Celletra

Cellular Transmission Solutions

Transmit Diversity Add-On System

Assembly and Operation Manual

TDA Unit

October 2003

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Preface

- This manual provides instructions for mounting, setting-up, and monitoring Celletra's TDA system.

Celletra's TDA system is only for installation indoors or in an outdoor shelter.

WARNING

Do not expose the TDA equipment to open-air moisture or rain.

Record of Changes

Change	Description	Initiated by	Date
0	Release	Erez Mutzafi	October 2003

Repeater Software (TSM) Versions

This manual covers the versions of the TDA System Manager (TSM) software version listed below. If your TSM version is not listed, check with Celletra or your Celletra dealer if this manual still applies. If it does, add the version number to this table.

TSM Version	Date
5.0.0.106	October 2003

Safety Information

This section describes the use of warnings, cautions, and notes in this manual. It is the user's responsibility to follow all safety instructions and regulations.

NOTE: Notes clarify issues.

CAUTION

This symbol indicates special CAUTION required in a procedure. CAUTION signs prevent actions that may result in equipment malfunction or damage.

WARNING

WARNING signs prevent actions that may result in harm to personnel.

CAUTION

Changes or Modifications not expressly approved by Celletra Ltd. could void the user's authority to operate the equipment.

For customer and technical support, contact
www.celletra.com or send an E-mail to support@celletra.com

WARRANTY

The following is to inform you that Celletra Ltd. warrants its products as per agreement.

Exclusions

The warranty (as per the agreement) shall not apply to defects resulting from: improper or inadequate use, unauthorized modifications or misuse.

Warranty Limitations

Under no circumstances will Celletra Ltd. be liable in any way to the user or any third party for damages, including any loss of profits, lost savings, or other incidental or consequential damages arising out of the use of, or inability to use, the product.

System Measurement and Testing Warnings

STOP

WARNING

When testing the units in the lab or during field installation, always practice RF radiation safety rules. It is not recommended for service or lab personnel to work closer than two meters from the radiating antenna surfaces when the TDA system operates.

CAUTIONS

- Disconnect the AC or DC power to the TDA Unit before any cable is connected or disconnected from the unit.
- Always use a DC block device connected to the measuring equipment input or output ports (spectrum analyzer, power meter, or RF signal source), when measuring is performed.
- Do not connect or disconnect the coaxial connectors while power is applied to the TDA system.
- Do not apply more than 0dBm of RF input power to any RF port of the TDA system, or irreversible damage may occur.
- When measuring high power outputs, always verify that the equipment input port is capable of handling the expected output power.
- During lab or field tests, with AC or DC voltage applied to the TDA Unit, do not use any mobile transmitters in a range of less than 10 meters from the unit. An unexpectedly high RF power might appear at the output ports, which might in turn damage the measuring equipment connected to that port.

Glossary

ABT	Active Bias T
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
dB	Decibel measurement of gain and loss
dBm	Decibel measurement of power or amplitude, related to 1mW
DL	Down-link from the donor base station to the mobile users
DLDU	Down-link Diversity Units
FWD	forward
HP	High Power
ICU	Interface and Control Unit
LPA	Linear Power Amplifier
M&C	Monitoring and Control
MRC	Maximum Ratio Combining
MS	Mobile Station (cellular phone)
mW	Milliwatt
NOC	Network Operating Center
PA	Power Amplifier
PCS	Personal Communications Services
RF	Radio Frequency
Rx	Receive
TD	Transmit Diversity
TDA	Transmit Diversity Add-on
TDR	Time-Domain Reflectometer
TDU	Transmit Diversity Units
TSM	TDA System Manager
Tx	Transmit

Table of Contents

Chapter 1. Introduction

1.1 About Celletra's TDA System

Celletra Transmit Diversity (TD) technology for CDMA signals enhances the forward link performance by improving the transmit power management, reducing blocking rate, and increasing capacity.

The TD technology is available as an add-on to existing (legacy) base stations. In this case, separate components are added to an existing cell site to enhance the performance that can be achieved by the cell site alone on a per-sector basis. This overview of the technology will provide some insights regarding how the TD solution can be applied to a cell site to enhance capacity performance at the site.

Add-on Transmit Diversity (TDA) provides for redundant replicas of transmitted signals (from the base station) by transmitting the same information over two or more antennas, providing independently faded channels between the BTS transmit and mobile receive antennas. In order to maintain the total transmitted power (or EIRP), each of the two base station transmit antennas in a TDA system has to transmit a minimum of 50% of the power from a conventional one transmit antenna system. Alternatively, higher power may be transmitted in addition to diversity gain by the two antennas (main and diversity). In this case, the cell footprint in the Down-link will increase, or (after down-tilting the antennas) the same coverage with higher capacity is obtained.

The TDA system reduces the per-link-power required for the mobile station (phone). Moreover, reducing the blocking-rate and access-failures improves the cell forward (FWD) link capacity. As a result, in FWD link limited sites, sector erlangs increase.

The TD process is carried out only at the base station; no modifications are required at the mobile handset. This gives TDA a clear advantage over other transmit diversity schemes such as OTD and STS which require new chipsets to be included in the mobile handset.

1.2 TDA System Description

1.2.1 Block Diagram
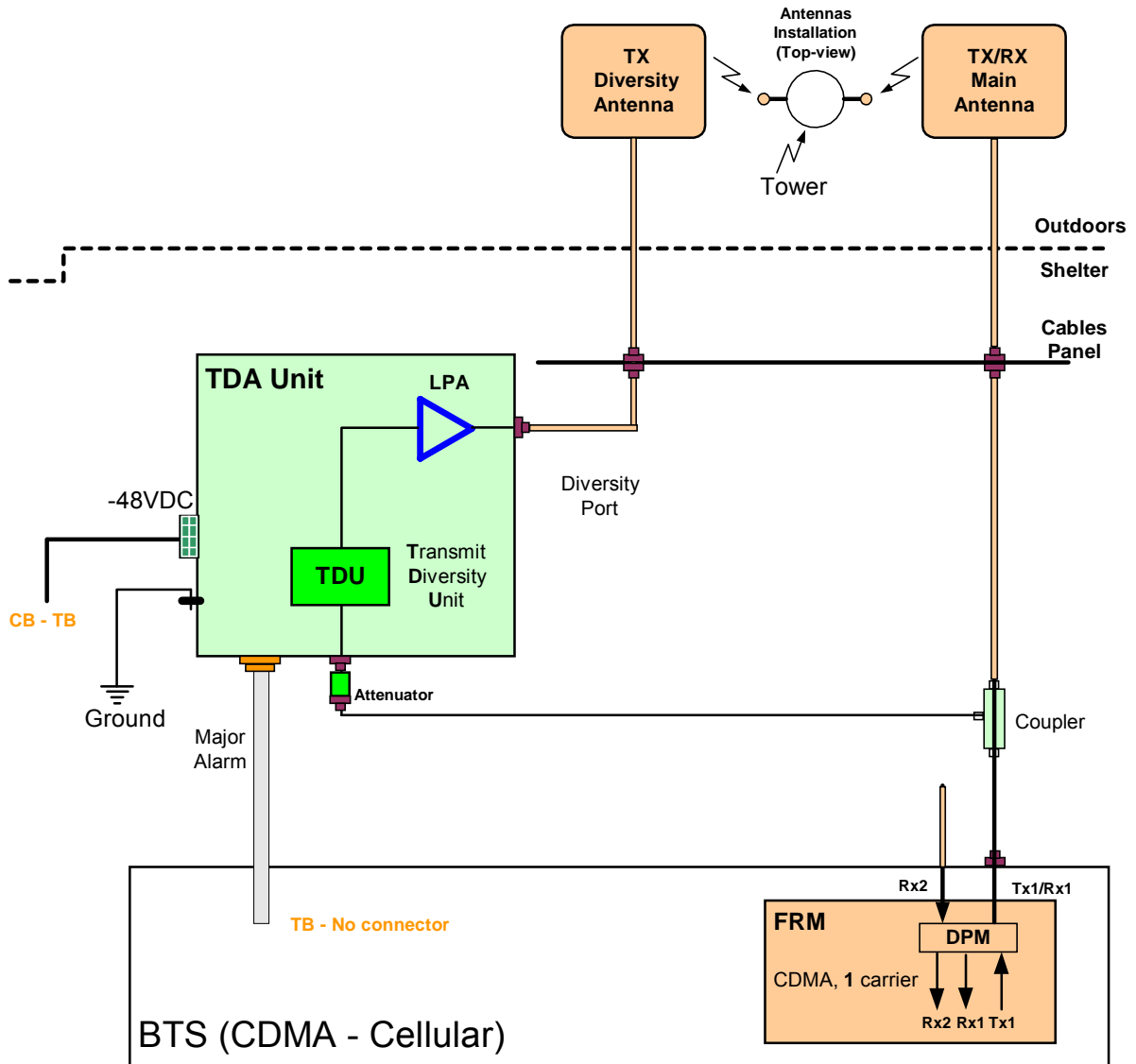
Figure 1-1 describes the TDA system.

Figure 1-1 TDA block diagram

1.2.2 General Description

The Celletra TDA system consists of the TDA Unit and Coupler:

The TDA Unit interfaces transparently to the BTS at RF low-power levels. The TDA Unit generates the Transmit Diversity (TD) signals and power-amplifies the TD signals to be transmitted through the Tx-Diversity antenna.

Chapter 2. Installation Procedure

> **NOTE:** Installing the TDA system requires site parameters, including the channel number in use, gain settings, and required sector power. If necessary, consult your network administrator for more information.

2.1 Pre-installation Procedures

2.1.1 Receiving and Inspecting the Units

CAUTION

Verify that the shipment is complete and undamaged. If the boxes appear damaged, do not open the shipment.

> **NOTE:** It is recommended to save the original shipping carton and packing materials for any future transportation of the TDA System.

Follow this procedure prior to installation:

1. Unpack the shipment boxes.
2. Verify the contents of the boxes against the packing inventory lists.
3. Inspect the TDA system for possible damage.

The following items are required for the installation. They are supplied separately.

- Documentation: This Assembly and Operation Manual.
- Software: TSM (TDA System Manager) CD, ready for installation. This software is for setup and tuning of the system during installation. Instructions for using TSM are located in Chapter 3. & **Error! Reference source not found.**

2.1.2   Required Tools and Test Equipment

Table 2-3: Tools and test equipment

Equipment	Use
Digital Voltmeter Fluke 77 or equivalent	Measure voltage and polarity for the installation process
Pilot Scanner	Measure Donor pilot signal levels
Frequency domain Reflectometer	Check Insertion loss and VSWR for system RF Cables
Network Analyzer (optional)	Check Insertion loss and VSWR for system RF Cables
PCS Band Signal Generator	Check diversity path gain
Spectrum Analyzer	Check TDA Unit Output Power
30dB 100W attenuator (PCS Band)	Protect RF Test equipment from overpowered signals
Standard calibrated jumper cables	Test equipment usage
Laptop PC equipped with Windows 95, 98, NT, or Windows 2000 with Service Pack 3.	Configure, control, and monitor the TDA using the TSM software through the RS-232 communication port

2.2 Verify BTS Transmitted Power

Verify that the BTS is running normally, transmitting a certain output power.

Find a calibrated Tx test point to measure the BTS output power (Tx, Down-link). Measure the BTS power and record it including the date and time. If such a calibrated test-point does not exist, refer to 2.5.4.

The Traffic load should be taken into account while setting up the TDA system. Allow a suitable power margin for possible load rise.

In any case, refer to the measured pilot power as the sector reference level. The pilot power is usually fixed. Add 7.5dB to this level to estimate the maximal Tx power of the sector.

Record the above main P_{out} max. as "Main Path Power Before TDA System" in Appendix C.

2.3 Run Sweep Test

Before installing the cables in the system, run a sweep test of all RF cables and record the cable loss (see Table 2-4 for RF cable list). Perform the sweep test using a Time-Domain Reflectometer or a Network Analyzer.

Record these parameters for each RF cable:

- Insertion loss of the cable
- VSWR
- Return loss

If you detect a fault in any of the cables, repair it and re-check until all the cables are in order.

> **NOTE:** Record the information for reference during the setup procedure in Appendix C.

Table 2-4: RF cables sweep test

Cable #	Cable Description		Insertion Loss	Return Loss	Remarks
	From	**To**			
W2	FRM Tx1/Rx1	Coupler			
W3	Coupler	Attenuator			
W5	TDA Unit	Cable Panel DIV			
LG1	Coupler	Cable Panel Main			Legacy Cable
LG2	Cable Panel Main	Tx/Rx Main Antenna			Legacy Cable
LG3	Cable Panel DIV	Tx DIV Antenna			Legacy Cable

2.4 Mount the TDA Unit

The TDA Unit should be installed preferably near the FRM output RF port.

CAUTION

The TDA Unit is a complex and accurate electrical apparatus and should be treated accordingly.

Use extra caution when installing the unit in the rack.

WARNING

The TDA Unit does not have an ON/OFF switch. Therefore, do not connect the DC supply to this unit until the end of the installation.

WARNING

RECAP THE POWER AND COMMUNICATION CONNECTORS
UNTIL THE TDA SYSTEM IS READY TO BE SET UP. **DO NOT
CONNECT POWER YET**.

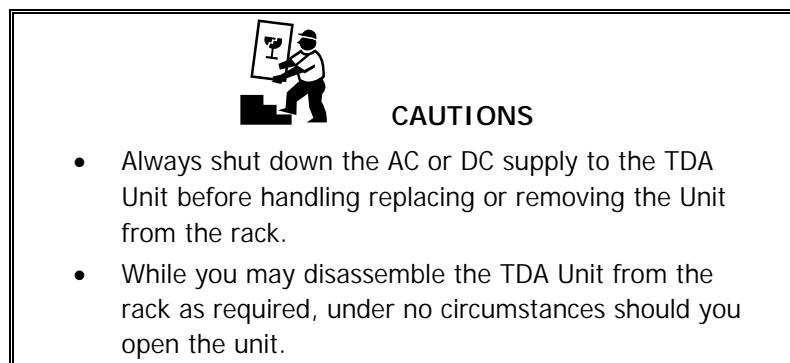### 2.4.1 Mount the TDA Unit

1. Place the TDA Unit in the rack.
2. Tighten the four screws at the Unit sides.

Figure 2-1 TDA Unit front panel

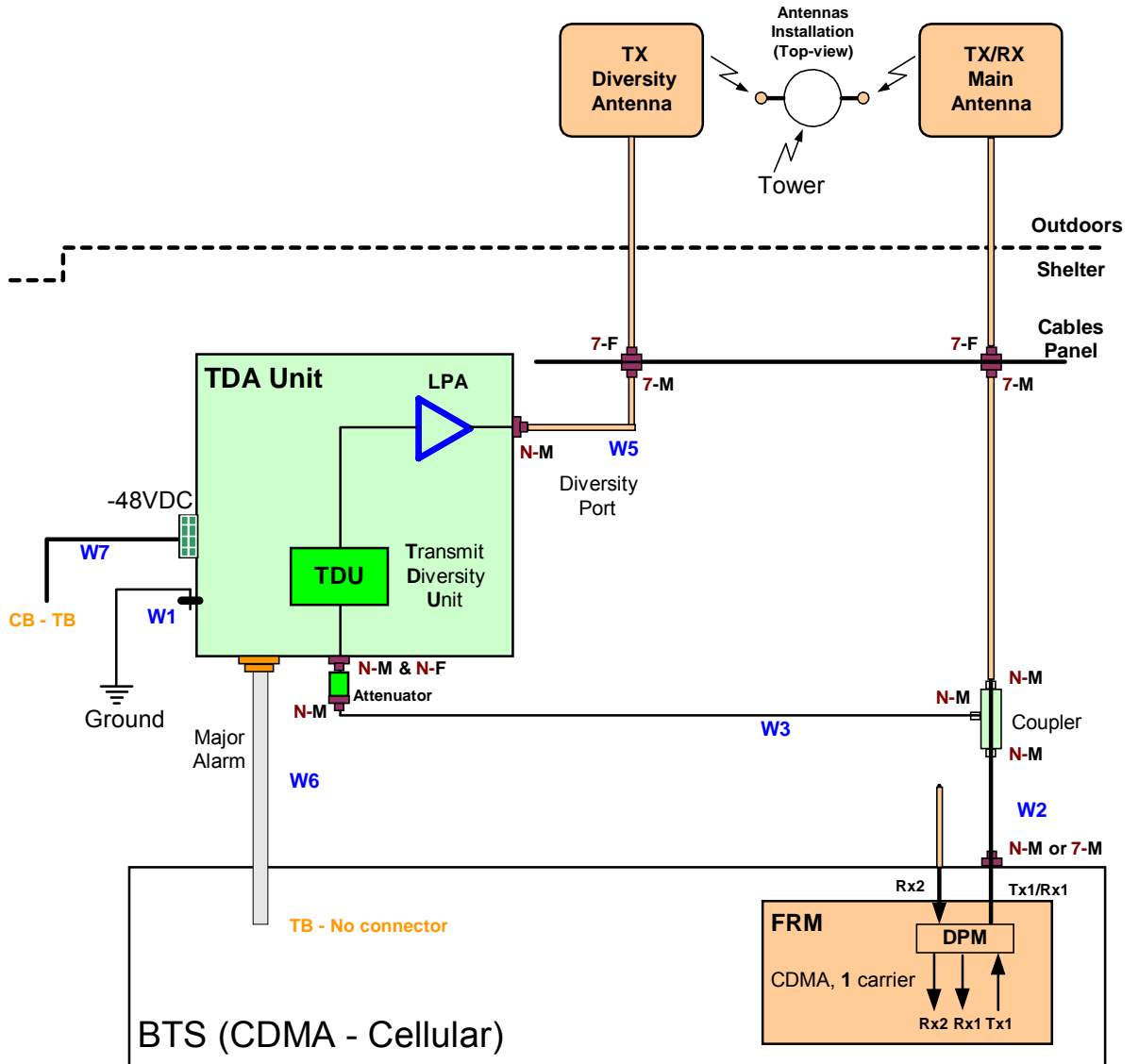## 2.5 Mount the TDA System Sub-Modules

2.5.1 Precautions

CAUTIONS

- Always shut down the AC or DC supply to the TDA
  Unit before handling replacing or removing the Unit
  from the rack.
- While you may disassemble the TDA Unit from the
  rack as required, under no circumstances should you
  open the unit.

2.5.2 RF Connection

Figure 2-2 TDA cables connection

The main Tx path must be open when installing the sampling coupler. Therefore:

1. Contact the Network Operating Center (NOC) to get permission to wilt the station.

STOP

WARNING

Disconnecting the main Tx path without wilting the station may cause damage to the station or to personnel.

---

2. Wilt the sector.

3. Open the main Tx path so that the sampling coupler can be installed.

4. Connect the coupler inline at the DPM Tx/Rx antenna port, using a male-male N-type adapter or a short cable (W2).

5. Reconnect the legacy cable to the other (open) dircet side of the coupler. Use connector adapter if required.

6. Connect W3 and the Attenuator between RF IN port on the TDA Unit and the Coupled Port of the coupler.

7. Connect W5 between the Tx Div antenna port (RF OUT) on the TDA Unit and the bulkhead.

CAUTION

Do not provide DC power to the TDA Unit yet.

2.5.3 Ground Connection

Make sure to connect the TDA Unit to the frame's chassis or the ground buss bar in the shortest way possible.

Do not chain the ground connection between units.

CAUTION

If you are using a 3-phase outlet system, do not connect any Ground to the Neutral.
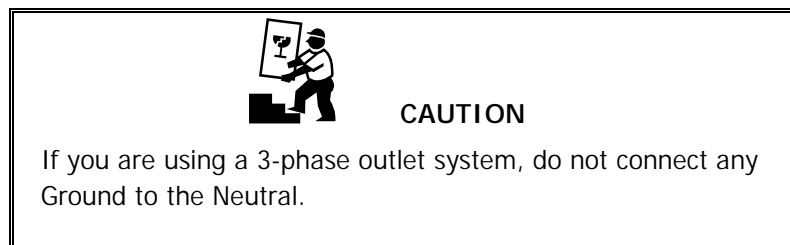
2.5.4 TDA Input Power Measurement

1. Bloom the station. Verify that the station transmits a pilot signal only.

2. **Don't** turn the TDA Unit power on.

3. Disconnect the attenuator from the TDA Unit.

4. Measure the pilot power from the attenuator. Record this level. Make sure that the attenuator is connected to W3.

5. Do not allow the power to exceed 0dBm.

6. Reconnect the attenuator to the TDA Unit.

7. Calculate the BTS output max. power.
   P_{out} max. $= P_{pilot} + 7.5dB + Att_{loss} + W3_{loss} + Coupler_{loss}$
   where

Att_{loss} = 20dB

$W3_{loss}$ = W3 Insertion loss, as measured in Table 2-4 [dB]

$Coupler_{loss}$ = 30dB

P_{out} max. = P_{pilot} + 7.5dB + 20dB + $W3_{loss}$ + 30dB

P_{out} max. = _____dBm

Record the above main P_{out} max. as "Main Path Power After TDA System" in Appendix C.

2.6 Prepare the Electrical Power Connections

CAUTION

Power to the units must be supplied according to the safety standards in the corresponding country (grounded outlets, circuit breaker, conduits, etc.). Check the power cable before connecting it to the units.

NOTE: Fuse is located on the TDA Unit front panel. Ensure the fuse is pushed in.

1. Supply power to the TDA Unit.
2. Verify that the unit is working properly by connecting directly with a PC as explained in the next Chapter.The three fans at the front panel are working only in case of excessive internal temprature. Thus, in an airconditioned site they may stay idle for long time priods.

Chapter 3. TDA System Setup

The general term for the software that manages Celletra's system is the Celletra System Manager. The software can process several types of systems (Repeaters, Cell-On-Wheels upgrade, etc.). The software for the TDA system type is called the TSM (TDA System Manager).

TSM features:

- TDA System monitoring
- TDA System control: setting and tuning
- Local (direct) connection to the TDA System

Follow the steps in this chapter to install and set up the TSM software for initial use. Chapter 4. explains how to use TSM for maintenance and calibration procedures.

3.1 Install the TSM (TDA System Manager)

The PCs on which the software will be installed must meet these minimum requirements:

- Pentium^{TM}-based
- Available serial port
- 4Mb free RAM or more
- Windows* 95, 98, or NT*, or Windows 2000 with Service Pack 3.

3.1.1 Notify NOC (Network Operating Center)

Notify NOC of the new System installation.

3.1.2 Install the Software

1. Insert the CD-ROM provided by Celletra in the CD drive and run Setup, located in the Package folder.
2. Follow the instructions. The installation software installs the program bsm.exe in the Program Files folder on your C: drive.
3. Create a shortcut on your desktop to bsm.exe. The shortcut icon is Celletra's triple hexagon symbol.

4. Copy the bsmutils folder from the CD-ROM to the root of your C: drive (C:\).

NOTE: When installing on Windows 98, you may be asked whether to keep an existing file called Richtx32.ocx or replace it with a new version. Select **No**.
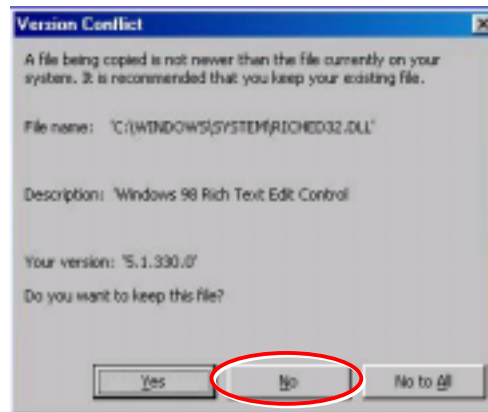
3.1.3 Power-on the TDA Unit

If the TDA Unit is not turned on, power-on the TDA System by connecting the power cord to the TDA unit, and lidt-up the circuit breaker.

3.1.4 Connect the PC to the TDA Unit

You may setup and monitor the TDA System through local connection, using the communication cable supplied by Celletra, connected to the C&M –Type connector.

3.2 Initial TSM Launch

Double-click the TSM icon on your desktop. The TSM menu bar appears.
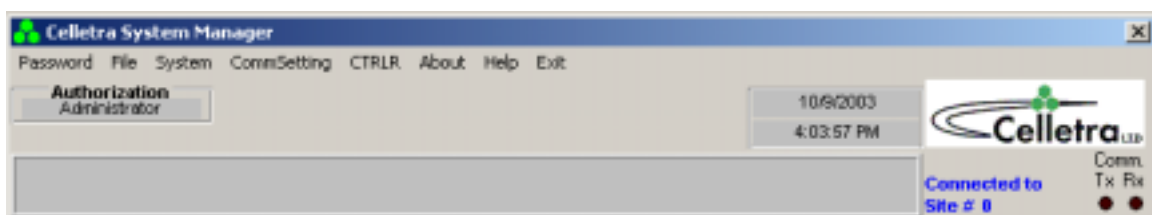
Figure 3-1 TSM menu bar

If your system is connected to comm port 1, the system block diagram also appears. Section 4.2 describes fully how to use this block diagram to maintain your system parameters.

3.2.1 Authorization levels

AUTHORIZATION

First time access to the system does not require you to enter a password. You will automatically be granted the authorization of an Administrator.

NOTE: This is the right time to define the passwords for all authorization levels.

After the first time you use TSM, you will access the software with one of these authorization levels.

Guest	No password is required. Shows most definitions and some monitored parameter values. No editing is permitted.
Operator	Shows all definitions and monitored parameter values. Provides edit capability to Modem Number field (TSM menu, System, Modem Definitions) only.
Supervisor	Provides access to all configuration and editing options *except* for password, date, and time changes.
Administrator	Provides access to all configuration and editing options including password changes.

Access the system at the appropriate level by entering the corresponding password.

AUTHORIZATION

This symbol alerts you to the authorization level required for the different procedures described below.

3.2.1.1   Define Passwords

AUTHORIZATION

Administrators can perform this procedure.

The Guest authorization level does not require password definition.

You can define a single password for each of the other authorization levels.

The passwords you set here apply across the whole TDA System. Define the passwords as follows:

1. From the Password menu, choose Change. The following window appears.

Figure 3-2 Authorization levels

2. Click an authorization level.
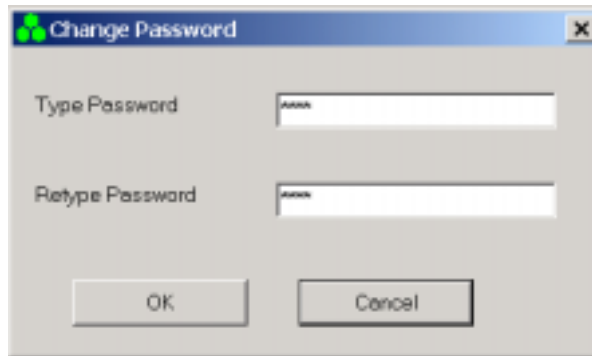3. Enter a password by typing it twice, then click OK:

Figure 3-3 Set password

4. Repeat for the other two authorization levels.
5. Click OK.

3.2.1.2   Access the System

After the initial entry to TSM, whenever you click the desktop icon you will enter TSM with guest authorization. To change from the Guest authorization level:

1. From the Password menu, select Enter Password. The following dialog appears showing the current authorization level.
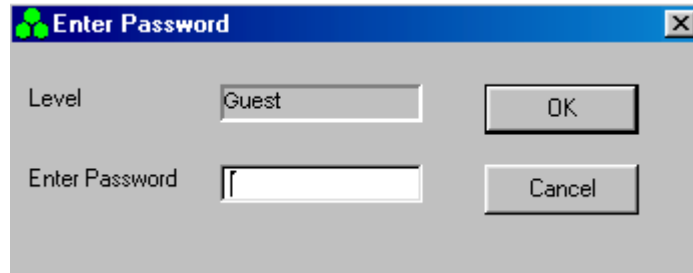
Figure 3-4 Password entry

2. Enter the Password corresponding to the authorization level you require.
3. Click OK.

> **NOTE:** All authorization levels revert to Guest level after five minutes of inactivity.

To change from a higher authorization level to Guest level, select Low Level from the Password menu.

3.2.2   Define COMM Settings and Connection Type

Connect to the TDA System as follows:

1. Connect the supplied RS-232 cable between the serial port on the PC and the RS-232 port on the TDA Unit.

2. Click the CommSetting menu. The Comm Setting dialog appears, as shown in Figure 3-5. Comm's appears in that screen are according to the Comm ports avaliable in your computer.
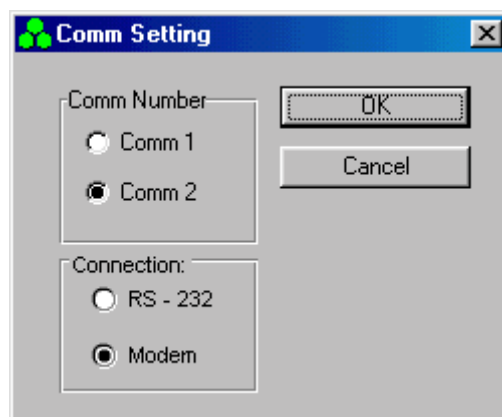
Figure 3-5 Comm setting dialog

3. Under Comm Number, click the radiobutton corresponding to your PC modem port.
4. Under Connection, click the RS-232. Modem option is not is use.
5. Click OK.

3.3 Navigate the TDA System Setup and Configuration Windows

All TDA System setup and configuration functions are implemented from a single menu option. To access the TDA System setup, click the System menu. The following tabs appear.

Configuration tab	For monitoring. This dialog shows a block diagram of the TDA sysem, where each unit in the block diagram (PA, Driver,…) provides access to corresponding monitoring options. Section 4.2 fully explains this block diagram and the data it displays.
Status and Control tab	For setup. Contains site information, gains, cable loss definitions, and power monitoring. See Section 3.3.1.

3.3.1 Status and Control

Figure 3-6 shows the dialog that appears when you click the Status and Control tab. The System Type for the TDA system is **21**.

With this tab you can change setup parameters such as

- Site Information
- Cable loss
- PA status (Distribution PA)
- PA ON/OFF
- PA output power ('Output Power [dBm] Amlifier')
- Output power to antenna ('Output Power [dBm] Antenna')
- Downlink Gain [dB]
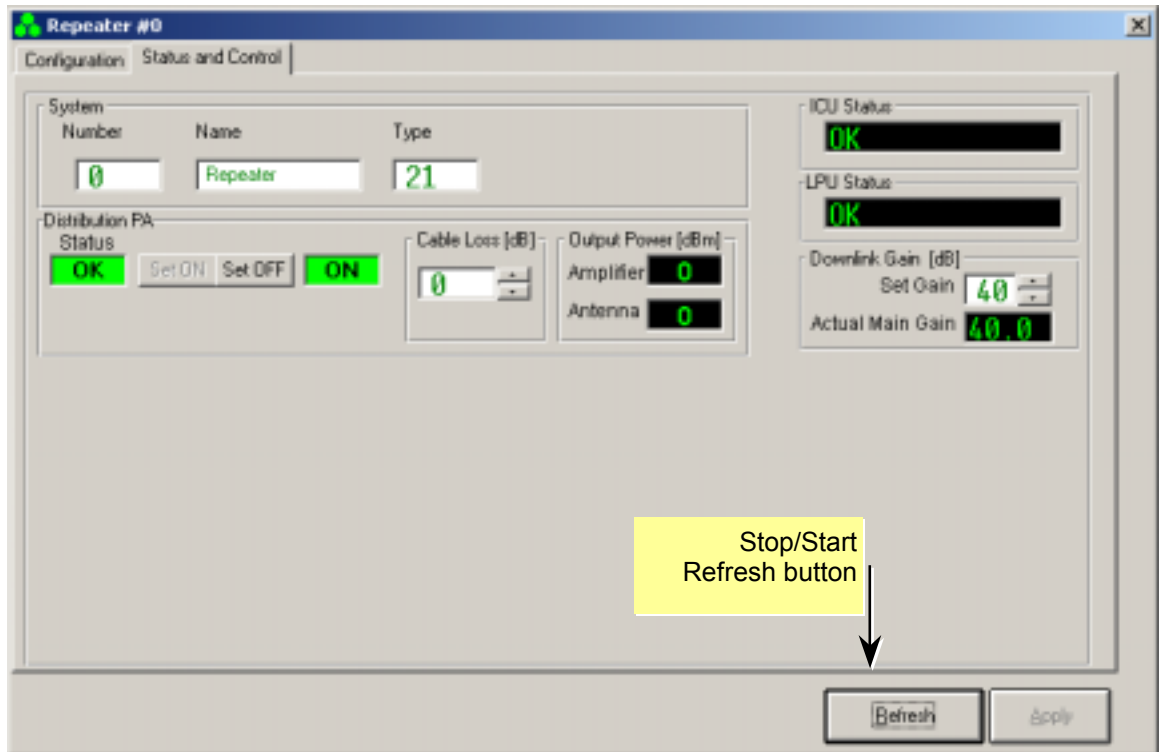- Actual Main Gain (monitoring)
- ICU status
- LPU ststus

Figure 3-6 Status and Control screen

AUTHORIZATION

As discussed in Section 3.2.1, Guest and Operator levels users are only authorized to *monitor* parameters.

Supervisor and Administrator level users are authorized to *monitor and change* parameters.

NOTE: Fields with white backgrounds can be modified. Other fields (with black and gray backgrounds) are only for display.

To make changes to displayed parameters:

1. Click the Stop Refresh button so that the data ceases updating on the screen.
2. Make your modifications.
3. Click Apply to save your changes, or Refresh to cancel. You may be asked to confirm your changes.
4. Wait for the changes to take effect.
5. Click X in the top right corner to close the dialog.

3.4 Set the TDA Identification and Clock

When status messages are sent by the TDA System to the TSM, the specific TDA System sending the information is identified according to the following parameters, explained below:

- TDA System number
- Site name
- Time stamp set by real-time clock settings
- Contact information (or call-back number)

3.4.1 TDA System Name and Number

AUTHORIZATION

Administrators and Supervisors can perform this procedure.
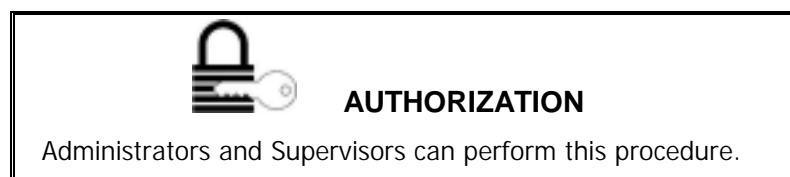
The TDA System identification details are for your record-keeping. Change them in keeping with your company policy.

1. From the TSM System window, choose the Status and Control tab.
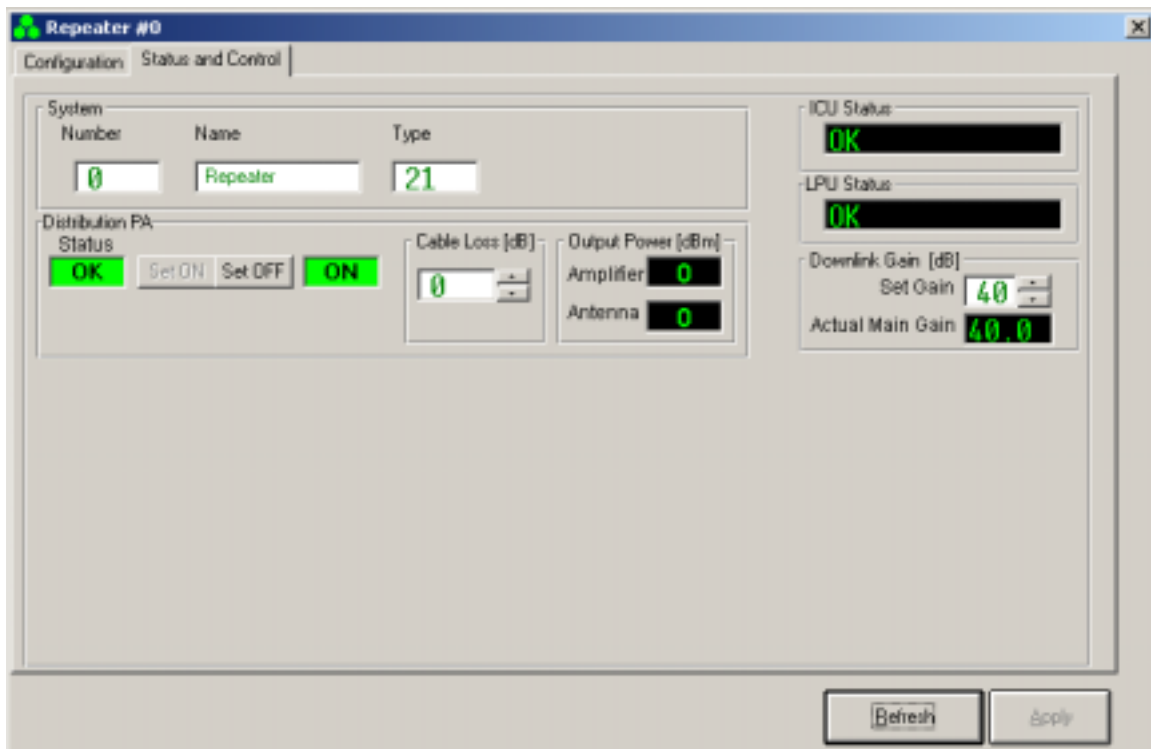
Figure 3-7 TDA System: Number, Name, and Type

2. Type a TDA System number in the range 1 through 999.
3. Type a TDA System name (alphanumeric) using a maximum of 20 characters. (You must enter both a name and a number.)
4. The system type should be **21 for the TDA System**.
5. Click the Start Refresh button.

3.4.2 TDA System Time and Date

AUTHORIZATION

Administrators can perform this procedure.

NOTE: This procedure sets the TDA System date and time to the corresponding values on the PC. To ensure that the generated logs are accurate, check that the PC date and time are correct.

To set the time and date for the TDA System:

1. Select the Configuration tab.
2. Click the ICU Controller button as indicated below. The CTRLR Status dialog shown in Figure 3-9 appears showing the status of the ICU.
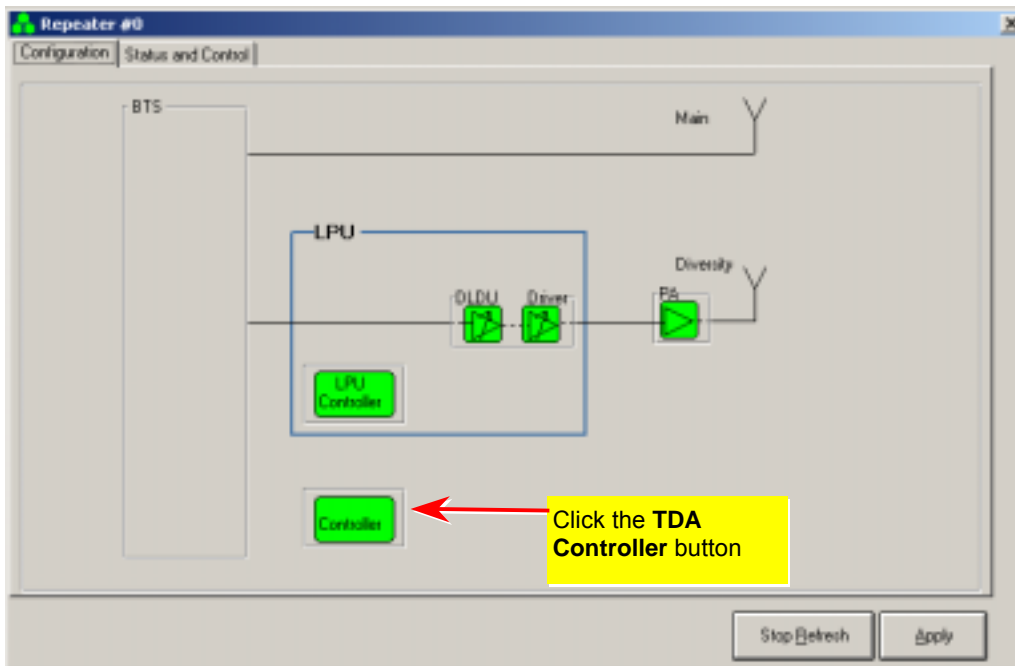

Click the **TDA Controller** button

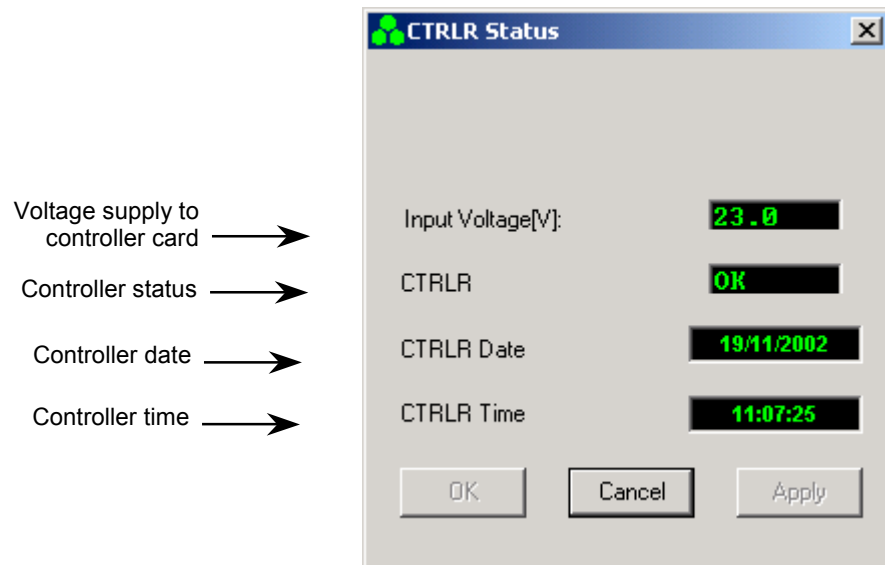**Figure 3-8 Configuration screen**

Figure 3-9 CTRLR Status high level

3. Update the date:

   a. Use the cursor to highlight the CTRLR Date box. If your current authorization level is Operator or Supervisor, you are prompted to enter the Admin Password.

   b. Press the Delete button on the keyboard.

   c. Click Apply twice. The Date updates automatically according to the date on your PC.

4. Update the time:

   a. Use the cursor to highlight the CTRLR Time box. If your current authorization level is Operator or Supervisor, you are prompted to enter the Admin Password.

   b. Press the Delete button on the keyboard.

   c. Click Apply twice. The time updates automatically according to the time on your PC.

5. Click OK.

Chapter 4. **System Calibration**

This chapter explains how to use the TSM software to calibratein and maintain the TDA System.

4.1 Access the System

When you click the desktop icon, you enter TSM with guest authorization. To change from the Guest authorization level:

1. From the Password menu, select Enter Password. The following dialog appears showing the current authorization level.
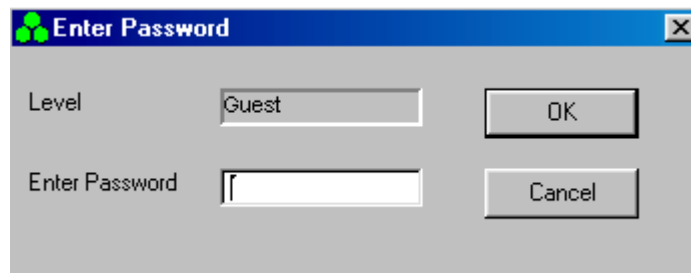

Figure 4-1 Password entry

2. Enter the Password corresponding to the authorization level you require.
3. Click OK.

> **NOTE:** All authorization levels revert to Guest level after five minutes of inactivity.

To change from a higher authorization level to Guest level, select Low Level from the Password menu.

4.2 Configuration

The Configuration tab shows schematically the TDA configuration for the single sector. It enables monitoring of all the sub-units in the system so that the experienced user can *manually* change parameters that have been set up automatically for each of the sub-units.

Figure 4-2 shows the TD and Main paths with Celletra's system.

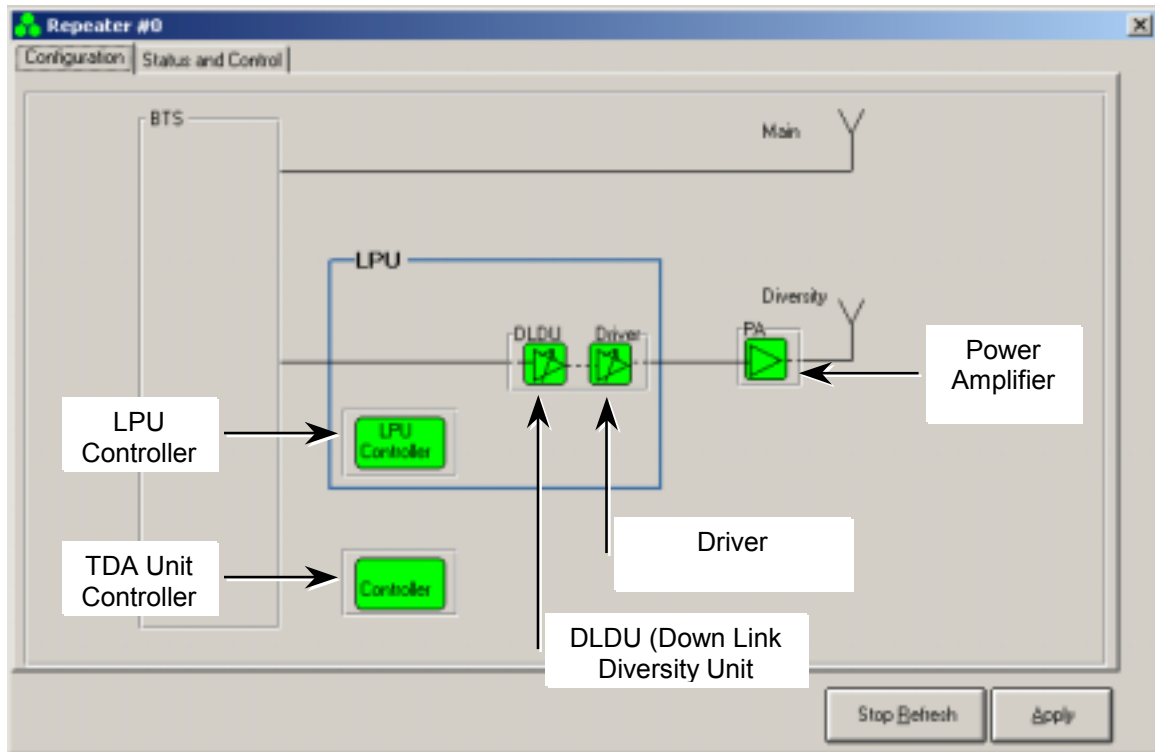To invoke the Configuration block diagram, select the Configuration tab.

Figure 4-2 Configuration screen

Units in the block diagram are colored as follows:

Color	Indication
Green	Correct functioning
Yellow	Minor misfunction
Red	Failure

Using any authorization level other than Guest, click each sub-unit to view the corresponding data. The sub-units, from left to right:

LPU Controller	Monitors the LPU controller status , Temperature and LPU Alarms.
DLDU and Driver	Down-link diversity unit and Driver monitor and Control.
PA	LPA ststus and Control parameter. Set PA ON or OFF.
TDA Unit Controller	Updates date and time, and monitors controller status and input voltage. Accesses additional dialog showing TDA Unit Controller Status parameters from which the Controller Parameters dialog is invoked.

The displays correlating to each sub-unit are shown in the next sections.

AUTHORIZATION

Guests cannot perform these procedures.
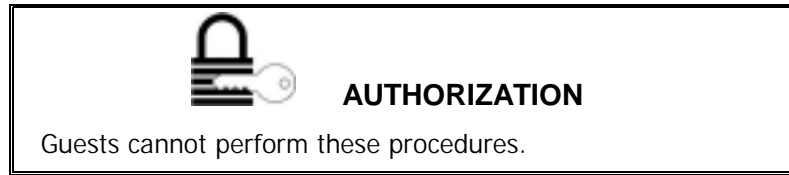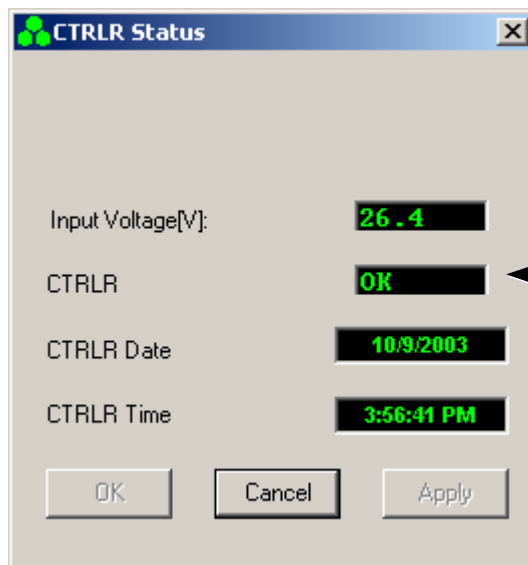

4.2.1   ICU Controller

Click Controller to make the screen in Figure 4-3 appear.

The screen consists of

- Controller card input voltage
- Controller card status
- Date
- Time

4.2.1.1   Input Voltage

The unit is functioning correctly when Input voltage is 24±4V.

Click the CTRLR field to invoke the ICU Controller Status details window, shown in Figure 4-4

Figure 4-3 CTRLR status high level

4.2.1.2   Date

To update the date:

1. Use the cursor to highlight the CTRLR Date box. If your current authorization level is Operator or Supervisor, you are prompted to enter the Admin Password.
2. Press the Delete button on the keyboard.

---

3. Click Apply twice. The Date updates automatically according to the date on your PC.

4.2.1.3   Time

To update the time:

1. Use the cursor to highlight the CTRLR Time box. If your current authorization level is Operator or Supervisor, you are prompted to enter the Admin Password.
2. Press the Delete button on the keyboard.
3. Click Apply twice. The time updates automatically according to the time on your PC.
4. Click OK.

4.2.1.4   Controller Card Status

Figure 4-4 shows details of the controller status. This screen is invoked by clicking the CTRLR field in Figure 4-3.

When all the parameters are OK, the unit is functioning correctly.

Click the Parameters field to invoke ICU Controller parameters window, shown in Figure 4-5
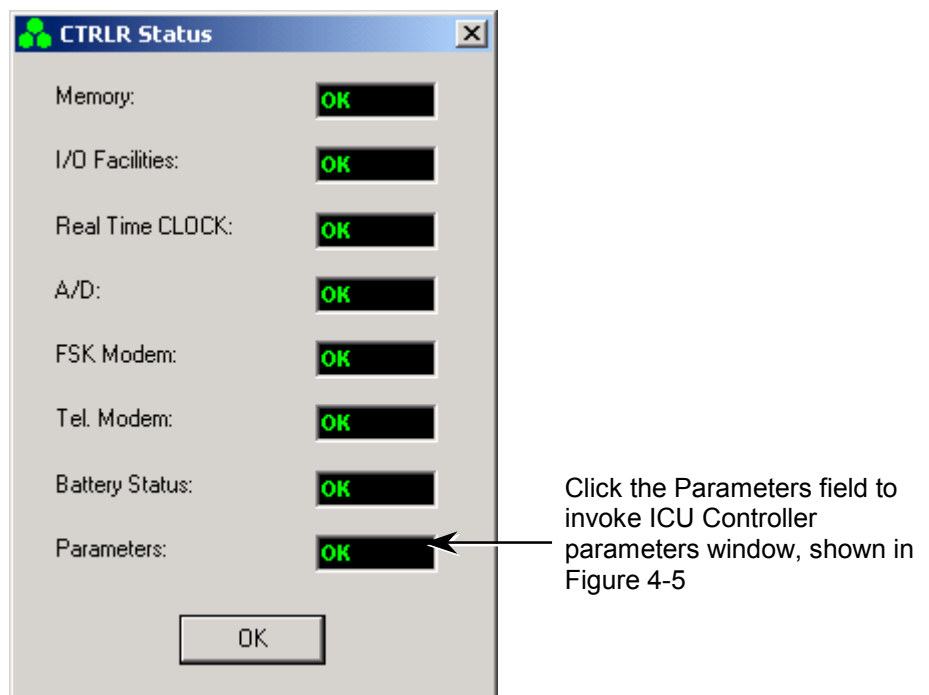
Figure 4-4 Controller status details

Figure 4-5 displays ICU Controller parameters. Invoke this screen by clicking the Parameters field in Figure 4-4.

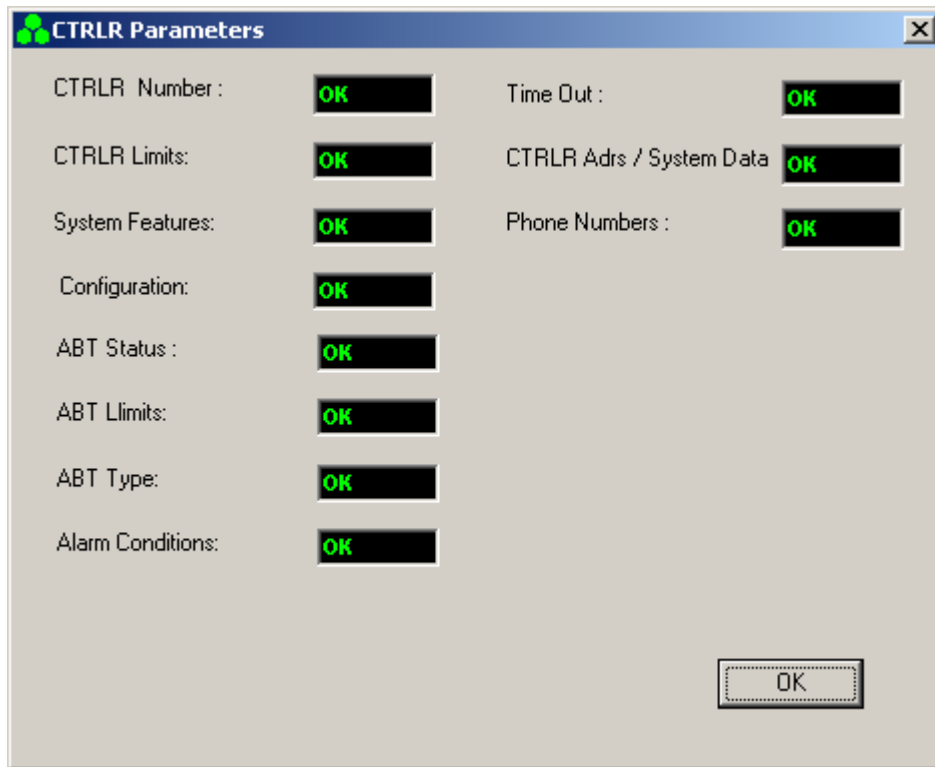When all the parameters are OK, the unit is functioning correctly.

Figure 4-5 CTRLR parameters

4.2.2 DLDL and Driver

Click DLDL and driver to open the screen shown in Figure 4-6. This screen enables

- Monitoring the Address and Location of the Driver
- Monitoring the ALC Status and setting
- Set ALC power level
- Monitoring Actual ALC power. When the Set ALC Power and the Actual ALC Power are not equal the ALC (Automatic Level Control) is ON
- Changing the unit attentuator setting
- Monitoring the status of the Unit Current

Setting the attenuators is an advanced system optimization process.
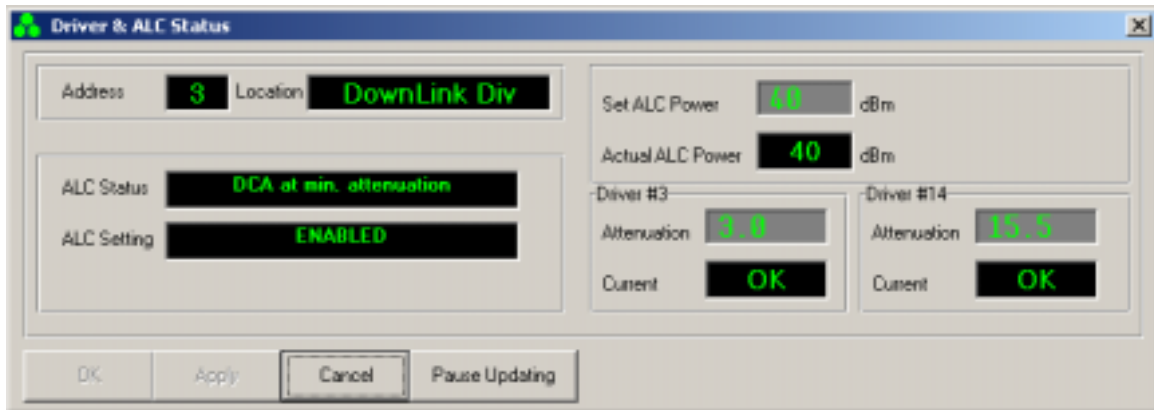
Figure 4-6 Driver & ALC Status

The unit is functioning correctly when

- Set ALC Power and Actual ALC Power are equal
- Current is OK

Click Pause Updating in order to change the ALC Power.

4.2.3 Power Amplifier (PA)

Click PA to make the screen in Figure 4-7 appear. This screen enables:

- monitoring of the P out and Temperature of the unit.
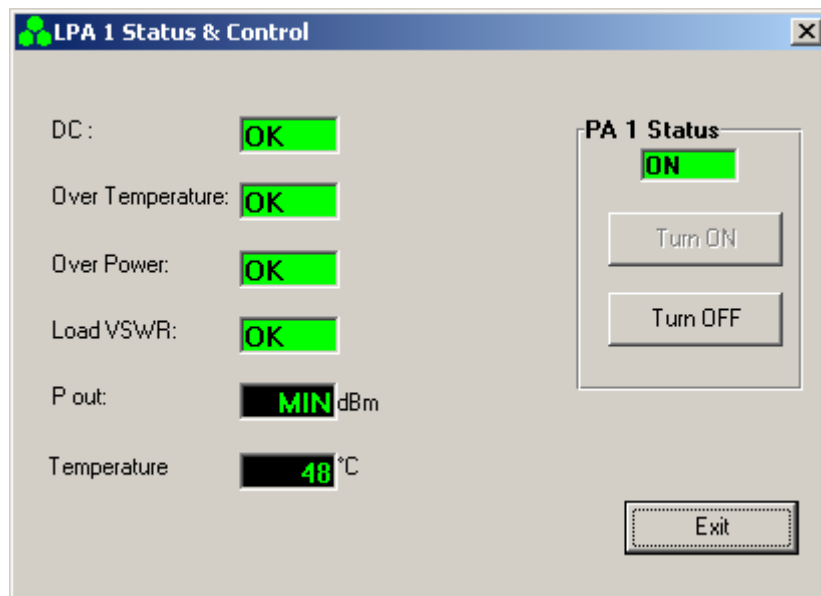- Turn the PA ON or OFF

Figure 4-7 PA monitoring

The unit is functioning correctly when Pout range is 32dBm to 42dBm .

Click Turn OFF in order to switch the PA OFF. Click OK when the acceptance dialog box appeare.Click Turn On in order to switch the PA ON.

4.3 Calibration

This section describes the calibration procedure for the Transmit Diversity (TDA) system. The objective of this procedure is to set the Tx power correctly in the diversity path in respect to the main path, after the TDA system installation.

The TDA system calibration refers to the two transmission branches:

- Main Tx
- Diversity Tx

The Transmit Diversity mechanisim functions best with equal radiated power from the main and diversity antennas. Moreover, the TDA system enables the overall Tx power transmitted by the two transmission paths (main and diversity) to be higher than that of the legacy BTS Tx power.

The overall sector power with the TDA system (including main and diversity) is determined by the operator according to network planning. Once the main path is calibrated by adjusting the BTS output power, the power to the diversity transmit antenna is calibrated by adjusting the digital controllable gain of the TDA Unit via the TSM software.

> **NOTE:** All of the steps in the following calibration procedure are on a per sector basis. Repeat all the steps for other sectors with the TDA system, where applicable.

4.3.1 Main Tx

See Figure 4-8. Set the BTS output power as follows:

1. Verify that the station is transmitting.
2. Calculate P_{out} max. as per Section 2.5.4.
3. Record the main P_{out} max. as "Main Path Power with TDA System" as in Appendix C.

> **NOTE:** The calibration procedure involves just gains in Main and Diversity branches. The power is recorded for reference only.
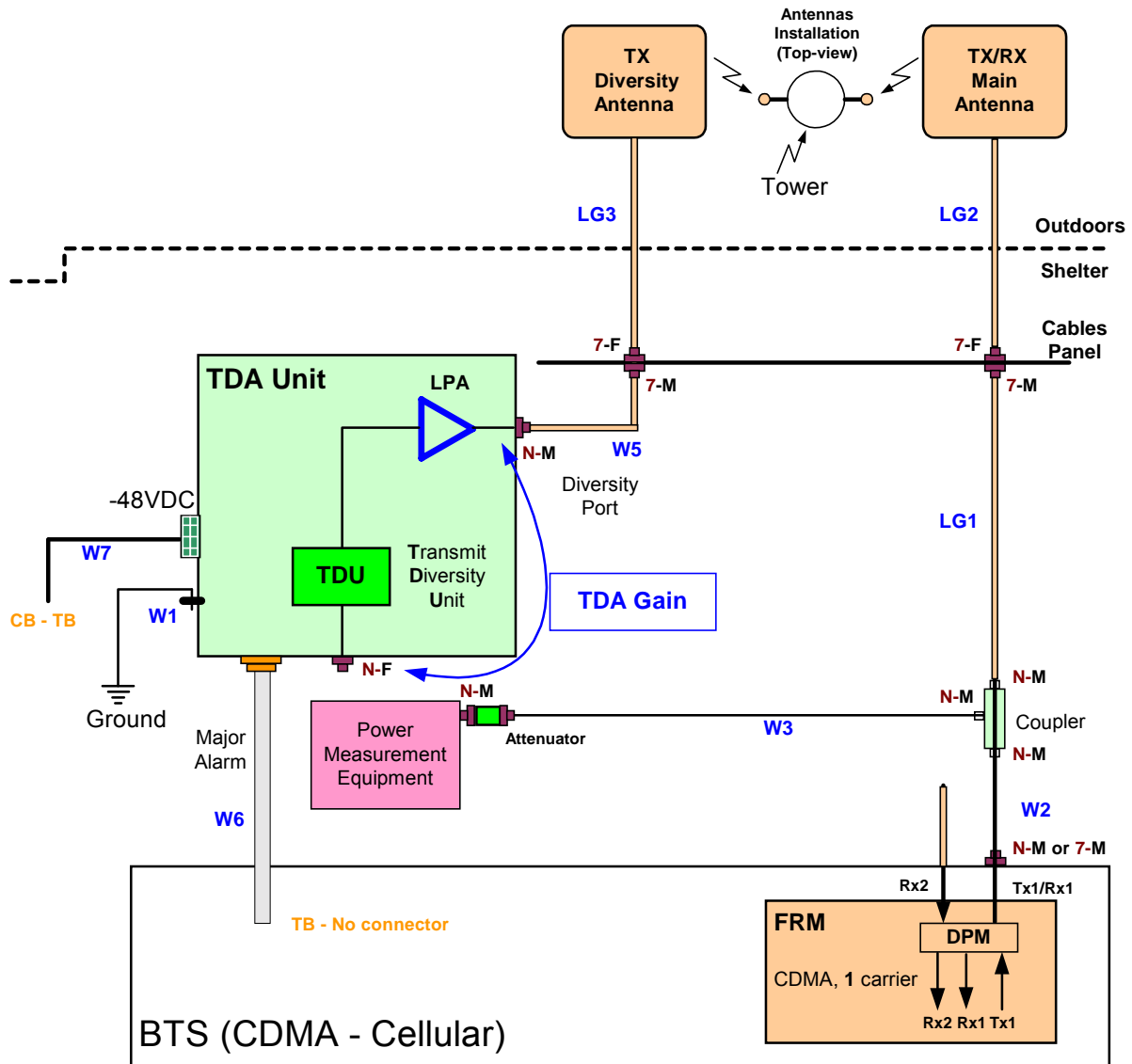
Figure 4-8 Tx measurements setup

4.3.2   Diversity (TD) Tx Calibration

Calibrate the diversity path Tx power.

1. Click the Status and Control tab (Section 3.3.1).
2. Enter the Cable Loss [dB] (W5) according to Table 2-4, W5 Insertion loss [dB].
3. Read the Antenna "Output Power [dBm]" from the TSM screen.

Antenna Power [dBm] = Amplifier Power [dBm] – Cable Loss [dB]
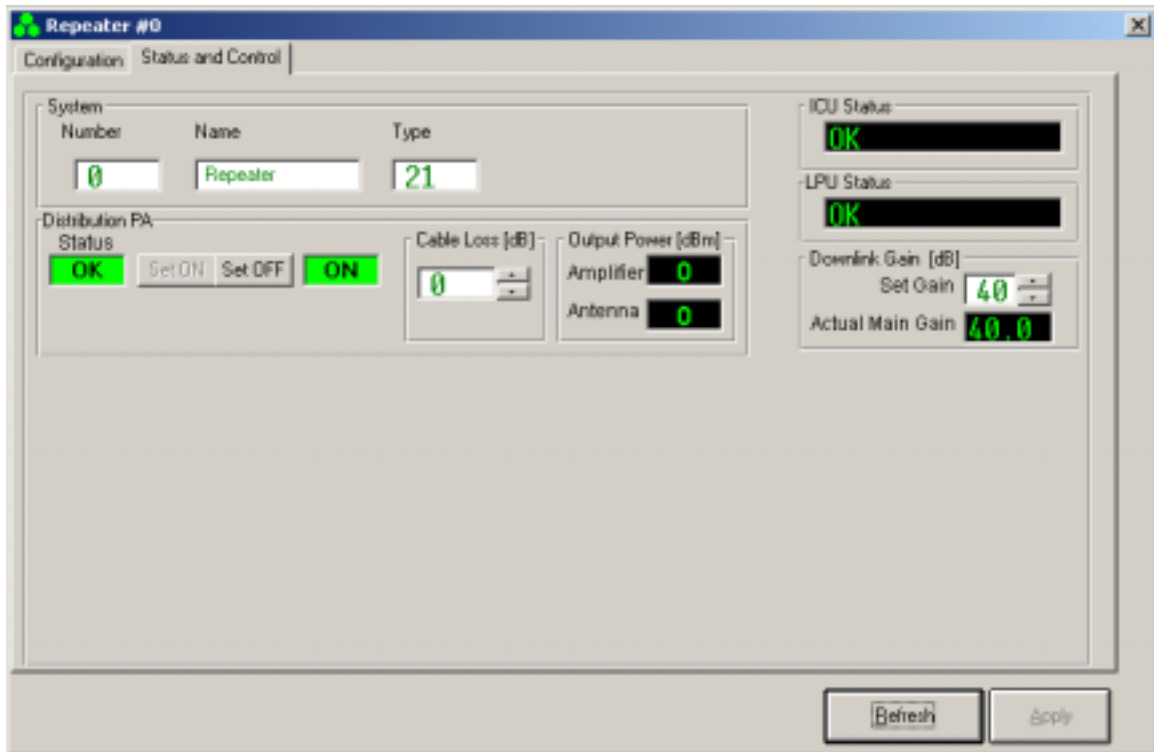Where the cable loss is a positive value in dB.

Figure 4-9 TDA System: Number, Name, and Type

4. Get the main and diversity antennas and the coax cables data from the cable shelf to the antennas. Look for the details belo:

   - Cable types and lengths
   - RF attenuations at operating frequency [dB]
   - Antenna types [verify that both sector antennas are isentical]

5. Measure the RF loss for the main and diversity paths according to.
   Main path loss = W2 + LG1+LG2 ≡ **A**
   Diversity path loss= W2+Coupler Loss (30dB) + W3 + Att loss (20dB)+
   +W5+LG3 ≡ **B**
   Comments:
   1. All losses (W2÷W5, LG1÷LG3) are positive values in dB
   2. If adapter is used instead of W2 the loss is negligible
   3. Coupler insertion loss is negligible

6. Calculate the TDA required gain (Downlink Gain [dB]) according to:
   Set Gain [dB] = **B** – **A**

7. Set the Set Gain integer value in the Ststus and Control screen rounding up (**B** – **A**).

8. Record the above Gain as " TDA Unit Downlink Gain Setting" in Appendix C.

4.4 TSM Software Version

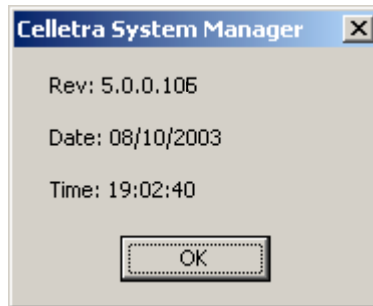Select the About menu to view the TSM software version.

Celletra System Manager

Rev: 5.0.0.106

Date: 08/10/2003

Time: 19:02:40

OK

Figure 4-10 TSM software version

4.5 PC Disconnect from TDA Unit

1. Close TSM.
2. Disconnect the PC from the TDA Unit.

Chapter 5. Servicing and Troubleshooting the TDA System

5.1 Servicing the TDA

The TDA system does not require any maintenance activities.

5.2 Troubleshooting

The following table details some common problems and recommended solutions.

NOTE: For unsolved problems or difficulties, contact Celletra Technical Support at support@celletra.com

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Table 5-1: Troubleshooting

Error/Fault	Check
System not responding to the TSM	• Check that all the TDA - PC connectors are firmly connected. • Verify proper installation and power connections to the TDA. (Check AC or DC input voltage).
Monitoring and control problems	• Check RS-232 cable connection; verify serial comm. port definition on the TSM software. • Check communication cable (For connector pin out refer to Appendix B). • Check the PC serial port.

Low/No RF Power	Operate TSM software and check the following parameters:
	  • DC power level in the TDA
	  • System setup
	  • In/Out RF power
	If the input seems OK yet the output is faulty, replace the unit and re-configure the system setup.

System Alarms	1. In the Configuration screen, look for alarms in the unit, where the frame may be colored red or yellow. 2. Drill down to the unit that shows a red or yellow frame. 3. If the PA is OFF, try to turn it ON. 4. If the PA does not go ON, replace the TDA unit.

5.3 Log File

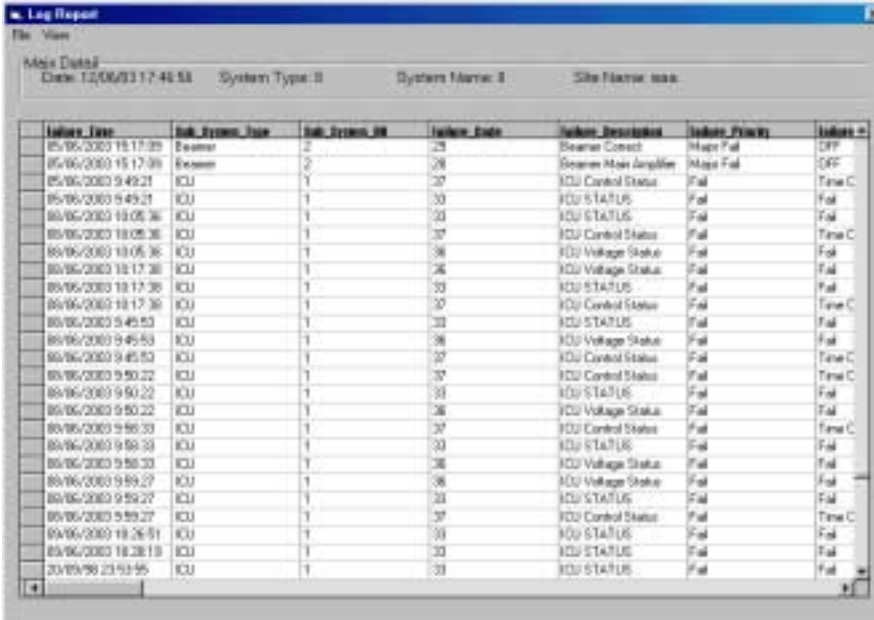The log file records system events such as malfunctions or TDA powering-on.

AUTHORIZATION

Only Administrators can perform this procedure.

5.3.1 Access the Log

Access the log file by selecting Get ICU Log from the File menu in the TSM. Following is an example of the log file display.

Figure 5-1 Log file

If no information is displayed, a serious communication problem is indicated.

You can manipulate the data stored and displayed using the menu bar shown at the top of the log file screen.

To exit the log file, click Exit in the File menu.

For more information about a particular error, go to the System Configuration block diagram and double-click the malfunctioning unit.

5.3.2 Display the Log

The log file provides the following information for each event.

Name	Explanation
Failure Time	The time at which the event occurred.
Sub-System Type	The unit where the event occurred.
Sub-System HO	Logical address of the unit.
Failure Code	Code (from the protocol)
Failure Description	Describes the problem in brief, for example, ICU Control Status.
Failure Priority	The failure severity assigned to the event, as described in Table B-3. Options are "Fail" (minor) and "Major fail".
Failure Value	Options are Fail, Timeout, Low, or Off.
BitStream	Any relevant data from the bit stream.

5.3.3 Store the Log

Every time you access the log file, the data is automatically stored to file and the log is cleared. To see a list of log files and their creation dates, select Show All Files from the View menu. You will see a dialog like this:
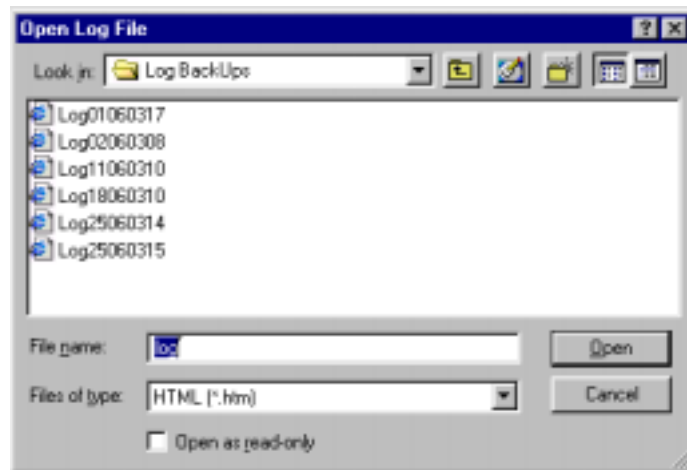

Figure 5-2 Log files list

5.3.4 View as HTML

To view the log file in HTML format, click Show HTML Version in the View menu. The resulting view may look something like this.
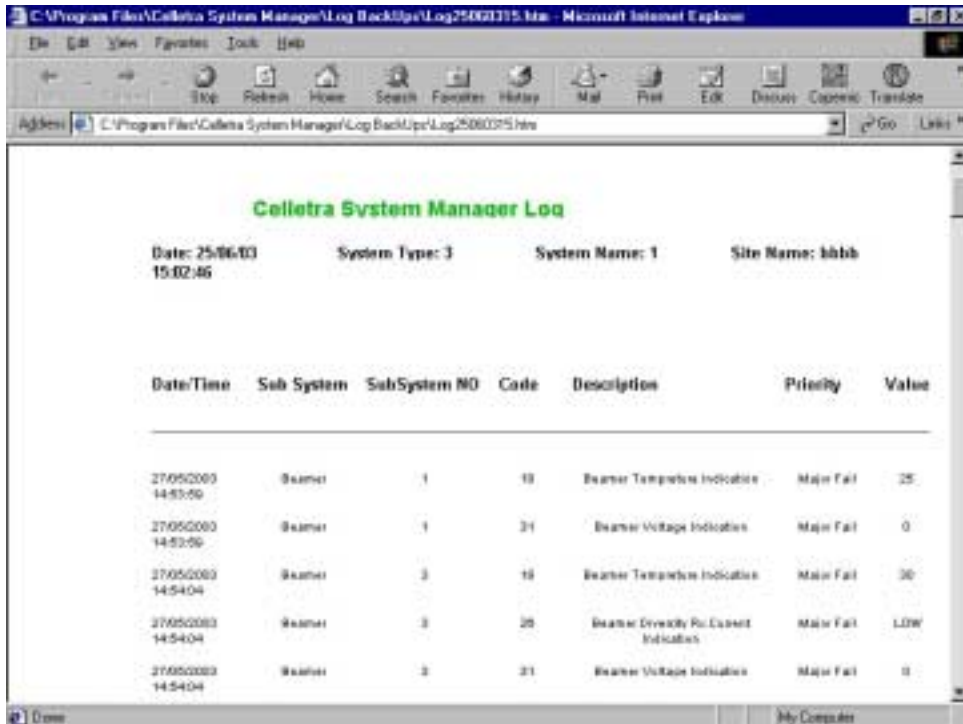

Figure 5-3 Log file as HTML

APPENDIX A. DEFAULT SYSTEM LIMITS

Defining System Failure Conditions

Failure conditions are predefined by the manufacturer, as shown in the following table:

Table A-2: Failure conditions

| Failure Description	Recommended Value
ABT voltage	Minor
DLDU voltage	Minor
ICU voltage	Minor
ABT current	Minor
DLDU current	Minor
ICU current	Minor
ICU Controller	Minor
Fan current	N/A

APPENDIX B. CONNECTOR PINS

The following table shows the connector pins for RS-232 cable.

Table B-1: RS-232 and modem activation communication connector

Amphenol C16-1 Connector (TDA side)		Communication Cable (PC Side)	
Pin #	Function	Pin #	Function
1	Bypass return	NA	NA
2	Modem Rx	NA	NA
3	CTRLR Rx	3	Pc Tx
4	CTRLR Tx	2	PC Rx
5	NA	NA	NA
6	Modem Tx	NA	-
7	GND	5	GND
1 to 7	Jumper	NA	NA

The following figure shows the DC power jumper cable layout.
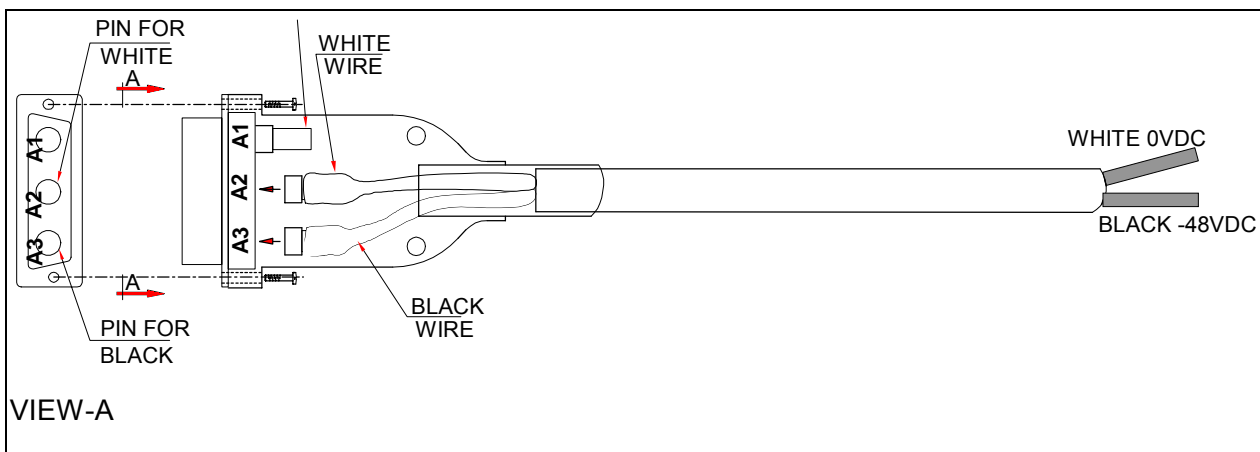
Figure B-1 DC power jumper cable layout

APPENDIX C.   RECORDS

TDA System Installation Record

After setting the TDA system, it is recommended to write down the site information for remote control records.

TDA System # ....

TDA System Name.... ....

Measured RF Cable Loss

Table C-1: RF cables sweep test

Cable #	Cable Description		Insertion Loss	Return Loss	Remarks
	From	**To**			
W2	FRM Tx1/Rx1	Coupler			
W3	Coupler	Attenuator			
W5	TDA Unit	Cable Panel DIV			
LG1	Coupler	Cable Panel Main			Legacy Cable
LG2	Cable Panel Main	Tx/Rx Main Antenna			Legacy Cable
LG3	Cable Panel DIV	Tx DIV Antenna			Legacy Cable

Main Path Power Before TDA System

P_{out} max. (Base-line) .. .. dBm

Main Path Power With TDA System

Main P_{out} max. with TDA ....   dBm

TDA Unit Downlink Gain Setting

Set Gain .... dB

Updated by: _____   **Signature**: _____   **Date**: _____