

# Cisco 3640 - PBX Interoperability: Nortel Option 11E PBX with a 2MFT E1 Card with E1-R2 Signaling

## Introduction

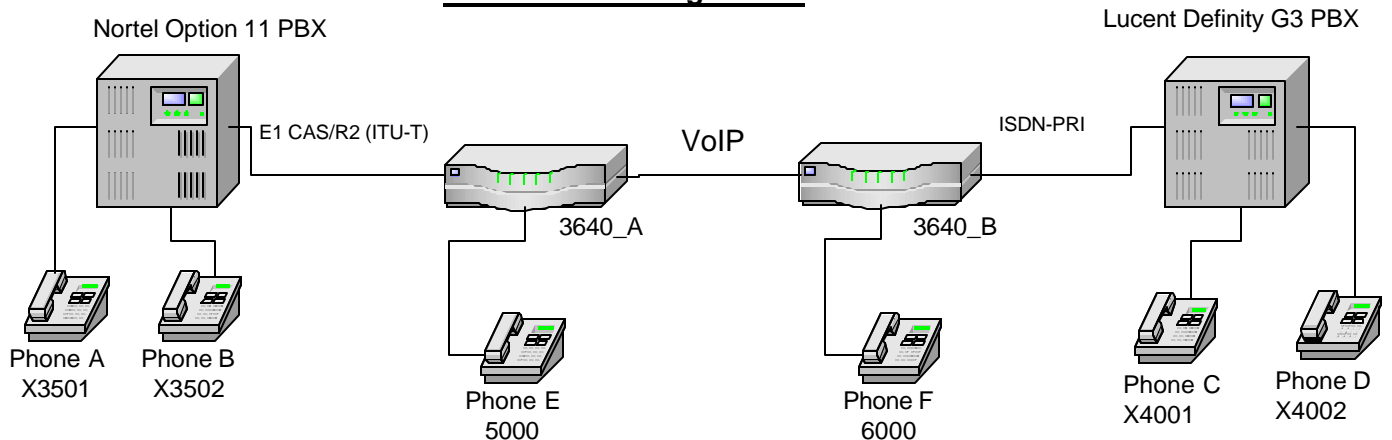
This document contains test results of PBX interoperability testing on E1-R2 analog signaling on the Cisco 3640 with 2MFT E1 card and the Nortel Option 11E PBX.

R2 signaling is an international signaling standard that is common to channelized E1 Networks. However there is no single signaling standard for R2. The ITU-T Q.400-Q.490 recommendations define R2, but many countries and geographic regions have their own E1 R2 specifications which deviate from the ITU-T recommendations.

There are two aspects of R2 signaling: line signaling and interregister signaling. R2 line signaling includes R2 digital, R2 analog, and R2 pulse. R2 interregister signaling includes R2 compelled, R2 non-compelled, and R2 semi-compelled. Most country variations in R2 signaling are in the interregister signaling portion.

For interoperability testing purposes, it was not necessary to go through all the country specific R2 settings available on the Cisco 3640 to be tested against the Nortel PBX since the Nortel Multifrequency Incoming and Outgoing tables are user defined. The Nortel PBX was configured so that it matches the Cisco 3640 router defaults when set to country code ITU-T.

### Basic Call Setup End-to-End Configuration



## Network Topology

As shown in the network topology diagram above, testing was done using the toll by-pass operation mode. The interoperability testing was done on the R2 link between a Cisco 3640 (3640\_A) router and the Nortel Option 11E PBX. The second Cisco 3640 (3640\_B) router was



connected to a Lucent PBX via an ISDN E1 PRI link. This set-up is to ensure that IOS translates the call status messages between R2 and ISDN PRI.

### Limitations

- An abnormal operation on the Cisco 3640 router was found when a call was made to a BUSY station on the Nortel PBX. Although the Nortel correctly sends a Level 2 Group B Signal number “3” (for BUSY), the 3640 does not seem recognize this as a BUSY state. The Cisco 3640 does not return a busy progress or any other tone to notify the caller of the current state. Refer to Section 3.2 and DDTS CSCdv90818.
- An abnormal operation on the Cisco 3640 was found when a call was made to an Invalid Number on the Nortel PBX. Although the Nortel correctly sends a Level 2 Group B Signal number “5” (for VACC or Vacant Number), the 3640 does not seem to recognize this state. The Cisco 3640 does not return any progress tone to notify the caller of the current state. Refer to Section 3.3 and DDTS CSCdv90818.

### System Components

#### Hardware Requirements

- Cisco 3640 router
- Nortel PBX Option 11E
  - 2MB DTI card (NTAK10xx)
  - External MFC Sender/Receiver card (NT5K21xx)

**Note:** The Option 11C Controller Card does not need an External MFC Sender/Receiver card as it already comes with an internal MFC tone sender/receiver

#### Software Requirements

- Cisco IOS Software Release 12.2(4)T
- Nortel PBX Option 11E Software Package 128

### Configuration

#### Configuring the Nortel PBX Option 11E

##### Configuring Common Equipment

LD 22

PT2000

MARP NOT ACTIVATED

REQ PRT

TYPE CEQU

CEQU

MPED 8D

SUPL 000 004 008 012



016 032 036 040  
048 P064  
XCT 008 000  
CONF 029 030 031  
DTI2 02  
MISP  
MTYP 384K

REQ \*\*\*\*

>

### Configuring the Route Data Block

>LD 21  
PT1000  
REQ: PRT  
TYPE: RDB  
CUST 0  
ROUT 102  
TYPE RDB  
CUST 00  
DMOD  
ROUT 102  
TKTP DID  
SAT NO  
RCLS EXT  
DTRK YES  
DGTP DTI2  
ISDN NO  
DSEL VCE  
PTYP DTO  
AUTO NO  
DNIS NO



ICOG IAO  
RANX NO  
SRCH LIN  
STEP  
ACOD 702  
TARG  
BILN NO  
OABS  
INST  
MFC R2MF  
MFCI 1  
R2MD NO  
SGL NO  
BSSU NO  
MFCO 2  
OPP NORM  
SWP NORM  
TIMR MFC 12032  
MFO 0  
ICF 512  
OGF 512  
EOD 13952  
DSI 34944  
NRD 10112  
DDL 70  
ODT 4096  
RGV 640  
FLH 510  
GTO 896  
GTI 896  
SFB 3



TFD 0  
SST 5 0  
DTD NO  
SCDT NO  
2 DT NO  
NEDC ETH  
FEDC ETH  
CPDC NO  
DLTN NO  
HOLD 02 02 40  
SEIZ 02 02  
SVFL 02 02  
OPCB NO  
DDO NO  
DRNG NO  
CDR NO  
CCO NO  
NATL YES  
SSL  
CFWR NO  
IDOP YES  
MUS NO  
MR NO  
PANS YES  
RACD NO  
RUCS 0  
EQAR NO  
FRL 0 0  
FRL 1 0  
FRL 2 0  
FRL 3 0



FRL 4 0  
FRL 5 0  
FRL 6 0  
FRL 7 0  
TTBL 0  
OHTD NO  
PLEV 2  
OPR NO  
PRDL NO  
DNSZ 0  
RCAL NO  
MCTS NO  
ALRM NO  
BTT 30  
ACKW NO  
NCNI 0  
CNIE NO  
CNIT YES  
CTAT YES  
ART 0  
OPDL 0  
PECL NO  
DCTI 0  
NADT 0  
SGRP 0  
REQ: \*\*\*\*  
>

### Configuring the Trunk

>LD 20  
PT0000  
MARP NOT ACTIVATED



```
REQ: PRT
TYPE: TNB
TN 2 1
DATE PAGE DES
TN 002 01
TYPE DID
CUST 0
TRK DTI2
SICA 3
PDCA 1
PCML A
NCOS 0
RTMB 102 1
NITE
CLS UNR MFC CNA WTA LPR APN THFD BARD
      P10
MFL 4
MFPD NO
TKID
DTCR NO
DATE 10 APR 1993
```

```
NACT ****
```

```
>
```

### Configuring the Signaling Category

```
SIGNALING CATEGORY 3 (SICA 3) CONFIGURATION FOR IMMEDIATE START
```

```
>LD 73DDB000
```

```
UDATA: 067959 0 PDATA: 065844 44
```

```
DISK RECS AVAIL: 512
```



REQ PRT  
TYPE DTI2  
FEAT ABCD  
SICA 3  
TNLS IN/OUT CALLS  
IDLE (S) 1101  
IDLE (R) 1101  
FALT (S) 1001  
FALT (R) 1001  
P RRC (S) UNUSED  
INCOMING CALLS  
E SEZ (R) 0101  
SEZD (R) UNUSED  
SEZV (R) UNUSED  
P CALL (R) UNUSED  
SEZA (S) 1101  
    TIME        150  
    FSZA        NO  
PRCS (S) UNUSED  
P WNKS (S) UNUSED  
P DIGT (R) UNUSED  
NRCV (S) UNUSED  
P EOSF (S) UNUSED  
EOSF (S) UNUSED  
P EOSB (S) UNUSED  
EOSB (S) UNUSED  
P OPCA (R) UNUSED  
E CONN (S) 0101  
CONN (R) 0001  
P BURS (S) UNUSED





P BURS (R) UNUSED  
C CLRB (S) 1101  
P RCTL (S) UNUSED  
P RCOD (S) UNUSED  
P OPRS (R) UNUSED  
P NXFR (S) UNUSED  
P ESNW (S) UNUSED  
P CAS (S) UNUSED  
CLRF (R) UNUSED  
SOS (R) UNUSED  
OUTGOING CALLS  
E SEZ (S) 0101  
SEZD (S) UNUSED  
SEZV (S) UNUSED  
SEZA (R) 1101  
P WNKS (R) UNUSED  
P EOS (R) UNUSED  
CONN (S) 0001  
E CONN (R) 0101  
P OPRC (R) UNUSED  
P BURS (S) UNUSED  
P BURS (R) UNUSED  
C CLRB (R) 1101  
P RCTL (R) UNUSED  
P NXFR (R) UNUSED  
P ESNW (R) UNUSED  
P CAS (R) UNUSED  
CLRF (S) UNUSED  
SOS (R) UNUSED

UDATA: 067959 0 PDATA: 065844 44



DISK RECS AVAIL: 512

## Configuring the Multifrequency Compelled Signaling Table

### Incoming Call Multifrequency Compelled Signaling Table

>LD 94

MFCT000

UDATA: 067959 0 PDATA: 065844 44

DISK RECS AVAIL: 512

REQ PRT

TYPE R2MFICOG ICTTBNO 1LVNO

TYPE R2MF

ICOG ICT

MAXT 2

TBNO 1

EECD 1

SMFC NO

SCNT NO

LVNO 1

RECV 1 DGT1

2 DGT2

3 DGT3

4 DGT4

5 DGT5

6 DGT6

7 DGT7

8 DGT8

9 DGT9



10 DGT0

11 HTDM

15 EODL

XMIT NEXT 1

TERM 6

COMP 3

CONG 4

SCAT 5

SCNI 5

FAIL 15

TYPE R2MF

ICOG ICT

MAXT 2

TBNO 1

EECD 1

LVNO 2

RECV 1 NOPR

2 PRIO

3 NOPR

5 OPER

6 NOPR

7 REST

8 NOPR

9 PRIO

10 OPER

11 NOPR

12 NOPR

13 NOPR



XMIT IDLE 6  
BUSY 3  
CONG 4  
VACC 5  
OUTT 8  
FAIL 9

REQ

### **Outgoing Call Multifrequency Compelled Signaling Table**

REQ PRT  
TYPE R2MF  
ICOG OGT  
TBNO 2  
LVNO

TYPE R2MF  
ICOG OGT  
MAXT 2  
TBNO 2  
SET 1  
ATT 1  
TIE 6  
NTT 6  
EECD 2  
SMFC NO  
SCNT NO  
LVNO 1

RECV 1 NEXT



2 TNM1  
3 COMP  
4 CONG  
5 CCNI  
6 TERM  
7 TNM2  
8 TNM3  
9 SCNI  
10 TFST  
11 TNXT  
15 FAIL

XMIT DGT1 1  
DGT2 2  
DGT3 3  
DGT4 4  
DGT5 5  
DGT6 6  
DGT7 7  
DGT8 8  
DGT9 9  
DGT0 10  
ECNI 15  
EODL 15

TYPE R2MF  
ICOG OGT  
MAXT 2  
TBNO 2  
SET 1  
ATT 1



TIE 6  
NTT 6  
EECD 2  
LVNO 2

RECV 2 IDLE  
3 BUSY  
4 CONG  
5 VACC  
6 IDLE  
8 OUTT  
9 FAIL

XMIT NOPR 1  
OPER 5  
REST 7

REQ \*\*\*\*

>

### Configuring the Digital Station Phone

>LD 11SL1000  
UDATA: 067959 0 PDATA: 065844 44  
DISK RECS AVAIL: 512

TNS	AVAIL:	896	USED:	104	TOT:	1000
ACD AGENTS	AVAIL:	1000	USED:	0	TOT:	1000
AST SET	AVAIL:	100	USED:	0	TOT:	100

REQ: PRTTYPE: 2616



TN 001 0 0 0DATE PAGE DES  
DES TEST2  
TN 001 0 00 00  
TYPE 2616  
CDEN 8D  
CUST 0  
AOM 0  
FDN  
TGAR 0  
LDN NO  
NCOS 0  
SGRP 0  
RNPG 0  
SCI 0  
SSU  
XLST  
SCPW  
SFLT NO  
CAC 0  
CLS UNR FBD WTA LPR MTD FND HTD ADD HFD  
MWD AAD IMD XHD IRD NID OLD VCE DRG1  
POD DSX VMD CMSD CCSD SWD LND CNDA  
CFTD SFD MRD PDN DDV **CNIA**  
ICDD CDMD LLCN MCTA AUTU  
GPUD DPUD DNDA CFXA ARHD CLTD ASCD  
CPFA CPTA HSPD ABDD DELD CFHD FICD NAID  
UDI RCC HBTD AHD DDGA NAMA MIND PRSD NRWD NRCN NROD  
EXR0  
USRD ULAD OCB  
CPND\_LANG ENG



HUNT  
PLEV 02  
AST  
IAPG 0  
ITNA NO  
DGRP  
MLWU\_LANG 0  
DNDR 0  
KEY 00 SCR 3501 MARP  
CPND  
CPND\_LANG ROMAN  
NAME BIG BIRD  
XPLN 20  
DISPLAY\_FMT FIRST, LAST  
01  
02  
03 CFW 12 3502  
04 AO6  
05 TRN  
06 DSP  
07  
08 ADL 16  
09 ADL 16  
10 ADL 16  
11 ADL 16  
12 ADL 16  
13 ADL 16  
14 ADL 16  
15 TRN  
DATE 13 APR 1993





NACT \*\*\*\*

>

## Configuring the External Multi-frequency Sender/Receiver Board

### External Multi-frequency Sender/Receiver Board Configuration

>LD 20

PT0000

REQ: PRT

TYPE: MFC

TN 008C

DEN

DATE

PAGE

TN 008 0 00 00

TYPE MFC

CDEN 8D

DATE 3 APR 1993

TN 008 0 00 01

TYPE **MFC**

CDEN 8D

DATE 3 APR 1993

DTC105

TN 008 0 00 02

TIM000 04:30 13/4/1993 CPU 0



TYPE **MFC**

CDEN 8D

DATE 3 APR 1993

TN 008 0 00 03

TYPE **MFC**

CDEN 8D

DATE 3 APR 1993

NACT \*

### **Software Packages Installed**

>LD 22

REQ PRT

TYPE PKG

OPTF 1

CUST 2

CDR 4

CTY 5

RAN 7

TAD 8

DNDI 9

EES 10

INTR 11

ANI 12



ANIR	13
BRTE	14
DNDG	16
MSB	17
SS25	18
DDSP	19
ODAS	20
DI	21
DISA	22
CHG	23
CAB	24
BAUT	25
BQUE	28
NCOS	32
CPRK	33
SSC	34
IMS	35
UST	35
UMG	35
ROA	36
BACD	40
ACDB	41
ACDC	42
LMAN	43
MUS	44
ACDA	45
MWC	46
AAB	47
GRP	48
NFCR	49
ACDD	50



LNK	51
FCA	52
SR	53
AA	54
HIST	55
AOP	56
BARS	57
FCBQ	61
SNR	64
HOT	70
DHLD	71
LSEL	72
SS5	73
DRNG	74
PBXI	75
DLDN	76
CSL	77
OOD	79
SCI	80
CCOS	81
RSDB	82
CDRQ	83
TENS	86
FTDS	87
DSET	88
TSET	89
LNR	90
DLT2	91
PXLT	92
SUPV	93
CPND	95



DNIS	98
BGD	99
RMS	100
MR	101
AWU	102
PMSI	103
OPAO	104
LLC	105
MCT	107
ICDR	108
APL	109
TVS	110
TOF	111
IDC	113
AUXS	114
DCP	115
PAGT	116
CBC	117
CCDR	118
EMUS	119
PLDN	120
FTC	125
OPCB	126
BKI	127
<b>MFC</b>	<b>128</b>
DTI2	129
SUPP	131
TBAR	132
ENS	133
LSCM	137
DTD	138



FFC	139
DCON	140
MPO	141
ABCD	144
ISDN	145
PRA	146
IEC	149
DNXP	150
CDRE	151
PRI2	154
ACNT	155
THF	157
FNP	160
ISDN INTL SUP	161
SAR	162
MINT	163
LAPW	164
HOSP	166
COOP	169
ARIE	170
CPGS	172
ECCS	173
AAA	174
EOVF	178
HVS	179
DKS	180
SACP	181
TFM	182
OVLP	184
EDRG	185
POVR	186



RPA	187
L1MF	188
SECL	191
RCK	193
OHOL	196
FFCSF	198
AINS	200
IPRA	202
XPE	203
XCT0	204
XCT1	205
MLWU	206
HSE	208
MAID	210
MLIO	211
VAWU	212
EAR	214
BRI	216
MWI	219
MSDL	222
SSAU	229
BRIT	233
FCDR	234
BRIL	235
MCMO	240
ALRM_FILTER	243
SCDR	251
ARFW	253
PHTN	254
INBD	255
ADMINSET	256



ATX 258  
CDRX 259  
UIGW 283  
CHINA 285  
ADSP 289  
CHTL 292  
BTD 294

Software Release

>LD 22

PT2000

REQ ISS

VERSION 1411

RELEASE 21

ISSUE 23 +

## **Configuring the Cisco 3640**

```
3640_A# show running config
```

```
Building configuration...
```

```
Current configuration : 1646 bytes
```

```
!
```

```
version 12.2
```

```
no parser cache
```

```
service nagle
```





```
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname 3640_A
!
logging buffered 12800 debugging
aaa new-model
!
!
aaa group server tacacs+ AuRAS
!
aaa session-id common
!
!
!
voice-card 1
!
ip subnet-zero
!
!
no ip domain-lookup
!
isdn switch-type primary-dms100
isdn voice-call-failure 0
!
voice rtp send-recv
!
voice class codec 1
  codec preference 1 g729r8
  codec preference 2 g711ulaw
```



```
    codec preference 3 g711alaw
!
!
!
!
!
controller E1 1/0
shutdown
    framing CRC4 Australia
!
controller E1 1/1
    framing NO-CRC4
    ds0-group 1 timeslots 1 type r2-analog r2-compelled ani
    cas-custom 1
!
!
!
!
interface Ethernet0/0
    ip address 10.18.1.2 255.255.255.0
    no ip mroute-cache
    full-duplex
    no cdp enable
!
interface Ethernet0/1
    ip address 10.1.1.129 255.255.255.0
    no ip mroute-cache
    half-duplex
    no cdp enable
!
ip classless
```



```
no ip http server
ip pim bidir-enable
!
no cdp run
!
!
snmp-server manager
call rsvp-sync
!
voice-port 1/1:1
!
voice-port 2/0/0
!
voice-port 2/0/1
!
!
mgcp profile default
!
dial-peer cor custom
!
!
!
dial-peer voice 3 voip
  destination-pattern 4...
  voice-class codec 1
  session target ipv4:10.18.1.1
  no vad
!
dial-peer voice 4 pots
  destination-pattern 5000
  port 2/0/0
```



```
!  
dial-peer voice 8 pots  
destination-pattern 3...  
direct-inward-dial  
port 1/1:1  
prefix 3  
!  
dial-peer voice 9 pots  
destination-pattern 6000  
port 2/0/1  
!  
dial-peer voice 2 voip  
destination-pattern 4...  
!  
!  
line con 0  
exec-timeout 0 0  
privilege level 15  
speed 115200  
line aux 0  
line vty 0 4  
!  
!  
end
```

### Important Information

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.



IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.



**Corporate Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 526-4100

**European Headquarters**

Cisco Systems International BV  
Haarlerbergpark  
Haarlerbergweg 13-19  
1101 CH Amsterdam  
The Netherlands  
www-europe.cisco.com  
Tel: 31 0 20 357 1000  
Fax: 31 0 20 357 1100

**Americas Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
www.cisco.com  
Tel: 408 526-7660  
Fax: 408 527-0883

**Asia Pacific Headquarters**

Cisco Systems, Inc.  
Capital Tower  
168 Robinson Road  
#22-01 to #29-01  
Singapore 068912  
www.cisco.com  
Tel: +65 317 7777  
Fax: +65 317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on **the Cisco Web site at [www.cisco.com/go/offices](http://www.cisco.com/go/offices).**

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia • Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland • Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland • Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden • Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

Copyright 2003 Cisco Systems, Inc. All rights reserved. Cisco, Cisco Systems, and the Cisco Systems logo are registered trademarks or trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries. All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0301R)