Cisco 7200 Series Router-PBX Interoperability: Nortel Option 11c PBX and VXC-2TE1+ Card with E1 ISDN PRI QSIG

This document describes the interoperability and configuration of a Cisco 7200 series router with a VXC-2TE1 card and a Nortel Option 11c PBX using ISDN PRI E1 QSIG signaling. It includes the following sections:

- System Components
- Configuration Tasks
- Caveats

System Components

PBX Model	Nortel Option 11c
PBX Release	Version 2111 Rel. 24
Telephony Signaling	E1 ISDN PRI QSIG
Voice Gateway	Cisco 7200 Series Router
Gateway Release	12.2(1)
VoX Protocol	H.323

Configuration Tasks

See the following sections for configuration tasks for this feature:

- Set Up
- Nortel Option 11c PBX Configuration
- Cisco 7200 Series Router Configuration

Set Up

This section includes the following information:

- Connectivity Diagrams
- Set Up Notes

Connectivity Diagrams

Figure 1: Test Configuration

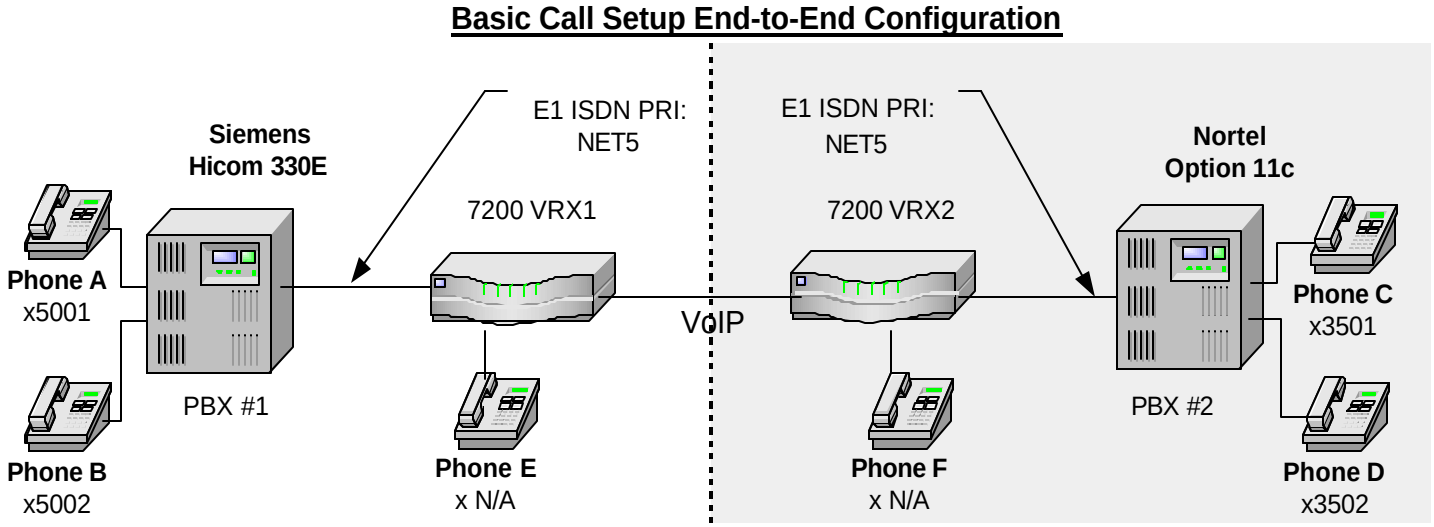

Figure 1 represents the configuration used for testing: a Cisco 7200 connected to a Nortel Option 11c PBX via an E1 PRI link.

Set Up Notes

The Cisco 7200 series router with ISDN switch type setting of **primary-qsig** supports both protocol sides by using the **isdn protocol-emulate network/use**r command.

The Nortel Meridian Option 11C, when set to ESIG, ISIG, ESGF or ISGF, supports both user and network protocol sides. Using LD 17 sets this user/network choice on the Nortel PBX.

The Nortel configuration screen for the E1 trunk interface is reached using LD 17, setting the CEQU (Common Equipment parameters):

QSIG Channel ID Coding/Mapping

For Nortel QSIG type ESIG (ETSI QSIG), loop status inquiry shows that channels 1-30 are used for B-channels while channel 31 is used for D-channel. The Cisco 7200 router uses the ECMA QSIG standard. ECMA QSIG uses channel numbers 1-15 and 17-31 as B-channels, while channel 16 is allocated for the D-channel. The Nortel actually uses physical/timeslot 16 even though it shows that it uses channel 31 as its D-channel. Logical channels 16-30 need to be mapped to the Cisco 7200 series router 17-31 timeslots. Calls

made using channels 17-31 have no voice path due to a problem with mapping which results in a mismatch between the actual B-channels being used and the Channel ID Information Element being sent. To alleviate this problem, issue the ISDN command **isdn contiguous-bchan** to allow the Cisco 7200 series router to support ETSI QSIG and correspond to Nortel channel mapping.

The Nortel Option 11C PBX allows channel coding for QSIG types ESGF, EGF4 and ISGF to be compatible with the ECMA QSIG standard. This allows the capability to configure the mapping between the channel number field in the Channel Identification IE and the timeslot number for timeslots 17 to 31 on the Nortel. This is done under the LD 17 QCHID prompt. Responding yes to the QCHID prompt associates timeslots 17 to 31 with channel number 17 to 31, therefore the 3640 **isdn contiguous-bchan** command is not necessary. Responding no associates timeslots 17 to 31 to channel number 16-30 of the Channel ID Information Element and this requires the **isdn contiguous-bchan** command to ensure voice path. This Nortel feature is only available in Generic Function (GF) QSIG platforms.

Nortel Option 11c PBX Configuration

Use the following information to configure the Nortel Option 11c PBX:

- Nortel Option 11c PBX Version Information
- Nortel Option 11c PBX Sample Configuration
- System Configuration
- Route Data Block Configuration
- Trunk Configuration
- Digital Station Configuration
- Software Packages Installed (Release 24)

Nortel Option 11c PBX Version Information

- Software: Version 2111 Release 24 Issue 24
- Hardware: Nortel Meridian 1 Option 11C
  System P/N: NTAK04AA
  E1/PRI Card NTBK50
  MSDL Card NTBK51

Nortel Option 11c PBX Sample Configuration

See the following sections for sample configuration information on the Nortel Option 11c PBX:

- System Configuration
- Route Data Block Configuration
- Trunk Configuration
- Digital Station Configuration
- Software Packages Installed (Release 24)

System Configuration

```
ld 22PT2000
MARP NOT ACTIVATED


REQ  prt
TYPE cfn
ADAN   HIST
```

```
  SIZE    5000
  USER MTC SCH BUG
ADAN     TTY 0
  TTY_TYPE SDI
  CAB 00
  CARD 00
  PORT 0
  DES
  FLOW NO
  USER MTC SCH BUG
  TTYLOG       0
  BANR YES
ADAN     TTY 1
  TTY_TYPE SDI
  CAB 00
  CARD 00
  PORT 1
  DES
  BPS  9600
  BITL 8
  STOP 1
  PARY NONE
  FLOW NO
  USER MTC SCH BUG
  TTYLOG       0
  BANR YES
ADAN     TTY 2
  TTY_TYPE SDI
  CAB 00
  CARD 00
  PORT 2
  DES
  BPS  9600
  BITL 8
  STOP 1
  PARY NONE
  FLOW NO
  USER MTC SCH BUG
  TTYLOG       0
  BANR YES
ADAN     DCH 3
  CTYP MSDL
  CARD 03
  PORT 1
  DES  ESIG2_USR_TIE
  USR  PRI
  DCHL 3
  OTBF 32
  PARM RS422  DTE
  DRAT 64KC
  CLOK EXT
  IFC  ESIG
    ISDN_MCNT 300
  CLID OPT0
  CO_TYPE  STD
  SIDE USR
  CNEG 1
  RLS  ID  22
  RCAP COLP


  MBGA NO
  OVLR NO
  OVLS NO
  T310 120
  T200 3
  T203 10
  N200 3
  N201 260
  K    7
ADAN     DCH 4
```

```
  CTYP MSDL
  CARD 04
  PORT 1
  DES  ESIG2_NET_TIE
  USR  PRI
  DCHL 4
  OTBF 32
  PARM RS422  DTE
  DRAT 64KC
  CLOK EXT
  IFC  ESIG
    ISDN_MCNT 300
  CLID OPT0
  CO_TYPE  STD
  SIDE NET
  CNEG 1
  RLS  ID  22
  RCAP COLP
  MBGA NO
  OVLR NO
  OVLS NO
  T310 120
  T200 3
  T203 10
  N200 3
  N201 260
  K    7
ADAN     DCH 5
  CTYP MSDL
  CARD 05
  PORT 1
  DES  esgf(user)
  USR  PRI
  DCHL 5
  OTBF 32
  PARM RS422  DTE
  DRAT 64KC
  CLOK EXT
  IFC  ESGF
    PINX_CUST 0
    ISDN_MCNT 300
  CLID OPT0
  CO_TYPE  STD
  SIDE USR
  CNEG 1
  RLS  ID  **
  QCHID YES
  RCAP COLP NDO
  MBGA NO
  OVLR NO
  OVLS NO



  T310 120
  T200 3
  T203 10
  N200 3
  N201 260
  K    7
ADAN     DCH 6
  CTYP MSDL
  CARD 06
  PORT 1
  DES  ESGF2_NET_TIE
  USR  PRI
  DCHL 6
  OTBF 32
  PARM RS422  DTE
  DRAT 64KC
  CLOK EXT
  IFC  ESGF
```

```
    PINX_CUST 0
    ISDN_MCNT 300
  CLID OPT0
  CO_TYPE  STD
  SIDE NET
  CNEG 1
  RLS  ID  22
  QCHID YES
  RCAP COLP
  MBGA NO
  OVLR NO
  OVLS NO
  T310 120
  T200 3
  T203 10
  N200 3
  N201 260
  K    7
PARM
  LPIB 192
  HPIB 32
  500B 16
  NCR  200
  MGCR NULL
  CFWS NO
  PCML MU
  ALRM YES
  ERRM ERR BUG AUD
  DTRB 100
  TMRK 128
  FCDR OLD
  PCDR NO
  TPO  NO
  TSO  NO
  CLID NO
  DUR5 NO
  MLDN YES
  MARP NO
  FRPT NEFR
  DCUS NULL
  MSCL 255
  PMSI
    MANU PMS1


    PMCR 20
    PORT NONE
  NDIS 20
  OCAC NO
  MTRO MR
  SBA_ADM_INS 001
  SBA_USER 010
  BCAP SPEECH
  NORTEL_BRAND NO
CEQU
  MPED 8D
  SUPL  000  004  008  012
        016  032  036  040
        044  048  064  068
        072
  XCT   000
  CONF  029  030  031  062
        094  095
  PRI2 03 04 05 06
       07 08
  DTI2
  MISP
OVLY
  SID  0
  BKGD 044
  PBXH 01
```

```
  TODR 01
  DROL 030 034 038 044 135
  MULTI_USER OFF
ATRN
  CODE 0
  SOLR 12
  ROLR +45.00
  AOLR +45.00
  TOLR -45.00
  AGCD NO
  VOLR NO
  HRLR +42.00
  HTLR -44.00

REQ  ****
>
OVL000
```

Route Data Block Configuration

```
>ld 21PT1000

REQ: prt
TYPE: rdb
CUST 0
ROUT 105
TYPE RDB
CUST 00
DMOD
ROUT 105
DES  ESGF(USER)
TKTP TIE
ESN  NO
CNVT NO
SAT  NO
RCLS EXT
DTRK YES
BRIP NO
DGTP PRI2
ISDN YES
    MODE PRA
    IFC  ESGF
    SBN  NO
    PNI  00001
    NCNA NO
    NCRD NO
    CTYP UKWN
    INAC NO
    ISAR NO
    CPFXS YES
    DAPC NO
    INTC NO
DSEL VOD
PTYP DTT
AUTO NO
DNIS NO
DCDR NO
ICOG IAO
SRCH RRB
TRMB YES
STEP
ACOD 705
TCPP NO
TARG 01
CLEN 1
BILN NO
OABS
INST
ANTK
SIGO STD
ICIS YES
TIMR ICF 512
```

```
     OGF 512
     EOD 13952
     NRD 10112
     DDL 70
     ODT 4096
     RGV 640
     GRD 896
     SFB 3
     NBS 2048
     NBL 4096
     TFD 0
DRNG NO
CDR  NO
MUS  NO
OHQ  NO
OHQT 00
CBQ  NO


PAGE 002

AUTH NO
TTBL 0
PLEV 2
ALRM NO
ART  0
SGRP 0
AACR NO

REQ: ****
>
OVL000
```

Trunk Configuration

```
>ld 20
PT0000
MARP NOT ACTIVATED

REQ: prt
TYPE: tnb
TN   5 1

DATE PAGE DES
TN   005 01
TYPE TIE
CDEN SD
CUST 0
TRK  PRI2
PDCA 1
PCML A
NCOS 0
RTMB 105 1
B-CHANNEL SIGNALING
TGAR 1
AST  NO
IAPG 0
CLS  UNR DTN CND WTA LPR APN THFD
     P10 VNL
TKID
DATE 22 APR 2001


NACT ****
>
OVL000
```

Digital Station Configuration

```
>ld 11SL1000
MARP NOT ACTIVATED

MEM AVAIL: (U/P): 1337098    USED U P: 105713 31748    TOT: 1474559
DISK RECS AVAIL: 477
TNS     AVAIL:    55    USED:   145    TOT:   200
ACD AGENTS AVAIL:   300    USED:     0    TOT:   300
AST     AVAIL:   100    USED:     0    TOT:   100
DIGITAL TELEPHONES AVAIL:  2498    USED:     2    TOT:  2500

REQ: prt
TYPE: 2616

MARP NOT ACTIVATED

TN   001 0 00 00
DATE PAGE DES
DES  TEST1
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
LNRS 16
XLST
CLS  CTD FBD WTA LPR MTD FND HTD ADD HFA
     MWD LMPN RMMD SMWD AAD IMD XHD IRD NID OLD VCE DRG1
     POD DSX VMD CMSD CCSD SWD LNA CNDA
     CFTD SFD MRD DDV CNID CDCA MSID DAPA BFED RCBD
     ICDD CDMD LLCN MCTD CLBD AUTU
     GPUD DPUD DNDA CFXA ARHD CLTD ASCD
     CPFA CPTA ABDD CFHD FICD NAID BUZZ AHD
     DDGA NAMA
     DRDD EXR0
     USMD USRD ULAD RTDD RBDD RBHD PGND FLXD FTTC DNDY DNO3
CPND_LANG ENG
HUNT
PLEV 02
AST
IAPG 0
AACS NO
ITNA NO
DGRP
MLWU_LANG 0
DNDR 0
KEY  00 SCR 2001 0     MARP
        CPND
          NAME Nortel Testphone 1
          XPLN 27
          DISPLAY_FMT FIRST,LAST
     01 SCR 2010 0     MARP
        CPND
          NAME Nortel Testphone 1B
          XPLN 27
          DISPLAY_FMT FIRST,LAST
     02
     03 CFW 12  5002
     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
DATE 20 APR 2001


NACT ****
>
OVL000
```

Software Packages Installed (Release 24)

```
>ld 22PT2000
MARP NOT ACTIVATED


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
CHG    23
CAB    24
BAUT   25
CASM   26
CASR   27
BQUE   28
NTRF   29
NCOS   32
CPRK   33
SSC    34
IMS    35
UST    35
UMG    35
ROA    36
NSIG   37
MCBQ   38
NSC    39
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
NARS   58
CDP    59
PQUE   60
FCBQ   61
OHQ    62
NAUT   63
SNR    64
NXFR   67
HOT    70
DHLD   71
LSEL   72
SS5    73
DRNG   74
PBXI   75
DLDN   76
CSL    77
OOD    79
SCI    80
CCOS   81
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
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
SCMP   121
FTC    125
BKI    127
DTI2   129
TBAR   132
ENS    133
FFC    139
DCON   140
MPO    141
ISDN   145
PRA    146
ISL    147
NTWK   148
IEC    149
DNXP   150
CDRE   151
IAP3P  153
PRI2   154
ACNT   155
THF    157
FGD    158
```

```
FNP    160
ISDN INTL SUP  161
SAR    162
LAPW   164
GPRI   167
ARIE   170
CPGS   172
ECCS   173
AAA    174
NMS    175
EOVF   178
HVS    179
DKS    180
SACP   181
OVLP   184
EDRG   185
POVR   186
SECL   191
ORC-RVQ  192
AINS   200
IPRA   202
XPE    203
XCT0   204
XCT1   205
MLWU   206
NACD   207
HSE    208
MLM    209
MAID   210
VAWU   212
EAR    214
ECT    215
BRI    216
IVR    218
MWI    219
MSDL   222
FC68   223
M911   224
CWNT   225
SSAU   229
BRIT   233
FCDR   234
BRIL   235
MCMO   240
MULTI_USER   242
ALRM_FILTER   243
VMBA   246
CALL ID   247
DPNA   250
SCDR   251
ARFW   253
PHTN   254
ADMINSET  256
ATX    258
QSIG   263
NI-2   291
MAT   296
MQA   297
CPP    301
QSIGGF   305
CPRKNET   306
PAGENET   307
CPCI   310
NGCC    311
TATO   312
OPEN ALARM  315
QSIG-SS   316
QTN   321
NGEN   324
RANBRD   327
MUSBRD   328
ESA  329
```

```
ESA_SUPP  330
ESA_CLMP  331
CNUMB   332
CNAME   333
NI-2 CBC   334
MEET   348
MC32   350
DBA   351
FDID   362
NMCE   364

REQ  ****
>
OVL000
>
```

Cisco 7200 Series Router Configuration

The following is the configuration of the Cisco 7200 series router connected to a Nortel Option 11c PBX ISDN interface:

- Cisco 7200 Series Router Version Information
- Cisco 7200 Series Router Sample Configuration
- Cisco 7200 Series Router Sample Diagnostics

Cisco 7200 Series Router Version Information

The following example shows how to obtain the software version information of the Cisco 7200 series router connected to a Nortel Option 11c PBX ISDN interface.

- Cisco IOS™ (C7200-JS-M), Version 12.2(1).
- Cisco 7206VXR (NPE300) processor (revision D) with 122880K/40960K bytes of memory.

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Version 12.2(1), RELEASE SOFTWARE (fc2)
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Thu 26-Apr-01 22:10 by cmong
Image text-base: 0x60008960, data-base: 0x616B0000

ROM: System Bootstrap, Version 12.0(19990210:195103) [12.0XE 105], DEVELOPMENT SOFTWARE

Router uptime is 19 minutes
System returned to ROM by power-on
System image file is "slot0:c7200-js-mz.122-1"

cisco 7206VXR (NPE300) processor (revision D) with 122880K/40960K bytes of memory.
Processor board ID 18282879
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2, 2048KB L3 Cache
6 slot VXR midplane, Version 2.0

Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
Primary Rate ISDN software, Version 1.1.
Channelized E1, Version 1.0.
1 FastEthernet/IEEE 802.3 interface(s)
31 Serial network interface(s)
2 Channelized E1/PRI port(s)
```

```
1 Voice resource(s)
125K bytes of non-volatile configuration memory.

16384K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

Cisco 7200 Series Router Sample Configuration

The following is a sample configuration of the Cisco 7200 series router directly connected to a Nortel Option 11c PBX ISDN interface.

```
Router# show run
Building configuration...

Current configuration : 1162 bytes
!
version 12.2
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
card type e1 1
logging rate-limit console 10 except errors
!
frame-clock-select 1 E1 1/0
dspint DSPfarm1/0
!
ip subnet-zero
!
!
no ip finger
!
no ip dhcp-client network-discovery
isdn switch-type primary-qsig
call rsvp-sync
!
!
!
!
!
!
!
controller E1 1/0
 pri-group timeslots 1-31
!
controller E1 1/1
!
!
interface FastEthernet0/0
 ip address 18.0.0.2 255.255.255.0
 no ip mroute-cache
 duplex full
 fair-queue
!
interface Serial1/0:15
 no ip address
 no logging event link-status
 isdn switch-type primary-qsig
 isdn overlap-receiving
 isdn incoming-voice voice
 isdn T203 30000
 isdn T310 60000
 no cdp enable
!
ip kerberos source-interface any
ip classless
```

```
no ip http server
!
!
!
voice-port 1/0:15
!
dial-peer voice 1 pots
 destination-pattern 2...
 direct-inward-dial
 port 1/0:15
 prefix 2
!
dial-peer voice 2 voip
 destination-pattern 5...
 session target ipv4:18.0.0.1
!
!
gatekeeper
 shutdown
!
!
line con 0
 transport input none
line aux 0
line vty 0 4
 login
line vty 5 15
 login
!
end
```

Cisco 7200 Series Router Sample Diagnostics

The following example shows sample diagnostic information of the Cisco 7200 series router connected to a Nortel Option 11c PBX ISDN interface.

```
Router# show diag
Slot 0:
       Fast-ethernet on C7200 I/O card with MII or RJ45 Port adapter, 1 port
       Port adapter is analyzed
       Port adapter insertion time 00:19:16 ago
       EEPROM contents at hardware discovery:
       Hardware revision 2.1         Board revision B0
       Serial number     18517759  Part number    73-4092-03
       Test history      0x0         RMA number     00-00-00
       EEPROM format version 1
       EEPROM contents (hex):
         0x20: 01 83 02 01 01 1A 8E FF 49 0F FC 03 00 00 00 00
         0x30: 58 00 00 00 00 04 16 00 00 00 FF FF FF FF FF FF

Slot 1:
       VXC-2TE1+ Port adapter, 2 ports
       Port adapter is analyzed
       Port adapter insertion time 00:19:15 ago
       EEPROM contents at hardware discovery:
       Hardware Revision        : 0.2
       PCB Serial Number        : MIC05022QA2
       Part Number              : 73-5340-03
       Board Revision           : A0
       RMA Test History         : 00
       RMA Number               : 0-0-0-0
       RMA History              : 00
       Deviation Number         : 0-0
       Product Number           : PA-VXC-2T1E1+
       Top Assy. Part Number    : 8034-08469-01
       EEPROM format version 4
       EEPROM contents (hex):
         0x00: 04 FF 40 02 11 41 00 02 C1 8B 4D 49 43 30 35 30
         0x10: 32 32 51 41 32 82 49 14 DC 03 42 41 30 03 00 81
         0x20: 00 00 00 00 04 00 80 00 00 00 00 CB 94 50 41 2D
```

```
        0x30: 56 58 43 2D 32 54 31 45 31 2B 20 20 20 20 20 20
        0x40: 20 C0 46 1F 62 00 21 15 01 FF FF FF FF FF FF FF
        0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
        0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
        0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Router# clear counters
Clear "show interface" counters on all interfaces [confirm]y
Router#
00:19:35: %CLEAR-5-COUNTERS: Clear counter on all interfaces by console
Router#
Router# show controllers e1 1/0
E1 1/0 is up.
  Applique type is Channelized E1 - balanced
  No alarms detected.
  alarm-trigger is not set
  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  International Bit: 1, National Bits: 11111
  Active xconns: 0
  Data in current interval (16 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
Router#
```

Caveats

- The Calling Name delivery function on the Nortel is only supported under a special mechanism function called Generic Functional (GF) Procedures. The GF platform allows non-QSIG messages to be passed through (end-to-end) on a QSIG link.
- ISDN command **isdn contiguous-bchan** may need to be set in the Cisco 7200 configuration to support the ESGF (ETSI QSIG) channel mapping standard, depending on how the Nortel PBX is configured.
- The Nortel allows QSIG channel coding for QSIG types ESGF and ISGF. This allows the capability to configure the mapping between the channel number field in the Channel Identification Information Element (IE) and the timeslot number for timeslots 17 to 31 on the Nortel PBX. This is set at the QCHID prompt under LD 17.