

MITEL NETWORKS

3300 | Integrated
Communications Platform

HARDWARE GUIDE



MITEL

| it's about **YOU**

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Chapter 1

Before You Begin

Before You Begin

Printing the Hardware User Guide

You can access a printable version of the Hardware User Guide from the System Administration Tool Help and from our web site.



Note: You must have Adobe Acrobat® Reader to view and print the Hardware User Guide. If you need a copy of Adobe Acrobat Reader, it is available for download at <http://www.adobe.com/acrobat>.

Go to What's New in this Release? to find a list of changes to software and hardware from one product version to the next.

What's New in this Release?

3300 ICP Release 3.2:

- Single software build: select your country to set the appropriate language, dialing plan, tone plan, and loss & level plan.
- IP-TDM (E2T) G.729 compression
- Optimized system performance: 300 MHz E2T and RTC
- Symbol wireless telephones
- 3300 ICP as a Stand-alone Wireless Gateway
- 3300 ICP as a Stand-alone Voice Mail
- Range programming to simplify the addition, change, or deletion of repetitive or incremental values
- Telephone power options
- Personal and Corporate Directories on the 5140 IP Appliance
- System Hardware Profile to view information about installed hardware
- Controller upgrade options for capacity, version, and/or compression
- ASU and Universal ASU to support the European market

3300 ICP Release 3.1:

- Migration of SX-2000® LIGHT to 3300 ICP
- Migration of SX-2000 MICRO LIGHT to 3300 ICP
- Migration of 3200 ICP to 3300 ICP
- Peripheral Node support
- Digital Service Unit support

- NSU Chaining
- 5001 IP Phone and 5005 IP Phone
- Security

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Safety Instructions

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Note: You must have Adobe Acrobat® Reader to view and print the Safety Instructions. If you need a copy of Adobe Acrobat® Reader, it is available for download at <http://www.adobe.com/acrobat>.

Chapter 2

Specifications

Specifications

Technical Information

Technical Characteristics

Signaling and Supervisory Tones

The standard range of programmed tones are composed of

- 12 DTMF sets of tones
- 1 set of tones that form part of the call progress tone plan
- 1 test of 1004 Hz (digital milliwatt).

DTMF Signaling

Input Signaling: The system is capable of accepting and repeating the standard DTMF tones as specified in EIA/TIA 464-B.

Output Signaling: The Mitel Networks 3300 ICP meets the output signaling requirements as specified in EIA/TIA 464-B.

DTMF Output Signaling as specified by EIA/TIA 464-B

frequency deviation	1 percent
tone duration	greater than 40 ms
interdigit time	greater than 40 ms
level, low group	greater than -10 dbm
level, high group	greater than -8 dbm
level, low group and high group combined	less than +2 db
level, third	greater than 40 db
frequency	below dtmf signal
twist	less than 4 db

Time-Out Information

The system is capable of responding to, or providing, the following supervisory conditions:

- Switchhook flashes having a duration of between 160 ms and 1500 ms (as programmed) to activate Transfer/Consultation/Hold/Add-On features.
- Call transfer dial tone can be obtained by generating a calibrated flash. This method is recognized internationally and is generated in one of three ways:
 - use a flash-hook for telephones connected to ONS circuits. Upper and lower detection thresholds for switchhook flash are programmable between 60 ms and 500 ms, and between 60 ms and 1500 ms respectively.
 - use the calibrated flash button (for equipped telephones)

- dial the digit '1' on an ordinary rotary telephone.
- Station switchhook flashes of less than the maximum programmed switchhook flash time will not be repeated towards the central office.
- An open Tip lead condition of 500 ms (optional 100 ms) or more duration on a CO trunk will release the system connection.
- Momentary open loop conditions of up to 350 ms (optional 100 ms) generated by the central office on outgoing system calls will not release calls.
- Station on-hook conditions will release a trunk connection after the selected maximum time.

Time-Out Information

Feature	Time-Out Period	Description
No Answer Recall Timer	0 - 125 s	If there is no answer at the extension after time-out expires, it will ringback at the attendant console or transfer station.
Camp-On Recall Timer	0 - 180 s	Incoming calls camped-on to a busy station before being returned to the attendant, if not answered before time-out expires.
Call Hold Timer	10 - 600 s	Calls placed on hold ring back to the station user upon expiry.
Attendant Busyout Timer	1 - 1440 min	System switches to night service if there is no activity at the attendant console after calls are received.
First Digit Timer	5 - 60 s	This is the time the system will wait for the first digit after going offhook at a station.
Interdigit Timer	3 - 60 s	Time between dialed digits.
Delay Ring Timer	5 - 60 s	Time before line rings on key set.
Callback Cancel Timer	1 - 24 hrs	Time after which callback functions are reset and cleared, or cancelled.
Call Forward - No Answer Timer	0 - 125 s	Length of time a station rings before the call is forwarded or rerouted.
Switchhook Flash	60 - 1500 ms	Length of time that a switchhook can be flashed without dropping the trunk or line.
Ringling Timer	60 - 300 s	The length of time a station rings another station before the call is terminated.

Line and Trunk Support Characteristics (NA)

The North American variant of the system supports the following line and trunk parameters:

- Station Loop - The industry standard station loop range, including the station apparatus, can be up to a maximum of 600 ohms (ONS Line).
- DNI Device Ranges - Any device which interfaces to a DNI line card has a loop length of 2 kilometers (6600 ft) with 24 (0.6mm) or 26 (0.45mm) AWG twisted pair cable with no bridge taps, and one kilometre with a maximum of one bridge tap of any length. A maximum of 50 m (162.5 ft) of 22 AWG (0.7mm) quad cable may also be used.

- CO Trunk Loop - The system operates with CO Trunks up to a maximum of 1600 ohms loop resistance.
- CO Trunk Seizure - The nominal seizure resistance is 265 ohms at 20 mA.
- CO Trunk Resistance - The on-hook dc input resistance of the LS trunks is not less than 5M ohms.

Transmission Characteristics

Compliance

The transmission characteristics for the North American and Latin American variants comply with:

- ANSI/EIA/TIA 464-C 'Requirements for Private Branch Exchange (PBX) Switching Equipment'.
- TIA-912 'Voice Gateway Transmission Requirements'.

The transmission characteristics for the United Kingdom variants comply with:

- ETSI ES 202 020 'Harmonized Pan-European/North American loss and level plan for voice gateways to IP based networks'.

Mitel Networks digital telephones meet the requirements of:

- ANSI/TIA/EIA-810-A 'Transmission Requirements for Narrowband Voice over IP and Voice over PCM Digital Wireline Telephones'.

Loss and Level Matrices

Requirements Specifications

Each country has stipulated requirements concerning acceptable transmission performance for telephone systems. The loss plan matrices provide the correct electrical losses in decibels (dB) for each connection to meet the specified requirement.

Loss plans have a direct effect on the acoustic levels provided at the set. Part of meeting the requirements is to identify the reference set requirements for all standard and proprietary sets to be used in each country. It is generally desirable to achieve the same relative loudness levels for all standard and proprietary telephones for a specified loss plan, taking into account loop lengths, transmission format (analog or digital), different transducers in use, line/trunk impedances, and terminating impedances.

Loss and Level Requirements Specifications

Country	Requirement Document
Canada	CS03, T520, T512
North America	TIA/EIA 464-B, TIA/EIA TSB 116
United Kingdom	BTR1050, BTR1080, BTR 1181, NCOP(86)42 and BS6450 Pt 4

Implementation

In the loss plans, positive values are losses and negative values are gains. The losses are shown in one direction only (outgoing, from the specified port type); the reverse path loss can be found by using a second look up (e.g. In North America, OPS to WAN is a -3dB gain and WAN to OPS is a 9dB loss).



Note: Mitel Networks digital telephones meet the following ITU-T recommended loudness rating: - Send Loudness Rating (SLR) 8 dB - Receive Loudness Rating (RLR) 2 dB.

In interpreting loss plans, refer to the following legend:

Port	Abbreviation
IP On Premise Station	iONS
On Premise Station	ONS
IP Off Premise Station	iOPS
Off Premise Station	OPS
Digital Station	DGS
Wide Area Network	WAN
Digital CO Trunk	DCO
IP Analog CO Trunk	iACO
IP Analog CO Trunk (short)	iACOs
Analog CO Trunk	ACO
Analog CO Trunk (short)	ACOs
Analog Tie Trunk	ATT

Note: iONS, iACO, and iACOs apply to the new analog interface designs that comply with the IP connected half-channel loss plan. The first instances of these is on the 3300 ASU.

North America

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	6	6	3	3	0	0	3	0	3	0	3	3
ONS	→	6	6	3	3	0	0	3	0	3	0	3	3
iOPS	→	3	3	0	0	-3	-3	0	0	0	0	0	3
OPS	→	3	3	0	0	-3	-3	0	0	0	0	0	3
DGS	→	9	9	6	6	0	0	0	2	3	0	3	3
WAN	→	9	9	6	6	0	0	0	3	0	3	0	3
DCO	→	9	9	6	6	0	0	0	3	0	3	0	3
iACO	→	0	0	0	0	-9	-6	-3	0	0	0	0	0
iACOs	→	3	3	0	0	-6	-3	-3	0	0	0	0	0
ACO	→	0	0	0	0	-9	-3	-3	0	0	0	0	0
ACOs	→	3	3	0	0	-6	0	0	0	0	0	0	0
ATT	→	3	3	0	0	-3	-3	-3	0	0	0	0	0

United Kingdom

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	11	11	11	11	5	5	5	3	6	3	6	6
ONS	→	11	11	11	11	5	5	5	3	6	3	6	6
iOPS	→	8	6	6	6	0	2	2	0	1	0	1	2
OPS	→	8	6	6	6	0	2	1	0	1	0	1	2
DGS	→	7	4	7	7	0	0	0	1	-2	-3	-2	0
WAN	→	7	7	7	7	0	0	0	1	4	4	4	4
DCO	→	7	7	7	7	0	0	0	1	1	4	1	4
iACO	→	3	3	1	1	-4	-4	-2	0	1	1	1	2
iACOs	→	2	2	1	1	1	0	-3	3	1	1	1	4
ACO	→	0	-2	1	1	-1	-3	-2	0	1	1	1	4
ACOs	→	2	2	1	1	1	0	-3	3	1	1	1	4
ATT	→	2	2	2	2	-2	-2	1	0	4	4	4	4

Latin America

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	6	6	3	3	0	0	3	0	3	0	3	3
ONS	→	6	6	3	3	0	0	3	0	3	0	3	3
iOPS	→	3	3	0	0	-3	-3	0	0	0	0	0	3
OPS	→	3	3	0	0	-3	-3	0	0	0	0	0	3
DGS	→	9	9	6	6	0	0	0	2	3	0	3	3
WAN	→	9	9	6	6	0	0	0	3	0	3	0	3
DCO	→	9	9	6	6	0	0	0	3	0	3	0	3
iACO	→	0	0	0	0	-9	-6	-3	0	0	0	0	0
iACOs	→	3	3	0	0	-6	-3	-3	0	0	0	0	0
ACO	→	0	0	0	0	-9	-3	-3	0	0	0	0	0
ACOs	→	3	3	0	0	-6	0	0	0	0	0	0	0
ATT	→	3	3	0	0	-3	-3	-3	0	0	0	0	0

Germany

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	13	13	10	10	4	4	4	2	2	3	3	3
ONS	→	13	13	10	10	3	3	3	0	2	1	3	3
iOPS	→	10	10	7	7	1	1	1	-1	-1	0	0	0
OPS	→	10	10	7	7	0	0	0	-1	1	0	0	0
DGS	→	10	10	7	7	0	0	0	-1	1	0	0	0
WAN	→	10	10	7	7	0	0	0	-1	1	0	0	0
DCO	→	10	10	7	7	0	0	0	-1	1	0	2	1
iACO	→	2	2	-1	0	-6	-6	-6	-7	-5	-6	-6	-6
iACOs	→	4	4	1	1	-6	-6	-6	-7	-5	-6	-6	-6
ACO	→	2	2	-1	0	-6	-6	-6	-7	-5	-6	-6	-6
ACOs	→	4	4	1	1	-6	-6	-6	-7	-5	-6	-4	-5
ATT	→	8	8	5	5	-2	-2	-2	-3	-1	-2	0	-1

Italy

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	19	17	16	16	7	7	7	6	6	6	6	5
ONS	→	17	13	14	12	3	3	3	6	6	6	6	7
iOPS	→	16	14	13	13	4	4	4	3	3	3	3	6
OPS	→	16	12	13	11	2	2	2	1	3	3	3	6
DGS	→	12	10	7	9	0	0	0	-1	-1	-1	-1	2
WAN	→	12	10	7	9	0	0	0	-1	-1	-1	-1	2
DCO	→	14	10	10	9	0	0	0	-1	2	2	2	4
iACO	→	4	4	-1	1	-6	-6	-6	-7	-7	-7	-7	-4
iACOs	→	4	4	1	1	-6	-6	-6	-7	-7	-7	-7	-4
ACO	→	5	4	2	1	-2	-2	-2	-3	-3	-5	-5	-4
ACOs	→	5	4	2	1	-2	-2	-2	-3	-3	-5	-5	-4
ATT	→	10	10	7	7	0	0	0	-1	-1	-1	-1	2

Netherlands

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	10	10	7	7	1	1	1	1	1	1	1	1
ONS	→	10	10	7	7	3	3	3	2	3	3	3	3
iOPS	→	7	7	4	4	-2	-2	-2	-2	-2	-2	-2	-2
OPS	→	7	7	4	4	0	0	0	-1	0	0	0	0
DGS	→	7	7	4	4	0	0	0	-1	0	0	0	0
WAN	→	7	7	4	4	0	0	0	-1	0	0	0	0
DCO	→	7	7	4	4	0	0	0	-1	0	0	0	0
iACO	→	1	1	-2	-2	-6	-6	-6	-7	-6	-6	-6	-6
iACOs	→	1	1	-2	-2	-6	-6	-6	-7	-5	-6	-6	-5
ACO	→	1	1	-2	-2	-6	-6	-6	-7	-6	-6	-6	-6
ACOs	→	1	1	-2	-2	-6	-6	-6	-7	-6	-6	-6	-5
ATT	→	5	5	2	2	-2	-2	-2	-2	0	-2	-2	0

Spain

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	15	15	12	12	5	5	5	2	4	3	5	5
ONS	→	13	13	10	10	3	3	3	2	4	3	5	5
iOPS	→	12	12	9	9	2	2	2	-1	1	0	2	2
OPS	→	10	10	7	7	0	0	0	-1	1	0	2	2
DGS	→	10	10	7	7	0	0	0	-1	1	0	0	0
WAN	→	10	10	7	7	0	0	0	-1	1	0	0	0
DCO	→	10	10	7	7	0	0	0	-1	1	0	2	1
iACO	→	2	2	-1	0	-6	-6	-6	-7	-5	-6	-6	-6
iACOs	→	4	4	1	1	-6	-6	-6	-7	-5	-6	-6	-6
ACO	→	2	2	-1	0	-6	-6	-6	-7	-5	-6	-6	-6
ACOs	→	4	4	1	1	-6	-6	-6	-7	-5	-6	-4	-4
ATT	→	6	6	3	3	-4	-4	-4	-5	-3	-4	-2	-2

Portugal

Loss Plan Matrix

		iONS ↑	ONS ↑	iOPS ↑	OPS ↑	DGS ↑	WAN ↑	DCO ↑	iACO ↑	iACOs ↑	ACO ↑	ACOs ↑	ATT ↑
iONS	→	15	15	12	12	5	5	5	2	4	3	5	5
ONS	→	13	13	10	10	3	3	3	2	4	3	5	5
iOPS	→	12	12	9	9	2	2	2	-1	1	0	2	2
OPS	→	10	10	7	7	0	0	0	-1	1	0	2	2
DGS	→	10	10	7	7	0	0	0	-1	1	0	0	0
WAN	→	10	10	7	7	0	0	0	-1	1	0	0	0
DCO	→	10	10	7	7	0	0	0	-1	1	0	2	1
iACO	→	2	2	-1	0	-6	-6	-6	-7	-5	-6	-6	-6
iACOs	→	4	4	1	1	-6	-6	-6	-7	-5	-6	-6	-6
ACO	→	2	2	-1	0	-6	-6	-6	-7	-5	-6	-6	-6
ACOs	→	4	4	1	1	-6	-6	-6	-7	-5	-6	-4	-4
ATT	→	6	6	3	3	-4	-4	-4	-5	-3	-4	-2	-2

Tone Plans

Tone plans permit the station user to distinguish different stages of call progress and different types of calls. Each tone is assigned a level which ensures an acceptable quality.

North America

Tone Plan

Tone	Frequency	Cadence
ARS 2nd Dial	350/440 Hz	Continuous
Busy	480/620 Hz	.5s on, .5s off, repeat
Camp-on	440 Hz	.1s on, .05s off, repeat 2 times
Conference	440 Hz	1s on, off
Confirmation	350/440 Hz	Continuous
Dial Tone	350/440 Hz	Continuous
Feature Active Dial	350/440 Hz	.1s on, .1s off 8 times, then continuous on
Interrupted Dial	350/440 Hz	.1s on, .1s off 8 times, then continuous on
Message Notification	350/440 Hz	(350/440, 0.1s on, 0.1s off, four times), (440, 0.2s on, 0.2s off, two times), (350/440 0.1s on, 0.1s off, four times), then 350/440 continuous on
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Override	440 Hz	.8s on, off
Paging	440 Hz	.2s on, off
Reorder	480/620 Hz	.25s on, .25s off, repeat
Ringback	440/480 Hz	1s on, 3s off, repeat
Special Busy	480/620 Hz	.5s on, .5s off, repeat
Special Ringback	440/480 Hz	.5s on, .5s off, .5s on, 2.5s off, repeat
Transfer Dial	350/440 Hz	.1s on, .1s off, 3 times, then continuous on
Voice Mail	440 Hz	.6s on, off

Tone	Output Level									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Busy	-27	-27	-27	-24	-24	-24	-24	-24	-24	-24
Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Camp-on	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Conference	-19	-19	-19	-16	-16	-16	-16	-16	-16	-16
Confirmation	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Feature Active Dial	-22	-22	-22	-19	-19	-19	-19	-19	-19	-19
Interrupted Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Message Notification	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Modem Answer	-20	-20	-20	-17	-17	-17	-17	-17	-17	-17
Override	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Paging	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Reorder	-27	-27	-27	-24	-24	-24	-24	-24	-24	-24
Ringback	-22	-22	-22	-19	-19	-19	-19	-19	-19	-19
Special Busy	-27	-27	-27	-24	-24	-24	-24	-24	-24	-24
Special Ringback	-22	-22	-22	-19	-19	-19	-19	-19	-19	-19
Transfer Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Voice Mail	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14



Note: DTMF Tones are supported.

Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

United Kingdom

Tone Plan

Tone	Frequency	Cadence
ARS 2nd Dial	350/440 Hz	Continuous
Busy	400 Hz	.35s on, .35s off, repeat
Camp-on	400 Hz	.1s on, off
Conference	400 Hz	.1s on, off
Confirmation	350/440 Hz	Continuous
Dial	350/440 Hz	Continuous
Feature Active Dial	350/440 Hz	.75s on, .75s off, repeat
Interrupted	1400 Hz	.1s on, off
Message Notification	350/440 Hz	(350/440, .75s on, .75s off, two times), (440, .1s on, .75s off, one time), (350/440 .75s on, .75s off, repeat)
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Number Unobtainable	400 Hz	Continuous
Paging	440 Hz	.2s on, off
Ringing (External)	400/450 Hz	1s on, 2s off, repeat
Special Busy	400 Hz	.35s on, .35s off, repeat
Special Ringing (Internal)	400/450 Hz	.4s on, .2s of, .4s on, 2s off, repeat
Transfer Dial	350/440 Hz	.75s on, .75s off, repeat
Interrupted Dial	350/440 Hz	.75s on, .75s off, repeat
Voice Mail	440 Hz	.6s on, off

Tone	Output Level									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-8	-7	-5	-10	-4	-3	-4	-4	-5	-4
	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-24	-18	-17	-18	-18	-19	-18
Busy	-9	-8	-6	-11	-5	-4	-5	-5	-6	-5
	-14	-13	-11	-16	-10	-9	-10	-10	-11	-10
	-19	-18	-16	-21	-15	-14	-15	-15	-16	-15
Dial	-8	-7	-5	-10	-4	-3	-4	-4	-5	-4
	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-24	-18	-17	-18	-18	-19	-18
Camp-on	-9	-8	-6	-11	-5	-4	-5	-5	-6	-5
	-14	-13	-11	-16	-10	-9	-10	-10	-11	-10
	-19	-18	-16	-21	-15	-14	-15	-15	-16	-15
Conference	-14	-13	-11	-16	-10	-9	-10	-10	-11	-10

Tone	Output Level									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
Confirmation	-8	-7	-5	-10	-4	-3	-4	-4	-5	-4
	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-24	-18	-17	-18	-18	-19	-18
Feature Active Dial	-8	-7	-5	-10	-4	-3	-4	-4	-5	-4
	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-24	-18	-17	-18	-18	-19	-18
Interrupted Dial	-8	-7	-5	-10	-4	-3	-4	-4	-5	-4
	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-24	-18	-17	-18	-18	-19	-18
Message Notification	-9	-8	-6	-11	-5	-4	-5	-5	-6	-5
	-14	-13	-11	-16	-10	-9	-10	-10	-11	-10
Modem Answer	-20	-19	-17	-22	-16	-15	-16	-16	-17	-16
Override	-18	-17	-15	-20	-14	-13	-14	-14	-15	-14
Paging	-19	-18	-16	-21	-15	-14	-15	-15	-16	-15
Reorder	-9	-8	-6	-11	-5	-4	-5	-5	-6	-5
	-14	-13	-11	-16	-10	-9	-10	-10	-11	-10
	-19	-18	-16	-21	-15	-14	-15	-15	-16	-15
Ringback	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-21	-18	-17	-18	-18	-19	-18
Special Busy	-8	-7	-5	-10	-4	-3	-4	-4	-5	-4
	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-24	-18	-17	-18	-18	-19	-18
Special Ringback	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
	-17	-16	-14	-19	-13	-12	-13	-13	-14	-13
	-22	-21	-19	-24	-18	-17	-18	-18	-19	-18
Transfer Dial	-8	-7	-5	-10	-4	-3	-4	-4	-5	-4
	-12	-11	-9	-14	-8	-7	-8	-8	-9	-8
Voice Mail	-19	-18	-16	-21	-15	-14	-15	-15	-16	-15



Note: DTMF Tones are supported. Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

Latin America

Tone Plan

Tone	Frequency	Cadence
ARS 2nd Dial	425 Hz	Continuous
Busy	480/620 Hz	.5s on, .5s off, repeat
Camp-on	440 Hz	.1s on, .05s off, repeat 2 times
Conference	440 Hz	1s on, off
Confirmation	350/440 Hz	Continuous
Dial	350/440 Hz	Continuous
Feature Active Dial	350/440 Hz	.1s on, .1s off, 8 times, then continuous on
Interrupted Dial	350/440 Hz	.1s on, .1s off, 8 times, then continuous on
Message Notification	350/440 Hz	(350/440, .1s on, .1s off, four times), (440, .2s on, .2s off, two times), (350/440 .1s on, .1s off, four times), then 350/440 continuous on
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Override	440 Hz	.8s on, off
Paging	440 Hz	.2s on, off
Reorder	480/620 Hz	.25s on, .25s off, repeat
Ringback	440/480 Hz	1s on, 3s off, repeat
Special Busy	480/620 Hz	.5s on, .5s off, repeat
Special Ringback	440/480 Hz	.5s on, .5s off, .5s on, 2.5s off, repeat
Transfer Dial	350/440 Hz	.1s on, .1s off, 3 times, then continuous on
Voice Mail	440 Hz	.6s on, off

Tone	Output Level									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Busy	-27	-27	-27	-24	-24	-24	-24	-24	-24	-24
Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Camp-on	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Conference	-19	-19	-19	-16	-16	-16	-16	-16	-16	-16
Confirmation	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Feature Active Dial	-22	-22	-22	-19	-19	-19	-19	-19	-19	-19
Interrupted Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Message Notification	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Modem Answer	-20	-20	-20	-17	-17	-17	-17	-17	-17	-17
Override	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Paging	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14
Reorder	-27	-27	-27	-24	-24	-24	-24	-24	-24	-24
Ringback	-22	-22	-22	-19	-19	-19	-19	-19	-19	-19
Special Busy	-27	-27	-27	-24	-24	-24	-24	-24	-24	-24
Special Ringback	-22	-22	-22	-19	-19	-19	-19	-19	-19	-19

Tone	Output Level									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
Transfer Dial	-23	-23	-23	-20	-20	-20	-20	-20	-20	-20
Voice Mail	-17	-17	-17	-14	-14	-14	-14	-14	-14	-14



Note: DTMF Tones are supported. Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

Germany

Tone Plan		
Tone	Frequency	Cadence
ARS 2nd Dial	425 Hz	Continuous
Busy	425 Hz	.1s on, .4s off, repeat
Camp-on	425 Hz	.25s on, off
Conference	425 Hz	.25s on, off
Confirmation	425 Hz	.1s on, .1s off, .1s on, .7s off, repeat
Dial	425 Hz	.1s on, .1s on, .1s off, .1s on, .7s off, repeat
External Camp-on	425 Hz	.1s on, .05s off, .1s on, .05s off
Feature Active Dial	425 Hz	(.95s on, .05s off) x 2, then (.1s on, .1s off, .1s on, .7s off, repeat forever)
Interrupted Dial	425 Hz	(.95s on, .05s off) x 2, then (.1s on, .1s off, .1s on, .7s off, repeat forever)
Message Notification	425 Hz	(.95s on, .05s off) x 2, then (.1s on, .1s off, .1s on, .7s off, repeat forever)
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Override	1400 Hz	.2s on, off
Paging	425 Hz	.25s on, off
Reorder	425 Hz	.2s on, .5s off, repeat
Ringback	425 Hz	1s on, 4s off, repeat
Special Busy	425 Hz	.35s on, .35s off, repeat
Special Ringback	425 Hz	1s on, 4s off, repeat
Transfer Dial	425 Hz	.1s on, .1s off, .1s on, .7s off, repeat
Voice Mail	440 Hz	.6s on, off

Tone	Output Level									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Busy	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Dial	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Camp-on	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Conference	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Confirmation	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
External Camp-on	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Feature Active Dial	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Interrupted Dial	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Message Notification	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Modem Answer	-24	-24	-21	---	-19	-22	-19	-19	-17	-21
Override	-27	-27	-24	---	-22	-25	-22	-22	-20	-24
Paging	-21	-21	-18	---	-16	-19	-16	-16	-14	-18
Reorder	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Ringback	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Special Busy	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Special Ringback	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Transfer Dial	-15	-15	-12	---	-10	-13	-10	-10	-8	-12
Voice Mail	-21	-21	-18	---	-16	-19	-16	-16	-14	-18



Note: DTMF Tones are supported. Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

Italy

Tone Plan		
Tone	Frequency	Cadence
ARS 2nd Dial	425 Hz	.2s on, .2s off, .6s on, 1s off, repeat forever
Busy	425 Hz	.2s on, .2s off, repeat forever
Camp-on	425 Hz	.2s on, .1s off, .2s on, .1s off
Conference	425 Hz	.2s on, off
Confirmation	425 Hz	.1s on, .1s off, .1s on, .7s off, repeat
Dial	350/425 Hz	Continuous
Feature Active Dial	350/425 Hz	.7s on, .7s off, repeat forever
Interrupted Dial	425 Hz	.9s on, .1s off then (.1s on, .1s off, .1s on, .7s off, repeat forever)
Message Notification	425 Hz	.7s on, .7s off
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Override	425 Hz	.2s on, off
Paging	425 Hz	.2s on, off
Reorder	425 Hz	.2s on, .2s off, repeat forever
Ringback	425 Hz	1s on, 4s off, repeat
Special Busy	425 Hz	.2s on, .2s off, repeat forever
Special Ringback	425 Hz	1s on, 4s off, repeat
Transfer Dial	350/425 Hz	.75s on, .75s off, repeat
Voice Mail	440 Hz	.6s on, off

Tone	Output Levels									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-17	-13	-14	-12	-12	-16	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-19	-19	-18	-13	-19
Busy	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
Dial	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
Camp-on	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
Conference	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-19	-19	-18	-13	-19
Confirmation	-17	-13	-14	-12	-12	-16	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-19	-19	-18	-13	-19
Feature Active Dial	-17	-13	-14	-12	-12	-16	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-19	-19	-18	-13	-19
Interrupted Dial	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
Message Notification	-17	-13	-14	-12	-12	-16	-16	-15	-10	-16
	-20	-16	-17	-15	-15	-19	-19	-18	-13	-19
Modem Answer	-24	-20	-21	-19	-19	-22	-23	-22	-17	-23
	-27	-23	-24	-22	-22	-25	-26	-25	-20	-26
Paging	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
Reorder	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
Ringback	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
Special Busy	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
	-17	-13	-14	-12	-12	-16	-16	-15	-10	-16
Special Ringback	-20	-16	-17	-15	-15	-19	-19	-18	-13	-19
	-17	-13	-14	-12	-12	-15	-16	-15	-10	-16
Transfer Dial	-20	-16	-17	-15	-15	-18	-19	-18	-13	-19
	-21	-17	-18	-16	-16	-19	-20	-19	-14	-20



Note: DTMF Tones are supported. Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

Netherlands

Tone Plan

Tone	Frequency	Cadence
ARS 2nd Dial	425 Hz	Continuous
Busy	425 Hz	.5s on, .5s off, repeat
Camp-on	425 Hz	.5s on, off
Conference	425 Hz	.1s on, off
Confirmation	425 Hz	Continuous
Dial	425 Hz	Continuous
Feature Active Dial	425 Hz	.75s on, .75s off, repeat
Interrupted Dial	425 Hz	.4s on, .04s off, repeat forever
Message Notification	425/400/425 Hz	(.75s on, .75s off x2), (.1s on, .75s off), (.75s on, .75s off, repeat)
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Override	425 Hz	.2s on, off
Paging	425 Hz	.2s on, off
Reorder	425 Hz	.07s on, .07s off, repeat
Ringback	425 Hz	1s on, 4s off, repeat
Special Busy	425 Hz	.5s on, .5s off, repeat
Special Ringback	425 Hz	1s on, 4s off, repeat
Transfer Dial	425 Hz	.75s on, .75s off, repeat
Voice Mail	440 Hz	.6s on, off

Tone	Output Levels									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Busy	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Dial	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Camp-on	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Conference	-18	-18	-15	---	-13	-16	-13	-13	-11	-15
Confirmation	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Feature Active Dial	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Interrupted Dial	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Message Notification	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Modem Answer	-24	-24	-21	---	-19	-22	-19	-19	-17	-21
Override	-22	-22	-19	---	-17	-20	-17	-17	-15	-19
Paging	-23	-23	-20	---	-18	-21	-18	-18	-16	-20
Reorder	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Ringback	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Special Busy	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Special Ringback	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Transfer Dial	-16	-16	-13	---	-11	-14	-11	-11	-9	-13
Voice Mail	-23	-23	-20	---	-18	-21	-18	-18	-16	-20



Note: DTMF Tones are supported. Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

Spain

Tone Plan

Tone	Frequency	Cadence
ARS 2nd Dial	425 Hz	Continuous
Busy	425 Hz	.2s on, .2s off, repeat
Camp-on	425 Hz	.6s on, .2s off, .6s on, off
Conference	1400 Hz	.4s on, off
Confirmation	425 Hz	Continuous
Dial	425 Hz	Continuous
Feature Active Dial	425 Hz	.1s on, .1s off, repeat 8 times, then continuous
Interrupted Dial	425 Hz	.1s on, .1s off, repeat 8 times, then continuous
Message Notification	425/440/425 Hz	(.1s on, .1s off x 4), (.2s on, .2s off x2), (.1s on, .1s off x 4), (425 continuous)
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Override	1400 Hz	.2s on, off
Paging	440 Hz	.2s on, off
Reorder	425 Hz	.2s on, .2s off, .2s on, .6s off, repeat
Ringback	425 Hz	1.5s on, 3s off, repeat
Special Busy	425 Hz	.2s on, .2s off, repeat
Special Ringback	425 Hz	.5s on, .5s off, .5s on, 2.5s off, repeat
Transfer Dial	425 Hz	.1s on, .1s off, .1s on, .1s off, .1s on, .1s off, then continuous
Voice Mail	440 Hz	.6s on, off

Tone	Output Levels									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Busy	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Camp-on	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Conference	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Confirmation	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Feature Active Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Interrupted Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Message Notification	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Modem Answer	-24	-24	-21	---	-19	-22	-19	-19	-17	-21
Override	-27	-27	-24	---	-22	-25	-22	-22	-20	-24
Paging	-21	-21	-18	---	-16	-19	-16	-16	-14	-18
Reorder	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Ringback	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Special Busy	-17	-17	-14	---	-12	-15	-12	-12	-10	-14

Tone	Output Levels									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
Special Ringback	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Transfer Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Voice Mail	-21	-21	-18	---	-16	-19	-16	-16	-14	-18



Note: DTMF Tones are supported. Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

Portugal

Tone Plan

Tone	Frequency	Cadence
ARS 2nd Dial	400 Hz	Continuous
Busy	425 Hz	.2s on, .2s off, repeat
Camp-on	425 Hz	.2s on, .1s off, .2s on, .1s off
Conference	425 Hz	.2s on, off
Confirmation	425 Hz	.1s on, .1s off, .1s on, .7s off, repeat
Dial	350/425 Hz	Continuous
Feature Active Dial	350/425 Hz	.7s on, .7s off, repeat
Interrupted Dial	425 Hz	.9s on, .1s off then (.1s on, .1s off, .1s on, .7s off, repeat forever)
Message Notification	425 Hz	.7s on, .7s off
Modem Answer	2025 Hz	.95s on, .05s off, repeat
Override	425 Hz	.2s on, off
Paging	425 Hz	.2s on, off
Reorder	425 Hz	.2s on, .2s off, repeat
Ringback	425 Hz	1s on, 4s off, repeat
Special Busy	425 Hz	.2s on, .2s off, repeat
Special Ringback	425 Hz	1s on, 4s off, repeat
Transfer Dial	350/425 Hz	Continuous
Voice Mail	440 Hz	.6s on, off

Tone	Output Levels									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
ARS 2nd Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Busy	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Camp-on	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Conference	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Confirmation	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Feature Active Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Interrupted Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Message Notification	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Modem Answer	-24	-24	-21	---	-19	-22	-19	-19	-17	-21

Tone	Output Levels									
	iONS	ONS	iOPS	OPS	iACO	iACOs	ACO	ACOs	DCO	ATT
Override	-27	-27	-24	---	-22	-25	-22	-22	-20	-24
Paging	-20	-20	-17	---	-15	-18	-15	-15	-13	-17
Reorder	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Ringback	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Special Busy	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Special Ringback	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Transfer Dial	-17	-17	-14	---	-12	-15	-12	-12	-10	-14
Voice Mail	-21	-21	-18	---	-16	-19	-16	-16	-14	-18



Note: DTMF Tones are supported. Note: DGS and WAN Tones are conveyed as RTP Packets.

Note: "---" indicates that this interface is not supported in this country.

Networking Voice Switches

Overview

Networked MITEL Systems

A network of Mitel Networks systems consists of two or more systems, each referred to as a network element.

By using OPS Manager, you can manage a network of Mitel Networks systems from a single centralized station.

Terminology

Network: a group of systems interconnected through DPNSS.

Network Element: a system that is a member of a network.

Cluster: a group of MITEL or Mitel Networks systems interconnected through DPNSS. All systems in a Cluster share the same primary node identifier.

Cluster Element: a single MITEL or Mitel Networks system which is a member of a cluster.

Portable Directory Number (PDN): a call processing feature available in a cluster of systems. This feature allows you to move a user's telephone directory number to any extension in the network (i.e., you can move a user's telephone directory number to an extension on any other system in the cluster and allow the user to retain the same directory number).

Advantages of a Network

A network of telephone systems is a highly functional communications system that provides a greater line size than a single system. A MITEL or Mitel Networks systems network

- Acts as a highly functional, virtual system for both local and wide area applications

- Can be customized and sized to meet long term growth requirements
- Can grow to a theoretical unlimited line size
- Provides enhanced MSDN network feature functionality
- Has an extremely effective digital/analog networking capability
- Can be fiber-distributed and workgroup focused
- Is standards-based and open to Computer Telephony Integration (CTI) development.

Each 3300 ICP network element will support up to 700 lines or up to 100 ACD agents. Two sizes of 3300 Controller are available. These units will support up to 250 IP telephones or 700 IP telephones.

Network elements can be geographically dispersed providing a high level of security to those organizations who maintain critical operations that might be interrupted due to some disastrous consequence. The element dispersal and the fiber optic connectivity of the nodes making up an element allow the terminating nodes to be located near the terminal devices, and they allow for savings in copper distribution cables and their associated protective devices.

Customers requiring ISDN or other broadband network connectivity can switch various voice, data, and video services to both the enterprise and desktop by utilizing other manufacturers equipment together with MITEL and Mitel Networks systems.

As the functionality, reliability, geographical coverage, and price points of virtual private networking (VPN) services improve, greater pressure will be placed on the private network. This trend will continue through the evolution of ISDN services. Network customers will be able to select products that can interface with a combination of products and services. For example, a typical customer may choose to use MITEL SUPERSWITCH Digital Network (MSDN) between major centers and VPN between smaller or more remote locations.

Selecting a Suitable Configuration

When building a network, the final design should provide the most effective communications at the lowest cost (impacted only by business and geographical constraints). Additions to existing networks, although complicated by what is already in place, should reflect the configuration design concepts.

Network Configurations

A network can consist of all MITEL and Mitel Networks systems or combinations of MITEL and Mitel Networks products and systems from other vendors. This combination can also be a mixture of various smart (digital systems) and dumb (electronic and electromechanical) systems. To have full MSDN functionality, all the systems in a MITEL or Mitel Networks MSDN/DPNSS North American network must be SX-2000 systems or Mitel Networks 3300 Integrated Communications Platforms.



Note: In this section, the term system describes a MITEL or Mitel Networks system or another vendor's system serving normally as a hub switch.

There are three basic network configurations:

- linear network
- non-linear network
- combination network.

Linear Network

A linear network is a network in which a number of systems are strung in a line. Networks of this type are typically used by railroads. An advantage of the linear network is that the design is simple. Some disadvantages are that as large numbers of systems are added, dialing can become complex with a tandem connection involved at each intermediate system in the connection; also, if all connections are routed through each intermediate system, a single facility system failure could seriously impact network operation.

Non-Linear Network

A non-linear network is a network in which every system has direct connections to every other system. This configuration has the advantage of a minimum of systems involved in each tandem call connection. Also, alternate routing can be used in cases where inter-switch facilities are busy or disabled. The disadvantage is the increased trunking requirements.

Combination Network

A combination network is a network that is a combination of both linear and non-linear networks. The combination network applies to most large network configurations. Maximum utilization is made of the advantages of both while minimizing the disadvantages. This configuration evolves into the following mesh, star, double star, and hierarchical star configurations used in more complex networks:

- The mesh network is one in which each and every system is connected by trunks to each and every other system. Mesh networks are trunk intensive and are used when there are comparatively high traffic levels between systems and the geographical or economical conditions allow the expensive trunking required.
- The star network utilizes an intervening system called a tandem switch. Each and every system is connected via a single tandem switch. Star configurations are normally applied when traffic levels between systems are comparatively low.
- The double star network includes single star sub-networks that are connected via higher order tandem switches. The factor that leads to star and multiple star network configurations is network complexity in the trunking outlets (and inlets) of a system in a full mesh. For example, the typical mesh network requires that each of the five systems be minimally equipped with four trunk groups or a total of 10 trunk groups reserved for inter-network traffic. In practice, most large networks are a compromise between mesh and star configurations.
- The hierarchical star network has evolved to eliminate confusion. That is, a systematic network was developed that reduces the trunk group outlets (and inlets) of a system, permits the handling of high traffic intensities where necessary, and allows for overflow and a means of restoration.

A hierarchical network provides levels of importance to the systems making up the network. Call traffic restrictions can be placed on traffic flow based on the designated level of importance. For example, in the illustrated hierarchical star network, there are three hierarchical levels of systems. The smallest symbols in the diagram have been marked with a "C" to indicate the lowest level. Note the restrictions (or rules) of traffic flow. As the figure is drawn, traffic from C8 bound for C9 would have to flow through system B2. Likewise, traffic from system B2 to B3 would have to flow through system A1. Carrying the concept somewhat further, traffic from any "A" system to any "B" system would have to be routed through an "A" system.

The high-usage route is the next consideration. For instance, if we found that there was high traffic intensity between B4 and B5 trunks, a switch gear might be saved by establishing a high-usage route between the two systems. We could call the high-usage route a high traveled shortcut.

High-usage routes could be established between any pair of systems in the network if traffic intensities and distances involved proved this strategy economical. When high-usage routes are established, traffic between the systems involved is first offered to the high-usage route and overflow when the route is busy or unavailable. If routing is through the highest level in the hierarchy, we call this route the final route. Hierarchical Network shows traffic routed between systems B4 and B5 via system A2 (the final route in this case).

Cluster Network Configurations

A cluster network is composed of two or more Mitel Networks systems.

A typical cluster network can function independently or as part of a larger network or networks. Cluster elements are categorized as follows:

- Main element
- Satellite element
- Hub element
- Remote main element
- Remote satellite element
- Remote hub element.

In the Typical Distribution of Network Elements illustration, the hub element is connected to both the Public Switched Telephone Network (PSTN) with both local exchange (LEC) and inter-exchange carrier (IXC) connections. It also serves as the gateway to the remote network. The main element has connections to the local exchange carrier (LEC) and the satellite element has no PSTN trunking. Each element is connected to every other element with MSDN/DPNSS to minimize multiple tandem connections.

Network Element Relationship shows the relationship between different types of network elements.

Main Element

Main Elements can perform the following functions:

- Originate and receive calls
- Serve as intermediate switches in which they can function as tandem points for receiving and passing calls and information
- Serve as terminating switches for most outside world trunking such as Central Office (CO), common carrier trunking, and tie trunks from the remote cluster network and/or other networks (note that the hub supports applications requiring tandeming capabilities)
- Support centralized attendants, ACD, and centralized voice mail.



Note: Each cluster network requires a minimum of one main element terminating all outside world trunking that supports access transparency.

Satellite Element

Satellite Elements can perform the following functions:

- Originate and receive calls
- Serve as intermediate switches in which they can function as tandem points for receiving and passing calls and information.



Notes:

1. Special application trunking can be terminated on a node within this switch.
2. Each network supports up to nine satellites with a minimum of one main or hub element for a maximum of ten elements. For Mitel Networks 3300 Software Release 3.0, physical restraints will limit this to 8 physical connections. XNET will allow further connections through amortisation of calls onto a common connection through the PSTN, i.e. traffic to multiple nodes could be carried through common physical links.
3. Satellite elements do not support centralized attendants, centralized voice mail, or ACD.

Hub Element

Hub Elements can perform the following functions:

- Provide extensive trunking if applications such as remote network, PSTN, LEC or IXC are to be located on a single element
- Serve as intermediate switches in which they can function as tandem points for receiving and passing calls and information between other cluster elements and the remote network, other networks as the PSTN (LEC and/or IXC), or other private networks
- Originate and receive calls
- Provide a centralized voice mail connection point
- Provide centralized attendants and/or ACD services (note that applications can support some lines, but the major function is trunking).

System Distribution

Campus or Contiguous Applications

These applications involve placing cluster elements in a single campus or contiguous location. Normally, all of the real estate parcels are adjacent to or touch each other. All inter-element transmission facilities are the responsibility of the customer (not the telephone company).



Note: The recommendations for campus environments apply to multi-element cluster applications within a single building.

- Provide more lines, trunks, and/or digital stations than are provided by a single system
- Overcome electrical/fiber optic distance limitations
- Disperse equipment minimizing total outages in the event of cable cuts or power failures.

Networks used in campus environments normally have two characteristics. First, customer-owned facilities (such as copper, fiber, and microwave) are used to provide the network transmission medium. Second, the geographical areas served by the network nodes are normally contiguous.

Take advantage of the following factors when designing a campus environment:

- Identify communities of interest. Where possible, meet the telephone needs of a community of interest with a single network system node. This approach keeps calling patterns within the node requiring fewer trunk facilities to connect to other system nodes.
- Take advantage of existing or planned fiber optic cable. When the fiber distances are short enough, DSU nodes from each of the network systems can be centralized. When distances are too long for this type of configuration, fiber optic multiplexers can be used to provide DS-1 (T1) or CEPT facilities.
- Look for opportunities to coordinate telephone and data services, and operations. Explore these opportunities carefully and, when possible, present and implement integrated solutions.

Remote Networking

The cluster can be installed with some or all of the cluster elements remotely dispersed. When designing a remote network involving all elements or cluster elements and other network systems, the information contained in this section applies. When designing a remote network involving mixed networks, cluster elements and other systems, the cluster should be designed as an entity, and then the connections to the other network systems should be considered.



Note: A cluster can be applied within a locality, across local, state and international boundaries.

Network Transmission Guidelines

A network consists of three parts:

1. Dedicated transmission facilities (tie trunks)
2. Exchange facilities (such as FX, Sprint/MCI/AT&T, and local exchange DDD/DID)

3. Switching equipment (such as a MITELE or Mitel Networks system).

Quality and Performance Guidelines are Required

Since the quality and stated performance characteristics of dedicated transmission and exchange facilities are most often controlled by common carriers, the number of creative or complex arrangements utilizing a combination of these three elements requires guidelines to ensure proper operation in the field. Off-net calling in a private network, multi-tandem on-net calling, and RADs are capabilities for which transmission guidelines are also required.

Maximize the Use of Digital Facilities

You can minimize transmission problems by using digital facilities. Use digital facilities when connecting the system nodes together and when connecting Local Exchange (LEC) and Inter-Exchange (IXC) carriers to the system nodes.

Private Network Calling

Off-Net Calling

Calls which originate in a private tandem network and extend through the public switched or other networks for completion are commonly called off-net calls. A frequent application of off-net calling occurs when long distance (LD) trunks are hubbed on one network switch and accessed through this hub switch by other (satellite) switches in the private, tandem networks. A second application involves the use of ARS routing over tie-trunks tandeming through multiple systems to complete off-net calls. Finally, switches can provide for off-net calling automatically at a distant network system location. These applications must be examined carefully prior to implementation to assure business operation compliance, transmission integrity, and documented economic savings.

Off-Net Trunks - The Public Switched Network (PSTN) trunks carry off-net traffic. In some cases calls may be carried as far as possible on-net and then be routed to off-net trunks. In other cases the call may access the public network at the closest system from which the call originated.

Off-Network Routing - The routing method to the public network depends on ARS and how the routing patterns are administered at each system involved in the connection. Calls that utilize the customer's private tandem network and DDD network are commonly called off-net calling, double-tandeming, or tail-end-hop-off. A frequent application of off-net calling occurs when a customer concentrates WATS lines in a system tandem switch which serves as a hub for these services with access via satellite systems. A second application involves the use of ARS routing over tie lines tandeming through multiple systems to complete off-net calls. Finally, the system can provide off-net calling automatically at a distant hub location.

Off-net trunks and off-network routing each offer economic and transmission quality compromises. In certain situations, transmission is satisfactory although there are times when the complexity of tandem switching, the quality of the trunks, and the common carrier involved, do not allow for successful transmission. Care must be taken in network design to identify potential transmission problem areas.

The three types of off-network routing methods are defined as follows:

1. Tail-End-Hop-Off (TEHO) routes an off-net call through the private network and hops off at the tandem switch closest to the destination of the call. As an example, a tandem switch in Atlanta which is connected to New York originates a call to Philadelphia. The call is first routed on-net over the inter-tandem trunks between Atlanta and New York and then hops off on the FX trunk to Philadelphia.
2. Head-End-Hop-Off (HEHO) routes an off-net call to the closest tandem switch from where the call originated. As an example, a private system in New York originates a call to Dallas. The call tandems to an on-net system in Washington, D.C., and hops off using WATS to complete the call.
3. Best-End-Hop-Off (BEHO) routes off-net calls using the most economical facility and departure point within the private network. The call may hop off the private network at the originating, intermediate, or terminating tandem switch depending on how the routing patterns are administered.

Tandem and On-Network Calling

To minimize network management problems where there are more than three systems in a network, consult MITEL. For networks in North America contact MITEL Dallas Systems Engineering. For networks in the UK, contact the MITEL Technical Advice Center.

The following factors must be taken into consideration with respect to tandem and on-network calling:

- Engineering Constraints - The availability of access codes and ARS routes at each network system and the digit outpulsing limit are engineering constraints. With careful engineering, you can design networks to include a considerable number of system nodes. Ideally, networks should be in a non-linear configuration.
- General Network Data - A network consists of tandem switches that accept and pass call traffic, inter-switch tie-trunks and transmission facilities that connect the tandem switches, and access or bypass access tie-trunks from a tandem switch to another tandem or end switch.
- Simple Networks - Simple networks are normally designed as symmetrical networks. The characteristics of a symmetrical network are tandem switches are of an equal level, all routes (trunk groups) are high usage, and circular call routing is prevented.
- Complex Networks - Complex networks can be configured hierarchically for call routing. The characteristics of a hierarchical network are each tandem switch has an assigned level (upper and lower), each lower level system connects to an upper level system, upper level systems are completely interconnected, and there is a routing plan that prevents circular call routing.
- Hierarchical Ranking - The hierarchical ranking allows an orderly routing of on-net access calls. The switching portion of the network is represented by the upper-level and lower-level tandem switches connected by inter-switch tie-trunks. The tandem switches can accept voice/data calls from any connected point and pass the calls to another connected point. The upper-level systems have a large amount of call traffic and the lower-level systems normally have small amounts of call traffic. Lower-level systems can be administered to

overflow to upper-level systems, in most cases. Calls from upper-level systems do not overflow to lower-level systems because of the large volume of traffic.

Network Trunks (MSDN, Non-MSDN)

The tie-trunks that connect the systems within the private network are named according to function. That is, names like inter-tandem/inter-machine, access, and by-pass access denote function (type of routing) rather than hardware differences. The off-net trunks that provide access to Direct Distance Dialing (DDD), Foreign Exchange (FX), or Inter-exchange Carrier (IXC) are used by ARS to complete calls to the destination. IXC trunks provide access to Other Common Carrier (OCC) facilities. An off-net call may be carried by on-net trunks part way to its final destination before accessing off-net facilities to complete the call.

Inter-tandem/Inter-machine Tie-trunks - As its name implies, an inter-tandem tie-trunk interconnects to tandem switches. It can be one-way incoming, one-way outgoing, or two-way. Inter-tandem tie-trunks are further classified as primary high-usage, intermediate high-usage, or final, depending on the routing of calls and overflow routing of calls. The complexity of network, customer requirements, and economic factors determine trunk type and classification.

On-Network Routing - The overflow routing characteristics for inter-tandem tie-trunks are as follows:

- **Primary High-Usage (PHU) Inter-tandem Tie-trunks** - These trunks serve first-choice traffic only. They do not receive any overflow traffic, but may overflow to intermediate or final trunk groups. They are designed to overflow at a present economic load level (see figure).
- **Intermediate High-Usage (IHU) Inter-tandem Tie-trunks** - These trunks serve first-choice and second-choice traffic and receive overflow traffic from primary high-usage trunk groups. Like PHU trunks, these trunks overflow at a preset economic load level. They direct any overflow traffic to final trunk groups.
- **Final Inter-tandem Tie-trunks** - These trunks receive overflow traffic from primary and intermediate high-usage trunk groups, but do not overflow to any other trunk group. These trunks block calls when all trunks are busy. When a call is blocked, the caller receives busy or intercept tone, or is placed in queue, depending on how the trunk is administered.
- **Overflow Routing** - In the inter-tandem Tie-trunk usage (overflow routing) example, a call originating in Los Angeles would, as a first choice, be routed directly from Los Angeles to Atlanta over the (A) primary high-usage trunks. If busy, the second-choice routing would be to New York over the (B) intermediate high-usage trunk and from New York to Atlanta via the (C) final trunks. If the (B) intermediate high-usage trunks connecting Los Angeles to New York were busy, the final route (C) from Los Angeles to Chicago, Chicago to New York, New York to Atlanta would be used. The fourth choice, if the final route was busy, would be to route the Los Angeles caller to busy tone.

Direct Inward System Access (DISA)

DISA is designed to allow local calling area access to a customer's system and its networking capabilities. Take care when supporting long distance inward access, particularly 800 type INWATS, via DISA for calls that could terminate in OUTWATS or DDD trunks in another distant point.

The primary problem is the uncertainty of the normal loss in the inward WATS connection, which may not allow users to break dial tone from their DTMF pads.

Even if successful connection has been made, the total amount of loss when connecting INWATS trunks to an OUTWATS trunk can be such that the user is not likely to hear the called party. The offering of WATS service, inward and outward, further complicates the problem.

These positions are consistent with common carrier transmission practices. It is very important to appreciate the capabilities and limitations of network configurations. Consultation with various common carriers is a required part of network selling and implementation. Any applications of off-net tandem dialing, built-up on-net calling, or remote DISA should be carefully reviewed by local systems engineering prior to any formal customer proposal.

Survivability

Survivability requires that all network operations would not be lost due to the failure of one or more, but not all, network elements. Network applications provide a much higher degree of survivability than a single system solution because networks are modular in design. Customer requirements and economics dictate the level of survivability for the network and the individual network elements.

Different Configurations Provide Different Levels of Survivability

Choose one of the following configurations to provide the required level of survivability:

- Linear configuration - failure of a single element disrupts inter-network calls between some of the elements
- Star configuration - failure of the hub element disrupts inter-network calls between all the elements
- Mesh configuration - failure of one element only affects the subscribers on that element.

Maximize the Survivability of Critical Elements

Any cluster is only as good as its critical element. It is important that you identify critical elements and reinforce their survivability.

To maximize element survivability:

- When possible, facilities for local exchange and common carrier trunking should come from more than one direction. Ideally, as a minimum, entrance facilities from more than one telephone company distribution cable system would be available.
- Equipment should be located in secure, dry, storm hardened building locations. Each system node should have some central office trunking, which can be backed up with cellular facilities to bypass the local CO and/or cable plant.

Survivability of Local Exchange and Common Carrier Trunks Facilities

If possible, locate local exchange and common carrier trunks on more than one element. If the network is a loop with local exchange (LEC) and inter-exchange carrier (IXC) on two (2)

elements, failure of an element with LEC and IXC trunking would affect only the subscribers located on the element. The rest of the network would only suffer diminished performance.

Designing the Network

To design a network you must complete the following tasks:

- Prepare an engineering plan
- Determine the number and type of elements required
- Determine the MSDN/DPNSS Network Resource Dimension required
- Calculate the trunking requirements
- Determine the method for interconnecting the elements
- Establish the numbering plan.

Prepare an Engineering Plan

Before you begin, prepare an engineering plan for the site consisting of the following information:

- Diagram of customer's existing systems or network
- Diagram of customer requested or proposed network
- Diagram of customer existing data communications
- Diagram of customer requested or proposed data communications
- Network node information sheet (one per node)
- Number plan for existing node and network
- Number plan for proposed node and network
- Common carriers and respective offerings
- Local exchange carriers and respective offerings.

Determine the Number and Type of Elements Required

When determining the number of elements required, be sure to take future growth into consideration.

In configurations involving two to ten elements, PSTN trunking is designed with a target of 12% and MSDN trunking with the assumption that every element is connected directly to every other element with a minimum of one MSDN/DPNSS inter-element link. In actual applications, a realistic number of lines will be around 500 for a 3300 ICP system depending on configuration and applications.



Note: The maximum number of elements in a contiguous/campus cluster configuration cannot exceed ten. The following table illustrates absolute line/trunk maximums and peripheral/NSU node quantities. Every available port would be occupied unless otherwise indicated.

The following tables illustrate the concept of breaking down the availability on a per line basis by trunking, inter-element, and intra-element CCS availability. Actual configurations and traffic information (CCS availability) will be determined and designed on a per case basis by using customer and/or consultant requirements and case studies conducted by MITEL sales and systems engineering staff.

Maximum Line/Trunk Sizes per Cluster (excluding Xnet)

% Cluster Elements	Max. lines per node	Max. PSTN trunks available	% PSTN trunks	Max MSDN trunks available	% Total Trunks	# NSUs	MSDN DS1	PSTN DS1	Total Trunks required per node
2	700	96	14%	46	15	3	2*	4**	130
3	700	96	14%	46	15	3	2*	4**	136
4	700	96	14%	92	27	4	3*	4**	141
5	700	96	14%	92	27	4	4*	4**	144
6**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Figures are based on Mitel Networks 3300 Software Release 3.0. Traffic Rate is 6CCS per line. Configuration without XNET, i.e. a physical connection to each node is required. 60% of internal traffic is between nodes. PSTN trunks are connected locally at each node.

Note:

* MSDN 2 x 23B + D, assumes one MSDN to every other element

** PSTN 2 x 24 CH

*** These combinations not possible with Mitel Networks 3300 Software Release 3.0 without Xnet (insufficient physical links per node).

**Maximum Line/Trunk Sizes per Cluster
(with Xnet and central switching, e.g. PSTN or tandem switching)**

% Cluster Elements	Max. lines per node	Max. PSTN trunks available	% PSTN trunks	Max MSDN trunks available	% Total Trunks	# NSUs	MSDN DS1	PSTN DS1	Total Trunks required per node
2	700	96	14%	46	15	3	2*	4**	131
3	700	96	14%	46	15	3	2*	4**	138
4	700	96	14%	92	27	4	3*	4**	144
5	700	96	14%	92	27	4	3	4**	148
6**	700	96	14%	92	27	4	3	4	156
7**	700	96	14%	92	27	4	3	4	162
8**	700	96	14%	92	27	4	4	4	166
9**	700	96	14%	92	27	4	4	4	168
10**	700	96	14%	92	27	4	4	4	168

Figures are based on Mitel Networks 3300 Software Release 3.0. Traffic Rate is 6CCS per line. Configuration with XNET, i.e. one physical connection can carry traffic for more than one end node. 60% of internal traffic is between nodes. PSTN trunks are connected locally at each node.

Note:

* MSDN 2 x 23B + D, assumes one MSDN to every other element

** PSTN 2 x 24 CH

PSTN and MSDN Trunking CCS Allocation at P.01 per link

LINES (users)	PSTN Trunks			MSDN Trunks		
	PSTN Trunks	Available CCS	PSTN CCS Per Line Usage	MSDN Trunks	Available CCS	MSDN CCS Per Line Usage
700	96	2891	4.13	46	1236	1.76
700	96	2891	4.13	69	1987	2.83
700	96	2891	4.13	92	2758	3.94

Calculate Trunking Requirements

Inter-element Trunking/Links

Inter-element trunking is MSDN/DPNSS, 23B+1D or 30B+2D. MSAN facilities can be used.

The following section is a worked example of how inter-node trunking requirements would be calculated. In practice the numbers to be used may differ, but the principles remain the same.

For elements installed in a campus or within a contiguous area, an inter-element link connects each element to every other element as a minimum. This minimizes tandem connections and involving more than two elements in a call.

This figure illustrates the connectivity between elements in a 10-element cluster installed in a campus/contiguous environment. Each element is connected to every other element by one link. In a campus/contiguous environment the number of elements will not normally exceed ten.

Additional links between specific elements will be provided when required to meet bid traffic requirements or conditions. These links are referred to as high traffic links. This figure shows a typical campus network with a high traffic link installed.

The first step in engineering the quantity of inter-element links is to determine the quantity required to support local traffic between the elements. It is most important that communities of interest/work groups/organization be confined to a single element to minimize inter-element traffic.

Use the following calculations to

- Determine the total CCS/Erlang requirement per line per busy hour
- Determine percentage trunk-in, trunk-out and local, per busy hour.

As an example, 900 seconds of traffic (9 CCS/.25 Erlang) per line will be used with 33.33% trunk-in, 33.33% trunk-out and 33.33% local. Local traffic represents 300 seconds, and for this calculation we assume 120 seconds is intra-element and 180 seconds inter-element. There will be 10 elements in the cluster so the 180-second inter-element traffic will be divided by 9. This allows for 20 seconds of traffic per line to each other element.

Traffic Requirements (Example)

TRUNK-IN	TRUNK-OUT	ELEMENT	LOCAL ELEMENT								
300 s	300 s	Intra-Nodal 120 s	Inter-Nodal 180 s								
Inter-Node Traffic			2	3	4	5	6	7	8	9	10
			20 s	20 s	20 s	20 s	20 s	20 s	20 s	20 s	20 s

Assuming 1,000 lines per switch

1,000 lines X 20 seconds = 20,000 seconds
200 CCS/5.56 Erlangs

Using traffic tables at P.01 (one busy per 100 attempts) Grade of Service (GOS) requires 12 channels equal to 195 CCS/5.42 Erlangs. Therefore, 12 channels will be required between each element to support local inter-nodal traffic.

Inter-nodal connections are also required for trunk traffic when the element containing stations does not have LEC, IXC, or network trunking. Ideally, as a minimum, each element should have dedicated outgoing LEC trunks. Providing both incoming and outgoing trunks on each element further minimizes the need for inter-nodal connections. When possible, DID trunks should be obtained from the LEC in groups that provide the numbers as they relate to the element number plan. To do this, each element should, to the highest degree possible, have a unique number plan. Over a period of time, moving portable directory numbers across the cluster will affect the numbering plans at each element.

To calculate the inter-nodal links required to access or receive calls from external trunking, we will go back to the 900 seconds per line traffic requirement and make the following assumption:

- 40 seconds of the 300 seconds of out-trunking will be outgoing common carrier (IXC) traffic connecting to one element. (In this example, incoming PSTN trunk calls are considered to arrive at the local nodes).

This assumption implies that an additional 40 seconds of traffic per line must be accommodated between elements two through ten to element one. Therefore, for each element, we calculate:

1,000 lines X 40 seconds = 40,000 seconds
400 CCS/11.11 Erlangs

The total is now:

Internodal 200 CCS 5.56 Erlangs
-Outgoing IXC 400 CCS 11.11 Erlangs

Total 600 CCS 16.67 Erlangs

Using traffic tables at P.01 GOS, each element (elements 2 through 10) requires 22 channels, 600 CCS/16.67 Erlangs to connect to element one.

The following table shows the total channel requirements:

Channel Requirements (for example)

Elements	Number of Channels
Elements 2-10 to Element 1	26 (12+14 for PSTN O/going)
Element 2 to Elements 3-10	12
Element 3 to Elements 4-10	12
Element 4 to Elements 5-10	12
Element 5 to Elements 6-10	12
Element 6 to Elements 7-10	12
Element 7 to Elements 8-10	12
Element 8 to Element 9-10	12
Element 9 to Element 10	12

This example illustrates the advantage of using CEPT (30B+2D) for inter-element connectivity in campus/contiguous environments whenever possible. If DS-1 (23B+D) were used between elements 2-10 and element 1, two DS-1 circuits would be required. With CEPT (30B+2D) the 30 B-channels at P.01 provide 675 CCS/18.74 Erlangs with the requirements being local 200 CCS/5.56 Erlangs and trunk 400 CCS/11.11 Erlangs for a total of 600 CCS/16.67 Erlangs, so a single CEPT would suffice. At P.01 30 channels provide 732 CCS/20.34 Erlangs.

Traffic Calculation Data

Total Traffic per Line

total traffic per line = total CCS/Erlangs in seconds per line

Total traffic per line (100%) can be split into: % trunk in plus % trunk out plus % local.

Intra-Element

local seconds per line x percent intra-element = seconds per line intra-element

Inter-Element

% Inter-elements = seconds per line element x # lines per element = total seconds traffic to each other element

CCS/Erlang Formulas

total secondstraffic/100 = CCS

total seconds traffic/3600 = Erlang

Inter-element Trunk Traffic

Seconds Trunk-in		Seconds Trunk-out	
% Intra-Element	% Inter-element	% Intra-element	% Inter-element
Number elements supporting trunks	Seconds = per line per element	Number elements supporting trunks	Seconds = per line per element

Seconds Trunk-in

Seconds per line x number lines per element = total seconds traffic to each other element

Seconds Trunk-out

Seconds per line per trunk x number lines per element = total seconds traffic to each other element

Total Element-to-Element Traffic

CCS Erlang

Local -----

Trunk-in -----

Trunk-out -----

Total -----

Obtain the number of channels from the following table.

Quick Traffic Reference at P.01 Grade of Service (GOS)

Quantity	channels/trunks	CCS	Erlangs
DS-1			
1	23B	521	14.47
2	46B	1236	34.32
3	69B	1987	55.20
4	92B	2758	76.60
5	115B	3535	98.20
6	138B	4324	120.10
7	161B	5119	142.20
8	184B	5915	164.30
CEPT			
1	30B	732	20.34
2	60B	1688	46.90
3	90B	2689	74.70
4	120B	3708	103.00
5	150B	4738	131.60
6	180B	5774	160.40
7	210B	6819	189.43
8	240B	7868	218.56

Trunking Between Elements

A cluster can be provided for a single campus/contiguous location or dispersed on a local, regional, national, or international basis. Many cluster applications will be combinations of one or more campus/contiguous locations and one or more dispersed remote elements.

Some applications will also require connectivity to other networks, or to systems that either are not part of the cluster or are not totally compatible with a cluster or MSDN/DPNSS.

This figure illustrates a regional cluster application, and this figure illustrates a nationally dispersed cluster connected to non-cluster applications.

Connectivity between contiguous and remote cluster elements always consists of MSDN/DPNSS links or MSAN/APNSS circuits. Connectivity between cluster elements and non-cluster systems and/or networks will consist of T1/D4 or analog E&M tie lines in North America, and it will adhere to national standards in CCITT areas.

The quantity of trunks between cluster elements and remote cluster elements, or cluster elements/remote cluster elements and non-cluster systems and/or networks, are engineered to meet actual traffic requirements or the customer specifications using Poisson or Erlang traffic tables. If acceptable to the customer, grades of service lower than P.01 may be used.

The engineer must be aware that this type of connectivity requires economic and/or business requirements to justify recommendations and implementation.

Public Switched Telephone Network Trunking

Public Switch Telephone Network (PSTN) trunking is provided by local exchange carriers (LEC) and common carriers, also known as inter-exchange carriers (IXC). Normally, a cluster element or group of cluster elements in a campus/contiguous application would be served by a single LEC. This is not always the case with common carriers. Multiple IXCs can connect to a single cluster element or group of cluster elements in a campus/contiguous application.

Connectivity from LEC's and IXC's can be digital or analog and an exact version will be determined by national standards. Examples are ISDN PRI, T1/D4, E1 with R-2 signaling, DASS, and various analog trunk signaling schemes.

To minimize inter-element link requirements, each cluster element should, to the highest degree possible, have incoming and outgoing LEC service connected directly to it.

Special trunks, such as ACD, DISA, or dedicated, should connect directly to the cluster element where primary utilization will take place.

Common carrier circuits (IXC) should also connect to the cluster element where primary utilization takes place. Economic reasons may justify the bundling of IXC circuits and connecting to a cluster hub or main element where they would be utilized by more than one cluster element.

Survivability should also be considered in cluster-PSTN trunk engineering.

Determine the Method for Interconnecting Elements

MSDN/DPNSS Connectivity

Refer to the MSDN/DPNSS feature for information on network features.

Digital Signaling

MSDN/DPNSS provides call setup capabilities between systems connected in an MSDN/DPNSS network. MSDN/DPNSS uses a Common-Channel Signaling (CCS) scheme in which the signaling information for a number of traffic channels is passed as addressed messages over a single channel. The traffic information is carried on E&M trunks, and the digital signaling information may be carried on an analog or digital circuit.

Network Applications

MSDN/DPNSS can be utilized in all digital networks.

DS-1 Link

DS-1 offers a full duplex, point-to-point, 1.544 Mbps digital link with defined frame format. Each frame of a DS-1 link consists of 23 voice/data channels and one signaling channel, and it takes 125 microseconds to transmit. A DS-1 digital link cannot be set up between a DS-1 Formatter card and CEPT Formatter card.

The DS-1 digital link complies with the ATT DSX-1 standards. The technical characteristics of the DS-1 link are as follows:

- twenty-four 64 Kbps traffic channels (23B + D)
- one bit for terminal and signaling frame alignment
- each channel has a sampling rate of 8,000 Hz at 8 bits per sample for a total of 64 Kbps. Each frame is then $(24 \times 8) + 1 = 193$ bits. The total bit rate is therefore: $193 \times 8000 = 1.544$ Mbps.

Fractional T1

The common carriers offer fractional T1 services at a DS-0 rate of 56 Kbps. Using this service, and a voice/data MUX, provides an effective means of providing MSAN connectivity to a remote location (see MSAN Connectivity To A Remote Location).

Various manufacturers provide voice/data MUXs which can provide various combinations of voice and data (for example, 4 data and 4 voice over 56 Kbps DS-0 line).

XNET

XNET allows DPNSS trunks to be allocated to individual nodes on a switching basis. Rather than have dedicated links to each individual node, XNET allows a number of physical trunks to carry all traffic to all required nodes. The switching to appropriate end nodes is carried out at the PSTN or tandem exchange, and it is typically setup in a star configuration. The benefit

is the increased number of nodes that can be added to the network, and the reduced cost of interconnection tied lines.

CCITT (E1) to NA (T1) Connectivity

Connectivity can be provided between North American (23B+1D) and CCITT (30B+2D) with the common carrier providing proper channel matching. Twenty-three B-channel and one D-channel will be presented at the CCITT end. A DS-1 (E1/T1) Formatter card which inverts D-channel data must be installed in the North American element.

Establish the Numbering Plan

Factors to Consider

When engineering the numbering plan, you must consider the following factors:

- Number of elements in campus/contiguous applications
- Quantity of directory numbers required in campus/contiguous applications
- Remote elements
- Quantity of directory numbers required in remote elements
- Telephone company exchange codes and DID number blocks
- Ability of the telephone company to break down by trunk group DID numbers by thousands digit and hundreds digit
- Any possible numbering conflicts, especially when remote elements are dispersed over wide geographic areas.

Implement Network Applications

This section discusses the implementation of the following network applications (as required):

- Station Message Detail Recording
- Voice Mail
- Data Applications.

Station Message Detail Recording (SMDR)

This section outlines the current methods used to gather SMDR information from multiple systems. These methods apply to either a network of elements or a cluster network.

The following SMDR report parameters are difficult to interpret in a network application:

- Time stamp on the call record
- Trunk number
- Call originating party ID.

Ensuring Accurate Time Stamps

When multiple systems are used, multiple call records are produced. Within the call accounting mechanism, some type of sort criteria is used to "glue" together multiple call records, resulting in a complete model of the call. This model will include all the intermediate transitions in and out of tandem elements. Timing on these calls is very important to get an accurate report from the call accounting system.

Use the OPS Manager time synchronization feature to synchronize the time-of-day clock on all elements in a network to one second precision. This time synchronization feature also allows you to compensate for time zone differences where network elements are geographically dispersed.

Prevent Duplicate Trunk Numbers

Ensure trunk numbering across the network is sequential and unique. Flexible trunk numbering allows you to program trunks with trunk numbers from 1 to 9999.



Note: Do not confuse trunk numbering with the number of trunks.

Identifying Calls

The network node identification and the trunk number are included for incoming trunk calls that are routed across the network (see Network SMDR for details).

Voice Mail

Voice mail services in a network may be provided as follows:

- On an individual node basis. Each node will have its own stand-alone voice mail system which will provide service to the users located on that node.
- Each node could have its own voice mail system providing service to the users located on that particular node. These individual voice mail systems can be networked according to manufacturer's specifications to provide network services such as a broadcast list across the network.
- A centralized system using a single voice mail system to serve either all network node subscribers or those users located on a group of network nodes. When such a system is provided at network nodes, the manufacturer's method of networking their systems can be used to further network these systems for multi-network applications.

Centralized Voice Mail Applications

Systems provide voice mail interfaces by using ONS or E&M Trunk circuits. These circuits can be configured to provide voice mail functionality from a centralized voice mail system.

Full voice mail functionality is obtained by use of the MSDN/DPNSS feature.

MSDN/DPNSS Voice I

MSDN/DPNSS Voice I provides

- Ability to send forwarding party node identification, directory number, and call forward type information across the DPNSS network
- Ability to display node identification and directory numbers on non-voice mail display sets.

MSDN/DPNSS Voice III

MSDN/DPNSS Voice III provides

- Ability to display the remote forwarder name in addition to the node identification and directory numbers on non-voice mail display sets
- DPNSS callback message cancellation (voice mail usage only).

MSDN/DPNSS Voice V

MSDN/DPNSS Voice V provides

- Ability to display remote node information on COV voice mail sets
- Ability to outpulse remote node, node identification, and extension number to voice mail ports with the ONS interface
- Ability to send and cancel voice mail messages on remote node subscribers via DPNSS callback messaging.

Typical Scenario in a Centralized Voice Mail Application

A trunk call is presented to extension 1234 and is forwarded to extension 5000 (COV voice mail) when no answer is received (see Centralized Voice Mail - Typical Scenario).

The COV voice mail display shows CFNA 1234, when the caller is forwarded to voice mail extension 5000. Voice mail answers the call and the caller leaves a message for extension 1234. The voice mail then goes off-hook, dials the voice mail activate feature access code (i.e., *20) followed by 1234. An ARS route has been established on Node A to route via an MSDN trunk (1 plus 3 digits = MSDN). The system dials 1234 and activates the message waiting lamp.



Note: Do not use *20 for ARS routes as this will cause a conflict with the network voice mail feature.

Message Waiting

Voice Mail Message Waiting indications are set from the main system by accessing the network trunks and outpulsing the Message Waiting activate/deactivate feature access code assigned on the remote system followed by the subscriber's extension number. The same feature access code is assigned on all systems unless the voice mail system can be assigned multiple message activate/deactivate codes; therefore, conflict dialing arises on the main site between the feature access code and ARS leading digits. The ARS leading digits for remote messaging will have to be programmed on the main system before the feature access code is assigned for Message Waiting activate/deactivate functions.

Most voice mail systems require return dial tone after activating/deactivating message indications for confirmation. The conflict dialing timer for subscribers on the main site, may have to be adjusted through programming. Some voice processors are able to insert a "#" tone at the end of the dialed message wait string, which could be interpreted as "end of dial". Return dial tone would be returned immediately after the ***, allowing quicker voice mail response and more digits to be dialed in setting another message indication without going on hook.

The message wait indications applied on the remote system will be considered "dial message waiting" messages not "callback messages".

Message Answering

Remote subscribers will reroute their calls to a defined ARS leading digit followed by their extension number. ARS will route the call through the network facilities to trunks on the main system where further digits will be outputted after accessing the centralized voice mail. The leading digit and extension number is passed through the network which will access the Loop Back or E&M Trunks on the main site. ARS digit modification for the trunks will output the voice mail hunt group pilot number and insert a pause and any necessary tones followed by the extension number after the voice processor has answered. Calls rerouted will be offered the personal greeting of the subscriber.

Message Retrieval

Using "ONS Voice Mail" with "non-MSDN"; subscribers on the remote site may access the voice mail hunt group pilot number directly through ARS, although the user will be required to manually enter the appropriate DTMF tones to access their mailbox.

Alternatively, subscribers could retrieve voice mail messages by dialing a defined ARS leading digit followed by their extension number. This leading digit and extension number are passed through the network which will access the trunks on the main site. ARS digit modification for the trunks will insert the voice mail hunt group access code and output the required codes and extension number to access their mailbox. Users will be prompted for their password.



Note: Advanced Analog Networking enhances message retrieval. ARS Modify Digits could insert the internal calling extension number automatically (i.e., <E>). Subscribers would simply dial a defined ARS digit string for message retrieval.

Using "COV Voice Mail with MSDN", remote subscribers call the voice mail hunt group pilot number directly through ARS. MSDN provides the subscriber's extension number to the COV voice mail, allowing the voice processor to identify the caller as a subscriber. Voice mail then prompts the user for a password.

Messages can be retrieved external to the system dependent on incoming trunk access to the voice processor. Usually, subscribers will have to manually enter one or two digits followed by their mailbox number to log into their mailbox.

Trunks for Centralized Voice Mail

The node which provides the centralized voice mail using COV or ONS voice mail interfaces will require Loop Back Trunks regardless of network interfaces. When direct E&M analog connection to the voice mail can be utilized, Loop Back Trunks will not be required.

Call identity information that is required by voice mail systems for telephone answering is NOT presently part of the MSDN protocol. The trunks will be used to provide call identity to the voice processor; therefore, providing an efficient and easy to use voice mail interface for remote sites.

Loop Back Trunks

Any digital or analog E&M Tie Trunk may be used for Loop Back Trunks.

Traffic levels must be considered to determine the number of Loop Back Trunks required. Traffic will typically consist of rerouted calls for COV and ONS voice mail and message retrieval for ONS voice mail. E&M voice mail does not require use of Loop Back Trunks.

MSDN trunks will not ignore answer supervision. When the voice processor answers, an answer supervision signal is passed to the MSDN trunks and no more digits will be outputted to the voice processor. DTMF tones will not be received, resulting in improper call handling. Therefore, Loop Back Trunks are used on the Main system to ignore fake answer supervision allowing pauses and DTMF tones to be outputted to the voice processor for proper call handling.

In Voice Mail Connection with Loop Back Trunk, extension 5000 on the MAIN system is externally call forwarded to the central voice mail system on the remote system. The subscriber call reroutes to the ARS leading digit followed by his/her extension number "85000". The ARS programming in the MAIN system is programmed not to absorb the leading digit "8" allowing this digit to be outputted across the network to access the Loop Back Trunks.

The ARS for the Loop Back Trunks in the remote system is programmed to absorb the leading digit "8" and insert the voice mail hunt group pilot number "3000". The E&M Circuit Descriptor is programmed to insert the necessary pause in dialing before the remaining digits are sent. This will allow the voice mail system time to answer and receive the digits "5000", which route the caller to the associated mailbox.

Extension 5000 will retrieve voice mail messages by dialing the hunt group access code for "3000" on the remote system. No digits are absorbed or deleted on the main system.

Direct Connection to Voice Mail with E&M Trunks

If the voice mail system provided allows for direct E&M Trunk interface, this approach can be used eliminating the requirement for Loop Back Trunks. Analog E&M Trunks must be used to allow for flash transfer of calls.

In Voice Mail Connection with E&M Trunks, we have extension 5000 in system A externally call forwarded to the central voice mail system on system B. The subscriber call reroutes to the ARS leading digit followed by his/her extension number "85000". The ARS programming in system A is NOT to absorb the leading digit "8" allowing this digit to be outputted across the network to access the E&M Trunks to voice mail.

The ARS for the E&M Trunks in system B is programmed to absorb the leading digit "8". The E&M Circuit Descriptor is programmed to insert the necessary pause in dialing before the remaining digits are sent. This will allow the voice mail system time to answer and receive the digits "5000", which route the caller to the associated mailbox.

Extension 5000 will retrieve voice mail messages by dialing the ARS digit string defined for message retrieval followed by their extension number "8*5000". The ARS - modify digits in system A will not absorb or insert any digits so the E&M voice mail ports can be accessed on system B. ARS on system B will absorb the leading digit "8". The E&M Circuit Descriptor is programmed to insert the necessary pause in dialing before the remaining digits are sent. This pause allows the voice mail time to answer and receive the digits "*5000", which routes the subscriber's call to the subscriber's mailbox. The subscriber on extension 6000 on system B retrieves messages in the same manner by dialing "8*6000".

Data Applications

Refer to Data Applications and Advanced Data feature package for information on data call features.

Third Party Network Devices

The following devices may be used in digital networks with MSDN and non-MSDN applications to support customer data requirements:

- Drop and Insert
- Channel Signaling Unit (CSU)
- Channel Bank
- Multiplexer
- Inverse Multiplexers.



Note: This section contains general guidelines for designing configurations that use these devices. See the manufacturers' specifications for specific instructions.

Drop and Insert (D/I)

Drop and Insert (D/I) provides an economical means to directly access a T1 (1.544 Mbps) transmission system or a CEPT (2.048 Mbps) transmission system. This includes DS-1 or CEPT circuits connecting MSDN network nodes and direct T1 or CEPT connections. Mitel systems connected to other vendor systems with direct digital (T1 or CEPT) connections are also accommodated.

The D/I devices connects to the DS-1 or CEPT line drops/inserts information into the desired time slots and passes the remainder of the channels through on a digital basis.

Voice, data, television, and audio program channels can be dropped/inserted. The data channels can be configured to provide 56/64 x N synchronous data in some versions. The number of channels that can be dropped/inserted depends on the method used, and the manufacturer and the manufacture's model type. In theory, with some devices, 24 channels

can be dropped/inserted. Note that MSDN DS-1 links are limited to 23 channels because channel 24 is used for signaling.

The only advantage of switched data arrangements over drop/insert is when alternate routing is provided. Switched circuits can be configured to reroute automatically in case of primary route failure.

The following D/I devices are supported:

- Channel Service Unit (CSU)
- Channel Bank
- Multiplexer.

Channel Service Unit Drop/Insert

Drop/Insert Channel Service Units (CSUs) are available from various manufacturers and replace the standard CSUs used to connect the T1 span line to the system. Versions provide for 2 or 4 drop insert connections which are V.35 or RS-232 compatible. Speeds of up to 64 Kbps are supported. Some manufacturers have a 19.2 Kbps version.

Channel Banks for Drop/Insert

Channel Banks can also be used for drop/insert applications because two are required at each end. This can be a costly, not very efficient arrangement. The circuits dropped/inserted can be voice, data, or audio programming with the only limitation being the term sets available.

Drop and Insert Multiplexers

Drop and Insert Multiplexers (D/I MUX) provide an economical means to directly access a standard T1 (1.544 Mbps) digital transmission system. The D/I MUX provides dropping/inserting voice, data, audio program or TV channels. The D/I MUX is more cost-effective and provides better transmission quality than back-to-back channel banks. The D/I MUX can be configured to drop or insert "N" amount of channels (See manufacturer's instructions). Note that MSDN DS-1 links are limited to 23 channels because channel 24 is used for signaling.

The D/I MUX connects to the DS-1 line, drops/inserts information contained into the desired time slots, and passes the remainder of the channels through on a digital basis. The D/I MUX should pass bipolar violations unchanged to accommodate span line testing and 64 Kbps clear channel operation. In the event of an internal failure, the D/I MUX should automatically bypass the line.

The D/I MUX, normally, can be configured for communication up or down the span line, or both. Typically, communication will be toward a network system node where switching equipment and access to other networks is located. The D/I MUX can operate in systems terminated by digital switches or conventional D3 and D4 channel banks. It should be compatible with D1D, D2, D3, and D4 mode 3 frame formats.

The D/I MUX should be designed to be used at customer premises and along cable, digital microwave, and fiber optic span lines. For voice and data channel access, the manufacturers

have a number of different modules which vary depending on circuit type, signaling data rates, etc. Single channel synchronous data rates that are multiples of 56 or 64 Kbps, up to 1.536 Mbps, should be accommodated.

The D/I MUX can be used to drop and insert information for transmission in one direction (unidirectional) or two directions (bidirectional). The number of channels dropped and inserted may be up to 24 depending on the manufacturer's configuration. The primary function performed by the D/I MUX is to provide access to a T1 line which is a full-duplex transmission medium.

In general, a typical system operates as follows: a T1 line enters the D/I MUX and drops off selected DS-0 channels which are received by the channel units, the channel unit then interfaces the baseband signals with the subscriber. In the reverse direction, the channel unit converts subscriber transmit information into a signal compatible with the D4 channelized T1 format which is then inserted into the T1 bit stream. All DS-0 channels not accessed pass through the D/I MUX.

Inverse Multiplexing

When given a single telephone number, an inverse multiplexer dials multiple digital "calls" between two sites and combines the bandwidth of the individual calls into a single, high-bandwidth channel. The inverse multiplexers at each end perform dialing, delay compensation and reordering tasks, and monitor and maintain the integrity of the connection. Inverse multiplexers can also combine leased and dialed bandwidth.

Inverse multiplexers can provide suitable bandwidth for data and video applications at rates from 56 Kbps to 4 Mbits using dialed and leased services depending on the manufacturer. Inverse multiplexers provide dynamic allocation of frequency and ISDN H-0, H-11 type services.

ISDN Basic Rate (BRI) and Primary Rate (PRI) lines provide access to switched and dedicated services within the wide area network (WAN), including 56K for T1 lines and 64K for E1 lines. The BRI card provides either 56K or 64K bandwidth per channel but does not perform any channel aggregation. An inverse multiplexer or similar device would be required to combine multiple switched 56K or 64K service channels for higher bandwidth.

Typical features on inverse multiplexers are:

- Field-selectable V.35, RS-449, or X.21 data ports
- RS-366, V.25 bis, X.21, and control-lead dialing
- Dual 56 ports for 112 Kbit/s operation
- Exact clocking and 56-64 Kbit/s rate adaption
- Speed dialing and stored call profiles
- Supports conference scheduling software
- Supports video
- Nx56, Nx64, and Nx384
- 56 Kbit/s to 4Mbit/s
- Built-in CSU/DSU.

MSDN Applications

Inverse multiplexers will be connected to system network nodes with T1/D4 circuits. When not in use, no circuits will be connected and no MSDN B-Channels will be occupied (see example).

In the example, the inverse multiplexer located in Dallas has dialed digits to set up DS-0 connections in both the Dallas and Kanata nodes. Six bearer (B) Channels on the first MSDN circuit were utilized. A bandwidth of 336/384 Kbps (H-0) is provided. Call set-up is flexible. DS-0 circuits within the system do not have to be sequential or in the same MSDN circuit. The six DS-0 connections required are distributed through both of the connecting MSDN circuits.

With a single MSDN circuit call, call set-up would be restricted to twenty-three DS-0 circuits (B Channels). Channel 24 is reserved for D Channel. When multiple MSDN circuits are available, rates above 23 X 64 Kbps can be set with the appropriate number of DS-0 (B Channels) distributed over the multiple MSDN circuits. Bandwidth Exceeding 23 x 64 Kbps Multiple MSDN Circuits illustrates a 1536/1344 Kbps (H-11) arrangement with twenty-four DS-0 circuits distributed over two MSDN circuits.

LAN/WAN

LAN Guidelines

To maintain optimum voice quality, it is recommended that voice and data traffic be segregated as much as possible. There are three methods of segregation, depending on the existing LAN configuration:

1. Run Voice and Data on separate physical networks
2. Run Voice and Data on separate Virtual LANs (VLAN).
3. Use a separate subnet for voice traffic.

LAN Recommendations:

- Use Ethernet switches instead of hubs. It is recommended that IP telephones be in a single sub-net incorporating Layer 2 switches.
- Use Full Duplex Fast Ethernet where possible between switches.
- For the single-port telephones (4015 IP Phone/4025 IP Phone), provide two switched Ethernet drops to the desktop -- one for the PC and one for the IP telephone.
- For the dual-port telephones (5010 IP Phone/5020 IP Phone), you have two options. First, provide one switched Ethernet drop to the desktop for the PC/IP Phone. In this case, the PC connects to the network through the IP telephone. Second, provide two switched Ethernet drops, one for the PC and one for the IP telephone. For optimum voice quality, VLANs are highly recommended where only one Ethernet drop to the desktop is used.
- The 3300 ICP system should be installed in the same broadcast domain as the majority of the IP telephones.
- There should be only one active Dynamic Host Configuration Protocol (DHCP) server within the Broadcast Domain. The 3300 ICP system includes a DHCP server.

- Place functional groups on the same switches and/or subnets to reduce traffic across backbones and routers.
- IEEE 802.1 p/Q priority is supported at the telephones but not supported on the Mitel Networks 3300 Controller. Use Layer 2 Switches (port based) to set the voice VLAN default for the 3300 Controller, and to modify the data format to add 802.1 p/Q (tagging).
- When VLANs (802.1 p/Q) are used with the dual-port telephones (5010 IP Phone/5020 IP Phone), the Layer 2 switch ports connected to IP telephones must have the port configured to accept data already tagged for the voice VLAN and a default or native VLAN (typically set to 1) to accept untagged data from an attached PC and convert it to tagged data.
- Do not mix data and voice with the same priority. Set any queues and priority so that voice and data are different priority (for example, High - Voice, Low - Data).
- For mobility of IP telephones, it is recommended that Layer 2 switch ports configured for operation with the 3300 ICP server and IP telephones should have "spanning tree protocol" disabled and/or configured to "Portfast". It is important to ensure that the telephones and 3300 Controller are not connected to the network such that they could introduce a network loop.
- This system supports G711 voice encoding between IP telephones.

WAN Guidelines

Recommendations for connection across a Layer 3 switch or router:

- To forward a DHCP request across a Layer 3 switch or router, activate DHCP forwarding (DHCP Helper) on the router. Alternatively, use a secondary DHCP server on the remote side of the Layer 3 device. This secondary DHCP server must be programmed with the same options as the main DHCP server for the telephones to operate properly.
- For optimum performance and voice quality when using IP telephones across routed links the routers should be configured to prioritize voice traffic based on Type Of Service (TOS) using techniques such as Weighted Fair Queuing (WFQ). IP phones are preset to precedence 5 with Minimum Delay. A high priority queue has settings 4, 5, 6, 7; A low priority queue has settings 0, 1, 2, 3. PCs should use low priority. On slow WAN links between routers set the Maximum Transmittable Unit (MTU) appropriately for the speed of the WAN link (a value of 500 is recommended for links using T1/E1 type seeds).
- Not all routers or Layer 3 switches will recognize 802.1p/Q VLAN information. In this situation, it will be necessary to provide a separate physical connection for each VLAN and subnet in use.
- The E2T / RTC Cards support the Internet Control Message Protocol (ICMP) Messages. Enable ICMP Redirect on your layer 3 switches and default gateway. The redirect will forward messages to the correct LAN segment and reduce broadcast messages and LAN usage.
- Minimum recommended WAN link speed is 1.544 Mbps (T1) with Frame Relay, HDLC, PPP, and compressed PPP.
- If the Layer 3 switch or router can support TOS and queue priority, then don't use more than 70% bandwidth. If the Layer 3 switch or router cannot support TOS queue, then no

more than 40% bandwidth should be used. The usage of the link should be determined before installing IP phones to determine the level of operation possible. A heavily used link may require an upgrade or implementation of TOS and MTU (500) settings.

Plan the Network

The 3300 ICP system is available in four main configurations:

1. IP telephone only
2. Analog Services Unit only
3. IP telephone and Analog Services Unit
4. ICP system with Peripheral and/or DSU Units.

When the 3300 ICP system is installed with the IP telephone option you will need two IP addresses for the system (E2T, RTC) and a range of IP addresses for the IP telephones.

The 3300 Controller uses a number of fixed IP addresses internally. It is highly recommended that IP addresses in the following range, NOT be present within the network: 192.168.10.X to 192.168.13.X. The 3300 Controller includes an internal Layer 2 switch for local communication. Only one connection is required to connect the unit to the network; this port should be set to Auto Configure, and should be connected to operate with 100BaseT for optimum performance. The remaining connections can be used for voice application devices, or left as spares. They should not be used to carry network traffic, other than that destined for the 3300 Controller. This will minimise unwanted data traffic which would otherwise reduce available connection bandwidth.



Note: The Real Time Complex (RTC) is used for the IP telephones signaling and also DHCP, TFTP, etc. Call progress, device status and screen updated messages are sent between the IP telephones and the RTC. The E2T (Ethernet to TDM) card is where the Ethernet voice is converted to TDM and vice versa.

3300 Controller

Mitel Networks™ 3300 Controller Components

Front Panel

- Remote Alarm port (DB-9 connector)
- Two RS-232 ports (DB-9 connectors) (Printer and Maintenance)
- Dual FIM ports to support the NSUs (Network Services Units)
- L2 switch provides four 10/100 Ethernet connections via RJ-45 (8-pin CAT5 cross-over cable)
- Four 2 MB CIM (copper interface module) ports are used to connect to the ASUs (Analog Services Units) with cross-over Category 5 cable
- FIM (fiber interface module), CIM (copper interface module), and Alarm LEDs.



IP0176

Rear Panel

- Power connector
- Supplementary ground to ground the chassis to the rack.



IP0213

Internal Components

- 20 GB EIDE hard drive
- 256 Mbytes of memory on the 300 MHz RTC that provides main control
- Stratum 3 clock
- 64 or 128 channel echo canceller (small and large 3300 Controller)
- 128 Ethernet to Time Division Multiplex (E2T) channels (300 MHz)
- Power fail protected real-time clock
- Digital Signal Processor (DSP) (provides for tone and conference functions)
- Two cooling fans.

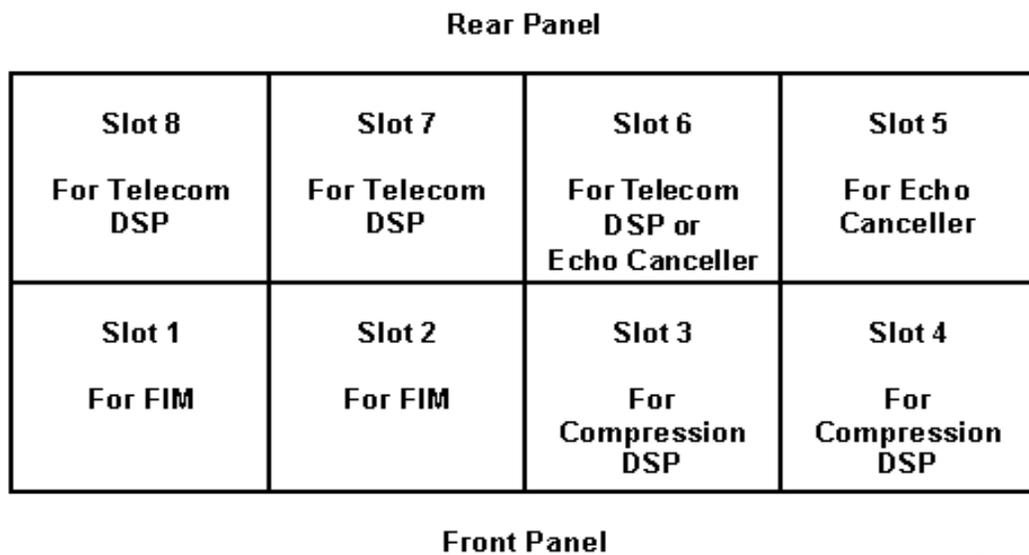
Configurations

There are several configuration options for the 3300 ICP:

- 250 user system without compression
- 250 user system with 32 compression channels
- 250 user system with 64 compression channels
- 700 user system without compression
- 700 user system with 32 compression channels
- 700 user system with 64 compression channels.

The following top view diagram shows the MMC/A slot numbering convention. The diagram also indicates the type of MMC module that will be used in a particular slot. Slots 1 through 4 allow connectors to protrude through the front panel.

3300 ICP MMC SLOT NUMBERING CONVENTION



IP0416

250 User System without Compression

This system uses:

- One 300 MHz RTC
- One 300 MHz E2T
- One 64 Channel Echo Canceller
- One Dual FIM
- One 21161 DSP Module for tone and conference support

This provides:

- Four DSP devices, to provide tone and conference functions
- 64 Channels of Echo Cancellation
- Two External FIM connections
- Four ASU connections (integral to unit)

The two external FIM connections are for providing connectivity for up to two Peripheral Units or up to four NSUs. Note that there are two T1/E1 links per NSU.

250 USER SYSTEM WITHOUT COMPRESSION

Slot 8 21161 DSP Telecom	Slot 7 Empty	Slot 6 Empty	Slot 5 64 Channel Echo Canceller
Slot 1 FIM	Slot 2 Empty	Slot 3 Empty	Slot 4 Empty

IP0412

250 User System with 32 Compression Channels

This system uses:

- One 300 MHz RTC
- One 300 MHz E2T
- One 64 Channel Echo Canceller
- One Dual FIM
- One Quad DSP Module for tone and conference support
- One Quad DSP for 32 Channels of compression

This provides:

- Four DSP devices, to provide tone and conference functions
- Four DSP devices, to provide 32 channels of compression
- 64 Channels of Echo Cancellation
- Two External FIM connections
- Four ASU connections (integral to unit)

The two external FIM connections are for providing connectivity for up to two Peripheral Units or up to four NSUs. Note that there are two T1/E1 links per NSU.

250 USER SYSTEM WITH 32 COMPRESSION CHANNELS

Slot 8 21161 DSP Telecom	Slot 7 Empty	Slot 6 Empty	Slot 5 64 Channel Echo Canceller
Slot 1 FIM	Slot 2 Empty	Slot 3 21161 DSP Compression	Slot 4 Empty

IP0410

250 User System with 64 Compression Channels

This system uses:

- One 300 MHz RTC
- One 300 MHz E2T
- One 64 Channel Echo Canceller
- One Dual FIM
- One Quad DSP Module for tone and conference support
- Two Quad DSP Modules for 64 Channels of compression

This provides:

- Four DSP devices, to provide tone and conference functions
- Eight DSP devices, to provide 64 channels of compression
- 64 Channels of Echo Cancellation
- Two External FIM connections
- Four ASU connections (integral to unit)

The two external FIM connections are for providing connectivity for up to two Peripheral Units or up to four NSUs. Note that there are two T1/E1 links per NSU.

250 USER SYSTEM WITH 64 COMPRESSION CHANNELS

Slot 8 21161 DSP Telecom	Slot 7 Empty	Slot 6 Empty	Slot 5 64 Channel Echo Canceller
Slot 1 FIM	Slot 2 Empty	Slot 3 21161 DSP Compression	Slot 4 21161 DSP Compression

IP0411

700 User System without Compression

This system uses:

- One 300 MHz RTC
- One 300 MHz E2T
- One 128 Channel Echo Canceller
- Two Dual FIMs
- Two Quad DSP Modules for tone and conference support

This provides:

- Eight DSP devices, to provide tone and conference functions
- 128 Channels of Echo Cancellation
- Two External FIM connections
- Four ASU connections (integral to unit)

The four external FIM connections are for providing connectivity for up to two Peripheral Shelves or up to six NSUs. Note that there are two T1/E1 links per NSU.

700 USER SYSTEM WITHOUT COMPRESSION

Slot 8 21161 DSP Telecom	Slot 7 21161 DSP Telecom	Slot 6 Empty	Slot 5 128 Channel Echo Canceller
Slot 1 FIM	Slot 2 FIM	Slot 3 Empty	Slot 4 Empty

IP0415

700 User System with 32 Compression Channels

This system uses:

- One 300 MHz RTC
- One 300 MHz E2T
- One 128 Channel Echo Canceller
- Two Dual FIMs
- Two Quad DSP Modules for tone and conference support
- One Quad DSP Module for 32 Channels of Compression

This provides:

- Eight DSP devices, to provide tone and conference functions
- Four DSP devices, to provide 64 channels of compression
- 128 Channels of Echo Cancellation
- Four External FIM connections
- Four ASU connections (integral to unit)

The four external FIM connections are for providing connectivity for up to two Peripheral Units or up to six NSUs. Note that there are two T1/E1 links per NSU.

700 USER SYSTEM WITH 32 COMPRESSION CHANNELS

Slot 8 21161 DSP Telecom	Slot 7 21161 DSP Telecom	Slot 6 Empty	Slot 5 128 Channel Echo Canceller
Slot 1 FIM	Slot 2 FIM	Slot 3 21161 DSP Compression	Slot 4 Empty

IP0413

700 User System with 64 Compression Channels

This system uses:

- One 300 MHz RTC
- One 300 MHz E2T
- One 128 Channel Echo Canceller
- Two Dual FIMs
- Two Quad DSP Modules for tone and conference support
- Two Quad DSP Modules for 64 Channels of Compression

This provides:

- Eight DSP devices, to provide tone and conference functions
- Eight DSP devices, to provide 64 channels of compression
- 128 Channels of Echo Cancellation
- Four External FIM connections
- Four ASU connections (integral to unit)

The four external FIM connections are for providing connectivity for up to two Peripheral Units or up to six NSUs. Note that there are two T1/E1 links per NSU.

700 USER SYSTEM WITH 64 COMPRESSION CHANNELS

Slot 8 21161 DSP Telecom	Slot 7 21161 DSP Telecom	Slot 6 Empty	Slot 5 128 Channel Echo Canceller
Slot 1 FIM	Slot 2 FIM	Slot 3 21161 DSP Compression	Slot 4 21161 DSP Compression

IP0414

E2T Compression

The 3300 ICP provides the option of G.729a voice compression. Licenses and the 21161 Quad DSP Modules enable this feature to a maximum 64 compression channels. Compression is carried out by the 21161 DSP under the control of the E2T.

IP phone to IP phone calls also support compression. Compression for this scenario is applied by DSP resources in the phones and does not require compression licenses.

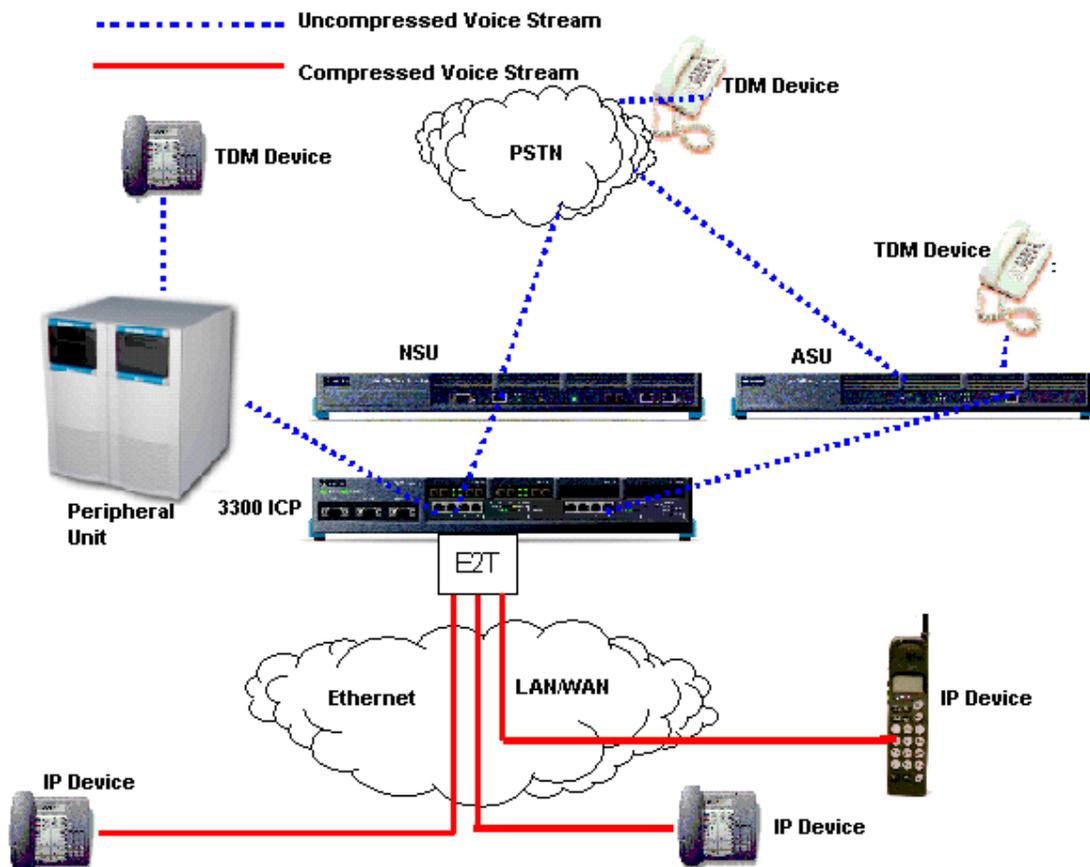
The compression of a standard call effectively reduces the bandwidth required per call from 64kbps to approximately 8kbps plus packet overhead.



Note: Only IP phones can be put in separate compression zones. The TDM resource of the system is always left in the default zone.

In the following example, when an IP device (assigned to a non-default zone) calls a TDM device, G.729ac compression will be invoked on the LAN or WAN side of the call providing there are adequate compression resources available in the controller.

The same applies to calls originate from a TDM device and terminate on an IP device.



Mitel Networks 3300 Controller Dimensions

Physical Dimensions

Height	2.625 in. (6.66 cm) (1.5 U)
Width	17.75 in. (45.1 cm) (19" rack mountable)
Depth	15.5 in. (39.4 cm)
Weight	15.8 lb (7.17 kg)

3300 Controller Environment

Storage Environment

Condition	Specification
Temperature	-40° to 140° F (-40° to +60° C)
Humidity	15-95% Relative Humidity, non-condensing
Vibration	0.5 g, 7 to 100 Hz, any orthogonal axis 1.5 g, 100 to 500 Hz, any orthogonal axis
Mechanical Stress	One 15.3 cm (6 in.) drop, each edge and corner adjacent to the rest face – unpackaged One 76.2 cm (30 in.) drop, each edge and corner packaged in cardboard & foam.

Operational Environment

Condition	Specification
Temperature	41° to 95° F (5° to 35° C)
Humidity	40-90% Relative Humidity, non condensing
Maximum Heat Dissipation - fully loaded (see Note)	750 BTUs per hour
Air Flow	46 cubic feet per minute at maximum output of the fans
Acoustic Emissions	Maximum 50 dBA continuous, 75 dB intermittent (<10% duty cycle)
Conversion factors: 1 watt is equal to 3.412 BTUs per hour, 1 ton of refrigeration is equal to 12,000 BTUs per hour or 3.516 Kilowatts, and 3/4 Kilowatt-hour is equal to 1 ton of refrigeration.	

3300 Controller Power

Power Supply

Input / disconnect	IEC 320 AC connector
Operation	120 Vac/230 Vac or auto selectable
Maximum input power	200 W
AC source	90 - 264 Vac; 47 - 63Hz

Output Power

Output Voltage	Max Current
+3.3 +/- 1.5%	30.0A
+5.0V +/- 1%	8.0A (Total power of 3.3V and 5.0V not to exceed 100W)
+12.0V +/- 7%	3.0A (Hard Disk Drive)

3300 Controller IRQ Assignments

IRQ Assignments

IRQ	Signal	Comment
IRQ0	PSI	NMI - comes from Power supply via Midplane
IRQ1	None (PCI - Optional)	---comes from Power supply via Midplane - stuffing option if it cannot be handled under IRQ0
IRQ2	IRQ_HI_MMC_N	Higher priority interrupt from Midplane, filtered through CPLD_8260_MMC
IRQ3	CKSTP_OUT_IRQ3	From COP interface - not used, pulled up
IRQ4	IRQ_LO_MMC_N	Lower priority interrupt from Midplane, filtered through CPLD_8260_MMC
IRQ5	FP_N	Frame Pulse interrupt for TestEng., pulled up
IRQ6	ATA2_IRQ_N	from Hard Drive, filtered through CPLD_8260_ATA
IRQ7	-	Not used, pulled up

3300 Controller PCB Interfaces

PCB (Printed Circuit Board) Interfaces

Connector Function	Type	Quantity	Signals	Comments
RS-232	DB9	2	Txd, Rxd, (RTS), (CTS), (DTR), (CD), DSR, Gnd (parenthesis indicates operational function, dependent upon application)	DCE pinout. Female style. Supports rates to 115K. Default setting 9600, 8 bits, No Parity, 1 Stop-bit, Txd, Rxd, Gnd
EIDE	40 pin male	1	Internal Hard Disk Drive	Internal to box. (On RTC)
10/100 Ethernet	8-pin Mod- jack	4	TxP, TxN , RxP, RxN (Cross-over DX connections)	User side pinout
CIM	8-pin Mod- jack	4	Txlink, Rxlink (all differential pairs)	Pinout is based on standard IT cable pairs.
Power	Per power supply	Per power supply	+5v, +3.3v, +12v, -12v, Gnd, Power-good	Internal to box, AC to integral PSU, or DC to external PSU
Alarm Drive	DB9	1	Contact closures, Critical, Major, Minor alarms	DB9 connection (female connection)

3300 Universal NSU Protocols

The 3300 Universal NSU provides T1 or E1 connectivity and supports up to two links per unit. The protocols supported by the interfaces are:

- T1 - PRI, Q.Sig, DPNSS, T1/D4
- E1 - PRI, Q.Sig, DPNSS, DASSII
- PRI variant - DMS-250, DMS-100, 4ESS, NI-2, 5ESS, and Euro ISDN (NET5, Q.SIG)
Protocol variant - EURO_STANDARD, EURO_NUMERIS, EURO_CAYMAN, NI2_STANDARD, NI2_5ESS, NI2_GTD5, QSIG_ISO, QSIG_ETSII)



Note: Q.SIG uses Master/Slave. All others use User/Network. T1/E1 running PRI or Q.SIG will support XNET over PRI, NFAS, D-Channel Backup, and Min/Max functionality.

3300 Universal NSU DIP Switch Settings

Hybrid Port DIP Switch Settings

DIP Switch	Use	Notes
1	Tx Ground	Ground when down; floating when up.
2	Rx Ground	Ground when down; floating when up.
3	Impedance selector #1	120 ohm (enabled when down)
4	Impedance selector #2	100 ohm (enabled when down)
5	Impedance selector #3	75 ohm (enabled when down)
6	LT/NT selector	Up for NT; down for LT.

PRI/T1 Mode Connector DIP Switch Settings

Impedance	1 Tx Gnd	2 Rx Gnd	3 I #1	4 I #2	5 I #3	6 LT/NT
100	Up	Up	Up	Down	Up	Down

E1/MF-R2 Mode/Connector DIP Switch Settings

BNC Adapter Required	Impedance	1 Tx Gnd	2 Rx Gnd	3 120 ohm	4 100 ohm	5 75 ohm	6 LT/NT
No	120	Up	Up	Down	Up	Up	Up
No	120	Up	Up	Down	Up	Up	Down
Yes	75	Note	Note	Up	Up	Down	Up
Yes	75	Note	Note	Up	Up	Down	Down

Note: Site dependant - normally Tx is grounded and Rx is not grounded, but that depends on which remote connection is grounded.

Mitel Networks™ 3300 R2 NSU Components

Front panel

- RS-232 serial port (DB9 connector to a PC) for maintenance purposes such as field installation, database upgrade, access to logs, and modem connection for remote access
- Ethernet port (RJ-45 connector) for future use
- Faceplate LEDs - Miscellaneous, Link Status, and Message Link Controlled
- FIM port for fiber connection to the 3300 Controller
- Two CIM ports
- Reset pin.



Rear panel

- DIP switch up (1) position for FIM connection; down (2) for CIM connection
- Two E1 ports (RJ-45 connectors) for network connection
- Two hybrid port status LEDs
- Two hybrid port DIP switch complexes
- Power connector
- Supplementary ground (to ground the chassis).



3300 R2 NSU Protocols

R2 is a protocol converter that allows the 3300 R2 NSU to access an R2 National Public Switched Telephone Network (PSTN) using MF-R2 digital trunk signaling. The 3300 Controller also receives and processes Calling Line Identification (CLI) and allows the information to be displayed on the user's telephone display screen.

The 3300 R2 NSU supports the CCITT Blue Book, Volume VI, Fascicle VI.4, Specifications of Signaling System R2, Recommendations Q.440 to Q.490 (with the exception of Echo Suppression (Q.479), Test Calls (Q.490) and international signals).

The 3300 R2 NSU converts the following:

- Incoming MF-R2 signals from the PSTN into Digital Private Network Signaling System (DPNSS) signals for the system
- Outgoing DPNSS signals from the system into MF-R2 signals for the PSTN.

3300 R2 NSU DIP Switch Settings

MF-R2 Port DIP Switch Settings

DIP Switch	Use	Default Setting	Notes
1	Tx Ground	Up	Tx shield ground when down
2	Rx Ground	Up	Rx shield ground when down
3	Impedance selector #1	Up	120 ohm
4	Impedance selector #2	Up	100 ohm
5	Impedance selector #3	Up	75 ohm
6	LT/NT selector	Up	Up for NT, down for LT

E1/MF-R2 Mode/Connector DIP Switch Setting

BNC Adapter Required	Impedance	LT/NT Mode	1 Tx Gnd	2 Rx Gnd	3 120 ohm	4 100 ohm	5 75 ohm	6 LT/NT
No	120	NT	Up	Up	Down	Up	Up	Up
No	120	LT	Up	Up	Down	Up	Up	Down
Yes	75	NT	Note	Note	Up	Up	Down	Up
Yes	75	LT	Note	Note	Up	Up	Down	Down

Note: Site dependent - normally Tx is grounded and Rx is not grounded, but that depends on which remote connection is grounded.

Mitel Networks™ 3300 BRI NSU Components

Front panel

- RS-232 serial port (DB9 connector) for installation, configuration, and maintenance
- BRI Circuit LEDs
- CEPT link Status LED
- Power LED
- Reset pin.



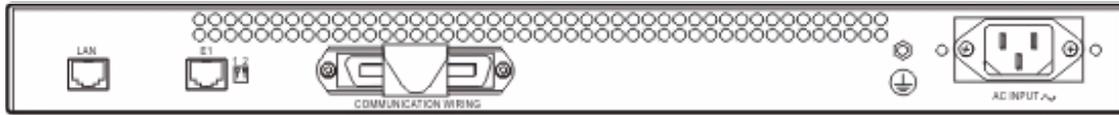
Rear panel

- Ethernet port (RJ-45 connector) for future use
- E1 port to connect to an NSU that is running E1 DPNSS
- E1 port DIP switches
- BRI connector (25-pair male D-type)

- Supplementary ground to ground the chassis
- Power connector.



Note: UK BRI will drive power to the BRI circuits; the NA BRI will not.



IP0215

3300 BRI NSU Protocols

Fifteen interfaces are programmed for line support in the NA product and line or trunk support in the UK version. The 3300 BRI NSU protocols are

- Euro-ISDN 2B+D, Basic Rate Interface
- North American National ISDN-1
- North American National ISDN-2.

Mitel Networks 3300 NSU Dimensions

Physical Dimensions

Height	1.75 in. (4.454 cm) (1 U)
Width	17.75 in. (45.1 cm) (19" rack mountable)
Depth	15.5 in. (39.4 cm)
Weight	9.41 lb (4.27 kg)

3300 NSU Environment

Storage Environment

Condition	Specification
Temperature	-40° to 140°F (-40° to +60°C)
Humidity	15-95% Relative Humidity, non-condensing
Vibration	0.5 g, 7 to 100 Hz, any orthogonal axis 1.5 g, 100 to 500 Hz, any orthogonal axis
Mechanical Stress	One 15.3 cm (6 in.) drop, each edge and corner adjacent to the rest face – unpackaged One 76.2 cm (30 in.) drop, each edge and corner packaged in cardboard & foam.

Operational Environment

Condition	Specification
Temperature	41° to 122°F (5° to 50°C)
Humidity	34-95% Relative Humidity, non-condensing
Maximum Heat Dissipation - fully loaded (see Note)	170 BTUs per hour
Conversion factors: 1 watt is equal to 3.412 BTUs per hour, 1 ton of refrigeration is equal to 12,000 BTUs per hour or 3.516 Kilowatts, and 3/4 Kilowatt-hour is equal to 1 ton of refrigeration.	

3300 NSU Power

Power Supply

Input / disconnect	IEC 320 AC connector
Operation	120 Vac/230 Vac Switch or auto selectable
Maximum power output	60 W (Universal and R2) 40 W (BRI)
AC source	90 - 132 Vac; 47 - 63Hz in North America 180 - 264 Vac; 47 - 63Hz in Europe

Output Power

Output Voltage	Max Current
+5.0V +/- 5%	8.0A (BRI Note: total power of 12V and 5V not to exceed 60W)
BRI only +12.0V +/- 7%	3.0A (Line power supply)

3300 NSU Pin Allocations

T1 and E1 Connector Allocation

Signal Name	RJ-45 Connector Pin
RXRING	1
RXTIP	2
Not used	3
TXRING	4
TXTIP	5
Not used	6
Not used	7
Not used	8

RS-232 Maintenance Connector Allocation

Signal Name	RJ-45 Connector Pin
DTR (data terminal ready) DCD (data carrier detector)	1
RXD (receive data)	2
TXD (transmit data)	3
DTR (data terminal ready)	4
GND	5
Not used	6
RTS (ready to send)	7
CTS (clear to send)	8
Not used	9

BRI Connector Allocation

T1	1
T2	2
T3	3
T4	4
T5	5
T6	6
T7	7
T8	8
T9	9
T10	10
T11	11
T12	12
T13	13
T14	14
T15	15
R1	26
R2	27
R3	28
R4	29
R5	30
R6	31
R7	32
R8	33
R9	34
R10	35
R11	36
R12	37
R13	38
R14	39
R15	40

3300 Analog Services Units

Mitel Networks™ 3300 Universal ASU Components

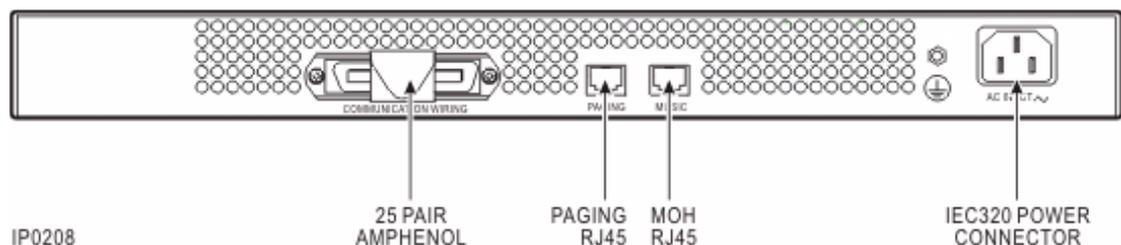
Front Panel

- 16 ONS LEDs showing circuit status
- 4 LS trunk LEDs showing circuit status
- 1 CIM Status LED
- RJ-45 connector (CIM connection to the 3300 Controller).



Rear Panel

- D-type 25 pair connector providing connectivity to the LS and ONS Tip/Ring or A/B circuits
- 8 pin modular jack (RJ-45) for 2 Paging ports
- 8 pin modular jack(RJ-45) for 4 Music on Hold ports (only one MOH port is supported through software on the system)
- Standard Male IEC 320 AC power connector.



Mitel Networks™ 3300 ASU Components

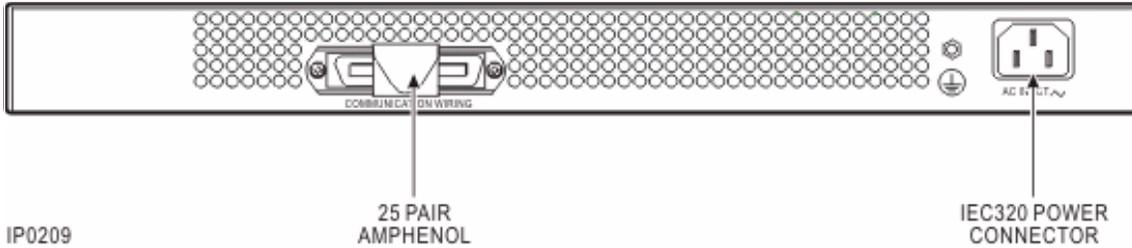
Front Panel

- 24 ONS Circuit LEDs indicate the status of the telephone circuits
- 1 CIM circuit LED indicates the status of the CIM link
- RJ-45 connector (CIM connection to the 3300 Controller).



Rear Panel

- 25 pair D-type connector provides access to the LS and ONS Tip/Ring or A/B circuits.
- Standard Male IEC AC input connector for power requirement.



3300 ASU and Universal ASU Dimensions

Physical Dimensions

Height	1.75 in. (4.454 cm) (1 U)
Width	17.75 in. (45.1 cm) (19" rack mountable)
Depth	15.5 in. (39.4 cm)
Weight	10.61 lb (4.81 kg)

3300 ASU and Universal ASU Environment

Storage Environment

Condition	Specification
Temperature	-40° to 140°F (-40° to +60°C)
Humidity	15-95% Relative Humidity, non-condensing
Vibration	0.5 g, 7 to 100 Hz, any orthogonal axis 1.5 g, 100 to 500 Hz, any orthogonal axis
Mechanical Stress	One 15.3 cm (6 in.) drop, each edge and corner adjacent to the rest face – unpackaged One 76.2 cm (30 in.) drop, each edge and corner packaged in cardboard & foam.

Operational Environment

Condition	Specification
Temperature	41° to 122°F (5° to 50°C)
Humidity	34-95% Relative Humidity, non-condensing
Maximum Heat Dissipation - fully loaded (see Note)	170 BTUs per hour
Conversion factors: 1 watt is equal to 3.412 BTUs per hour, 1 ton of refrigeration is equal to 12,000 BTUs per hour or 3.516 Kilowatts, and 3/4 Kilowatt-hour is equal to 1 ton of refrigeration.	

3300 ASU and Universal ASU Power

Power Supply Input Specifications

Note: Connector is a Standard Male IEC320 AC input.	
Voltage	Universal input design, operating input voltages from 90VAC to 264VAC. It regulates a +5, -48V, -30V, -5V, 70VAC ringing signal, and the -115VAC Message Waiting Signal.
Current	< 1.0A RMS at 90VAC and full rated load.
Frequency	AC input frequencies from 47Hz to 63Hz.
Holdover	With an input voltage of 120VAC or 240VAC under a full rated load, the power supply outputs remain in regulation for a minimum of 16ms after loss of AC mains input voltage.
Brown-Out Recovery	Recovers from an AC input brown-out or sag condition automatically.

3300 ASU and Universal ASU Pin Allocations

CIM Connector Pin Allocations

Pin	Signal	Pin	Signal
1	RX+	5	Not Used
2	RX-	6	TX-
3	TX+	7	Not Used
4	Not Used	8	Not Used

Note: The 3300 Universal ASU connects to the 3300 Controller over a Category 5 Universal Twisted Pair (UTP) cross-over cable through a CIM interface. The Category 5 cable is of the same type used for Ethernet connections and within the cable twisted pairs are arranged as: 1,2: 3,6; 4,5; 7,8. Each tied pair is connected to a 75 ohm resistor. The 3300 Universal ASU can be located up to 30 meters (98.4 feet) away from the 3300 Controller. The interface employs a single standard 8-pin modular jack consisting of 2 balanced signal pairs and is located on the front of the unit.

25 pair Connector Pin Allocations

Pin	Signal	Pin	Signal
Note: Connection of the Tip and Ring (A and B) leads of the ONS lines and LS trunk circuits are through a 25 pair female D-type connector.			
1	ONS Tip 1	26	ONS Ring 1
2	ONS Tip 2	27	ONS Ring 2
3	ONS Tip 3	28	ONS Ring 3
4	ONS Tip 4	29	ONS Ring 4
5	ONS Tip 5	30	ONS Ring 5
6	ONS Tip 6	31	ONS Ring 6
7	ONS Tip 7	32	ONS Ring 7
8	ONS Tip 8	33	ONS Ring 8
9	ONS Tip 9	34	ONS Ring 9
10	ONS Tip 10	35	ONS Ring 10
11	ONS Tip 11	36	ONS Ring 11
12	ONS Tip 12	37	ONS Ring 12
13	ONS Tip 13	38	ONS Ring 13

25 pair Connector Pin Allocations (continued)

Pin	Signal	Pin	Signal
14	ONS Tip 14	39	ONS Ring 14
15	ONS Tip 15	40	ONS Ring 15
16	ONS Tip 16	41	ONS Ring 16
17	LS Tip 1	42	LS Ring 1
18	LS Tip 1-1	43	LS Ring 1-1
19	LS Tip 2	44	LS Ring 2
20	LS Tip 1-2	45	LS Ring 1-2
21	LS Tip 3	46	LS Ring 3
22	LS Tip 1-3	47	LS Ring 1-3
23	LS Tip 4	48	LS Ring 4
24	LS Tip 1-4	49	LS Ring 1-4
25	N/C	50	N/C

Music on Hold Connector Pin Allocations (Universal ASU only)

Pin	Signal	Pin	Signal
1	Tip 1	5	Ring 3
2	Ring 1	6	Ring 2
3	Tip 2	7	Tip 4
4	Tip 3	8	Ring 4

Note: The four MOH tips & rings occupy an 8 pin female modular jack located on the rear panel.
Note: Only one port is supported through software on the system.

Paging Connector Pin Assignments (Universal ASU only)

Pin	Signal	Pin	Signal
1	Tip 1	5	Ring 2
2	Ring 1	6	Ring 1-1
3	Tip 1-1	7	Tip 1-2
4	Tip 2	8	Ring 1-2

Note: The paging port employs a single standard 8-pin modular RJ-45 jack located on the rear panel. Each paging port has a tip/ring pair for audio and a second tip/ring pair designated tip1/ring1 contact closures for zone control.

ONS Line Specifications

ONS Line Features (ASU)

The ONS line circuit has the following features:

- Maximum of 600-Ohm external loop drive capability. This equates to approximately one mile of loop range over 26-gauge cable terminated by a 150-Ohm set. Longer loops are supported but with the characteristics as described by the next bullet item.

- Constant current design with the loop current set at 25mA. If the loop range extends pass 600 Ohm, this circuit will revert to a voltage feed of approximately 2xVdc (design dependant parameter between 22-26 Vdc). The circuit remains active and the loop current will be dependant on the external loop impedance.
- Supports a Ringing Equivalent Number (REN) of 3.
- Capable of on-hook transmission. Used in conjunction with a centralized resource to deliver calling line ID.
- Positive disconnect (removal of battery from the ring lead).
- Battery reversal (UK< LA< EU variants only - used for CLID).
- Ground button detection.
- Message waiting indication (dc voltage method).
- Message waiting indication (class message).
- Status led indicator per circuit.
- Low level diagnostics.

ONS Transmission Parameters (ASU)

Transmission	Parameters for NA	Parameters for UK
Input Impedance	600 ohms	300R + (1000R // 220uF)
Balance Impedance	600 ohms	300R + (1000R // 220uF)
Digital Coding	ITU μ -law – MT8966 CODEC	ITU A-law – MT8967 CODEC

Transmission	Parameters for LA	Parameters for EU
Input Impedance	600 ohms	270R + (750R // 150uF)
Balance Impedance	600 ohms	270R + (750R // 150uF)
Digital Coding	ITU μ -law – MT8966 CODEC	ITU A-law – MT8967 CODEC

ONS DC Supervision Parameters (ASU)

DC Supervision	Parameters for NA/LA	Parameters for UK/EU
Battery Feed	-30Vdc feed, constant current set at 25mA +/- 1mA	-30Vdc feed, constant current set at 25mA +/- 1mA
Loop Resistance	600 Ohms (includes set)	600 Ohms (includes set)
Loop Detect Threshold	12mA	12mA
Flash Detect	SW timed function from switch hook detector	SW timed function from SWHK detector
Ground button detect threshold	13mA Tip or Ring to ground in off hook state	13mA tip or Ring to ground in the off hook state
Positive Disconnect	SW timed function that breaks loop current	SW timed function that breaks loop current

ONS Ringing Parameters (ASU)

Ringling	Parameters for NA/LA	Parameters for UK/EU
Voltage	65 Vrms sinewave superimposed onto -48Vdc	65 Vrms sinewave superimposed onto -48Vdc
Frequency	20Hz	25 Hz
Trip Battery Silent interval Ring Interval	-30Vdc -50Vdc	-30Vdc -50Vdc
Number of bridged ringers	3	3
Max. bridged capacitance	3uF//15kOhms	3uF//15Kohms
Ring Trip detect time	HW detector response <100ms HW ring trip overrides application of ringing signal	HW detector response <100ms HW ring trip overrides application of ringing signal
SW ring trip response time	Within 50ms of switch hook detect	Within 50ms of switch hook detect

ONS Message Waiting Parameters (ASU)

Message Waiting	Parameters for NA/LA	Parameters for UK/EU
Voltage	-115Vdc +/- 5V dc	-115Vdc +/- 5V dc
Source Impedance	Between 2k and 4K	Between 2k and 4K
MSW trip	SW control, interlocks with application of ringing	SW control, interlocks with application of ringing
Flash Rate	Cadenced, SW controlled. 300ms on/1500ms off cont.	Cadenced, SW controlled. 300ms on/1500ms off cont.

LS Trunk Specifications

LS Trunk Features (3300 Universal ASU only)

Four Loop Start (LS) trunk circuits are supported by the 3300 Universal ASU with the following features:

- Loop Start trunk capability only
- 50Hz meter pulse detection over a second T/R pair is supported on the UK variant
- Loop disconnect detection
- Loop reversal detection
- Incoming ringing detection
- Status led indicator per circuit
- Low level diagnostics
- Power Cross-protection as specified by CSA/UL 950 Safety Specifications
- Lightning Protection as specified by FCC Part 68/CS-03.

LS Trunk Signaling Protocols (3300 Universal ASU)

LS Trunk Signaling Supported Protocols

ASU Variant	LS Protocol
North America (NA) Latin America (LA)	TIA/EIA-464-B
United Kingdom (UK)	UK Subscriber / Subsidiary Loop
United Kingdom (UK)	UK Loop Start Disconnect Clear
United Kingdom (UK) Europe (EU)	CTR-21

LS Trunk Parameters (3300 Universal ASU)

Trunk Functions	Parameters for NA/LA	Parameters for UK/EU
Input Impedance	600 Ohms	370R + (620R//310uF) (UK) 270R + (750R//150uF) (EU)
Balance Impedance	600 Ohms for short loop application 350R + (1000R//.21uF) for long loops	370R + (620R//310uF) (UK) 270R + (750R//150uF) (EU) for all loop lengths
Min. operating loop current	18mA	18mA
Max operating loop current	100mA	60mA
Loop Current Limit	None	60mA
Ring detector Threshold	30Vrms	20Vrms
Dummy Ringer load	10kOhms + 2.2uF (NA) 65Ohms + 2.2uF (LA)	10kOhms + 2.2uF
Reversal detector	Detects CO battery polarity	Detects CO battery polarity
Loop detect for CO disc. (no battery)	< 2V across Tip and Ring	< 2V across Tip and Ring
Meter Pulse Detection	None	50Hz longitudinal (UK) None (EU)
Note: The NA variant is designed according to the performance standard EIA/TIA 464C. The UK Variant is designed in accordance with CTR21, but has design parameters favoring towards BS6305 and BS6450. The EU variant is designed in accordance with CTR21.		

Music On Hold (3300 Universal ASU only)

Four physical ports are supported for Music on Hold (MOH) on the 3300 Universal ASU.

The MOH interface supports the following features:

- 600 Ohm input impedance
- Signal level overload protection as mandated by FCC part 68 on encoded analog content
- Dry Tip/Ring interface (no battery)
- Always active input (no external control required or provided).

The four MOH tips & rings occupy an 8 pin female modular jack located on the rear panel.



Note: Only one port is supported through software on the system.

Paging (3300 Universal ASU only)

There are two paging ports on the 3300 Universal ASU. The paging port is a transformer coupled interface with 600 ohms input impedance. The port is full duplex and has a complete 2/4 wire hybrid interface. The Balance impedance is set at 600 ohms.

Paging is accomplished by one of two methods:

- Zone control via outputted DTMF digits
- Emulates E&M trunks, using the contact closure control.

The 3300 Universal ASU provides two overhead paging outputs. In combination with their relay contacts, two paging zones are supported.

ASU Paging Zone Number	Paging Audio Circuit Number	Paging Circuit's Relay Position
1	1	Off
2	1	On
3	2	Off
4	2	On
0	1 & 2	Off & Off

System Fail Transfer (3300 Universal ASU only)

Four System Fail Transfer (SFT) relays are supported, one per LS trunk circuit. Control of the relay is via loss of power (power fail transfer), or software directed transfer (System Fail Transfer).

The SFT switches activate under the following conditions:

- Failure of the 3300 Controller
- Interruption of the system AC power
- Loss of the CIM link between the 3300 Controller and ASUs.

SFT requires fixed mapping between four ONS ports and LS trunks as follows:

LS Trunk	ONS Port
1	13
2	14
3	15
4	16



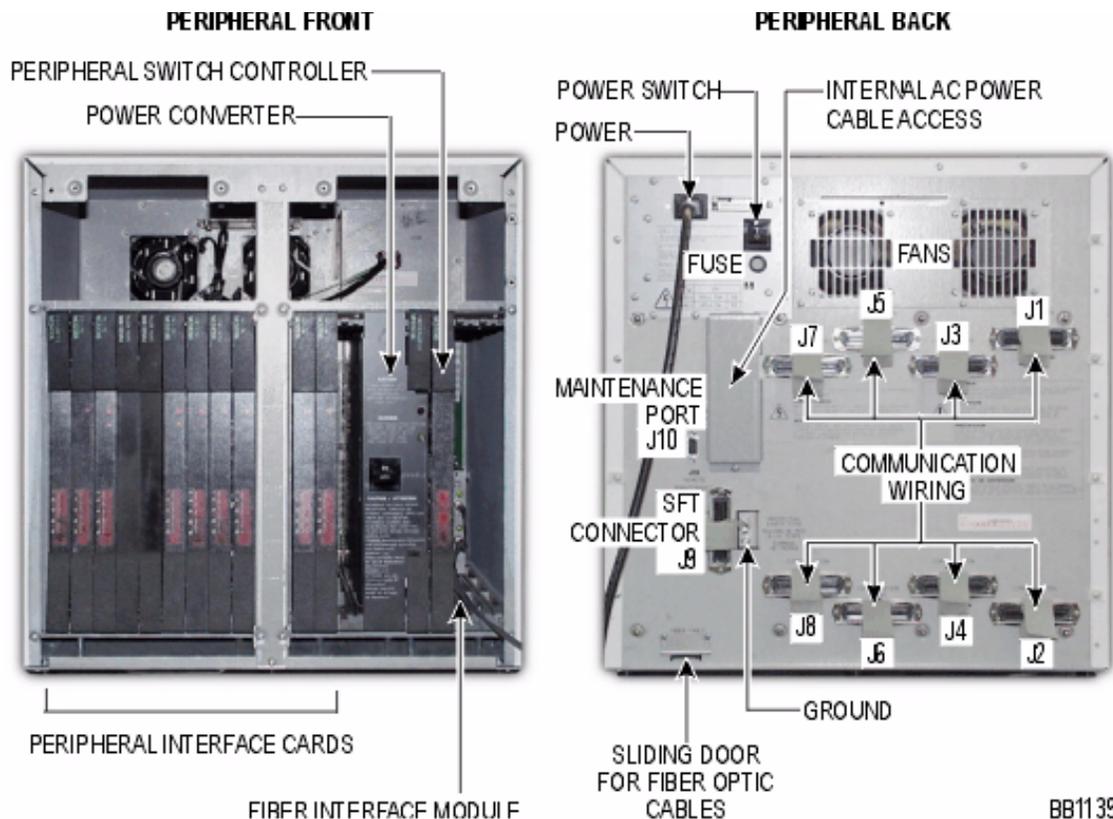
Note: When the 3300 Universal ASU is in reset condition it goes into System Fail Transfer mode. While in this mode, the 4 ONS pre-defined circuits and the corresponding LS circuits will be connected together by hardware relays allowing callers to make calls without any local call control intervention (telephones are connected directly to the CO or exchange).

Peripheral Node

Peripheral Unit Components

Each peripheral cabinet holds up to 12 Peripheral Interface Cards and provides up to 192 ONS or DNI ports. With the Peripheral Unit Expansion, a slave cabinet can be added that expands the unit up to a total of 384 ports and 24 Peripheral Interface cards (the number of voice channels remains the same). One Peripheral Switch Controller (PSC) card and one Fiber Interface Module (FIM) is installed in the master cabinet of each Peripheral Unit. The PSC card provides control for all Peripheral Interface cards, and fiber optic cable connects the FIM to the main control.

The 3300 Peripheral Cabinet fits into a 19" rack. All components are the same as for existing peripheral cabinets, only the cabinet frame is slightly smaller. This cabinet is dark grey in color and cannot be used with peripheral stacking brackets.



The peripheral cabinet consists of the following components:

- **Peripheral Interface Cards:** The Peripheral Interface cards connect telephone trunks and peripheral devices (such as SUPERSET™ telephones) to the system. They are located in slots 1 through 12.
- **Power Converter (AC):** The AC power converter converts AC input power to the voltages required by the circuit cards and FIMs (+5 Vdc, +12 Vdc, -27 Vdc, -48 Vdc and 80 Vac ringing). It is installed in slots 13 to 15.
- **Peripheral Switch Controller card (PSC):** The PSC card performs all peripheral switch functions for up to 12 Peripheral Interface cards (or 24 cards with the addition of a peripheral slave cabinet. It is installed in slot 16 of the master peripheral cabinet.
- **Fiber Interface Module (FIM):** The FIM connects the peripheral node to the control node. It is installed in slot 17 of the master peripheral cabinet.
- **Cabinet Frame:** Each peripheral cabinet has 17 slots numbered from left to right. Slots 1 to 12 support Peripheral Interface cards and slots 13 to 15 hold the Power Converter. A master peripheral cabinet also holds a PSC card in slot 16, a FIM in slot 17, and a Peripheral Interconnect card in slot 16B (if your unit is expanded). A peripheral slave cabinet holds a Peripheral Interconnect card in slot 16, in addition to the Peripheral Interface cards and Power Converter. Slots 16B and 17 of the slave cabinet are not programmable.



Note: 3300 peripheral cabinets with a slightly smaller frame are available for stacking in a 19" rack.

- **Power Distribution Unit (PDU) (AC):** The AC PDU filters and switches the 120/240 Vac input power to the Power Converter and fan assembly.
- **Power Distribution Unit (PDU) (DC):** The DC PDU filters and switches the -48 Vdc input power to the Power Converter and fan assembly. Note that the server is available in AC version only.
- **Fan Assembly:** Two fans in the removable fan assembly cool the cabinet.
- **Rear Panel:** The following switches and connectors are located on the rear panel of the cabinet:
 - A power on/off switch
 - A fuse to protect the line lead on the input power (AC systems) or circuit breaker (DC systems)
 - A 3-conductor male receptacle to connect AC input power
 - A sliding door for the Tx and Rx fiber optic cables
 - An RS-232 Maintenance Terminal port for remote access (remote maintenance connections will only work on the master cabinet of a peripheral pair)
 - Nine 25-pair male, filtered, Amphenol connectors are located on the rear panel. All lines and trunks from the main distribution frame connect to the eight horizontally positioned connectors using 25-pair cable. The single vertically positioned 25-pair D-phone connector provides power and contact closure to an optional external system fail transfer unit.

- A 3-conductor female plug is recessed in the rear panel behind a small cover plate (AC systems only). The plug connects to the power connector on the AC Power converter.
- A ground connector.

Peripheral Unit Dimensions

Physical Dimensions

Height	19 inches (48.0 cm)
Width	18 inches (45.8 cm)
Depth	16.5 inches (42.0 cm)
Weight	95 lbs (43.2 kg)

Peripheral Unit Environment

Storage Environment

Condition	Specification
Temperature	-40° to 150°F (-40° to 66°C)
Humidity	5-95% Relative Humidity, non-condensing
Vibration	0.5 g, 5 to 100 Hz, any orthogonal axis 1.5 g, 100 to 500 Hz, any orthogonal axis
Mechanical Stress	One 20.3 cm (8 inch) drop, each edge and corner adjacent to the rest face – unpackaged
Horizontal Transportation Impact Stress	One shock pulse applied on each face perpendicular to the direction of motion of the transporting vehicle; the shock pulse is a half-sine acceleration 30 g peak, 20 ms duration

Operational Environment

Condition	Specification
Temperature	32° to 122°F (0° to 50°C)
Humidity	5-95% Relative Humidity, non-condensing
Maximum Heat Dissipation - fully loaded (see Note)	724 BTUs per hour
Air Flow	150 cubic feet per minute at maximum output of the fans
Radiated Emissions	The system meets Class A limits as outlined in FCC Rules, Part 15, Subpart J
Conducted Emissions	The system meets Class A limits as outlined in FCC Rules, Part 15, Subpart J, and complies with conducted emissions standards as outlined in BS800
Acoustic Emissions	Maximum 50 dBA continuous, 75 dB intermittent (<10% duty cycle)
Static Discharge	Withstands 50 discharges of each polarity through a 10 k resistor connected to a 60 pF capacitor charged to 20 kV, and 20 discharges of each polarity through 500 ohm resistor connected to a 100 pF capacitor charged to 10 kV

Operational Environment (continued)

Condition	Specification
Lightning Surge	2.5 kV peak, with a maximum rise time of 2 μ s and minimum decay time of 10 μ s applied to power lead terminals, and 800 V peak with a maximum rise time of 10 ms and minimum decay time of 560 ms applied to outside plant interface terminals
Induction (Normal)	50 Vrms at 60 Hz, open circuit, longitudinal mode (Tip and Ring to ground)
Power line Faults and Line Crosses (Abnormal)	600 Vrms between Tip and Ring or to ground
Flammability	Minimum oxygen index: 28%, as outlined in ASTM D2863-70 and ASTM D28664-74; meets all safety specifications for product type (CSA, UL, and BT) for use in office environment
Conversion factors: 1 watt is equal to 3.412 BTUs per hour, 1 ton of refrigeration is equal to 12,000 BTUs per hour or 3.516 Kilowatts, and 3/4 Kilowatt-hour is equal to 1 ton of refrigeration.	

Peripheral Unit Power**Power Supply**

Operation	120 Vac/230.120 Vac
Maximum AC power input Watts	212 W

Equipment	Power Requirements
AC Cabinet	120 Vac, 6 amps 240 Vac The input power is converted to ± 5 , ± 12 , -27 and -48 Vdc, and 80 Vac ringing voltage by the power converter (AC)

The AC input power connects to the PDU on the back of the Peripheral Unit by an AC power cord. An internal power cord extends AC power to the AC power converter and DC power to the backplane. A fan power connector at the rear of the PDU provides power to the fans. See Peripheral Cabinets for views of the power system components.

At the Peripheral Unit, the power entry point is one 250 V removable fuse. In 120 Vac systems, this fuse must be a 10 A slow blow fuse. In 240 Vac systems, the fuse must be a 5 A slow blow fuse.

Peripheral Unit Cards

- **DID/Loop Tie trunk card** The Direct Inward Dialing/Loop Tie (DID/LT) trunk card can terminate up to four DID and/or Loop Tie trunks.
- **DNI line card** The Digital Network Interface (DNI) line card provide 16 circuits to interface with Mitel digital telephones and consoles.
- **DTMF Receiver** The DTMF receiver card provides 16 circuits to support DTMF telephone keypads and end-to-end signaling equipment.
- **E&M trunk card** The Ear and Mouth (E&M) trunk card provides four circuits to interface E&M Trunks to the system.

- Fiber Interface Module The FIM, with 16 circuits, provides for the interface with the 3300 ICP Controller.
- LS/GS trunk card The Loop Start/Ground Start (LS/GS) trunk card can terminate eight analog CO trunks.
- ONS line card and ONS CLASS/CLIP line card The On-Premises (ONS) line card and the ONS Custom Local Area Signaling Service (CLASS)/Caller Line Identification Presentation (CLIP) line card provides 16 circuits for industry-standard rotary dial and DTMF telephones.
- OPS line card The Off-Premises (OPS) line card provides eight circuits for industry-standard telephones where the external loop resistance exceeds 600 ohms or where lightning surge protection is required.



Note: AC15 Trunk Cards and COV Line Cards are not supported.

LS/GS Trunk Card

The LS/GS trunk card is used to terminate eight central office (CO) trunks. The LS/GS trunk card connects to any Peripheral Interface card slot on the peripheral shelf via connectors J1 and J2.

The alternate LS/GS trunk card Layout is currently only available in Germany.

LS/GS Trunk Card Specifications

Variants Available:	μ-law (NA), A-law (UK), N.Z./UK, Italy, Germany)
Number of Circuits per Card:	8 LS/GS trunk circuits
Power Consumption:	NA, UK, NZ, Italy: 4.20 watts Germany: 3.36 watts
External Loop Resistance:	2367 ohms (includes CO feed resistance and is measured based on -48 V @ 18mA)
Features Provided:	2-wire/4-wire conversion A-D/D-A conversion address Signaling: MF-R1, DTMF or dial pulse programmable loop start or ground start mode balanced network selection gain control/circuit descriptor tip ground and ring ground detection metering: 12 kHz (Italy), 16 kHz (Germany), 50 kHz (UK) or dc message registration (NA) self test capability automatic card identification
Compliance:	Complies with all pertinent sections of EIA Standard RS-464 (NA), BTR Spec 1050 (UK and NZ), and FTZ 123 R-1 standards for Germany.

Operation

The LS/GS trunk card interfaces with analog central office (CO) trunks on either a -48 Vdc loop start (LS) or -48 Vdc ground start (GS). The preferred interface is GS.

The German variant has LS function only.

The trunk circuits on the LS/GS trunk card are configured during the initial system programming process. Each trunk circuit can be programmed to operate in an LS or GS mode. LS or GS options can be changed at any time via the System Administration Tool.

When GS mode is selected, incoming trunk calls are initiated by a ground on the Tip lead, or by a ringing source applied to the trunk by the CO. Outgoing calls are initiated by seizing an idle trunk (via the DATA IN link of the trunk circuit) and by placing a ground on the Ring lead.

When LS mode is selected, incoming trunk calls are initiated by a ringing source applied to the trunk by the CO. Outgoing calls are initiated by first seizing an idle trunk (via the DATA IN link on an LS/GS trunk card circuit) and by placing a low resistance loop across the Tip and Ring leads.

Dictation equipment used on a trunk can indicate a busy or idle status by interconnecting a third wire lead to either the T(MR) or R(MR) termination at the 3300 ICP system. The actual configuration that should be used is dependent upon the type of centralized dictation equipment used and its busy status (i.e., whether a busy condition is indicated by a voltage or ground condition on the third wire; see Dictation Access in Troubleshooting, Hardware, Peripheral Unit, LS/GS Trunk Card).

In addition, T(MR) and R(MR) leads can be connected to the CO for message registration purposes. The system can record message registration pulses either by polarity reversal over the Tip and Ring leads (when the called party answers) or by loop signaling from the CO over the second pair of leads. Various types of terminations can be used for message registration pulses transmitted from the CO. In each case, M and MM leads terminate respectively on the T(MR) and R(MR) leads. A message registration signal is given when the MR contact at the CO is closed.

E & M Trunk Card

The E&M Trunk card provides a means of interfacing four external trunk circuits to the system. E&M trunk cards connect to any Peripheral Interface card slot on the peripheral shelf via connectors J1 and J2.

E&M Trunk Card Specifications

Variants Available:	A-law (UK), μ -law (NA)
Number of Circuits per Card:	4 E&M trunk circuits
Power Consumption:	Type I, mechanical CO: 21.45 watts Type I, electronic CO: 8.01 watts Type V: 4.83 watt
External Loop Resistance:	Type I: 150 ohms Type V: 4000 ohms

Features Provided:	2-wire/4-wire conversion A-D/D-A conversion E&M signaling leads 2 dB software-switchable VNL pads software-selectable standard carrier levels switch-selectable 2-wire or 4-wire operation protection/isolation against foreign potentials switch-selectable E&M types self-test capability automatic card identification
Compliance:	Complies with all pertinent sections EIA Standard RS-464.

E&M Trunk Card Settings

The E&M trunk card accommodates E&M interface circuits Types I through V. The configuration of the four trunk circuits on the E&M trunk card to accommodate these five interface types is accomplished by using DIP switches SN-1 and SN-2. These DIP switches must be set on-site as follows:

SN-1 and SN-2 Switch Settings

Types of Interface Cards		Switch Positions	
Signal/carrier set types	Co-located trunk types	SN-1	SN-2
TYPE I	NONE	A	B
TYPE II	TYPE II	B	A
TYPE IV	TYPE IV	B	A
TYPE V	TYPE I	B	B
TYPE V	TYPE III	B	B
TYPE V	TYPE V	B	B

Note: Positions are SN-1 and SN-2 where N is the particular trunk circuit number on the card (1 through 4).

Operation

In addition to the E&M trunk types that can be configured by using DIP switches, it is also possible to configure various software options via system programming. The software options can be changed at any time using the System Administration Tool.

Fiber Interface Module (FIM)

Guidelines for Handling Fiber Optic Cable

- Never touch the tip of a fiber connector. Cleanliness of the connector ferrule (tip) is important for error free transmission.
- Always place the dust caps onto the connectors immediately after disconnecting.
- You can clean the ferrule tips on the connectors with ethyl-alcohol.

- Fiber optic cables are often more easily installed and pulled than copper because of their light weight and flexibility. However, take care not to exceed the minimum bend radius or maximum tensile strength.
- Procedures for the repairing, splicing, or assembling fiber optic cables are available from fiber component manufacturers (many offer training courses).

WARNING: Fiber optic sources emit infrared light that is invisible to the human eye. Never look directly into a source or into the end of a fiber energized by a source because it can damage the retina.

When working with raw fiber optic cable, be careful of the fiber ends or slivers that can puncture the skin or cause irritation.

Specifications

At each end of a fiber optic cable is a Fiber Interface Module (FIM). At the transmitting end, the FIM converts electrical signals into pulses of light to be transmitted over the cable. At the receiving end, the FIM converts the pulses of light back into electrical signals usable by the node.

The FIM connects the 3300 Controller to a peripheral unit or DSU. These FIMs cannot be installed in the Applications Gateway. Each FIM variant may be identified by its optical wavelength and fiber type (indicated on the FIM faceplate). The same FIM variant must be used at each end of a fiber optic cable. However, a node may be equipped with different FIM variants to suit the length of each cable run.

Fiber Interface Module Specifications (9400-300-301-NA)	
Approximate maximum fiber cable run length (See Note 1)	1km (0.62 miles)
Power consumption (Watts)	2.5
Number of fiber links per FIM	1 Tx, 1 Rx
Fiber connector type	ST (See Note 2)
Electrical interface (See Note 3)	8 serial ST links
Optical wavelength (nm)	820
Optical budget (See Note 4)	6 db
Date rate (Mbits/second)	16.384
Bit rate after encoding (Mbaud)	20.48
Fiber optic cable type	62.5/125 um Multimode
Notes:	
1. The run length is the one-way length of fiber optic cable between nodes.	
2. ST is a registered trademark of AT&T.	
3. Some channels of the electrical interface are not available.	
4. The optical budget is the allowable loss through fiber optic cable, splices, and connectors. The optical budget applies to the run length.	

Operation

The FIM has three functional sections: a transmitter, a receiver, and a control section.

The transmitter section accepts data from the node in which it is installed. The data is converted to byte-interleaved format, and a checksum is calculated. The checksum byte is combined with the data and the frame synchronization information. The frame is encoded as serial data and transmitted on the fiber.

The receiver section converts the incoming data to parallel format, extracts the frame synchronization information, and decodes the data. Control and status information are extracted and further decoded. The checksum is verified and an error counter updated. The status information and data are combined, frame-aligned, and re-formatted for output.

The control section generates control signals and the transmit clocks. This section also regenerates the telephony clocks for the peripheral nodes, and provides status information for the Main Controller.

Two LEDs indicate the detection of local and remote clocks.

DID/Loop Tie Trunk Card

The DID/LT Trunk card terminates up to four trunks. These trunks can be Direct Inward Dialing (DID) trunks, Loop Tie (LT) trunks, or any combination of DID and LT Trunks. Direct Inward Dialing provides direct access to system subscriber lines from the public telephone network. Loop Tie provides a means of connecting two systems together over a common trunk.

The assignment of trunk types is programmed through the System Administration Tool. Programmable parameters include Dial-In Trunk versus Non-Dial-In Trunk and Loop Pulsing versus Battery Ground Pulsing.

DID/Loop Tie Trunk Card Specifications

Variants Available:	A-law (UK), μ -law (NA)
Number of Circuits per Card:	4 DID/Loop Tie trunk circuits
Power Consumption:	Incoming mode (DID/DDI): 15.01 watts Outgoing mode (Loop Tie): 5.28 watts Mixed/Both ways: 10.14 watts
External Circuit Resistance:	2450 ohms
External Loop Length:	7986 meters (25955 ft.), 26 AWG (27 IWG) 19995 meters (64984 ft.), 22 AWG (23 IWG)
Minimum Conductor Leakage:	30000 ohms

Features Provided:	2-wire/4-wire conversion A-D/D-A conversion address signaling: MF-R1, DTMF or dial pulse incoming/outgoing/both way selection independent gain control for incoming and outgoing mode software-selectable balance networks tip ground and ring ground sensing protection/isolation against foreign potentials forward/reverse loop voltage sensing incoming DC loop supervision and debounced dial pulse collection incoming forward or reverse battery feed battery/ground pulsing (optional) backwards busy self-test capability automatic card identification
Compliance:	Complies with all pertinent sections of EIA Standard RS-464.

Operation

The DID/LT trunk card is software-controlled by the Main Controller. The DID/LT trunk card can maintain voice and data communications through four trunks supported by the DID/LT trunk card in both incoming and outgoing modes. For example, the DID/LT trunk card interfaces incoming DID trunks from a CO, and incoming and outgoing trunks between co-related systems. Any combination of these applications can be handled by the DID/LT trunk card.

DNI Line Card

The Digital Network Interface (DNI) Line Card provides 16 voice and data lines. The DNI line card provides an interface for MITEL digital network devices including SUPERSET telephones, and attendant consoles.

The DNI line card features devices that are compatible with MITEL SUPERSWITCH™ DIGITAL NETWORK (MSDN) data transmission protocols. MSDN technology allows simultaneous 2-way transmission of digitized voice and data over a twisted copper pair. The DNI line card supports voice/data transmission at the rate of 128 kb/s (64 kb/s on each of two voice channels) and 16 kb/s on one signaling channel over a loop length of up to 1000 meters (using 24 - 26 AWG wire (25 - 27 IWG)).

DNI Line Card Specifications

Number of Circuits per Card:	16 DNI circuits (up to 32 channels)
Power Consumption:	17.24 watts
External Loop Length:	Up to 1000 meters; 24 or 26 AWG (25 or 27 IWG) twisted pair, including up to 50 meters (162.5 ft) 22 AWG (23 IWG) quad wire and up to 3 m modular line cord without bridge taps.
External Loop Resistance:	300 ohms
Data Error Rate:	Better than 1 in 10,000,000 bits, in the presence of an interfering signal (ringing).

Features Provided:	Interface for MITEL digital telephone sets, and attendant consoles 2-wire / 4-wire conversion full DX chip on-board high-level data link controller (HDLC) on-board 32 K of on-board RAM memory 16 K of on-board PROM self-test capability, including power-up diagnostics automatic card identification
Compliance to Standards:	Meets all ONS-type requirements for North America and the United Kingdom meets Harmful Voltages requirement of POR1065.

Operation

The DNI line card provides full duplex digital transmission of both voice and data. The DNI line card is a "smart" card capable of downloading information to and from peripheral devices.

ONS Line Card

The ONS line card connects up to 16 standard telephone sets with line loop resistances usually not exceeding 400 ohms. As such, the ONS line card is used to connect internal telephone extensions close to the system. The ONS line card installs in any Peripheral Interface card slot, and is hot-swappable.

ONS Line Card Specifications (all variants)



Note: The following variants apply to the ONS and ONS CLASS/CLIP line cards.

Number of Circuits per Card:	16 ONS circuits
Loop Detector Threshold:	15 mA (+1 mA) (ONS line card) 13 mA (+1 mA) (ONS CLASS/CLIP line card)
Trip Battery Ringing Interval:	-48 Vdc nominal
Bridged Ringers:	5 (C4 or equivalent)
Features Provided:	2-wire/4-wire conversion A-D/D-A conversion DC loop supervision and dial pulse collection ringing and ring trip detection up to 5 telephones per circuit ground button detection self-test capability automatic card identification constant current feed

ONS Line Card Variant Specifications

Note: The ONS CLASS/CLIP line card is available in NA and the UK only.					
Feature	NA	Germany	China	UK	Int'l*
MC320 Card Variants	BD, BE for ONS line card; EA for ONS CLASS/CLIP line card	CH	CG	CD for ONS line card; EB for ONS CLASS/CLIP line card	CE
PCM Coding	μ -law	A-law	A-law	A-law	A-law
External Loop Resistance (see Note 1)	600 ohms	850 ohms @ 23mA	600 ohms	600 ohms	600 ohms
External Wire Resistance (see Note 2)	400 ohms	650 ohms	400 ohms	400 ohms	400 ohms
Power Consumption	BD: 9.09 W BE: 9.82 W	9.64 W	9.82 W	9.82 W	9.82 W
Message Waiting (see Note 4)	Yes	Yes	Yes	Yes	Yes
Calibrated Flash	No	Yes	Yes	Yes	Yes
Nominal Ringing Voltage	80 Vrms @ 20 Hz	65 Vrms @ 25 Hz	80 Vrms @ 25 Hz	80 Vrms @ 25 Hz	80 Vrms @ 25 Hz
Nominal Trip Battery Silent Interval	-27 Vdc	-30 Vdc	-27 Vdc	-27 Vdc	-27 Vdc
External Loop Length: 22 AWG (23 IWG) 26 AWG (27 IWG)	3800 m (12350 ft.) 1500 m (4875 ft.)		3700 m (12025 ft.)	3700 m (12025 ft.)	3700 m (12025 ft.)
* International = Caribbean, Cuba, Europe, Middle East and Africa					
Notes:					
<ol style="list-style-type: none"> 1. Stations whose line loop resistances range between 400 and 1600 ohms must terminate on an OPS line card. 2. External wire resistance measurements are based on the assumption that a 200 ohm set was used. 3. The German variant also provides impedance matching, fixed and variable gains, as well as Tip and Ring protection, with selectable fuse or EMI choke option. 4. The message waiting circuit for the ONS CLASS/CLIP line card has a voltage below 120v on the ring lead. 					

Operation

Incoming analog calls are converted to digital (PCM) signals by one of 16 line circuit modules on the ONS line card. Calls are switched by the Main Controller and the two parties are

connected. Outgoing calls are converted from PCM digital signals to analog signals by one of the 16 line circuit modules on the ONS line card. Calls are switched by the Main Controller and the two parties connected.

All signals are passed through the 2-wire to 4-wire hybrid circuit on the line circuit module. The line busy status LED remains lit while the call is in progress. When calls are terminated, receipt of an on-hook condition turns off the line status LED. The call is disconnected from the circuit switch and the line circuit reverts to an idle condition.

The ONS line card provides for "Ground button" signaling. A ground button, on a telephone extension so equipped, provides a means of connecting ground to the ring lead. In addition to ground button support, the ONS line card features a calibrated flash function. Unlike telephone installations using ground button signaling, telephone extensions using calibrated flash signaling do not require a third wire connected to ground. Calibrated flash is also the only method recognized internationally for recall simulation. The minimum calibrated flash duration that can be detected by the ONS line card is 40 milliseconds.

ONS CLASS/CLIP Line Card

The ONS CLASS/CLIP line card supports the same functionality as the ONS line card, but also provides CLASS/CLIP functionality when enabled by the software. The ONS CLASS line card is available in North America, and the ONS CLIP line card is available in the UK. The ONS CLASS/CLIP line card installs in any Peripheral Interface card slot, and is hot-swappable.



Note: Sending CLASS/CLIP information to an ONS line card will not harm the card.

ONS CLASS Line Card Specifications (North America)

The ONS CLASS line card (NA) supports ONS CLASS sets (NA) that meet the following specifications:

- ANSI/TIA/EIA-716 Standard "Telecommunications Telephone Terminal Equipment - Type 1 Caller Identity Equipment Performance Requirements"
- ANSI/TIA/EIA-777 Standard "Telecommunications Telephone Terminal Equipment - Type 2 Caller Identity Equipment Performance Requirements".

For more information on ONS CLASS/CLIP line card specifications, see ONS Line Card.

OPS Line Card

The OPS line card connects to any Peripheral Interface card slot. The OPS line card is a digital card intended to be used to interface up to eight outside telephone extensions with the system. The card is meant to interface telephone extensions whose line loop resistance exceeds 400 ohms. As such, the OPS line card is used to connect external telephone systems whose loop resistance is anywhere from 400 to 1600 ohms (external resistance from 600 to 1800 ohms).

OPS Line Card Specifications	
Variants Available:	A-law (UK), μ -law (NA)
Number of Circuits per Card:	8 OPS Circuits
Power Consumption:	UK: 8.53 Watts NA: 8.67 Watts
External Loop Resistance:	1800 ohms maximum
External Wire Resistance:	1600 ohms maximum
External Loop Length:	5853 meters (19022 ft.), 26 AWG (27 IWG) 15240 meters (49530 ft.), 22 AWG (23 IWG)
Minimum Conductor Leakage:	1500 ohms
Loop Detector Threshold:	12 mA (+1 mA)
Trip Battery Silent Interval:	-50 Vdc nominal
Trip Battery Ringing Interval:	-50 Vdc nominal
Bridged Ringers:	5 (C4 or equivalent)
Ringing Voltage and Frequency:	82 to 90 Vrms, 17 to 25 Hz
Features Provided:	2-wire/4-wire conversion A-D/D-A Conversion DC Loop Supervision and Dial Pulse Collection Ground Button Detection and Ring Lead Current Limiting Self-Test Capability Automatic Card Identification
Compliance:	Complies with all pertinent sections of EIA Standard RS-464.

OPS Line Card Message Waiting Switches

Eight message waiting switches (S1 through S8) are mounted on the OPS card. These switches are used to select the type of message-waiting signaling employed on each of the eight OPS line card circuits. Each circuit provides two message-waiting switch types.

Message-Waiting Switch Types

Setting	Description
A	Circuits are connected to OPS lines. Loop extended over the Message-Waiting Answer (MWA)/ Message-Waiting Busy (MWB) pair to the called extension.
B	Circuits are connected to ONS lines. Consists of a -140 Vdc source delivered at a variable rate to the Ring lead of the called extension. Rate is custom programmed to be continuously on through 80 Hz.

Operation

Calls incoming to the OPS line card are converted from analog to digital signals by a line circuit module. The call is then switched and the two parties connected. All signals are passed through the 2-wire to 4-wire hybrid circuit on the line circuit module. The line busy status LED is turned on (lit) while the call is in progress.

Calls outgoing on the OPS line card are converted from digital signals to analog signals by a line circuit module. The main control processor oversees the connection between the two

parties. All signals are passed through the 2-wire to 4-wire hybrid circuit on the line circuit module. The line busy status LED is lit while a station is off-hook. When calls are terminated, receipt of an on-hook condition turns off the line status LED. The call is disconnected from the circuit switch and the line circuit reverts to an idle condition.

The OPS line card also provides for "Ground button" signaling. A ground button, on a telephone extension so equipped, provides a means of detecting a Ring lead with ground applied to it.

DTMF Receiver Card

The DTMF Receiver card is used to detect and decode dual-tone multi-frequency (DTMF) tone signaling from telephone keypads and end-to-end signaling equipment. There are 12 DTMF receivers located on each peripheral switch controller. If additional DTMF receivers are required, the DTMF Receiver card provides 16 DTMF circuits.

The DTMF Receiver card connects to a Peripheral Interface card slot on the peripheral shelf via connectors J1 and J2.

DTMF Receiver Card Specifications

Variants Available:	A-law (UK), μ -law (NA)
Number of Circuits per Card:	16 DTMF receivers
Power Consumption:	3.43 watts
Features Provided:	DTMF digit decoding (up to 16 DTMF Digits) selectable line splitting function digital loopback control software-driven status lamp
Compliance:	Complies with North American and CCITT specifications for tones.

Operation

The DTMF Receiver card incorporates 16 DTMF receiver circuits that detect and decode DTMF dial tones. Basic data and timing required for the DTMF Receiver card are supplied through the peripheral backplane from the peripheral switch controller.

SUPERSET HUB

The SUPERSET HUB builds on the distributed system concept by delivering advanced digital telephony functionality for workgroup. It allows SUPERSET telephones to be cost-effectively provided where a distributed system would be too expensive.

The SUPERSET HUB provides DNIC connectivity through an RJ-45 patch panel and Fibre Interface Module (FIM) connection to the host peripheral cabinet. At the peripheral cabinet, a carrier module provides the connection for the FIM and interfaces back into the system. The SUPERSET HUB may be rack-mounted or wall-mounted.



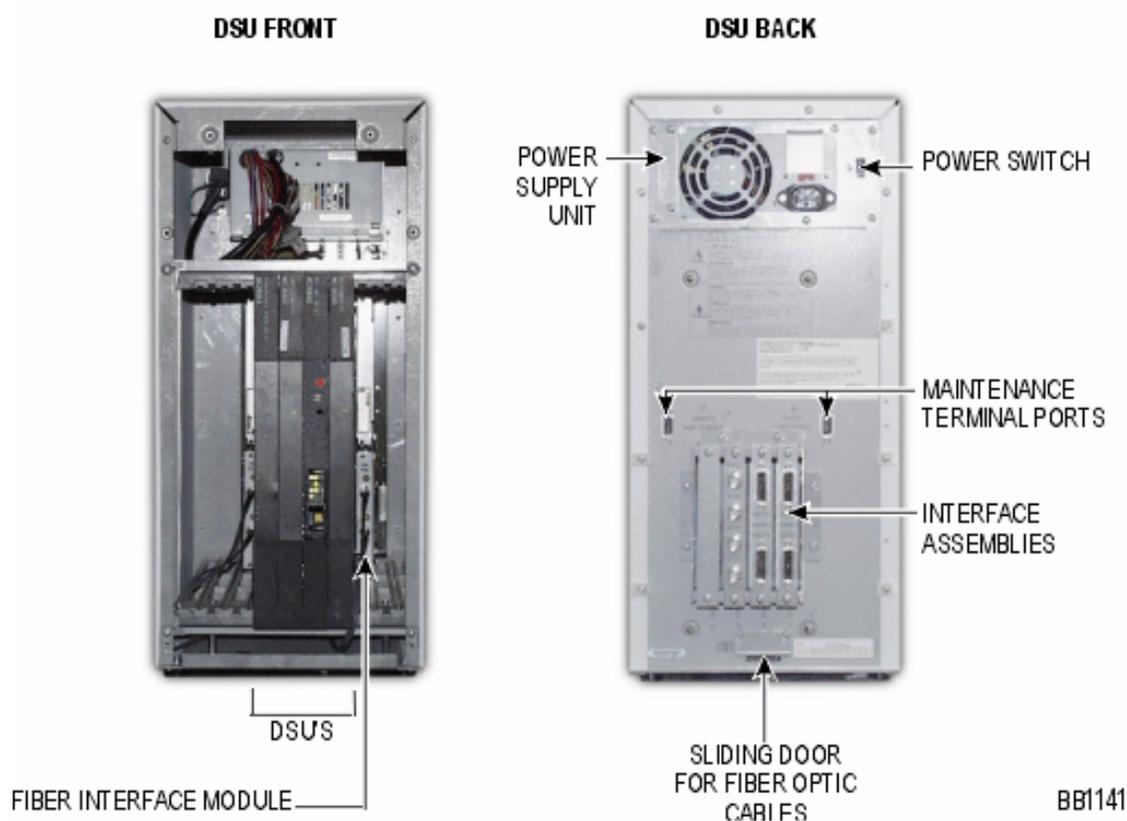
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Digital Service Unit

Digital Service Unit Components

A DSU cabinet holds up to four DSU cards and two FIMs. The DSU cards provide digital trunk interfaces for public or private network access and specialized digital functions (such as messaging, expanded conference, and ISDN service). The FIMs support the transmission of voice and data signals between nodes.

DSU NODE



The DSU cabinet consists of the following components:

- **Cabinet Frame:** The DSU cabinet is separated into two shelves. Shelf 1 is located at the bottom of the cabinet and Shelf 2 is located at the top of the cabinet (both shelves are at the front of the cabinet). Shelf 1 consists of slots 1 to 6 and contains 2 FIMs and 4 DSUs. Shelf 2 consists of two Peripheral Resource Cards (PRCs).
- **Power Supply:** The 200 Watt AC power supply provides power for the cabinet. The power supply fan cools the cabinet.
- **Peripheral Resource Cards:** The peripheral resource cards provide additional circuitry to support the distributed architecture. These cards are installed in Shelf 2, slots 1 and 6.

- **Fiber Interface Modules (FIMs):** The DSU cabinet holds up to two fiber interface modules (FIMs). Each FIM supports two DSU cards; the FIM installed in Shelf 1, slot 1 supports the DSU cards in Shelf 1, slots 2 and 3. The FIM in Shelf 1, slot 6 supports the DSU cards in Shelf 1, slots 4 and 5.
- **DSU Cards:** The DSU cabinet holds up to four DSU cards. These are intelligent cards that provide specialized digital functions. The DSU cards are installed in Shelf 1, slots 2 to 5.
- **DSU Backplane:** The backplane holds up to four DSU cards, two fiber interface modules, two peripheral resource cards, the power supply cable, and two Maintenance Terminal ports. The four DSU cards are split into pairs (each pair with a FIM, Peripheral Resource card, and maintenance port). The following switches and connectors are located on the DSU backplane (rear panel):
 - A power on/off switch
 - A small red sliding switch for selecting the input power source. The switch can be set to either 115 Vac, 60 Hz or 230 Vac, 50 Hz.
 - A 3-conductor male receptacle to connect AC power
 - A sliding panel for the Tx and Rx fiber optic cables
 - Two RS-232 Maintenance Terminal ports
 - A 3 inch wide x 4 inch high (7.6 cm x 10.2 cm) metal box projecting from the middle of the panel. The box holds up to four CEPT or DS1 Interface Assemblies.

CAUTION: Do not connect any devices to the female power receptacle.

Digital Service Unit Dimensions

Physical Dimensions

Height	19 inches (48.0 cm)
Width	9 inches (22.9 cm)
Depth	16.5 inches (42.0 cm)
Weight	40 lbs (18.0 kg)

Digital Service Unit Environment

Storage Environment

Condition	Specification
Temperature	-40° to 150°F (-40° to 66°C)
Humidity	5-95% Relative Humidity, non-condensing
Vibration	0.5 g, 5 to 100 Hz, any orthogonal axis 1.5 g, 100 to 500 Hz, any orthogonal axis
Mechanical Stress	One 20.3 cm (8 inch) drop, each edge and corner adjacent to the rest face – unpackaged
Horizontal Transportation Impact Stress	One shock pulse applied on each face perpendicular to the direction of motion of the transporting vehicle; the shock pulse is a half-sine acceleration 30 g peak, 20 ms duration

Operational Environment

Condition	Specification
Temperature	32° to 122°F (0° to 50°C)
Humidity	5-95% Relative Humidity, non-condensing
Maximum Heat Dissipation - fully loaded (see Note)	266 BTUs per hour
Air Flow	150 cubic feet per minute at maximum output of the fans
Radiated Emissions	The system meets Class A limits as outlined in FCC Rules, Part 15, Subpart J
Conducted Emissions	The system meets Class A limits as outlined in FCC Rules, Part 15, Subpart J, and complies with conducted emissions standards as outlined in BS800
Acoustic Emissions	Maximum 50 dBA continuous, 75 dB intermittent (<10% duty cycle)
Static Discharge	Withstands 50 discharges of each polarity through a 10 k resistor connected to a 60 pF capacitor charged to 20 kV, and 20 discharges of each polarity through 500 ohm resistor connected to a 100 pF capacitor charged to 10 kV
Lightning Surge	2.5 kV peak, with a maximum rise time of 2 µs and minimum decay time of 10 µs applied to power lead terminals, and 800 V peak with a maximum rise time of 10 ms and minimum decay time of 560 ms applied to outside plant interface terminals
Induction (Normal)	50 Vrms at 60 Hz, open circuit, longitudinal mode (Tip and Ring to ground)
Power line Faults and Line Crosses (Abnormal)	600 Vrms between Tip and Ring or to ground
Flammability	Minimum oxygen index: 28%, as outlined in ASTM D2863-70 and ASTM D28664-74; meets all safety specifications for product type (CSA, UL, and BT) for use in office environment
Conversion factors: 1 watt is equal to 3.412 BTUs per hour, 1 ton of refrigeration is equal to 12,000 BTUs per hour or 3.516 Kilowatts, and 3/4 Kilowatt-hour is equal to 1 ton of refrigeration.	

Digital Service Unit Power

Power Supply

Operation	120 Vac/230.120 Vac
Maximum AC power input Watts	78 W

Equipment	Power Requirements
AC Cabinet	120 Vac, 6 amps 240 Vac The input power is converted to ±5, ±12, -27 and -48 Vdc, and 80 Vac ringing voltage by the power converter (AC)

The AC power enters the DSU node at the Power Supply Unit (PSU) power input on the backplane. The PSU converts the power to DC voltages and delivers it to the DSU backplane.

Digital Service Unit Cards

- **CEPT Formatter Card** The system supports MSDN/DPNSS, DASS II (UK only), and Italian CAS (Italy only) protocols. The system connects to CEPT links by using a CEPT Formatter card that has two 30-channel links.
- **Conference Card** With the Conference card, the maximum number of conferees per system is 64 and the maximum number of conferences per system is 21. Without the Conference card, the maximum number of conferees per system is 24 (at one time) and the maximum number of three-party conferences per system is 8.
- **DS1 Formatter Card** The system supports CO, DID, E&M, MSDN/DPNSS, and MSAN/AP-NSS protocols. The system connects to DS1 links by using a DS1 Formatter card that has two 24-channel links.
- **Fiber Interface Module** The FIM, with 16 circuits, provides for the interface with the 3300 ICP Controller.
- **BRI Card** The BRI card supports Euro-ISDN 2B+D, Basic Rate, or North American National ISDN-1 and ISDN-2 protocols. There is a 6-circuit BRI card and a 15-circuit BRI card.
- **PRI Card** The PRI card supports DMS-100, DMS-250, Bellcore National ISDN, 4ESS, NI-2, 5ESS NI-2, Q.SIG and Euro-ISDN (CTR4) protocols. The E1 PRI has two 30-channel links; the T1 has two 24-channel links.
- **R2 Card** The R2 card is a protocol converter, converting incoming MF-R2 signals from the PSTN to DPNSS and outgoing DPNSS to MF-R2 signals for the PSTN.

CEPT Formatter Card

The CEPT Formatter card is a microprocessor-controlled card which provides DASS and DPNSS digital trunk interfacing. Each interface controls a 32-channel serial link. Two of the channels are dedicated to signaling and synchronization. The remaining 30 channels (traffic channels) transmit PCM voice or data samples.

In a DPNSS network, the connection from the PBX line terminating equipment and either the BT terminating point or another PBX line terminating equipment must be made with RG59B/U coaxial cable of characteristic impedance 75W. The maximum cable length is 700ft. Each traffic channel is considered a trunk and is assigned a trunk number. Trunk numbers allow the channels to be placed in trunk groups and accessed by the system's Automatic Route Selection feature. In the Trunk Service Assignment form, you can assign an incoming traffic channel to a dedicated answer point for non-dial in trunk applications or provide digit modification for direct-in dial trunk applications.

CEPT Formatter Card Specification

Card Type	DSU
Channels Provided	60 (two 30-channel links)
Features Provided	transfers data at 2.048 Mb/s over DPNSS digital links

CEPT Link

The CEPT digital link complies with the European standards specified by the CCITT (International Committee for Telephone and Telegraph) G703 and G734. The technical characteristics of the CEPT link are:

- thirty 64 Kbps traffic channels
- two 64 Kbps framing and signaling channels
- eight consecutive bits per channel
- channel sampling rate: 8,000 Hz.
- total bit rate: 8000 frames/second X 8 bits X 32 channels = 2.048 Mbps.

CEPT Interface Assembly Jumpers

There are four jumpers and eight jumper positions (J06 to J13). Jumper positions J06 to J09 allow you to ground the shields of the coaxial cable connectors, and jumper positions J10 to J13 provide a location to affix the jumpers if they are not in the grounding position.



Note: Jumpers J06, J07, J08, J09, J11, and J12 are located beneath the side of the faceplate. Use needlenose pliers to change the positions of these jumpers.

CEPT Interface Assembly Connector Shield Grounding

Circuit 0		Circuit 1	
RX grounded	jumper across J06	RX grounded	jumper across J08
RX not grounded	no jumper across J06	RX not grounded	no jumper across J08
TX grounded	jumper across J07	TX grounded	jumper across J09
TX not grounded	no jumper across J07	TX not grounded	no jumper across J09
Note: Default settings are shown in bold.			

Conference Card

The Conference card provides 64 channels of conference capability. No more than five parties are allowed per conference. The Conference card is optional because conference capability is provided on the system Controller. If the Conference card is installed, the conference capability on the Controller is superseded.

Conference Card Specifications	
Conference Channels	64
Power Consumption	15.6 Watts
Features Provided	Flexible assignment for up to 64 channels of conference Up to five conferees per conference Conferencing of both symmetrical and asymmetrical terminals Conference control memory provided by three DX chip output links On-board RAM for accumulator buffer On-board RAM for frame buffer (128 K) On-board attenuation control by ROM A-law and μ -law PCM translation via ROM lookup

Operation

The Conference card allows conferences on circuit switch channels. Channel conference is accomplished by generating a sum of all data from all channels in a conference, and returning this sum to any given channel minus the portion produced in that channel.

Both symmetrical and asymmetrical terminals are supported for conference purposes by the Conference card. Symmetrical terminals have the same loss requirements for transmit/receive. Asymmetrical terminals have different loss requirements for transmit than receive (i.e., analog tie trunk). When asymmetrical and symmetrical terminals are connected in the same conference call, the Conference card attenuates the loss level of the lines to minimize distortion between the conference parties. Echo, a problem in multi-party conferences, is also attenuated (filtered).

DS1 Formatter Card

DS1/T1 Formatter II Card

The software is pre-loaded on the DS1/T1 Formatter card and software upgrades can be performed in the field.



Note: The lock latch for this card is "DS1/T1 II Formatter MC270CA".

After the card is installed and running, LED behavior will indicate a download by flashing in a downward progression. An Interface Assembly is required.

E1/T1 (DS1) Formatter Card

The E1/T1 (DS1) Formatter card provides two interfaces. Each interface controls a 24-channel serial link. One channel (channel 24) is dedicated to signaling, and the remaining 23 channels (traffic channels) transmit PCM voice or data samples.

A dual DIP switch on the E1/T1 card allows you to set the links for either T1 mode or E1 mode. In T1 mode, the card operates as a DS1 Formatter card. In E1 mode, the data on channel 24 of each link is not inverted. In an MSDN private network, the links are compatible with externally converted CEPT (E1) links. E1 mode is only supported in MSDN applications.



Note: The E1/T1 (DS1) Formatter card does not provide direct connection to CEPT (E1) links

Card Specifications	
Channels Provided	46 traffic channels and 2 signaling channels
Features Provided	transfers data at 1.544 Mbps over T1 telephone trunks

Setting the links for E1 or T1 operation

You can set the links for either E1 or T1 mode by using the E1/T1 switches on the side of the card.

Switch settings for E1 or T1 mode

Mode	Channel 24	E1/T1 Switches	
		Switch 1 (Link 1)	Switch 2 (Link 2)
E1 mode (compatible for connection to MSDN DS1 trunks that have been externally converted from MSDN CEPT trunks)	data not inverted	open	open
T1 mode (normal DS1 Formatter card operation)	data inverted	closed	closed
Note: If you set a link for E1 mode, the data on channel 24 is not inverted. The external carrier must map the channels to the CEPT link.			

Connecting to MSDN CEPT Links (E1 Mode)

Channel mapping is required to connect with CEPT links; the external carrier must map the channels to the CEPT link. If you set a link for E1 mode, the data on channel 24 is not inverted. Channel 24 of the E1/T1 (DS1) link must be mapped to channel 16 of the CEPT (E1) link.

You must dedicate channels to either voice or data transmission. You must also inform the carrier which channels are used for data transmission and which channels are used for voice transmission. The carrier must program the voice channels for A-law to m-law conversion. Data channels and the common channel signaling (CCS) channels must NOT be converted.

The datasets for the dedicated data channels of a link must be set for 64kbps operation. You must also reverse the polarity of the dataset Tx and Rx leads at one of the PBXs. For consistency, always reverse the dataset leads on the system with the E1/T1 (DS1) Formatter card.

Basic Rate Interface (BRI) Card

The BRI card provides an interface between either six (6-circuit card) or fifteen (15-circuit card) ISDN basic rate interface ('U'-bus) circuits and one CEPT circuit. The card converts the Euro-ISDN or North American National ISDN-1 and ISDN-2 protocols used by the BRI circuits to the DPNSS protocol used by the CEPT circuit.

The connections to and from the BRI card are made via the CEPT Interface Assembly mounted at the back of the DSU cabinet. These connections are:

- DPNSS Tx to the CEPT Interface Assembly Rx port via a BNC to BNC connector
- DPNSS Rx to the CEPT Interface Assembly Tx port via a BNC to BNC connector
- BRI 'U' bus tip-and-ring pairs via a D-type to Amphenol connector
- MMI connection to the configuration terminal via an RJ45 to D-type connector
- Provision for an RJ45 Ethernet port as a future development of the card.



Note: The BRI card, Release 2, supports both User and Network Termination; for European installations only.

BRI Cable Pinout for 6-port Card

Pair	Pin	Color Code	BRI Port
1	26	W/BL	0T
	1	BL/W	0R
2	27	W/OR	1T
	2	OR/W	1R
3	28	W/GR	2T
	3	GR/W	2R
4	29	W/BR	3T
	4	BR/W	3R
5	30	W/SL	4T
	5	SL/W	4R
6	31	R/BL	5T
	6	BL/R	5R

BRI Cable Pinout for 15-port Card

Pair	Pin	Color Code	BRI Port
1	26	W/BL	0T
	1	BL/W	0R
2	27	W/OR	1T
	2	OR/W	1R
3	28	W/GR	2T
	3	GR/W	2R
4	29	W/BR	3T
	4	BR/W	3R
5	30	W/SL	4T
	5	SL/W	4R
6	31	R/BL	5T
	6	BL/R	5R
7	32	R/OR	6T
	7	OR/R	6R
8	33	R/GR	7T
	8	GR/R	7R
9	34	R/BR	8T
	9	BR/R	8R
10	35	R/SL	9T
	10	SL/R	9R
11	36	BK/BL	10T
	11	BL/BK	10R
12	37	BK/OR	11T
	12	OR/BK	11R

Pair	Pin	Color Code	BRI Port
13	38	BK/GR	12T
	13	GR/BK	12R
14	39	BK/BR	13T
	14	BR/BK	13R
15	40	BK/SL	14T
	15	SL/BK	14R

Primary Rate Interface (PRI) Card

ISDN PRI in North America supplies 23 B-channels (bearer channels) plus one D-channel (data channel). PRI in Europe supplies 30 B-channels plus one D-channel. Each channel is capable of transmitting voice or data calls at 64 Kbps. PRI is commonly referred to as 23B+D or 30B+D.

Each PRI card has two links, either T1 for the Dual Port T1 (Universal T1) card in North America or E1 for the Dual Port E1 (Universal E1) card in Europe. The card occupies one DSU card slot and allows another DSU card (including another PRI card) to be installed in the slot beside it on the same FIM. The PRI card is hot-swappable.

The PRI card is configured with Network-side termination (NT) as the default. There are two jumper positions for each circuit; one for NT and one for Line-side termination (LT). To set the card for LT, remove the jumper blocks from the NT position and place them on the LT position.

The connections to and from the PRI card are made through an Interface Assembly mounted at the back of the DSU cabinet. These connections include:

- two T1 or E1 interfaces for network connection (T1 = RJ-45 connectors) (E1 = RJ-45 or coaxial connectors)
- an RS-232 port (DB9 connector) for administration and debug
- an Ethernet port (RJ-45 connector) for future use

PRI Card Specifications

The following CO types and protocols are the only protocols supported by the ISDN PRI Card:

- 4ESS Custom (T1 only)
- 5ESS (N1-2) only (N13 Calling name delivery) N199 SR4619 spec (T1 only) (AT&T)
- DMS 100 (Nortel Custom) (T1 only)
- DMS 250 (Nortel Custom) (T1 only)
- GTD5 (N12) (N13 Calling name delivery) N199 SR4619 spec (T1 only) (GTE)
- BellCore (N12) (N13 Calling name delivery) N199 SR4619 spec (T1 only) (Siemens)
- Q.SIG (ETSI and ISO Standard E1) and (ISO Standard T1)
- Euro-ISDN (E1 only)

Dual Port T1 PRI (Universal T1) Card Features

- 1.544 Mbps primary rate (23B+D) connectivity (2 links)
- B8ZS or AMI line coding
- Super Frame (SF) or Extended Super Frame (EXF) framing
- Generation and detection of the following status indications:
 - Loss of Signal (LOS or Yellow Alarm)
 - Alarm Indication Signal (AIS or Blue Alarm)
 - Loss of Frame Alignment
 - Excessive CRC errors



Note: To determine if a Universal T1 is a PRI T1 or DS1/T1 Formatter II, you must check the card by inspecting the lock latch or using the Firmware command.

Dual Port E1 PRI (Universal E1) Card Features

- 2.048 Mbps primary rate (30B+D) connectivity (2 links)
- CRC4 enable or disable
- Generation and detection of the following status indications:
 - Loss of Signal (LOS or Yellow Alarm)
 - Alarm Indication Signal (AIS or Blue Alarm)
 - Loss of Frame Alignment
 - Excessive CRC errors

Programmable Data Inversion (NA only)

This feature is required for inter-working with T1/D4 and BRI interfaces that have inverted in-band data enabled on a per-call basis. This feature is programmed on a link-by-link basis (default means no inversion).

Administration of PRI Card Software

The IMAT (ISDN Maintenance and Administration Tool) software runs on an independent computer with a Windows 95, 98, or 2000 Professional operating system. The IMAT computer is used for programming and maintaining the PRI configuration databases. It accesses the PRI card either through a direct connection on-site, or remotely through a modem.

To install the IMAT application, refer to the PRI software CD-ROM jacket. For more information on IMAT, see Using the ISDN Maintenance and Administration Tool (IMAT).

Options are managed and controlled as features on the 3300 ICP. The options are configured simultaneously on all PRI cards installed on the 3300 ICP. This means, for example, that if Min/Max were enabled, every PRI card in the 3300 ICP would have this feature enabled.

Software Upgrades

The PRI card has factory-installed software and a default database for each variant - UK and NA. Use IMAT to make changes to the database.

Use IMAT to upgrade PRI card software and install or restore the database.

See your IMAT online Help for more information.

Details of how to perform software upgrades are given in Upgrade the PRI Software provided in the IMAT On-Line Help.

Multiple ISDN Variants and Configurations

The PRI card supports the option to program multiple ISDN variants and configurations through IMAT. This option provides the ability to do the following:

- Program multiple ISDN variants on the two links of the PRI Gateway, allowing you to connect the PRI Gateway to two different Central Office switches (for example, DMS 100 and Bellcore).
- Program multiple ISDN configurations on the two links of the PRI Gateway. For example, program Network-side on one link of the PRI Gateway and program User-side on the other link of the PRI Gateway. The PRI Gateway can act as both the User-side and Network-side and still run different protocols. For example, one link can be User-side running DMS 100 and the other link can be Network-side running Bellcore.

You must configure both links as either T1 or E1 on the same PRI Gateway. For more information on programming multiple ISDN variants and configurations, refer to the IMAT online Help.



Note: Options must be purchased from MITEL to support Network-side and/or Q.SIG.

The following protocols support User-side configurations:

- 4ESS (Custom) (T1 only)
- 5ESS (NI2) only (NI3 calling name delivery) NI99 SR4619 spec (T1 only) (AT&T)
- DMS 100 (Nortel Custom) (T1 only)
- DMS 250 (Nortel Custom) (T1 only)
- GTD5 (NI2) (NI3 Calling name delivery) NI99 SR4619 spec (T1 only) (GTE)
- BellCore (NI2) (NI3 Calling name delivery) NI99 SR4619 spec (T1 only) (Siemens)
- Q.SIG E1 (ETSI and ISO Standard) T1 (ISO Standard)
- Euro-ISDN (E1 only)

The following protocols support Network-side configurations:

- 4ESS (Custom) (T1 only)
- DMS 100 (Nortel Custom) (T1 only)
- DMS 250 (Nortel Custom) (T1 only)
- BellCore (NI2) (NI3 Calling name delivery) NI99 SR4619 spec (T1 only) (Siemens)
- Q.SIG E1 (ETSI and ISO Standard) T1 (ISO Standard)
- Euro-ISDN (E1 only)

R2 Card

The R2 card is a protocol converter that allows the 300 ICP system to access an R2 National Public Switched Telephone Network (PSTN) with MF-R2 digital trunk signaling. The card also receives and processes Calling Line Identification (CLI) and allows the information to be displayed on the user's telephone display screen. The R2 card converts the following:

- Incoming MF-R2 signals from the PSTN into Digital Private Network Signaling System (DPNSS) signals for the 3300 ICP system.
- Outgoing DPNSS signals from the 3300 ICP into MF-R2 signals for the PSTN.

R2 signaling

Although many countries use R2 signaling, most do not adhere to the CCITT recommendations in their entirety, and there are many protocol variations around the world. R2 support on the 3300 ICP system provides exceptional flexibility, which enables you to support the regional variations in the R2 protocol. Line signaling, tone interpretation, and timing parameters for the R2 card can be adapted to suit any national or regional requirement. For example:

- Line signaling features allow you to program up to four bits to define the incoming and outgoing patterns for line commands such as Idle and Answer.
- Register signaling features allow you to program the type of address signaling termination (signaled or timed) and whether signaling should be fully-compelled or semi-compelled. These features also allow you to define each register signaling tone individually.

Using IMAT (ISDN Maintenance and Administration Tool), you can adapt line signaling, tone interpretation, and timing parameters for the R2 card to suit any national or regional requirement. For more information about IMAT, refer to *Using the ISDN Maintenance and Administration Tool (IMAT)*.

Line Signaling

In the R2 protocol, line signaling is used to begin and terminate the call setup process. Line signaling features in IMAT allow you to program up to four bits to define the incoming and outgoing tone patterns for the following line commands:

- Idle
- Seize
- Seize Ack

- Answer
- Clear Backward
- Clear Forward
- Blocking

Register Signaling

In the R2 protocol, register signaling is used during the call setup process to exchange information about the calling and called party numbers and the calling party category. You can use IMAT to define any of the specific tones used in R2 register signaling.

R2 register signals are defined as either forward or backward signals. Forward, or outgoing, signals are generated by the originator of a call. Backward, or incoming, signals are generated by the terminating end of a call. Forward and backward signals are grouped into the categories shown in the following table.

R2 Signaling

Signal direction	Event Group	Function
Forward (outgoing)	Group I	Transmits digit information.
	Group II	Transmits the category of the calling party (such as a coin box) and calling line identification.
Backward (incoming)	Group A	Acknowledges Group I signals, and requests digit information and the category and identification of the calling party.
	Group B	Acknowledges Group II signals and transmits status information about the called party (such as busy).
	Group C	Acknowledges Group I signals and requests digit information for the calling party (optional).

When you are defining the specific signals in each group, the IMAT menus list each tone number and the corresponding signal token. The following tables list the tokens in each group, and their meanings.

Event Group I

Event Token	Description
T1_DIGIT_1 to T1_DIGIT_9	Process digit 1 to Process digit 9
T1_DIGIT_0	Process digit 0
T1_INCOMING_OP	Marks the caller as an operator
T1_DELAY_OP	Marks the caller as a delay operator
T1_ACCS_TEST_EQUIP	Marks the caller as test equipment
T1_REQ_HALF_ECHO_SUPRES	Indicates that the call requires half-echo suppression
T1_END_OF_INFO	Indicates end of pulsing
T1_SPARE	Spare token
T1_REQ_NOT_ACCEPTED	Call setup request is not accepted

Event Group II

Event Token	Description
T2_NATNL_SUBS	Marks the caller as a national subscriber
T2_NATNL_PRI_SUBS	Marks the caller as a national subscriber with PRI
T2_NATNL_MAINT_EQUIP	Marks the caller as maintenance equipment
T2_SPARE	Spare token
T2_NATNL_OP	Marks the caller as a national operator
T2_NATNL_DATA_TRANS	Marks the call as a national data transmission
T2_INTNATNL_SUBS	Marks the caller as an international subscriber
T2_INTNATNL_DATA_TRANS	Marks the call as an international data transmission
T2_INTNATNL_PRI_SUBS	Marks the caller as an international subscriber with PRI
T2_INTNATNL_OP	Marks the caller as an international operator
T2_NATNL_SUBS_SPECIAL	Marks the call for special charging
T2_COIN_BOX	Marks the caller as a coin box
T2_IMM_CHRGE_SRVCE	Marks the call as an immediate charge call
T2_INTRCEPTN_SERVCE_OP	Marks the caller as an interception service operator

Event Group A

Event Token	Description
TA_SND_NXT_DIG	Send the next digit
TA_SND_DIG_N-1	Send the second last digit
TA_ADD_CMPLT_REC_B	Address is complete. Change to Group B signals.
TA_CONGEST_NATNL	Indicates congestion on the national level
TA_SND_CPC	Send the Calling Party Category
TA_ADD_CMPLT_END_SIG	Address is complete. Apply charge. Set up speech conditions.
TA_SND_DIG_N-2	Send the third last digit
TA_SND_DIG_N-3	Send the fourth last digit
TA_SND_1ST_DIG	Send the first digit
TA_COUNTRY_CODE	Send the country code
TA_LANG_DIG	Send the language or discrimination digit
TA_NATURE_CIRCT	Send the nature of the circuit
TA_SND_CALLING_LN	Send calling language
TA_ECHO_SUPRES	Indicates that echo suppression is in use
TA_CONGEST_INTNATNL	Indicates congestion at an international exchange
TA_VACANT	Indicates a vacant line (China)
TA_SPARE	Spare token
TA_CPC_CHNGE_TO_GRC	Send calling party category. Change to Group C signals.
TA_SND_TARIF_ZONE_NO	Send tariff zone number.
TA_SND_CHINA_KA	Send KA. Start collecting the calling party address. (China)

Event Group B

Event Token	Description
TB_SPARE	Spare token
TB_SND_SPECIAL_INFO	Send the special information tone
TB_SUBS_LINE_BUSY	Indicates that the subscriber line is busy
TB_CONGEST	Indicates that congestion is encountered after the change from Group A to Group B
TB_UNALLOC_NO	Indicates an unallocated number
TB_SUBS_LINE_FREE_CHRGE	The subscriber line is free. Charge.
TB_SUBS_LINE_FREE_NOCHRGE	The subscriber line is free. No charge.
TB_SUBS_LINE_OUT_SERVICE	The subscriber line is out of service
TB_MALICIOUS_CALL	Indicates a malicious call
TB_XFERRED_SUBS	Indicates a transferred subscriber
TB_LINE_FREE_CHRGE_XFER_B	The subscriber line is free. Charge. Transfer to Group B signals.
TB_SUBS_LINE_INTERCEPTED	The subscriber line is intercepted
TB_SUBS_LINE_FREE_LST_PRTY_RLS	The subscriber line is free. Last party release.
TB_VACANT_NO	Indicates a vacant number (China)

Event Group B

Event Token	Description
TC_SND_NXT_CLG_DIG	Send the next calling number digit
TC_SND_1ST_CLD_DIG	Send the first called number digit
TC_SND_GROUPB	Send Group B signal. Change to Group B signals.
TC_CONGESTION	Indicates congestion on the line
TC_SND_NXT_CLD_DIG	Send the next called number digit
TC_SND_SAME_CLD_DIG	Send the same called digit. Change to Group A.
TC_SPARE	Spare token

Physical Specifications

Each R2 card has two E1 links. The R2 card occupies one DSU slot. The R2 card can be installed with the power on and is hot-swappable .

The physical connections to and from the R2 card are made at the rear of the cabinet. These connections include:

- two E1 interfaces (RJ-45 or coaxial connectors) for network connection
- an RS-232 port (DB9 connector) for administration and debugging
- an Ethernet port (RJ-45 connector) for in-house development and troubleshooting.

R2 Card Specifications

Card type:	DSU with network interface assemblies		
Protocols supported:	The R2 card supports the CCITT Blue Book, Volume VI, Fascicle VI.4, Specifications of Signaling System R2, Recommendations Q.440 to Q.490 (with the exception of Echo Suppression (Q.479), Test Calls (Q.490) and international signals).		
Tone generation	Low Tone -1 to -12 dBm	High Tone -1 to -12 dBm	
Tone detection sensitivity	Normal -35 dBm	Low -15 dBm	High -50 dBm
R2 signaling frequencies (in Hz)	Tone	Backward (Groups A&B)	Forward (Groups I & II)
	15	540 + 660	1980 + 1860
	14	540 + 780	1980 + 1740
	13	540 + 900	1980 + 1620
	12	540 + 1020	1980 + 1500
	11	540 + 1140	1980 + 1380
	10	660 + 780	1860 + 1740
	9	660 + 900	1860 + 1620
	8	660 + 1020	1860 + 1500
	7	660 + 1140	1860 + 1380
	6	780 + 900	1740 + 1620
	5	780 + 1020	1740 + 1500
	4	780 + 1140	1740 + 1380
	3	900 + 1020	1620 + 1500
	2	900 + 1140	1620 + 1380
	1	1020 + 1140	1500 + 1380

Administration of R2 Card Software

The IMAT (ISDN Maintenance and Administration Tool) application is used to perform operation and maintenance functions on the R2 card. You can use IMAT to download R2 card software for backup and upgrade purposes and to install or restore the database.

IMAT runs on an independent computer with a Windows 95, 98, or 2000 Professional operating system and is connected to the R2 card through a serial link. The IMAT computer accesses the R2 card either through a direct connection on-site or remotely through a modem.

To install the IMAT application, see the README.TXT file on the R2 card software CD-ROM. For more information on IMAT, refer to Using the ISDN Maintenance and Administration Tool (IMAT).

Software Upgrades

Use IMAT to upgrade the R2 card software and to install or restore the database. For more information on upgrading R2 card software, refer to the IMAT online Help.

Details of how to perform software upgrades are given in Upgrading or Re-installing R2 Software.

Telephone Power Options

Telephone Power Sources

Mitel IP Phones are capable of receiving power from a variety of sources. These include:

- local 48VDC power adapter that inserts power on the LAN cable spare pairs 3300 In-line Power Unit (PD-PH-4024/AC/48) and an In-line Power Adapter PowerDsine 24PT In-line Power Unit (PD-PH-6024/AC/48)
- power jack from a 24VDC power adapter
- 3300 Power Dongle (cisco compliant) (p/n 50002922) will allow Mitel IP Phones to receive power from a Cisco end-span Catalyst switch or a Cisco mid-span power hub.



Note: An updated set firmware load is delivered as part of the 3300 ICP Release 3.2 software. When the 5001 IP Phone and 5005 IP Phones reset during system startup, the new firmware will be downloaded from the 3300 ICP to the set.

Note: Note: 5001 IP Phones and 5005 IP Phones delivered prior to 3300 ICP Release 3.2 may be powered through the 3300 In-line Power Unit, PowerDsine 4024 In-line Power Unit, or a 48VDC power adapter.

Note: Note: Mitel IP telephones powered by a 3300 In-line Power Unit require a 3300 Phone Power adapter (p/n 57003121) at the set end to operate. The following Mitel IP Phones may be powered using the Mitel Networks 3300 Phone Power adapter: 5001 IP Phone, 5005 IP Phone, 5010 IP Phone, 5020 IP Phone, and 5140 IP Appliance.

WARNING: Sets delivered prior to Release 3.2 will NOT be equipped with the firmware download capability. Special configuration is required to permit these telephones to be powered from a Cisco switch or hub through the 3300 Power Dongle (cisco compliant) (see Pre-Release 3.2 IP Phones).

3300 In-line Power Unit

3300 In-line Power Unit Safety and Approvals

You must read the following safety information before carrying out any installation, removal or any maintenance procedure on the 3300 In-Line Power Unit.

WARNING:

Read the installation instructions before connecting the 3300 In-Line Power Unit to its power source.

Follow basic electricity safety measures whenever connecting the 3300 In-Line Power Unit to its power source.

The 3300 In-Line Power Unit chassis is intended to be grounded. Ensure that the power host is connected to earth ground during normal use.

This product relies on the building installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A. U.S. (240 VAC, 10A international) is used on the phase conductor.

Do not work on the system or connect or disconnect cables during periods of lightning activity.

A voltage mismatch can cause equipment damage and may pose a fire hazard. If the voltage indicated on the label is different from the power outlet voltage, do not connect the 3300 In-Line Power Unit to this power outlet.

For shelf-mounted equipment, be certain that the surface is stable and strong enough to support the equipment. Do not stack more than 4 of the Power over Hubs on top of one another.

Ultimate disposal of this product should be handled according to all national laws and regulations.

The 3300 In-Line Power Unit "Data In" and "Data & Power Out" ports are shielded RJ-45 data sockets. They cannot be used as Plain Old Telephone Service (POTS) telephone sockets. Only RJ-45 data connectors may be connected to these sockets.

Important Safety Information

- Installation and removal of the Mitel Networks 3300 In-Line Power Unit must be carried out by qualified personnel only.
- Power Cord Set: The power cord must be approved for the country in which it is used:

U.S.A. and Canada	The cord set must be UL-approved and CSA certified. The minimum specification for the flexible cord is: No. 18 AWG (1.2mm), Type SV or SJ, 3-conductor. The cord set must have a rated current capacity of at least 10A. The attachment plug must be an earth-grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.
Denmark	The supply plug must comply with section 107-2-D1, standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011

- The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN60320/IEC320 appliance inlet.
- The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.

- This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.
- Switzerland only: The supply plug must comply with SEV/ASE 1011.
- France and Peru only: This unit cannot be powered from IT supplies. If your supplies are of IT type, this unit must be powered by 230V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labelled Neutral, connected directly to earth (ground).
- U.K. only: The Mitel Networks 3300 In-Line Power Unit is covered by OfTel General Approval, NS/G/12345/J/100003, for indirect connection to a public telecommunications system. This can only be achieved using the console port on the unit and an approved modem.

Approvals and Standards Compliance

The **PD-PH-4024/AC/48, Mitel Networks 3300 In-Line Power Unit** complies with the requirements of the EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC and carries the CE marking accordingly. In addition, the product is in conformity with the requirements of the documents listed in bellow:

This declaration is based on results of Conducted and Radiated Emissions, ESD, Radiated Immunity, Surges, Conducted Immunity and Voltage Drops, Interrupts tests and Safety analysis and tests.

Safety

Country	Subject	Document No.	Title
USA, Canada	UL/cUL listing	UL60950	Underwriters Laboratories Inc. Standard for information technology equipment, UL1950.
Europe	TUV GS mark CE	EN60950	TÜV Rheinland Safety GmbH
Japan	VCCI (1999)		CB Report
ALL Countries	CB Test Report		IEC system for conformity testing and certification of electrical equipment (IECEE)

EMC

Country	Subject	Document No.	Title
Canada	ICES-003	CSA C108.8-M1983 CAN/CSA-CISPR 22-96	Electromagnetic Emissions from Data Processing Equipment and Electronic Office Machines.
USA	FCC	CFR 47 part 15	Federal Communication Commission (FCC) Radio Frequency Devices, Sub part B Unintentional Radiators: Sections 15.107 & 15.109, Class B (with FTP cable), Class A (with UTP cable).

Country	Subject	Document No.	Title
Europe	CE	EN55022 Class B (with FTP cable)	information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement.
		EN55024	Information Technology Equipment – Immunity characteristics – Limits and methods of measurement.
		IEC/EN61000-4-2	EMC Testing and measurement techniques – Electrostatic discharge immunity test.
		IEC/EN61000-4-3	EMC Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test.
		IEC/EN61000-4-4	EMC Testing and measurement techniques – Electrical fast transient/burst immunity test.
		IEC/EN61000-4-5	EMC Testing and measurement techniques – Surge immunity tests.
		IEC/EN61000-4-6	EMC Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields.
		IEC/EN61000-4-8	EMC Testing and measurement techniques – Power frequency magnetic field immunity test.
		IEC/EN61000-4-11	EMC Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity test.
		IEC/EN61000-3-2	Electromagnetic compatibility, Limits for harmonic current emissions.
		IEC/EN61000-3-3	Electromagnetic compatibility, Limitation of voltage fluctuations and flickers.
		CISPR22 Class B (with FTP cable)	Information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement.
		CISPR24	Information Technology Equipment – Immunity characteristics – Limits and methods of measurement.
Japan	VCCI	V-1/99.05	Agreement of Voluntary Control Council for Interference by Information Technology Equipment.
		CISPR 22 Class B (with FTP cable)	Information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement.

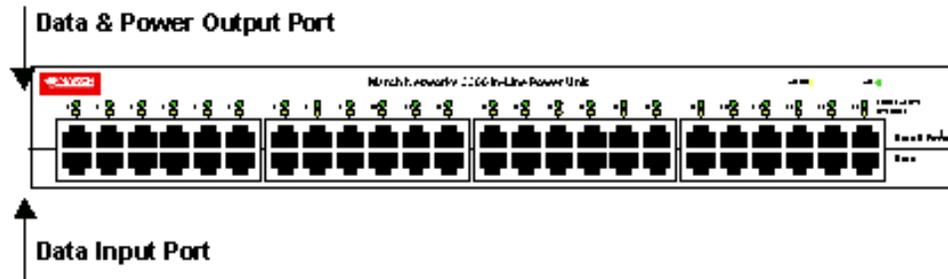
3300 In-Line Power Unit Components

The 3300 In-Line Power Unit (PD-PH-4024/AC/48) has the following hardware features:

- Remote power feeding of Ethernet terminals
- Eliminates the need for terminal's AC outlets, UPS and AC/DC adapters
- 24 10/100BaseT data + power combined channels
- Universal 90-264VAC, 50/60Hz power input

- Independent overload & short-circuit protection for each channel
- Port Status Indications
- RS-232 software download, monitoring and control serial port
- Standard 19" 1.5U Rack Mountable.

Front Panel



10/100BASE-TX Data Input Ports, Lower 24 Ports

The 3300 In-Line Power Unit has 24 10 Base-T / 100 Base-Tx data input ports configured as Media Dependant Interface (MDI) (non-crossover). These ports are designed to carry Ethernet Data only (Tx/Rx) over the standard 2-wire pairs (RJ-45 pins 1,2 and 3,6).

10/100BASE-TX Data & Power Output Ports, Upper 24 Ports

The 3300 In-Line Power Unit has 24 Data & Power ports configured as MDI (non-crossover). These ports are designed to carry Ethernet Data over the standard 2-wire pairs (RJ-45 pins 1/2 and 3/6) and DC Power Source over the spare wire pair (RJ-45 pins 4/5 and 7/8).

According to the IEEE 802.3 standard, the maximum allowable distance between two Ethernet links is 100m (328ft). The 3300 In-Line Power Unit meets this IEEE 802.3 requirement.

Rear Panel



Console Port

The console port (DB-9 connector) allows one to connect a terminal and perform local out-of-band management. The console port uses a standard null modem cable and is set to 19,200-baud, 8 data bits, no parity, and 1 stop bit.

AC Power Receptacle

The 3300 In-Line Power Unit automatically adjusts its power setting to any supply voltage in the range 90–240Vac.

In-line Power Unit Dimensions

Physical Dimensions

Height	2.6 in. (6.6 cm) 2.8 in. (7.2 cm) with rubber feet
Width	17.3 in. (44.0 cm) 19.0 in. (48.3 cm) with 19" brackets
Depth	12.0 in. (30 cm)
Weight	8.6 lb (3.9 kg)

In-Line Power Unit Environment

Storage and Operating Environment

Mode	Temperature	Humidity
Operating	0 to 40°C (32 to 104°F)	10 to 90% (no condensing)
Storage	-20 to 70°C (-4 to 158°F)	10 to 90% (no condensing)

In-Line Power Unit Power

The 3300 In-Line Power Unit normally powers devices that are Power over LAN Enabled or are equipped to receive power over Ethernet.

Power Supply

Input Voltage	90 to 264 VAC (47-63 Hz)
Input Current at 110 VAC	3 Amperes Max
Total Power Consumption, Continuous, 24 ports at full load	216 Watts Max

Output Power

Output Power, per Port	9 Watts
Nominal Output Voltage, per Port	48 Vdc (±4V)

3300 In-Line Power Unit Interfaces

The 3300 In-Line Power Unit is a 24 Ethernet channel power feeding device. The unit is designed for use with a 10/100 Base-Tx standard Ethernet network over a standard TIA/EIA-568 Category 5, 6 or 6e cabling plant. The DC operating power for the data terminal units is fed through the unused pairs (7/8 and 4/5).

Ethernet Interface

Input (Data In): 24 Ports; Ethernet 10/100 Base-T	RJ-45 female socket
Output (Data & Power Out): 24 Ports; Ethernet 10/100 Base-T, and 48 Vdc	RJ-45 female socket, with DC voltage on pins 7/8 and 4/5

Serial Port Interface

Connector Type	DB9 Male Serial Data Monitor port
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3300 Power Dongle (cisco compliant)

The 3300 Power Dongle (cisco compliant) is used when connecting Mitel sets on Cisco Local Area Networks (LAN). The dongle is used when connecting Mitel IP telephones to Cisco hubs that provide LAN power.

The dongle provides signaling to the Cisco hub or the Cisco Power Panel to provide power on the Ethernet line.

WARNING: When power is to be supplied from the Cisco equipment to the Mitel desktop appliance, the Ethernet cable must run directly from the Cisco equipment supplying the power to the 3300 Power Dongle (cisco compliant). The dongle will be directly connected to the Mitel desktop appliance.

WARNING: When the 3300 Power Dongle (cisco compliant) is used, equipment that cannot support 48 volts shall not be connected to the dongle. The dongle is specifically developed to interconnect between the Mitel desktop appliance and the Cisco power equipment.

Cisco Switches

Cisco end-span, power/data hubs include the Catalyst 3500, 4000 and 6000. The Cisco WS-PWR-PANEL is a mid-span power hub. These hubs each have the capability to power the following Mitel IP Phones: 5001 IP Phone, 5005 IP Phone, 5010 IP Phone, 5020 IP Phone, and 5140 IP Appliance.

The WS-PWR-PANEL is electrically located between a conventional data hub and the powered device. This unit passes through the data pairs from the data hub to the terminal device while inserting power on the spare pairs (4/5 and 7/8).

Before enabling port power this unit generates a signal that a power-ready device will loop back. This signal is transmitted on the 7/8 pair and if this is looped back on the 4/5 pair the hub then assumes a power-ready device is connected and enables power on that port. The hub continuously probes the port with signal to ensure the device is still connected. When the hub no longer detects the looped-back probing signal it assumes the terminal device has been disconnected and disables power to that port.

The Catalyst 3500, 4000 and 6000 series products provide 48VDC on the data pairs (1/2 and 3/6).

Before applying this voltage on its port the Cisco hub first ensures that the attached device is capable of accepting power. It does this by transmitting a Fast Link Pulse (FLP) on one data pair while monitoring the second data pair. A power-ready device will loop back this signal to the hub via the second data pair. Once the hub senses this return signal it ramps up voltage on the port.

Once enabled the port continues to provide power provided the link signal from the terminal device is present. When this signal disappears the port interprets this as a disconnection of the terminal device and then disables power to that port.

PowerDsine In-line Power Unit

PowerDsine 24PT In-line Power Unit Safety and Approvals

You must read the following safety information before carrying out any installation, removal or any maintenance procedure on the PowerDsine 24PT In-Line Power Unit (PD-PH-6024/AC/48).

WARNING:

Read the installation instructions before connecting the PowerDsine In-Line Power Unit to its power source.

Follow basic electricity safety measures whenever connecting the PowerDsine In-Line Power Unit to its power source.

The PowerDsine In-Line Power Unit chassis is intended to be grounded. Ensure that the power host is connected to earth ground during normal use.

This product relies on the building installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A. U.S. (240 VAC, 10A international) is used on the phase conductor.

Do not work on the system or connect or disconnect cables during periods of lightning activity.

A voltage mismatch can cause equipment damage and may pose a fire hazard. If the voltage indicated on the label is different from the power outlet voltage, do not connect the PowerDsine In-Line Power Unit to this power outlet.

For shelf-mounted equipment, be certain that the surface is stable and strong enough to support the equipment. Do not stack more than 4 of the Power over Hubs on top of one another.

Ultimate disposal of this product should be handled according to all national laws and regulations.

The PowerDsine In-Line Power Unit "Data In" and "Data & Power Out" ports are shielded RJ-45 data sockets. They cannot be used as Plain Old Telephone Service (POTS) telephone sockets. Only RJ-45 data connectors may be connected to these sockets.

Important Safety Information

- Installation and removal of the PowerDsine PD-PH-6024/AC/48 In-Line Power Unit must be carried out by qualified personnel only.
- Power Cord Set: The power cord must be approved for the country in which it is used:

U.S.A. and Canada	The cord set must be UL-approved and CSA certified. The minimum specification for the flexible cord is: No. 18 AWG (1.2mm), Type SV or SJ, 3-conductor. The cord set must have a rated current capacity of at least 10A. The attachment plug must be an earth-grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.
Denmark	The supply plug must comply with section 107-2-D1, standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011

- The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN60320/IEC320 appliance inlet.
- The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.
- This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.
- Switzerland only: The supply plug must comply with SEV/ASE 1011.
- France and Peru only: This unit cannot be powered from IT supplies. If your supplies are of IT type, this unit must be powered by 230V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labelled Neutral, connected directly to earth (ground).
- U.K. only: The PowerDsine In-Line Power Unit is covered by Ofel General Approval, NS/G/12345/J/100003, for indirect connection to a public telecommunications system. This can only be achieved using the console port on the unit and an approved modem.

Approvals and Standards Compliance

Product: PD-PH-6024/AC/48 PowerDsine In Line Power Unit

The product described above complies with the requirements of the EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC and carries the CE marking accordingly. In addition, the product is in conformity with the requirements of the documents listed in bellow:

This declaration is based on results of Conducted and Radiated Emissions, ESD, Radiated Immunity, Surges, Conducted Immunity and Voltage Drops, Interrupts tests and Safety analysis and tests.

Safety

Country	Subject	Document No.	Title
USA, Canada	UL/cUL listing	UL60950	Underwriters Laboratories Inc. Standard for information technology equipment, UL1950.
Europe	TUV GS mark CE	EN60950	TÜV Rheinland Safety GmbH
Japan	VCCI (1999)		CB Report
ALL Countries	CB Test Report		IEC system for conformity testing and certification of electrical equipment (IECEE)

EMC

Country	Subject	Document No.	Title
Canada	ICES-003	CSA C108.8-M1983 CAN/CSA-CISPR 22-96	Electromagnetic Emissions from Data Processing Equipment and Electronic Office Machines.
USA	FCC	CFR 47 part 15	Federal Communication Commission (FCC) Radio Frequency Devices, Sub part B Unintentional Radiators: Sections 15.107 & 15.109, Class B (with FTP cable), Class A (with UTP cable).
Europe	CE	EN55022 Class B (with FTP cable)	information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement.
		EN55024	Information Technology Equipment – Immunity characteristics – Limits and methods of measurement.
		IEC/EN61000-4-2	EMC Testing and measurement techniques – Electrostatic discharge immunity test.
		IEC/EN61000-4-3	EMC Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test.
		IEC/EN61000-4-4	EMC Testing and measurement techniques – Electrical fast transient/burst immunity test.
		IEC/EN61000-4-5	EMC Testing and measurement techniques – Surge immunity tests.
		IEC/EN61000-4-6	EMC Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields.
		IEC/EN61000-4-8	EMC Testing and measurement techniques – Power frequency magnetic field immunity test.
		IEC/EN61000-4-11	EMC Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity test.
		IEC/EN61000-3-2	Electromagnetic compatibility, Limits for harmonic current emissions.
		IEC/EN61000-3-3	Electromagnetic compatibility, Limitation of voltage fluctuations and flickers.

Country	Subject	Document No.	Title
		CISPR22 Class B (with FTP cable)	Information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement.
		CISPR24	Information Technology Equipment – Immunity characteristics – Limits and methods of measurement.
Japan	VCCI	V-1/99.05	Agreement of Voluntary Control Council for Interference by Information Technology Equipment.
		CISPR 22 Class B (with FTP cable)	Information Technology Equipment – Radio disturbance characteristics – Limits and methods of measurement.

PowerDsine 24PT In-line Power Unit Components

The PowerDsine In-Line Power Unit (PD-PH-6024/AC/48) has the following hardware features:

- Remote power feeding of Ethernet terminals
- Eliminates the need for terminal's AC outlets, UPS and AC/DC adapters
- 24 10/100BaseT data + power combined channels
- Universal 100-240VAC, 50/60Hz power input
- Independent overload & short-circuit protection for each channel
- Bicolor LED Port Status Indicators
- RS-232 software download, monitoring and control serial port
- Standard 19" 1U rack mounting hardware included.
- 16.8 Watts output per port (24 port model has a 200W overall power limit).
- IEEE 802.3af (Draft 3.0) compliant power outputs.

Front Panel



10/100BASE-TX Data Input Ports, Lower 24 Ports

The PowerDsine 24PT In-Line Power Unit has 24 10 Base-T / 100 Base-Tx data input ports configured as Media Dependant Interface (MDI) (non-crossover). These ports are designed to carry Ethernet Data only (Tx/Rx) over the standard 2-wire pairs (RJ-45 pins 1,2 and 3,6).

10/100BASE-TX Data & Power Output Ports, Upper 24 Ports

The PowerDsine 24PT In-Line Power Unit has 24 Data & Power ports configured as MDI (non-crossover). These ports are designed to carry Ethernet Data over the standard 2-wire pairs (RJ-45 pins 1/2 and 3/6) and DC Power Source over the spare wire pair (RJ-45 pins 4/5 and 7/8).

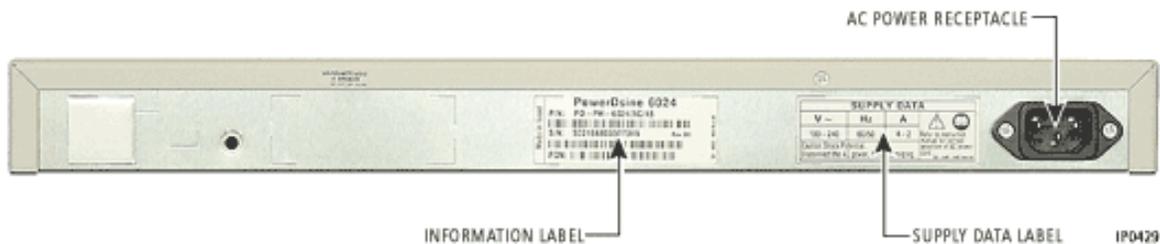
According to the IEEE 802.3 standard, the maximum allowable distance between two Ethernet links is 100m (328ft). The PowerDsine 24PT In-Line Power Unit is IEEE 802.3af Draft 3.0 compliant.

Console Port

The console port (DB-9 connector) allows one to connect a terminal and perform local out-of-band management. The console port uses a standard null modem cable and is set to 19,200-baud, 8 data bits, no parity, and 1 stop bit.

Port LEDs

One bicolor LED (green and orange) per port provides port status. Green indicates that the terminal unit has been identified as, "Power over LAN Enabled" and is active and receiving power. Orange or blinking indicates a fault or other condition. See User Guide for more information.



AC Power Receptacle

The 3300 PowerDsine 24PT In-Line Power Unit automatically adjusts its power setting to any supply voltage in the range 100–240Vac.

PowerDsine 24PT In-Line Power Unit Dimensions

Physical Dimensions

Height	1.75 in. (4.4 cm) (1 U)
Width	17.0 in. (43.2 cm) 19.0 in. (48.3 cm) with 19" rack mount brackets
Depth	11.9 in. (30.2 cm)
Weight	8.8 lb (4.0 kg)

PowerDsine 24PT In-Line Power Unit Environment

Storage and Operating Environment

Mode	Temperature	Humidity
Operating	0 to 40°C (32 to 104°F)	10 to 90% (no condensing)
Storage	-20 to 70°C (-4 to 158°F)	10 to 90% (no condensing)

PowerDsine 24PT In-Line Power Unit Power

The PowerDsine 24PT In-Line Power Unit is designed to power devices that are Power over LAN Enabled and are IEEE 802.3af compliant. Devices that are not compliant may require an external power adapter to be powered.

Power Supply PD-PH-6024/AC/48

Input Voltage	90 to 264 VAC (47-63 Hz)
Input Current (90/264VAC)	4 / 2 Amps RMS
Maximum Power Input at full load	270 Watts

Output Power

Output Power, per Port (Note)	16.8 Watts
Nominal Output Voltage, per Port	44 – 57VDC



Note: Maximum power output is 200W for the 24 port hub. See User Manual for power allocation details.

PowerDsine 24PT In-Line Power Unit Interfaces

The PowerDsine 24Pt In-Line Power Unit is a 24 Ethernet channel power feeding device. The unit is designed for use with a 10/100 Base-Tx standard Ethernet network over a standard TIA/EIA-568 Category 5, 6 or 6e cabling plant. The DC operating power for the data terminal units is fed through the unused pairs (7/8 and 4/5).

Ethernet Interface

Input (Data In): 24 Ports; Ethernet 10/100 Base-T	RJ-45 female socket
Output (Data & Power Out): 24 Ports; Ethernet 10/100 Base-T, and 48 Vdc	RJ-45 female socket, with DC voltage on pins 7/8 and 4/5

Serial Port Interface

Connector Type	DB9 Male Serial Data Monitor port
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Chapter 3

Installing

Installing

Required Components

To complete the system installation, you will need the following items and information:

- Suitable installation site
- Parts and equipment
- Information and services
- Power for the system
- Uninterruptible power supply (recommended)
- List of customer-purchased options
- User information (CSV) file
- Username and password for the Mitel Networks™ 3300 Configuration Tool
- Username and password for the 3300 Controller
- Serial cable to connect PC to 3300 Controller
- Ethernet cable to connect PC to 3300 Controller.

Your PC must meet the following requirements:

- Operating system - Windows NT Server - Windows NT Workstation - Windows 2000 Server - Windows 2000 Professional, or - Windows 98
- Browser - Microsoft Internet Explorer 5.5 or 6.0 (we recommend 6.0)
- Network Interface Card - Full Duplex 10/100M (we recommend 100M)



Note: We recommend that you set your monitor resolution to 1024 x 768.

If you need to install software (not upgrade) your PC will also need:

- Serial port for accessing the RTC
- Minimum 250MB of free hard disk space
- Internet Information Server (IIS) or Personal Web Server (PWS)

Installation Site

Allow at least 76.5 cm (30 inches) between the rear of each cabinet and the wall for maintenance access to the system.

The system must be located in an area that is

- Dry and clean

- Adequately lit
- Easily accessible.

Do not locate the system near

- Sprinkler systems, sweating pipes, steam pipes, or steam vents
- Corrosive fumes or exhaust from machinery
- Electronic equipment that generates strong radio frequency fields (such as a radio or television receiver)
- Equipment that generates strong magnetic fields that can corrupt data on hard disks or floppy disks
- Reproducing machines.



Note: If a reproducing or copying machine must be located in same room as the system, ensure that it is more than 3 m (10 ft.) away from the system. If the machine is not equipped with a filtering system, ensure that the room is ventilated by an exhaust fan.

Parts and Equipment

In order to complete the installation, you must supply the following items:

Item	Application
Computer connected to a LAN	Configure and manage the system
Main Distribution Frame (MDF)	Connect 25-pair peripheral cables with lines and trunks
25-pair cable with male amphenol connectors (AMP Champ or equivalent connectors: 50 pin RS, screw lock, 90x tapered slide on hood)	Connect lines and trunks from the rear of the ASU to the MDF
3 category 5 cables with RJ-45 connector (no longer than 100m)	<ul style="list-style-type: none"> - Standard Ethernet cable to connect to a Layer 2 switch - Ethernet crossover cable to connect the CIM ports - Cable from the digital trunk (NSU) and the demarcation point has a different pinout.
Fiber optic cables	Connect the 3300 Controller to digital trunks and NSUs; terminate at the FIM ports
ST-type fiber connectors (four)	
14 AWG (1.8 mm) cable (minimum)	Ground the NSU and ASU
RJ-45 connector cable	Provide connectivity between NSU and demarcation point
UPS	Power back-up
Equipment rack (optional)	Mounting components

Information and Services

In order to complete the installation, you must ensure that the

- Ethernet connection is available at the site of server (one Ethernet connection (100 Base-T) is required if you are installing Mitel Networks IP telephones)

- Server is assigned two valid, static IP address one for the RTC and the other for the E2T card
- Customer data network information is available (for example DNS server information)
- Range of IP addresses from your LAN authority is available - one IP address for each Mitel Networks IP telephone
- System fail transfer (SFT) extensions are identified
- Feature codes and numbering plans are available
- Central Office services are available and in the correct locations.



Note: If the 3300 ICP is part of a cluster, an IP Console telephony keyboard, 4015IP or 4025IP telephone must be assigned a Static IP Address.

Note: An IP Console, 4015IP, or 4025IP telephone in a clustered environment requires a specific Format, Value, and Scope for Options 128 and 129.

Power

Power wiring to the system must conform to the requirements of the local electrical code. The system power is supplied from a commercial ac power supply. Each unit is powered individually.

The system power must meet the following requirements:

- The units may share a branch circuit that is dedicated to one system only; the circuit must not be shared with any other equipment.
- Each receptacle of the branch circuit should have a rating of 120 V, 60 Hz, 15 A (or 230 V, 50 Hz, 8 A for 230 V systems)
- If the total power requirements of the entire system exceed the rating of one branch circuit, individual dedicated branch circuits may be installed for each unit.
- Each unit must have one power receptacle that is three-wire type with the ground wire connected to the ground of the electrical system. Do not attempt to defeat the grounding conductor. The receptacle must not be controlled by a switch.
- The location of the power receptacle must be accessible so that the system can be unplugged during maintenance; however, you must ensure that the power cord does not present a hazard to users or pedestrians and that it is protected from accidental removal.



Note: To prevent accidental removal, attach a warning tag to the plug end of the cord.

Uninterruptible Power Supply

We recommend that you install an uninterruptible power supply (UPS) for the server.

System Installation Overview

To install your 3300 ICP system:

1. Install the 3300 ICP Controller
2. Configure the Controller
3. Install the Universal NSU
4. Install the R2 NSU
5. Install the BRI NSU
6. Install the Universal ASU
7. Install the ASU
8. Install the Peripheral Unit
9. Install the SUPERSET HUB
10. Install the Digital Service Unit
11. Install Wireless Devices
12. Connect the Controller to the LAN
13. Launch the System Administration Tool to program the system. (Refer to Overview of Programming).



Tip: You can complete all of the programming without having physical connections to the Controller. After programming you can connect units to the controller and then power-up the system.

Installation Planner

The following required and default settings are necessary for an installation:

System Administration Tool

username	(Default = system)
password	(Default = password)

Controller Configuration (RTC)

	Default Settings	Settings to Change	
boot device	ata=0,0		
processor number	0		
host name			
file name	/sysro/RTC8260		
inet on ethernet (e)	192.168.1.2		IP address: subnet mask
inet on backplane (b)			
host inet (h)			IP address: ftp server
gateway inet (g)			Default Gateway
user (u)	ftp		FTP user (installer's PC)
ftp password (pw)	@		FTP password (installer's PC)

Controller Configuration (RTC)

flags (f)	0x0		
target name (tn)			
startup scripts (s)			
other (o)	motfcc		

DHCP Configuration (for scope supporting IP Voice devices)

IP Address Scope			
Start Address			
End Address			
Subnet Mask			
Lease Duration	Days:	Hours:	Minutes:
Options (for all devices)	Identifier	Data Type	Value
(Router) Default Gateway	003	IP Address	
Options (for WEB devices)			
DNS Server	006	IP Address	
DNS Domain Name	015	ASCII String	
Options (for 3300 E2T)			
TFTP Server (hostname or IP)	066	ASCII String	(typically the IP address of the controller RTC)
TFTP BootFile	067	ASCII String	/sysro/E2T8260
Options (for IP Phones)			
Mitel IP Phone DHCP server	130	ASCII String	MITEL IP PHONE
IP Phone TFTP Server	128	IP Address	(typically the IP address of the controller RTC)
MN3300 (RTC) IP Address	129	IP Address	
VLAN ID	132	Hex Long (32 bit word)	e.g. 0x2
VLAN Priority	133	Hex Long (32 bit word)	0x6

IP Phone MAC Information

IP Set Registration Code		(See System Option Assignment)
IP Set Replacement Code		

Set Programming Guide

User Name	Location	Set Type	Number	MAC Address (optional)

Capacity

The 250-user 3300 ICP will support one of the following maximum configurations:

- 250 IP telephones and 96 ONS telephones with no peripheral unit support.
- 250 IP telephones and a 192 port peripheral unit with a DTMF card installed.
- a combination of IP, ONS, and DNI telephones (for example, 100 IP telephones, 96 ONS telephones, and 100 DNI telephones on a peripheral unit).

The 700-user 3300 ICP will support the quantities listed in the following hardware and feature capacity tables.

3300 ICP Hardware Capacity

Parameter Name	Number
Attendant Consoles	24
DNI Channels	2368
Programmable Key Modules	75
System Ports	
- DTMF Receivers	128
- Multiline Sets	756
- Single Line Sets (ONS/OPS Lines)	700
- Trunks	628
Tone Detector Circuits	32

3300 ICP Feature Capacity

Parameter Name	Number
ACDII - Agent Groups	32
Agents per Group	500
ACDII - Agent IDs	1181
ACDII - Agent Paths	256
Attendant Console Groups	48
Attendant Console Calls Waiting	72
Broadcast Groups	1875
- Members per Broadcast Group	32
Busy Lamp Groups (Monitored Devices)	439
- Members per Busy Lamp Group	16
Call Reroute Always	176
Call Reroute 1st Alternates	336
Call Reroute 2nd Alternates	32
Class of Restriction (COR)	96
Class of Service (COS)	96
Conferences; maximum	5
Conferees in a conference; maximum	5

3300 ICP Feature Capacity (continued)

Parameter Name	Number
Default Account Codes	225
Departments (in Tel Dir)	2000
Digit Modification Tables	256
Digit Blocks	4055
Digital Links	16
Group Page Groups	16
Hunt Groups	176
- Members per Hunt Group	64
Independent Account Codes	1000
Locations (in Tel Dir)	250
Modem Groups	15
Modems per Modem Group	10
MSDN/DPNSS Cluster Elements	30
MSDN/DPNSS Remote Directory Numbers	18500
Networked ACD - Remote Agent Subgroups	32
Page Groups (Zones)	16
Personal Speed Call Users (blocks of 10 speed calls per user)	500
Pickup Groups	200
- Members per Pickup Group	75
Routes	200
Route Lists	128
Speed Call Digit String (avg. 12 digits)	1500
SUPERSET Callback Messages per System	500
System Account Codes	24
System Digit Strings	6814
System Speed Call	600
Telephone Directory Entries	19995
Trunk Groups	112
Trunks per Trunk Group	175
Trunk Service Numbers	150

Install the 3300 Controller

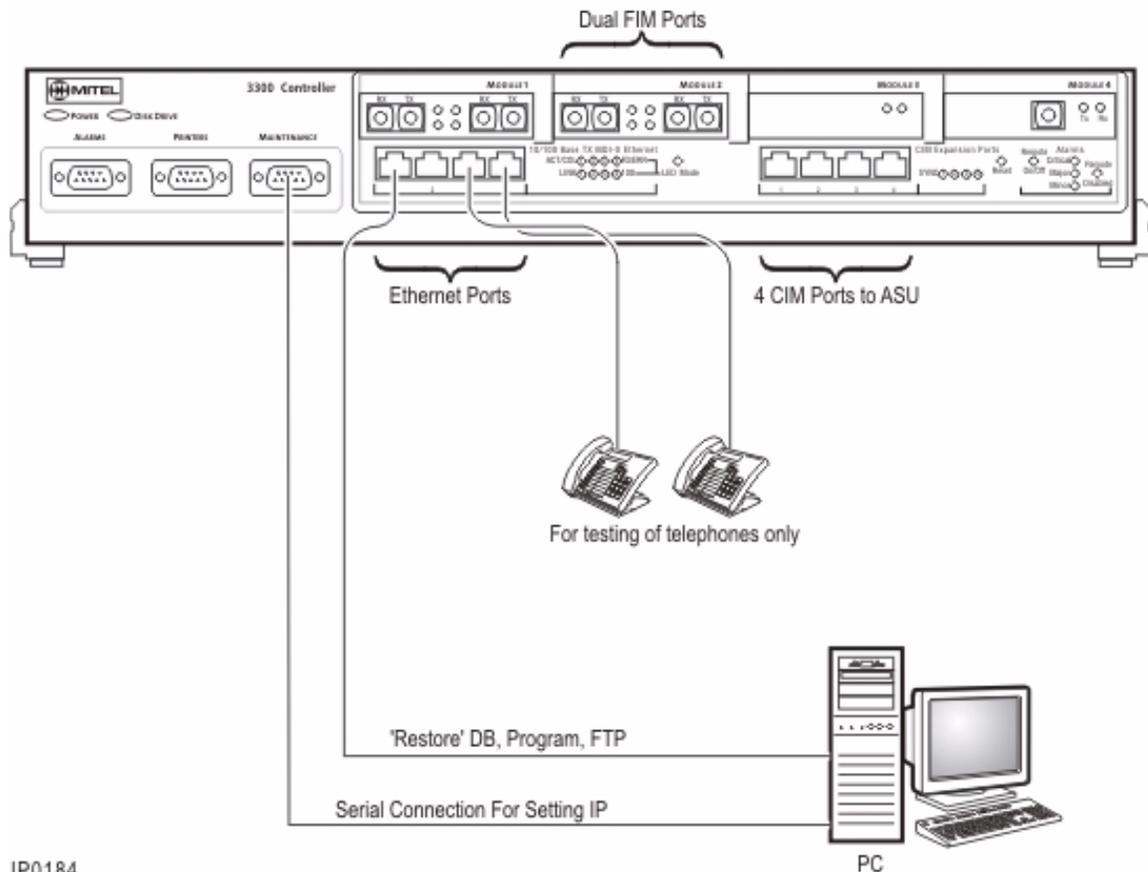
To install the 3300 Controller:

1. Install the System ID Module.
2. Set up a serial connection between the 3300 Configuration Tool PC and the Maintenance (RS-232) port on the 3300 Controller. Baud rate - 9600, Data bits - 8, Parity - None Stop bits - 1, Flow control - None.
3. Set up an Ethernet connection between the 3300 Controller and the 3300 Configuration Tool PC (a standard LAN cable from an RJ-45 connector on the 3300 Controller L2 switch to the PC NIC).



Note: You can connect IP telephones to the 3300 Controller through L2 switch external ports, for testing only, after installation of the database and configuration. IP Phones require a configured DHCP server.

3300 ICP Controller Installation



IP0184

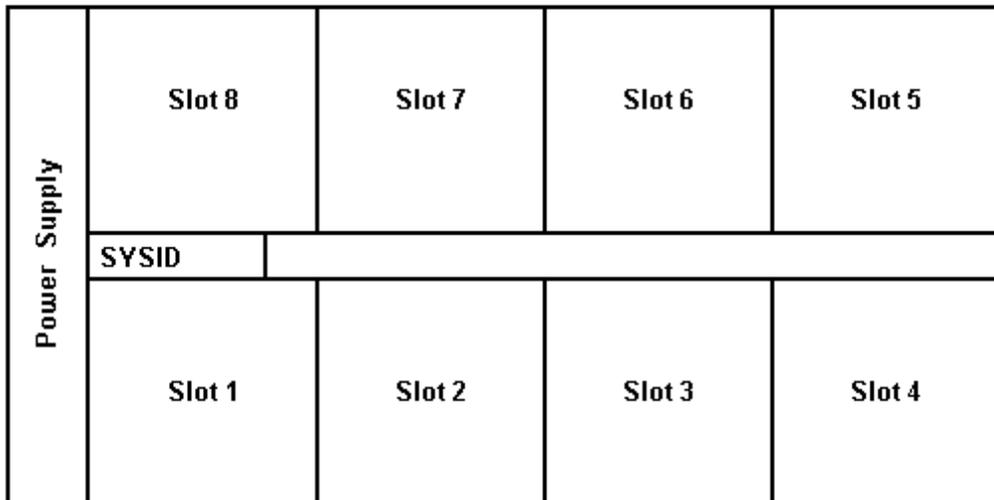
Install the System ID Module

The system ID module is shipped with the software. You must install the system ID module in the 3300 ICP controller. The module contains a unique identifier that the system reads on start-up.

To install the System ID Module:

1. Remove the cover.
2. Press firmly to seat the module on the board. Placement is between MMC 1 (the Dual FIM) and MMC 8 (the DSP). The module will cover the 'MMC 8' text printed on the board.
3. Replace the cover.

System ID Module Placement



IP0421

Configure the Controller



Note: Before you begin, you should review the LAN and WAN guidelines and plan the network. Complete the Installation Planner. You will need to know the IP addresses reserved by the customer for the 3300 ICP Controller (one for the RTC and one for the E2T) and for the IP Phones.



Tip: The initial power-up and the reset in this procedure will each take 15 to 20 minutes.

To complete the installation of the Mitel Networks 3300 ICP:

1. Connect power to the 3300 Controller. The controller will come up, in 15 to 20 minutes, with factory-installed software.
2. To check the connections between the 3300 Controller and the PC: PING the 3300 Controller IP address FTP to the 3300 Controller IP address Go to the 3300 Controller URL address (<http://192.168.1.2>).
3. Launch browser to login to the System Administration Tool (<http://192.168.1.2> -- username is system, password is password).
4. Optional. Install the Mitel Networks 3300 Configuration Tool on your PC. Use the Configuration Tool to reset the default database, import the .csv file, and make programming changes. Refer to the 3300 Configuration Tool online help for detailed instructions.
5. Enable the options in the License and Option Selection form and reboot.
6. Program the system by using the System Administration Tool or restore a database.
7. Configure the DHCP Server with IP addresses provided by the customer. Refer to the Note and default settings table following this procedure.
8. If you are using an external DHCP Server, disable the internal DHCP Server.
9. Perform a Backup.
10. Reboot the system.
11. Set the 3300 Controller (RTC) IP address through a communication program.
12. Install the other units as described in the System Installation Overview.
13. As the final step, connect the 3300 Controller to the LAN.



Note: You may use the internal or an external DHCP Server. The controller is shipped with the DHCP server Enabled. Use DHCP reservations against the MAC address for the E2T.

Internal DHCP Server default settings - shipped enabled

TFTP Server	066	192.168.1.2
TFTP BootFile	067	/sysro/E2T8260
IP Phone TFTP Server	128	192.168.1.2
MN330 (RTC) IP Address	129	192.168.1.2
Mitel IP Phone DHCP Server	130	MITEL IP PHONE
Range	Start End	192.168.1.20 192.168.1.24

Set the 3300 Controller IP Address

To set the 3300 Controller IP address:

1. Establish a serial connection from the 3300 Configuration Tool PC (or any PC equipped with a communications program) to the Maintenance Port on the 3300 Controller.
2. Launch the communication program.
3. Set the RS-232 communication parameters: Baud rate - 9600 Data bits - 8 Parity - None Stop bits - 1 Flow control - None
4. Connect AC power to the 3300 Controller.
5. Press the Reset button on the 3300 Controller with a small pointed object.
6. Wait for the "Press any key to stop auto-boot" message and then press a key.
7. At VxWorks Boot type c and then press Enter. Press Enter after you enter required text. For all other fields, (displayed in grey text, for information only) accept the default value or leave blank. boot device: ata=0,0 (Boot device is Disk) unit number: 0 (default, leave at 0, not used) processor number: 0 (default, leave at 0, not used) host name: (optional) file name: /sysro/Rtc8260 (boot location and file name) inet on ethernet (e): 134.199.63.11:ffff00 (example RTC IP and subnet mask) Note: Type the IP address and subnet mask (in hexadecimal format for the end user's site (i.e. fffff represents 255.255.255.00). inet on backplane (b): host inet (h): gateway inet (g): 134.199.63.251 (example Router (Gateway)address) Note: Enter the IP address of the end user's gateway for the 3300 Controller. user (u): ftp (must be ftp for Release 3.1) ftp password (ftp) (blank = @): flags (f): 0x0 (a fixed IP address (0x40 is used on E2T for DHCP) target name (tn): startup script (s): other (o): motfcc (other device, E2T using Network to boot from)
8. Press the Reset button on the 3300 Controller.
9. Remove the Serial connection. The system will return to service in about 10 to 15 minutes.



Note: It may be helpful to leave the serial connection in place to capture any potential errors.

Install the 3300 Configuration Tool

The 3300 Configuration Tool PC must have Windows NT 4.0 or Windows 2000 Professional operating system. In addition, the Java Plug-in 1.1.3 by Sun™ Microsystems is required (Netscape Communicator 4.05 and the Java Plug-in are shipped with the 3300 Configuration Tool software).

To install the 3300 Configuration Tool:

1. Insert the 3300 Configuration Tool CD-ROM into the CD-ROM drive.
2. Open Explorer and double-click the Setup.exe file in the root directory of the CD-ROM drive.
3. Enter your user name and company name. Click Next.
4. Click Next to select the default destination folder, or click Browse to install in a different folder.
5. Click Typical install.

6. Click Next to begin copying files to the target directory. The 3300 Configuration Tool installation program automatically starts the Oracle installation program. Follow the prompts to install Oracle.

Install and Configure the Java Plug-In

Install the Java Plug-in on the 3300 Configuration Tool PC to improve performance of the 3300 Configuration Tool application. You can access the Java Plug-in from a browser at the following URL: <http://servername/opsclient/> where servername is the netbios name of the 3300 Configuration Tool platform.

After you have installed the plug-in you must set the parameters as follows:

1. From the Start menu, point to Programs, and click Java Plug-in ControlPanel.
2. Click Basic.
3. Enter the following parameter: Network Access: Unrestricted or Applet host (do not select None)
4. Use the default settings for the parameters in the Advanced and Proxies property sheets.
5. Click Apply.

The 3300 Configuration Tool PC, operating on Windows NT 4.0 or Windows 2000 Professional, is connected to the 3300 Controller through a serial connection and a network connection. The PC must be equipped with an Ethernet card, an Ethernet cable, a communications program, a serial port (use Hyperterminal default settings), and a serial cable.

Install the 3300 Universal NSU

Install the 3300 Universal NSU

To install the 3300 Universal NSU:

1. Set DIP switch #6 for Network or Line termination mode. The default is network termination mode. Refer to Universal NSU DIP Switch Settings.
2. Establish a fiber connection from the fiber port on the NSU to the fiber port on the 3300 Controller.
3. Connect the NSU L0 and/or L1 port to the remote system (the PSTN or another system) by using Category 5 cable.
4. Connect power to the NSU.



Note: The Ethernet port is used for FTP upgrades.

Note: The cable for the CIM ports must be an Ethernet crossover cable.

Install for PRI/Q.SIG

To install and configure the 3300 Universal NSU as a PRI/QSIG variant:

1. Install a Direct Connection Device Driver on a computer.
2. Create a Dial-up Network connection on your computer.
3. Connect the computer to the 3300 Universal NSU.
4. Use the IMAT Tool to complete required PRI configuration.
5. Connect the 3300 Universal NSU to the ISDN network.

Connecting a Laptop Computer to the NSU

To connect a computer to the NSU:

1. Install IMAT. From the 3300 Software CD-ROM, run Tools/IMAT/Disk1/setup.exe.
2. Use a straight through serial cable for a direct connection.
3. Use a null modem adapter if connecting to the card through a modem.
4. If you have not already done so on the laptop computer, install a Direct Connect modem type. You may also wish to install a modem for remote connection.
5. On the laptop, create a new Dial-up Networking entry.

Create a Modem Connection

1. Install the modem following the manufacturer's installation instructions.
2. In the Modem Properties/Advanced Settings window - Turn off error control - Turn on flow control and select Hardware.

Install Direct Connect Device Driver

By default, Windows does not support a direct cable connection. You must add a device driver. Windows takes the information from a Mitel file and creates the driver called NT Direct Connection.

Refer to detailed installation and configuration instructions for:

- Direct Connection Device Driver for Windows 95 and Windows 98
- Direct Connection Device Driver for Windows 2000 Professional

Driver for Windows 95 and Windows 98

To install and configure the Direct Connection Device Driver for Windows 95 or Windows 98:

1. On the Start menu, point to Settings, and then click Control Panel.
2. Double-click the Modems icon.
3. In the Modem Properties window, click Add.
4. In the Install New Modem screen, click Other.
5. Select Don't detect my modem, I will select from a list. Click Next.

6. Click Have Disk.
7. Type c:\Program Files\Mitel\lmat in the Copy manufacturer's files from field and click OK.
8. On the Install from Disk window, click OK.
9. Click Next to select the NT Direct Connection.
10. Select COM 1 or COM 2, and then click Next.
11. Click Finish.
12. In the Modem Properties window, select NT Direct Connection, then click Properties.
13. Set the following parameters: - Maximum speed: 38400 - Check: only connect at this speed
- Data bits: 8 - Parity: none - Stop bits: 1 - Mode: auto answer In the Advanced Settings window, do the following for a direct connect cable: - Turn off: error control - Turn off: flow control
14. Click OK and close the Control Panel window.

Driver for Windows 2000

To install and configure Direct Connection Device Driver for Windows 2000 Professional:

1. On the Start menu, point to Settings, then click Control Panel.
2. Double-click Phone and Modem Options icon.
3. Select the Modem tab.
4. Click Add.
5. Click Other on the Install New Modem screen.
6. Select Don't detect my modem, I will select it from a list and click Next.
7. In the Modems field, select Communications cable between two computers, then click Next.
8. Select COM 1 or COM 2, then click Next.
9. Click Finish.
10. The COM Port will be displayed in the Phone and Modem Options window, Modems tab. Select the COM Port and then click Properties.
11. From the Maximum Port Speed drop-down menu, select 38400.
12. In the Communications cable between two computers, select the Advanced tab, and then click Change Default Preferences.
13. From the Port speed drop-down list select 38400, and then from the Flow control drop-down list select None.
14. Select the Advanced tab. From the drop-down menus, set the fields as follows: - Data bits: 8 - Parity: none - Stop bits: 1
15. Click OK and close the Control Panel window.

Create a Dial-up Network Connection

Typically, you will want to follow this procedure twice to create two Dial-up Networking connections, one for on-site direct access, and one for remote modem access.

Refer to detailed instructions for:

- Dial-up Networking Connection for Windows 95 or Windows 98
- Dial-up Network connection for Windows 2000 Professional

Dial-up Connection for Windows 95 or Windows 98

To create a dial-up networking connection for Windows 95 or Windows 98:

1. On the Start menu, point to Programs, point to Accessories, and then click Dial-Up Connections.
2. Double-click Make New Connection.
3. Enter an appropriate name for the connection (for example, Direct for direct connections, Remote or a customer's name for remote connections) and click Next. Note: If you are creating a direct connection, make sure NT Direct Connection is listed in the drop-down list in the Make a New Connection window.
4. Enter an Area Code and Telephone Number and select a Country Code from the drop-down list. Click Next. Note: Even though it is not needed for a direct connection, Windows requires that you enter this information.
5. Click Finish.
6. Right-click your new connection icon and click Properties.
7. Click Configure, then make sure the fields are set as follows: - Data bits: 8 - Parity: none
For a direct connection: - Maximum speed: 38400 - Check: only connect at this speed - Select wait for dial tone before dialing - Select cancel the call time at 60 sec. - Click Advanced and turn off error control and flow control
For a remote connection: - Stop bits: 1 - Click Advanced and turn on error control and select Compress data. - Turn on flow control and select Hardware.
8. Click OK.
9. Select Server Types tab and make sure that PPP: Windows, WindowsNT3.5, Internet or PPP:Internet appears in the Type of Dial-Up Server field.
10. In the Advanced Options field, select Log onto Network and Enable software compression.
11. Make sure that only TCP/IP is selected in the Allowed network protocols field.
12. Select the Scripting tab and enter c:\program files\mitel\lmat\pridun.scp for a 3300 Universal NSU c:\program files\mitel\lmat\r2dun.scp for a 3300 R2 NSU.
13. Click OK.

Dial-up Connection for Windows 2000

To create a dial-up networking connection for Windows 2000 Professional:

1. On the Start menu, point to Programs, point to Accessories, click Communications, and then click Dial-Up Connections.
2. Double click Make New Connection, and then click Next.
3. Select Dial-up to the Internet, and then click Next.
4. Select I want to set up my Internet connection manually, or I want to connect through a local area network (LAN). Click Next.
5. Select I connect through a phone line and a modem, and then click Next.
6. Use the COM Port that has been configured as a NULL Modem connection: 38400, 8, none, 1.
7. In the Choose Modem box, from the drop-down list select Communications cable between 2 computers. Click Next.
8. Clear the box Use area code and dialing rules, and then click Advanced.
9. For the Connection type, select PPP (Point to Point Protocol). For the Logon procedure, select Use logon script, and then click Browse. Select pridun.scp. Click OK, and then click Next.
10. In the Internet account logon information box, leave the username and password fields blank and then click Next.
11. Dialog boxes appear that warn you that you will not be able to connect to your Internet service provider without your user name and your password. Disregard these warnings and click Yes on these boxes to continue.
12. Enter the Connection name, then click Next.
13. In the box to set up an Internet mail account, select No, then click Next.
14. De-select the option to connect to the Internet immediately, then click Finish.
15. In the Network and Dial-up Connections window, right-click on the new DUN connection, point to Properties, then click Configure.
16. From the Maximum speed (bps) drop-down list, select 38400 for the baud rate.
17. Click OK until you exit the windows.

Install the 3300 R2 NSU

To install and configure the 3300 R2 NSU:

1. Set the DIP switches for the protocol and site installation. The default configuration of the DIP switches will support T1 protocols in network termination mode.
2. Establish a fiber connection from the fiber port on the NSU to the fiber port on the 3300 Controller.
3. Connect the NSU L0 and/or L1 port to the remote system (the PSTN or another system).
4. Install a Direct Connection Device Driver on a PC. Refer to Install the 3300 Universal NSU for details.

5. Create a Dial-up Network connection on the PC. Refer to Install the 3300 Universal NSU for details.
6. Connect the computer to the 3300 R2 NSU.
7. Use the IMAT Tool to complete the required configuration.
8. Connect the 3300 R2 NSU to the PSTN network.
9. Connect the 3300 R2 NSU to the 3300 Controller.
10. Connect power to the NSU.

Connections

Connect the computer to the 3300 R2 NSU

To connect the computer to the 3300 R2 NSU:

1. Connect the serial cable from the computer's COM port to the 3300 R2 NSU 9-pin serial port.
2. On the File menu, click Connect to Remote Site.
3. In the Dial-Up Entry box, select the <name> you entered for the connection when creating the dial-up connection. (See Dial-Up Networking Connection.) Note: The 3300 R2 NSU does not require a password.
4. Ensure that PRI CARD is selected under Remote ISDN System.
5. Click Connect.
6. In the Connected to remote site window, click OK.



Note: A networked computer running Win95/98 has difficulties communicating using Dial-up Networking. It is strongly suggested that a non-networked computer be used.

Connect the 3300 R2 NSU to the 3300 Controller

A fiber connection originates from a fiber interface module (FIM) port on the front of the 3300 Controller and is terminated on the FIM port of the digital trunking 3300 R2 NSU.

The 3300 R2 NSU is connected to the Public Switched Telephone Network (PSTN) termination point from the L0 port with Category 5 cable.

Install the 3300 BRI NSU

To install the 3300 BRI NSU:

1. Configure the 3300 Controller E1 DPNSS on the 3300 Universal NSU that will be used to connect to the 3300 BRI NSU.
2. Program the BRI-specific requirements for the E1 DPNSS interface.
3. Set up the maintenance PC.
4. Complete the 3300 BRI NSU programming.
5. Connect power to the NSU.



Note: The 3300 BRI NSU is set for 75 ohms impedance when connected to a digital trunking NSU running E1 DPNSS. The 3300 Universal NSU is also set for 75 ohms impedance.

Note: A Category 5 connection from the 3300 BRI NSU E1 port to a 3300 Universal NSU that is running E1 DPNSS. E1 connections as TX and RX pairs in RJ-45. Option to ground one side of TX and or RX (using DIP switch) to use with coax adapter.

Note: The 3300 BRI NSU is connected to an appropriate device (such as a PSTN or ISDN device) from a 25-pair Amphenol connector.

Setting Up the Maintenance PC

To install, configure, and maintain the 3300 BRI NSU, you must connect it to a maintenance computer. The computer must be running DOS and have a communications program (such as ProComm Plus ©) installed.

To connect a maintenance PC to the 3300 BRI NSU:

1. Using the RJ45 to 9-pin D-type MMI cable, connect the RS-232 port on the 3300 BRI NSU to COM port 1 or 2 on the PC.
2. Set up the communications program on COM port 1 or 2 with the following parameters: 9600 baud, 8 data bits, no parity, 1 stop bit, ASCII character set, and XON/XOFF flow control.

NSU Chaining

NSU chaining refers to the physical connection of two NSUs together, on one fiber interface, from the Controller. BRI NSUs may not be chained.

To connect two NSUs to the Controller:

1. Connect the first NSU to the controller through a fiber connection from the fiber port on the NSU to the fiber port on the 3300 Controller.
2. Using a CAT5 crossover cable make a connection from CIM2 on the first NSU to CIM1 on the second NSU.
3. Connect power to the NSU.



Note: The first NSU must have the Message Link dip switch set to 1, up. The second NSU must have the Message Link dip switch set to 2, down.

Install the 3300 Universal ASU

Before you begin, ensure that there is a free CIM port on the 3300 Controller.

To install the 3300 Universal ASU:

1. Mount the 3300 Universal ASU in the 19-inch rack (if applicable).
2. Connect the supplied Cross-over Category 5 cable with RJ-45 connector to the CIM port on the 3300 Universal ASU and a free CIM port on the 3300 Controller. Note that up to four ASUs can be connected to the 3300 Controller.

3. Complete telephony cabling.
4. Complete programming.
5. Connect power to the 3300 Universal ASU. CIM LEDs will be on once the CIM link synchronizes. The 3300 Controller will detect the 3300 Universal ASU, and the application software will download and start immediately.

Install the 3300 ASU

Before you begin, ensure there is a free CIM port on the 3300 Controller.

To install the 3300 ASU:

1. Mount the 3300 ASU in the 19-inch rack (if applicable).
2. Connect the supplied cross-over Category 5 cable with RJ-45 connector to the CIM port on the 3300 ASU and a free CIM port on the 3300 Controller. Up to four ASUs can be connected to a 3300 Controller.
3. Complete telephony cabling.
4. Complete programming.
5. Connect power to the 3300 ASU. CIM LEDs will be on once the CIM link synchronizes. The 3300 Controller will detect the 3300 ASU, and the application software will download and start immediately.

Install the Peripheral Unit

Overview of the Peripheral Unit Installation

To install a Peripheral Unit:

1. Unpack, position, and ground the Peripheral Unit.
2. Check the card layout.
3. Connect the fiber cable to the node.
4. Check the grounding.
5. Install the power converter.
6. Install the Peripheral Interface cards.
7. Cable the node to the MDF.
8. Power up the Peripheral Unit.



Note: For information about removing and replacing the front panel of the cabinet, see Front Panels in the Install Upgrades and FRUs section.

Once you have completed these steps, you can proceed to Installing a DSU Node, Installing a SUPERSET HUB, or return to System Installation Overview.

Unpack, Position, and Ground the Peripheral Unit

To unpack, position, and ground the node:

CAUTION: Power must not be applied to the Peripheral Unit until you have installed the ground cable.

1. Unpack the peripheral node.
2. Check the contents against the packing list.
3. Visually inspect the node and attached equipment for damage. Repack and return any damaged equipment.
4. Position the node.
5. Connect an external ground to the ground terminal on the rear panel of the peripheral cabinet. Refer to the Safety Instructions for detailed grounding requirements. These instructions are packaged with each system.

Peripheral Unit Card Layout

Typically, a peripheral cabinet is shipped with the peripheral switch controller (PSC) card and Fiber Interface Module (FIM) installed. If these cards were not shipped in the cabinet, install them as Field Replaceable Units (FRUs). You must install and cable the FIM before you install the peripheral switch controller card and power converter (see Peripheral Unit FRUs section).

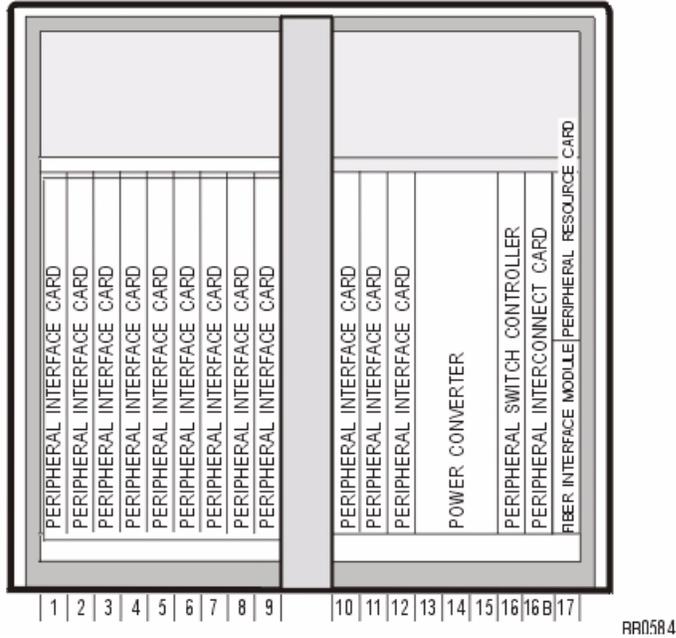
The cards in the peripheral unit should be installed in the following configuration:

Slot Number	Card Type
1 to 12	Peripheral Interface card
13, 14, 15 (combined)	Power Converter
16	Peripheral Switch Controller (PSC)
17	Fiber Interface Module (FIM)



Note: If you are installing an expanded Peripheral Unit, or expanding an existing one, the card layout will be different depending on if the cabinet is used as the master or slave of the peripheral pair.

PERIPHERAL CABINET SLOT LAYOUT



Connect Fiber Cable to the Peripheral Unit

The fiber optic cable connects the FIM in the 3300 Controller to the FIM in the Peripheral Unit.

To connect the fiber optic cable to the FIM in the peripheral node:

1. Review the guidelines for handling fiber optic cable.
2. Route the fiber optic cable through the cable port at the rear of the peripheral cabinet into the cabinet. Extend the fiber cable approximately 30 cm (1 ft) beyond the front of the cabinet.
3. Install a short piece of nylon spiral wrap over the cable at the point where the cable exits the rear of the cabinet.
4. Close the sliding cable port door. Ensure that the door closes on the nylon spiral-wrapped section of fiber cable.
5. Remove the plastic dust caps from the fiber optic cable and the connector ferrules on the FIM faceplate.
6. Plug the fiber connectors into the connectors on the FIM faceplate. The fiber connectors have a small key that must be aligned with a slot on the FIM connectors. Lock each connector into position by pushing the metal collar forward and clipping it onto the FIM connector.

Peripheral Unit Grounding

CAUTION: Ensure that the grounding meets the requirements specified in the Safety Instructions. These instructions are packaged with each system.

WARNING: Danger to personnel and/or equipment damage could result if the cabinet is not powered off.

To check the grounding:

1. Ensure that the power switch (S1) on the power distribution unit (PDU) is set to the off (0) position and that the switch on the power converter faceplate is set to the off (0) position.
2. Attach the anti-static wrist strap to your wrist.
3. Slide the installed circuit cards forward slightly so that the card connectors are not in contact with the cabinet backplane. Leave the power converter installed.
4. Remove the anti-static wrist strap.
5. Plug the external power cable from the AC commercial power supply into the power input plug on the power distribution unit (PDU).
6. Disconnect the protective earth wire from the protective earth ground stud on the rear of the cabinet.
7. Using a digital multimeter, measure the AC potential between the protective earth wire (building ground) and the protective earth ground stud. A voltage reading of less than 1 VAC is acceptable. To prevent damage to the multimeter, set it to the maximum AC scale, then reduce the setting gradually to the 10 VAC range.
8. If the potential is greater than 1 VAC, recheck the ground connections and repeat the measure.
9. If the reading still exceeds 1 VAC, the building ground is unacceptable. Connect the protective earth wire to a new building ground and repeat the steps 7 through 9 until you have an acceptable AC potential. **WARNING:** Do not continue until you have a potential of 1 VAC or less between the building ground and the protective earth ground stud. Otherwise, personal injury and/or equipment damage may result.
10. Reconnect the protective earth wire to the protective earth ground stud and attach the anti-static wrist strap to your wrist.
11. Slide the installed circuit cards back into contact with the cabinet backplane. Ensure that each card is fully inserted in its slot.

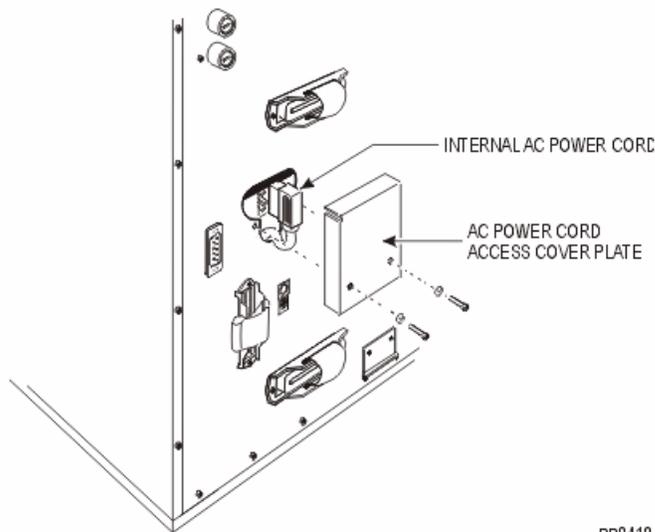
Power Converter

To install an AC power converter:

WARNING: Danger to personnel and/or equipment damage could result if the cabinet is not powered off during installation of the AC power converter.

1. At the rear of the cabinet, remove the two screws that fasten the internal AC power cord access cover plate to the backplane, and remove the cover plate (see figure).
2. Ensure that the switch on the power converter faceplate is set to off (0).
3. Install the power converter in slots 13 through 15.
4. Plug the internal AC power cord from the power distribution unit (PDU) into the power converter through the access cutout in the backplane.
5. Replace the internal AC power cord access cover plate over the access cutout in the backplane, and replace the two screws.

PERIPHERAL NODE REAR



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Install Peripheral Interface Cards

To install the Peripheral Interface cards:

CAUTION: To prevent static damage to electrical components, ensure that the system is grounded before you install the cards. Whenever you handle circuit cards, wear an anti-static strap.

1. Install the peripheral switch controller card in slot 16.
2. Set the E&M Trunk Card settings and the OPS Line Card Message Waiting Switches in the Peripheral Unit Specifications section.
3. Install the Peripheral Interface cards. Refer to Install a Circuit Card in "Install Upgrades and FRUs" for circuit card installation procedures.

Cable the Unit to the MDF

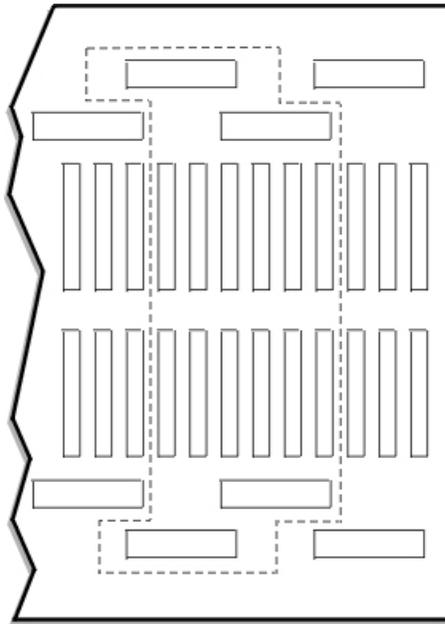
Cable the lines and trunks from the Peripheral Unit to the Main Distribution Frame (MDF) by using the Peripheral Interface Cabling Tables.

About Peripheral Interface Cabling

Peripheral equipment (e.g., stations, SUPERSET telephones, trunks) is connected to the relevant interface circuits of the system via a cross-connect field. Peripheral Interface cards, situated in slots 1 through 12, are connected to the cross-connect field by a maximum of eight 25-pair cables (customer-supplied) per Peripheral Unit. Cables terminate at the node on 50-pin plugs, J1 through J8, with the number of cables being dependent on the quantity and type of interface cards installed in the node.

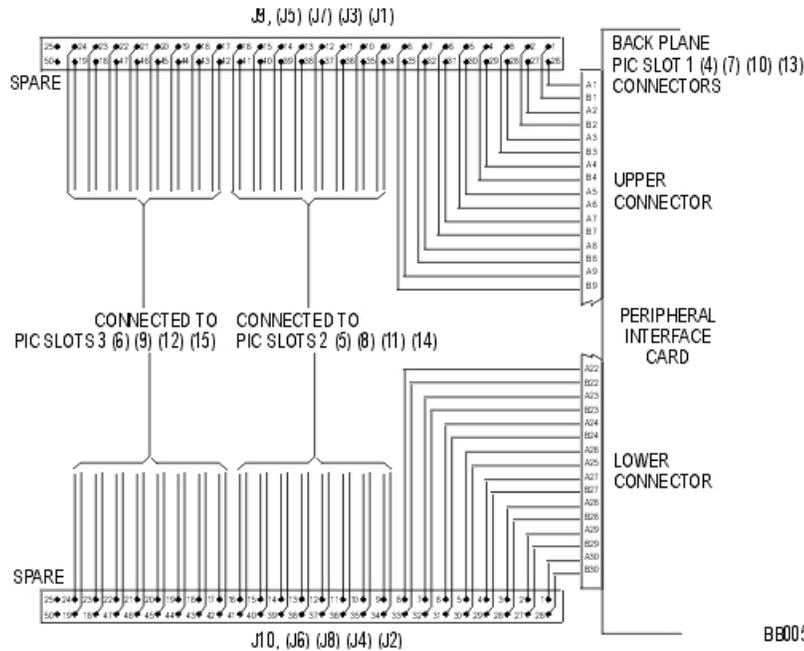
Plugs J1 through J8 are hardwired to backplane connectors in slots 1 through 12 to form four slot groups, each comprising three adjacent cards and each associated with a pair of plugs. Two adjacent slot groups are shown in Backplane Connector Arrangements. The circuits of interface cards contained in a slot group are evenly distributed to the relevant pair of plugs, such that, half the circuits of each card in a group are connected to the odd-numbered plug and half to the even-numbered plug. Peripheral Wiring (Backplane) details the hardwire connections between one slot group and the associated plugs. The wiring sequence is identical for the remaining three slot groups.

Cable jacks (P1 through P8), are customer-supplied and should be labeled at time of installation. P1 through P8 are secured to J1 through J8 with hook and loop type fasteners. Equipment which is external to the system (i.e., system to cross-connect field cables and cross-connect field hardware) is not supplied by MITEL. Therefore, the type of equipment used and the layout of the cross-connect field cables is at the discretion of the installation company. Installation information for such equipment must be obtained from the equipment manufacturer.



RR0565

Backplane Connector Arrangements



BB0050

Peripheral Wiring (Backplane)

Peripheral Interface Cabling Tables

Use the tables to cable the Peripheral Unit card connectors to the main distribution frame.



Note: When cabling the SX-2000 MICRO LIGHT node connectors, use the cabling tables that correspond to the Peripheral Interface card slot in the node.

Cable Connectors

Connectors for customer supplied 25-pair cables terminating on peripheral backplane (to MDF) and SFT unit (to MDF) use AMP Champ or equivalent cable connectors:

- 50-pin RS (receptacle - screw lock)
- female
- screw lock
- 90 tapered slide-on hood.

USOC Connector Pin Designations

The USOC connector numbers are:

- RJ21 X for CO Trunks
- RJ2EX for 2-wire E&M Trunks
- RJ2FX for 4-wire E&M Trunks
- RJ2GX for 4-wire E&M Trunks
- RJ2HX for 4-wire E&M Trunks.

USOC Connector Pin Designations

Pin	Color Code	RJ21X	RJ2EX	RJ2GX	RJ2FX	RJ2HX
26	W/BL	T	T	T	T	T
1	BL/W	R	R	R	R	R
27	W/O	T	E	T1	E	T1
2	O/W	R	M	R1	SG	R1
28	W/G	T	T	E	M	E
3	G/W	R	R	M	SB	SG
29	W/BR	T	E	T	T	M
4	BR/W	R	M	R	R	SB
30	W/S	T	T	T1	E	T
5	S/W	R	R	R1	SG	R
31	R/BL	T	E	E	M	T1
6	BL/R	R	M	M	SB	R1
32	R/O	T	T	T	T	E
7	O/R	R	R	R	R	SG

Pin	Color Code	RJ21X	RJ2EX	RJ2GX	RJ2FX	RJ2HX
33	R/G	T	E	T1	E	M
8	G/R	R	M	R1	SG	SB
34	R/BR	T	T	E	M	T
9	BR/R	R	R	M	SB	R
35	R/S	T	E	T	T	T1
10	S/R	R	M	R	R	R1
36	BK/BL	T	T	T1	E	E
11	BL/BK	R	R	R1	SG	SG
37	BK/O	T	E	E	M	M
12	O/BK	R	M	M	SB	SB
38	BK/G	T	T	T	T	T
13	G/BK	R	R	R	R	R
39	BK/BR	T	E	T1	E	T1
14	BR/BK	R	M	R1	SG	R1
40	BK/S	T	T	E	M	E
15	S/BK	R	R	M	SB	SG
41	Y/BL	T	E	T	T	M
16	BL/Y	R	M	R	R	SB
42	Y/O	T	T	T1	E	T
17	O/Y	R	R	R1	SG	R
43	Y/G	T	E	E	M	T1
18	G/Y	R	M	M	SB	R1
44	Y/BR	T	T	T	T	E
19	BR/Y	R	R	R	R	SG
45	Y/S	T	E	T1	E	M
20	S/Y	R	M	R1	SG	SB
46	V/BL	T	T	E	M	T
21	BL/V	R	R	M	SB	R
47	V/O	T	E	T	T	T1
22	O/V	R	M	R	R	R1
48	V/G	T	T	T1	E	E
23	G/V	R	R	R1	SG	SG
49	V/BR	T	E	E	M	M
24	BR/V	R	M	M	SB	SB
50	V/S	--	--	SPARE	--	--
25	S/V	--	--	SPARE	--	--

Card Connections to Cross-Connect Field

The following tables show the “pin-out” signals of the interface cards as they appear on J1 through J8. The following abbreviations are used in the tables:

ONS L C: ONS line card and ONS CLASS/CLIP line card

OPS L C: OPS line card

LS/GS Trunk: Loop Start/Ground Start Trunk card

E&M Trunk: E&M trunk card

DID/LT Trunk: direct inward dialing/loop tie trunk card

DID/2 Trunk: direct inward dialing

DNI L C: digital network interface line card.

Tables for Card Slots 1 through 12 follow.

Card Slot 1

Card Slot 1 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
26	W/BL	1T	1T	1T	1T	1T	1T	1T	P1
1	BL/W	1R	1R	1R	1R	1R	1R	1R	
27	W/O	2T	1MWB	1T(MR)	1T1			2T	
2	O/W	2R	1MWA	1R(MR)	1R1			2R	
28	W/G	3T	2T	2T	1E	2T	2T	3T	
3	G/W	3R	2R	2R	1SG	2R	2R	3R	
29	W/BR	4T	2MWB	2T(MR)	1M			4T	
4	BR/W	4R	2MWA	2R(MR)	1SB			4R	
30	W/S	5T	3T	3T	2T		3T	5T	
5	S/W	5R	3R	3R	2R		3R	5R	
31	R/BL	6T	3MWB	3T(MR)	2T1			6T	
6	BL/R	6R	3MWA	3R(MR)	2R1			6R	
32	R/O	7T	4T	4T	2E		4T	7T	
7	O/R	7R	4R	4R	2SG		4R	7R	
33	R/G	8T	4MWB	4T(MR)	2M			8T	
8	G/R	8R	4MWA	4R(MR)	2SB			8R	

Card Slot 1 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
26	W/BL	9T	5T	5T	3T	3T	5T	9T	P2
1	BL/W	9R	5R	5R	3R	3R	5R	9R	
27	W/O	10T	5MWB	5T(MR)	3T1			10T	
2	O/W	10R	5MWA	5R(MR)	3R1			10R	
28	W/G	11T	6T	6T	3E	4T	6T	11T	
3	G/W	11R	6R	6R	3SG	4R	6R	11R	
29	W/BR	12T	6MWB	6T(MR)	3M			12T	
4	BR/W	12R	6MWA	6R(MR)	3SB			12R	
30	W/S	13T	7T	7T	4T		7T	13T	
5	S/W	13R	7R	7R	4R		7R	13R	
31	R/BL	14T	7MWB	7T(MR)	4T1			14T	
6	BL/R	14R	7MWA	7R(MR)	4R1			14R	
32	R/O	15T	8T	8T	4E		8T	15T	
7	O/R	15R	8R	8R	4SG		8R	15R	
33	R/G	16T	8MWB	8T(MR)	4M			16T	
8	G/R	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 2

Card Slot 2 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
34	R/BR	1T	1T	1T	1T	1T	1T	1T	P1
9	BR/R	1R	1R	1R	1R	1R	1R	1R	
35	R/S	2T	1MWB	1T(MR)	1T1			2T	
10	S/R	2R	1MWA	1R(MR)	1R1			2R	
36	BK/BL	3T	2T	2T	1E	2T	2T	3T	
11	BL/BK	3R	2R	2R	1SG	2R	2R	3R	
37	BK/O	4T	2MWB	2T(MR)	1M			4T	
12	O/BK	4R	2MWA	2R(MR)	1SB			4R	
38	BK/G	5T	3T	3T	2T		3T	5T	
13	G/BK	5R	3R	3R	2R		3R	5R	
39	BK/BR	6T	3MWB	3T(MR)	2T1			6T	
14	BR/BK	6R	3MWA	3R(MR)	2R1			6R	
40	BK/S	7T	4T	4T	2E		4T	7T	
15	S/BK	7R	4R	4R	2SG		4R	7R	
41	Y/BL	8T	4MWB	4T(MR)	2M			8T	
16	B/Y	8R	4MWA	4R(MR)	2SB			8R	

Card Slot 2 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
34	R/BR	9T	5T	5T	3T	3T	5T	9T	P2
9	BR/R	9R	5R	5R	3R	3R	5R	9R	
35	R/S	10T	5MWB	5T(MR)	3T1			10T	
10	S/R	10R	5MWA	5R(MR)	3R1			10R	
36	BK/BL	11T	6T	6T	3E	4T	6T	11T	
11	BL/BK	11R	6R	6R	3SG	4R	6R	11R	
37	BK/O	12T	6MWB	6T(MR)	3M			12T	
12	O/BK	12R	6MWA	6R(MR)	3SB			12R	
38	BK/G	13T	7T	7T	4T		7T	13T	
13	G/BK	13R	7R	7R	4R		7R	13R	
39	BK/BR	14T	7MWB	7T(MR)	4T1			14T	
14	BR/BK	14R	7MWA	7R(MR)	4R1			14R	
40	BK/S	15T	8T	8T	4E		8T	15T	
15	S/BK	15R	8R	8R	4SG		8R	15R	
41	Y/BL	16T	8MWB	8T(MR)	4M			16T	
16	BL/Y	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 3

Card Slot 3 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
42	Y/O	1T	1T	1T	1T	1T	1T	1T	P1
17	O/Y	1R	1R	1R	1R	1R	1R	1R	
43	Y/G	2T	1MWB	1T(MR)	1T1			2T	
18	G/Y	2R	1MWA	1R(MR)	1R1			2R	
44	Y/BR	3T	2T	2T	1E	2T	2T	3T	
19	BR/Y	3R	2R	2R	1SG	2R	2R	3R	
45	Y/S	4T	2MWB	2T(MR)	1M			4T	
20	S/Y	4R	2MWA	2R(MR)	1SB			4R	
46	V/BL	5T	3T	3T	2T		3T	5T	
21	BL/V	5R	3R	3R	2R		3R	5R	
47	V/O	6T	3MWB	3T(MR)	2T1			6T	
22	O/V	6R	3MWA	3R(MR)	2R1			6R	
48	V/G	7T	4T	4T	2E		4T	7T	
23	G/V	7R	4R	4R	2SG		4R	7R	
49	V/BR	8T	4MWB	4T(MR)	2M			8T	
24	BR/V	8R	4MWA	4R(MR)	2SB			8R	
50	----	----	----	----	SPARE	----	----	----	
25	----	----	----	----	SPARE	----	----	----	

Card Slot 3 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
42	Y/O	9T	5T	5T	3T	3T	5T	9T	P2
17	O/Y	9R	5R	5R	3R	3R	5R	9R	
43	Y/G	10T	5MWB	5T(MR)	3T1			10T	
18	G/Y	10R	5MWA	5R(MR)	3R1			10R	
44	Y/BR	11T	6T	6T	3E	4T	6T	11T	
19	BR/Y	11R	6R	6R	3SG	4R	6R	11R	
45	Y/S	12T	6MWB	6T(MR)	3M			12T	
20	S/Y	12R	6MWA	6R(MR)	3SB			12R	
46	V/BL	13T	7T	7T	4T		7T	13T	
21	BL/V	13R	7R	7R	4R		7R	13R	
47	V/O	14T	7MWB	7T(MR)	4T1			14T	
22	O/V	14R	7MWA	7R(MR)	4R1			14R	
48	V/G	15T	8T	8T	4E		8T	15T	
23	G/V	15R	8R	8R	4SG		8R	15R	
49	V/BR	16T	8MWB	8T(MR)	4M			16T	
24	BR/V	16R	8MWA	8R(MR)	4SB			16R	
50	----	----	----	----	SPARE	----	----	----	
25	----	----	----	----	SPARE	----	----	----	

Card Slot 4

Card Slot 4 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
26	W/BL	1T	1T	1T	1T	1T	1T	1T	P3
1	BL/W	1R	1R	1R	1R	1R	1R	1R	
27	W/O	2T	1MWB	1T(MR)	1T1			2T	
2	O/W	2R	1MWA	1R(MR)	1R1			2R	
28	W/G	3T	2T	2T	1E	2T	2T	3T	
3	G/W	3R	2R	2R	1SG	2R	2R	3R	
29	W/BR	4T	2MWB	2T(MR)	1M			4T	
4	BR/W	4R	2MWA	2R(MR)	1SB			4R	
30	W/S	5T	3T	3T	2T		3T	5T	
5	S/W	5R	3R	3R	2R		3R	5R	
31	R/BL	6T	3MWB	3T(MR)	2T1			6T	
6	BL/R	6R	3MWA	3R(MR)	2R1			6R	
32	R/O	7T	4T	4T	2E		4T	7T	
7	O/R	7R	4R	4R	2SG		4R	7R	
33	R/G	8T	4MWB	4T(MR)	2M			8T	
8	G/R	8R	4MWA	4R(MR)	2SB			8R	

Card Slot 4 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
26	W/BL	9T	5T	5T	3T	3T	5T	9T	P4
1	BL/W	9R	5R	5R	3R	3R	5R	9R	
27	W/O	10T	5MWB	5T(MR)	3T1			10T	
2	O/W	10R	5MWA	5R(MR)	3R1			10R	
28	W/G	11T	6T	6T	3E	4T	6T	11T	
3	G/W	11R	6R	6R	3SG	4R	6R	11R	
29	W/BR	12T	6MWB	6T(MR)	3M			12T	
4	BR/W	12R	6MWA	6R(MR)	3SB			12R	
30	W/S	13T	7T	7T	4T		7T	13T	
5	S/W	13R	7R	7R	4R		7R	13R	
31	R/BL	14T	7MWB	7T(MR)	4T1			14T	
6	BL/R	14R	7MWA	7R(MR)	4R1			14R	
32	R/O	15T	8T	8T	4E		8T	15T	
7	O/R	15R	8R	8R	4SG		8R	15R	
33	R/G	16T	8MWB	8T(MR)	4M			16T	
8	G/R	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 5

Card Slot 5 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
34	R/BR	1T	1T	1T	1T	1T	1T	1T	P3
9	BR/R	1R	1R	1R	1R	1R	1R	1R	
35	R/S	2T	1MWB	1T(MR)	1T1			2T	
10	S/R	2R	1MWA	1R(MR)	1R1			2R	
36	BK/BL	3T	2T	2T	1E	2T	2T	3T	
11	BL/BK	3R	2R	2R	1SG	2R	2R	3R	
37	BK/O	4T	2MWB	2T(MR)	1M			4T	
12	O/BK	4R	2MWA	2R(MR)	1SB			4R	
38	BK/G	5T	3T	3T	2T		3T	5T	
13	G/BK	5R	3R	3R	2R		3R	5R	
39	BK/BR	6T	3MWB	3T(MR)	2T1			6T	
14	BR/BK	6R	3MWA	3R(MR)	2R1			6R	
40	BK/S	7T	4T	4T	2E		4T	7T	
15	S/BK	7R	4R	4R	2SG		4R	7R	
41	Y/BL	8T	4MWB	4T(MR)	2M			8T	
16	B/Y	8R	4MWA	4R(MR)	2SB			8R	
34	R/BR	9T	5T	5T	3T	3T	5T	9T	P4
9	BR/R	9R	5R	5R	3R	3R	5R	9R	
35	R/S	10T	5MWB	5T(MR)	3T1			10T	
10	S/R	10R	5MWA	5R(MR)	3R1			10R	
36	BK/BL	11T	6T	6T	3E	4T	6T	11T	
11	BL/BK	11R	6R	6R	3SG	4R	6R	11R	
37	BK/O	12T	6MWB	6T(MR)	3M			12T	
12	O/BK	12R	6MWA	6R(MR)	3SB			12R	
38	BK/G	13T	7T	7T	4T		7T	13T	
13	G/BK	13R	7R	7R	4R		7R	13R	
39	BK/BR	14T	7MWB	7T(MR)	4T1			14T	
14	BR/BK	14R	7MWA	7R(MR)	4R1			14R	
40	BK/S	15T	8T	8T	4E		8T	15T	
15	S/BK	15R	8R	8R	4SG		8R	15R	
41	Y/BL	16T	8MWB	8T(MR)	4M			16T	
16	BL/Y	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 6

Card Slot 6 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs	
42	Y/O	1T	1T	1T	1T	1T	1T	1T	P3	
17	O/Y	1R	1R	1R	1R	1R	1R	1R		
43	Y/G	2T	1MWB	1T(MR)	1T1			2T		
18	G/Y	2R	1MWA	1R(MR)	1R1			2R		
44	Y/BR	3T	2T	2T	1E	2T	2T	3T		
19	BR/Y	3R	2R	2R	1SG	2R	2R	3R		
45	Y/S	4T	2MWB	2T(MR)	1M			4T		
20	S/Y	4R	2MWA	2R(MR)	1SB			4R		
46	V/BL	5T	3T	3T	2T		3T	5T		
21	BL/V	5R	3R	3R	2R		3R	5R		
47	V/O	6T	3MWB	3T(MR)	2T1			6T		
22	O/V	6R	3MWA	3R(MR)	2R1			6R		
48	V/G	7T	4T	4T	2E		4T	7T		
23	G/V	7R	4R	4R	2SG		4R	7R		
49	V/BR	8T	4MWB	4T(MR)	2M			8T		
24	BR/V	8R	4MWA	4R(MR)	2SB			8R		
50	----	----	----	----	SPARE	----	----	----		
25	----	----	----	----	SPARE	----	----	----		
42	Y/O	9T	5T	5T	3T	3T	5T	9T		P4
17	O/Y	9R	5R	5R	3R	3R	5R	9R		
43	Y/G	10T	5MWB	5T(MR)	3T1			10T		
18	G/Y	10R	5MWA	5R(MR)	3R1			10R		
44	Y/BR	11T	6T	6T	3E	4T	6T	11T		
19	BR/Y	11R	6R	6R	3SG	4R	6R	11R		
45	Y/S	12T	6MWB	6T(MR)	3M			12T		
20	S/Y	12R	6MWA	6R(MR)	3SB			12R		
46	V/BL	13T	7T	7T	4T		7T	13T		
21	BL/V	13R	7R	7R	4R		7R	13R		
47	V/O	14T	7MWB	7T(MR)	4T1			14T		
22	O/V	14R	7MWA	7R(MR)	4R1			14R		
48	V/G	15T	8T	8T	4E		8T	15T		
23	G/V	15R	8R	8R	4SG		8R	15R		
49	V/BR	16T	8MWB	8T(MR)	4M			16T		
24	BR/V	16R	8MWA	8R(MR)	4SB			16R		
50	----	----	----	----	SPARE	----	----	----		
25	----	----	----	----	SPARE	----	----	----		

Card Slot 7

Card Slot 7 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
26	W/BL	1T	1T	1T	1T	1T	1T	1T	P5
1	BL/W	1R	1R	1R	1R	1R	1R	1R	
27	W/O	2T	1MWB	1T(MR)	1T1			2T	
2	O/W	2R	1MWA	1R(MR)	1R1			2R	
28	W/G	3T	2T	2T	1E	2T	2T	3T	
3	G/W	3R	2R	2R	1SG	2R	2R	3R	
29	W/BR	4T	2MWB	2T(MR)	1M			4T	
4	BR/W	4R	2MWA	2R(MR)	1SB			4R	
30	W/S	5T	3T	3T	2T		3T	5T	
5	S/W	5R	3R	3R	2R		3R	5R	
31	R/BL	6T	3MWB	3T(MR)	2T1			6T	
6	BL/R	6R	3MWA	3R(MR)	2R1			6R	
32	R/O	7T	4T	4T	2E		4T	7T	
7	O/R	7R	4R	4R	2SG		4R	7R	
33	R/G	8T	4MWB	4T(MR)	2M			8T	
8	G/R	8R	4MWA	4R(MR)	2SB			8R	
26	W/BL	9T	5T	5T	3T	3T	5T	9T	P6
1	BL/W	9R	5R	5R	3R	3R	5R	9R	
27	W/O	10T	5MWB	5T(MR)	3T1			10T	
2	O/W	10R	5MWA	5R(MR)	3R1			10R	
28	W/G	11T	6T	6T	3E	4T	6T	11T	
3	G/W	11R	6R	6R	3SG	4R	6R	11R	
29	W/BR	12T	6MWB	6T(MR)	3M			12T	
4	BR/W	12R	6MWA	6R(MR)	3SB			12R	
30	W/S	13T	7T	7T	4T		7T	13T	
5	S/W	13R	7R	7R	4R		7R	13R	
31	R/BL	14T	7MWB	7T(MR)	4T1			14T	
6	BL/R	14R	7MWA	7R(MR)	4R1			14R	
32	R/O	15T	8T	8T	4E		8T	15T	
7	O/R	15R	8R	8R	4SG		8R	15R	
33	R/G	16T	8MWB	8T(MR)	4M			16T	
8	G/R	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 8

Card Slot 8 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
34	R/BR	1T	1T	1T	1T	1T	1T	1T	P5
9	BR/R	1R	1R	1R	1R	1R	1R	1R	
35	R/S	2T	1MWB	1T(MR)	1T1			2T	
10	S/R	2R	1MWA	1R(MR)	1R1			2R	
36	BK/BL	3T	2T	2T	1E	2T	2T	3T	
11	BL/BK	3R	2R	2R	1SG	2R	2R	3R	
37	BK/O	4T	2MWB	2T(MR)	1M			4T	
12	O/BK	4R	2MWA	2R(MR)	1SB			4R	
38	BK/G	5T	3T	3T	2T		3T	5T	
13	G/BK	5R	3R	3R	2R		3R	5R	
39	BK/BR	6T	3MWB	3T(MR)	2T1			6T	
14	BR/BK	6R	3MWA	3R(MR)	2R1			6R	
40	BK/S	7T	4T	4T	2E		4T	7T	
15	S/BK	7R	4R	4R	2SG		4R	7R	
41	Y/BL	8T	4MWB	4T(MR)	2M			8T	
16	B/Y	8R	4MWA	4R(MR)	2SB			8R	
34	R/BR	9T	5T	5T	3T	3T	5T	9T	P6
9	BR/R	9R	5R	5R	3R	3R	5R	9R	
35	R/S	10T	5MWB	5T(MR)	3T1			10T	
10	S/R	10R	5MWA	5R(MR)	3R1			10R	
36	BK/BL	11T	6T	6T	3E	4T	6T	11T	
11	BL/BK	11R	6R	6R	3SG	4R	6R	11R	
37	BK/O	12T	6MWB	6T(MR)	3M			12T	
12	O/BK	12R	6MWA	6R(MR)	3SB			12R	
38	BK/G	13T	7T	7T	4T		7T	13T	
13	G/BK	13R	7R	7R	4R		7R	13R	
39	BK/BR	14T	7MWB	7T(MR)	4T1			14T	
14	BR/BK	14R	7MWA	7R(MR)	4R1			14R	
40	BK/S	15T	8T	8T	4E		8T	15T	
15	S/BK	15R	8R	8R	4SG		8R	15R	
41	Y/BL	16T	8MWB	8T(MR)	4M			16T	
16	BL/Y	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 9

Card Slot 9 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs	
42	Y/O	1T	1T	1T	1T	1T	1T	1T	P5	
17	O/Y	1R	1R	1R	1R	1R	1R	1R		
43	Y/G	2T	1MWB	1T(MR)	1T1			2T		
18	G/Y	2R	1MWA	1R(MR)	1R1			2R		
44	Y/BR	3T	2T	2T	1E	2T	2T	3T		
19	BR/Y	3R	2R	2R	1SG	2R	2R	3R		
45	Y/S	4T	2MWB	2T(MR)	1M			4T		
20	S/Y	4R	2MWA	2R(MR)	1SB			4R		
46	V/BL	5T	3T	3T	2T		3T	5T		
21	BL/V	5R	3R	3R	2R		3R	5R		
47	V/O	6T	3MWB	3T(MR)	2T1			6T		
22	O/V	6R	3MWA	3R(MR)	2R1			6R		
48	V/G	7T	4T	4T	2E		4T	7T		
23	G/V	7R	4R	4R	2SG		4R	7R		
49	V/BR	8T	4MWB	4T(MR)	2M			8T		
24	BR/V	8R	4MWA	4R(MR)	2SB			8R		
50	----	----	----	----	SPARE	----	----	----		
25	----	----	----	----	SPARE	----	----	----		
42	Y/O	9T	5T	5T	3T	3T	5T	9T		P6
17	O/Y	9R	5R	5R	3R	3R	5R	9R		
43	Y/G	10T	5MWB	5T(MR)	3T1			10T		
18	G/Y	10R	5MWA	5R(MR)	3R1			10R		
44	Y/BR	11T	6T	6T	3E	4T	6T	11T		
19	BR/Y	11R	6R	6R	3SG	4R	6R	11R		
45	Y/S	12T	6MWB	6T(MR)	3M			12T		
20	S/Y	12R	6MWA	6R(MR)	3SB			12R		
46	V/BL	13T	7T	7T	4T		7T	13T		
21	BL/V	13R	7R	7R	4R		7R	13R		
47	V/O	14T	7MWB	7T(MR)	4T1			14T		
22	O/V	14R	7MWA	7R(MR)	4R1			14R		
48	V/G	15T	8T	8T	4E		8T	15T		
23	G/V	15R	8R	8R	4SG		8R	15R		
49	V/BR	16T	8MWB	8T(MR)	4M			16T		
24	BR/V	16R	8MWA	8R(MR)	4SB			16R		
50	----	----	----	----	SPARE	----	----	----		
25	----	----	----	----	SPARE	----	----	----		

Card Slot 10

Card Slot 10 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs
26	W/BL	1T	1T	1T	1T	1T	1T	1T	P7
1	BL/W	1R	1R	1R	1R	1R	1R	1R	
27	W/O	2T	1MWB	1T(MR)	1T1			2T	
2	O/W	2R	1MWA	1R(MR)	1R1			2R	
28	W/G	3T	2T	2T	1E	2T	2T	3T	
3	G/W	3R	2R	2R	1SG	2R	2R	3R	
29	W/BR	4T	2MWB	2T(MR)	1M			4T	
4	BR/W	4R	2MWA	2R(MR)	1SB			4R	
30	W/S	5T	3T	3T	2T		3T	5T	
5	S/W	5R	3R	3R	2R		3R	5R	
31	R/BL	6T	3MWB	3T(MR)	2T1			6T	
6	BL/R	6R	3MWA	3R(MR)	2R1			6R	
32	R/O	7T	4T	4T	2E		4T	7T	
7	O/R	7R	4R	4R	2SG		4R	7R	
33	R/G	8T	4MWB	4T(MR)	2M			8T	
8	G/R	8R	4MWA	4R(MR)	2SB			8R	
26	W/BL	9T	5T	5T	3T	3T	5T	9T	P8
1	BL/W	9R	5R	5R	3R	3R	5R	9R	
27	W/O	10T	5MWB	5T(MR)	3T1			10T	
2	O/W	10R	5MWA	5R(MR)	3R1			10R	
28	W/G	11T	6T	6T	3E	4T	6T	11T	
3	G/W	11R	6R	6R	3SG	4R	6R	11R	
29	W/BR	12T	6MWB	6T(MR)	3M			12T	
4	BR/W	12R	6MWA	6R(MR)	3SB			12R	
30	W/S	13T	7T	7T	4T		7T	13T	
5	S/W	13R	7R	7R	4R		7R	13R	
31	R/BL	14T	7MWB	7T(MR)	4T1			14T	
6	BL/R	14R	7MWA	7R(MR)	4R1			14R	
32	R/O	15T	8T	8T	4E		8T	15T	
7	O/R	15R	8R	8R	4SG		8R	15R	
33	R/G	16T	8MWB	8T(MR)	4M			16T	
8	G/R	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 11

Card Slot 11 Connections To Cross-Connect Field

Pin	Color Code	ONSL C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNIL C	Backplane Plugs
34	R/BR	1T	1T	1T	1T	1T	1T	1T	P7
9	BR/R	1R	1R	1R	1R	1R	1R	1R	
35	R/S	2T	1MWB	1T(MR)	1T1			2T	
10	S/R	2R	1MWA	1R(MR)	1R1			2R	
36	BK/BL	3T	2T	2T	1E	2T	2T	3T	
11	BL/BK	3R	2R	2R	1SG	2R	2R	3R	
37	BK/O	4T	2MWB	2T(MR)	1M			4T	
12	O/BK	4R	2MWA	2R(MR)	1SB			4R	
38	BK/G	5T	3T	3T	2T		3T	5T	
13	G/BK	5R	3R	3R	2R		3R	5R	
39	BK/BR	6T	3MWB	3T(MR)	2T1			6T	
14	BR/BK	6R	3MWA	3R(MR)	2R1			6R	
40	BK/S	7T	4T	4T	2E		4T	7T	
15	S/BK	7R	4R	4R	2SG		4R	7R	
41	Y/BL	8T	4MWB	4T(MR)	2M			8T	
16	B/Y	8R	4MWA	4R(MR)	2SB			8R	
34	R/BR	9T	5T	5T	3T	3T	5T	9T	P8
9	BR/R	9R	5R	5R	3R	3R	5R	9R	
35	R/S	10T	5MWB	5T(MR)	3T1			10T	
10	S/R	10R	5MWA	5R(MR)	3R1			10R	
36	BK/BL	11T	6T	6T	3E	4T	6T	11T	
11	BL/BK	11R	6R	6R	3SG	4R	6R	11R	
37	BK/O	12T	6MWB	6T(MR)	3M			12T	
12	O/BK	12R	6MWA	6R(MR)	3SB			12R	
38	BK/G	13T	7T	7T	4T		7T	13T	
13	G/BK	13R	7R	7R	4R		7R	13R	
39	BK/BR	14T	7MWB	7T(MR)	4T1			14T	
14	BR/BK	14R	7MWA	7R(MR)	4R1			14R	
40	BK/S	15T	8T	8T	4E		8T	15T	
15	S/BK	15R	8R	8R	4SG		8R	15R	
41	Y/BL	16T	8MWB	8T(MR)	4M			16T	
16	BL/Y	16R	8MWA	8R(MR)	4SB			16R	

Card Slot 12

Card Slot 12 Connections To Cross-Connect Field

Pin	Color Code	ONS L C	OPS L C	LS/GS Trunk	E&M Trunk	DID/LT Trunk	DID/2 Trunk	DNI L C	Backplane Plugs	
42	Y/O	1T	1T	1T	1T	1T	1T	1T	P7	
17	O/Y	1R	1R	1R	1R	1R	1R	1R		
43	Y/G	2T	1MWB	1T(MR)	1T1			2T		
18	G/Y	2R	1MWA	1R(MR)	1R1			2R		
44	Y/BR	3T	2T	2T	1E	2T	2T	3T		
19	BR/Y	3R	2R	2R	1SG	2R	2R	3R		
45	Y/S	4T	2MWB	2T(MR)	1M			4T		
20	S/Y	4R	2MWA	2R(MR)	1SB			4R		
46	V/BL	5T	3T	3T	2T		3T	5T		
21	BL/V	5R	3R	3R	2R		3R	5R		
47	V/O	6T	3MWB	3T(MR)	2T1			6T		
22	O/V	6R	3MWA	3R(MR)	2R1			6R		
48	V/G	7T	4T	4T	2E		4T	7T		
23	G/V	7R	4R	4R	2SG		4R	7R		
49	V/BR	8T	4MWB	4T(MR)	2M			8T		
24	BR/V	8R	4MWA	4R(MR)	2SB			8R		
50	----	----	----	----	SPARE	----	----	----		
25	----	----	----	----	SPARE	----	----	----		
42	Y/O	9T	5T	5T	3T	3T	5T	9T		P8
17	O/Y	9R	5R	5R	3R	3R	5R	9R		
43	Y/G	10T	5MWB	5T(MR)	3T1			10T		
18	G/Y	10R	5MWA	5R(MR)	3R1			10R		
44	Y/BR	11T	6T	6T	3E	4T	6T	11T		
19	BR/Y	11R	6R	6R	3SG	4R	6R	11R		
45	Y/S	12T	6MWB	6T(MR)	3M			12T		
20	S/Y	12R	6MWA	6R(MR)	3SB			12R		
46	V/BL	13T	7T	7T	4T		7T	13T		
21	BL/V	13R	7R	7R	4R		7R	13R		
47	V/O	14T	7MWB	7T(MR)	4T1			14T		
22	O/V	14R	7MWA	7R(MR)	4R1			14R		
48	V/G	15T	8T	8T	4E		8T	15T		
23	G/V	15R	8R	8R	4SG		8R	15R		
49	V/BR	16T	8MWB	8T(MR)	4M			16T		
24	BR/V	16R	8MWA	8R(MR)	4SB			16R		
50	----	----	----	----	SPARE	----	----	----		
25	----	----	----	----	SPARE	----	----	----		

Install the SUPERSET HUB

Overview of the SUPERSET Hub Installation

To install the SUPERSET HUB:

1. Install the Peripheral Slot FIM Carrier in the Peripheral Cabinet.
2. Install the SUPERSET HUB unit. The supplied mounting brackets allow you to install the unit in an equipment rack or to mount the unit on a wall.

Once you have completed these steps, you can proceed to Installing a DSU Node or return to System Installation Overview.



Notes:

- When installing the SUPERSET HUB in an enclosed rack, you **MUST** provide adequate ventilation (for example, fans) to ensure that the maximum ambient temperature inside the rack does not exceed 40°C.
- When mounting the SUPERSET HUB in a rack, you should ensure that a hazardous condition is not achieved due to any uneven mechanical loading.
- When using the SUPERSET HUB in a rack, you should consider the connection of the equipment to the supply circuit and the effect that overloading of circuits might have on over-current protection and supply wiring. When addressing this concern, consider the SUPERSET HUB's ratings label.
- You can upgrade or replace the Fiber Interface Module in a SUPERSET HUB.

WARNING: This product uses a Class 1 LED. Fiber optic sources emit infrared radiation. This radiation is invisible to the human eye and can damage the retina. NEVER look directly into the end of a fiber optic cable which you suspect is energized by a fiber optic source. When working with raw fiber optic cable, be aware of fiber ends and slivers which can puncture the skin and cause irritation.

Install the Peripheral Slot FIM Carrier

To install the Peripheral Slot FIM Carrier:

1. Attach an anti-static wrist strap.
2. Unpack the Peripheral Slot FIM Carrier and inspect it to ensure that it is not damaged.
3. Remove the Peripheral Cabinet front and rear panels.
4. Slide the Peripheral Slot FIM Carrier part-way into the first available slot from the right.
5. Remove the black plastic dust caps from the fiber optic cable connectors and from the connector ferrules on the faceplate of the FIM.
6. Connect the fiber optic cables to the connectors on the FIM via the fiber optic access port on the rear of the cabinet. Note: The fiber optic cable connectors have a small key that

you must align with a slot on the FIM connectors. Lock each connector into position by pushing its metal collar forward and clipping it onto the FIM connector.

7. Push the Peripheral Slot FIM Carrier fully into the slot and secure it with the card latch.
8. Remove the anti-static wrist strap.
9. Route the fiber optic cables from the Peripheral Cabinet to the SUPERSET HUB.
10. Replace the Peripheral Cabinet front and rear panels.



Note: For more information, see Fiber Interface Module (FIM).

Install the SUPERSET HUB

To install the SUPERSET HUB unit:

1. Attach the rubber feet to the base of the unit.
2. If required, secure the mounting brackets to the SUPERSET HUB case by using the holes appropriate to the selected mounting position and install the unit in an equipment rack or mount the unit on a wall. Note: The side which contains the row of RJ-45 connectors faces the front when the unit is rack-mounted or the top when the unit is wall-mounted. If you are wall-mounting the unit; use wall anchors that are appropriate for the wall type, use # 12 screws that are at least 1.5 inches long, and ensure that the screws are not fully tightened so that the unit may be easily removed (without the use of a tool) for servicing.
3. Ensure that the ventilation holes are not blocked.
4. Remove the black plastic dust caps from the fiber optic cables and from the connector ferrules on the unit.
5. Connect the fiber optic cables from the Peripheral Slot FIM Carrier in the Peripheral Cabinet to the connectors on the SUPERSET HUB unit.
6. Connect the RJ-45 connectors to the UTP distribution panel according to the building wiring plan.
7. Connect the power cable to a convenient wall socket. Note: The wall socket is the main disconnect device and must, therefore, be installed near the unit and be easily accessible.
8. Program the peripheral devices.



Note: Program the SUPERSET HUB as a DNI Line Card in the slot where the Peripheral Slot FIM Carrier is inserted.

Install the Digital Service Unit

Overview of the Digital Service Unit Installation

WARNING: Power must not be applied to the equipment at any time during equipment installation.

To install a DSU Node:

1. Unpack, position, and ground the DSU Node.
2. Check the card layout.
3. Connect the fiber cable to the node.
4. Install the DSU cards.
5. Install the interface assembly on cards.
6. Install the DS1 interface assembly and cabling.
7. Install the CEPT interface assembly and cabling.
8. Power up the DSU.

Once you have completed these steps, you can return to System Installation Overview.

Unpack, Position, and Ground the DSU

To unpack and position the DSU Node:

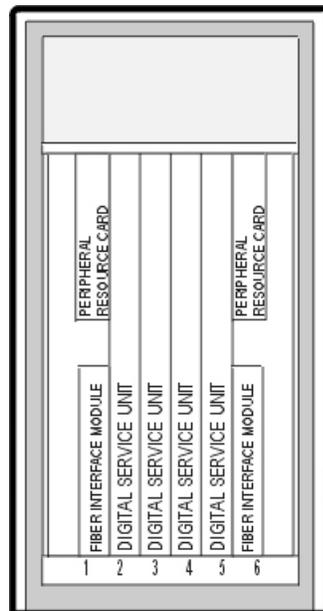
CAUTION: Do not open or unpack any printed circuit board cartons at this time.

1. Open the DSU node carton.
2. Remove the plastic bag from the top and sides of the cabinet. Lift the DSU node out of the carton.
3. Check that the node and all attached equipment are undamaged. Repack and return any damaged equipment.
4. Place the node in its assigned position.
5. Remove the DSU node front panel.

CAUTION: Ensure that you use the Cabinet Stacking Brackets if you want to stack cabinets on top of each other. Stacking cabinets without these brackets could result in damage to the equipment or injury.

DSU Card Layout

Each DSU node has one or two FIMs, depending on the number and location of DSU cards installed in the node. The FIM in the bottom of slot 1 provides communications with the 3300 Controller for the DSU cards in slots 2 and 3, and the FIM in the bottom of slot 6 provides communications for the DSU cards in slots 4 and 5. You must install and cable the FIMs before you install any cards in the DSU node.



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DSU Card Layout

Connect Fiber Cable to the DSU

The fiber optic cable connects the FIMs in the 3300 Controller to the FIMs in the DSU node.

To connect the fiber optic cable to the FIM in the peripheral node:

1. Review the guidelines for handling fiber optic cable.
2. Route the fiber optic cable through the sliding cable port at the rear of the DSU cabinet into the cabinet. Extend the fiber cable approximately 30 cm (1 ft) beyond the front of the cabinet.
3. Install a short piece of nylon spiral wrap over the cable at the point where the cable exits the rear of the cabinet.
4. Close the sliding cable port door. Ensure that the door closes on the nylon spiral-wrapped section of fiber cable.
5. Remove the plastic dust caps from the fiber optic cable and the connector ferrules on the FIM faceplate.
6. Plug the fiber connectors into the connectors on the FIM faceplate. The fiber connectors have a small key that must be aligned with a slot on the FIM connectors. Lock each

connector into position by pushing the metal collar forward and clipping it onto the FIM connector.

Install DSU Cards

To install the DSU cards:

CAUTION: To prevent static damage to electrical components, ensure that the system is grounded before you install the cards. Whenever you handle circuit cards, wear an anti-static strap.

1. Ensure that the FIMs are installed and cabled.
2. Connect the power cord to the external ac power source.
3. Install the DSU cards. Refer to "Install Upgrades and FRUs" for circuit card installation procedures.

Interface Assembly

The Interface Assembly attaches to the following cards:

- PRI card
- DS1/T1 Formatter II cards
- CEPT Formatter II cards.
- R2 card

To install the Interface Assembly:

1. Attach the anti-static strap to your wrist.
2. Unpack the Interface Assembly and inspect it to ensure that it is not damaged.
3. At the rear of the cabinet, locate the slot in the DSU cabinet that corresponds to the slot that you will use for the PRI, R2, CEPT, or DS1/T1 Formatter card.
4. Remove the blanking plate from the selected slot.
5. Using the screws which secured the blanking plate, mount the Interface Assembly extension bracket on the selected slot. The closed side of the extension bracket must be to the left when viewed from the rear of the cabinet.
6. Insert the Interface Assembly. Ensure the edge connector on the card aligns with the connector on the backplane of the system.
7. Secure the Interface Assembly to the extension bracket with the screws provided.

DS1 Interface Assembly and Cabling

If you install a DS1 Formatter Card, you must also install a DS1 Interface Assembly and connect the external cables.

The DS1 Interface Assembly provides two filtered DB-15 pin connectors for the external cables required by one DS1 Formatter Card. You can mount up to four DS1 Interface Assemblies in the DSU.

To install the DS1 Interface Assembly and Cables:

1. Attach the anti-static strap to your wrist.
2. Unpack the DS1 Interface Assembly. Inspect it to ensure that it is not damaged.
3. Locate the slot in the DSU that corresponds to the DSU slot that holds the DS1 Formatter card. When you are facing the rear panel, the DSU slots, from right to left, correspond to DSU slots 3/1/2 to 3/1/5 or on the SX-2000 they correspond to DSU slots 2 to 5.
4. Remove the cover plate from the slot on the metal box by unscrewing the two screws that hold it in place.
5. Insert the DS1 Interface Assembly into the empty slot in the DSU box, and plug it into the DIN connector in the back of the DSU box.
6. Align the screw holes on the DS1 Interface Assembly faceplate with the screw holes in the metal box, and fasten the faceplate to the box.
7. Connect the 22 AWG (22 IWG) shielded twisted pair cables from the external network to the DB-15 pin connectors on the DS1 Interface Assembly.
8. Remove the DS1 Formatter Card.
9. If the card is an E1/T1 (DS1) Formatter card, set the links for either E1 or T1 operation by using the E1/T1 switches located on the side of the card. For E1 operation, see Connecting to MSDN CEPT links.
10. Set the DS1 Formatter card line equalizer switches (S1 and S2).
11. Re-install the DS1 Formatter card.
12. Remove the anti-static strap from your wrist.

CEPT Interface Assembly and Cabling

If you install a CEPT Formatter card, you must also install a CEPT Interface Assembly and connect the cables.

The CEPT Interface Assembly provides four filtered BNC connectors for the external cables required by one CEPT Formatter card. You can mount up to four CEPT Interface Assemblies on a SX-2000 MICRO LIGHT node or an SX-2000 DSU node. Each CEPT Interface Assembly plugs into a J3 DIN 3 X 32 connector. These connectors are located in a 9 cm x 12.5 cm (3.5 inch x 5 inch) metal box that projects from the backplane.

To install the CEPT Interface Assembly or CEPT Interface Assembly II and Cables:

1. Attach the anti-static strap to your wrist.

2. Unpack the CEPT Interface Assembly. Inspect it to ensure that it is not damaged.
3. Set the CEPT Interface Assembly jumpers to the desired positions.
4. Locate the slot in the DSU box that corresponds to the DSU slot that holds the CEPT Formatter card. When you are facing the rear panel, the DSU box slots, from right to left, correspond to DSU slots 3/1/2 to 3/1/5, or on an SX-2000 DSU node correspond to DSU slots 2 to 5.
5. Remove the cover plate from the slot on the metal box by unscrewing the two screws that hold it in place.
6. Insert the CEPT Interface Assembly into the empty slot in the DSU box, and plug it into the DIN connector in the back of the DSU box.
7. Align the screw holes on the CEPT Interface Assembly faceplate with the screw holes in the metal box, and fasten the faceplate to the box.
8. Connect the cables from the external network to the BNC connectors on the CEPT Interface Assembly.
9. Remove the anti-static strap from your wrist.

Install Wireless Devices

To install a wireless device:

1. Symbol Technologies will complete a site survey.
2. Symbol Technologies will install and configure the Air Access Points.
3. Complete Programming on 3300 ICP.
4. Install the Symbol NetVision MiNET Phone Administrator Tool on a Windows NT or Windows 2000 PC.
5. Upgrade the Symbol phone firmware to use the MiNET protocol. Refer to the Symbol NVP II MiNET Update Procedure located in the Hardware User Guide.
6. Configure the wireless phones using the Symbol NetVision MiNET Phone Administrator Tool.



Note: To migrate from a 3200 ICP or 3800 WAG the wireless network must use the Direct Sequencing (D.S.) Spread Spectrum using the 802.11b protocol. The wireless phones must have new firmware downloaded.

Install Symbol NetVision MiNET Phone Administrator Tool

The tool is found on the 3300 ICP software CD and must be installed on a PC that is running Windows NT or Windows 2000.

To install the tool:

1. Insert the software CD into the CD-ROM drive.
2. Click `\3rd_Party\Wireless\Administration_Tool\MiNET<xxx>.exe`.
3. Click UnZip to place files in `C:\temp\symbol`.
4. Click Close.

5. Open the C:\temp\symbol folder.
6. Click setup.exe.
7. Follow the instructions in the install wizard.

Install 3300 ICP as a Stand-alone IP Gateway

The 3300 ICP can be used as an IP Gateway providing the functionality of both IP and Wireless MiNET protocols adjunct to a legacy or third party PBX connected over DPNSS or Q.Sig trunks.

Before you Begin

- Ensure that Symbol Technologies have installed and configured the Air Access Points.
- Ensure you have the ESS ID numbers of the Air Access Points.
- Install the Symbol NetVision MiNET Phone Administrator Tool on a Windows NT or Windows 2000 PC.

To install as a stand-alone system:

1. Install the 3300 ICP Controller.
2. Install the System ID Module.
3. Connect power to the 3300 Controller. The controller will come up, in 15 to 20 minutes, with factory-installed software.
4. To check the connections between the 3300 Controller and the PC:
PING the 3300 Controller IP address
FTP to the 3300 Controller IP address
Go to the 3300 Controller URL address (e.g. <http://192.168.1.2>).
5. Launch browser to login to the System Administration Tool (<http://192.168.1.2> -- username is system, password is password).
6. License and Option Selection form
- program number of digital links, IP device licenses and country variant.
Reboot the system.
7. Controller Module Configuration form. Select the Programmed Module Type.
8. Network Services Unit Configuration form. Set the type of NSU and the protocol to be used.
9. Program digital trunks Q.SIG or MSDN/DPNSS
10. Program Symbol Wireless phones as per instructions in System Administration Tool.
Note: You will require the ESS ID's of the Air Access Points for the configuration required by the Symbol MiNET Phone Administrator Tool.
Note: Information on the steps requiring the Symbol NetVision MiNET Phone Administrator Tool can be found in the tool's help system. You will be required to upgrade the Symbol phones firmware to the MiNET protocol.
11. Perform a Backup.
12. Reboot the system.
13. Set the 3300 Controller (RTC) IP address through a communication program.
14. Install a Universal NSU.

Install 3300 ICP as a Stand-alone Voice Mail

The 3300 ICP can be used as a voice mail system adjunct to a legacy or third party PBX.

To install as a stand-alone voice mail system:

1. Install the 3300 ICP Controller.
2. Install the System ID Module.
3. Connect power to the 3300 Controller. The controller will come up, in 15 to 20 minutes, with factory-installed software.
4. To check the connections between the 3300 Controller and the PC:
 - PING the 3300 Controller IP address
 - FTP to the 3300 Controller IP address
 - Go to the 3300 Controller URL address (<http://192.168.1.2>).
5. Launch browser to login to the System Administration Tool (<http://192.168.1.2> -- username is system, password is password).
6. License and Option Selection form
 - program number of digital links, voice mail licences, and country variant.
 - If OPS Manager is being used to manage the voice mail select Yes in the Networking Option field.
7. Reboot the system.
8. Controller Module Configuration form. Select the Programmed Module Type.
9. Network Services Unit Configuration form. Set the type of NSU and the protocol to be used.
10. Program digital trunks Q.SIG or MSDN/DPNSS
11. Program voice mail as per instructions in System Administration Tool.
12. Perform a Backup.
13. Reboot the system.
14. Set the 3300 Controller (RTC) IP address through a communication program.
15. Install a Universal NSU.

Install the 3300 In-Line Power Unit

The 3300 In-Line Power Unit (PD-PH-4024/AC/48) is suited for use in an office environment where it can be free standing or mounted in a standard 19-inch equipment rack. Alternatively, the 3300 In-Line Power Unit can be rack-mounted in a wiring closet or equipment room. A rack-mounting kit, containing two mounting brackets and six screws, is supplied with the 3300 In-Line Power Unit.

WARNING: Electrocutation Hazard. Before connecting power to the 3300 In-Line Power Unit, please refer to the Safety Instructions.

Rack Mounting

To rack mount the 3300 In-Line Power Unit:

1. Place the 3300 In-Line Power Unit right side up on a hard flat surface, with the front facing towards you.
2. Locate a mounting bracket over the mounting holes on one side of the 3300 In-Line Power Unit.
3. Insert the three screws and tighten with a suitable screwdriver. Note: You must use the screws supplied with the mounting brackets. Damage caused to the unit by using incorrect screws invalidates your warranty.
4. Repeat steps 2 and 3 for the other side of the 3300 In-Line Power Unit.
5. Insert the 3300 In-Line Power Unit into the 19-inch rack and secure it to the rack with suitable screws (not provided). Ensure that ventilation holes are not obstructed.

Shelf Mounting

When shelf mounting the 3300 In-Line Power Unit, the self-adhesive rubber feet provided in the kit should be placed on the underside of the 3300 In-Line Power Unit. Be sure to place the rubber feet on the provided 90° angle marking in order to assure stable placement.

Do not place more than four 3300 In-Line Power Units on top of one another if the units are shelf mounted.

Powering Up

CAUTION: The 3300 In-Line Power Unit has no ON/OFF switch. To connect or disconnect power to the Unit, simply insert or remove the power cable from the AC power receptacle on the rear of the Unit.

To power up the 3300 In-Line Power Unit:

1. Insert a power cord into the power socket on the rear of the 3300 In-Line Power Unit.
2. Insert the other end of the power cord into the power receptacle.

The 3300 In-Line Power Unit powers-up and the internal fans begin operating.

Power-Up LED Sequence

The 3300 In-Line Power Unit then runs through its Power On Self Test (POST), which takes less than 10 seconds. During the POST, all ports on the 3300 In-Line Power Unit are disabled and the LEDs light up in the following sequence:

1. The "AC" and "Alarm" LEDs light up.
2. After approximately 2 seconds, all "Power Active" and "Power Not Active" LEDs light up.

3. After approximately 2 seconds, all "Power Active" and "Power Not Active" LEDs and the "Alarm" LED turn off.
4. The "AC" LED will light up and remain lit.
5. All "Power Active" and "Power Not Active" LEDs are ready for normal indications.

Connecting Cables to the In-Line Power Unit

All of the ports on the front of the 3300 In-Line Power Unit are configured as data "route through" ports for all data wires (pins 1, 2, 3 and 6).

Be certain to use a standard Category 5, 6 or 6e straight-through cable including all 8 wires (4 pairs) as shown in Figure 5.

Data In Ports

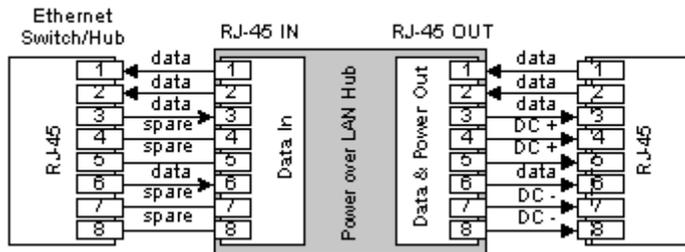
Using a standard Category 5, 6 or 6e straight-through cable, connect cable leading from the Ethernet Switch/Hub to the "Data In" port.

Data & Power Out Ports

Using a standard Category 5, 6 or 6e straight-through cable, connect the cable leading to the end device to the corresponding "Data & Power Out" port.



Note: Be certain to connect correspondingly numbered "Data In" and "Data & Power Out" ports.



Connecting Cables to End Devices

The 3300 In-Line Power Unit (PD-PH-4024/AC/48) contains proprietary line sensing capabilities that enable it to send power only to end devices that know how to receive power. These end devices, termed "Power over LAN Enabled", will receive power once connected the 3300 In-Line Power Unit.



Note: Mitel IP telephones powered by a 3300 In-line Power Unit require a 3300 Phone Power adapter (p/n 57003121) at the set end to operate.

In order to safeguard devices that have not been "enabled", the 3300 In-Line Power Unit will detect devices that are not enabled and therefore not send power. It is important to note that

data continues to flow via the Category 5, 6 or 6e cabling regardless of the status of the end device.

Prior to connecting end devices to the 3300 In-Line Power Unit, determine if:

1. The end device is "Power over LAN Enabled" or not. If the end device is not "Power over LAN Enabled", the end device may be safely connected. However, the port will supply no power and will function as a normal Ethernet data port.
2. The end device's power requirements are consistent with the 3300 In-Line Power Unit voltage and power ratings.

To connect end devices to the 3300 In-Line Power Unit:

1. Connect a Category 5, 6, or 6e cable to the end device directly (if the device is "Power over LAN Enabled").
2. Connect the opposite end of the same cable to the RJ-45 wall outlet.
3. On the front panel of the 3300 In-Line Power Unit, monitor the response of the corresponding port LEDs. If the "Power Active" LED lights up, the 3300 In-Line Power Unit has identified your end device as a "Power over LAN Enabled" device and the port is sending power.

Install the 3300 In-Line Power Adapter

The Mitel Networks 3300 Phone Power adapter (p/n 57003121) is required to enable certain Mitel Networks IP Phones to be powered from the Mitel Networks 3300 In-Line Power Unit p/n 57003131.

To install the In-Line Power Adapter:

1. Connect the RJ-45 output (male end) of the power adapter to the IP Phone network connector located on the underside of the telephone.
2. Connect the LAN cable (male end) to the power dongle RJ-45 input (female end).

The Power Unit, sensing the Power Adapter, will apply -48VDC across pins 4,5 and 7,8 spare pair LAN cable to power the IP Phone.

Install 3300 Power Dongle (cisco compliant)

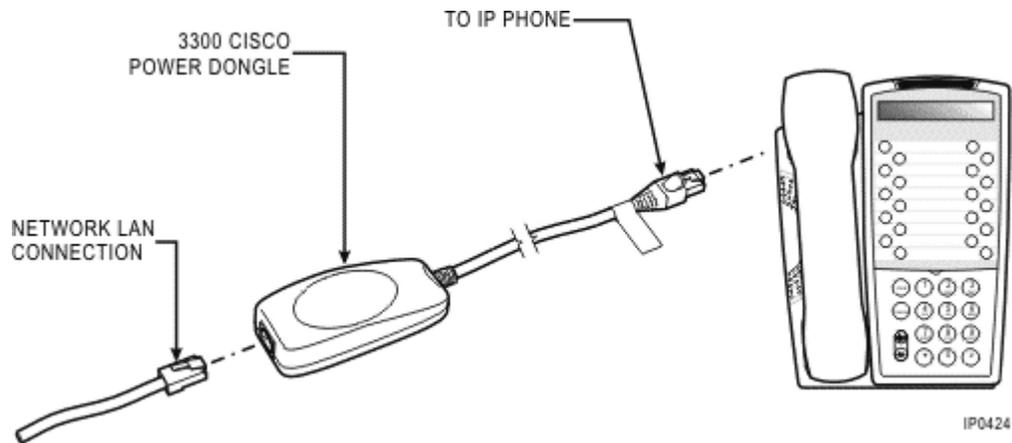
Install 3300 Power Dongle (cisco compliant)

The 3300 Power dongle (p/n 50002822 - 10 Pack) is required to enable Mitel Networks IP Phones to be powered from a Cisco mid-span or a Catalyst series end-span power hub.

To install the 3300 Power Dongle:

1. Connect the RJ-45 output (male end) of the power dongle to the IP Phone network connector located on the underside of the telephone.
2. Connect the LAN cable (male end) to the power dongle RJ-45 input (female end).

The 3300 Power Dongle will permit the Mitel IP Phone to receive power from Cisco-powered LAN ports. The dongle will accept 48VDC across pins 1, 2 and 3, 6 from the end-span hub and pins 4, 5 and 7, 8 from the mid-span hub. In either case, the 3300 Power Dongle 48VDC output appears on pins 4, 5 and 7, 8.



Pre-Release 3.2 IP Phones

The Mitel IP set must conform to the Cisco Discovery Protocol (CDP) startup sequence to sustain power to the set from a Cisco switch or hub through the 3300 Power Dongle. The updated set firmware load is delivered as part of the 3300 ICP Release 3.2 software.

WARNING: Sets delivered prior to Release 3.2 will NOT be equipped with the firmware download capability. Special configuration is required to permit these telephones to be powered from a Cisco switch or hub through the 3300 Power Dongle.

To make the Mitel IP telephone conform to the Cisco Discovery Protocol:

1. Verify that the IP network, to which the set will be connected, does not have any Release 3.0 3300 ICPs that are accessible from the IP set during its boot sequence. You must ensure that the IP Phone will get the R3.2 set firmware load.
2. If R3.1 ICPs are located in the same DHCP domain as the R3.2 ICP, please update the R3.1 IP Phone TFTP Server firmware.
3. The set must be powered from a wall plug before connecting to the IP network.
4. After connection to the IP network, the IP set will receive a new load from the 3300 ICP.
5. After the set has received its updated load, the 3300 Power Dongle can be inserted in the Ethernet path and the power cord removed.

CAUTION: Sets released from the factory after Release 3.2 will have the boot capability built into them. They will not have to follow the above set configuration sequence. However, if in doubt, the above configuration steps should be followed.

Mixed Release 3.1 and 3.2 Network

The 3300 ICP Release 3.2 software will be delivered into existing IP trunking configurations made up of 3300 ICPs running Release 3.1 software. To support the Cisco Discovery Protocol (CDP) in these configurations, all IP sets requiring the CDP protocol will need Release 3.2 set firmware. Every IP telephone must receive the Release 3.2 set firmware during its boot sequence.

All 3300 ICPs in the DHCP domain must have the 128: IP Phone TFTP Server refer to the Release 3.2 set firmware load. The IP Phone TFTP Server is part of the DHCP options form.

There are several methods of configuring the IP Phone TFTP Server:

1. The Release 3.1 IP Phone TFTP Server may reference any Release 3.2 TFTP server.
2. The Release 3.1 IP Phone TFTP Server may reference a centralized TFTP Server that contains the Release 3.2 set firmware load.
3. The Release 3.1 system can have the Release 3.2 set firmware loads manually loaded in the IP Phone TFTP Server directory from a Release 3.2 system.

WARNING: Failure to correctly configure the 128: IP Phone TFTP Server in a mixed Release 3.2 and Release 3.1 network topology may cause the IP sets to become non-functional.

Chapter 4

Install Upgrades and FRUs

Install Upgrades and FRUs

Hardware

Controller Upgrade Options

There are several upgrade options for the 3300 ICP Controller:

- 250 user to 700 user system
- 250 user system upgrade to support 32 compression channels
- 250 user system upgrade to support 64 compression channels
- 700 user system upgrade to support 32 compression channels
- 700 user system upgrade to support 64 compression channels

Before you begin:

- Ensure that the upgrade kit is complete.
- Check each module to ensure that no damage has occurred in transit.
- You will need a Philips screwdriver.
- Have a 3300 ICP system back-up.

Caution: To prevent ESD damage while handling modules on any unit, always attach the wrist strap from the cabinet being serviced, and immediately place any item removed from a cabinet into an anti-static bag.

You can also migrate an SX-2000 and 3200 ICP:

- SX-2000 LIGHT to 3300 ICP
- SX-2000 MICRO LIGHT to 3300 ICP
- 3200 ICP to 3300 ICP

250 User to 700 User System - No Compression

This system uses the following existing modules:

- One RTC (3.0/3.1 133 MHz; 3.2 300 MHz)
- One E2T (3.0/3.1 133 MHz; 3.2 300 MHz)
- One Dual FIM Module
- One Quad DSP Module for tone and conference support
- One 64 Channel Echo Celler

You will need the following new modules:

- One Quad DSP Module (21161) for tone and conference support
- One Dual FIM Module
- One 64 Channel Echo Canceller

This provides:

- Eight DSP devices, to provide tone and conference functions
- 128 Channels of Echo Cancellation
- Four External FIM connections
- Four ASU connections (integral to unit)

The four external FIM connections are for providing connectivity for up to two Peripheral Units or up to six NSUs. Note that there are two T1/E1 links per NSU.

To upgrade a 250 user system to a 700 user system:

1. Remove the cover.
2. Install the new Dual FIM Modules (slot MMC2).
3. Install the new 21161 DSP Module (slot MMC7).
4. Install the 64 Echo Canceller Module (slot MMC6).
5. Replace the cover.

250 User System to 700 User System - No Compression

Slot 8 DSP for Telecom	Slot 7 DSP for Telecom	Slot 6 64 Channel Echo Canceller	Slot 5 64 Channel Echo Canceller
Slot 1 FIM	Slot 2 FIM	Slot 3 Empty	Slot 4 Empty

IP0423

250 User System - Add 32 Compression Channels

250 User System (Release 3.0/3.1 chassis) upgrade to add support for 32 compression channels.

This system uses the following existing modules:

- One 133 MHz RTC
- One 133 MHz E2T
- One 64 Channel Echo Cancellor
- One Dual FIM
- One Quad DSP Module (21061) for tone and conference support

Add one new module:

- One Quad DSP Module (21161) for 32 Channels of Compression

This provides:

- Four Quad DSP devices (21061), to provide tone and conference functions
- Four Quad DSP devices (21161), to provide 32 channels of compression
- 64 Channels of Echo Cancellation
- Two External FIM connections
- Four ASU connections (integral to unit)

The two external FIM connections are for providing connectivity for up to two Peripheral Units or up to four NSUs. Note that there are two T1/E1 links per NSU.

To add 32 compression channels to a 250 user system (Release 3.0/3.1 chassis):

1. Remove the cover.
2. Install the additional Quad DSP Module (slot MMC3).
3. Replace the cover.

250 User System - Add 32 Compression Channels

Slot 8 21061 DSP Telecom	Slot 7 Empty	Slot 6 Empty	Slot 5 64 Channel Echo Canceller
Slot 1 FIM	Slot 2 Empty	Slot 3 21161 DSP Compression	Slot 4 Empty

IP0418

250 User System - Add 64 Compression Channels

250 User System (Release 3.0/3.1 chassis) upgrade to add support for 64 compression channels requires a new Release 3.2 chassis.



Note: Retain your System ID Module and Hard Drive.

The 250 user, 64 channel compression upgrade package includes:

- One 300 MHz RTC
- One 300 MHz E2T
- One 64 Channel Echo Canceller
- One Dual FIM
- One Quad DSP Module for tone and conference support
- Two Quad DSP Modules for 64 channels of compression
- 40 Compression licenses.

This provides:

- Four 21061 DSP devices, to provide tone and conference functions
- Eight 21161 DSP devices, to provide 64 channels of compression
- 64 Channels of Echo Cancellation
- Two external FIM connections
- Four ASU connections (integral to unit)

The two external FIM connections are for providing connectivity for up to two Peripheral Units or up to four NSUs. Note that there are two T1/E1 links per NSU.

To add 64 compression channels to a 250 user system (Release 3.0/3.1 chassis):

The old Release 3.0/3.1 chassis:

1. Remove the cover.
2. Remove the Sys ID Module.
3. Remove the Hard Drive.

The new Release 3.2 chassis:

1. Remove the cover.
2. Install the two DSP Modules (slots MMC3 and MMC4).
3. Install the Sys Id Module.
4. Install the Hard Drive.
5. Replace the cover.

250 User System - Add 64 Compression Channels

Slot 8 21161 DSP Telecom	Slot 7 Empty	Slot 6 Empty	Slot 5 64 Channel Echo Canceller
Slot 1 FIM	Slot 2 Empty	Slot 3 21161 DSP Compression	Slot 4 21161 DSP Compression

IP0417

700 User System - Add 32 Compression Channels

700 User System (Release 3.0/3.1 chassis) upgrade to add support for 32 compression channels.

This system uses the following existing modules:

- One 133 MHz RTC
- One 133 MHz E2T
- One 128 Channel Echo Canceller
- Two Dual FIMs
- Three Quad DSP Modules (21061) for tone and conference support

And one new module:

- One Quad DSP Module (21161) for 32 Channels of Compression (you must purchase compression licenses)

This provides:

- Twelve DSP devices (21061), to provide tone and conference functions
- Four DSP devices (21161), to provide 32 channels of compression
- 128 Channels of Echo Cancellation
- Four external FIM connections
- Four ASU connections (integral to unit)

The four external FIM connections are for providing connectivity for up to two Peripheral Units or up to six NSUs. Note that there are two T1/E1 links per NSU.

To add 32 compression channels to a 700 user system (Release 3.0/3.1 chassis):

1. Remove the cover.
2. Install the DSP Module (slot MMC3).
3. Replace the cover.

700 User System - Add 32 Compression Channels

Slot 8 21061 DSP Telecom	Slot 7 21061 DSP Telecom	Slot 6 21061 DSP Telecom	Slot 5 128 Channel Echo Canceller
Slot 1 FIM	Slot 2 FIM	Slot 3 21161 DSP Compression	Slot 4 Empty

IP0419

700 User System - Add 64 Compression Channels

700 User System (Release 3.0/3.1 chassis) upgrade to add support for 64 compression channels requires a new Release 3.2 chassis.



Note: Retain your System ID Module and Hard Drive.

The 700 user, 64 channel compression upgrade package includes:

- One 300 MHz RTC
- One 300 MHz E2T
- One 128 Channel Echo Canceller
- Two Dual FIMs
- Two Quad DSP Modules for tone and conference support
- Two Quad DSP Modules for compression
- 40 Compression licenses

This provides:

- Eight DSP devices, to provide tone and conference functions
- Eight DSP devices, to provide 64 channels of compression
- 128 Channels of Echo Cancellation
- Four external FIM connections
- Four ASU connections (integral to unit)

The four external FIM connections are for providing connectivity for up to two Peripheral Units or up to six NSUs. Note that there are two T1/E1 links per NSU.

To add 64 compression channels to a 250 user system (Release 3.0/3.1 chassis):

The old Release 3.0/3.1 chassis:

1. Remove the cover.
2. Remove the Sys ID Module.
3. Remove the Hard Drive.

The new Release 3.2 chassis:

1. Remove the cover.
2. Install the DSP Modules (slots MMC3 and MMC4).
3. Install the Sys ID Module.
4. Install the Hard Drive.
5. Replace the cover.

700 User System - Add 64 Compression Channels

Slot 8 21161 DSP Telecom	Slot 7 21161 DSP Telecom	Slot 6 Empty	Slot 5 128 Channel Echo Canceller
Slot 1 FIM	Slot 2 FIM	Slot 3 21161 DSP Compression	Slot 4 21161 DSP Compression

IP0420

Upgrade SX-2000 LIGHT to 3300 ICP Hardware

To upgrade SX-2000 LIGHT hardware for 3300 control:

- 384 port Peripheral - main control replacement
- DSU - main control replacement
- Peripheral cards - DNIC Line, ONS CLASS, ONS Line, LS/GS Trk, E&M Tie Trk, OPS Line, DID/Loop Tie
- DSU cards - T1 (DS1) Formatter, CEPT Interface, ISDN PRI, E1/T1 Dig Trk Formatter, E1 R2, 6CCT BRI, 15CCT BRI
- If existing capacity is greater than that of the 3300 ICP, the conversion will fail. See the capacity table for the 3300 ICP.

The SX-2000 LIGHT Digital Services Unit (DSU) cabinet provides digital trunk capability, and the SX-2000 LIGHT peripheral cabinet provides connectivity for analog trunks, analog telephones, and Mitel DNI devices. Both cabinet types can be connected to the 3300 Controller by using multi-mode fiber connections.

The DSU cabinet supports BRI, PRI, T1/D4, MSDN/DPNSS, and DASS II trunks.

The peripheral cabinet supports the following analog trunks:

- Analog CO trunks
- E&M trunks
- Direct Inward Dial and Tie Trunks.

The peripheral cabinet also supports the following DNI telephones and devices:

- SUPERSET 401
- SUPERSET 401+
- SUPERSET 410
- SUPERSET 420
- SUPERSET 430
- SUPERSET 4001
- SUPERSET 4015
- SUPERSET 4025
- SUPERSET 4125
- SUPERSET 4150
- SUPERCONSOLE 1000.

For additional information, refer to SX-2000 technical documentation.

Upgrade SX-2000 MICRO LIGHT to 3300 ICP Hardware

To upgrade SX-2000 MICRO LIGHT hardware for 3300 control:

- Replace the Main Controller in the MICRO LIGHT with a Triple FIM Card.
- If existing capacity is greater than that of the 3300 ICP, the conversion may fail. See the capacity table for the 3300 ICP.

By installing a triple FIM card in the SX-2000 MICRO LIGHT main cabinet, you can physically connect it to the 3300 ICP by using multi-mode fiber. As a result, you can use the existing peripheral and digital trunk cards within the main cabinet. Any external cabinets can also be connected by using FIMs.

Upgrade 3200 ICP to 3300 ICP Hardware

- If existing capacity is greater than that of the 3300 ICP, the conversion may fail. See the capacity table for the 3300 ICP.

The 3200 ICP database is converted and restored to a 3300 ICP database, and any peripheral cabinets connected to the FIM ports on the 3300 Controller.

In addition to the DNIC telephones supported by the peripheral cabinet, the 3300 ICP supports the following legacy IP telephones:

- SUPERSET 4015IP
- SUPERSET 4025IP.

Software

Upgrade Procedure (Release 3.0 to 3.1)

Before you begin:

- Ensure you have a new option password.
- Ensure you have a 3300 ICP system back-up.
- Upgrade OPS Manager if you are using it to manage your system, to minimum Version 6.5.3.x.
- Inform all system users that the system is being upgraded.
- Windows 2000 users should clear the browser cache.

Ensure that your PC is equipped with the following software and hardware:

- The CD-ROM containing the Mitel Networks 3300 ICP software release deliverables
- An Ethernet cable (RJ45) to connect from your PC to the 3300 ICP controller
- A serial cable (9600,8n1) to connect from your PC to the 3300 ICP maintenance port.



Timer: When you enter the upgrade command, the upgrade process will take about 45 minutes. Total upgrade time is about 2 1/2 hours.



Tip: You will need the 3300 ICP IP address, username, and password.

To perform a software upgrade:

1. Log in to the RTC and type BootChange.
2. Insert the software CD-ROM into the CD drive of the installer's PC.
3. Run the "Setup.exe" program from the CD.
4. Select NA or UK **Upgrade**.
5. Choose a location for the Setup program to install files (default is C:\MN3300).
6. Type in the IP address of the Controller RTC.
7. Enter the username and password to Log into the FTP Server (by default the username is "ftp" and the password is "@"). The installSetup program will: - Provide a progress indicator and log file - Check the disk space in the specified location - Check the country variant of existing software - Put files in the created directory under the chosen location. Default location will result in: "c:3300 ICP\". - Run an FTP Client Session to load new software files to the Install directory.
8. Establish a serial connection from the 3300 Configuration Tool PC (or any PC equipped with a communications program) to the Maintenance Port on the 3300 Controller.
9. Launch the communication program.
10. Set the communication program parameters to the following:
Baud rate - 9600
Data bits - 8

Parity - None
Stop bits - 1
Flow control - None.

11. Review the Readme file.
12. Enter to the cmd prompt of the RTC shell.
13. Type the command "upgrade". This process will take about 45 minutes. The program will:
 - Check disk space in the Hard Disk Drive of the 3300 ICP
 - Display the current software version and the new version to be upgraded to
 - Stop all active user sessions
 - Disallow any new user sessions
 - Stop system services
 - Move original software and data to a different location in Hard Disk drive as a temporary back up.
14. The system will reset and then extract the software file hierarchy from the tar file.
15. Log into the System Administration Tool.
16. Restore the database data. The system will display a 'successful' message.
17. Reboot the system.
18. Close the (COM) serial session.
19. Enable options through the System Administration Tool.
20. Restore data.
21. Reset the system.



Tip: A DBMS Save is automatically performed after the Data Restore but it is a good practice to check if the DBMS flag is on.



Note: The upgrade procedure will not change the DHCP Server settings or the Voice Mail messages.

Upgrade SX-2000 LIGHT to 3300 ICP Software

- Only one 3300 ICP can be configured at a time; and only one SX-2000 PBX can be migrated to a 3300 ICP at a time.
- Migration and Configuration cannot be performed in a single task or session using the 3300 Configuration Tool.
- After migration, configuration must be completed using System Administration Tool.
- Data restoration automatically triggers data migration.
- If existing capacity is greater than that of the 3300 ICP, the conversion will fail. See the capacity table for the 3300 ICP.
- Windows 2000 users should clear the browser cache.

To transfer database from SX-2000 LIGHT to 3300 ICP:

1. Prepare the SX-2000 LIGHT for migration: - reduce Peripheral and DSU nodes to a maximum of 4 - deprogram unsupported devices and cards (AC13, AC15, SCDC, DID3, Advanced Tone Detector, ISDN Gateway, FIM Carrier Card, COV Line Card, 3DN, 4DN, SUPERSET 3, SUPERSET 4, SUPERSET 700, SUPERSET 7DN, SUPERCONSOLE 2000, and datasets).
2. Program SX-2000 connectivity using the Configuration Tool. Create a Network Element that is the same as the SX-2000 PBX.
3. Backup SX-2000 database (datasave) to the 3300 Configuration Tool or copy a datasave from OPS Manager to the Configuration Tool. The Configuration Tool will convert the SX-2000 database to a 3300 database.
4. Change the Variant to 3300 ICP and change the IP Address if required.
5. Enable Options.
6. Perform a Restore of the SX-2000 converted database onto the 3300 ICP. An automatic validation operation occurs to determine if the restore can proceed.
7. Reboot the 3300 ICP. Check the logs for any data restore failures (see Note).
8. Change the 3300 ICP system name through the System Administration Tool.



Tip: After the Restore and Reboot, check the log file. In the System Administration Tool, click Maintenance and Diagnostics, select Maintenance Commands, and click All. Type the following text in the Command line: type *.dr.logfile_1 and click Submit.

Upgrade SX-2000 MICRO LIGHT to 3300 ICP Software

- Only one 3300 ICP can be configured at a time; and only one SX-2000 can be migrated to a 3300 ICP at a time.
- Migration and Configuration cannot be performed in a single task or session using the 3300 Configuration Tool.
- After migration, configuration must be completed using the System Administration Tool.
- Data restoration automatically triggers data migration.
- The MICRO LIGHT is seen by the 3300 ICP as 2 pair of NSUs and a Peripheral Unit.
- If existing capacity is greater than that of the 3300 ICP, the conversion will fail. See the capacity table for the 3300 ICP.
- Windows 2000 users should clear the browser cache.

To transfer database from SX-2000 MICRO LIGHT to 3300 ICP:

1. Prepare the SX-2000 MICRO LIGHT for migration: - reduce Peripheral and DSU nodes to a maximum of 4 - deprogram unsupported devices and cards (AC13, AC15, SCDC, DID3, Advanced Tone Detector, ISDN Gateway, FIM Carrier Card, COV Line Card, 3DN, 4DN, SUPERSET 3, SUPERSET 4, SUPERSET 700, SUPERSET 7DN, SUPERCONSOLE 2000, and datasets).
2. Program SX-2000 connectivity using NE Editor.

3. Backup SX-2000 database (datasave) from the 3300 Configuration Tool. The Configuration Tool will convert the SX-2000 database to a 3300 database.
4. Program 3300ICP connectivity using NE editor with the Variant as 3300 ICP.
5. Enable Options.
6. Perform a Restore of the SX-2000 converted database onto the 3300 ICP. An automatic validation operation occurs to determine if the restore can proceed.
7. Reboot the 3300 ICP. Check the logs for any data restore failures (see Note).
8. Change the 3300 ICP system name through the System Administration Tool.



Note: After the Restore and Reboot, check the log file. In the System Administration Tool, click Maintenance and Diagnostics, select Maintenance Commands, and click All. Type the following text in the Command line: type *.dr.logfile_1

Upgrade 3200 to 3300 Software

- Only one 3200 ICP can be migrated to a 3300 ICP at a time.
- Migration and Configuration cannot be performed in a single task or session using the 3300 Configuration Tool.
- After migration, configuration must be completed using System Administration Tool.
- Data restoration automatically triggers data migration.
- If existing capacity is greater than that of the 3300 ICP, the conversion may fail. See the capacity table for the 3300 ICP.
- Windows 2000 users should clear the browser cache.
- Export the Name, Number and PIN of each user with a Symbol phone to a .csv file using the Telephone Directory Export Application in OPS Manager (only do this if you are migrating a 3200 ICP that has Symbol Phones programmed that use Direct Sequence Spread Spectrum).
- Install the Symbol NetVision MiNET Phone Administrator Tool on a Windows NT or Windows 2000 PC.



Note: Although the 3200 ICP FD_DSU programming is restored to the 3300 ICP, you must deprogram the DSU and reprogram using the System Administration Tool after you install new hardware.

To transfer database from a 3200 ICP to a 3300 ICP:

1. Prepare the 3200 ICP for migration:
 - deprogram unsupported devices and cards (AC15, SCDC, Advanced Tone Detector, ISDN Gateway, FIM Carrier Card, COV Line Card, 3DN, 4DN, SUPERSET 3, SUPERSET 4, SUPERSET 7DN, and datasets).
2. Program 3200 ICP connectivity using the Configuration Tool. Create a Network Element that is the same as the 3200 ICP.
3. Backup 3200 ICP database (datasave) to the 3300 Configuration Tool or copy a datasave from OPS Manager to the Configuration Tool. The Configuration Tool will convert the 3200 database to a 3300 database.

4. Change the Variant to 3300 ICP and change the IP Address if required.
5. Perform a Restore of the 3200 ICP converted database onto the 3300 ICP. An automatic validation operation occurs to determine if the restore can proceed.
6. Reboot the 3300 ICP. Check the logs for any data restore failures (see Note).
7. (Optional - see Note) Collect the telephone directory information from the 3300 ICP using the Full Collect application in the Configuration Tool.
8. (Optional - see Note) Collect information on the free PLIDs using the Free PLID Collection application.
9. (Optional - see Note) Import the .csv file that contains the Name, Number and PIN information of each Symbol phone user using the Moves, Adds and Changes Import application in the Configuration Tool.
10. Change the 3300 ICP system name through the System Administration Tool.
11. Deprogram the 3200 ICP FD_DSU using the System Administration Tool.
12. Install new hardware (Network Services Unit or DSU Cabinet).
13. Reprogram the digital links.
14. (Optional - see Note) Update the firmware in the Symbol NetVision phone. Refer to the Symbol NVP II MiNET Update Procedure located in the Hardware User Guide.
15. (Optional - see Note) Complete the programming of the Symbol phone using the Symbol NetVision MiNET Phone Administrator Tool.



Note: After the Restore and Reboot, check the log file. In the System Administration Tool, click Maintenance and Diagnostics, select Maintenance Commands, and click All. Type the following text in the Command line: type *.dr.logfile_1



Note: The optional steps are only applicable if the database has Symbol Wireless phones being migrated.

Upgrade 3800 WAG to 3300 ICP Software

- Only one 3800 WAG can be migrated to a 3300 ICP at a time.
- Only D.S. Wireless phones can be migrated.
- Migration and Configuration cannot be performed in a single task or session using the 3300 Configuration Tool.
- After migration, configuration must be completed using System Administration Tool.
- Data restoration automatically triggers data migration.
- Windows 2000 users should clear the browser cache.
- For steps requiring the Configuration Tool refer to the Configuration Tool Help System.
- Install the Symbol NetVision MiNET Phone Administrator Tool on a Windows NT or Windows 2000 PC.

To transfer database from a 3800 WAG to a 3300 ICP:

1. Prepare the 3800 ICP for migration.
 - Export the Name, Number and PIN of each user with a Symbol phone to a .csv file using

- the Telephone Directory Export Application in OPS Manager.
- change OPS Manager Configuration Settings.
2. Prepare the 3300 ICP for migration.
 - Input the License information in the License and Option Selection form.
 - Reboot the system.
 - Change the System Name to the same as that of the 3800 WAG being migrated in the System Options Assignment form.
 3. Program 3800 WAG connectivity using the Configuration Tool. Create a Network Element that is the same as the 3800 WAG.
 4. Backup 3800 WAG database (datasave) to the 3300 Configuration Tool or copy a datasave from OPS Manager to the Configuration Tool. The Configuration Tool will convert the 3800 database to a 3300 database.
 5. Change the Variant to 3300 ICP and change the IP Address if required.
 6. Perform a Restore of the 3800 WAG converted database onto the 3300 ICP. An automatic validation operation occurs to determine if the restore can proceed.
 7. Manually Reboot the 3300 ICP. Check the logs for any data restore failures (see Note).
 8. Collect the telephone directory information from the 3300 ICP using the Telephone Directory Full Collect application in the Configuration Tool.
 9. Collect unused circuit information from the 3300 ICP using the Collect Unused Directory Circuits application in the Configuration Tool.
 10. Import the .csv file that contains the Name, Number and PIN information of each Symbol phone user using the Moves, Adds and Changes application in the Configuration Tool.
 11. Change the 3300 ICP system name and the default usernames/passwords using the System Administration Tool.
 12. Update the firmware in the Symbol NetVision phone. Refer to the Symbol NVP II MiNET Update Procedure located in the Hardware User Guide.
 13. Complete the programming of the Symbol phone using the Symbol NetVision MiNET Phone Administrator Tool.



Note: After the Restore and Reboot, check the log file. In the System Administration Tool, click Maintenance and Diagnostics, select Maintenance Commands, and click All. Type the following text in the Command line: type *.dr.logfile_1

Field Replaceable Units

Controller FRUs

Remove the Cover



Note: Ensure that you have read the Safety Instructions before carrying out these procedures.

WARNING: Before any servicing that requires the case to be removed, the power to the system must be removed by disconnecting the system plug from the power supply. All PSTN/Network connections must also be removed before opening the case.

WARNING: Servicing of this unit shall be performed by suitably-qualified, trained technicians who are fully aware of the safety requirements contained in the Hardware User Guide.

To remove the 3300 ICP Controller cover:

1. Turn off the power to the unit.
2. Disconnect all cables.
3. Remove the 3300 Controller from the rack and place it on a suitable work area.
4. Remove the front face-plate (this will clip off).
5. Turn the 3300 Controller over gently, keeping the front panel facing forward.
6. Remove the two screws from the underside of the 3300 Controller.
7. Turn the 3300 Controller the right side up and rotate until the back of the unit is facing forward.
8. Remove the two screws from the back panel.
9. Slide the cover forward until it catches, then tilt the cover upward to remove it.
10. Turn the 3300 Controller until the front panel is toward you.

Replace the Cover

To replace the 3300 ICP cover:

1. Turn the 3300 Controller until the back panel is facing forward.
2. Lift the lock for the AC power cord and place the shell at an angle to hook onto the back of the unit.
3. Straighten and slide the cover forward as far as it will go.
4. Secure the shell by inserting and snugly securing the two screws on the back panel.
5. Rotate the 3300 Controller until the front panel is facing forward.
6. Turn the 3300 Controller gently upside down.
7. Secure the screws on the bottom front of the unit.

8. Turn the 3300 Controller right side up.
9. Clip on the front face-plate taking care not to damage the protruding FIM connectors.
10. Reinstall the 3300 Controller into the rack (if applicable).
11. Reconnect all cables.
12. Power on the unit.

Dual FIM Module

CAUTION: To prevent ESD damage while handling modules on any unit, always attach the wrist strap from the cabinet being serviced, and immediately place any item removed from a cabinet into an anti-static bag.

CAUTION: Do not drop screws or lock washers in the controller.

To remove a Dual FIM Module:

1. Remove the cover.
2. Remove the two Philips screws from the faceplate in slot MMC 2
3. Remove the faceplate.
4. Remove the screws and lock washers from the Dual FIM Module.
5. Pull up on the module to remove it.

To install a Dual FIM Module:

1. Remove the cover.
2. Remove the two Philips screws from the faceplate in slot MMC 2.
3. Remove the faceplate.
4. Remove the Dual FIM Module from the packaging, line up the connectors and firmly seat onto the board.
5. Secure the module onto the board using the screws and lock washers provided.
6. Replace the cover.

DSP or Echo Canceller Module

CAUTION: To prevent ESD damage while handling modules on any unit, always attach the wrist strap from the cabinet being serviced, and immediately place any item removed from a cabinet into an anti-static bag.

CAUTION: Do not drop screws or lock washers in the controller.

To remove an MMC Module:

1. Remove the cover.
2. Remove the screws and lock washers from the module.
3. Pull up on the module to remove it.
4. Replace the cover.

To install DSP Modules:

1. Remove the cover.
2. Line up the connectors module and firmly seat onto the board.
3. Secure the module onto the board using the screws and lock washers provided.
4. Replace the cover.

Hard Drive

CAUTION: To prevent ESD damage while handling modules on any unit, always attach the wrist strap from the cabinet being serviced, and immediately place any item removed from a cabinet into an anti-static bag.

To replace the hard drive:

1. Turn off the power to the unit.
2. Disconnect all cables.
3. Place the 3300 Controller on the work area with the bottom of the unit facing up.
4. To remove the hard drive, remove the 6 smaller, border screws (the four larger screws secure the hard drive to the backing plate).
5. Replace the hard drive.
6. Return power to the unit but do not connect to the network.
7. Reset the IP Address of the RTC, through the RS232 port, to the default 192.168.1.2.
8. Set the IP Address of the source PC to match the RTC IP scheme.
9. Connect the PC NIC to the 3300 ICP.
10. Configure the FTP server for the install process.
11. From the software CD-ROM, select INSTALL.
12. Reboot the system.
13. Login to the System Administration Tool.
14. Restore a backup.
15. Reset the RTC IP Address to the customer setting.
16. Connect to the network.
17. Reset the system.



System ID Module

To remove the System ID Module:

1. Remove the cover.
2. Remove the module from the board. Placement is between Slot 1 (the Dual FIM) and Slot 8 (the DSP).
3. Replace the cover.

System ID Module Placement

Power Supply	Slot 8	Slot 7	Slot 6	Slot 5
	SYSID			
	Slot 1	Slot 2	Slot 3	Slot 4

IP0421

Peripheral Node FRUs

Power Down the Peripheral Unit

To power down a Peripheral Unit:

1. Remove the front panels.
2. Switch off the power converter.
3. Set the power switch on the rear of the node to '0' (OFF).
4. Unplug the external power cord at the rear of the node.

Power Up the Peripheral Unit

To power up a Peripheral Unit:

1. Ensure the voltage selector switch is set to the required setting for your country.
2. Connect the power cord at the rear of the unit to the external AC power source.
3. Set the power switch on the rear of the node to '1' (ON).
4. Set the switch on the power converter faceplate to '1' (ON).

Remove a Front Panel

To remove a front panel from the DSU or Peripheral Unit:

1. Insert a screwdriver in the slot on the right side of the front grill and pry it open.
2. Loosen the two screws on the front cover and lift the cover up and away from the cabinet.

Replace a Front Panel

To replace a front panel in a DSU or Peripheral Unit:

1. Align the front panel screws with the holes in the cabinet and tighten the two screws.
2. Insert the left front grill into the slot and snap it closed.

Remove a Circuit Card

To remove a DSU or Peripheral Unit circuit card:

CAUTION: Wear an anti-static wrist strap whenever you handle circuit cards.

1. Enter `BUSY <PLID of faulty card>`, and select the `COURTESY DOWN` option.
2. To confirm that all circuits are in the busy state, enter `STATE <PLID of faulty card>`.
3. Pull the upper and lower latches outward until they are both in the horizontal release position.
4. Draw the card toward you.
5. Immediately place the card in an anti-static bag.

Install a Circuit Card

To install a DSU or Peripheral Unit circuit card:

CAUTION: Wear an anti-static wrist strap whenever you handle circuit cards.

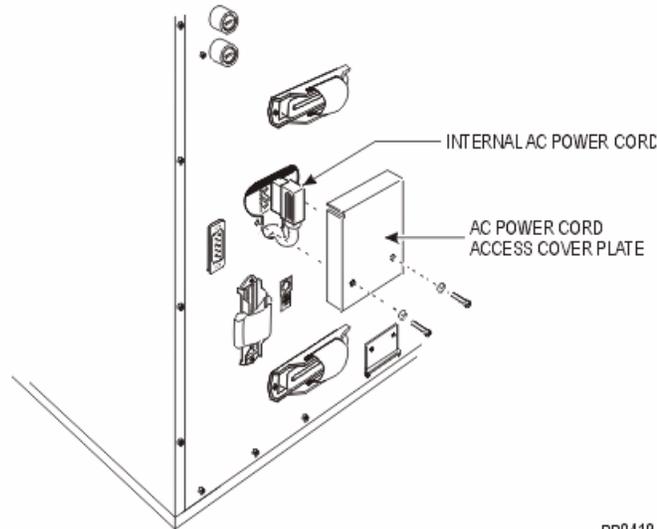
1. For cards that have switches, refer to the card's hardware description for information about switch settings.
2. Check the connector pins to be certain that they are straight.
3. Slide the card into the slot.
4. Push the upper and lower latches away from you until they are vertical and the card is locked in place.
5. To return the circuits to service, enter RTS <PLID>.

Install a Power Converter

To replace an AC Power Converter in a Peripheral Unit:

1. Remove the front panels.
2. Power down the node.
3. Disconnect the internal AC power cord.
 - Unscrew and remove the cover plate over the internal AC power cord access on the rear of the node (see the figure below).
 - Unplug the internal AC power cord from the rear of the AC power converter (accessed through cutout in the backplane).
4. Remove the converter.
 - Move the card latches on the converter to the horizontal position.
 - Carefully withdraw the converter unit from the shelf.
5. Unpack and inspect the converter.
 - Unpack the converter and remove all packing materials.
 - Inspect the converter to ensure that the unit is not dented or scratched and that all fittings are secure.
6. Install a new converter.
 - Slide the replacement converter into position (slots 13 - 15).
 - Move the card latches to the vertical position to secure the converter.
 - Plug the internal ac power cord from the PDU into the ac power converter, through the cutout in the backplane.
 - Replace the cover plate over the access cutout in the backplane, and fasten in place with the screws removed in step 3.
7. Power up the node.
8. Replace the front panels.

PERIPHERAL NODE REAR



RR0419

Install a Power Distribution Unit (PDU)

To replace a PDU in a Peripheral Unit:

1. Power down the node.
2. Remove the front panels.
3. Remove the PDU.
 - Unplug the external power cord from the PDU.
 - Remove the PDU internal power cover plate.
 - Unplug the PDU internal power cord from the power converter.
 - Remove the outer screws on the PDU faceplate.
 - Pull the PDU out until you can access the fan power connector at the rear of the PDU.
 - Disconnect the fan power connector and remove the PDU.
4. Install a new PDU.
 - Unpack and inspect the new PDU for damage.
 - Set the power switch on the new PDU to off (O).
 - Connect the fan power connector at the rear of the PDU.
 - Insert the PDU and replace the outer screws on the PDU faceplate.
 - Plug the PDU internal power cord into the power converter.
 - Replace the internal power access cover plate.
 - Plug the external power cord into the PDU.
5. Power up the node.
6. Replace the front panels.

Install a Cooling Fan

To replace a cooling fan in a Peripheral Unit:

1. Power down the node.
2. Remove the front panels.
3. Disconnect the fan assembly.
4. Remove the defective fan.
5. Insert the new fan.
6. Replace the fan assembly.
7. Replace the front panels.
8. Power up the node.

Install an Electronic Filter for Cooling Fan

To replace an electronic filter for a cooling fan in a peripheral cabinet:

1. Power down the node.
2. Remove the front panels.
3. Remove the cards from the left side of the cabinet.
4. Identify and disconnect the plugs from the filter which is attached to the underside of the top of the cabinet.
5. Remove the screws holding the filter to the cabinet, and remove the filter from the cabinet.
6. Unpack, inspect, and install the filter by reversing the previous steps.
7. Replace the cards.
8. Replace the front panels.
9. Power up the node.

Install a Fiber Interface Module (FIM)

Remove a FIM

To remove a FIM from a Peripheral Unit:

WARNING: Power must not be applied to the Peripheral Unit while the Fiber Interface Module is removed.

1. Power down the node.
2. Remove the front panels.
3. Attach the anti-static strap to your wrist.
4. If you need more room, remove the power converter and the PSC.
5. Disconnect the fiber cables from the FIM.
 - Place dust caps on the fiber cable connectors and on the FIM connectors.

- Remove the cable by sliding it through the cable port at the rear of the cabinet.
- 6. Pull the FIM out gently from slot 17, unplugging it from the backplane.

Install a FIM

To install a FIM in a Peripheral Unit:

WARNING: Power must not be applied to the Peripheral Unit during the installation of the Fiber Interface Module.

1. Attach the anti-static strap to your wrist.
2. Unpack the FIM, and inspect it to ensure that it is not damaged.
3. Slide the FIM into the bottom of slot 17 until it connects with the backplane firmly.
4. Fasten the FIM in place with the two screws provided or the latch on the card guides.
5. Attach the FIM cable by following the steps in Connect the Fiber Optic Cable.
6. If the PSC and power converter were removed, replace them at this time.
7. Power up the node.
8. Replace the front panels.

Install a Peripheral Switch Controller Card (PSC)

To replace a peripheral switch controller card:

CAUTION: This procedure takes the peripheral devices connected to the node out of service.

CAUTION: Wear an anti-static strap whenever you handle circuit cards.

1. Power down the Peripheral Unit.
2. Replace the faulty peripheral switch controller card with the new peripheral switch controller card.
3. Power up the Peripheral Unit.

Install a Dual 10Base-T Interface Assembly

To replace a Dual 10Base-T Interface Assembly

1. Remove the front panels.
2. Disconnect the Ethernet cables from port J5 on each of the Ethernet Interface (ETI) cards. Note that disconnecting these cables disconnects access to the switch from OPS Manager and raises an alarm on the OPS Manager station.

3. Go to the rear of the cabinet.
4. Disconnect the Ethernet LAN cables from the dual 10Base-T connector assembly. The dual 10Base-T connector assembly is located in the 12th FIM slot.
5. Remove and retain the two screws that fasten the dual 10Base-T connector assembly to the fiber carrier box.
6. Remove the dual 10Base-T connector assembly and carefully draw the attached cables out through the 12th FIM slot. If the cables become entangled, do not attempt to force them from the cabinet. Reach in through the front of the cabinet and free the cables.
7. Unpack the replacement 10Base-T connector assembly.
8. Insert the cables that are attached to the replacement 10Base-T connector assembly into the 12th FIM slot.
9. Go to the front of the cabinet and carefully draw the two cables through to the front of the cabinet. Route the cables along the base of the cabinet.
10. At the rear of the cabinet insert the dual 10Base-T connector assembly into the 12th FIM slot.
11. Fasten the dual 10Base-T connector assembly to the fiber carrier using the two screws that you removed in step 5.
12. Connect the two Ethernet cables to the 8-position, 8-pin connectors on the dual 10Base-T connector assembly.
13. At the front of the cabinet, connect the 10 Base-T internal cable for plane A to port J5 on the faceplate of the Ethernet interface card in slot 1/1/3.
14. Connect the 10 Base-T internal cable for plane B to port J5 on the faceplate of the Ethernet interface card in slot 1/1/6.
15. Reset the ETI cards using the RESET switch on the faceplate of each ETI card. The RDY LED on the ETI cards turn on steady indicating that the ETI cards are receiving their software loads from OPS Manager.

DSU FRUs

Power Down the DSU

1. To power down a DSU node:
2. Set the power switch on the rear of the node to '0' (OFF).
3. Unplug the external power cord at the rear of the node.

Power Up the DSU

To power up a DSU node:

1. Connect the external power cord at the rear of the node.
2. Set the power switch on the rear of the node to '1' (ON).

Basic Rate Interface (BRI)

BRI Installation Overview

Before you install the BRI card, ensure that:

- The configuration includes a CEPT Formatter card that has an unused hybrid circuit (one Rx/Tx pair) configured with DPNSS protocol
- The system has a free DSU slot for the BRI card
- The wiring from the Network Termination Terminal Equipment (NTTE), Network Termination 1 (NT1), or terminating equipment is Cat 5 UTP
- A computer is available for use as a maintenance PC.

Installation Sequence

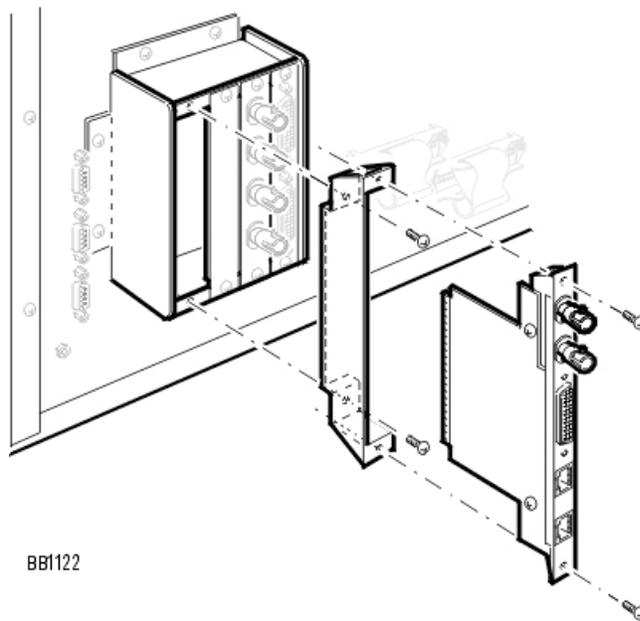
Install the BRI card in the following sequence:

- Program the customer data in the 3300 ICP
- Install the BRI interface assembly
- Install the BRI card and make connections
- Connect the terminal equipment.

Install a BRI Interface Assembly

To install the BRI interface assembly:

1. Attach the anti-static strap to your wrist.
2. Unpack the interface assembly and inspect it to ensure that it is not damaged.
3. At the rear of the DSU cabinet, locate the slot in the DSU box that corresponds to the slot in the system card frame that will be used for the BRI card. The BRI card should be as close as possible to its associated CEPT card.
4. Remove the blanking plate from the selected slot.
5. Insert the interface assembly extension bracket into the slot with the closed side of the bracket to the left (when viewed from the rear of the cabinet).
6. Using the screws that secured the blanking plate, secure the interface assembly extension bracket into the slot.
7. Insert the interface assembly into the slot.
8. Using the screws provided, secure the interface assembly to the extension bracket.



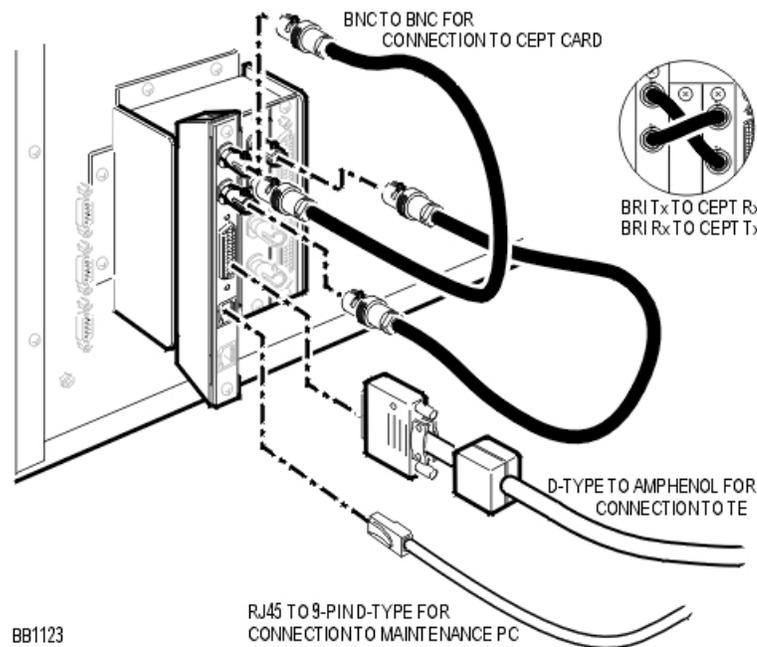
Install a BRI Card

To install the BRI card:

1. Attach the anti-static strap to your wrist.
2. Unpack the BRI card and inspect it to ensure that it is not damaged.
3. Insert the BRI card into the slot that corresponds to the BRI interface assembly and close the locking latches.

To make the connections to the BRI card:

1. Using a BNC to BNC cable, connect the Rx port on the BRI interface assembly to the Tx port on the CEPT interface assembly.
2. Using a BNC to BNC cable, connect the Tx port on the BRI interface assembly to the Rx port on the CEPT interface assembly.
3. Using the 44-pin D-type to Amphenol cable, connect the ISDN BRI port on the BRI interface assembly to the distribution frame, RJ45 patch panel, or network terminating rack. (See tables for the cable pinout; 6 circuit and 15 circuit)



Install a CEPT or DS1 Formatter II Card

Before you begin

- Program the Card Assignment with CEPT Formatter or DS1 Formatter cards.
- Install the Interface Assembly.

The CEPT DS1/T1 Formatter cards are installed in any empty DSU slot. The DSU cabinet supplies the power for the card and provides a message interface back to the control cabinet through the FIM interface and the fiber optic cable.

To install the cards:

1. Attach the anti-static strap to your wrist.
2. Insert the card into the slot and close the locking latches.

Testing the Card

If the installation is successful, the card will boot up.

To test the card:

1. Inspect the LEDs on the faceplate to verify that the card is functioning. See Faceplate LEDs.
2. In the System Administration Tool, Maintenance and Diagnostics, use the STATE command to verify that the trunks associated with the corresponding channels are all in IDLE state.

DSU PRI Card

PRI Installation Overview

The following section describes how to install the PRI card and PRI interface assembly. You will need to program the PRI card into the 3300 ICP database to allocate links and trunks.

Install the PRI card in the following sequence:

- Program the customer data in the 3300 ICP
- Configure the card for Line Side or Trunk Side termination
- Install the interface assembly
- Install the PRI card
- Configure the IMAT database
- Connect the computer to the PRI card
- Save the IMAT database onto the PRI card
- Connect the PRI card to the ISDN network

Install a PRI Card

The PRI card is installed in any empty DSU slot. The DSU cabinet supplies the power for the card and provides a message interface back to the control cabinet through the FIM interface and the fiber optic cable.

To install the PRI card:

1. Attach the anti-static strap to your wrist.
2. Insert the PRI card into the slot and close the locking latches.

Connect PRI Card to the Network

To connect the PRI card to the network:

1. Unpack and inspect the ISDN PRI cables. Retain the original package.
2. Plug the ISDN PRI cable into the PRI port.
3. Plug the ISDN PRI cable into the network terminating equipment.



Note: A dual-port card needs two ISDN PRI cables if you are using both ports.

Install for PRI QSIG

To install and configure the PRI Card in the DSU as a PRI/QSIG variant, refer to the 3300 Universal NSU Install for PRI QSIG instructions.

These are the steps that are required for installation and programming:

1. Connect a computer to the PRI card.

2. Install a Direct Connection Device Driver on a computer.
3. Create a Dial-up Network connection on your computer.
4. Connect the computer to the PRI Card.
5. Use the IMAT Tool to complete required PRI configuration.
6. Connect the PRI Card to the ISDN network.

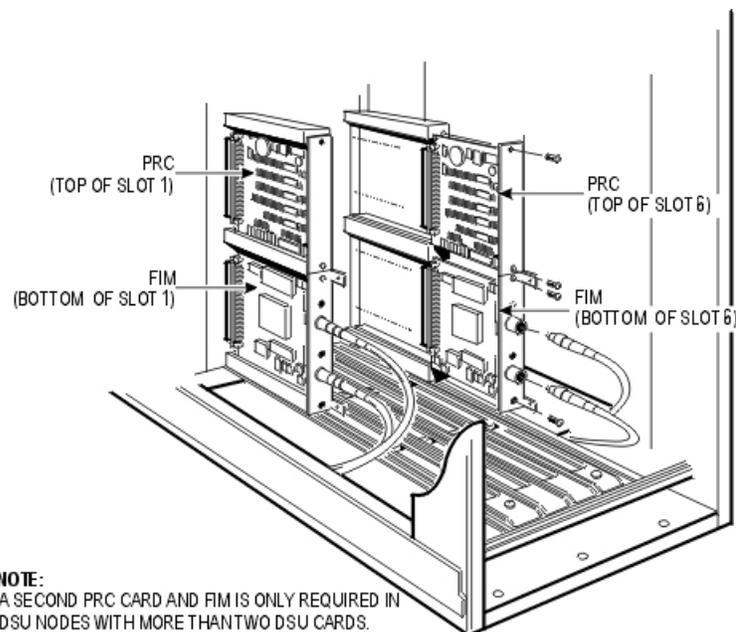
Install a Peripheral Resource Card

Each FIM in the DSU must have a Peripheral Resource Card (PRC) installed above it.

To install a PRC in a DSU:

WARNING: Power must not be applied to the Peripheral Unit while you are installing the Peripheral Resource card.

1. Unpack the PRC.
2. Slide the PRC into the top of slot 1 until it connects firmly with the backplane.
3. Fasten the PRC in place using the two screws provided, or use the latches on the card guides.
4. If a second PRC is required, install it in the same manner in the top of slot 6.



Install a Fiber Interface Module (FIM)

Replace a FIM

To replace a FIM in a DSU:

1. Power down the node.
2. Remove the front panels.
3. Attache an anti-static strap to your wrist.
4. If you need more room, remove adjoining DSU cards.
5. Disconnect the fiber cables from the FIM.
 - Mark the cable connectors so they are replaced correctly on the new FIM.
 - Remove the screws or release the latches on the FIM.
 - Pull the FIM out gently from slot 1 or 6, unplugging it from the backplane.
6. Install a new FIM.
 - Slide the new FIM into the bottom slot 1 or 6, seating it firmly.
 - Fasten the screws or release the latches on the FIM.
 - Remove the plastic caps from the cable connectors on the FIM faceplate and connect the optical fiber cables to those connectors.
7. Replace the DSU cards.
8. Power up the node.
9. Replace the front panels.

Install a FIM

To install a FIM in a DSU Node:

WARNING: Fiber optic sources emit infrared light invisible to the human eye which can damage the retina. Never look directly into a source or into the end of a fiber energized by a source. When working with raw fiber optic cable, be careful of fiber ends or slivers that can puncture the skin and cause irritation.

1. Attach the anti-static strap to your wrist.
2. Unpack the FIM. Inspect the FIM to ensure that it is not damaged.
3. Remove the DSU node front door
 - Pry open the two latches on the right hand side of the black cover panel on the front door, and swing the cover panel off to the left.
 - Loosen the two screws under the black panel to release the front door.
 - Pull the top corners of the front door out and lift it off the lip at the bottom front of the node.
4. Remove the DSU cards from the cabinet. Insert each circuit card in a separate anti-static bag.

5. Slide the FIM into the bottom slot 1 or slot 6 until it connects with the backplane firmly. Fasten the FIM in place with the two screws provided or use the latch on the card guides. See FIM and PRC Installation in the DSU Node.
6. Remove the anti-static strap from your wrist.

DSU R2 Card

R2 Installation Overview

The following section describes how to install the R2 card and R2 interface assembly. You will need to program the R2 card into the 3300 ICP database to allocate links and trunks.

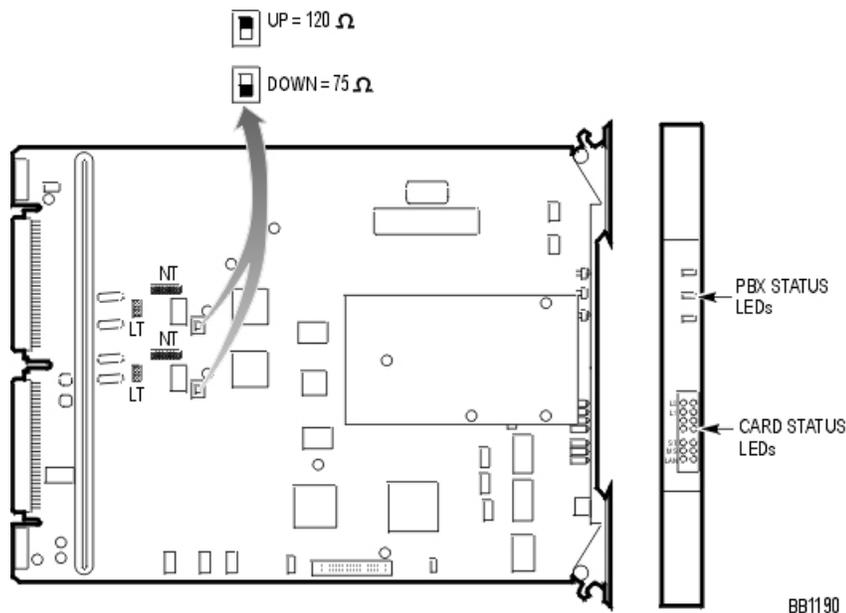
Install the R2 card in the following sequence:

- Program the customer data in the 3300 ICP
- Configure the card for Line Side or Trunk Side termination
- Install the interface assembly
- Install the R2 card
- Configure the IMAT database
- Connect the computer to the R2 card
- Save the IMAT database onto the R2 card
- Connect the R2 Card to the PSTN network

Configure for Line Side/Trunk Side Termination

To configure the R2 card for Line Side or Trunk side termination:

1. Attach the anti-static strap to your wrist.
2. Unpack the R2 card and inspect it to ensure that it is not damaged.
3. Ensure the jumper block covers the NT position for the Trunk Side termination and the LT position for Line Side termination.
4. Set the termination impedance switch of the line to the up position for 120 ohms or down for 75 ohms.



Install the R2 Card

The R2 card is installed in any empty DSU slot. The DSU cabinet supplies the power for the card and provides a message interface back to the control cabinet through the FIM interface and the fiber optic cable.

To install the R2 card:

1. Attach the anti-static strap to your wrist.
2. Insert the R2 card into the slot and close the locking latches.

Connect the R2 card to the PSTN network

To connect the R2 card to the network:

1. Unpack and inspect the R2 coaxial cables.
2. Plug the R2 cable into the R2 port.
3. Plug the R2 cable into the network terminating equipment.



Note: A dual-port card needs two coaxial cables if you are using both ports.



Note: The R2 coaxial cables have both transmit (arrow pointing away from cable) and receive (arrow pointing towards cable) connectors. When you set the card for trunk side termination (jumper at NT position), connect the R2 coaxial cable transmit lead to the network receive connector, and the R2 coaxial receive lead to the network transmit connector. When you set the card for line side termination (jumper at LT position), connect the R2 coaxial cable transmit lead to the network transmit connector, and the R2 coaxial receive lead to the network receive connector.

RJ-45 Connector Pin Functions

Pin	Function
1 & 2	TX
4 & 5	RX

Field Replaceable Units**Hardware**

Part Number	Description
50000363	Power Distribution Unit
50000730	CEPT Interface Assembly
50001246	3300 - 64 Channel Echo Canceller
50001247	3300 - 128 Channel Echo Canceller
50001248	3300 - Dual Fiber Interface Module
50001260	3300 - Hard Disk Replacement
50001261	3300 - 250 to 700 Controller Upgrade Kit (FIM and Echo Canceller; exchange DSP for the new DSP)
50001266	3300 Analog Services Unit 4/16 Combo (NA)
50001267	3300 Analog Services Unit 24 Port (NA)
50001268	3300 Analog Services Unit 4/16 Combo (UK)
50001269	3300 Analog Services Unit 24 Port (UK)
50001270	3300 Universal Network Services Unit (NA)
50001271	3300 Universal Network Services Unit (UK)
50001274	3300 BRI Network Services Unit (NA)
50001275	3300 BRI Network Services Unit (UK)
50001856	SX-2000 Triple FIM Carrier
50002046	3300 Analog Services Unit 24 Port (LA)
50002047	3300 Analog Services Unit 4/16 Combo (LA)
50001272	3300 R2 NSU
50002370	3300 Peripheral Expansion Node (dark grey, 120V, NA)
50002371	3300 Peripheral Expansion Node (dark grey, 240V, NA)
50002372	3300 Peripheral Expansion Node (dark grey, 120V, UK)
50002373	3300 Peripheral Node (dark grey, 120V, AC, NA)
50002374	3300 Peripheral Node (dark grey, 240V, AC, NA)
50002375	3300 Peripheral Node (dark grey, 120V, AC, UK)
50002376	3300 Peripheral Node Door (dark grey)
50002572	3300 Peripheral Cabinet FRU
50002580	3200 to 3300 Upgrade 250 Users UK (upgrade components to 3.2)
50002581	3200 to 3300 Upgrade 250 Users NA (upgrade components to 3.2)
50002582	3340 Branch Office Solutions (LA)
50002583	3340 Branch Office Solutions (UK)
50002584	3340 Branch Office Solutions (NA)

Hardware (continued)

Part Number	Description
50002813	3300 Analog Services Unit 24 Port Euro
50002814	3300 Universal Analog Services Unit 4/16 Combo Euro
50002922	3300 Power Dongles 10 PK (cisco compliant)
50002952	Power Cord 3 Pack Euro
50002970	3300 Controller 250 User
50002971	3300 Controller 700 User
50002972	3300 Configuration Tool 3.2
50002976	Power Cord 3 Pack NA
50002977	Power Cord 3 Pack UK
50002978	3300 Controller (contains E2T and RTC only)
50002979	3300 Quad DSP MOD II
50002980	3300 Configuration Tool 3.2 Upgrade
52000810	3300 Chassis Upgrade 64 Channels Compression 700 User (contains 50002971- 700 User Controller, 2 X DSPs , 40 Compression Licenses (use old SysID and Hard Drive))
52000840	3300 Chassis Upgrade 64 Channels Compression 250 User (contains 50002970 - 250 User Controller, 2 X DSPs , 40 Compression Licenses (use old SysID and Hard Drive))
9125-100-100-NA	EMI Filter Kit
9125-100-106-NA	Cabinet Interconnect Cable (15 Ft)
9180-305-000-NA	System Fail Transfer Unit (6 circuit)
9189-000-400-NA	SUPERCONSOLE 1000 - Light Grey; Back lit
9189-000-401-NA	SUPERCONSOLE 1000 - Dark Grey; Back lit
9400-200-116-NA	Peripheral Node
9400-200-117-NA	Peripheral Expansion Node II (AC)
9400-200-118-NA	Peripheral Cabinet II (AC)
9400-200-119-NA	Peripheral Interconnect Card
9400-200-122-NA	DSU Node
9400-200-125-NA	DSU Cabinet (AC)
9400-200-144-NA	Cabinet Stacking Brackets
9400-200-200-NA	Power Module Redundant (in Control Node)
9400-200-301-NA	Peripheral/DSU Resource Card
9400-200-303-NA	Peripheral Slot FIM Carrier Card
9400-200-304-BA	SUPERSET Hub Unit
9400-200-306-BA	SUPERSET Hub Package
9400-200-310-NA	Doors for Control/Peripheral Nodes (Pkg. of 2)
9400-300-202-BA	Fan (240 VAC)
9400-300-204-NA	AC Power Supply
9400-300-301-NA	Fiber Interface Module (FIM)
9400-300-302-NA	Quad FIM Carrier
9400-300-308-NA	DSU Slot FIM Carrier

Hardware (continued)

Part Number	Description
9400-300-310-NA	FIM Carrier Card
9401-000-024-NA	Music on Hold Paging Unit (DNIC)
MA218AA	DS1 Interface Assembly
MA225AA	PRI Interface Assembly
MA233AA	Dual 10Base-T Interface Assembly (for OPS Man)
MA501AA	BRI Interface Assembly
MC268AA	6 CCT BRI Card
MC268AB	15 CCT BRI card
MC269AA	PRI Card, E1 Dual Link
MC269CA	CEPT Interface Card
MC270AA	PRI Card, T1 Dual Link
MC270CA	T1 (DS1) Formatter card
MC271AA	E1 R2 Card
MC312AB	Peripheral Switch Control II card
MC320CL	ONS CLASS Line Card (UK) with positive disconnect
MC320CM	ONS CLASS IBR Line Card
MC320EA	ONS CLASS Line Card (16 circuits)
MC320FA	ONS CLASS Line Card with positive disconnect
MC321AC	OPS Line Card (8 circuits)
MC330AB	DNI Line Card (16 circuits)
MC340BA	LS/GS Trunk Card (8 circuits)
MC341CA	DID/Loop Tie Trunk Card (4 circuits)
MC342BB	E&M Tie Trunk Card (4 circuits)
MP914AA	AC Power Converter
MT914AD	Power Converter (for the MICRO LIGHT 220v)
MW401AA	BRI Cable - MDF (3 meter) 25 pair cable
MW401AB	BRI Cable - MDF (10 meter) 25 pair cable
MW402AA	BRI CEPT Cables
MW403AA	BRI MMI Cable
MW404AA	R2 Card, RJ-45 to Coaxial Adapter cable (2X BNC)
Software Options	
50002585	3300 3.1 Base Software CD-ROM, SysID, Handbook
50002690	3300 3.1 Base Software CD-ROM
50002839	3300 3.2 Base Software Upgrade (Software CD-ROM, Hard Drive, Handbook)
50002953	3300 3.2 Base Software Replacement (Software CD-ROM)
50002974	3300 3.2 Base Software CD-ROM, SysID, Hard Drive, Handbook
50002981	3300 Base Software 3.2 Upgrade (Software CD-ROM and Handbook)
54000291	3300 User License (One User)
54000294	3300 Device License (One Device)
54000297	3300 Mail Box License (One Mail Box)

Hardware (continued)

Part Number	Description
54000300	3300 ACD Agent License (One Agent)
54000303	3300 Network Link License
54000497	3300 XNET Networking License
54000540	3300 IP Networking License
54000582	3340 Branch Office Solution Upgrade (NA)
54000581	3340 Branch Office Solution Upgrade (UK)
54000580	3340 Branch Office Solution Upgrade (LA)
54000650	3300 Compression License (8 Channels)
9125-271-000-NA	R2 Application CD-ROM Software
9125-070-002-NA	PRI T1 Card CD-ROM Software
9125-070-011-NA	Euro ISDN PRI Card Release 6 Application Software
9125-070-012-NA	ISDN PRI Card Release 6 Application Software
9125-501-001-NA	ISDN Min/Max Software Option for the PRI Card
9125-501-002-NA	ISDN Auto Min/Max Software Option for the PRI Card
9125-501-003-NA	ISDN NFAS Software Option for the PRI Card
9125-501-004-NA	ISDN D-Channel Back up software option - PRI Card
9125-501-005-NA	ISDN remote LAN Access software option - PRI Card

Chapter 5

Programming

Programming

Overview of Programming

To program the system:

4. Use the 3300 Configuration Tool. Refer to the 3300 Configuration Tool online help for programming information.
5. Use the System Administration Tool. Refer to the System Administration Tool online help for programming information.
6. Use IMAT.
7. Register the IP telephones.



Note: The following options are required in the DHCP server programming:

- 3 (Router) Default Gateway IP Address
- 6 DNS Server IP Address
- 66 TFTP Server ASCII String format (typically the 3300 ICP Controller)
- 67 TFTP BootFile (ASCII String = /sysro/e2t8260)
- 128 TFTP Server IP address format (typically the 3300 ICP Controller)
- 129 RTC IP address format (typically the 3300 ICP Controller)
- 130 IP phone DHCP Server (ASCII String = MITEL IP PHONE)
- 132 VLAN ID for the voice LAN (Hex - 32 bit word, optional)
- 133 Priority, values of 1-7 (Mitel recommends 6; optional).

Use IMAT

The IMAT software is used to program hardware and call characteristics for the NSUs that run PRI or R2 protocols. IMAT is also used to install software upgrades.

Maintenance activities include access to the following R2 maintenance information:

- A list of all software files and versions on the 3300 R2 NSU
- Log messages which contain a history of activities and the status of faults
- R2 database.

Use IMAT to backup the database from the 3300 R2 NSU, or to upgrade the R2 software on the 3300 R2 NSU. For more information, refer to the IMAT online Help.

To log on to an IMAT computer:

1. Launch IMAT from the desktop. IMAT may display a user-name configuration error message. Ignore this message, and press OK.
2. From the **File** menu, select **Connect to Remote Site**.

To exit the IMAT application:

1. Save any open databases.
2. On the **File** menu, click **Exit**.

Chapter 6

Troubleshooting

Troubleshooting

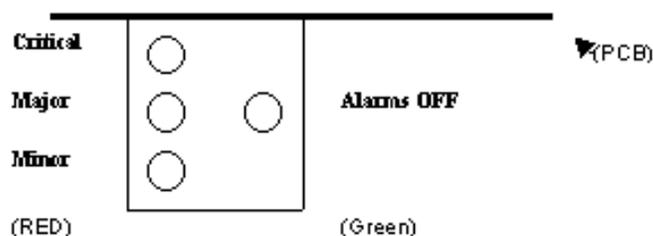
Hardware

Troubleshoot the 3300 Controller

Fiber Interface Module LEDs

FIM LED	Meaning for Local, Upper and Remote, Lower FIM
On	In frame synchronization.
Off	Power off or held in reset.
Flashing	Out of synchronization, or Tx or Rx cables might be reversed.
Note: If a remote MFC Status LED is OFF, go to the FIM and check its local FIM Status LED. If it is ON, the fiber cable may be faulty.	

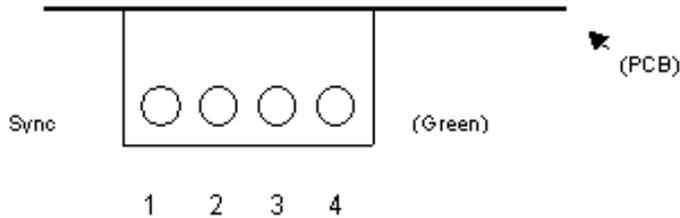
Alarm LEDs



Alarm	State	LED	Meaning
Critical	On	Red	Indicates that customer service has been lost and immediate maintenance is required. A critical alarm invokes system fail transfer if enabled. This LED will be on during POR (power on reset) or when the INIT switch is activated (resets all boards).
	Off		No alarm.
Major	On	Red	Indicates that service has degraded beyond predetermined thresholds. This LED is also on when there is a critical Alarm. This LED will be on during POR or INIT switch active.
	Off		No alarm.
Minor	On	Red	Indicates the presence of a minor malfunction in the system. A minor alarm is raised whenever the system is not fully operational. This LED is also on when there is a critical Alarm. This LED will be on during POR or INIT switch active.
	Off		No alarm.
Alarms OFF	On	Green	Alarm is on but silenced. Silence state is toggled by the Remove Alarms ON/OFF switch.
	On	Green	During POR or INIT switch active.
	Off		Alarm is audible.
	Off		During power-up state.

Alarm	State	LED	Meaning
Integrated Voice Mail			
Major	On	Red	The voice mail is not functioning or disk space is at 95%.
	Off		No alarm.
Minor	On	Red	Voice mail disk space is at 90%.
	Off		No alarm.

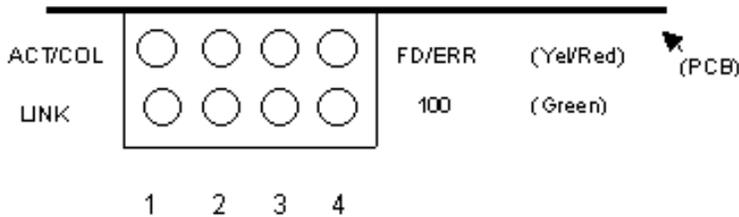
Copper Interface Module (CIM)



CIM LED Patterns

LED Pattern	Description; Local - Upper and Remote - Lower
Off	No Power
Flashing	Link established but not configured
On	Communication Link established and configured

LAN Ethernet Ports



10/100 Base TX MDI-X Ethernet

Normal mode	LED State	Color	Meaning
	Top - On	Yellow	Link activity
	Top - On	Red	Collision
	Bottom - On	Green	Link integrity
	Bottom - Off		No link integrity

	LED State	Color	Meaning
LED mode switch pressed	Top - On	Yellow	Full Duplex
	Top - On	Red	ERR
	Bottom - On	Green	100 Mbps
	Bottom - Off		10 Mbps

System Hardware Profile

To check the hardware that is installed in the controller:

1. Click System Hardware Profile from the Maintenance and Diagnostic menu.
2. Select one of the following:
 - Compute Cards for information on the E2T or RTC cards
 - Modules for information on the MMC cards (Dual FIMs, Echo Cancellers, DSPs).

Troubleshoot the 3300 Universal NSU

Link Status

LED	State	Meaning
LAN	flashing	LAN activity
MS (message system)	solid green	message link open to the system
	off	message link not open to the system; may be downloading when L0 and L1 are "walking"
ST (status)	flashing	operational; flashing in 1/2 second intervals
	off	not operational
	solid	card is booting or not operating; should be blinking in 1/2 sec intervals
L0 and L1 (on front and rear panel)	right side - solid red	no Layer 1
	right side - off	no error
	left side - solid green	D-channel established (PRI) Layer 1 established (T1, E1, DPNSS)
	left side - flashing green	Layer 1 established (PRI)
	left side - off	no link
	right side - yellow with left side - flashing green	alarm indication from far end
	right side - yellow with left side - off	blue alarm from card - normal during link startup (PRI NA or response to yellow)
	yellow and green alternating between L0 and L1	downloading (15 - 25 minutes)
	yellow alternating between L0 and L1	decompressing and copying files (2 - 4 minutes)

CIM LED Patterns

LED Pattern	Description
Off	No Power
Flashing	Powered On, BSP Running
On	Communication Link synchronized with 3300 Controller

Message Link Controlled (Card status)

LED State	Meaning
Green - On	no error
Yellow - On	out of service
Red - On	error - does not necessarily indicate total failure
Green and Yellow - On	out of service - this combination may occur at power-up
Green and Red - On	a fault has been detected
Yellow and Red - On	out of service - this combination appears at power-up
Green, Yellow and Red - On	at power-up before fully operational
No LEDs illuminated	fully operational

Fiber Interface Module LEDs

FIM Upper LED	Meaning for Local, upper and Remote, lower FIM
On	In frame synchronization
Off	Power off or held in reset
Flashing	Out of synchronization or Tx and Rx cables reversed
Note: When a remote MFC Status LED is off, go to the FIM and check its local FIM Status LED. If it is on then the fiber optic cable may be faulty.	

Troubleshoot the 3300 R2 NSU

To access the 3300 R2 NSU maintenance window:

1. Connect the modem or the straight-through cable to the 3300 R2 NSU.
2. For terminal emulation (dumb terminal), do the following:
 - Run a communications package (for example, ProComm Plus ©)
 - Ensure that the settings are 8 bits, no parity, 1 stop bit, 38400 baud rate.

Link Status

LED	State	Meaning
LAN	flashing	LAN activity
MS (message system)	solid green	message link open to the system
	off	message link not open to the system
ST (status)	flashing	operational
	off	not operational
	solid	card in booting

Link Status

LED	State	Meaning
L0 and L1	right side - solid red	error (no physical layer is present or network/line side (NT/LT) jumper is not set correctly)
	right side - off	no error
	left side - solid green	AB signaling established
	left side - flashing green	Layer 1 established
	left side - off	no link
	right side - yellow with left side - flashing green	alarm indication from far end
	right side - yellow with left side - off	blue alarm from card - normal during link startup
	Yellow and green alternating between L0 and L1	downloading (15 - 25 minutes)
	Yellow alternating between L0 and L1	decompressing copying files (2 - 4 minutes)

CIM LED Patterns

LED Pattern	Description
Off	No Power
Flashing	Powered On, BSP Running
On	Communication Link synchronized with 3300 Controller

Troubleshoot the 3300 BRI NSU

One status LED and fifteen circuit LEDs are mounted on the faceplate. The status LED shows the status of the CEPT link, and each of the circuit LEDs shows the status of one BRI circuit. The BRI circuit LEDs are also used during card initialization to indicate the progress of the self-test and to indicate that the download is in progress.

CEPT LED	State	Meaning
Status	Off	CEPT link not established
	Flashing at 1 Hz	Layer 1 established
	Flashing at 4 Hz	Layer 2 established
	On	Call in progress on the DPNSS link

3300 BRI NSU CEPT Port DIP Switch Manufacture Settings

DIP Switch	Use	Setting	Notes
1	Tx Ground	Up	Off - ungrounded Not required for RJ-45 connector
2	Rx Ground	Up	Off - ungrounded Not required for RJ-45 connector

Note: Site dependant - normally Tx is grounded but that depends if the remote Rx connection is grounded.

Troubleshoot the 3300 Universal ASU

LEDs are located on the front panel and indicate the status of the CIM circuit, ONS circuits, LS circuits, and power.



Note: The Music on Hold and Paging Ports do not have an LED to show status

CIM LED Patterns

LED Pattern	Description
Off	No Power
Flashing	Powered On, BSP Running
On	Communication Link synchronized with 3300 Controller

ONS Circuit LED Patterns

The front panel has 16 LEDs representing the ONS line circuits.

LED Pattern	Circuit State	Status
Off	Idle	NA
Steady On	Off Hook	NA
Slow Flash	Idle	Circuit is manual busy
Fast Flash	Idle	Circuit Fault
Flashing in a pattern		Loading software

LS Trunk Circuit LED Patterns

There are four LEDs on the front panel of the unit representing the LS trunk circuits

LED Pattern	Circuit State	Status
Off	Idle	NA
Steady On	Off Hook	NA
Slow Flash	Idle	Circuit is manual busy
Fast Flash	Idle	Circuit Fault

Troubleshoot the 3300 ASU

LEDs are located on the front panel and indicate the status of the CIM circuit, ONS Circuits, and power.

CIM LED Patterns

LED Pattern Status	Description
Off	No Power
Flashing	Powered On, BSP Running
On	Communication Link synchronized with 3300 Controller

ONS Circuit LED Patterns

The front panel has 24 LEDs representing the ONS line circuits.

LED Pattern Status	Circuit State	Circuit Status
Off	Idle	NA
Steady On	Off Hook	NA
Slow Flash	Idle	Circuit is 'manual busy'
Fast Flash	Idle	Circuit Fault

Troubleshoot the 3300 In-Line Power Unit

LEDs

Power Status Indications

Note: Power Active (Green) and Power Not Active (Orange)		
Port LED	Port Load Conditions	Port Voltage
Green – Off Orange – Off	Non-Active load, or unplugged port	No DC voltage is present over the wires
Green – On Orange – Off	Active load is plugged in and complies to normal load conditions	Continuous nominal DC voltage is present on the spare pairs.
Green – Off Orange – On	Overload conditions or shorted terminal port or forced external voltage feed (constant DC) into the port	Power to the port is disconnected. No DC voltage is present on the spare pairs.
Green – On Orange – On	Internal Hardware Fault	No DC voltage is present over the wires
Green – Blinking Orange – Off	Transitional mode in which Load detection is in process or discharged capacitor in the PDTE	Power is disconnected. No DC voltage is present over the wires
Green – Off Orange – Blinking	Total aggregate power exceeds pre-defined power budget	Power is disconnected the blinking port.

Main Power Status Indications - AC LED (Green)

AC LED	Main Power Status	Remarks
Off	Main internal power supply unit is unplugged or faulty	Main voltage is under 12v
On	Main power supply unit is plugged & under normal operating conditions	Main voltage is 42v to 57v
Green Blinking (Port's Green LED on)	Main power supply unit voltage exceeds specified limits	Main voltage is 38v to 42v or 57v to 59v Port's power enabled
Green Blinking (Port's Green LED off)	Main power supply unit voltage exceeds specified limits	Main voltage is under 38v or above 57v Port's power disabled

Unit Status Indications - Alarm LED (Orange)

Alarm LED	Remarks
Off	Built in Self Test passed
On	Built in Self Test failed
Blinking	S/W load failure. Reinstall S/W.

Troubleshooting

This section provides a symptom and resolution sequence in order to assist in troubleshooting minor operating problems.

If you encounter problems

- Ensure power is applied to the 3300 In-Line Power Unit
- Ensure a “crossover” type Ethernet cable is not used
- Ensure input Ethernet cable is connected to the Data In port
- Ensure output Ethernet cable is connected to the Data & Power Out port
- Ensure input and output cable pairs are attached to corresponding ports.

Symptom	Resolution
3300 In-Line Power Unit is plugged to main AC inlet, but does not power up.	Verify the use of a correct and functional AC power cord, including good and solid ground connection. Verify that the AC inlet is supplying power (test with a different device) and that the voltage is between 100Vac to 264VAC (50Hz to 60Hz). Re-connect the 3300 In-Line Power Unit to the AC inlet and verify LEDs power up sequence.
3300 In-Line Power Unit is plugged in and running, but the fans are not working.	Verify that all fan openings in the case are clear of any air blocking materials. If fans are not working, there may be an internal power supply fault.
3300 In-Line Power Unit operates, but the "AC" LED is off.	If both internal fans are working (i.e. air flows out of the case or can be heard), there is a possible internal circuitry fault. If fans are not working, there may be an internal power supply fault.
3300 In-Line Power Unit has powered up and the "Alarm" LED remains lit.	Establish whether the Power On Self Test (POST) sequence is as listed or not. If the LEDs light up in the correct sequence, the 3300 In-Line Power Unit is fully operational. If the Alarm LED remains lit following the POST sequence, the 3300 In-Line Power Unit POST detected an internal fault. Contact your local dealer.
The "Power Active" LED is lit but one of the end devices does not operate.	Verify that the "Power Active" LED that is lit corresponds to the end device that is not working. The 3300 In-Line Power Unit has successfully identified the end device as Power over LAN Enabled and is providing power. Try to connect a different end device to the same port – if the end operates, there is probably an internal fault in the previous end device.

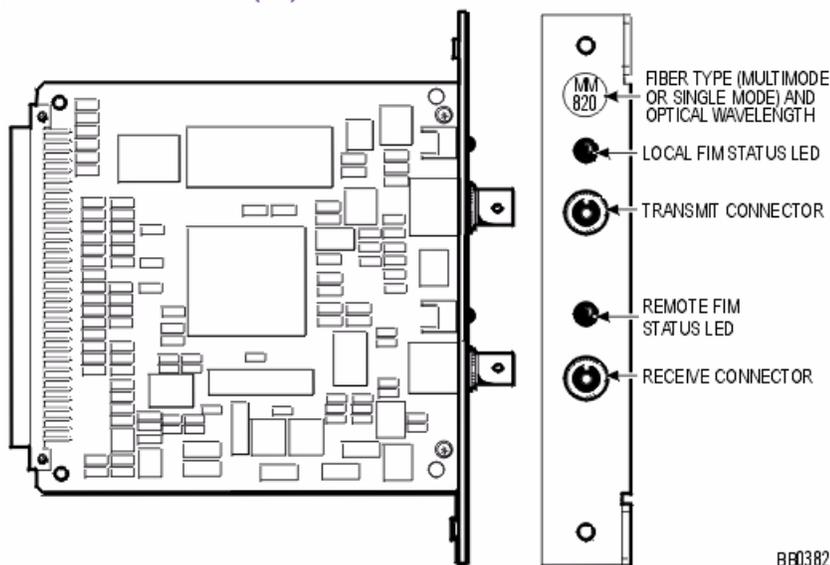
Symptom	Resolution
<p>The "Power Active" and "Power Not Active" LEDs on one port are not lit and the corresponding end device does not operate.</p>	<p>The 3300 In-Line Power Unit did not detect a connected end device and therefore the port is not providing power.</p> <p>Verify that you are using a standard UTP Category 5, 6 or 6e cable, including all 8 wires (4 pairs).</p> <p>Verify that you are not using a crossover twisted pair wire.</p> <p>Verify that the end device is connected to the "Data & Power Out" port (upper RJ-45 connector).</p> <p>Try to re-connect the same end device into a different port on the same unit – if it works, there is probably a faulty port or RJ-45 connection.</p> <p>Try to bypass the long twisted pair cable and bring the end device close to the 3300 In-Line Power Unit and connect to one of the ports using a short cable – if it works, there is probably a faulty connection or short on the long cable, or one bad RJ-45 connection along the line.</p> <p>If possible, try to connect the end device into a different 3300 In-Line Power Unit – if it works, the 3300 In-Line Power Unit is probably faulty. Try to power it up again and verify a correct power up LEDs sequence.</p>
<p>The end device operates, but there is no data link.</p>	<p>Verify that the "Power Active" LED on the 3300 In-Line Power Unit front panel is lit (continuously).</p> <p>Verify that the "Data In" and "Data & Power Out" ports correspond.</p> <p>The end device may require a Mitel Networks 3300 Phone Power adapter (p/n 57003121) at the set end to operate. If an adapter is already in use, replace it with a new adapter. If this works, discard the faulty adapter.</p> <p>Verify that you are using a standard UTP Category 5, 6 or 6e cable, including all 8 wires (4 pairs), and is 100m or less in length between the switch and the end device.</p> <p>Verify that you are not using any crossover twisted pair wires.</p> <p>Verify that the 3300 In-Line Power Unit is connected to a switch/hub with a good RJ-45 patch cord connection.</p> <p>Try to bypass the long twisted pair cable and bring the end device close to the 3300 In-Line Power Unit and connect to one of the ports using a short cable – if it works, there is probably a faulty connection or short on the long cable, or one bad RJ-45 connection along the line.</p> <p>Try to connect a different end device to the same port – if it works and the link is established, there is probably a faulty data link in the end device.</p> <p>Try to re-connect the end device to a different "Data & Power Out" port and remember to move the "Data In" port of the switch/hub accordingly – if it works, there is probably a faulty "Data & Power Out" or "Data In" port in Networks 3300 In-Line Power Unit or a bad RJ-45 connection</p>

Symptom	Resolution
A "Power Not Active" LED on one port is lit and the end device is not operating.	<p>Wait for 5 sec to 10 sec while the "Power Not Active" LED is on and the end device is connected – if it changes to "Power Active", there was a charged capacitor in the end device, which was discharged after being plugged in. Only then the end device can be detected and activated.</p> <p>Verify that you are not using any crossover cable between the 3300 In-Line Power Unit "Power & Data Out" port to the end device.</p> <p>The end device may require a Mitel Networks 3300 Phone Power adapter (p/n 57003121) at the set end to operate. If an adapter is already in use, replace it with a new adapter. If this works, discard the faulty adapter.</p> <p>Try to bypass the long twisted pair cable and bring the end device close to the 3300 In-Line Power Unit and connect to one of the ports using a short cable – if it works, there is probably a faulty connection or short on the long cable, or one bad RJ-45 connection along the line.</p> <p>Move the device into a different output port – if it works, there is probably a faulty port or bad RJ-45 connection.</p> <p>Unplug the device and verify that the "Power Not Active" LED turns off – if not, there is probably a faulty port or internal short in the RJ-45 socket.</p>
One of the ports is powering an end device without turning the "Power Active" LED on.	Re-connect the end device to a different "Data & Power Out" port – if the LED turns on, there is a fault in the previous output port (probably a faulty LED).
Is it safe to keep the 3300 In-Line Power Unit running while "Power Not Active" LED is on?	Yes, this is a safe condition. "Power Not Active" conditions mean that a non-power-ready device was detected, terminals 4/5 and 7/8 are shorted together or forced external power feed into the port. During these conditions, port power is disconnected. However, a single low power pulse every 5 sec continues to sense the line.

Peripheral Unit

Troubleshoot Fiber Interface Module

FIBER INTERFACE MODULE (FIM)



BB0382

There are two LEDs on each FIM. The top LED indicates the status of the FIM itself; the bottom LED indicates the status of the other FIM (the FIM connected to the far end of the fiber optic cable).

FIM LED States

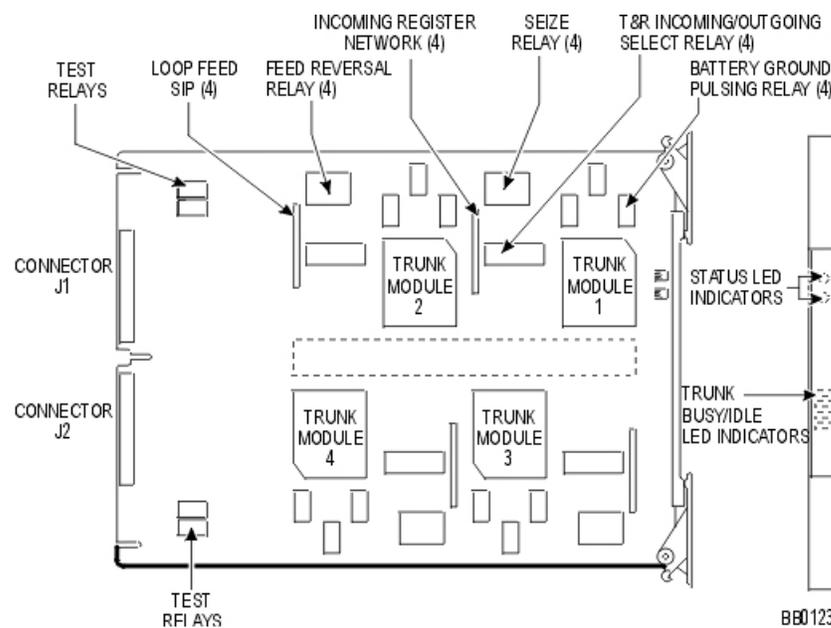
State	Meaning
On	In frame synchronization
Off	Power off or held in reset
Flashing	Out of synchronization (see Notes below) OR Tx or RX cables could be reversed.



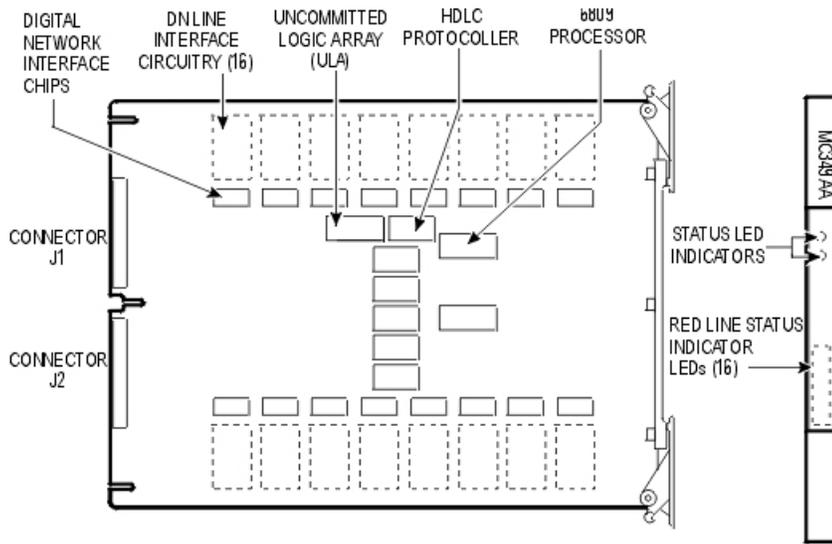
Notes:

1. The FIM in the 3300 ICP monitors the synchronization of the clock that appears on the fiber link coming from the FIM in the peripheral or DSU Cabinet.
2. The FIM in the peripheral or DSU cabinet monitors the synchronization of the clock that appears on the fiber link from the main control cabinet FIM. This synchronization state is encoded along with other information and sent back to the main control cabinet.

Troubleshoot the DID Loop/Tie Trunk Card

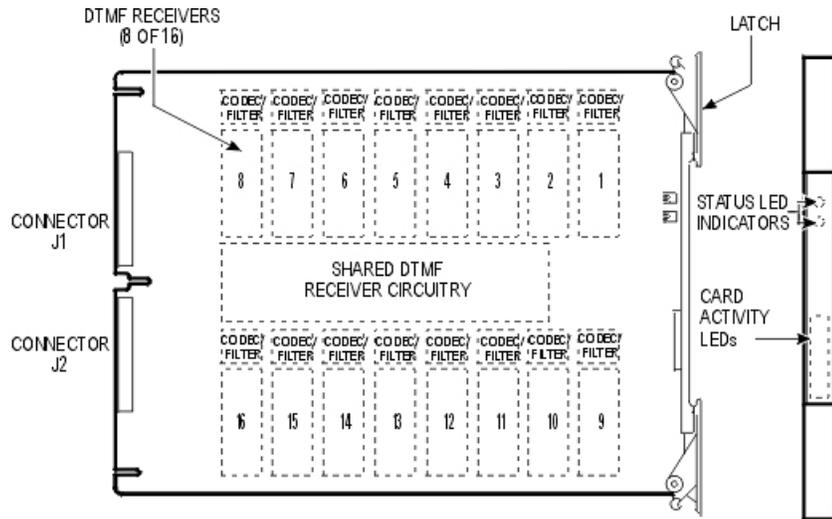


Troubleshoot the DNI Line Card



RR0120

Troubleshoot the DTMF Receiver Card



RR0119

Troubleshoot E&M Trunk Card

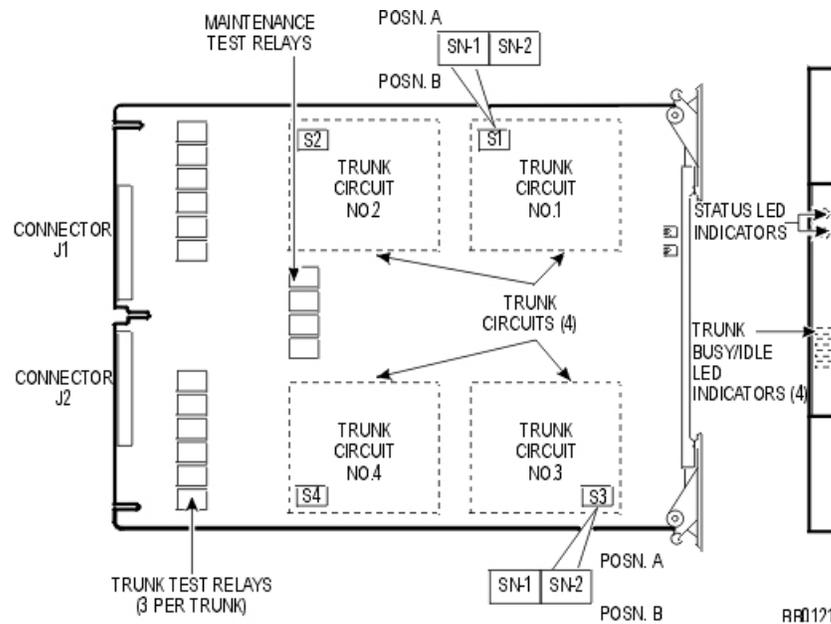
Trunk Circuit Configuration

CONFIGURATION SERIAL NO.	SWITCH POSITION (NOTE)		CIRCUIT CONFIGURATION	TYPES OF INTERFACE CIRCUITS	
	SN-1	SN-2		SIGNAL CARRIER SET TYPES	COLLOCATED TRUNK TYPES
1	A	B		TYPE I	NONE
2	B	A		TYPE II TYPE IV	TYPE II TYPE IV
3	B	B		TYPE V	TYPE I TYPE III TYPE V

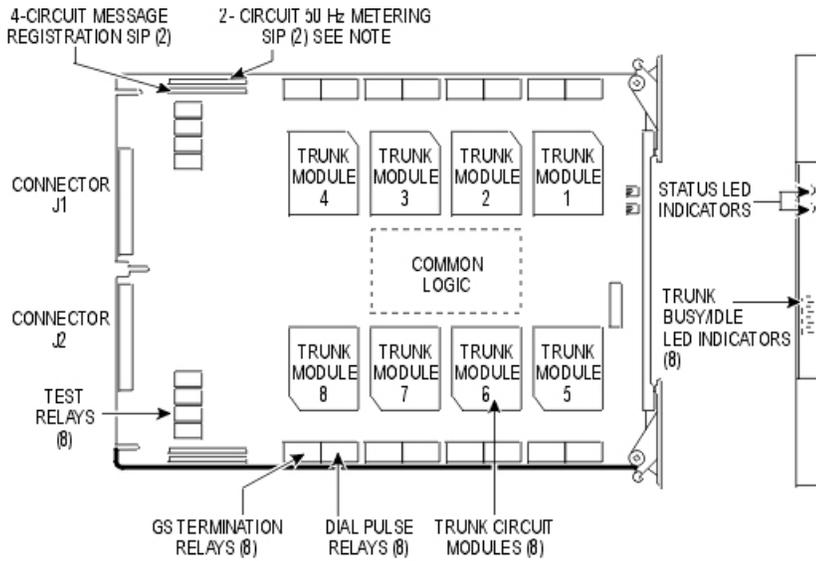
NOTE: SWITCH SECTIONS ARE SN-1 AND SN-2, WHERE N IS THE PARTICULAR TRUNK CIRCUIT NUMBER ON THE CARD

BB0149

SN-1 and SN-2 Dip Switches

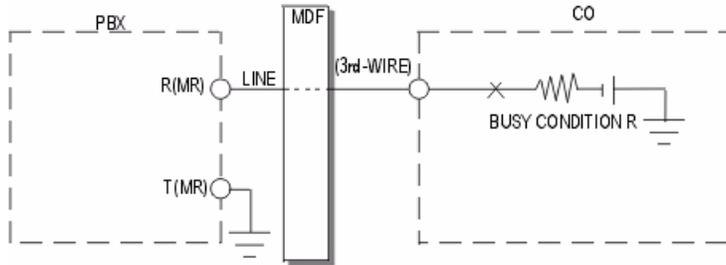


Troubleshoot LS/GS Trunk Card

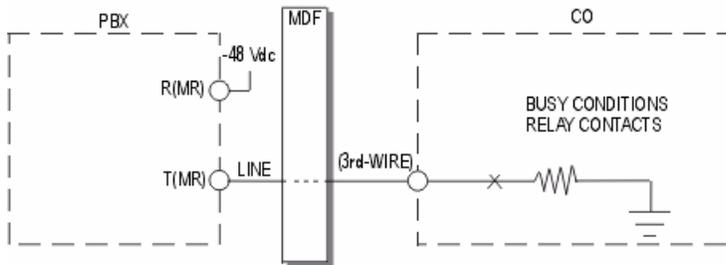


NOTE: 50 Hz METERING SIP INSTALLED ON MC340AB, MC340AD AND MC340AE CARDS ONLY. BB0117

DICTIONATION ACCESS



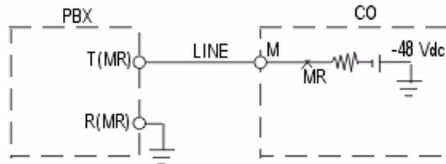
A) DICTIONATION ACCESS - BATTERY DRIVEN BUSY CONDITION



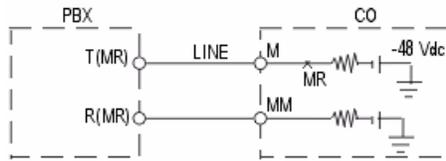
B) DICTIONATION ACCESS - GROUND DRIVEN BUSY CONDITION

RR1251

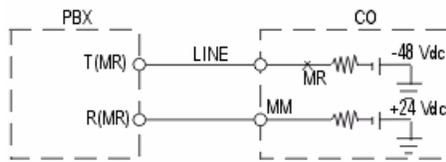
TERMINATION TYPES



A) MESSAGE REGISTRATION, -48 Vdc, GROUND RETURN



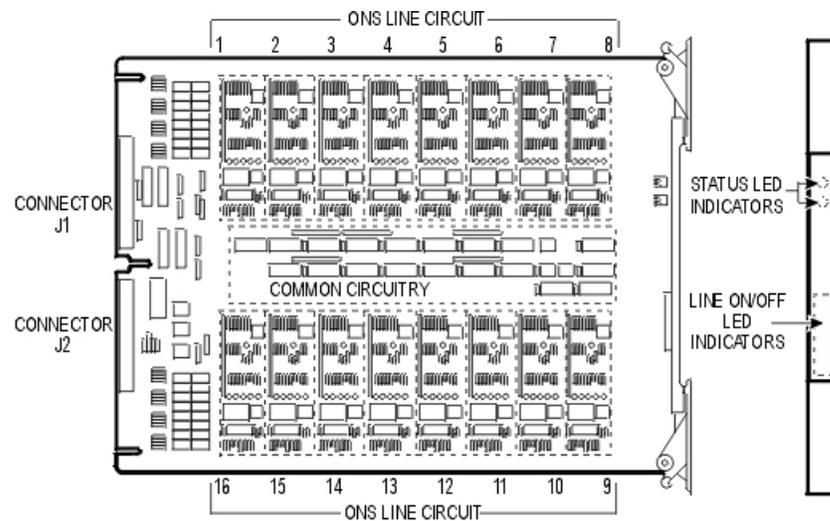
B) MESSAGE REGISTRATION, -48 Vdc, METALLIC RETURN



C) MESSAGE REGISTRATION, -72 Vdc, METALLIC RETURN

RR0266

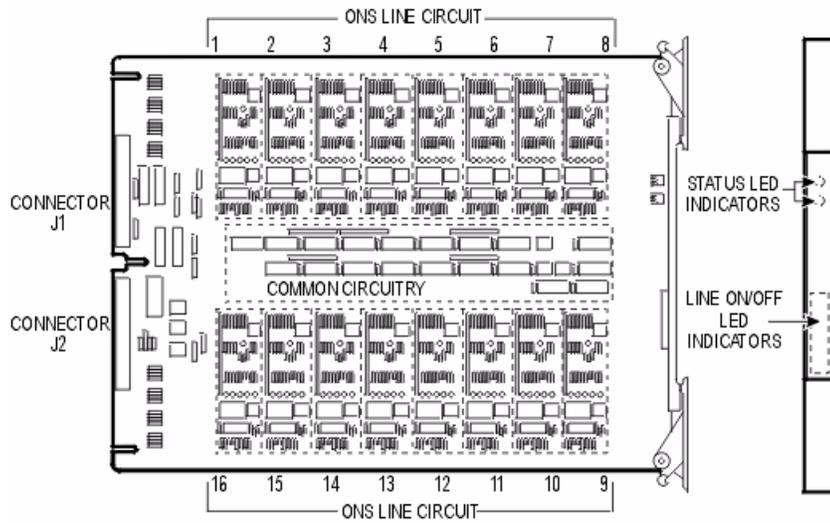
Troubleshoot the ONS Line Card



RR0367

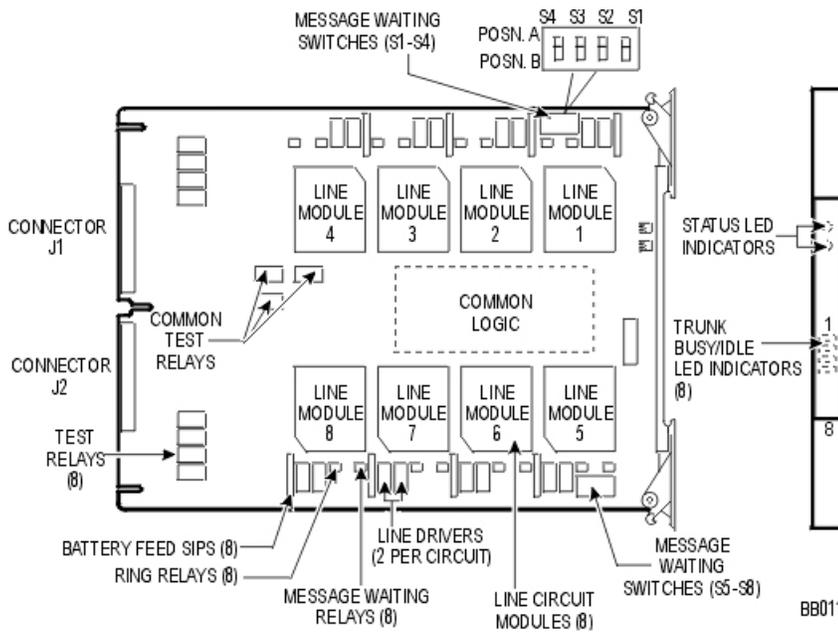
Troubleshoot the ONS CLASS/CLIP Card

ONS CLASS/CLIP LINE CARD



BB1202

Troubleshoot the OPS Line Card

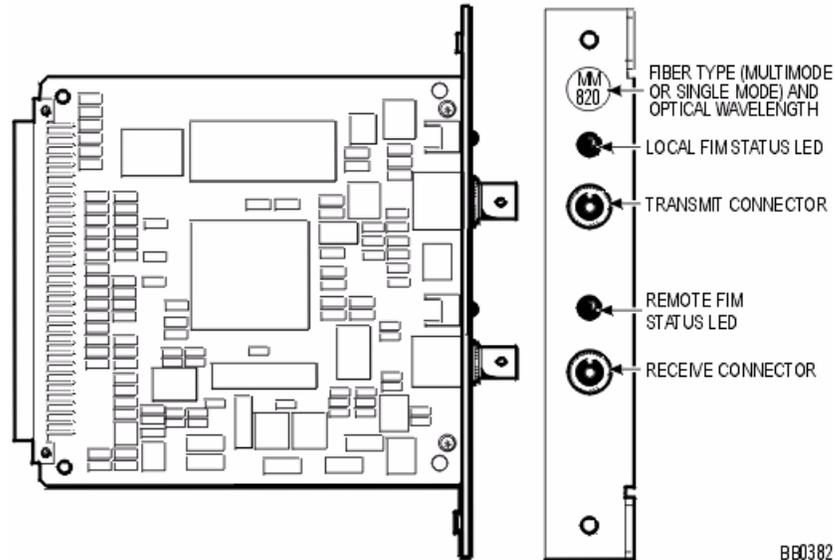


BB0118

DSU Node

Troubleshoot Fiber Interface Module

FIBER INTERFACE MODULE (FIM)



There are two LEDs on each FIM. The top LED indicates the status of the FIM itself; the bottom LED indicates the status of the other FIM (the FIM connected to the far end of the fiber optic cable).

FIM LED States

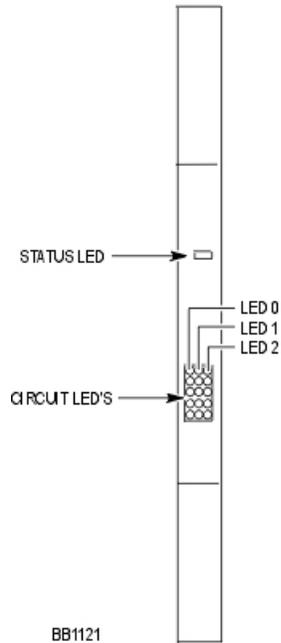
State	Meaning
On	In frame synchronization
Off	Power off or held in reset
Flashing	Out of synchronization (see Notes below) OR Tx or RX cables could be reversed.



Notes:

1. The FIM in the 3300 ICP monitors the synchronization of the clock that appears on the fiber link coming from the FIM in the peripheral or DSU Cabinet.
2. The FIM in the peripheral or DSU cabinet monitors the synchronization of the clock that appears on the fiber link from the main control cabinet FIM. This synchronization state is encoded along with other information and sent back to the main control cabinet.

Troubleshoot the BRI Card



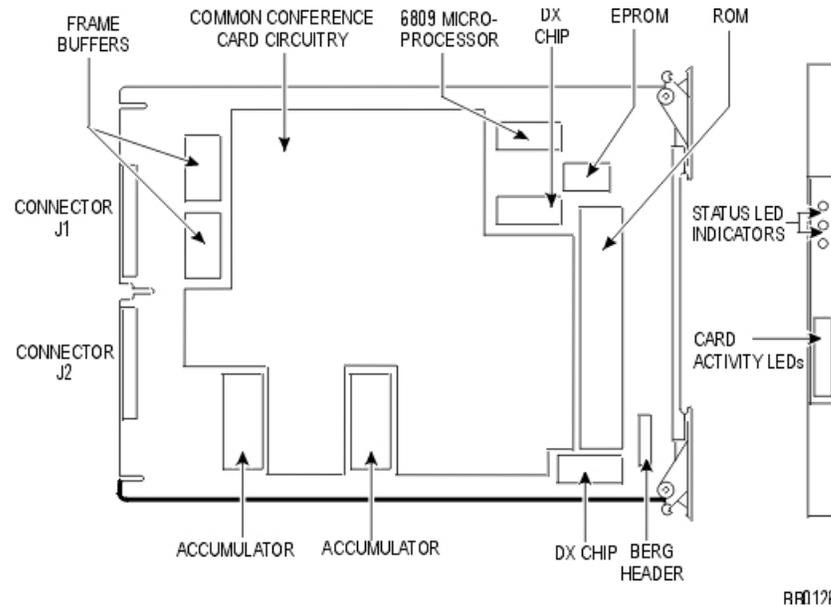
One status LED and fifteen circuit LEDs are mounted on the faceplate. The status LED shows the status of the CEPT link, and each of the circuit LEDs shows the status of one BRI circuit. The BRI circuit LEDs are also used during card initialization to indicate the progress of the self-test and to indicate that the download is in progress.

BRI LED	State	Meaning
Status	Off	BRI circuit not in use (no device connected to circuit)
	Flashing at 1 Hz	Idle device connected to the circuit (layer 1 established)
	Flashing at 4 Hz	Call being established from device on circuit (layer 2 established)
	On	Call in progress at device on circuit (layer 3 established)

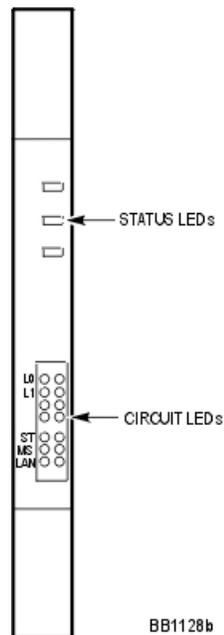
Troubleshoot the CEPT/DS1 Formatter Card

Refer to PRI Card troubleshooting for a description of LED behavior.

Troubleshoot the Conference Card



Troubleshoot the PRI Card



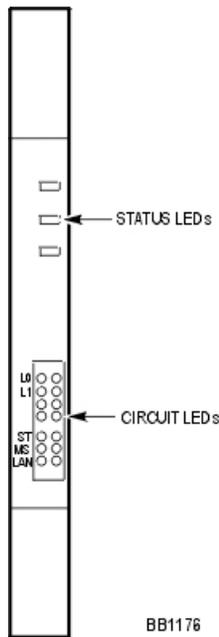
Faceplate LEDs

Three status LEDs and 4 circuit LEDs are mounted on the PRI card faceplate. Each of the card circuit LEDs shows the status of one PRI circuit.

PRI Card Link Status

LED	State	Meaning
MS (message system)	solid green	message link open to the system
	off	message link not open to the system
ST (status)	flashing	operational
	off	not operational
	solid	card is booting
L0 and L1	right side - solid red	error
	right side - off	no error
	left side - solid green	D-channel established
	left side - flashing green	Layer 1 established
	left side - off	no link
	right side - yellow with left side - flashing green	alarm indication from far end
	right side - yellow with left side - off	blue alarm from card - normal during link startup

Troubleshoot the R2 Card



Faceplate LEDs

Three status LEDs and 4 circuit LEDs are mounted on the R2 card faceplate. Each of the card circuit LEDs shows the status of one R2 circuit.

Link Status

LED	State	Meaning
MS (message system)	solid green	message link open to the system
	off	message link not open to the system
ST (status)	flashing	operational
	off	not operational
	solid	card in booting
L0 and L1	right side - solid red	error (no physical layer is present or network/line side (NT/LT) jumper is not set correctly)
	right side - off	no error
	left side - solid green	AB signaling established
	left side - flashing green	Layer 1 established
	left side - off	no link
	right side - yellow with left side - flashing green	alarm indication from far end
	right side - yellow with left side - off	blue alarm from card - normal during link startup

Other

Troubleshooting

Refer to the System Administration Tool for additional troubleshooting information.

