy basis i.e. if one PSU fails, other will be the active load driver and provides a stable DC power to other cards in the system. The DPU8 is also referred as PSU. The PSU delivers 250 W power output, 12 V output voltage.

NOTE: Do not jack out/jack in DPU8 with Power Cable connected to the Card. This could damage the DPU8 and create safety hazards.



DANGER: Do not jack-in/jack-out PSU/PFU card in the system with Power Cable connected. PSU/PFU have high energy and/or voltage level that can cause serious electrocution or burn.



CAUTION: When removing a card, the unit should not be replaced into the system for at least 5 seconds to ensure that unit capacitors have discharged. Always disconnect (unplug) the power to DPU8 module before removing (or) inserting into its respective slot.



STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.



HOT SURFACE: Do not touch the heat sinks on the unit just after removal.

Front Panel

The front panel of this unit provides a power connector and a local safety ground connection.

Figure 8: Front Panel- DPU8



Operating parameters

Table 7: Operating parameters

Parameter	Specification
Input voltage range	-40V to -72V DC
Output voltage	12V
Output power	250 W Maximum
Fuse	10 Amps fuse

Functional Description

The DPU8 consists of a single output DC-DC converter and all the cards including the base card have hot-swap controller and buck converters as required. The output voltage is set to 12 V. The cards are required to derive the suitable voltages from the stable 12 V supplied by the DPU8.

Protection

DPU8 has the following protections:

- Output short-circuit
- Output over-current
- Input reverse polarity
- Input over-voltage
- Input under-voltage
- Inrush limiting
- Over-temperature
- Non-latching thermal shutdown

Operational specifications

Table 8: Operational specifications- DPU8

Specification	Range
Input voltage range	-40 V to -72 V DC
Reverse polarity protection	Continuous
Input current	8.2A continuous, 10A Max. During normal operation
Operating temperature range	0°C to 50°C
Output voltage	12 V \pm 0.6 V
Output current	21A
Ripple	120mV _{p-p}
Dynamic response	1000mV _{p-p} (50% to 100% Load step)
Efficiency	$\geq 85\%$ @ >50% Load when input is 48V
Fuse	10 A Fast Acting Fuse
Under voltage protection	<ul style="list-style-type: none"> ▶ Recovery: 38V \pm 2V ▶ Shutdown: Recovery - 4V
Over voltage protection	<ul style="list-style-type: none"> ▶ Recovery: 72V \pm 2V ▶ Shutdown: Recovery + 4V
EMI/EMC/Safety compliance	<ul style="list-style-type: none"> ▶ IEC 60950-1 ▶ EN 60950-1 ▶ UL 60950-1 ▶ In-rush Current limiting as per ETSI EN 300 132-2 ▶ ETSI EN 300 386 requirements as applicable (equipments operating in telecommunication centers) ▶ ETSI EN 300 019 Part 1-1 ▶ EN55022 Class A ▶ EN61000-4-4 (500V) ▶ ESD (4.0 kV contact discharge and 8.0kV Air Discharge)
Hold-up time (Interruption)	2ms at 54V and above
Power interface	One no. of 3-pin Single level connector Phoenix 1827871.
Protections	<ul style="list-style-type: none"> ▶ Over-temperature at 115°C \pm 10°C and hysteresis of 15°C min (Auto-recovery) ▶ Output Short-Circuit (Latched Protection) ▶ Output Over-Current (26A \pm 2A, Latched Protection) ▶ Output Over-Voltage (13.6\pm 0.6V, Latched Protection) ▶ Input Reverse Polarity (Continuous) ▶ Input Under/Over voltage (Auto Retry Mode)

Specification		Range	
Status indication	This is with redundant power supply in the system		
	LED	Color	Remarks
	Status	RED	<ul style="list-style-type: none">▶ When the card is jacked in without input feed▶ output voltage out of range▶ Red will blink if card goes for over current protection
		GREEN	<ul style="list-style-type: none">▶ Card is working fine▶ Green will blink when the card goes down because of input voltage protection
		RED and GREEN	<ul style="list-style-type: none">▶ Red and Green will blink alternatively if card goes for over temperature protection
	If there is no redundant power supply in the system		
	LED	Color	Remarks
	Status	RED	<ul style="list-style-type: none">▶ output voltage out of range▶ Red will blink if card goes for over current protection
		GREEN	<ul style="list-style-type: none">▶ Card is working fine▶ Green will blink when the card goes down because of input voltage protection
		RED and GREEN	<ul style="list-style-type: none">▶ Red and Green will blink alternatively if card goes for over temperature protection
		BLANK	If input is not present

Power Supply Unit- DPU18

The DC Power Supply Unit (DPU18) is a part of the common unit of TJ1400 network element. The DPU18 supports load sharing on redundancy basis i.e. if one PSU fails, other will be the active load driver and provides a stable DC power to other cards in the system. The DPU18 is also referred as PSU. The PSU delivers 325 W power output, 12 V output voltage.

NOTE: Do not jack out/jack in DPU18 with power cable connected to the card. This could damage the DPU18 and create safety hazards.



CAUTION: When removing a card, the unit should not be replaced into the system for at least 5 seconds to ensure that unit capacitors have discharged. Always disconnect the (unplug) power to DPU18 module before removing (or) inserting into its respective slot.



STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

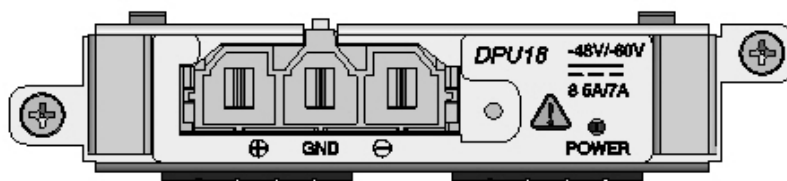


HOT SURFACE: Do not touch the heat sinks on the unit just after removal.

Front Panel

The front panel of this unit provides a power connector, a local safety ground connection, and the monitor ports to monitor the input and derived voltages from the card.

Figure 9: Front Panel - DPU18



Operating parameters

Table 9: Operating parameters

Parameter	Specification
Input voltage range	-40V to -72V DC
Output voltage	12V
Output power	325 W Maximum
Fuse	12.5A Fast Acting Fuse

Functional Description

The DPU18 consists of a single output DC-DC converter and all the cards including the base card have hot-swap controller and buck converters as required. The output voltage is set to 12 V. The cards are required to derive the suitable voltages from the stable 12 V supplied by the DPU18.

Protection

DPU18 has the following protections:

- Over-temperature (Auto-recovery)
- Output Short-Circuit (Hiccup Mode)
- Output Over-Current (125%)
- Output Over-Voltage (13.6 ± 0.6 V Latched Mode)
- Input Reverse Polarity
- Input Under-voltage (Auto Retry Mode)

NOTE: Field Replaceable Units (FRU) should not be reseated within 30 seconds.

Operational Specifications

Table 10: Operational specifications- DPU18

Specification	Range
Input voltage range	-40V to -72V DC
Reverse polarity protection	Continuous
Input current	8.2A continuous
Operating temperature range	0°C to 50°C full power Upto 65°C with derating
Output voltage	12 V \pm 0.6 V
Output current	27A
Ripple	120mV _{pp}
Dynamic response	500mV _{pp} (50% to 100% Load step)
Efficiency	$\geq 85\%$ @ >50% Load when input is 48V
Fuse	12.5 A Fast Acting Fuse
Under voltage protection	<ul style="list-style-type: none"> ▶ Recovery: 38V \pm 2V ▶ Shutdown: Recovery - 4V
Over voltage protection	<ul style="list-style-type: none"> ▶ Recovery: 74V \pm 2V ▶ Shutdown: Recovery + 2V
EMI/EMC/Safety compliance	<ul style="list-style-type: none"> ▶ IEC 60950-1 ▶ EN 60950-1 ▶ UL 60950-1 ▶ In-rush Current limiting as per <ul style="list-style-type: none"> ■ ETSI EN 300 132-2 ▶ ETSI EN 300 386 requirements as applicable (equipments operating in telecommunication centers) ▶ ETSI EN 300 019 Part 1-1 ▶ EN55022 Class A ▶ EN61000-4-4 (500V) ▶ ESD (4.0 kV contact discharge and 8.0kV Air Discharge)
Hold-up time (Interruption)	0.5ms at 54V and above
Power interface	<p>Input: One no of 3-pin, 50A Mini-FIT series Connector 428203212.</p> <p>Output:</p> <ul style="list-style-type: none"> ▶ Card edge Connector, 461120201 ▶ Female FCI 223987_1

Specification		Range	
Protections		<div><div>▶ Over-temperature (Auto-recovery)</div><div>▶ Output Short-Circuit (Hiccup Mode)</div><div>▶ Output Over-Current (125%)</div><div>▶ Output Over-Voltage (13.6± 0.6V Latched Mode)</div><div>▶ Input Reverse Polarity</div><div>▶ Input Under-voltage (Auto Retry Mode)</div></div>	
Status indication	This is with redundant power supply in the system		
	LED	Color	Remarks
	Status	RED	<div><div>▶ When the card is jacked in without input feed</div><div>▶ output voltage out of range</div><div>▶ Red will blink if card goes for over current protection</div></div>
		GREEN	<div><div>▶ Card is working fine</div><div>▶ Green will blink when the card goes down because of input voltage protection</div></div>
		RED and GREEN	<div><div>▶ Red and Green will blink alternatively if card goes for over temperature protection</div></div>
	If there is no redundant power supply in the system		
	LED	Color	Remarks
	Status	RED	<div><div>▶ output voltage out of range</div><div>▶ Red will blink if card goes for over current protection</div></div>
		GREEN	<div><div>▶ Card is working fine</div><div>▶ Green will blink when the card goes down because of input voltage protection</div></div>
		RED and GREEN	<div><div>▶ Red and Green will blink alternatively if card goes for over temperature protection</div></div>
		BLANK	If input is not present

Chapter 5

FTU20 - Fan Tray Unit and OAM Card

This chapter describes FTU20 - Fan Tray Unit and gives an overview of the features and functional description of the Operations, Administration and Maintenance of OAM Cards.



STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

IN THIS CHAPTER

FTU20 - Fan Tray Unit and OAM Functions	36
---	----

FTU20 - Fan Tray Unit and OAM Functions

The FTU20 - Fan Tray Unit is used in the TJ1400 (Type-7SR) network element to cool the equipment. The FTU20 supports six fans.

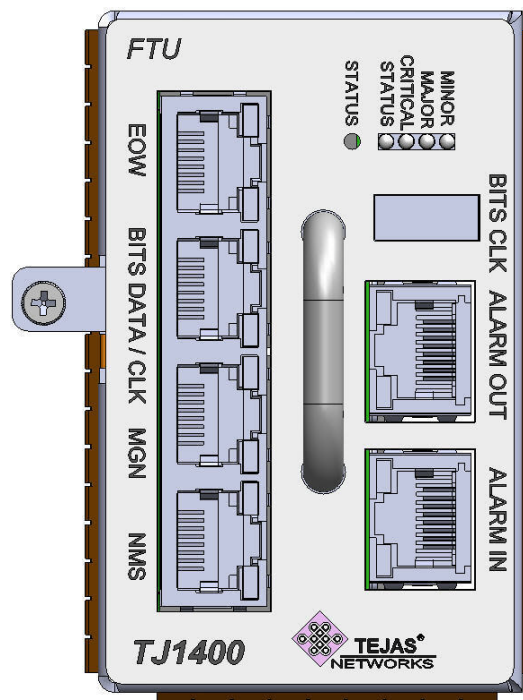


ROTATING PART: Keep fingers, screwdrivers, and other objects away from the openings in the fan tray assembly. The fans might still be turning when you remove the fan assembly from the chassis.

Front Panel

FTU20 is included with the OAM card in the TJ1400 (Type-7SR).

Figure 10: FTU20+OAM



Power Specifications

Table 11: Power Specifications- FTU20

Specification	Range
Input Voltage	12 V
Power consumption	54 W Maximum

Functional Description

The OAM provides static user interfaces for configuration and visual indications. OAM has the following functional features:

- ▶ Provides NMS, Alarm IN, Alarm Out, BITS clock, BITS data/clock and EOW interfaces
- ▶ Alarm LEDs (Critical, Major, Minor)
- ▶ User configurable alarm inputs
- ▶ Alarm outputs for Critical, Major, Minor and Deferred
- ▶ Temperature monitoring

The following are the functional features of FAN:

- ▶ Fuse on each fan power supply to isolate any failed fan from other fans
- ▶ Fan speed monitoring and control through software, based on the temperature sensed
- ▶ Temperature monitoring on the airflow path
- ▶ Field replaceable

OAM Visual Indicator Details

The visual indicators on the OAM include ACTIVE, STATUS and Alarm LEDs.

Table 12: LED status and their significance- OAM

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)	Amber (Steady)
Card in service: Initialization complete and card in service.	Green (Steady)	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

There are three alarm visual indications on the faceplate of OAM:

- ▶ Critical Alarm
- ▶ Major Alarm
- ▶ Minor Alarm

Table 13: *Alarm LED status and their significance- OAM*

LED	Color	LED Status
Critical LED	Red	Critical alarm detected by network element
	Off	Default State. No Critical alarm detected
Major LED	Red	Major alarm detected by network element
	Off	Default State. No Major alarm detected
Minor LED	Amber	Minor alarm detected by network element
	Off	Default State. No Minor alarm detected

BITS Interface

The BITS clock input/output is at 2.048 MHz (rectangular wave) and can be nominated as a reference for node synchronization. Loss-of-Signal (LOS) is detected on the clock input and this triggers to change over to the next synchronization reference. The timing reference failed alarm is reported on the user interface. The OAM provides BITS clock interface through USB port, a Tejas proprietary.

The BITS data input/output is at 2.048 Mbps, balanced, 120 ohms impedance and as per ITU-T G.703 standard. Both PCM30 and PCM31 (with/without CRC) framing can be used on the input. This input can be nominated as a reference for node synchronization. LOS, LOF and AIS are detected on this input and this triggers to change over to the next synchronization reference. The timing reference failed alarm is reported on the user interface. The OAM provides BITS data interface through a RJ45 connector.

The BITSIN-1-10-1 (USB port) interface can be used to provision a 1.5 MHz clock to the network element, while the BITSIN-1-10-2 (RJ45 port) interface supports a 1.5 Mbits data input in SONET mode.

The timing reference can be synchronized from:

- ▶ Received line interfaces
- ▶ Clock derived from External BITS clock
- ▶ Clock derived from External BITS data

External Alarms Interface

The OAM provides seven external alarm inputs and four external alarm outputs.

- ▶ **Alarm-In:** The alarm inputs connect external triggers for events (such as open door or a shelf high temperature) to the OAM. When an event occurs, which activates the trigger connected to the external alarm input, the network element raises an environmental alarm. The external inputs are either enabled or disabled from the Network Element (NE) user interface. The severity, alarm text and the SNMP trap ID can be edited from the network element user interface. The Alarm-In interface is through a RJ-45 connector.
- ▶ **Alarm-Out:** The alarm outputs can be used to trigger the operation of external equipment, such as a generator, fan or audible alarm. The alarm outputs are caused by alarms detected by the NE. The alarm-out is classified as minor, major and critical. The Alarm-Out interface is through a RJ-45 connector. There are three LEDs on the faceplate of OAM for Alarm out displays:
 - Critical Alarm
 - Major Alarm
 - Minor Alarm

MGN Interface

The MGN interface helps to connect the network element to a PC terminal with an Ethernet cable of RJ-45 connector type.

NMS Interface

The NMS Interface provides a CSMA/CD based LAN transceiver of an Ethernet link. This is available through an RJ-45 connector.

The NMS interface is associated with two LEDs: Green and Amber.

Table 14: LED status and their significance- OAM(NMS)

Card Status	NMS LED (Green)	NMS LED (Amber)
Link speed 10 Mbps	--	--
Link speed 100 Mbps	--	On
NMS port up	On	--
Receiver Activity	Blink on packet received	--

EOW Interface

This is an operations communication channel that directly supports a two-wire analog telephone. The orderwire interface provides a 64 kbps voice channel between two network elements. Voice and signaling traffic is carried over E1 or E2 bytes of the SDH overhead. Orderwire interface is terminated using RJ-45 connectors.

Chapter 6

Cross-connect Cards

This chapter gives an overview of the features and functional description of the traffic and cross-connect card.

IN THIS CHAPTER

Cross Connect Card - XA14ET.....	41
Cross Connect Card - XA14OT5.....	44
Cross Connect Card - XA10G	47
Cross Connect Card - XA20G	50
Cross Connect Card - XA60G	53

Cross Connect Card - XA14ET

The XA14ET is the cross-connect and aggregate card for the system. The system supports redundancy on the XA14ET card. The card provides 2xSTM-1/OC-3 or 1xSTM-4/OC-12 aggregate interface and 32E1/DS1 interface with LFH connectors. The card supports an uplink capacity of 2.5G.

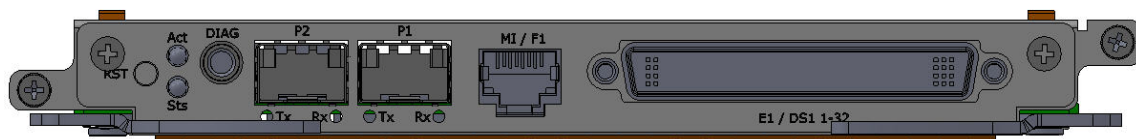


STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of XA14ET card is shown below.

Figure 11: Front Panel - XA14ET Card



Power Specifications

Table 15: Power Specifications- XA14ET

Specification	Range
Input Voltage	12 V \pm 5%
Power consumption	14 W

Visual Indicator Details

The visual indicators on the XA14ET card include two LEDs, the ACTIVE and the STATUS LEDs for alarm indication.

Table 16: LED status and their significance- XA14ET

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion.	Amber (Steady)	Amber (Steady)
Card in service: Initialization complete and card in service.	Green (Steady)	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

Table 17: Transmit and Receive Laser status- XA14ET

LED	Color	Status
Tx	Red	Power on state
	Off	Laser Off
	Green	Laser On
Rx	Red	Power on state
	Off	No receive power
	Green	Receive power OK

Optical Interface (2xSTM-1/OC-3 mode)

XA14ET houses two optical transceivers operating at STM-1/OC-3 line rate.

Optical Interface (1xSTM-4/OC-12 mode)

XA14ET houses one (P1) optical transceiver operating at STM-4/OC-12 line rate.

Digital Diagnostics

All diagnostic features of SFP optics (Receive power measurement, back facet, laser bias, temperature) can be monitored.

Clocking scheme

Clocks from master XA14ET card are selected for clocking ST63E1 card. Default option is to use the clock from the backplane. The clocks for E3 LIU are given through an onboard 19.44M crystal. Clocks from master XA14ET card are selected. Default option is to use the clock from the backplane.

Functional Description

XA14ET card supports the following functional features:

- ▶ Supports 2xSTM-1/OC-3 or 1xSTM-4/OC-12 interfaces
- ▶ Supports reset of processor with a reset switch
- ▶ Supports diag-audio jack
- ▶ Supports craft (MI/F1) interface

Cross Connect Card - XA14OT5

The XA14OT5 is the cross-connect and aggregate card for the product. The card consists of the cross-connect sub-system and the timing sub-system. The system provides for redundancy on the XA14OT5 card. The card provides 2xSTM-1+2xSTM-4 or 4xSTM-1 aggregate interface. The card supports an uplink capacity of 5G.

NOTE: The SFPs for P1 and P2 are inserted with locking mechanism on the top and it is reverse to P3 and P4.

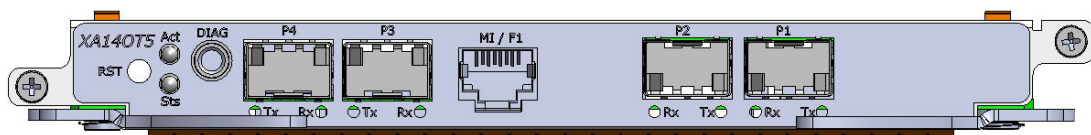


STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of XA14OT5 card is shown below.

Figure 12: Front Panel- XA14OT5



Power Specifications

Table 18: Power Specifications- XA140T5

Specification	Range
Input Voltage	12 V \pm 5%
Power consumption	14 W

Visual Indicator Details

The visual indicators on the XA140T5 card include two LEDs, the ACTIVE and the STATUS LEDs for alarm indication. The other two LEDs namely Tx and Rx is for Laser status indication.

Table 19: LED status and their significance - XA140T5

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)	Amber (Steady)
Card in service: Initialization complete and card in service.	Green (Steady)	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

Table 20: Transmit and Receive Laser status- XA140T5

LED	Color	Status
Tx	Red	Power on state
	Off	Laser Off
	Green	Laser On
Rx	Red	Power on state
	Off	No receive power
	Green	Receive power OK

Optical Interface (4xSTM-1 mode)

XA14OT5 houses four optical transceivers operating at STM-1 line rate.

Optical Interface (2xSTM-1+2xSTM-4 mode)

XA14OT5 houses two optical transceivers operating at STM-1 line rate and two (P3 and P4) optical transceiver operating at STM-4 line rate.

Digital Diagnostics

All diagnostic features of SFP optics (Receive power measurement, back facet, laser bias, temperature) can be monitored.

Clocking scheme

Clocks from master XA14OT5 card are selected for clocking ST63E1 card. Default option is to use the clock from the backplane. The clocks for E3 LIU are given through an onboard 19.44M crystal. Clocks from master XA14OT5 card are selected. Default option is to use the clock from the backplane.

Functional Description

XA14OT5 card supports the following functional features:

- ▶ Supports 2XSTM-1+2XSTM-4 or 4XSTM-1 interfaces
- ▶ Supports reset of processor with a reset switch
- ▶ Supports diag-audio jack
- ▶ Supports craft(MI/F1) interface

Cross Connect Card - XA10G

The XA10G is the cross-connect and aggregate card for the product. The card consists of the cross-connect sub-system and the timing sub-system. The system provides for redundancy on the XA10G card. The card provides 1xSTM-4/16/OC-12/48 + 2xSTM-1/OC-3 aggregate interface. The card supports an uplink capacity of 10G.

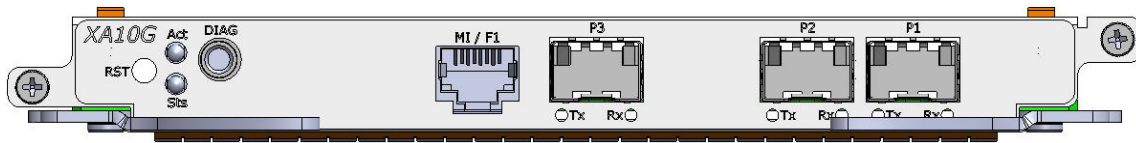


STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of XA10G card is shown below.

Figure 13: Front Panel - XA10G



Power Specifications

Table 21: Power Specifications- XA10G

Specification	Range
Input Voltage	12 V \pm 5%
Power consumption	25 W Maximum

Visual Indicator Details

The visual indicators on the XA10G card include two LEDs, the ACTIVE and the STATUS LEDs for alarm indication. There are other two LEDs namely Tx and Rx for Laser status indication.

Table 22: LED status and their significance- XA10G

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)	Amber (Steady)
Card in Master service: Initialization complete and card in service as Master.	Green	Green
Card in Slave service: Initialization complete and card in service as Slave.	Green	Off
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

Table 23: Transmit and Receive Laser status- XA10G

State	Rx LED	Tx LED
SFP present (Laser on) with Rx LOS	Amber	Green
SFP present (Laser off) with Rx LOS	Amber	Off
SFP present (Laser on) with no Rx LOS	Green	Green
SFP present (Laser off) with no Rx LOS	Green	Off
SFP missing (LOS detected), Laser On (attempted)	Amber	Green
SFP missing (LOS masked since SFP missing and set to Admin_down), Laser Off (attempted)	Amber	Off
SFP failed (whether provisioned, unprovisioned, LOS or no LOS)	Red	Red

Optical Interface (1xSTM-4/16/OC-12/48 mode)

XA10G supports one (P3) optical transceiver operating at STM-4/16/OC-12/48 line rate.

Optical Interface (2xSTM-1/OC-3 mode)

XA10G supports two optical transceivers operating at STM-1/OC-3 line rate.

Digital Diagnostics

All diagnostic features of SFP optics (Receive power measurement, back facet, laser bias, temperature) can be monitored.

Functional Description


XA10G card supports the following functional features:

- ▶ Supports 1xSTM-4/16/OC-12/48 + 2xSTM-1/OC-3 interfaces
- ▶ Supports reset of traffic with a reset switch
- ▶ Supports diag-audio jack
- ▶ Supports craft (MI/F1) interface
- ▶ Supports redundancy
- ▶ Supports 15G cross connect size

Cross Connect Card - XA20G

The XA20G is the cross-connect and aggregate card for the product. The card consists of the cross-connect sub-system and the timing sub-system. The system provides for redundancy on the XA20G card. The card provides 1xSTM-16/OC-48+1xSTM-4/OC-12+2xSTM-1/OC-3 aggregate interface. The card supports an uplink capacity of 16G.

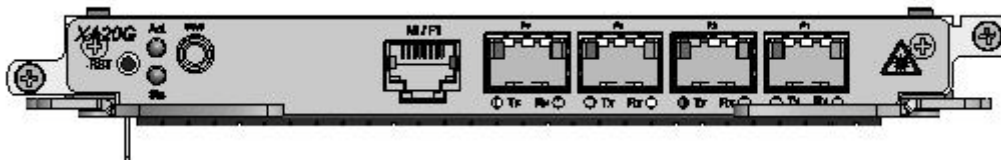


 **STATIC DISCHARGE WARNING:** Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of XA20G is shown below.

Figure 14: XA20G - Front Panel



Power Specifications

Table 24: Power Specifications- XA20G

Specification	Range
Input Voltage	12 V \pm 5%
Power consumption	30 W Maximum

Visual Indicator Details

The visual indicators on the XA20G card include two LEDs, the ACTIVE and the STATUS LEDs for alarm indication. There are another two LEDs namely Tx and Rx for Laser status indication.

Table 25: LED status and their significance- XA20G

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)	Amber (Steady)
Card in Master service: Initialization complete and card in service as Master.	Green	Green
Card in Slave service: Initialization complete and card in service as Slave.	Green	Off
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

Table 26: Transmit and Receive Laser status- XA20G

State	Rx LED	Tx LED
SFP present (Laser on) with Rx LOS	Amber	Green
SFP present (Laser off) with Rx LOS	Amber	Off
SFP present (Laser on) with no Rx LOS	Green	Green
SFP present (Laser off) with no Rx LOS	Green	Off
SFP missing (LOS detected), Laser On (attempted)	Amber	Green
SFP missing (LOS masked since SFP missing and set to Admin_down), Laser Off (attempted)	Amber	Off
SFP failed (whether provisioned, unprovisioned, LOS or no LOS)	Red	Red

Optical Interface (1xSTM-16/OC-48 mode)

XA20G supports one (P4) optical transceiver operating at STM-16/OC-48 line rate.

Optical Interface (1xSTM-4/OC-12 mode)

XA20G supports two optical transceivers operating at STM-4/OC-12 line rate.

Optical Interface (2xSTM-1/OC-3 mode)

XA20G supports two optical transceivers operating at STM-1/OC-3 line rate.

Digital Diagnostics

All diagnostic features of SFP optics (Receive power measurement, back facet, laser bias, temperature) can be monitored.

Functional Description

XA20G card supports the following functional features:

- ▶ Supports 1xSTM-16/OC-48 + 1xSTM-4/OC-12 + 2xSTM-1/OC-3 interfaces
- ▶ Supports reset of traffic with a reset switch
- ▶ Supports diag-audio jack
- ▶ Supports craft (MI/F1) interface
- ▶ Supports redundancy

Cross Connect Card - XA60G

The XA60G is the cross-connect and aggregate card for the product. The card consists of the cross-connect sub-system and the timing sub-system. Port P5 supports STM-64/OC-192 interface, Ports P4 and P3 supports STM-1/4/16/OC-3/12/48 interface and P1 and P2 supports STM-1/4/OC-3/12 interface. The front panel consists of one XFP port (P5) and four SFP ports (P1 to P4). The card supports an uplink capacity of 60G. The card supports redundancy.

NOTE: Port P5 supports STM-64/OC-192 irrespective of P1-P4 port rates.

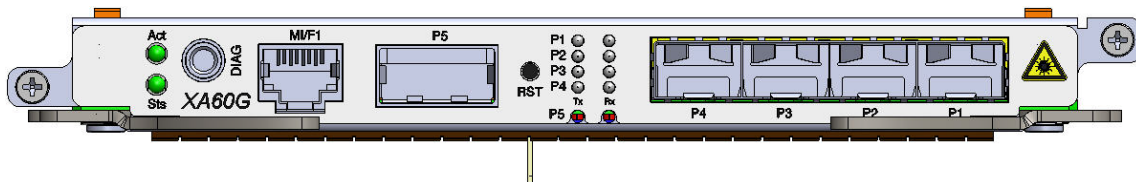


STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of XA60G is shown below.

Figure 15: Front Panel- XA60G



Power Specifications

Table 27: Power Specifications- XA60G

Specification	Range
Input Voltage	12 V \pm 5%
Power consumption	70 W Maximum

Visual Indicator Details

The visual indicators on the XA60G card include two LEDs, the ACTIVE and the STATUS LEDs for alarm indication.

Table 28: LED status and their significance- XA60G

Card State	All Card Types	Redundancy	
	Status LED	Active LED - Master	Active LED - Slave
Power On: First LED activity noticed on card insertion.	Off for less than 10 seconds and then Amber	Off for less than 10 seconds and then Amber	Off for less than 10 seconds and then Amber
Card Oos (admin Down): Initialization Complete And Circuit Pack In Out-of-service State (and Not Failed).	Green	Off	Off
Card Is: Initialization Complete And Circuit Pack In-service (and Not Failed)	Green	Green	Off (indicating Slave)
Circuit Pack Mis-match	Amber	Amber	Amber
Pack Fail During Boot-up	Red	Amber	Amber
Card Oos (admin Down): Circuit-pack Out Of Service And Failed	Red	Off	Off
Card Fail: Circuit Pack Failed While In-service (this May Happen With The Only Master Card)	Red	Green	Off
Hard Reset: All Devices Reset, Fpgas Cleared And Reprogrammed. Node Goes To Initializing State Next.	Amber	Amber	Amber
Soft Reset: Software Is Restarted, Devices Are Re-initialized With Provisioning. Node Goes To Initializing State Next.	Amber	Amber	Amber

There are two LEDs namely Tx and Rx for Laser status indication.

Table 29: SFP Port Transmitter (Tx) and Receiver (Rx) LED Status- XA60G

State	Receiver LED Status	Transmitter LED Status
SFP present (Laser on) with Rx LOS	Amber	Green
SFP present (Laser off) with Rx LOS	Amber	Off
SFP present (Laser on) with no Rx LOS	Green	Green
SFP present (Laser off) with no Rx LOS	Green	Off
SFP missing (LOS detected), Laser On (attempted)	Amber	Green
SFP missing (LOS masked since SFP missing and set to Admin_down), Laser Off (attempted)	Amber	Off

State	Receiver LED Status	Transmitter LED Status
SFP present (Laser on) with Rx LOS	Amber	Green
SFP failed (whether provisioned, unprovisioned, LOS or no LOS)	Red	Red

Optical Interface (1xSTM-64/OC-192 mode)

XA60G supports one optical transceiver operating at STM-64/OC-192 line rate.

Optical Interface (2xSTM-4/16/OC-12/48 mode)

XA60G supports two optical transceivers operating at STM-4/16/OC-12/48 line rate.

Optical Interface (2xSTM-1/4/OC-3/12 mode)

XA60G supports two optical transceivers operating at STM-1/4/OC-3/12 line rate.

Digital Diagnostics

All diagnostic features of SFP optics (Receive power measurement, back facet, laser bias, temperature) can be monitored.

Functional Description

XA60G card supports the following functional features:

- ▶ Supports live insertion
- ▶ Supports reset of processor with a reset switch
- ▶ Supports diag-audio jack
- ▶ Supports craft (MI/F1) interface

Chapter 7

PDH Tributary Cards


This chapter gives an overview of the features and functional description of the PDH Tributary cards.

IN THIS CHAPTER

E1/DS1 Tributary Card – ST63E1	57
E3/DS3 Tributary Card – ST6E3	59

E1/DS1 Tributary Card – ST63E1

This section gives an overview of the features and functional description of the ST63E1 card. The card provides sixty three E1/DS1 interfaces.



STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup

Front Panel

The front panel diagram of ST63E1 card is shown below.

Figure 16: Front Panel- E1/DS1



Power Specifications

Table 30: Power Specifications- ST63E1

Specification	Range
Input Voltage	12 V \pm 5%
Power consumption	16W Maximum

Visual Indicator Details

The visual indicators on the ST63E1 card include two LEDs, the ACTIVE and the STATUS LEDs.

Table 31: LED status and their significance- ST63E1

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion.	Amber (Steady)	Amber (Steady)
Card in service: Initialization complete and card in service.	Green (Steady)	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

Functional Description

Interfaces

The ST63E1 card provides line interface to sixty three E1/DS1 channels in both add and drop directions. The E1/DS1 interface is provided through LFH connector.

Functional Description

The ST63E1 provides the following functional features:

- ▶ Transporting both framed and unframed E1/DS1 traffic
- ▶ E1/DS1 interface can be nominated as a timing source
- ▶ Performance monitoring for errors and alarm conditions
- ▶ Software configurable E1/DS1 mode

E3/DS3 Tributary Card – ST6E3

This section gives an overview of the features and functional description of the ST6E3 card. The card provides six E3/DS3 interfaces. E3/DS3 signals are fed through the SMB connectors.

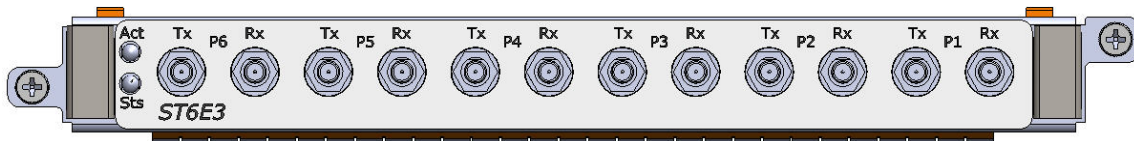


STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup

Front Panel

The front panel diagram of ST6E3 card is shown below.

Figure 17: Front Panel- ST6E3



Power Specifications

Table 32: Power Specifications- ST6E3

Specification	Range
Input Voltage	12 V \pm 5%
Power consumption	8.5 W Maximum

Visual Indicator Details

The visual indicators on the ST6E3 card include two LEDs, the ACTIVE and the STATUS LEDs.

Table 33: LED status and their significance- ST6E3

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)	Amber (Steady)
Card in service: Initialization complete and card in service	Green (Steady)	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card	Amber	Amber
Card failed during boot up	Red	Amber
Card failed while in-service	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next	Amber	Amber

Interfaces

The ST6E3 card provides line interface to six E3/DS3 channels in both add and drop directions. The E3/DS3 interface is provided through SMB connector.

Functional Description

The ST6E3 provides the following functional features:

- ▶ Transporting both framed and unframed E3/DS3 traffic
- ▶ Performance monitoring for errors and alarm conditions
- ▶ Software configurable E3/DS3 mode

Chapter 8

Optical Tributary Card

This chapter gives an overview of the features and functional description of the optical tributary card.



STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

IN THIS CHAPTER

Optical Tributary Card - SOT18.....61

Optical Tributary Card - SOT18

This section gives an overview of the features and functional description of the optical tributary card SOT18. SOT18 card provides 8xSTM-1/OC-3/ 2xSTM-4/OC-12/ 1xSTM-16/OC-48 line interfaces in both transmit and receive directions.

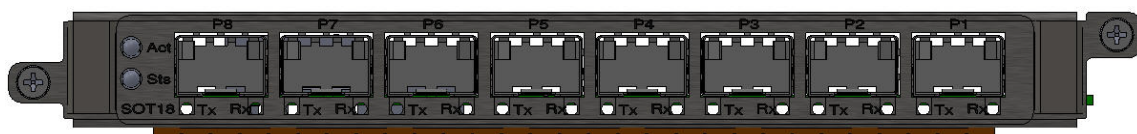


STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of SOT18 card is shown below.

Figure 18: Front Panel - SOT18 Card



Power Specifications

Table 34: Power Specifications- SOT18

Specification	Range
Input Voltage	12 V \pm 10%
Power consumption	17 W Maximum

Visual Indicator Details

The visual indicators on the SOT18 card include two LEDs: ACTIVE and STATUS.

Table 35: LED status and their significance- SOT18

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)	Amber (Steady)
Card in service: Initialization complete and card in service.	Green (Steady)	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

Card Configuration

SOT18 card can be field configured by using different SFP plug-ins to operate as either 8xSTM-1/OC-3 or 2xSTM4/OC-12 or 1xSTM-16/OC-48 or 8xSTM-1/OC-3/ 4xSTM-1/OC-3+1xSTM-4/OC-12/ 1xSTM-4/OC-12+4xSTM-1/OC-3/ 2xSTM-4/OC-12. In STM-4/OC-12 mode, SFPs of STM-4/OC-12 capacity is plugged in at ports 1 and 5.

- ▶ **STM-1/OC-3 Optical Interface:** SOT18 has eight LC connectors operating at STM-1/OC-3 line rate.
- ▶ **STM-4/OC-12 Optical Interface:** SOT18 has ports 1 and 5 with LC connectors operating in STM-4/OC-12 line rate.
- ▶ **STM-16/OC-48 Optical Interface:** SOT18 has port 1 with LC connectors operating in STM-16/OC-48 line rate.

NOTE: Some long haul SFPs will not measure receive power beyond (-8.5 dbm). Hence before connecting long haul lasers, check the receive power with the optical power meter.



OPTICAL SAFETY: Don't stare or look directly into the optical connector output beam, as this can cause irreparable damage to your eyes and even loss of eye sight.

Table 36: SFP Port Transmitter (Tx) and Receiver (Rx) LED Status- SOT18

State	Rx LED	Tx LED
SFP present (Laser on) with Rx LOS	Amber	Green
SFP present (Laser off) with Rx LOS	Amber	Off
SFP present (Laser on) with no Rx LOS	Green	Green
SFP present (Laser off) with no Rx LOS	Green	Off
SFP missing (LOS detected), Laser On (attempted)	Amber	Green
SFP missing (LOS masked since SFP missing and set to Admin_down), Laser Off (attempted)	Amber	Off
SFP failed (whether provisioned, unprovisioned, LOS or no LOS)	Red	Red

Functional Description

SOT18 card processes the received STM-1/OC-3/STM-4/OC-12/STM-16/OC-48 frame for all alarms and performance monitoring signals. SOT18 card supports the following functional features:

- ▶ Laser On/Off control for safety requirements
- ▶ Laser optical power and temperature monitoring
- ▶ Overhead byte processing for DCC-R, DCC-M and F1/F2/F2F3 channels
- ▶ Pointer processing, performance monitoring and POH termination
- ▶ Overhead bytes tunneling from different optical interfaces across the base chassis
- ▶ SDH data path which has independent ADD and DROP capacity to support both unidirectional and bi-directional cross-connects
- ▶ Supports live insertion

Chapter 9

Ethernet Cards

This chapter gives an overview of the features and functional description of the Ethernet cards.

IN THIS CHAPTER

Ethernet Transport Card - CEL-1	65
Ethernet Switching Card - CEF-1	68

Ethernet Transport Card - CEL-1

This section describes the features and functional description of the Ethernet tributary card CEL-1. The CEL-1 consists of 2xGE (Optical, 1000 Mbps) + 1xGE (Electrical, 10/100/1000 Mbps) + 3xFE (Electrical, 10/100 Mbps) ports. The card supports STM-16/OC-48 uplink bandwidth.

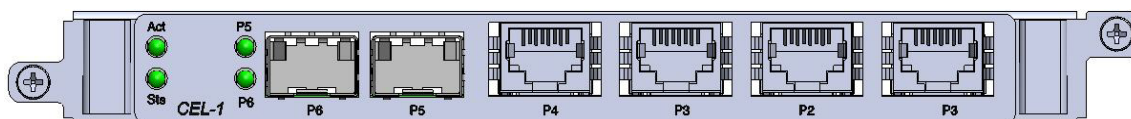


STATIC DISCHARGE WARNING: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of CEL-1 card is shown below.

Figure 19: Front Panel- CEL-1



Power Specifications

Table 37: Power Specifications- CEL-1

Specification	Range
Input Voltage	12 V \pm 10%
Power consumption	25 W Maximum

Visual Indicator Details

The visual indicators on the CEL-1 card include an STATUS LED.

Table 38: LED status and their significance-CEL-1

Card State	Status LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)
Card in service: Initialization complete and card in service.	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card.	Amber
Card Admin down: Initialization complete and circuit pack in out-of-service state (and not failed).	Green
Card fail during boot up.	Red
Card failed while in-service.	Red
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber
Card Admin down: circuit-pack out of service and failed	RED
Soft Reset: Software is restarted, devices are re-initialized with provisioning. Node goes to Initializing state next.	Amber

Ethernet Interface (Optical)

CEL-1 card supports 2xGE (Optical, 1000 Mbps) optical interfaces. The optical interface is supported through SFP modules. LED for optical port is used to indicate admin status of the port.



OPTICAL SAFETY: Don't stare or look directly into the optical connector output beam, as this can cause irreparable damage to your eyes and even loss of eye sight.

Table 39: SFP port LED status- CEL-1

State	Receiver LED status	Transmitter LED status
SFP present (Laser on) with Rx LOS	Amber	Green
SFP present (Laser off) with Rx LOS	Amber	Off
SFP present (Laser on) with no Rx LOS	Green	Green
SFP present (Laser off) with no Rx LOS	Green	Off
SFP missing (LOS detected), Laser On (attempted)	Amber	Green
SFP missing (LOS masked since SFP missing and set to Admin_down), Laser Off (attempted)	Amber	Off

State	Receiver LED status	Transmitter LED status
SFP failed (whether provisioned, unprovisioned, LOS or no LOS)	Red	Red

Ethernet Interface (Electrical)

CEL-1 card supports 1x10/100 Base-Tx/1000 Base-T + 3 x 10/100 Base-Tx electrical interfaces. The electrical interface is supported through RJ-45 connectors.

Table 40: Ethernet interface LED status- CEL-1

LED Color		
Green	Amber	Status
Off	Off	Admin Down Or Admin Up, Link is down
On	Off	Admin Up, Link Up, No Activity on Link
On	Blinking	Admin Up, Link Up, Activity present on Link

Functional Description

CEL-1 card maps and de-maps the Ethernet data into the virtual containers of lower and higher order of the SDH frame.

CEL-1 card supports following functional features:

- ▶ VCGs supported in both SDH and SONET mode
- ▶ Virtual concatenation for SDH/SONET
- ▶ Jumbo frames up to 9216 bytes
- ▶ Higher order and lower order virtual concatenation
- ▶ Auto-negotiation and flow control

Ethernet Switching Card - CEF-1

This section describes the features and functional description of the Ethernet switching card CEF-1. The CEF-1 consists of 4 FE Electrical (10/100Base-Tx) and 2 GE Optical (1000Base-X) ports. CEF-1 card supports a switching capacity of 5G. The card supports STM-4/16/OC-12/48 uplink bandwidth. Signal connections uses High Speed connector. For power connections, a 12-pin power connector is used which receives 12V input from the backplane.

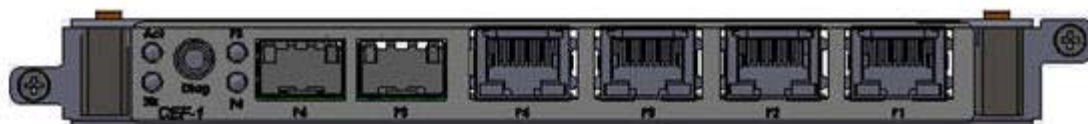


STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of CEF-1 card is shown below.

Figure 20: Front Panel- CEF- 1



Power Specifications

Table 41: Power Specifications- CEF-1

Specification	Range
Input Voltage	12 V \pm 10%
Power consumption	30 W Maximum

Visual Indicator Details

The visual indicators on the CEF-1 card include two LEDs: ACTIVE and STATUS.

Table 42: LED status and their significance- CEF-1

Card State	Status LED	Active LED
Card initialization: State before the card initialize is complete on card insertion	Amber (Steady)	Amber (Steady)
Card in service: Initialization complete and card in service.	Green (Steady)	Green (Steady)
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber
Card failed during boot up.	Red	Amber
Card failed while in-service.	Red	Green
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber

Ethernet Interface (GE- Optical)

CEF-1 card supports two 1000 Mbps optical interfaces. The optical interface is supported through LC connectors. LED for optical port is used to indicate admin status of the port.



OPTICAL SAFETY: Don't stare or look directly into the optical connector output beam, as this can cause irreparable damage to your eyes and even loss of eye sight.

Table 43: SFP Port LED Status- CEF-1

LED Color	Status
Off	Admin down
Amber	Admin Up, Link Down
Green	Admin Up, Link Up
Red	Transmitter Laser Fault

Ethernet Interface (4 x 10/100 Base-Tx/1000 Base-T)

CEF-1 card supports four 10/100 Base-Tx/1000 Base-T electrical interfaces. The electrical interface is supported through RJ-45 connectors.

Table 44: Ethernet interface LED status- CEF-1

LED Color		
Green	Amber	Status
Off	Off	Admin Down Or Admin Up, Link is down
On	Off	Admin Up, Link Up, No Activity on Link
On	Blinking	Admin Up, Link Up, Activity present on Link

Functional Description

CEF-1 card supports following functional features:

- ▶ CEF-1 card has L2 switching capability
- ▶ Jumbo frames up to 9216 bytes
- ▶ Supports diag-audio jack
- ▶ L2 Physical parameters: auto-negotiation and flow control

Chapter 10

TJ1400 (Type-5SEP) Expansion Chassis

This chapter describes the TJ1400 (Type-5SEP) expansion chassis.

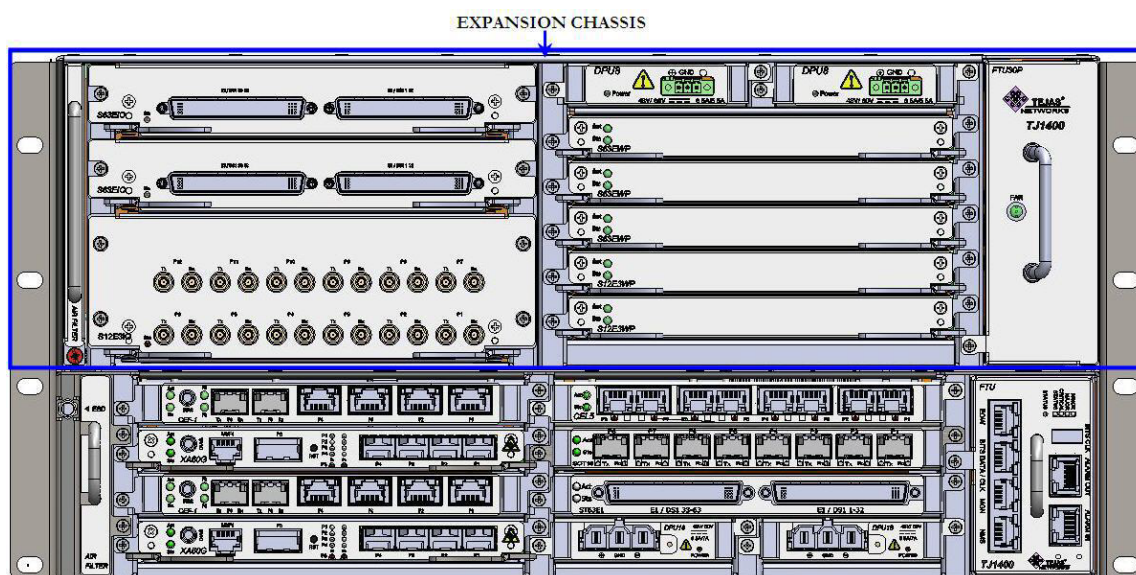
IN THIS CHAPTER

Introduction	71
Power Supply Unit- DPU8	73
Fan Tray Unit-FTU30P	77
PDH Tributary Card - S63EWP	79
Protection IO Card - S63EIO	81
PDH Tributary Card - S12E3WP	82
Protection IO Card - S12E3IO	85

Introduction

TJ1400 (TYPE-5SEP) is a 3U add-on chassis used in the TJ1400 series of products. TJ1400 (TYPE-5SEP) is powered from the PSU slots provided in the chassis.

Figure 21: Expansion Chassis



NOTE: The Expansion chassis will be shipped as plugged into the Base chassis.

Slot ID Diagram

Figure 22: Slot ID for TJ1400 (TYPE 5SEP)

S101	S105	S106	S112
S102	S107		
	S108		
S103	S109		
S104	S110		
	S111		

NOTE: Ensure that all unused slots (I/O or Trib side) are closed with appropriate fillers.

Physical Dimensions

Table 45: Physical dimensions details of TJ1400 (TYPE-5SEP)

Dimension	Values
Height	132 mm
Width	438mm
Depth	204 mm

Cards Overview

Table 46: Cards Overview of TJ1400 (TYPE-5SEP)

Cards	Features
DPU8	<ul style="list-style-type: none"> Supports 250 W power output, 12 V output voltage
S63EWP	<ul style="list-style-type: none"> Supports 63 ports of E1/DS1 WP channels Provides 1:2 and 1: 4 Protection scheme
S63EIO	<ul style="list-style-type: none"> Provide I/O for 63 ports 120 Ohms E1/DS1 channels
S12E3WP	<ul style="list-style-type: none"> Supports 12 ports of E3/DS3 WP channels Provides 1:1 Protection.
S12E3IO	<ul style="list-style-type: none"> Provide I/O for 12 Port E3/DS3 channels Provides 1:2 and 1:4 protection

NOTE: PDH cards (ST63E1 and ST6E3), SDH card (SOT18) and Ethernet card (CEL-1) are used in Type-5SEP system. If in case the IO cards are not used, then use the appropriate I/O fillers in its place.

Power Supply Unit- DPU8

The DC Power Supply Unit (DPU8) is a part of the common unit of TJ1400 network element. The DPU8 supports load sharing on redundancy basis i.e. if one PSU fails, other will be the active load driver and provides a stable DC power to other cards in the system. The DPU8 is also referred as PSU. The PSU delivers 250 W power output, 12 V output voltage.

NOTE: Do not jack out/jack in DPU8 with Power Cable connected to the Card. This could damage the DPU8 and create safety hazards.



DANGER: Do not jack-in/jack-out PSU/PFU card in the system with Power Cable connected. PSU/PFU have high energy and/or voltage level that can cause serious electrocution or burn.



CAUTION: When removing a card, the unit should not be replaced into the system for at least 5 seconds to ensure that unit capacitors have discharged. Always disconnect (unplug) the power to DPU8 module before removing (or) inserting into its respective slot.



STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.



HOT SURFACE: Do not touch the heat sinks on the unit just after removal.

Front Panel

The front panel of this unit provides a power connector and a local safety ground connection.

Figure 23: Front Panel- DPU8



Operating parameters

Table 47: Operating parameters

Parameter	Specification
Input voltage range	-40V to -72V DC
Output voltage	12V
Output power	250 W Maximum
Fuse	10 Amps fuse

Functional Description

The DPU8 consists of a single output DC-DC converter and all the cards including the base card have hot-swap controller and buck converters as required. The output voltage is set to 12 V. The cards are required to derive the suitable voltages from the stable 12 V supplied by the DPU8.

Protection

DPU8 has the following protections:

- Output short-circuit
- Output over-current
- Input reverse polarity
- Input over-voltage
- Input under-voltage
- Inrush limiting
- Over-temperature
- Non-latching thermal shutdown

Operational specifications

Table 48: Operational specifications- DPU8

Specification	Range
Input voltage range	-40 V to -72 V DC
Reverse polarity protection	Continuous
Input current	8.2A continuous, 10A Max. During normal operation
Operating temperature range	0°C to 50°C
Output voltage	12 V \pm 0.6 V
Output current	21A
Ripple	120mV _{p-p}
Dynamic response	1000mV _{p-p} (50% to 100% Load step)
Efficiency	$\geq 85\%$ @ >50% Load when input is 48V
Fuse	10 A Fast Acting Fuse
Under voltage protection	<ul style="list-style-type: none"> ▶ Recovery: 38V \pm 2V ▶ Shutdown: Recovery - 4V
Over voltage protection	<ul style="list-style-type: none"> ▶ Recovery: 72V \pm 2V ▶ Shutdown: Recovery + 4V
EMI/EMC/Safety compliance	<ul style="list-style-type: none"> ▶ IEC 60950-1 ▶ EN 60950-1 ▶ UL 60950-1 ▶ In-rush Current limiting as per ETSI EN 300 132-2 ▶ ETSI EN 300 386 requirements as applicable (equipments operating in telecommunication centers) ▶ ETSI EN 300 019 Part 1-1 ▶ EN55022 Class A ▶ EN61000-4-4 (500V) ▶ ESD (4.0 kV contact discharge and 8.0kV Air Discharge)
Hold-up time (Interruption)	2ms at 54V and above
Power interface	One no. of 3-pin Single level connector Phoenix 1827871.
Protections	<ul style="list-style-type: none"> ▶ Over-temperature at 115°C \pm 10°C and hysteresis of 15°C min (Auto-recovery) ▶ Output Short-Circuit (Latched Protection) ▶ Output Over-Current (26A \pm 2A, Latched Protection) ▶ Output Over-Voltage (13.6\pm 0.6V, Latched Protection) ▶ Input Reverse Polarity (Continuous) ▶ Input Under/Over voltage (Auto Retry Mode)

Specification		Range	
Status indication	This is with redundant power supply in the system		
	LED	Color	Remarks
	Status	RED	<ul style="list-style-type: none">▶ When the card is jacked in without input feed▶ output voltage out of range▶ Red will blink if card goes for over current protection
		GREEN	<ul style="list-style-type: none">▶ Card is working fine▶ Green will blink when the card goes down because of input voltage protection
		RED and GREEN	<ul style="list-style-type: none">▶ Red and Green will blink alternatively if card goes for over temperature protection
	If there is no redundant power supply in the system		
	LED	Color	Remarks
	Status	RED	<ul style="list-style-type: none">▶ output voltage out of range▶ Red will blink if card goes for over current protection
		GREEN	<ul style="list-style-type: none">▶ Card is working fine▶ Green will blink when the card goes down because of input voltage protection
		RED and GREEN	<ul style="list-style-type: none">▶ Red and Green will blink alternatively if card goes for over temperature protection
		BLANK	If input is not present

Fan Tray Unit-FTU30P

The Fan Tray Unit (FTU30P) is used in the TJ1400 (TYPE-5SEP) network element to cool the equipment. The TJ1400 (TYPE-5SEP) supports six fans. Alarm will be raised in case of over temperature and fan fail.



ROTATING PART: Keep fingers, screwdrivers, and other objects away from the openings in the fan tray assembly. The fans might still be turning when you remove the fan assembly from the chassis.

Front Panel

The front panel diagram of FTU30P is shown below.

Figure 24: Front Panel- FTU30P



Power Specifications

Table 49: Power Specifications- FTU30P

Specification	Range
Input Voltage	12 V
Power consumption	52 W Maximum

Visual Indicator details

The Front Panel interface consists of LED display. A bicolor LED is used to display the FAN status.

Table 50: LED indications and their status- FTU30P

LED	Color	Status
Status	Green	Fan active
	Red	Fan fail
	Amber	Power on

Functional Description

The following are the functional features of FTU30P:

- ▶ Supports six fans
- ▶ Fan speed monitoring and control through software, based on the temperature sensed
- ▶ Temperature monitoring on the airflow path
- ▶ Field replaceable

PDH Tributary Card - S63EWP

This section provides an overview of the features and functional description of the S63EWP card. S63EWP tributary card supports 63 ports of E1/DS1 WP channels in 120 ohm configurations. S63EWP card can be plugged into the slots S107, S108, S109, S110 and S111 of the TJ1400 (TYPE-5SEP) depending on Protection configuration as shown in the Slot ID diagram. For 252 E1/DS1 with 1: 4 Protection scheme, all slots will be equipped with S63EWP cards and slot S107 is used as Protect slot. In case of 126 E1/DS1 with 1:2 protection scheme, slots S108, S109 (with S63EIO in S101, S102) are used as work slots and slot S107 is used as protect slot.



STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of S63EWP card is shown below.

Figure 25: S63EWP



Power Specifications

Table 51: Power Specifications for S63EWP

Specification	Range
Input Voltage	12 V \pm 10%
Power consumption	16 W Maximum

Visual Indicator Details

The visual indicators on the S63EWP card include two LEDs: ACTIVE and STATUS.

Table 52: LED status and their significance- S63EWP

Card State	Status LED	Active - Work Card	Active - Protect Card
Card initialization: State before the card initialize is complete on card insertion.	Amber (Steady)	Off	Off
Card in service: Initialization complete and card in service.	Green (Steady)	Green	Off
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber	Amber
Card failed during boot up.	Red	Amber	Amber
Card failed while in-service.	Red	Green	Off
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber	Amber

Functional Description

S63EWP card supports the following functional features:

- ▶ Supports 63 E1/DS1 ports
- ▶ Supports live insertion and hot-swap capability

Protection IO Card - S63EIO

S63EIO card is a 63 E1/DS1 protection IO card. The E1/DS1 ports from the line side interface are switched to either work or protect tributary card depending on the control from the Control Card. Four S63EIO cards in TJ1400 (Type-5SEP) provides 1:4 protection on system.

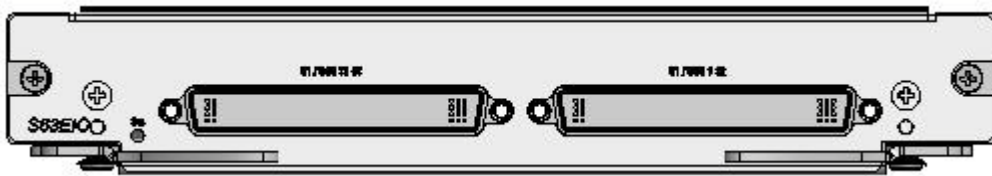


STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of S63EIO card is shown below.

Figure 26: Front Panel- S63EIO



Power Specifications

Table 53: Power Specifications- S63IO

Specification	Range
Input Voltage	12 V \pm 10%
Power consumption	6.8 W Maximum

Visual Indicator Details

The visual indication on the S63EIO card is provided by a single STATUS LED.

Table 54: LED indications and their status- S63IO

LED	Color	LED Status
Status	Amber	Power on
	Green	Card is active
	Red	Hardware error
	OFF	Card is Off

E1/DS1 Interface

S63EIO card provides line interface to E1/DS1 channels in both add and drop directions.

Functional Description

S63EIO card has the following functional features:

- ▶ Surge protection for all the channels
- ▶ Isolation and impedance conversion
- ▶ Switching of I/O channels to work and protect cards
- ▶ Supports only 120 Ohm E1/DS1 ports.
- ▶ Inventory ROM
- ▶ Failure indication LED

PDH Tributary Card - S12E3WP

This section provides an overview of the features and functional description of the S12E3WP card. S12E3WP tributary card supports 12 ports of E3/DS3 WP channels in 75 ohm configurations. S12E3WP card can be plugged into the slots S108, S109, S110 and S111 of the TJ1400 (Type-5SEP) depending on Protection configuration as shown in the Slot ID diagram. For 24 E3/DS3 with 1: 1 Protection scheme, populate all the four slots S108, S109, S110 and S111 slots with S12E3WP cards. S109 is work slot and corresponding protect slot is S108; similarly S111 is the work slot and the corresponding protect slot is S110. For 12 E3/DS3 with 1:1 protection populate S110 and S111 with S12E3IO in S104 or S108 and S109 with S12E3WP cards with S12E3IO in S102 slot. S111 is work slot and S110 is used as Protect slot or S109 is work slot and S108 is used as Protect slot.



STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of S12E3WP card is shown below.

Figure 27: S12E3WP



Power Specifications

Table 55: Power Specifications for S12E3WP

Specification	Range
Input Voltage	12 V \pm 10%
Power consumption	25 W Maximum

Visual Indicator Details

The visual indicators on the S12E3WP card include two LEDs: ACTIVE and STATUS.

Table 56: LED status and their significance- S12E3WP

Card State	Status LED	Active - Work Card	Active - Protect Card
Card initialization: State before the card initialize is complete on card insertion.	Amber (Steady)	Off	Off
Card in service: Initialization complete and card in service.	Green (Steady)	Green	Off
Card mis-match: Network Element has already configured the slot with some other card.	Amber	Amber	Amber
Card failed during boot up.	Red	Amber	Amber
Card failed while in-service.	Red	Green	Off
Hard Reset: All devices reset, FPGAs cleared and reprogrammed. Goes to initializing state next.	Amber	Amber	Amber

Functional Description

S12E3WP card supports the following functional features:

- ▶ Supports 12 ports of 75 ohms E3/DS3 signals
- ▶ Supports live insertion and hot-swap capability

Protection IO Card - S12E3IO

S12E3IO card is a 12 E3/DS3 protection IO card. The E3/DS3 ports from the line side interface are switched to either work or protect tributary card depending on the control from the Control Card. Two S12E3IO cards in TJ1400 (Type-5SEP) provides 1:1 Protection for 24 E3 ports. One S12E3IO card in TJ1400 (Type-5SEP) provides 1:1 Protection for 12 E3 ports. The power consumption is 8W Maximum.

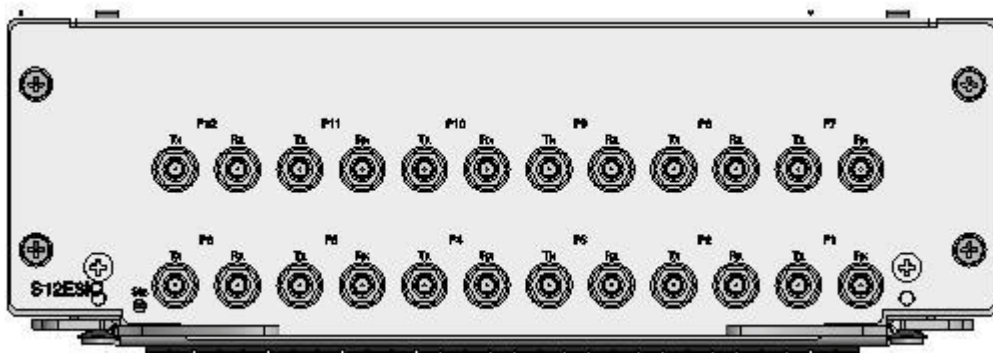


STATIC DISCHARGE DAMAGE: Static charge can damage the equipment. While handling cards for making system interconnections, wear an ESD strap to discharge the static buildup.

Front Panel

The front panel diagram of S12E3IO card is shown below.

Figure 28: S12E3IO



Power Specifications

Table 57: Power Specifications- S12E3IO

Specification	Range
Input Voltage	12 V \pm 10%
Power consumption	25 W Maximum

Visual Indicator Details

The visual indication on the S12E3IO card is provided by a single STATUS LED.

Table 58: LED indications and their status- S63IO

LED	Color	LED Status
Status	Amber	Power on
	Green	Card is active
	Red	Hardware error
	OFF	Card is Off

E3/DS3 Interface

S12E3IO card provides line interface to E3/DS3 channels in both add and drop directions.

Functional Description

S12E3IO card has the following functional features:

- ▶ Surge protection for all the channels
- ▶ Isolation and impedance conversion
- ▶ Switching of I/O channels to work and protect cards
- ▶ Supports only 75 Ohm E3/DS3 ports.
- ▶ Inventory ROM
- ▶ Failure indication LED

NOTE: PDH cards (ST63E1 and ST6E3), SDH card (SOT18) and Ethernet card (CEL-1) can be used in Type-5SEP system as normal Trib cards without any protection. In such scenario, fill the empty IO and WP slots with filler panels.

Appendix I

Optical Interface Specifications

STM-1/OC-3 Optical interface specifications

Table 59: STM-1/OC-3 optical interface specifications for the SFP used

Specifications	S1.1	L1.1	L1.2
Minimum Output Power	-15 dBm	-5 dBm	-5 dBm
Maximum Output Power	-8 dBm	0 dBm	0 dBm
Receiver Sensitivity	-28 dBm	-34 dBm	-34 dBm
Receiver Overload	-8 dBm	-10 dBm	-10 dBm
Wavelength (nominal)	1310 nm	1310 nm	1550 nm
Connector Type	LC	LC	LC
Fiber Type	Single mode	Single mode	Single mode

STM-4/OC-12 Optical interface specifications

Table 60: STM-4/OC-12 optical interface specifications for the SFP used

Specifications	S4.1	L4.1	L4.2
Minimum Output Power	-15 dBm	-3 dBm	-3 dBm
Maximum Output Power	-8 dBm	+2 dBm	+2 dBm
Receiver Sensitivity	-28 dBm	-28 dBm	-28 dBm
Receiver Overload	-8 dBm	-8 dBm	-8 dBm
Wavelength (nominal)	1310 nm	1310 nm	1550 nm
Connector Type	LC	LC	LC
Fiber Type	Single mode	Single mode	Single mode

STM-16/OC-48 Optical interface specifications

Table 61: STM-16/OC-48 optical interface specifications for the SFP used

Specifications	S16.2	L16.1	L16.2
Minimum Output Power	-5 dBm	-2 dBm	-2 dBm
Maximum Output Power	0 dBm	3 dBm	3 dBm
Receiver Sensitivity	-18 dBm	-27 dBm	-28 dBm
Receiver Overload	0 dBm	-7 dBm	-7 dBm
Wavelength (nominal)	1550 nm	1310 nm	1550 nm
Connector Type	LC	LC	LC
Fiber Type	Single mode	Single mode	Single mode

STM-64/OC-192/10GE Optical interface specifications

Table 62: STM-64/OC-192/10GE Optical interface specifications for the XFP

Specifications	S64.1/10km	S64.2a/20km	S64.2b/40km	L64.1/40km	L64.2/80km
Minimum Output Power	1 dBm	-5 dBm	-1 dBm	4 dBm	-2 dBm
Maximum Output Power	5 dBm	-1 dBm	2 dBm	7 dBm	2 dBm
Receiver Sensitivity	-11 dBm	-18 dBm	-14 dBm	-19 dBm	-26 dBm
Receiver Overload	-1 dBm	-8	-1	-10 dBm	-9 dBm
Wavelength (nominal)	1310 nm	1550nm	1550nm	1310 nm	1550 nm
Connector Type	LC	LC	LC	LC	LC
Fiber Type	Single mode	Single mode	Single mode	Single mode	Single mode

Glossary of Terms

B

BITS

Building Integrated Timing Supply (BITS) is a clock in a central location that supplies E1 and/or composite clock timing references to all synchronous network elements in that location.

C

CRC

Cyclic Redundancy Check (CRC) is an error-detecting code commonly used in digital networks and storage devices to detect accidental changes to raw data. Blocks of data entering these systems get a short check value attached, based on the remainder of a polynomial division of their contents; on retrieval the calculation is repeated, and corrective action can be taken against presumed data corruption if the check values do not match.

CSMA/CD

Carrier Sense Multiple Access/Collision Detection (CSMA/CD) are a set of rules determining how network devices respond when two devices attempt to use a data channel simultaneously (called a collision). Standard Ethernet networks use CSMA/CD to physically monitor the traffic on the line at participating stations. If no transmission is taking place at the time, the particular station can transmit.

D

DCC-M

Data Communication Channel Multiplex Section/Line (DCC_M) are the bytes in SDH frame that enable OAM communication between individual network elements as well as inter network element communication. The bytes D4-D12 in multiplex section are used to set the DCC_M communication channel.

DCC-R

Data Communication Channel Regenerator Section (DCC_R) are the bytes in SDH frame that enable OAM communication between individual network elements as well as inter network element communication. The bytes D1-D3 in regenerator section are used to set the DCC_R communication channel.

E

ELAN

Emulated Local Area Network (ELAN) An emulated LAN is a set of clients and servers connected by virtual circuits over a network.

L

LCAS

Link Capacity Adjustment Scheme (LCAS) is a method to dynamically increase or decrease the bandwidth of virtual concatenated containers. It allows on-demand increase or decrease of the bandwidth of the virtual concatenated group in a hitless manner. This brings bandwidth-on-demand capability for data clients like Ethernet when mapped into TDM containers.

LED

Light Emitting Diode (LED) is a semiconductor device that emits visible light when an electric current passes through it. LEDs are used as visual indicators in network elements.

N

NMS

Network Management System (NMS) provides an integrated management of Element Management Systems (EMS) across an intelligent optical network. NMS collects and represents management data from geographically dispersed EMSs on to a centralized database.

O

OAM

Operation Administration Maintenance (OAM) is a group of management functions that provide node or network the functionality of fault indication, performance monitoring, security management and diagnostic functions. It is a popular framework among service providers for their network management systems.

P

PCM

Pulse Code Modulation (PCM) is a digital representation of an analog signal where the magnitude of the signal is sampled regularly at uniform intervals, then quantized to a series of symbols in a digital (usually binary) code.

PDH

Plesiochronous Digital Hierarchy (PDH) is a technology used in telecommunications networks to transport large quantities of data over digital transport equipment such as fibre optic and microwave radio systems. It is the conventional multiplexing technology for network transmission systems.

S

SDH

Synchronous Digital Hierarchy (SDH) is an international standard for high speed synchronous data transmission over optical/electrical networks which can transport digital signals in variable capacities. It is a synchronous system which intend to provide a more flexible and simple network infrastructure.

SFP

Small Form-factor Pluggable (SFP) is a compact optical transceiver used in optical communications for both telecommunication and data communications applications. It interfaces a network device to a fiber optic cable.

SNMP

Simple Network Management Protocol (SNMP) is an application layer protocol that facilitates the exchange of management information between network management system and the network devices. It enables network administrators to manage network performance, find and solve network problems, and plan for network growth.

STM

Synchronous Transport Module (STM) is the Synchronous Digital Hierarchy (SDH) ITU-T fiber optic network transmission standard. It is the basic building block of SDH.

U

USB

Universal Serial Bus (USB) is a high speed connectivity standard enabling simple plug and play connections to the devices. USB provides an advantage of the connected devices being hot pluggable without data loss or interruption.

V

VCG

Virtual Concatenation Group (VCG) is a logical entity in which the VC channel bandwidth is divided into smaller individual containers and are grouped together to form a VCG.

VT

Virtual Tributary (VT) is a type of Synchronous Payload Envelope (SPE) defined for a Synchronous Optical Network (SONET). It is a structure used to carry sub rate payloads across a SONET transport network.