U.S. Department of Homeland Security

United States Coast Guard

IT "C" School

# Unit 3 - Adding Analog and Digital Trunks

***Telephone Trunks Overview – Programming Analog Trunks – Programming Digital Trunks***

**STUDENT GUIDE**

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**Notice to Students**

Purpose: This course will provide training on Nortel CS1000E PBX installation, programming, troubleshooting and maintenance. The graduate of this course will possess the skills necessary to install and maintain a CallPilot Voice Processing System.

**IMPORTANT NOTE:** This text has been compiled for TRAINING ONLY. It should NOT be used in place of official directives or publications. The text information is current according to the references listed.

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# Lesson 1

# OVERVIEW

## Lesson Content: Trunks Overview

### Overview

In this lesson, you will be introduced to process of adding trunks. This lesson is designed to provide you with the key performance elements to assist you in adding analog trunks. This lesson begins with an overview of trunks. Next, you will learn about different types of signaling followed by the following types of trunks:

- Loop Start
- Ground Start
- Direct Inward Dial

There will be a performance activity at the end of this lesson to test comprehension of the key performance elements that you'll need to perform for upcoming tasks.

---

### Performance Objectives

Upon successful completion of this lesson, you will be able to

**3.1** **INSTALL** an analog trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.1.1** **REVIEW** manufacturer's documentation
- **3.1.2** **REVIEW** applicable security policies
- **3.1.3** **PROGRAM** analog trunk routes
- **3.1.4** **PERFORM** function check
- **3.1.5** **COMPLETE** unit documentation

### Performance Evaluation

The performance evaluations for these tasks are scheduled immediately following this lesson. These performance evaluations will be in delivered via a work order. These work orders will test the performance objective you have just completed in this lesson. These work orders will build in complexity based on previous tasks from previous lessons. These performance evaluations will be in a separate workbook from your student guide. Your instructor will hand out these workbooks out in class. Please do not complete these work orders prior to the instructor assigning them to you. You will work in your booth with your partner as a class. Your instructor will sign off these performance evaluations as you complete each tasks.

### References

Northern Telecom Publications (NTPs) is the documentation for the CS1000E system. These publications provide reference tools and information that is related to the various features and options of the system.

| **Document** | **Document #** |
|---|---|
| *Communication Server 1000E Planning and Engineering* | NN43041-220 |
| *Communication Server 1000E Installation and Commissioning* | NN43041-310 |
| *Communication Server 1000E Maintenance* | NN43041-700 |
| *Communication Server 1000 Software Input Output Administration* | NN43001-611 |
| *Communication Server 1000 Software Input Output Reference - System Messages* | NN43001-712 |
| *Communication Server 1000 Software Input Output Reference - Maintenance* | NN43001-711 |
| *Element Manager System Reference – Administration* | NN43001-632 |

### Tools and Equipment

The tools and equipment used for this lesson are:

- Nortel CS1000E switch and console

### Job Aids

There are no job aids for this lesson.

### Handouts

There are no handouts for this lesson.

### Key Terms

Review the following key terms before you begin the reading assignment:

| Terms | Definitions |
|---|---|
| Glare | Occurs when both ends of a telephone circuit are seized at the same time. |
| Supervision | Detecting when a called party has picked up his phone and when that party has hung up. |

### Pre-Lesson Work

There is no pre-lesson work for the lessons in this unit.

## Lesson Content: Trunks Overview, Continued

### What is a Trunk?

A trunk is a communications connection between two switching devices.

Trunks may be used to connect switches in the following ways:

- Central Office (CO) to Central Office (CO)
- PBX to Central Office (CO)
- PBX to PBX (Tie)

### Signaling Types

In order for these trunks to operate properly, some sort of signaling is used to pass control information between the switching devices.

This signaling comes in many different types and performs specific functions:

- Supervisory states
- Address signaling
- Information signaling

### Supervisory States

Supervisory states provide call initiation or termination signals. There are two possible states:

- On-hook (Idle)
- Off-hook (Busy)

### Address Signaling

This is how the caller generates the dialed number, which is the address or destination telephone number. We will cover two types:

- Dual Tone Multi-frequency (DTMF) or Digitone (DTN)
- Dial Pulsing (DP)

| Dial Pulsing (DP) | Dual Tone Multi-Frequency (DTMF) aka DTN |
|---|---|
| Used in rotary dial telephones. The number is pulsed by making breaks in the loop at determined intervals, which the receiving equipment translates into digits. | Used in push-button phones. The dual tone comes from the two tones generated when each key is pressed on the phone, which is translated into digits at the receiving end. |

### Information Signaling

These signals provide users with circuit status and call progress signals. They are presented in the form of audible frequencies and are listed below:

| Signal | Frequency | Function |
|---|---|---|
| Dial Tone | 350 Hz+440 Hz | Indicates to the user that the line is ready to receive digits. |
| Ringback | 440 Hz+480 Hz | Indicates to the user that the destination number is valid and the telephone is being signaled to ring. |
| Busy | 480 Hz+620 Hz with intervals at 60 IPM intervals per minute (IPM) | Indicates that the destination number is valid and that it is unavailable to receive calls. |
| Reorder Tone | 480 Hz+620 Hz with intervals at 120 IPM, also called Fast Busy | Indicates that the trunk circuit is not available to make this call. |

### Trunk Signaling Types

These different types of signals are used in conjunction with the trunk signaling to make telephone calls happen. The three most common types of trunk signaling are:

- Loop Start
- Ground Start
- Direct Inward Dial (DID)

### Loop Start Operations

These trunks are the same as subscriber loops used to provide service to most homes. They use a loop condition at the (Primary Branch Exchange) PBX to signal the (Central Office) CO to send and disconnect service.

One major limitation to this type of trunk is its inability to eliminate glare. Glare occurs when both the PBX and the CO try to seize a trunk at the same time. See Figure 3.1.1.

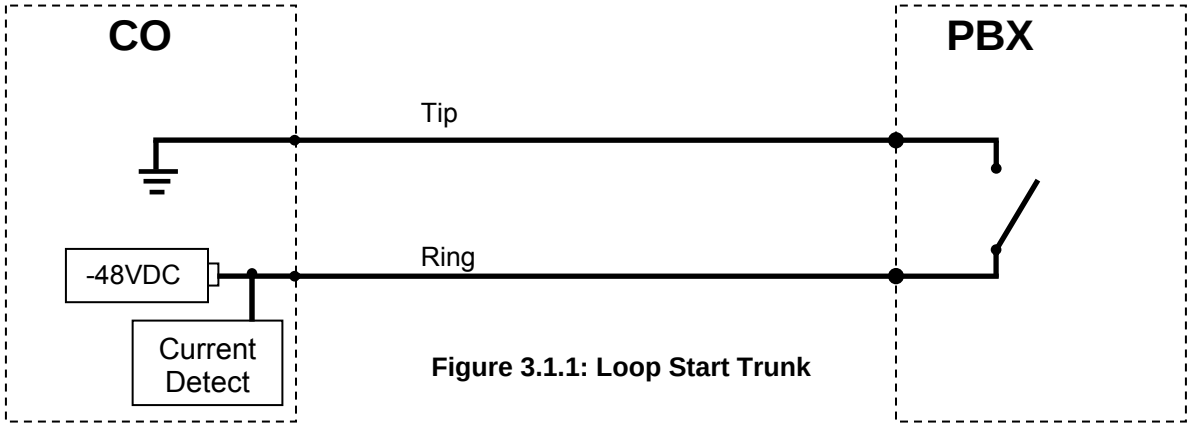


**Figure 3.1.1: Loop Start Trunk**

### Loop Start (Incoming Call)

The process for Loop Start (Incoming Call) is described in the following table:

| Step | Action |
|---|---|
| 1 | The CO signals the PBX by sending ringing voltage over the ring lead. |
| 2 | When a user answers the trunk call, the PBX signals the CO by connecting the tip and ring leads. |
| 3 | This causes current to flow over the ring lead, which is detected by the CO's current detector circuit. |
| 4 | The CO removes the ringing voltage from the circuit and connects the call. |
| End of process | |

The call is completed when one of the callers hangs up, but the circuit remains active until both of the callers have hung up.

### Loop Start (Outgoing Calls)

The process for Loop Start (Outgoing Call) is described in the following table:

| Step | Action |
|---|---|
| 1 | When a customer requests a trunk, the PBX signals the CO by connecting the tip and ring leads, forming a loop. |
| 2 | This causes current to flow over the ring lead, which is detected by the CO's current detector circuit. |
| 3 | The CO sends the PBX dial tone and attaches a digit collection device awaiting the address signals. |
| End of process | |

The user hears dial tone and dials the telephone number of the receiving party. The CO collects the digits and routes the call accordingly. If the number is available, the CO sends ringing voltage to it and a ringback signal to the customer. When the receiving party answers the call, the CO removes ringing voltage and connects the callers.

The call is completed when one of the callers hangs up, but the circuit remains active until both of the callers have hung up.

### Ground Start Operations

Ground start trunks were created to improve the start signaling between switching equipment and reduce the occurrence of glare. Using a ground signal over the tip and ring wires provides a way to signal between the switches to tell when a connection needs to be made or disconnected when complete. See Figure 3.1.2.

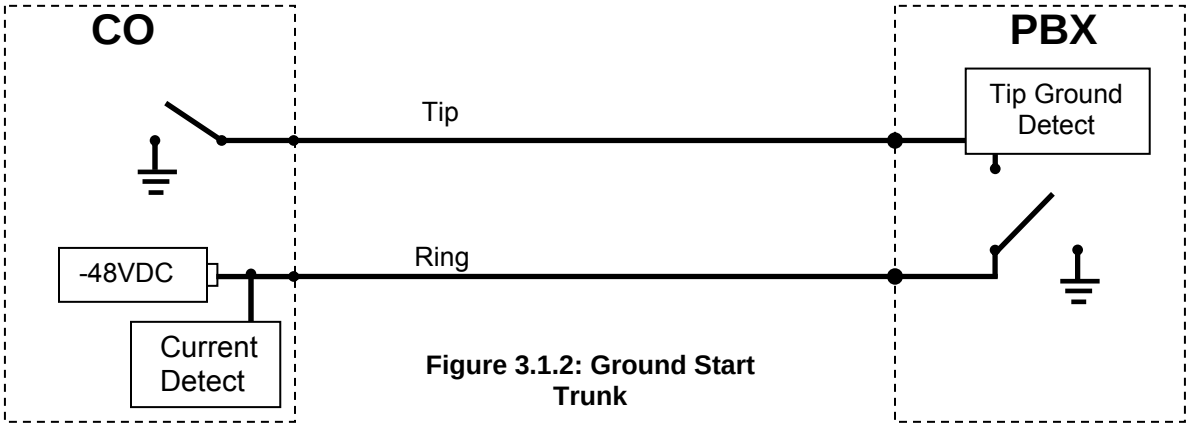


**Figure 3.1.2: Ground Start Trunk**

### Ground Start (Incoming Call)

The process of a Ground Start (Incoming Call) is described in the following table:

| Step | Action |
|---|---|
| 1 | The CO signals the PBX by applying a ground to the tip lead and sends ringing voltage across the tip and ring leads to the PBX. |
| 2 | The PBX senses the ground and ringing voltage, signals the preprogrammed answer point, and waits for a user to answer the call. |
| 3 | When a user answers the trunk call, the PBX signals by connecting the tip and ring leads. This causes current to flow over the ring lead, which is detected by the CO's current detector circuit. |
| 4 | The CO removes ringing voltage from the circuit and connects the calls. |
| End of process | |

Completion of the call by hanging up causes the PBX to open the tip and ring connection or the CO to remove the ground from the tip lead, depending upon which side hangs up first.

### Ground Start (Outgoing Call)

The process of a Ground Start (Outgoing Call) is described in the following table:

| Step | Action |
|---|---|
| 1 | When a customer requests a trunk, the PBX signals the CO by placing a momentary ground on the ring lead. |
| 2 | The CO senses the ground, grounds the tip lead, and sends dial tone to the PBX. |
| 3 | The PBX senses the ground on the tip, removes the ground on the ring lead, and connects the tip and ring leads. |
| End of process | |

### Ground Start (Outgoing Call)

The user hears the dial tone and dials the telephone number of the receiving party. The CO collects the digits and routes the call accordingly. If the number is available, the CO sends ringing voltage to it and a ringback signal to the customer. When the receiving party answers the call, the CO removes ringing voltage and connects the callers.

Completion of the call by hanging up causes the PBX to open the tip and ring connection or the CO to remove the ground from the tip lead, depending upon which side hangs up first.

### DID

These Direct Inward Dial (DID) trunks allow direct access to PBX extensions without going through an operator or attendant, and are used only to receive calls from the CO. This type of trunk uses a reverse battery signal, in that the PBX provides the battery voltage for the circuit and the CO provides the loop closure to initiate connect and disconnect signals. See Figure 3.1.3.

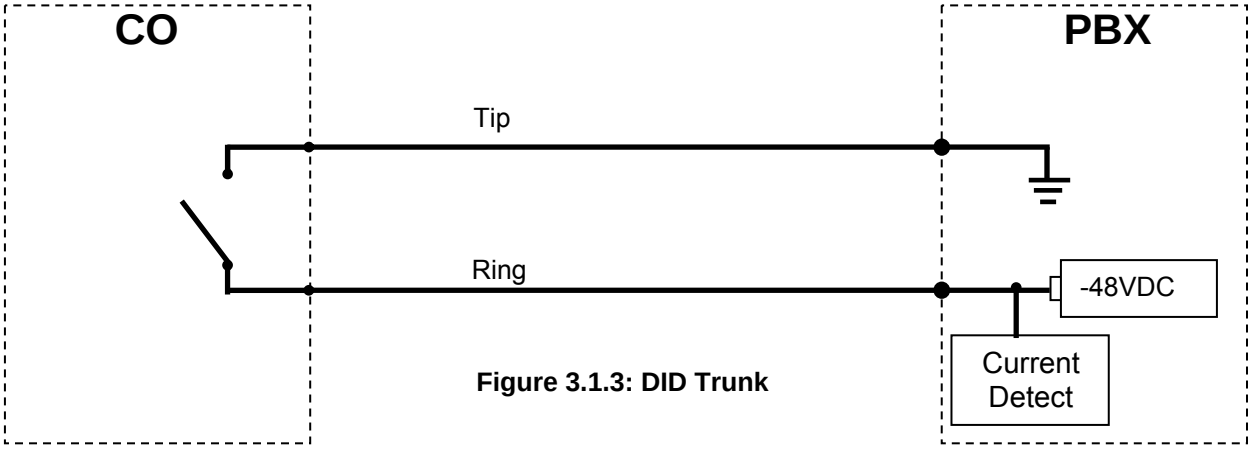


**Figure 3.1.3: DID Trunk**

### DID Operations

The process of DID Operations is described in the following table:

| Step | Action |
|---|---|
| 1 | When the CO wants to pass digits to the PBX, it creates a loop condition causing current to flow from the PBX on the ring lead. |
| 2 | The PBX senses the current flow and signals the CO by sending dial tone, wink condition, immediate start, or delay start signal. |
| 3 | Upon receipt of the signal, the CO sends the digits to the PBX. Receipt of the digits is confirmed by the PBX sending a forward battery (reversing the tip and ring leads) condition to the CO, which stays until the call is complete. |
| End of process | |

The PBX returns the trunk to idle by returning the leads to the reverse battery condition. The CO receives the reverse battery signal and returns the trunk to idle by removing the loop condition.

## Review Activity: Trunks Overview

**Directions**

Using the information you have learned in this module of instruction, answer the following questions:

---

**Questions**

1. Which of the following represent a type of address signaling?

   A. On-hook
   B. Ringback
   C. DTMF/DTN
   D. DS-1

2. Name the three most common types of trunk signaling?

   _____

   _____

   _____

3. Loop Start Trunks are the same as what other service you already learned about?

   A. Premise Distribution
   B. POTS
   C. Basic Electronics
   D. Horizontal Cabling

4. Which trunk type is most commonly used to reduce the occurrence of glare?

   A. Loop Start
   B. Ground Start
   C. DID
   D. E&M

5. Which trunk type is used when dialing directly to a PBX extension from the outside without going through an operator or attendant?

   A. Loop Start
   B. Ground Start
   C. DID
   D. E&M

---

# Summary

## Lesson Summary

In this lesson, you were introduced to the concept of trunks, trunk signaling types, and four different types of trunks. Upon completion of this student guide and after the lesson presentation and practice exercises, you should be able to:

**3.1** **INSTALL** an analog trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.1.1** **REVIEW** manufacturer's documentation
- **3.1.2** **REVIEW** applicable security policies
- **3.1.3** **PROGRAM** analog trunk routes
- **3.1.4** **PERFORM** function check
- **3.1.5** **COMPLETE** unit documentation

# Lesson 2

# ANALOG TRUNKS

## Lesson Content: Programming Analog Trunk Routes

### Overview

In this lesson you will be introduced to how to program analog trunks. This lesson is designed to provide you with the key performance elements to assist you in adding analog trunks. This lesson begins with an overview of analog trunks. You will go over the process for adding trunks which starts with gathering the information for the customer installation. Next you will learn about trunk types and trunk usage. Next, this is followed by a discussion on TGAR and TARG relationships as they relate to programming trunks. Finally, you will program trunks with your booth partner using the job aids in this lesson. There will be a performance activity at the end of this lesson to test comprehension of the key performance elements that you'll need to perform for upcoming tasks.

### Performance Objectives

Upon successful completion of this lesson, you will be able to:

**3.1** **INSTALL** an analog trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.1.1** **REVIEW** manufacturer's documentation
- **3.1.2** **REVIEW** applicable security policies
- **3.1.3** **PROGRAM** analog trunk routes
- **3.1.4** **PERFORM** function check
- **3.1.5** **COMPLETE** unit documentation

### Performance Evaluations

The performance evaluations for these tasks are scheduled immediately following this lesson. These performance evaluations will be in delivered via a work order. These work orders will test the performance objective you have just completed in this lesson. These work orders will build in complexity based on previous tasks from previous lessons. These performance evaluations will be in a separate workbook from your student guide. Your instructor will hand out these workbooks out in class. Please do not complete these work orders prior to the instructor assigning them to you. You will work in your booth with your partner as a class. Your instructor will sign off these performance evaluations as you complete each tasks.

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| *Communication Server 1000 Software Input Output Reference - System Messages* | NN43001-712 |
| *Communication Server 1000 Software Input Output Reference - Maintenance* | NN43001-711 |
| *Element Manager System Reference – Administration* | NN43001-632 |

### Tools and Equipment

The tools and equipment used for this lesson are:

- Nortel CS1000E switch and console
- Standard IT Toolkit

### Job Aids

There are no job aids for this lesson.

### Handouts

Your instructor will provide you with the following handouts:

- Work order WO-04C (located in the Performance Evaluation workbook)
- Work order WO-05C (located in the Performance Evaluation workbook)
- Work order WO-06C (located in the Performance Evaluation workbook)

### Job Aids

There are no key terms for this lesson.

### Trunk Services

Up to this point you have programmed your PBX for telephones with different features and options. These phones can call each other within the PBX, but they don't have the ability to receive or make calls outside of the PBX.

We use trunks to make this happen.

### Adding a Trunk Procedure

Adding new trunks to a PBX is not an everyday task. The following are the steps to add a new trunk to an existing PBX:

- Gather the information about the installation
- Program the Route
- Program the Trunk
- Cross connect the Trunk
- Verify the installation
- Document all programming and cabling information

### Gather Information

In order to program trunks for the users in a system, there is some basic information you need to gather:

| If performing this task | Gather this information |
|---|---|
| Trunk programming | Type of trunk installing |
| Trunk and route programming | Type of trunk card |
| Route and phone programming | Trunk access and restrictions |
| Trunk programming and cabling | Connectivity points |
| Trunk programming | Trunk signaling type |
| Trunk and route programming | Trunk route assignment |

### Types of Signaling

When you are tasked with adding a trunk to a PBX, you will be told what type of trunk you are going to use and what signaling type will be involved.

Below is an example of information you will typically be provided with:

| Information Provided | Notes |
|---|---|
| Trunk Signaling Type | Types could include:<br>• Loop Start (LS)<br>• Ground Start (GS)<br>• Loop Dial Repeat (LDR) |
| Address Signaling Type | What type of dialing format to use:<br>• Dial Pulse (DIP)<br>• Digitone (DTN) |
| Supervisory Signaling | What is the Starting Arrangement for Incoming and Outgoing calls on this trunk, and does it need Answer and Disconnect Supervision? |

### Trunk Types

The type of trunk you will install is determined by its use. PBX manufacturers each have their own terms for types of trunks.

| Type | Description |
|---|---|
| Central Office (COT) | Connects the PBX to Central Office (CO) telephone switches, typically part of the public switched telephone network (PSTN). Used for incoming and outgoing calls. |
| TIE (TIE) | Connects the PBX to another PBX. Used for incoming and outgoing calls. |
| PAGE (PAG) | Connect the PBX to equipment used for paging. Used for outgoing connections. |
| Direct Inward Dial (DID) | Connect the PBX to CO telephone switches for incoming calls, which are routed directly to the recipient based upon digits received. |

Continued next page

### Trunk Types, contd.

| Type | Description |
|---|---|
| Music (MUS) | Used to carry recorded music for Music On Hold from a music device. |
| Recorded Announcement (RAN) | Connects to RAN equipment and is used to carry the recorded announcements for the PBX. |
| Wide Area Telephone Service (WAT) | Connects to a special service provided by CO telephone switch that allows PBX users long-distance services at a reduced rate. Used for outgoing calls. |

### Trunk Types Supported

After determining the type of trunk you are installing, ensure the correct type of trunk card is in the PBX. The classroom PBX uses a **Universal Trunk Card,** which supports the following types of trunks:

- Central Office Trunk (COT)
- Foreign Exchange Trunk (FEX)
- Wide Area Telephone Service (WATS)
- Direct Inward Dial (DID)
- Direct Outward Dial (DOD)
- Tie Trunk (TIE)
- Paging (PAG)
- Recorded Announcement (RAN)

**NOTE:** Most of the options required for these types of trunks are in programming. Sometimes you may need to set actual switches on the card to make them operate for a particular type of trunk. In the classroom the cards are pre-set for the types of trunks we will be adding to the PBX, so there will be no need to remove the card and verify the switch settings.

### Trunk Usage

Knowing how the trunk will be used gives you the information needed to make it available to your customers.

| Usage Type | Notes |
|---|---|
| Incoming only (ICT) | Dedicated trunk for receiving calls only. Typically is programmed for DID trunks. |
| Outgoing only (OGT) | Dedicated trunk for making calls only. |
| Incoming and Outgoing (IAO) | Most common use for Loop Start and Ground Start trunks. Typically optioned to ring to a central answer point for incoming calls. |

### Access Codes

For your customer to be able to make calls on the trunk, you need to build a route that references the trunks you need to access. The logical address is typically in the form of an access code assigned to the route. Once the route is built, it may be accessed by a telephone using the Access Code (ACOD).

**NOTE:** Allowing or denying users access to trunks is generally set by the unit's command; they provide you with who should or shouldn't have access to outside lines.

Access to the trunks, if allowed, is generally provided in the following way:

| Access Methods | Notes |
|---|---|
| Access code (ACOD) | Generally a code is assigned (like '9') to allow users access to outgoing calls on trunks. |

### Determining Access Restrictions

The best way to ensure trunks are not going to be abused (long-distance phone calls for personal use) is to restrict the ability to access them. Typically, users who need to access trunks will be allowed, like an office or a main communications center. But users at locations in the unit that don't normally make phone calls out will be denied access to trunks, like the barracks or the boat docks.

In order to block or allow access to trunks, there needs to be a relationship between how the trunks are accessed and how the user gains access to them. This link in the Nortel CS1000E is the Trunk Access Restriction Group (TARG) and Trunk Group Access Restrictions (TGAR) values.

### TGAR and TARG Relationships

Trunk Group Access Restrictions (TGAR) is a value assigned to a phone allowing you to "group" phones with like restrictions. This value is programmed in LD 10, LD 11, and in LD 14 (LD 14 when you are dealing with Tie or DID trunks, because they treat incoming calls as a telephone extension in the system, and allow you to directly dial extensions within the system.)

Trunk Access Restriction Group (TARG) is a value assigned to the trunk route, allowing you to let the system know which phones will be restricted from accessing that trunk. This value is programmed in LD 16.

---

### Example

Ext. 6001 is a barracks phone and has a TGAR value of 1 programmed. It wants to make a call on a commercial trunk. Commercial trunks are assigned to Route 001, which has a TARG value of 1. This means that the TARG and TGAR values match when Ext. 6001 tries to access that route and a value match denies access. If its TGAR value was set for any value other than 1, then Ext. 6001 would be allowed access to the trunks.

---

### TARG Chart

To keep track of the possible trunk and extension associations, we will build a chart. This chart provides the necessary values to input at the TARG and TGAR values, allowing us to block trunk access to unnecessary users as well as allow it to those who need it. See Figure 3.2.1.

| | COT | FTS | PAGE | TIE | **TGAR** **(LD 10,11,14)** |
|---|---|---|---|---|---|
| Barracks | 1 | 1 | 1 | 1 | 1 |
| Shop | 2 | 2 | 2 | 2 | 2 |
| Office | 3 | 3 | 3 | 3 | 3 |
| **TARG (LD 16)** | 1 | 1, 2 | 1, 3 | 0 | |

**Figure 3.2.1: TARG Chart**

In order to make these restrictions happen, you modify the TGAR settings in the telephone programming.

---

### Build Trunk Route

Once you've gathered the information needed, you can begin programming. When adding a new trunk to the Call Server assign it to a route. Routes allow you to group trunks of the same type together, simplifying their programming.

### Explanation of Prompts and Responses

**LD 16** has many different prompts that can be used when adding routes to the Call Server; however, we cover only the ones you need to option to make the trunk available in the system.

The table below assists you in using the guide for the first time. Refer to the *Communication Server 1000 Software Input Output Administration* document as you review these explanations.

| How to Program a New Route | |
|---|---|
| **Step** | **Action** |
| 1 | Log into the PBX. |
| 2 | Type in **LD 16.** |
| 3 | At the **REQ**: prompt, enter **NEW.** |
| 4 | At the **TYPE:** prompt, enter **RDB.** |
| 5 | At the **CUST** prompt, enter **0.** |
| 6 | At the **ROUT** prompt, enter the route number you are programming. |
| 7 | At the **RCLS** prompt, enter the routing classification you would like to assign to this route. This is also used for the feature Call Forward by Call Type. |
| 8 | At the **AUTO** prompt enter **YES** if you wish incoming calls on the trunks to terminate on DNs within the PBX. |
| 9 | At the **ICOG** prompt, enter the desired trunk direction usage, incoming, outgoing, or both. |

Continued on Next Page

## Explanation of Prompts and Responses

| How to Program a New Route | |
|---|---|
| **Step** | **Action** |
| 10 | At the **ACOD** prompt, enter the access code you want to assign to this route. |
| 11 | At the **TARG** prompt, enter the **TGAR** values of the phones you wish to deny access to this route (TGARs from LD 10, 11 and 14). |
| 12 | At the **CNTL** prompt enter **YES** to access additional control and timers functionality |
| 13 | At the **DLTN** prompt enter **YES** to allow a second dial tone after the access code is dialed on originating calls |
| **End of procedure** | |

## Verify Programing

Use the Table below as a guide to verify your programming:

| How to Verify Programming | |
|---|---|
| **Step** | **Action** |
| 1 | Use **LD 21**. |
| 2 | Use **REQ**: **PRT** to print route data block. |
| 3 | Type: RDB. |
| 4 | Use **CUST 0** to select the customer 0 database. |
| 5 | Use **ROUT** xxx to print the route (xxx = route to print, i.e. 001, 002). |
| **End of procedure** | |

## Practice Activity: Programming the Routes

**Directions**

Build the following new routes using Work Order 04C:

- Route 001—Local
- Route 002—Long Distance
- Route 003—Enterprise Network (E-Net)

You will use the LD 16 Route Data Block Worksheet and Trunk Access Restriction Chart to build your Route Data Blocks. Your instructor will go over this worksheet and give you guidance on filling it out by using one of the routes defined in the work order as an example.

# Lesson Content: Programming Analog Trunks

## Programming Analog Trunks

**LD 14** has many different prompts for adding trunks to the Call Server; however, we will only go over the ones you need to option to make the trunk available in the system.

Use the chart below as a guide for programming a new trunks. Your instructor will validate your programming when you print out all trunks using LD 20. This procedure is found on the following page.

| How to Program a New Trunk | |
|---|---|
| **Step** | **Action** |
| 1 | Log into the PBX. |
| 2 | Type **LD 14** at the prompt. |
| 3 | At the **REQ**: prompt enter **NEW.** |
| 4 | At the **TYPE:** prompt enter the trunk type. |
| 5 | At the **TN** prompt enter the TN you wish to assign the trunk to. |
| 6 | At the **XTRK** prompt enter **EXUT.**<br><br>***NOTE:*** *XTRK prompt will only show if this is the first trunk programmed on the card.* |
| 7 | At the **CUST** prompt, enter **0.** |
| 8 | At the **RTMB** prompt enter the route # and member # you want to assign the trunk to. |
| 9 | Continue following the LD 14 worksheets, filling out each prompt you have a response for until the programming is complete.<br><br>**NOTE:** Once you have reached the final prompt, the system will display the following header:<br><br>*RDB000*<br>*MEM AVAIL: (U/P): XXXX  USED: XXXXX  TOT: XXXXX*<br>*DISK RECS AVAIL: XXX*<br>*RAN RTE AVAIL: (U/P): XXX  USED: XXX  TOT: XXX* |
| End of procedure | |

### Verify Programming

Once you have entered all of the trunks, print each one using LD 20:

| Prompt | Response | Notes |
|---|---|---|
| LD 20 | | Access overlay 20. |
| REQ: | PRT | Print the data block for the TYPE specified. |
| TYPE: | COT | Print only COT-type trunks. |
| TN | <cr> | Leaving this blank will print all of the TYPE specified. |
| CUST | 0 | Use the customer 0 database. |
| DATE | <cr> | Not date-specific. |
| PAGE | <cr> | (Printing doesn't stop at each page and wait for you to tell it to continue.) |

Compare the printed trunks to the programming information you gathered earlier, and ensure they match. If they don't match, make the necessary modifications.

## Practice Activity: Programming Analog Trunks

### Directions

Build the following new trunks using Work Orders 05C and 06C:

- Two Local Trunks
- Three Long Distance Trunks
- Three Enterprise Network (E-Net) Trunks
- One DID Route and Trunk

You will use the LD 14 Trunks Worksheet and Trunk Access Restriction Chart to build your Route Data Block and associated trunks. Your instructor will go over this worksheet and give you guidance on filling it out by using one of the routes defined in the work order as an example.

### Cross Connecting the Trunks

Once you have finished adding the routes and trunks in the programming, you need to wire it to the proper terminals so your customer can use it. You have already gathered this information, so all you have to do is make the connections.

Use the *Communication Server 1000E Installation and Commissioning Guide* as a reference for making connections to the universal trunk card.

# Lesson Content: Routes & Trunks with Element Manager

## Introduction

The **Routes and Trunks** branch of the Element Manager navigator is used to launch web pages that enable the user to configure and edit data relating to customers and their equipment.

## Accessing Routes and Trunks

Click the **Routes and Trunks** link on the **Routes and Trunks** branch of the Element Manager navigator to open the **Routes and Trunks** Web page, as shown below. From this Web page, users can view information about existing customers, routes, and trunks.

This Web page also contains buttons that link to additional Web pages. Follow these links to

- add a new route
- edit route data
- add a new trunk
- edit trunk data
- delete multiple trunks

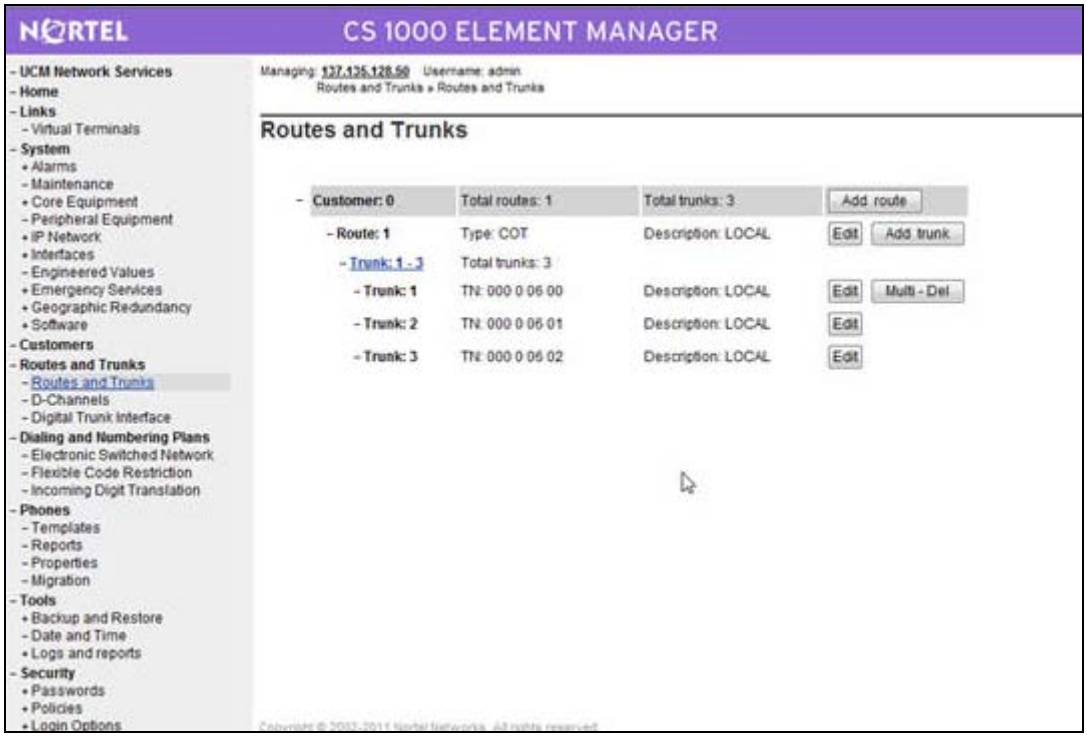


**Figure 3.2.2**

**--End--**

## Adding Routes

Click the **Add Route** button beside the Customer row to open the **New Route Configuration** Web page for the selected customer and route. Enter Route configuration data as shown in the example below.

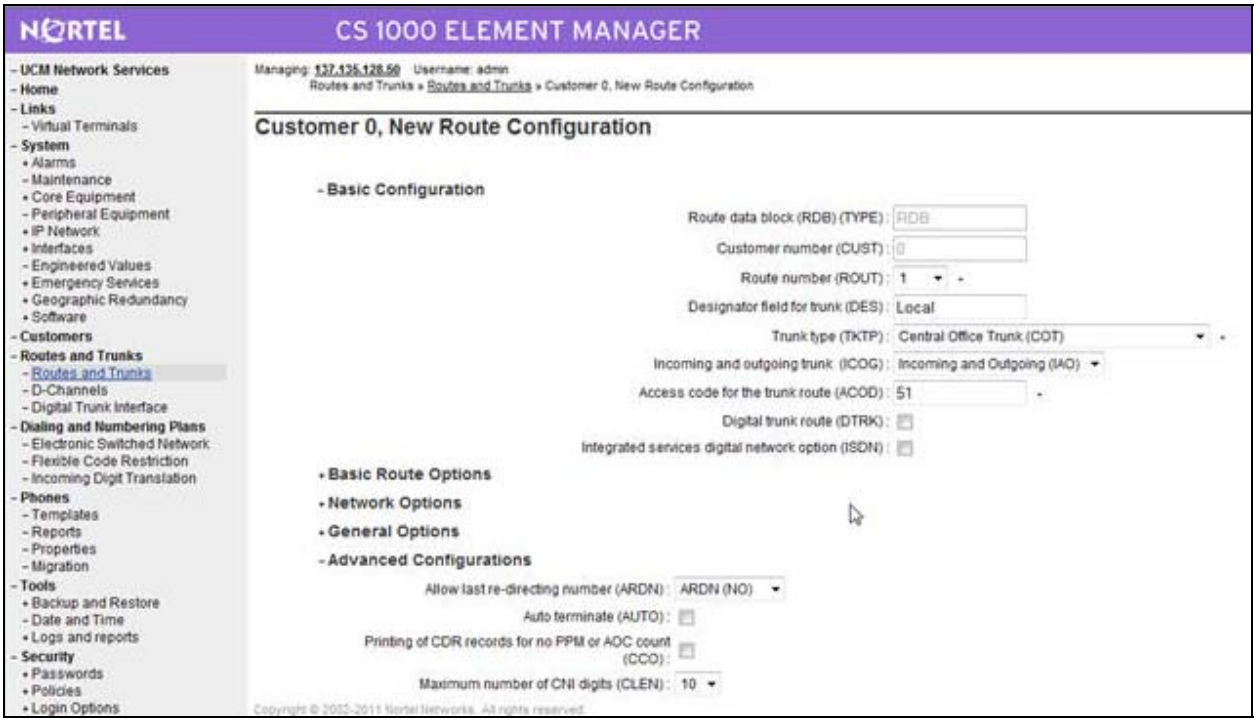


**Figure: 3.2.3**

The **New Route Configuration** Web pages are divided into **Five** categories:

1. Basic Configuration

2. Basic Route Options

3. Network Options

4. General Options

5. Advanced Configurations

To save changes made in this section, click **Submit** at the bottom of the **Route Property Configuration** Web page.

**--End--**

## Adding Trunks

Click the **Add Trunk** button beside a Route Row to open the **New Trunk Configuration** Web page for the selected customer, route, and trunk, as shown in the figure below.

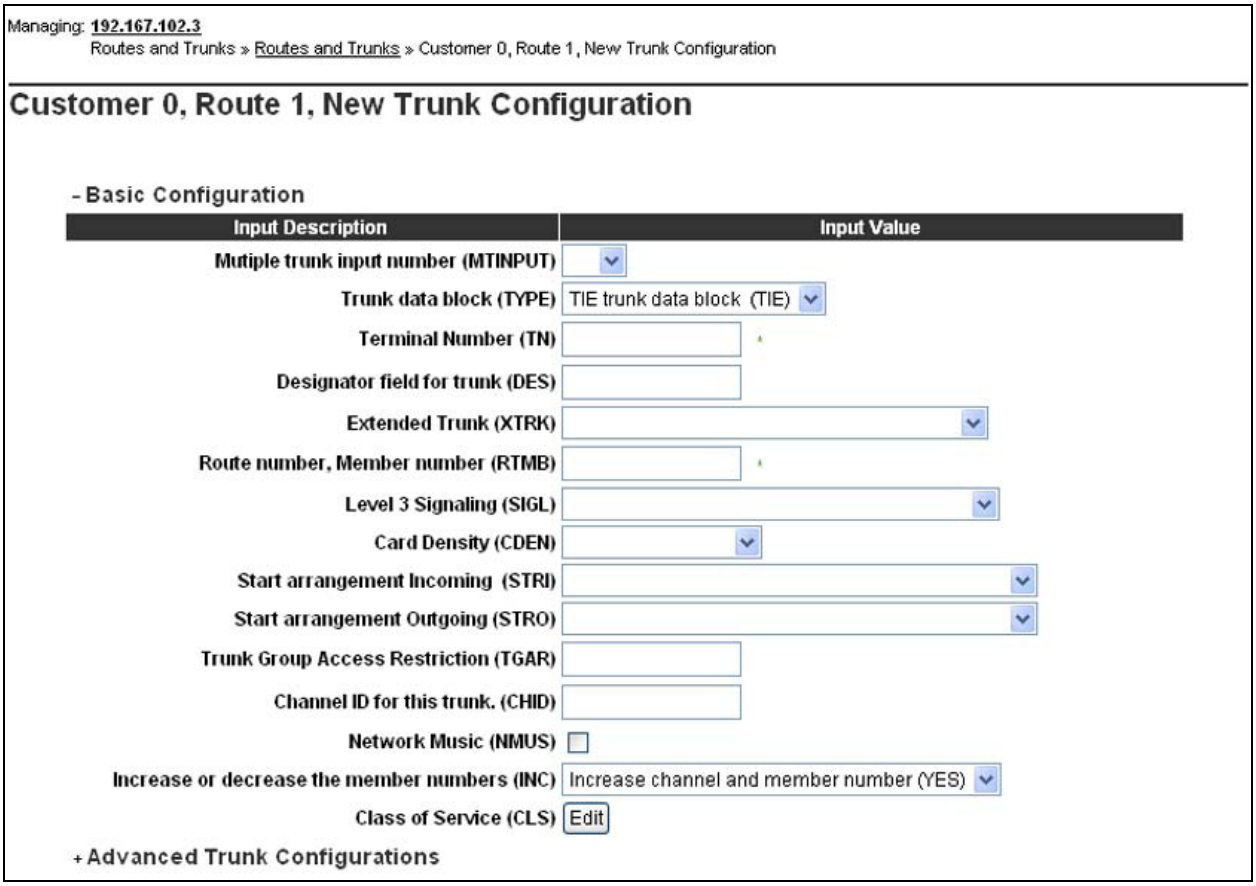


**Figure: 3.2.4**

The **New Trunk Configuration** Web pages are divided into **Two** categories:

1. Basic Configuration

2. Advanced Trunk Configurations

**Continued on next page**

## Class of Service

To access the Class of Service for trunks click on the edit button next to the (CLS) prompt.

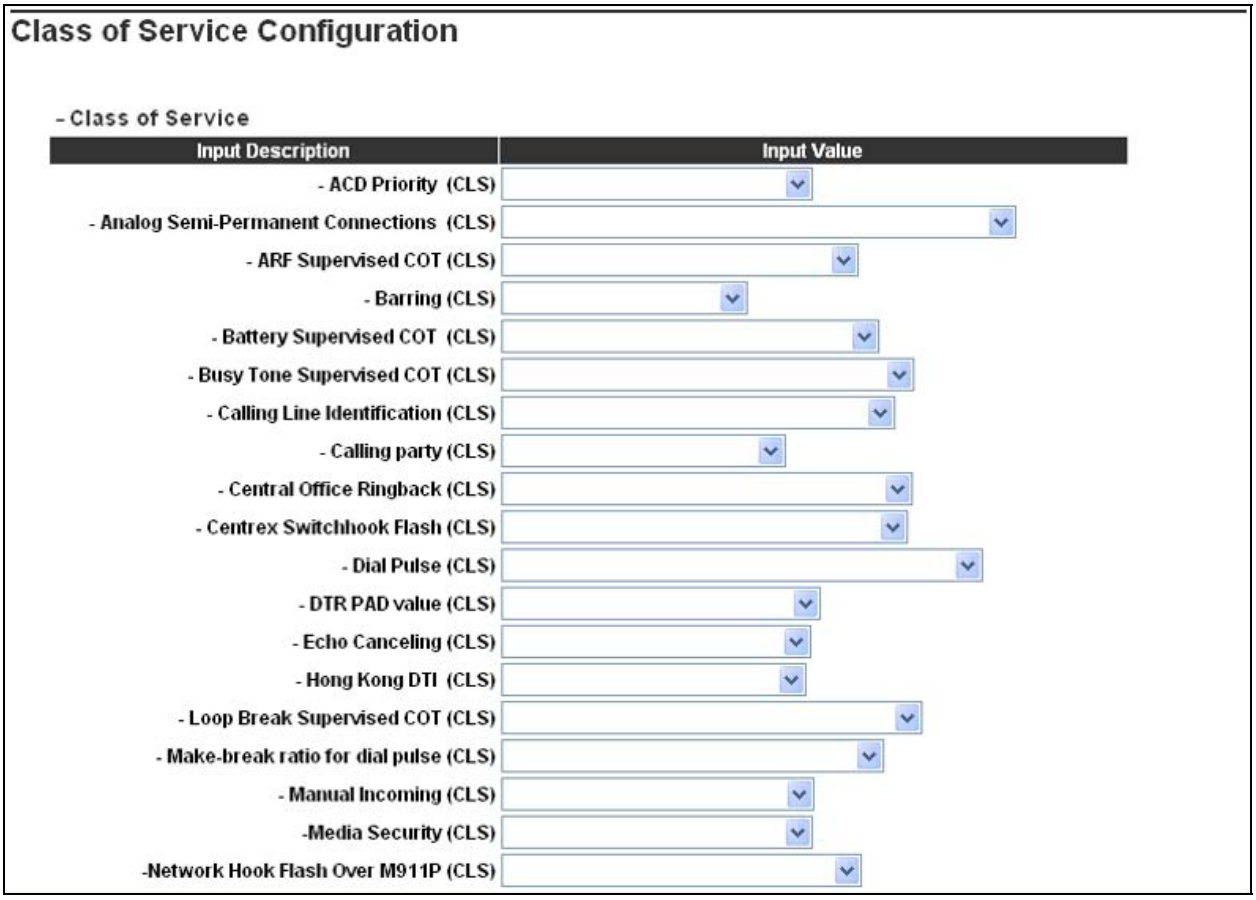


**Figure: 3.2.5**

To save Class of Service configuration click the **Return Class of Service** button. You will be returned to the **New Trunk Configuration** Web page.

To save trunk configuration changes, click **Submit** at the bottom of the **New Trunk Configuration** Web page.

**--End--**

## Review Activity: Programming Analog Routes and Trunks

**Directions**

Using the information you have learned in this module of instruction, answer the following questions.

---

**Questions**

1. What LD order should you follow when adding a new trunk group to Nortel CS1000E?

   A. LD 11, then 14
   B. LD 14, then 16
   C. LD 16, then 14
   D. Doesn't matter

2. What prompt in LD 16 do you use to set the trunks for Incoming Only?

   _____

   _____

3. Using question number two, what is the response at that prompt for an Outgoing Only trunk?

   _____

   _____

4. What LD do you use to print a route?

   _____

   _____

5. Use the answer from the previous question, and fill in the responses to print route 66.

| Prompts | Response |
|---|---|
| LD | |
| REQ | |
| TYPE | |
| CUST | |
| ROUTE | |

---

# Summary

## Lesson Summary

Upon completion of this lesson presentation and practice exercise, you will be able to:

**3.1** **INSTALL** an analog trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.1.1** **REVIEW** manufacturer's documentation
- **3.1.2** **REVIEW** applicable security policies
- **3.1.3** **PROGRAM** analog trunk routes
- **3.1.4** **PERFORM** function check
- **3.1.5** **COMPLETE** unit documentation

# Lesson 3

# TRUNK MAINTENANCE

## Lesson Content: Overview

### Overview

In this lesson, you will be introduced to performing trunk maintenance. This lesson is designed to provide you with the key performance elements to assist you in maintaining trunks. This lesson begins with an overview of maintenance loads. This will be followed by a practice activity where you perform common maintenance functions. There will be a performance activity at the end of this lesson to test comprehension of the key performance elements that you'll need to perform for upcoming tasks.

### Performance Objectives

Upon successful completion of this lesson, you will be able to:

**3.2** **PERFORM** maintenance on a trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.2.1** **REVIEW** manufacturer's documentation
- **3.2.2** **REVIEW** applicable security policies
- **3.2.3** **PERFORM** function check

### Performance Evaluations

The performance evaluations for these tasks are scheduled immediately following this lesson. These performance evaluations will be in delivered via a work order. These work orders will test the performance objective you have just completed in this lesson. These work orders will build in complexity based on previous tasks from previous lessons. These performance evaluations will be in a separate workbook from your student guide. Your instructor will hand out these workbooks out in class. Please do not complete these work orders prior to the instructor assigning them to you. You will work in your booth with your partner as a class. Your instructor will sign off these performance evaluations as you complete each tasks.

## Lesson Content: Overview, continued

### References

We will be referring to the following Northern Telecom Publications (NTPs) as we go through this unit of instruction.

| Document | Document # |
|---|---|
| *Communication Server 1000 Software Input Output - Administration* | NN43001-611 |
| *Communication Server 1000 Software Input Output - Maintenance* | NN43001-711 |
| *Communication Server 1000E Maintenance Guide* | NN43041-700 |
| *Element Manager System Reference – Administration* | NN43001-632 |

### Tools and Equipment

There are no tools needed for this lesson.

### Job Aids

There are no job aids for this lesson.

### Handouts

There are no handouts for this lesson.

### Key Terms

There are no key terms for this lesson.

### Pre-Lesson Work

There is no pre-lesson work for the lessons in this unit.

# Lesson Content: Maintenance

## Introduction

Performing maintenance on a line can be a regular activity on a CS1000 system. Maintenance functionalities allow administrators to check line status, disable, and enable card/unit level items in addition to many other options. These tasks may also serve an important role in the diagnoses of hardware faults.

---

LD 32 performs checks and maintenance functions on network and Peripheral Signaling equipment. LD 32 will allow commands to be used for TDM cards.

On a CS1000E, this program can be used to:

- get the status of peripheral equipment cards and units
- enable and disable peripheral equipment cards and units
- print set and card IDs

---

## Overlay 32 Linkage

Overlay programs 10, 11, 20 and 32 are linked, thus eliminating the need to exit one Overlay and enter another. Once one of the aforementioned Overlays has been loaded, it is possible to add, print and obtain the status of a set without having to exit one Overlay and load another.

Input processing has also been enhanced. Prompts ending with a colon (:) allow the user to enter either:

1. a question mark (?) followed by a carriage return (<CR>)

   This entry will present you with a list of valid responses to that prompt.

2. an abbreviated response

   The system responds to this entry with the nearest match. If there is more than one possible match, the system responds with SCH0099, the input followed by a question mark, and a list of possible responses.

The user can then enter a valid response.

---

### Common Maintenance Commands

The following table contains some of the most often used commands within LD 32.

| Action | Command |
|---|---|
| Card Status | STAT L S C |
| Circuit Status | STAT L S C U |
| Enable Card | ENLC L S C |
| Enable Circuit/Unit | ENLU L S C U |
| Disable Card | DISC L S C |
| Disable Circuit/Unit | DISU L S C U |

### Maintenance Commands in Element Manger

When the user clicks the **Maintenance** link in the **System** branch of the Element Manager navigator, the **Maintenance** Web page appears. The user can choose how the options are presented. If the user chooses **Select by Functionality**, the diagnostic tool options are presented by functionality. The default view of **Select by Overlay** is shown below.

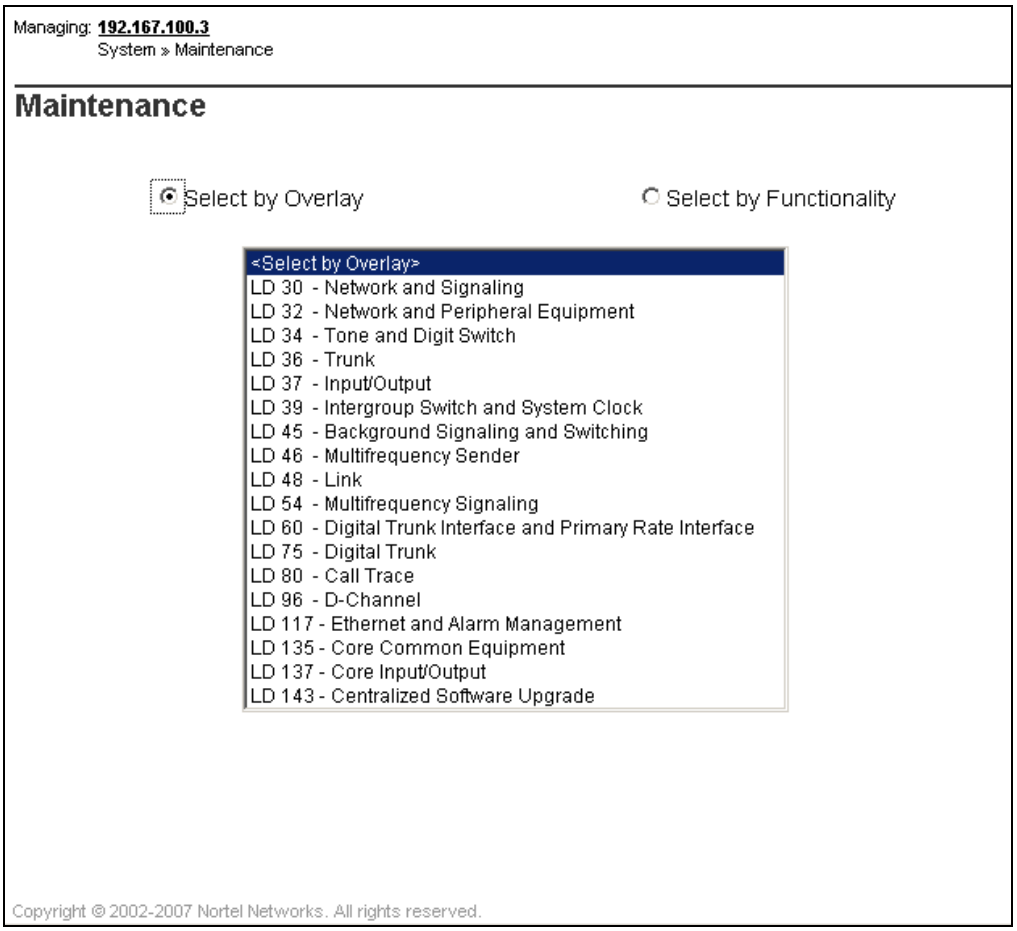


**Figure 3.3.1**

**Continued on next page**

### Network and Peripheral Equipment

Click the **Network and Peripheral Equipment Diagnostics** link in the list of **Maintenance** diagnostic tools to open the **Network & Peripheral Diagnostics** Web page as shown below.

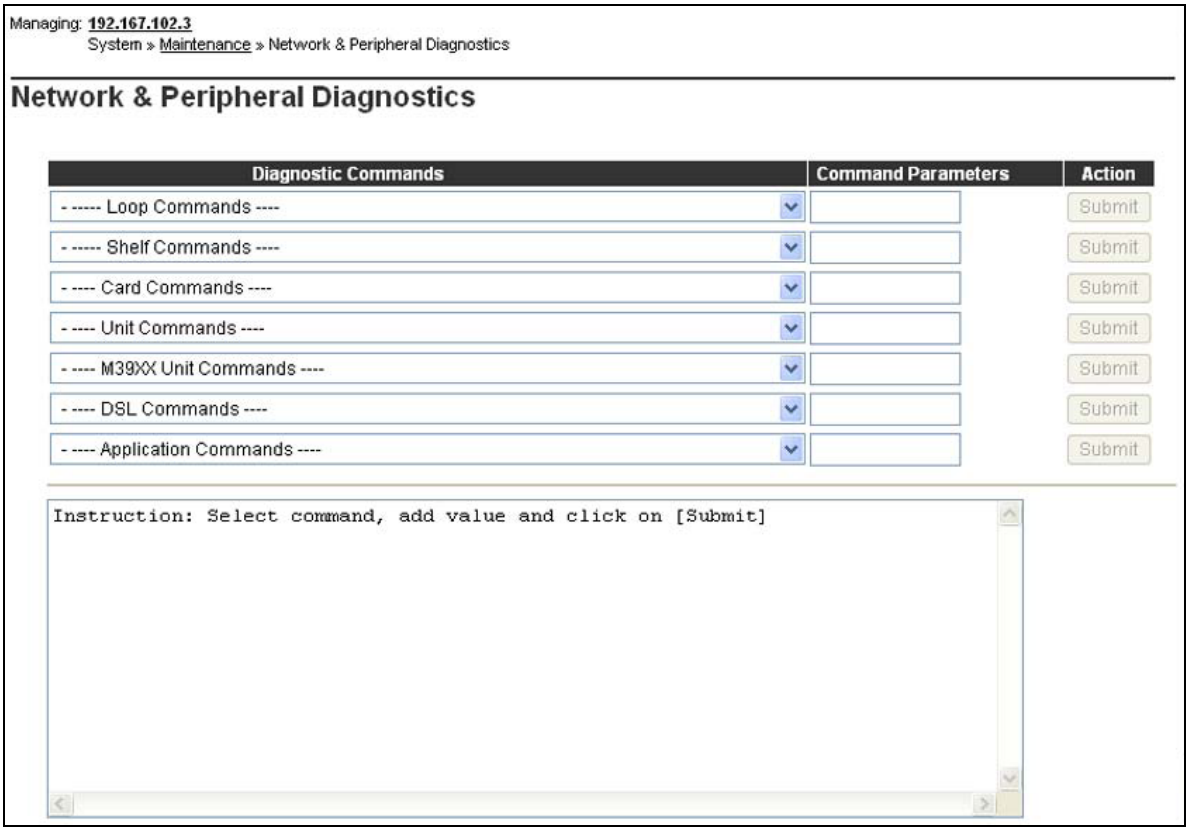


**Figure 3.3.2**

This Web page is used to test and maintain network and peripheral equipment. The commands available from this Web page correspond to the data traditionally maintained by using the LD 32 - Network and Peripheral Equipment Diagnostic.

**Loop Commands**

- Network Loop
  - ENLL - Enable network loop
  - DISL - Disable network loop
- Super Loop
  - STAT - Get status of Superloop
  - SUPL - Print data for Superloops
  - ENLL - Enable specified Superloop

**Shelf Commands**

- DISS - Disable the shelf
- ENLS - Enable specified shelf
- LBSY - List TNs of all busy units
- LDIS - List TNs of all disabled units
- LIDL - List TNs of all idle units
- LMNT - List TNs of all maint. busy units

**Card Commands**

- General Card Commands
  - STAT - Get card status
  - ENLC - Enable and reset card
  - DISC - Disable peripheral card
  - IDC - Print card ID for PE card

**Unit Commands**

- General Unit Commands
  - STAT - Get unit status
  - ENLU - Enable unit
  - IDU - Print set ID
  - DISU - Disable unit

**--End--**

## Summary

### Lesson Summary

In this lesson, you performed maintenance on a trunk. Upon completion of this student guide and after the lesson presentation and practice exercises, you should be able to:

**3.2** **PERFORM** maintenance on a trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.2.1** **REVIEW** manufacturer's documentation
- **3.2.2** **REVIEW** applicable security policies
- **3.2.3** **PERFORM** function check

# Lesson 4

# DIGITAL TRUNK INTERFACE (DTI)

## Lesson Content: Digital Trunks Overview

### Overview

In this lesson you will be introduced to how to program digital trunks. This lesson is designed to provide you with the key performance elements to assist you in adding digital trunks. This lesson begins with an overview of Digital trunks. You will learn how to locate the DTI card which is the interface between the Digital trunk and the Call Server. You will then enable the DTI card, program the route, trunk, and the clocking source. There will be a performance activity at the end of this lesson to test comprehension of the key performance elements that you'll need to perform for upcoming tasks.

### Performance Objectives

Upon successful completion of this lesson, you will be able to:

**3.3** **INSTALL** a digital trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.3.1** **REVIEW** manufacturer's documentation
- **3.3.2** **REVIEW** applicable security policies
- **3.3.3** **DETERMINE** digital trunk type (DTI/PRI)
- **3.3.4** **PROGRAM** Digital Data Block (DDB)
- **3.3.5** **CREATE** a Digital Loop (DLOP)
- **3.3.6** **CREATE** the D-Channel
- **3.3.7** **ENABLE** Calling Line Identification (CLID)
- **3.3.8** **PROGRAM** Calling Line Identification (CLID) Entries
- **3.3.9** **PROGRAM** a trunk route
- **3.3.10** **PERFORM** function check
- **3.3.11** **COMPLETE** unit documentation

### Performance Evaluations

The performance evaluations for these tasks are scheduled immediately following this lesson. These performance evaluations will be in delivered via a work order. These work orders will test the performance objective you have just completed in this lesson. These work orders will build in complexity based on previous tasks from previous lessons. These performance evaluations will be in a separate workbook from your student guide. Your instructor will hand out these workbooks out in class. Please do not complete these work orders prior to the instructor assigning them to you. You will work in your booth with your partner as a class. Your instructor will sign off these performance evaluations as you complete each tasks.

### References

Northern Telecom Publications (NTPs) is the documentation for the CS1000E system. These publications provide reference tools and information that is related to the various features and options of the system.

| Document | Document # |
|---|---|
| *Communication Server 1000E Planning and Engineering* | NN43041-220 |
| *Communication Server 1000E Installation and Commissioning* | NN43041-310 |
| *Communication Server 1000E Maintenance* | NN43041-700 |
| *Communication Server 1000 Software Input Output Administration* | NN43001-611 |
| *Communication Server 1000 Software Input Output Reference - System Messages* | NN43001-712 |
| *Communication Server 1000 Software Input Output Reference - Maintenance* | NN43001-711 |
| *ISDN Primary Rate Interface Installation and Commissioning* | NN43001-301 |
| *Element Manager System Reference – Administration* | NN43001-632 |

### Tools and Equipment

The tools and equipment used for this lesson are:

- Nortel CS1000E switch and console
- Standard IT Toolkit

### Job Aids

The job aids for this lesson are:

- How to install DTI Trunk
- Verify DTI switch settings on the clock controller
- How to program the digital loop
- How to enable the loop
- How to verify digital trunk operations

### Handouts

Your instructor will provide you with the following handouts:

- Work order WO-07C (located in the Performance Evaluation workbook)

### Key Terms

There are no key terms for this lesson.

### Pre-Lesson Work

There is no pre-lesson work for this lesson.

# Lesson Content: Programming Digital Trunk Interfaces

## Digital Trunking

Analog trunks are commonly used in all phone systems; however, once in a while you will have a phone system that receives its services from a digital trunk. These trunks allow multiple trunk connections to be made at the same time, typically only using two pairs of wire. There are different types of digital trunks available from the Public Switched Telephone Network (PSTN); we will be describing and installing a DTI trunk interface using a T-1 connection.

## DTI Trunks

A Digital Trunk Interface (DTI) is a physical connection from the Call Server to a digital trunk being provided from the PSTN or another phone system.

In the CS1000E this trunk interface is provided on a DTI/PRI TMDI trunk card. This card provides a full T-1 connection allowing up to 24 separate voice calls to be processed on one digital span. These calls are separated into the 24 different connections by assigning each one its own channel (1–24).

The channels are connected to each phone system through the DTI loop created by the TMDI card. These channels are connected, that is channel one on one system connects to channel one on the other system, and so on until all 24 channels are connected. The Call Server software allows each of these channels to be optioned as trunks that can be accessed by users within the system as well as users outside, just like analog trunks.

## Channel Service Units

When connecting the DTI/PRI trunk to the PSTN, a channel service unit (CSU) is required. The CSU provides:

- A demarcation point for the T-1 trunk being provided by the Public Switched Telephone Network
- Protection for the T1 line and the user equipment from lightning strikes and other types of electrical interference
- Built-in test modes assist in troubleshooting the T-1 trunk by allowing the telephone company to loop the trunk signal back to themselves. In this way, they can verify the transmit and receive paths to the CSU are operational.

### DTI Trunk Installation Process

The following is an outline of the process to add a DTI trunk to your CS1000E Call Server:

| How to Install DTI Trunk | |
|---|---|
| **Step** | **Action** |
| **Hardware** | |
| 1 | Locate the DTI/PRI (TMDI) Card. |
| 2 | Identify the clocking source and location. |
| 3 | Connect the cabling (booth-to-booth). |
| **Programming** | |
| 1 | Enable the card in the Call Server. |
| 2 | Set the alarm threshold values. |
| 3 | Option the trunk for the correct signaling. |
| 4 | Program the route. |
| 5 | Program the trunk(s). |
| 6 | Program the clocking source. |
| End of procedures | |

## Clocking Source

T-1 is a synchronous transmission, which requires only one clock source. This clocking source is used to synchronize the internal system clock with the digital trunk, allowing both systems to be in synch, eliminating the potential of information being lost. Once the two digital switches are connected to one another, one system can, therefore, derive its timing from the other in a master/slave relationship, allowing them to be in synch with each other. This synchronization between the two switches is important; it allows the trunks to be properly matched up on each system, eliminating possible misconnections.

## Installing the Clock Controller

The clock controller is installed on the TMDI trunk card: See Figure 3.4.1.

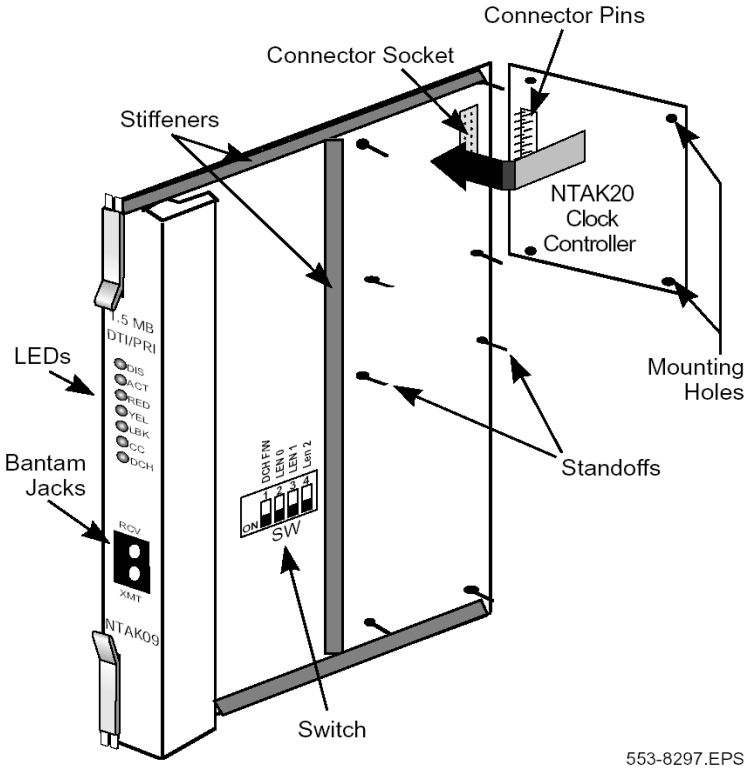


**Figure 3.4.1: Clock Controller**

## Installing the Clock Controller —PRI Switch Settings

The following table shows the PRI switch settings:

| Verify PRI Switch Settings on the Clock Controller | | | | |
|---|---|---|---|---|
| **Distance to Digital Cross-Connect** | **1 DCH F/W** | **2 (LEN 0)** | **3 (LEN 1)** | **4 (LEN 2)** |
| 0–133 feet | Off | Off | Off | On |
| 133–266 feet | Off | On | On | Off |
| 266–399 feet | Off | Off | On | Off |
| 399–533 feet | Off | On | Off | Off |
| 533–655 feet | Off | Off | Off | Off |

## Connect the Cables

Once you have located the card, you need to install the cabling. To interface your PBX TMDI card to the Public Switched Telephone Network you need to:

| IF | THEN |
|---|---|
| Using a Nortel proprietary cable | Connect one end of the Nortel NTB04 cable to the corresponding connection on the PBX backplane. |
| | Connect the other end to the Channel Service Unit (CSU) provided by operating company. |
| Using a standard telephony cable | Connect the amphenol cable to the corresponding connection on the PBX backplane. |
| | Connect the other cable to the termination block. |
| | Make all cross connections. |
| End of procedure | |

## Programming Overview

In order to use the TMDI card, you need to program the system so it can use the trunk coming from the Public Switched Telephone Network (the “cloud”). The procedure is as follows:

| HOW TO PROGRAM THE TMDI LOOP | |
|---|---|
| **Step** | **Action** |
| 1 | Define error detection thresholds (LD 73). |
| 2 | Add a DTI loop (LD 17). |
| 3 | Define the route data block for the DTI (LD 16). |
| 4 | Define the trunks associated with Step 3 (LD 14). |
| 5 | Define clock synchronization (LD 73). |
| End of procedure | |

A breakdown of each prompt and response can be found in the NTPs associated with programming the Nortel CS1000E. We only go over the basic prompts needed to get the TMDI card to operate and assign a working trunk to the DTI loop.

## LD 73—Detention Threshold

Define the threshold parameters using the following table.

| Prompt | Response | Notes |
|---|---|---|
| REQ: | NEW | NEW or CHG data. |
| TYPE: | DDB | Digital data block. |
| TRSH | 0-15 | Add a threshold set or table; enter this number in LD 17 when defining a DTI loop. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

## LD 17—ADD DTI Loop

To add a DTI loop, use the following process.

| How to Add a DTI Loop | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| REQ | CHG | Change existing data. |
| TYPE | CEQU | Jump to the CEQU gate. |
| DLOP | 1 24 ESF | • DTI digital loop number: 1<br>• channels allowed on the DTI: 24<br>• Framing format used: ESF |
| MG_CARD | 0 0 X | MG card assigned to superloop. Where X is your TMDI Card slot number. |
| MODE | TRK | Select Digital Trunk Interface. |
| TMDI | YES | Tell the system the card is a TMDI card. |
| LCMT | B8S | Code substitution method.<br><br>**NOTE:** This must match the far end setting. |
| YALM | FDL | Use the yellow alarm method to signal when there is a communication problem with the trunk.<br><br>**NOTE:** This must match the far end setting. |
| TRSH | 15 | The threshold table configured in the LD 73. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

## LD 16—DTI Trunk Route

Use the following table to program a DTI trunk route.

| Prompt | Response | Notes |
|---|---|---|
| REQ | NEW | Add new data. |
| TYPE | RDB | Route Data Block. |
| CUST | 0 | |
| ROUT | X | Enter a new RDB Number |
| TKTP | | COT, TIE, DID, FEX, WAT, etc. |
| RCLS | | Internal or External treatment. |
| DTRK | (NO) **YES** | Tell the system it is a digital trunk route. |
| DGTP | DTI | Enter the digital trunk type for the route as DTI. |
| ICOG | IAO | Incoming and outgoing trunk route. |
| ACOD | XX | Access code for the trunk route. The access code must not conflict with the numbering plan. |
| TARG | 0 | Trunk access group restriction. |
| CNTL | YES | Changes to controls and timers. |
| DLTN | YES | Dial tone on originating calls. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

### LD 14—DTI Trunks

Define the DTI trunks. This programming is the same as in Programming Analog Trunks, except you assign the trunk to a channel on the DTI loop.

| Prompt | Response | Notes |
|---|---|---|
| REQ | NEW 24 | Use NEW to build a new trunk. |
| TYPE | | The type of trunk you are installing. |
| TN | 00X 1 | Enter the DTI Loop number (X) and channel number (1-24). |
| CUST | 0 | Customer number. |
| RTMB | | Route and Member number. This determines what route you are assigning this trunk to. The route needs to be a digital trunk route since your TN is associated with a digital trunk circuit. |
| TGAR | | Trunk Group Access Restrictions. |
| SIGL | | See the work order for details. |
| STRI | | Start Arrangement Incoming. This determines which signal type the trunk uses to initiate digit collecting (See the work order). |
| STRO | | Start Arrangement Outgoing. This determines which signaling type the trunk uses to initiate digit sending (See the work order).<br>**NOTE:** Your STRO and STRI responses should reflect the type of operation in use at the far end. |
| SUPN | (No) Yes | Answer and disconnect supervision required. |
| CLS | | Class of Service options for trunks. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

## LD 73—Synchronous

Use this table to define the synchronization.

| Prompt | Response | Notes |
|---|---|---|
| REQ | CHG | Request change. |
| TYPE | DDB | Change the digital data block. |
| MGCLK | 0 0 X | Slot location of the Clock Controller Daughterboard. (TMDI)<br>**Note: To remove a MGCLK reference, use X followed by the loop and shelf (X 0 0)** |
| PREF | 1 | Primary reference source for the clock controller. Slot location of Primary Clocking Source. |
| SREF | <cr> | Secondary reference source for the clock controller. This is prompted only if the primary source is free-run. Use a secondary source only if the Meridian1 system is equipped with dual CPUs. |

## Enable the Loop

Once you have programmed all of the options, you need to enable the digital loop to make it usable:

| How to Enable Loops | |
|---|---|
| **Step** | **Action** |
| 1 | Type **LD 96** at the prompt. |
| 2 | At the prompt, type **ENL TMDI 0 0 X ALL** (where X is your TMDI Card slot number) |
| 3 | Type **LD 60** at the prompt. |
| 4 | At the prompt, type **ENLL 00X**. (This enables the DTI loop.)<br><br>To enable only 1 channel use the following:<br><br>At the prompt, type **ENCH 00X 1** |
| End of procedure | |

## Alarm States

There are two different alarm states for the DTI trunk to tell you when something is wrong:

| Alarm | Description |
|---|---|
| Red (local alarm) | A red alarm indicates that the digital trunks have been taken out of service (OOS) due to a loss of frame alignment or due to some facility performance OOS threshold being exceeded. |
| Yellow (remote alarm) | A yellow alarm (indicated by the YEL LED on the NTRB21 circuit card) indicates a red alarm at the far end (remote end). The NTRB21 receiving a yellow alarm pattern indicates that there is a T-1 connection, but the far end is not ready or the T-1 connection is one-way only. |

## Alarms Overview

These two alarm states are used to provide feedback about how the T-1 trunk is operating. Figure 3.4.2 shows a typical T-1 trunk with a fault.

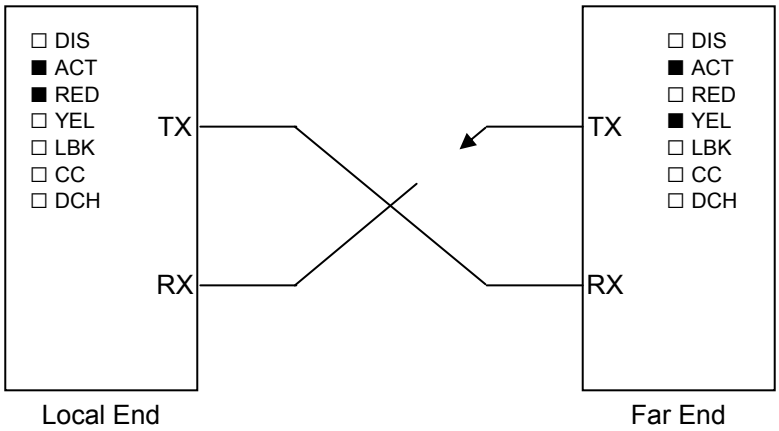


**Figure 3.4.2: T-1 trunk with a fault**

Each of the trunk cards has alarms that visually represent what is wrong. In the picture above, the local end is in a red alarm state, showing that it cannot see the trunk information coming from the far end. This causes it to transmit a yellow alarm to the far end. The far end shows a yellow alarm state, indicating that it receives information from the local end. Receipt of the yellow alarm indicates a good transmission path from the local end's transmit pair to the far end's receive pair. It is also a good indicator that the trunks are programmed properly, since the far end recognizes the local end's yellow alarm signal. The alarms indicate that the problem in this T-1 circuit is located in the cabling between the two sites, specifically in the far end transmission to the local end receive link.

## Card LED States

The TMDI card has lights on it that provide you with information about the condition of the digital trunk. Before you have the trunk connected and programmed, the card shows red lights. If all is working properly, the lights should be green. The table below provides a list of the card LED states:

| LED | State | Description |
|---|---|---|
| OOS | On (Red) | The card is disabled. |
| | **Off** | The card is enabled. |
| ACT | **On (Green)** | The card is active, with no alarms or loop-back. |
| | Off | The card is disabled because an alarm or loop-back state exists. |
| RED | On (Red) | A red alarm state exists. |
| | **Off** | No red alarm state exists. |
| YEL | On (Yellow) | A yellow alarm state exists. |
| | **Off** | No yellow alarm state exists. |
| LBK | On (Green) | The card is in loop-back mode. |
| | **Off** | The card is not in loop-back mode. |
| CC | **On (Green)** | The card is clock controller-equipped, and is either locked to a reference or in free run mode. |
| | On (Red) | The card is clock controller-equipped, and is disabled. |
| | Flashing (Green) | The card is clock controller-equipped and attempting to lock to a reference. |
| DCH | In PRI MODE, a green light indicates the D-channel is UP. Red indicates the D-channel is DOWN. No light indicates the card is not programmed for PRI. | |

**NOTE:** The items in bold indicate a properly programmed and connected trunk card. If your card shows other lights than these, then there may be a problem with the trunk connection or the trunk programming.

## Practice Activity: Install DTI Trunk

**Directions**

Using the information below and Work Order 07C provided by your instructor, install a DTI trunk between phone systems. You instructor will expect to see all programming and cabling documentation upon completion.

| Step | Action |
|---|---|
| 1 | Install a tie trunk that allows dialing into the far end phone system. |
| 2 | Allow all phones access to the new tie trunk. |
| 3 | Verify operation of the trunk. |
| 4 | Update programming and cabling documentation. |
| 5 | Show your instructor all programming and cabling documentation when complete. |
| End of procedure | |

## Review Activity: Programming Digital Trunks

**Directions**

Using the information you have learned in this module of instruction, answer the following questions.

---

**Questions**

1. What LD and prompt do you use to set the yellow alarm method used to signal where there is a communication problem with the trunk?

   _____

   _____

2. What LD do you use to enable the DTI loop?

   _____

   _____

3. What does a red alarm status represent?

   _____

   _____

4. How many trunks can you program and assign to a DTI loop?

   A. 4
   B. 24
   C. 23
   D. 16

5. What type of transmission does a T-1 use?

   A. Binary
   B. Analog
   C. Asynchronous
   D. Synchronous

6. What does it mean if you have a TMDI card with a green LED lit for ACT?

   _____

   _____

7. What other LEDs should be lit on the TMDI besides the green LED to indicate that this trunk is working properly?

   _____

   _____

# Summary

## Lesson Summary

Upon completion of this lesson presentation and practice exercise, you will be able to:

**3.3** **INSTALL** a digital trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.3.1** **REVIEW** manufacturer's documentation
- **3.3.2** **REVIEW** applicable security policies
- **3.3.3** **DETERMINE** digital trunk type (DTI/PRI)
- **3.3.4** **PROGRAM** Digital Data Block (DDB)
- **3.3.5** **CREATE** a Digital Loop (DLOP)
- **3.3.6** **CREATE** the D-Channel
- **3.3.7** **ENABLE** Calling Line Identification (CLID)
- **3.3.8** **PROGRAM** Calling Line Identification (CLID) Entries
- **3.3.9** **PROGRAM** a trunk route
- **3.3.10** **PERFORM** function check
- **3.3.11** **COMPLETE** unit documentation

# Lesson 5

# PRIMARY RATE INTERFACE (PRI)

## Lesson Content: ISDN Overview

### Overview

In this lesson you will be introduced to how to program digital trunks. This lesson is designed to provide you with the key performance elements to assist you in adding digital trunks. This lesson begins with an overview of Digital trunks. You will learn how to locate the TMDI card which is the interface between the Digital trunk and the Call Server. You will then enable the TMDI card, program the route, trunk, and the clocking source. There will be a performance activity at the end of this lesson to test comprehension of the key performance elements that you'll need to perform for upcoming tasks.

### Performance Objectives

Upon successful completion of this lesson, you will be able to:

**3.3** **INSTALL** a digital trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.3.1** **REVIEW** manufacturer's documentation
- **3.3.2** **REVIEW** applicable security policies
- **3.3.3** **DETERMINE** digital trunk type (DTI/PRI)
- **3.3.4** **PROGRAM** Digital Data Block (DDB)
- **3.3.5** **CREATE** a Digital Loop (DLOP)
- **3.3.6** **CREATE** the D-Channel
- **3.3.7** **ENABLE** Calling Line Identification (CLID)
- **3.3.8** **PROGRAM** Calling Line Identification (CLID) Entries
- **3.3.9** **PROGRAM** a trunk route
- **3.3.10** **PERFORM** function check
- **3.3.11** **COMPLETE** unit documentation

### Performance Evaluations

The performance evaluations for these tasks are scheduled immediately following this lesson. These performance evaluations will be in delivered via a work order. These work orders will test the performance objective you have just completed in this lesson. These work orders will build in complexity based on previous tasks from previous lessons. These performance evaluations will be in a separate workbook from your student guide. Your instructor will hand out these workbooks out in class. Please do not complete these work orders prior to the instructor assigning them to you. You will work in your booth with your partner as a class. Your instructor will sign off these performance evaluations as you complete each tasks.

### References

Northern Telecom Publications (NTPs) is the documentation for the CS1000E system. These publications provide reference tools and information that is related to the various features and options of the system.

| Document | Document # |
|---|---|
| *Communication Server 1000E Planning and Engineering* | NN43041-220 |
| *Communication Server 1000E Installation and Commissioning* | NN43041-310 |
| *Communication Server 1000E Maintenance* | NN43041-700 |
| *Communication Server 1000 Software Input Output Administration* | NN43001-611 |
| *Communication Server 1000 Software Input Output Reference - System Messages* | NN43001-712 |
| *Communication Server 1000 Software Input Output Reference - Maintenance* | NN43001-711 |
| *ISDN Primary Rate Interface Installation and Commissioning* | NN43001-301 |
| *Element Manager System Reference – Administration* | NN43001-632 |

### Tools and Equipment

The tools and equipment used for this lesson are:

- Nortel CS1000E switch and console
- Standard IT Toolkit

### Job Aids

The job aids for this lesson are:

- How to install PRI Trunk
- Verify PRI switch settings on the clock controller
- How to program the digital loop
- How to enable the loop
- How to verify digital trunk operations

### Handouts

Your instructor will provide you with the following handouts:

- Work order WO-08C (located in the Performance Evaluation workbook)

### Key Terms

There are no key terms for this lesson.

### Pre-Lesson Work

There is no pre-lesson work for this lesson.

## Integrated Services Digital Network (ISDN) Trunks

**Integrated Services Digital Network**

Integrated Services Digital Network (ISDN) is a recommended standard for digital communication. ISDN provides standard digital interfaces between phones, terminals, and telecommunication networks.

ISDN uses a common signaling protocol transmitted over a dedicated data channel called the D-channel. The D-channel carries call set-up and feature activation information to the call destination. This allows users to have access to network-wide features. These features include:

- Malicious Call Trace (MCT)
- MCDN Alternate Routing
- Network Automatic Call Distribution (NACD)
- Network Call Party Name Display (NCPND)
- Network Call Redirection (NCRD)
- Network Call Forward All Calls (NCFAL)
- Network Call Transfer
- Zone Based Dialing (ZBD)

ISDN Primary Rate Interface (PRI), provides 23B+D (T-1 carriers) or 30B+D (E-1 carriers) digital connectivity between systems and the following interfaces:

- host computers
- SL-100
- DMS-100, DMS-250
- QSIG

---

**ISDN protocol overview**

ISDN protocols govern the format, timing and sequencing used to exchange data and control information between two terminal stations connected through an ISDN network.

These protocols are based on a model containing seven layers of protocol developed by the International Standards Organization (ISO). This seven-layer model, called the Open Systems Interconnection (OSI) model, has been adopted by the International Telegraph and Telephony Consultative Committee (CCITT). It is the basis for building protocol structures for ISDN service. ISDN currently uses four of the seven layers:

- Layer 1—Physical Layer
- Layer 2—Link Layer
- Layer 3—Network Layer
- Layer 7—Application Layer

### ISDN Contd.

Each layer uses the series of services provided by the layer beneath it, and builds on these services to perform communication functions for the layer above. For example, layer two builds on the services from layer one and provides the combined services to layer three. This layered approach splits the complex protocols into a series of easily managed blocks, each of which can be modified without affecting protocols in another layer. Layers one through three control the set-up of connections. These layers also supervise the transmission of information between terminals and the packet-switched and circuit-switched networks.

The PRA protocol layers are implemented as follows:

- Layer 1 (the Physical Layer) is handled by the Primary Rate Interface (PRI) card.
- Layer 2 (the Link Layer) is handled by the D-channel Interface.
- Layer 3 (the Network Layer) is handled by the system software.
- Layer 7 (the Application Layer) is also handled by system software.

The Application Layer uses the Transaction Capability Application Part (TCAP) and the Remote Operation Service Element (ROSE) to process applications. The transport of applications has three main parts:

- a simple interface allowing applications to send and receive data
- a non-call-associated supplementary service to handle TCAP remote operation
- a call-associated supplementary service to handle ROSE remote operation

*Note:* ROSE messaging is supported for call-associated messages; TCAP messaging is supported for non-call-associated messages.

---

**ISDN Primary Rate Interface**

ISDN PRI provides the interface between a customer's equipment and the public and private network, and allows basic call services and network business services capabilities across the public and private networks. The characteristics of PRI provide a standard digital interface that supports the Q.931 protocol, as recommended by the International Telegraph and Telephony Consultative Committee (CCITT). This protocol is a message-oriented out-of-band signaling protocol that provides telephony, data and supplementary services. The PRI architecture allows continued growth in operations, maintenance and network business services.

---

## ISDN Contd.

### Primary Rate Interface structure

ISDN consists of two types, Basic Rate Interface (BRI), and Primary Rate Interface (PRI). The Primary Rate Interface is structured as a collection of digital, 64 Kbit/s channels. One channel is required for D-channel signaling information. The other channels are for user voice and data transport and are referred to as Bearer Channels or B-channels. The physical (layer 1) specification for the Primary Rate Interface supports the standard electrical characteristics and frame structures of the 1.5 Mbit/s T-1 digital carrier. Therefore, the PRI can have up to 23 B-channels and one D-channel.

| Interface | Description |
|---|---|
| Basic Rate Interface (BRI) | BRI has two Bearer or B-channels at 64 Kbps and one Data or D-channel at 16 Kbps. It is an international standard for connecting terminals to a system. |
| Primary Rate Interface (PRI) | PRI has 23 Bearer or B-channels at 64 Kbps and one Data or D-channel at 64 Kbps. The information passes over a T1 route with 24 channels. |

## ISDN Contd.

### Network Call Party Name Display

Network Call Party Name Display (NCPND) provides a network-wide visual display of names and phone numbers to both parties of a call. For phones equipped with an alphanumeric display, NCPND provides the display of the calling party's name on the terminating phone and the called party's name on the calling phone. The name and number display lasts for the duration of the call.

The sending of the names over the private network is an option set up on a per route basis. The name is provided by Call Party Name Display (CPND) configured in each switch. For call redirections, a phone option provides a display of the redirecting name instead of the calling name.

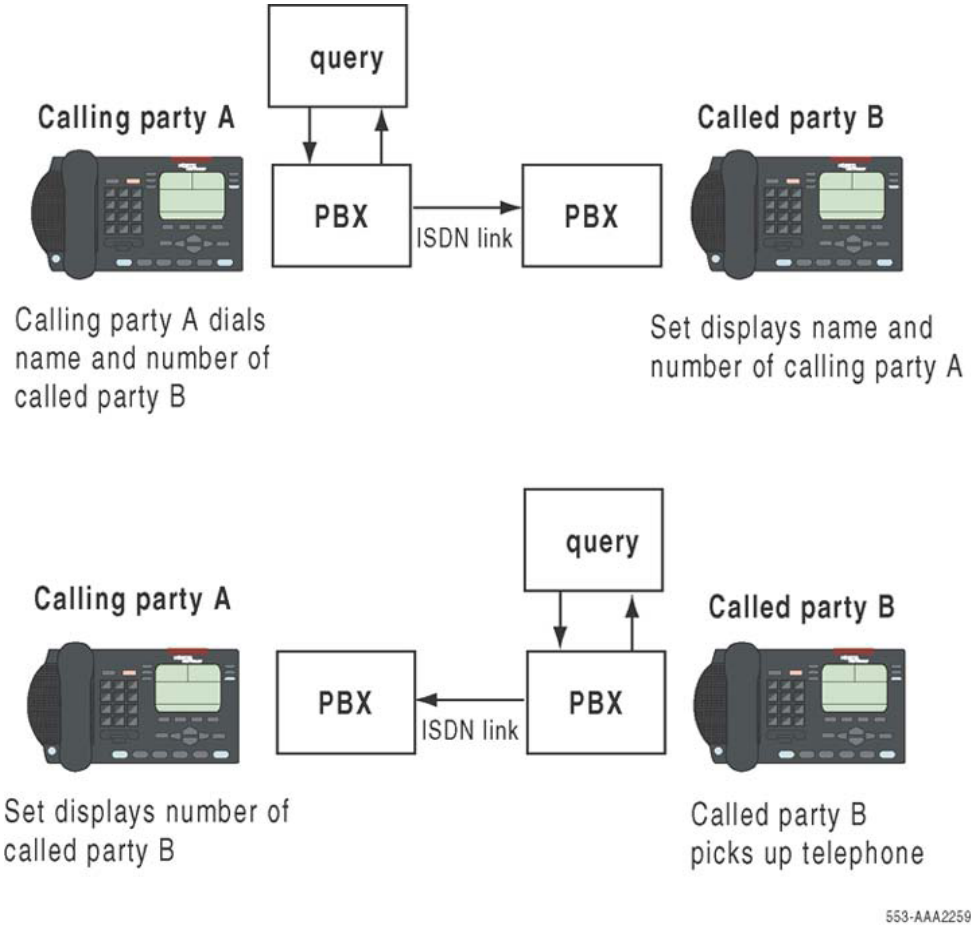


**Figure 3.5.1**

## Lesson Content: Programming Primary Rate Interface

### Enable a PRI Loop

Use the procedure below to enable a PRI loop. The PRI loop enables the circuit. The instructor will validate this is completed by using the STAT command to status the loop.

| How to Add a PRI Loop (LD 17) | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| REQ | CHG | Change existing data. |
| TYPE | CEQU | Jump to the CEQU gate. |
| DLOP | 1 23 ESF | • PRI digital loop number: 1<br>• channels allowed on the PRI: 23<br>• Framing format used: ESF |
| MG_CARD | 0 0 X | MG card assigned to superloop. Where X is your TMDI Card slot number. |
| MODE | PRI | Select Primary Rate Interface. |
| TMDI | YES | Tell the system the card is a TMDI card. |
| LCMT | B8S | Code substitution method.<br><br>**NOTE:** This must match the far end setting. |
| YALM | FDL | Use the yellow alarm method to signal when there is a communication problem with the trunk.<br><br>**NOTE:** This must match the far end setting. |
| TRSH | 15 | The threshold table configured in the LD 73. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

| How to Enable the Card (LD 96) | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| . | ENL TMDI 0 0 X All | Enable TMDI card and all channels. |

## Enable the D-Channel

| How to Enable the D (Data) Channel (LD 17) | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| REQ | CHG | Change existing data. |
| TYPE | ADAN | Jump to the CEQU gate. |
| ADAN | NEW DCH XX | Add a Primary D Channel (any unused SDI port 0-254) |
| CTYP | TMDI | TMDI = D-channel configuration on TMDI card |
| CDNO | X | Card slot number to be used as the primary DDCH/DCHI. |
| PORT | 1 | Port must be set to 1 |
| DES | <CR> | Designator field |
| USR | PRI | D-channel is for ISDN PRI only. |
| IFC | SL1 | Far End switch type |
| DCHL | X | PRI loop number. |
| SIDE | NET (USR) | Prompted only if IFC is set to SL1.<br>NET = network, the controlling switch.<br>USR = slave to the controller. |
| RCAP | ND1 | Remote capabilities. ND1 enables network call party name display. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

## Stat the loop

| How to check Card Status (LD 60) | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| . | STAT XXX | XXX = PRI loop |

## Provision Calling Line Identification

| Defining a PRI Customer (LD 15) | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| REQ | CHG | Change existing data. |
| TYPE | LDN_Data | Listed Directory Number Data Block |
| LDN0 | NXX-XXXX | Listed Directory Number. Use your local directory number. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | CHG | Change existing data. |
| TYPE | NET_Data | Networking Data |
| CLID | (NO) YES | (Do not allow) Allow Calling Line Identification option |
| ENTRY | XX | CLID entry to be configured |
| HNTN | 1 | National code for home national number (1-6 digits) |
| ISDN | (NO) YES | Integrated Services Digital Network allowed for customer |
| PFX1 | 1NPA | Long Distance Prefix 1 |
| PFX2 | NXX | Local Prefix 2 |
| HLOC | NXX | Home location code (ESN) (1-7 digits) |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

## Create a Route Data Block

| Creating a Route Data Block (LD 16) | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| REQ | NEW | Add new data. |
| TYPE | RDB | Route Data Block. |
| CUST | 0 | |
| ROUT | X | Enter a new RDB Number |
| TKTP | | COT, TIE, DID, FEX, WAT, etc. |
| RCLS | | Internal or External treatment. |
| DTRK | (NO) **YES** | Tell the system it is a digital trunk route. |
| DGTP | PRI | Enter the digital trunk type for the route as DTI. |
| ISDN | (NO) YES | Dedicated Integrated Services Digital Network (ISDN) route. |
| MODE | PRA | Mode of operation |
| DCH | XX | **(EM ONLY)** D-Channel Number |
| IFC | SL1 | Interface type for route |
| ICOG | IAO | Incoming and outgoing trunk route. |
| ACOD | XX | Access code for the trunk route. The access code must not conflict with the numbering plan. |
| TARG | 0 | Trunk access group restriction. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

### Create the Trunks

| Creating Trunks (LD 14) | | |
|---|---|---|
| **Prompt** | **Response** | **Notes** |
| REQ | NEW 23 | Use NEW to build a new trunk. |
| TYPE | | The type of trunk you are installing. |
| TN | 00X 1 | Enter the PRI Loop number (X) and channel number (1-23). |
| CUST | 0 | Customer number. |
| PCML | MU | Pulse Code Modulation Law |
| RTMB | | Route and Member number. This determines what route you are assigning this trunk to. The route needs to be a digital trunk route since your TN is associated with a digital trunk circuit. |
| TGAR | | Trunk Group Access Restrictions. |
| SIGL | | **(EM ONLY)** See the work order for details. |
| STRI | | **(EM ONLY)** Start Arrangement Incoming. This determines which signal type the trunk uses to initiate digit collecting (See the work order). |
| STRO | | **(EM ONLY)** Start Arrangement Outgoing. This determines which signaling type the trunk uses to initiate digit sending (See the work order).<br>**NOTE:** Your STRO and STRI responses should reflect the type of operation in use at the far end. |
| SUPN | (No) Yes | **(EM ONLY)** Answer and disconnect supervision required. |
| CLS | | Class of Service options for trunks. |
| Return through the rest of the prompts until the REQ prompt appears. | | |
| REQ | **** | Exit the overlay. |

## Practice Activity: Installing Primary Rate Interface Trunks

### Directions

Using the information below and Work Order 08C provided by your instructor, install a PRI trunk between two phone systems. You instructor will expect to see all programming and cabling documentation upon completion.

| Step | Action |
|---|---|
| 1 | Install a tie trunk that allows dialing into the far end. |
| 2 | Allow all phones access to the new tie trunk. |
| 3 | Verify operation of the trunk. |
| 4 | Update programming and cabling documentation. |
| 5 | Show your instructor all programming and cabling documentation when complete. |
| End of procedure | |

# Summary

## Lesson Summary

In this lesson, you discussed how to program a digital trunk. Upon completion of this lesson presentation and practice exercises, you will be able to:

**3.3** **INSTALL** a digital trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.3.1** **REVIEW** manufacturer's documentation
- **3.3.2** **REVIEW** applicable security policies
- **3.3.3** **DETERMINE** digital trunk type (DTI/PRI)
- **3.3.4** **PROGRAM** Digital Data Block (DDB)
- **3.3.5** **CREATE** a Digital Loop (DLOP)
- **3.3.6** **CREATE** the D-Channel
- **3.3.7** **ENABLE** Calling Line Identification (CLID)
- **3.3.8** **PROGRAM** Calling Line Identification (CLID) Entries
- **3.3.9** **PROGRAM** a trunk route
- **3.3.10** **PERFORM** function check
- **3.3.11** **COMPLETE** unit documentation

# Lesson 6

# DIGITAL TRUNKS IN ELEMENT MANAGER

## Lesson Content: Overview

### Overview

In this lesson you will be introduced to how to program digital trunks using Element Manager. This lesson is designed to provide you with the key performance elements to assist you in adding digital trunks. This lesson begins with an overview of Digital trunks in Element Manager. You will learn how to locate the TMDI card which is the interface between the Digital trunk and the Call Server. You will then enable the TMDI card, program the route, trunk, and the clocking source. There will be a performance activity at the end of this lesson to test comprehension of the key performance elements that you'll need to perform for upcoming tasks.

### Performance Objectives

Upon successful completion of this lesson, you will be able to:

**3.2** **PERFORM** maintenance on a trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.2.1** **REVIEW** manufacturer's documentation
- **3.2.2** **REVIEW** applicable security policies
- **3.2.3** **PERFORM** function check

**3.3** **INSTALL** a digital trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.3.1** **REVIEW** manufacturer's documentation
- **3.3.2** **REVIEW** applicable security policies
- **3.3.3** **DETERMINE** digital trunk type (DTI/PRI)
- **3.3.4** **PROGRAM** Digital Data Block (DDB)
- **3.3.5** **CREATE** a Digital Loop (DLOP)
- **3.3.6** **CREATE** the D-Channel
- **3.3.7** **ENABLE** Calling Line Identification (CLID)
- **3.3.8** **PROGRAM** Calling Line Identification (CLID) Entries
- **3.3.9** **PROGRAM** a trunk route
- **3.3.10** **PERFORM** function check
- **3.3.11** **COMPLETE** unit documentation

## Lesson Content: Overview, Continued

### Performance Evaluations

The performance evaluations for these tasks are scheduled immediately following this lesson. These performance evaluations will be in delivered via a work order. These work orders will test the performance objective you have just completed in this lesson. These work orders will build in complexity based on previous tasks from previous lessons. These performance evaluations will be in a separate workbook from your student guide. Your instructor will hand out these workbooks out in class. Please do not complete these work orders prior to the instructor assigning them to you. You will work in your booth with your partner as a class. Your instructor will sign off these performance evaluations as you complete each tasks

### References

Northern Telecom Publications (NTPs) is the documentation for the CS1000E system. These publications provide reference tools and information that is related to the various features and options of the system.

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|---|---|
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| *Communication Server 1000E Installation and Commissioning* | NN43041-310 |
| *Communication Server 1000E Maintenance* | NN43041-700 |
| *Communication Server 1000 Software Input Output Administration* | NN43001-611 |
| *Communication Server 1000 Software Input Output Reference - System Messages* | NN43001-712 |
| *Communication Server 1000 Software Input Output Reference - Maintenance* | NN43001-711 |
| *ISDN Primary Rate Interface Installation and Commissioning* | NN43001-301 |
| *Element Manager System Reference – Administration* | NN43001-632 |

### Tools and Equipment

The tools and equipment used for this lesson are:

- Nortel CS1000E switch and console
- Standard IT Toolkit

## Lesson Content: Overview, Continued

**Job Aids**

There are no job aids for this lesson

**Handouts**

Your instructor will provide you with the following handouts:

- Work order WO-07C (located in the Performance Evaluation workbook)
- Work order WO-08C (located in the Performance Evaluation workbook)

**Key Terms**

There are no key terms for this lesson.

**Pre-Lesson Work**

There is no pre-lesson work for this lesson.

### Programming Overview

In order to use the TMDI card, you need to program the system so it can use the trunk coming from the Public Switched Telephone Network (the “cloud”). The procedure is as follows:

| HOW TO PROGRAM A DIGITAL TRUNK | |
|---|---|
| **Step** | **Action** |
| 1 | Define error detection thresholds (Digital Trunk Interface) |
| 2 | Add a Digital Trunk loop (Core Equipment) |
| 3 | Add a D-Channel (D-Channel’s) * |
| 4 | Provision Calling Line Identification (Customer) * |
| 5 | Define the route data block for the Digital Trunk (Routes and Trunks) |
| 6 | Define the trunks associated with Step 5 (Routes and Trunks) |
| 7 | Define clock synchronization (Digital Trunk Interface) |
| End of procedure | |

* Applies to ISDN/PRI only

## Define Error Detection Thresholds

When the user clicks the **Digital Trunk Interface** link on the **Routes and Trunks** branch of the Element Manager navigator, the **Digital Trunk Interface** Web page appears, as shown below. This Web page allows the user to configure or edit Digital Trunk Interface information.

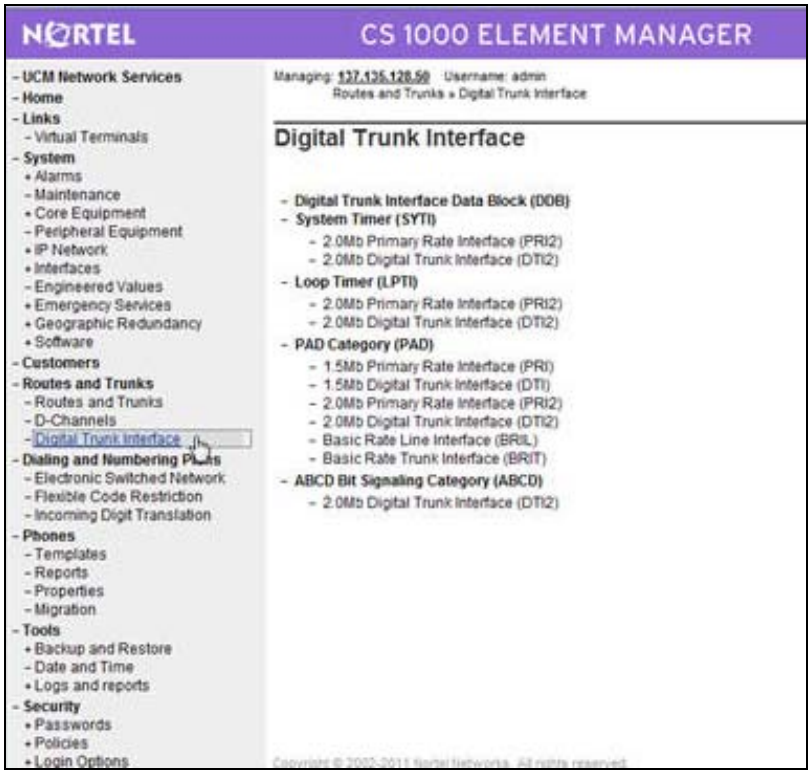


**Figure: 3.6.1**

**Continued on next page**

## Define Error Detection Thresholds

To configure or edit Digital Trunk Interface Data Block (DDB) information, click **Digital Trunk Interface Data Block (DDB)**. The **Threshold Set List** Web page appears.

**Figure: 3.6.2**

From this Web page, users can access additional Web pages to perform the following functions:

- add a Threshold Set Index
- edit an existing Threshold Set Block

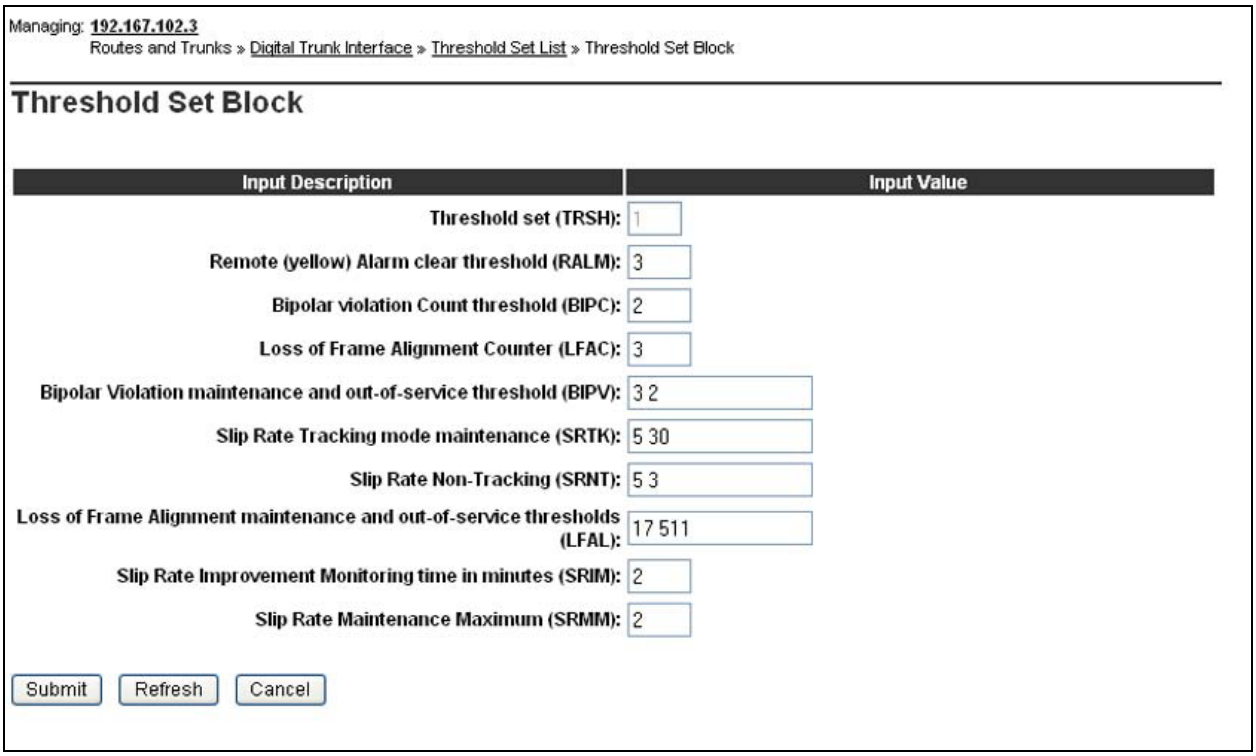


**Figure: 3.6.3**

**--End--**

## Define a Digital Loop

To configure or edit Loops (Common Equipment) information, click the **Core Equipment > Loops** link of the **System** branch of the Element Manager navigator. The **Common Equipment** Web page appears as shown below. To Add a Digital Loop click the **Add** button next to **Digital Trunk Interface Loop Number**.

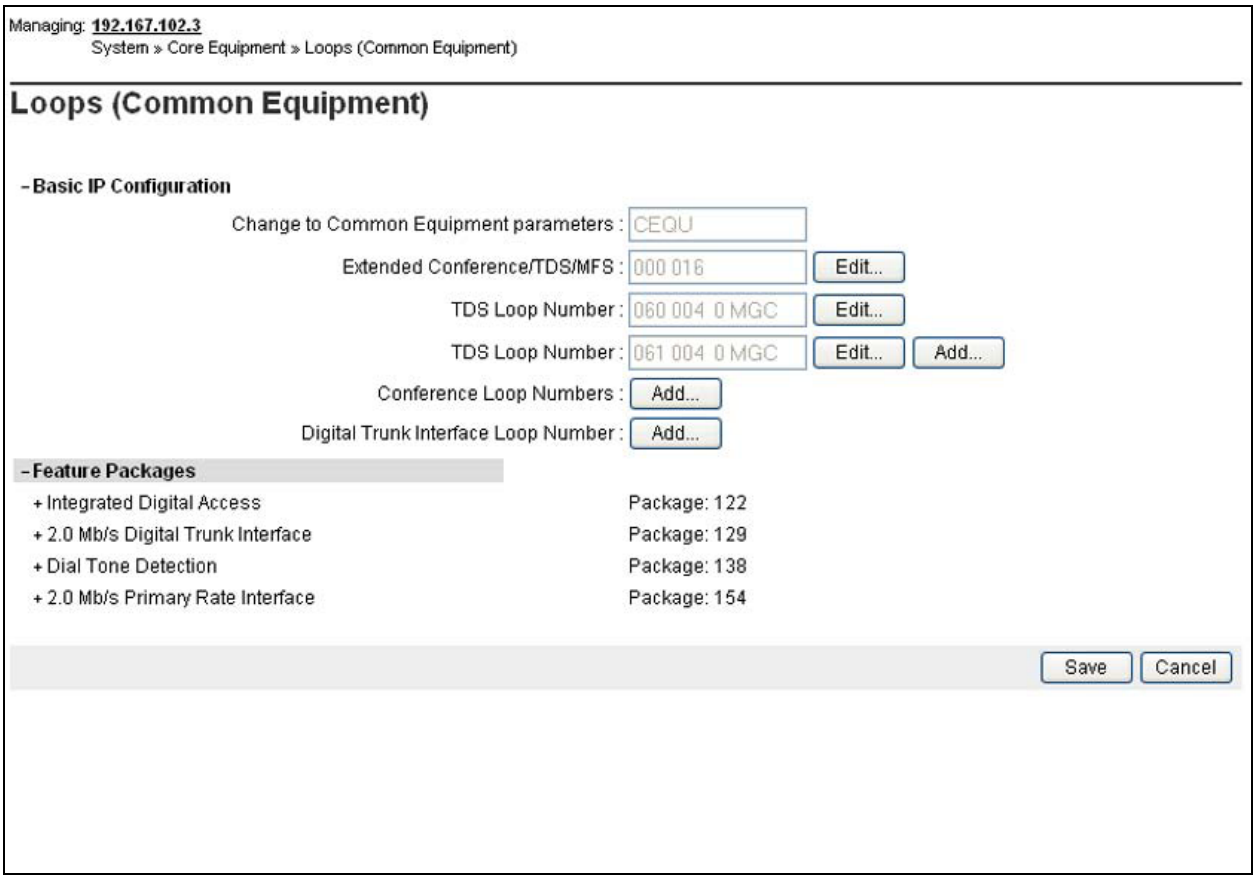


**Figure: 3.6.4**

The **Common Equipment** Web page contains buttons that act as links to additional Web pages. The following functions can be performed from these pages:

- add and delete Tone and Digit Switch (TDS) numbers
- add and delete Digital Trunk Interface Loop (DLOP) numbers
- add and delete Conference loop (CONF) numbers

The information entered in this section corresponds to CEQU (Common Equipment) data traditionally configured using LD 17 – Configuration Record 1.

**Continued on next page**

## Define a Digital Loop

To Add a Digital Loop click the **Add** button next to **Digital Trunk Interface Loop Number**. Once you have entered all necessary values click **Return**. The **Common Equipment** Web page will appear, click **Save** to enter changes into the Call Server database.

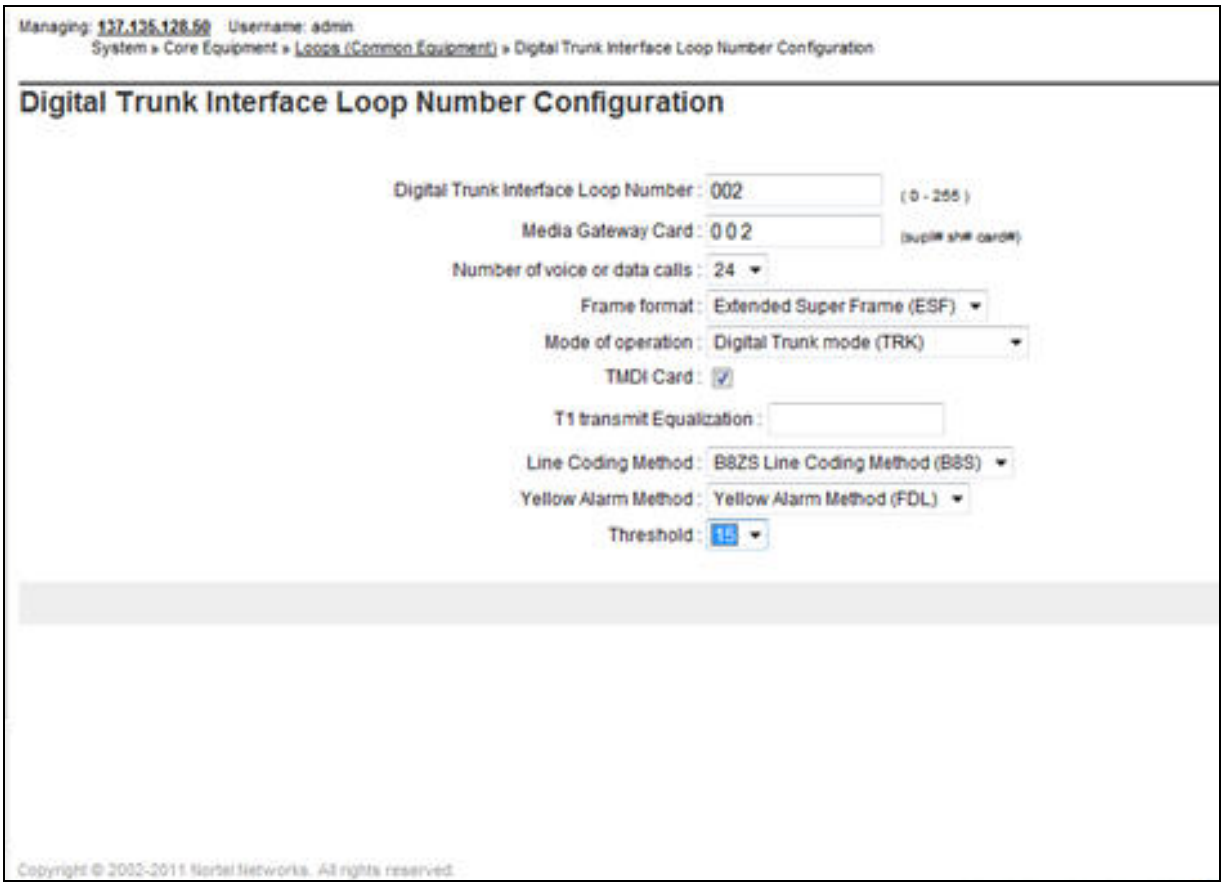


**Figure: 3.6.5**

**--End--**

## Define a D-Channel

The following D-Channel procedure will only need to be completed for a Primary Rate Interface configuration.

Click the **D-Channels** link on the **Routes and Trunks** branch of the Element Manager navigator to open the **D-Channels** Web page. This Web page allows users to configure or edit D-channel information, as shown below.

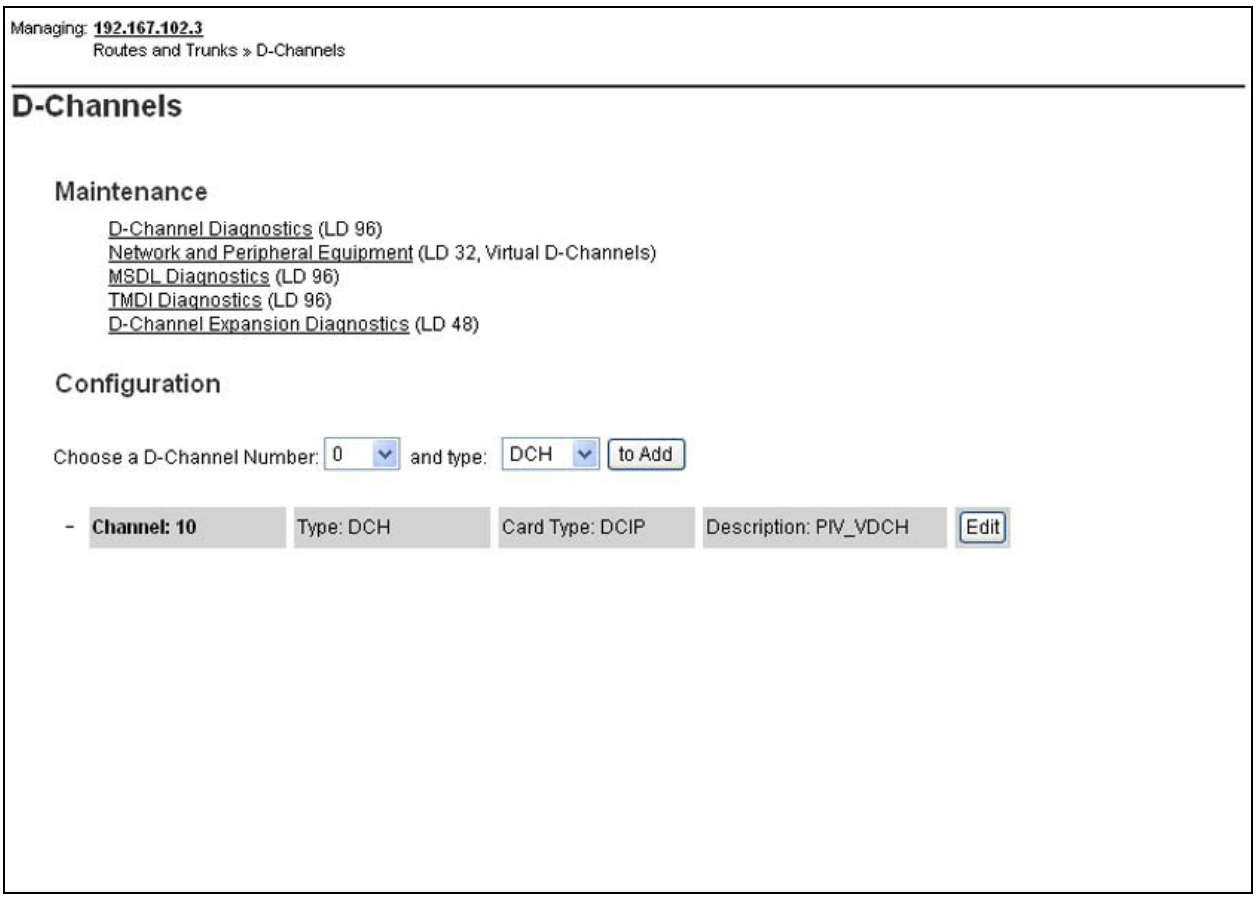


**Figure: 3.6.6**

From the **D-Channels** Web page users can view basic information about existing D-channels. This Web page also contains buttons that link to additional Web pages.

Follow these links to do the following:

- add a new D-channel
- edit D-channel data

**Continued on next page**

## Define a D-Channel

To add a new D-channel, select a number from the **Choose a D-channel Number** drop-down list, select a D-channel **type** from the type drop-down list, and click **to Add**. To edit the configuration information about an existing D-channel, click the **Edit** button located to the right of the Description field.

Click the **to Add** button, or any of the **Edit** buttons, to open the **D-Channels Property Configuration** Web page for that channel, as shown below. To save changes made in this section, click **Submit** at the bottom of the **D-channels Property Configuration** Web page.

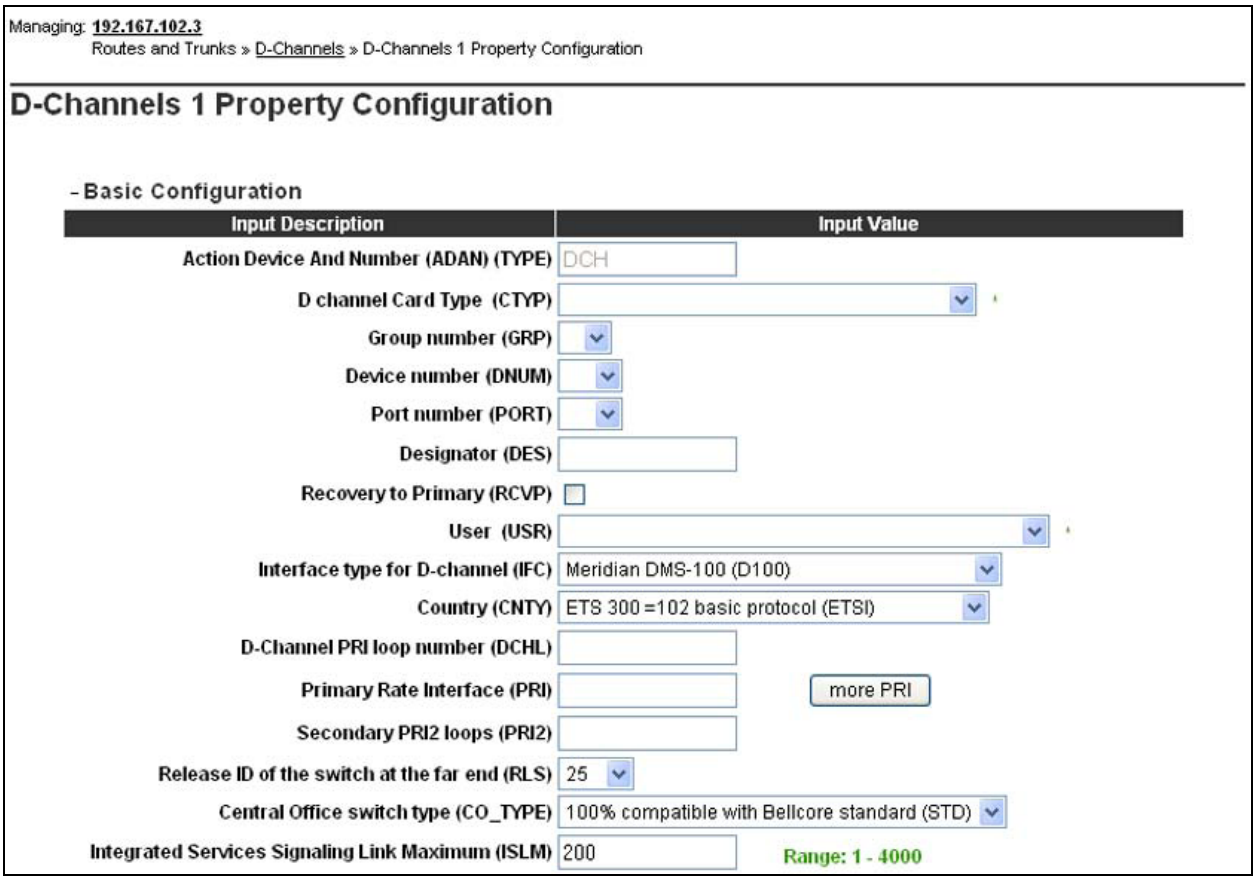


**Figure: 3.6.7**

**--End--**

## Define CLID

The following Calling Line Identification Data (CLID) procedure will only need to be completed for a Primary Rate Interface configuration.

The **ISDN and ESN Networking** Web page allows users to configure the ISDN and ESN Networking data block for a customer. Click **ISDN and ESN Networking** to open this Web page, as shown below.

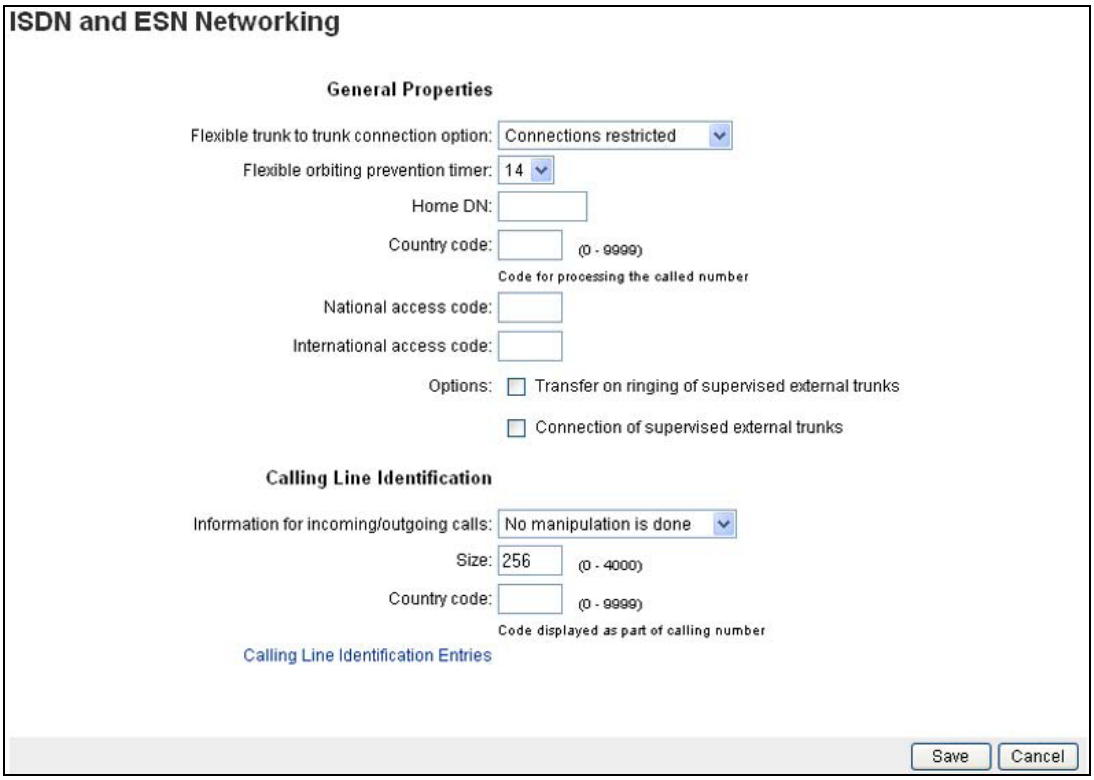


**Figure: 3.6.8**

To configure Calling Line Identification (CLID) parameters, click **Calling Line Identification Entries**. The **Calling Line Identification Entries** Web page appears, as shown below.

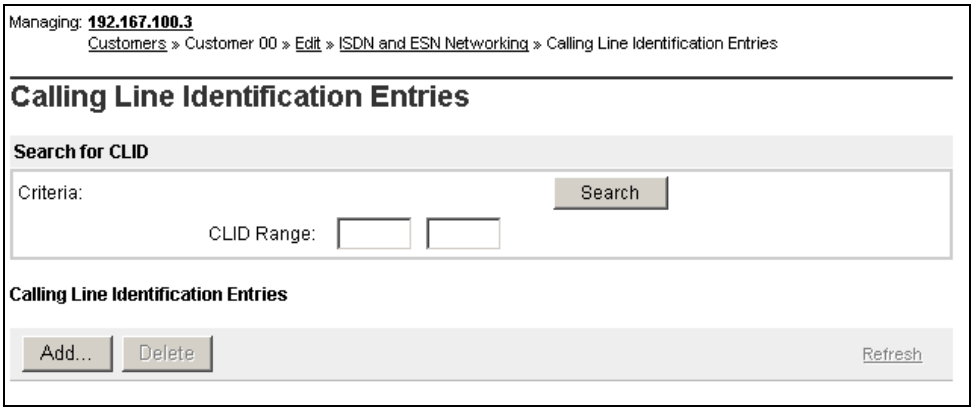


**Figure: 3.6.9**

**Continued on next page**

## Define CLID

To add a CLID, click **Add**. The **New Calling Line Identification** Web page appears, as shown below. Enter the parameters for the new CLID and click **Save**.

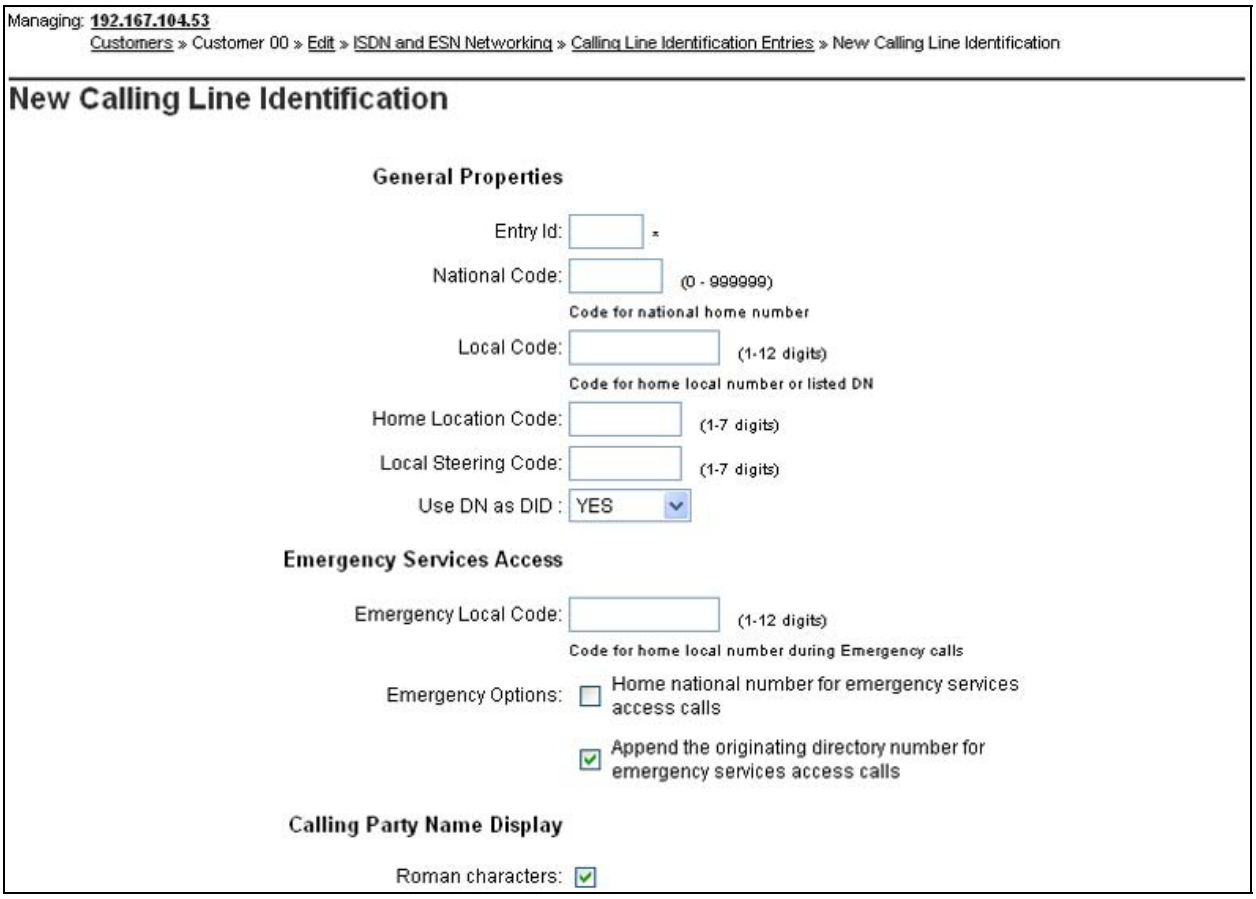


**Figure: 3.6.10**

**--End--**

**Define Routes & Trunks**

For the procedure to add Routes and Trunks refer to Lesson 2.

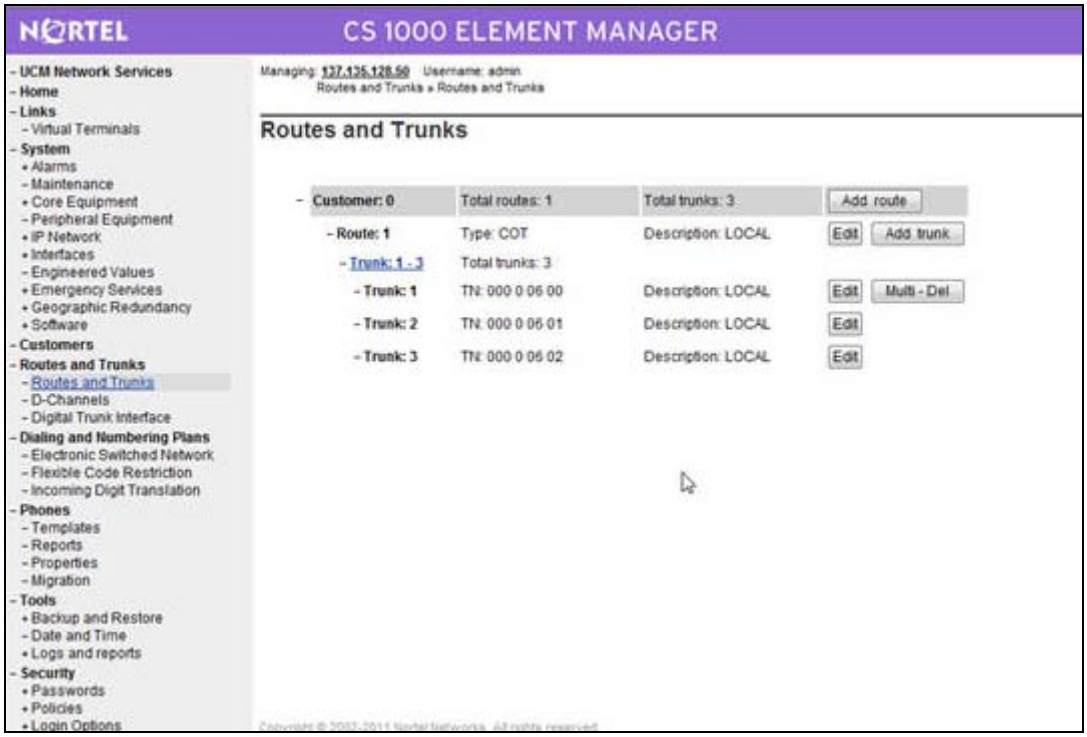


**Figure: 3.6.11**

**--End--**

## Define Clock Synchronization

When the user clicks the **Digital Trunk Interface** link on the **Routes and Trunks** branch of the Element Manager navigator, the **Digital Trunk Interface** Web page appears, as shown below. This Web page allows the user to configure or edit Digital Trunk Interface information.

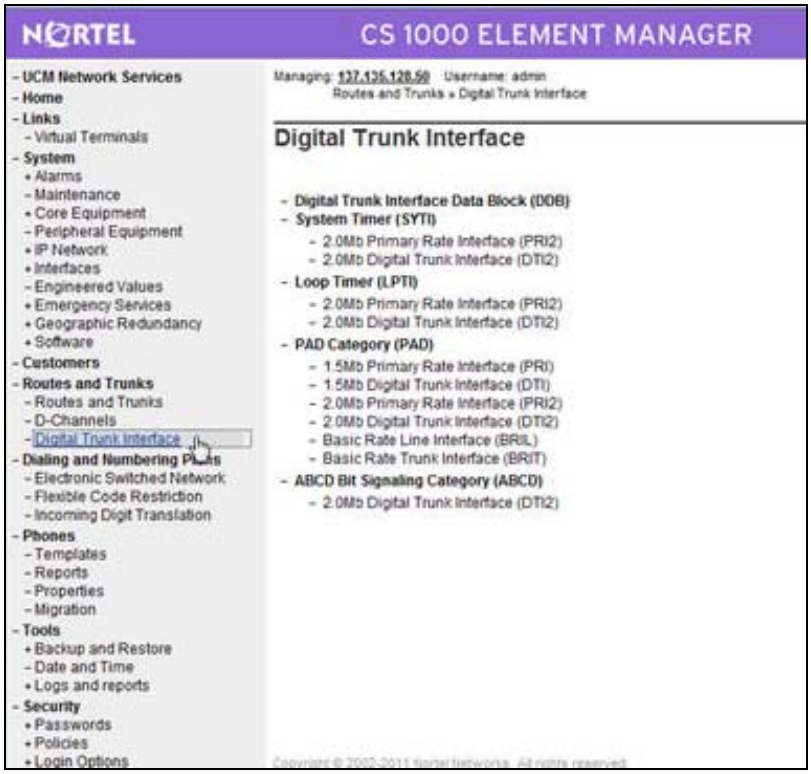


**Figure: 3.6.12**

To configure or edit Digital Trunk Interface Data Block (DDB) information, click **Digital Trunk Interface Data Block (DDB)**. The **Threshold Set List** Web page appears.

**Figure: 3.6.13**

**Continued on next page**

## Define Clock Synchronization

Users can edit Clock Controller properties by clicking the **Edit** button next to the **Clock Controller Basic Properties** button. The **Clock Controller Basic Properties** Web page appears, as shown below. Users can then enter the required information in the text boxes and click **Submit** when finished.

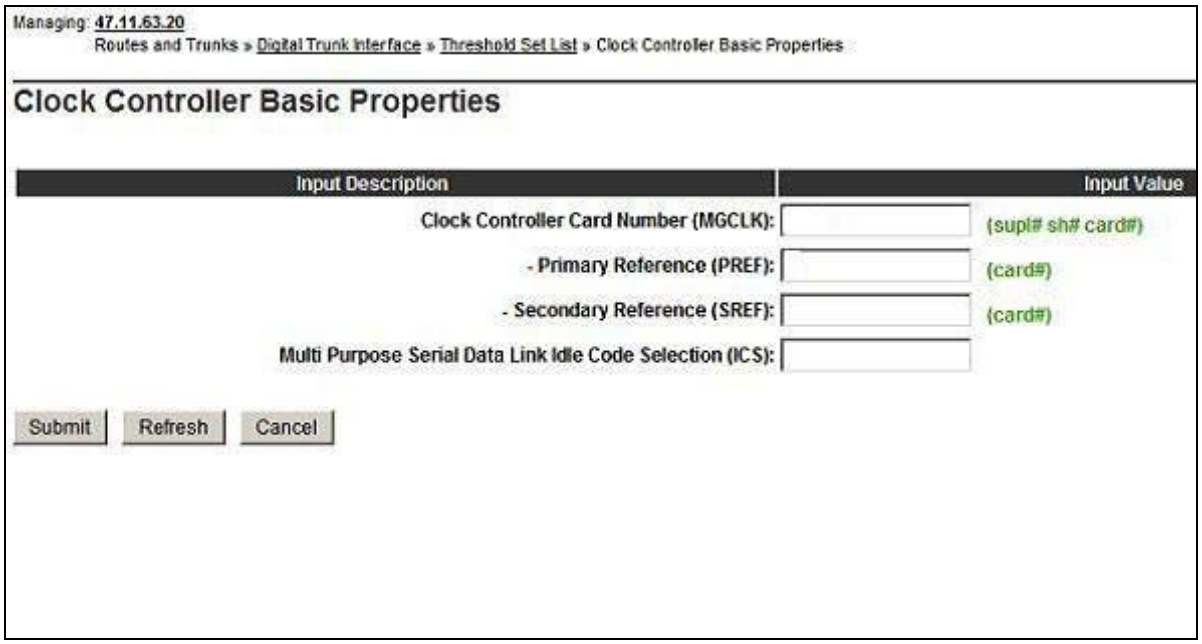


**Figure: 3.6.14**

**--End--**

## Enable TMDI card

Click the **TMDI Diagnostics** link in the list of Call Server diagnostic tools to open the **TMDI Diagnostics** Web page as shown below.

This Web page is used to test and maintain TMDI (DTI/PRI/DCH) cards. The commands available from this Web page correspond to the TMDI data traditionally configured by using LD 96 - D-channel.

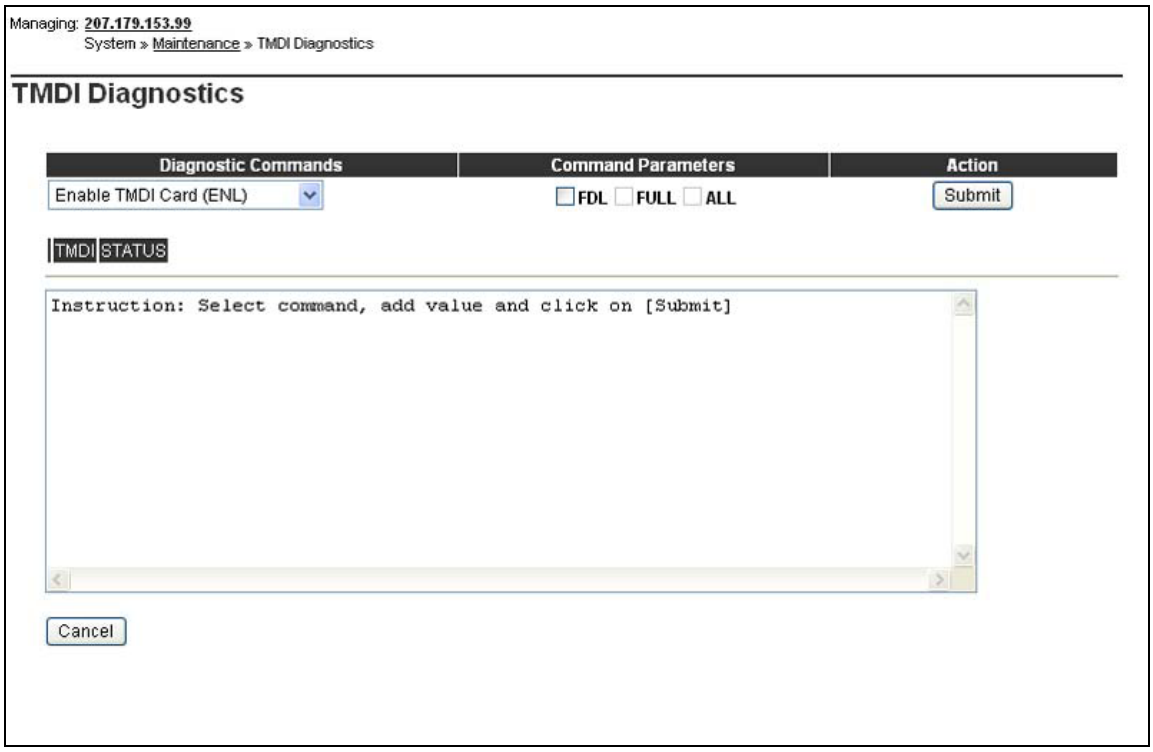


**Figure: 3.6.15**

**Performing TMDI diagnostic activities**

| Step | Action |
|---|---|
| **1** | Select an Action from the **Commands** drop-down list:<br>• Enable TMDI Card (ENL)<br>• Disable TMDI card (DIS)<br>• Reset TMDI card (RST)<br>• Self Test on TMDI Card (SLFT)<br>• Get TMDI Status (STAT) |
| **2** | Select one of the following **Command Parameters**:<br>• FDL<br>• FULL<br>• ALL |
| **3** | Click **Submit**. |

**--End--**

## Enable Digital Loop

Click the **Digital Trunk Diagnostics** link in the list of **Maintenance** diagnostic tools to open the **Digital Trunk Interface and Primary Rate Interface: Digital Trunk Diagnostics** Web page as shown below.

This Web page is used to test and maintain Digital Trunk Cards. The commands available from this Web page correspond to the DTI/PRI data traditionally maintained by using LD 60 - Digital Trunk Interface and Primary Rate Interface Diagnostics.

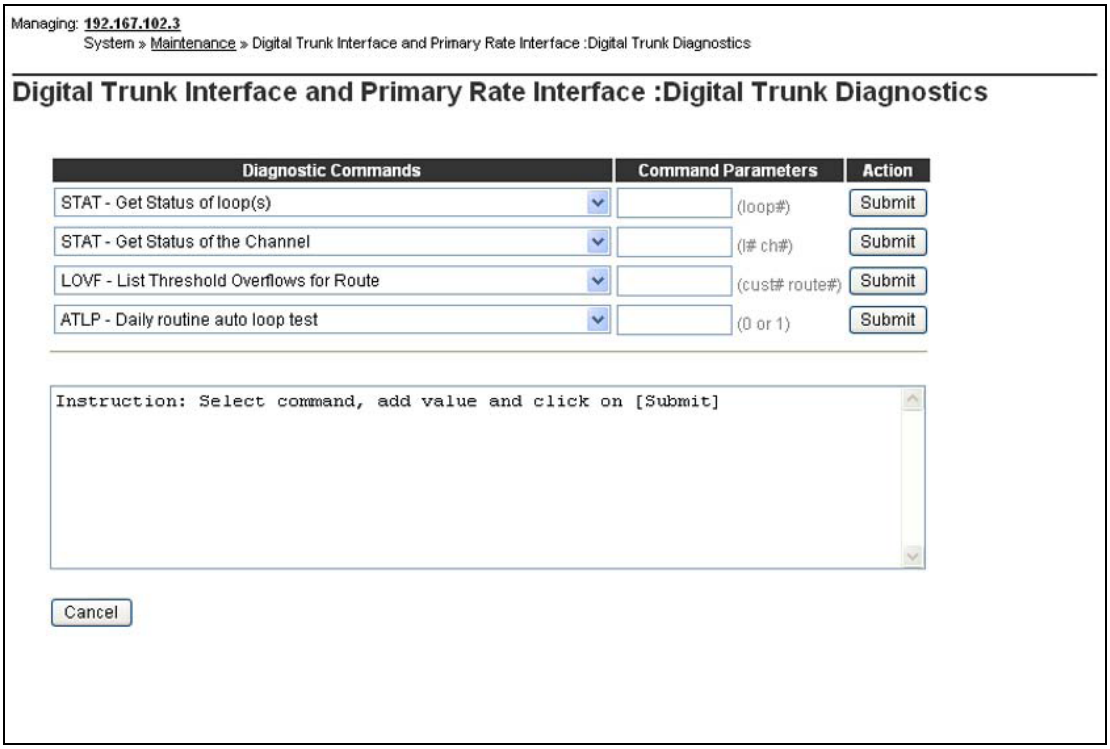


**Figure: 3.6.16**

**Performing maintenance activities on a Digital Trunk Card**

| Step | Action |
|---|---|
| 1 | Select an action from the first Commands drop-down list:<br>• STAT - Get Status of loop(s)<br>• DISL - Disable network and DTI/PRI cards of loop<br>• DISI - Disable loop (when all channels are idle)<br>• ENLL - Enable network and DTI/PRI cards of loop |
| 2 | Enter the Loop number in the Command Parameters text box. |
| 3 | Click Submit. |
| | **--End--** |

# Summary

## Lesson Summary

In this lesson, you discussed how to program a digital trunk with Element Manager. Upon completion of this lesson presentation and practice exercises, you will be able to:

**3.3** **PERFORM** maintenance on a trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.3.1** **REVIEW** manufacturer's documentation
- **3.3.2** **REVIEW** applicable security policies
- **3.3.3** **PERFORM** function check

**3.3** **INSTALL** a digital trunk using both Command Line Interface (CLI) and Element Manager (EM) with 100 % accuracy as evidenced by a positive function check.

- **3.3.1** **REVIEW** manufacturer's documentation
- **3.3.2** **REVIEW** applicable security policies
- **3.3.3** **DETERMINE** digital trunk type (DTI/PRI)
- **3.3.4** **PROGRAM** Digital Data Block (DDB)
- **3.3.5** **CREATE** a Digital Loop (DLOP)
- **3.3.6** **CREATE** the D-Channel
- **3.3.7** **ENABLE** Calling Line Identification (CLID)
- **3.3.8** **PROGRAM** Calling Line Identification (CLID) Entries
- **3.3.9** **PROGRAM** a trunk route
- **3.3.10** **PERFORM** function check
- **3.3.11** **COMPLETE** unit documentation

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# APPENDIX A-1

## LD 16 Trunk Route Worksheet

## Station Name _____

Use the worksheet below to document the programming for Trunk Routes.

| Prompt | Local Route | Long Distance Route | E-Net Route | DID Route | DTI Route | PRI Route |
|---|---|---|---|---|---|---|
| REQ | | | | | | |
| TYPE | | | | | | |
| CUST | | | | | | |
| ROUT | | | | | | |
| DES | | | | | | |
| TKTP | | | | | | |
| RCLS | | | | | | |
| DTRK | | | | | | |
| DGTP | | | | | | |
| AUTO | | | | | | |
| ICOG | | | | | | |
| ACOD | | | | | | |
| TARG | | | | | | |

# APPENDIX A-2

## Trunk Access Restrictions Worksheet

## Station Name _____

| | | | | | TGAR |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| TARG (LD 16) | | | | | |

**NOTE**

In order to make these restrictions happen, you need to modify the TGAR settings in the telephone programming.

# APPENDIX A-3

## LD 14 Trunks Worksheet

Use the worksheet below to document your programming for trunks.

| Prompt | Trunk #1 | Trunk #2 | Trunk #3 | Trunk #4 | Trunk #5 | Trunk #6 | Trunk #7 | Trunk #8 |
|---|---|---|---|---|---|---|---|---|
| REQ | NEW | NEW | NEW | NEW | NEW | NEW | NEW | NEW |
| TYPE | | | | | | | | |
| TN | | | | | | | | |
| XTRK | | | | | | | | |
| CUST | | | | | | | | |
| RTMB | | | | | | | | |
| ATDN | | | | | | | | |
| SIGL | | | | | | | | |
| LDOP | | | | | | | | |
| STRI | | | | | | | | |
| STRO | | | | | | | | |
| SUPN | | | | | | | | |
| CLS | | | | | | | | |

# APPENDIX A-3, CONTINUED

## LD 14 Trunks Worksheet, continued

Use the worksheet below to document your programming for trunks.

| Prompt | Trunk #9 | Trunk #10 | Trunk #11 | Trunk #12 | Trunk #13 | Trunk #14 | Trunk #15 | Trunk #16 |
|---|---|---|---|---|---|---|---|---|
| REQ | NEW | NEW | NEW | NEW | NEW | NEW | NEW | NEW |
| TYPE | | | | | | | | |
| TN | | | | | | | | |
| XTRK | | | | | | | | |
| CUST | | | | | | | | |
| RTMB | | | | | | | | |
| ATDN | | | | | | | | |
| SIGL | | | | | | | | |
| LDOP | | | | | | | | |
| STRI | | | | | | | | |
| STRO | | | | | | | | |
| SUPN | | | | | | | | |
| CLS | | | | | | | | |

# APPENDIX A-4

## DTI Trunk Worksheet

### LD 73 and LD 17 Worksheet

Use the worksheet below to document the programming for the DTI trunk.

**NOTE:** Any prompt not listed on this worksheet should be left at its default setting.

LD 73 (Digital Trunk Error Thresholds)

| Prompt | Response |
|---|---|
| REQ | |
| TYPE | |
| TRSH | |

LD 17 (Digital Loop Configuration)

| Prompt | Response |
|---|---|
| REQ | |
| TYPE | |
| DLOP | |
| MODE | |
| TMDI | |
| LCMT | |
| YALM | |
| TRSH | |

LD 73 (Clock Reference)

| Prompt | Response |
|---|---|
| MGCLK | |
| PREF | |
| SREF | |

# APPENDIX A-5

## Nortel Quick Reference Guide

| Action | Load | Command |
|---|---|---|
| Circuit Status, Digital Trunks | LD 60 | STAT (c u) |
| Circuit Status, All others | LD 10, 11, 20, 32 | STAT (c u) |
| Enable Loop or Channel, Digital Trunks | LD 60 | ENLL (c) or ENCH (c ch) |
| Enable Card or Unit, All others | LD 10, 11, 20, 32 | ENLC (c) or ENLU (c u) |
| Disable Loop or Channel, Digital Trunks | LD 60 | DISL (c) or DSCH (c ch) |
| Disable Card or Unit, All others | LD 10, 11, 20, 32 | DISC (c) or DISU (c u) |
| List Trunk Route Members | LD 21 | LTM (Route #) or (ACOD) |
| Find DN Info | LD 10, 11, 20 | PRT (DNB) |
| Find TN Info | LD 10, 11, 20 | PRT (TNB) |
| Find/List Flex Codes | LD 57 | PRT FFC (FEAT = All or feat) |
| List Phones with Feature x | LD 81 | LST FEA x |
| List Hunting Assignments | LD 82 | HNT (DN) |
| Find Unused DNs | LD 10, 11, 20 | PRT (LUDN) |
| Find Unused TNs | LD 10, 11, 20 | LUU, LUVU |
| Trace a Call | LD 80 | TRAC (cust DN or c u)<br>TRAK (c u ) |
| Trace a Digital Trunk Call | LD 80 | TRAD (c ch) |
| Internal/External Backup | LD 43 | EDD |
| Internal/External Restore | LD 43 | RES |
| Display/Change Name | LD 95 | PRT/CHG (NAME) |
| Find Issues & Release | LD 22 | ISS |
| List Card Model & SN | LD 32 | IDC c |
| Show S/W Patches | LD 22 | ISSP |

### DTI/PRI COMMANDS (LD 60)

| Command | Action |
|---|---|
| Disable DTI Loop idle | DISL l (courtesy down) |
| Force disable DTI Loop | DISL l |
| Enable DTI/PRI loop | ENLL l |
| List alarm counters | LCNT c |
| Reset alarm counters | RCNT (c) |
| Do DTI/PRI self-test | SLFT (c) |
| List DTI/PRI status | STAT (l) or (l ch) |
| Disable Channel | DSCH (l ch) |
| Enable Channel | ENCH (l ch) |
| *Remote loopback | RLBK (c ) (loops back YOUR DTI) |
| *Disable (cancel) loopback | DLBK (c) |
| *Remote Test | RMST (c) far end command |
| *Indicates that DTI must be disabled before settings loopback or loopback test | |
| Print Digital Data Block Info | LD 22 PRT CEQU |

### TMDI MAINTENANCE COMMANDS (LD 96)

| Command | Action |
|---|---|
| Disable TMDI card x | DIS TMDI l s x |
| Enable TMDI card x and force a download | ENL TMDI l s x (FDL) |
| Enable TMDI card x | ENL TMDI l s x |
| Reset TMDI card x | RST TMDI l s x |
| Invoke self-test on TMDI card x | SLFT TMDI l s x |
| Get TMDI status | STAT TMDI (x FULL) |

### CLOCK CONTROLLER COMMANDS (LD 60)

| Command | Action |
|---|---|
| Disable clock controller n | DIS CC n |
| Enable clock controller n | ENL CC n |
| Status of clock controller n | SSCK n |
| Set clock controller tracking | TRCK xxxx n |
| | Where xxxx = |
| | PCK, Track primary clock reference source |
| | SCLK, Track secondary clock reference code |
| | FRUN, Free run mode |

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