AS4000
Wireless Local Loop System

Central Terminal
Level Control Unit
Operators Manual

605-0000-428
Issue 1.2 Date 5/11/98

Airspan Communications Corporation

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2.

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Safety Instructions - Warnings and Cautions

SAFETY

1. Read and follow all warning notices and instructions marked on the product or included in this manual

2. Do not allow anything to rest on the power cord and do not locate the product where persons could step or walk on the power cord.

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EN50082-1 for Immunity.
EN55022 Group 1 Class A for the Central Terminal Emissions.
EN55022 Group 1 Class B for the Subscriber Terminal Emissions.

NOTE

The Subscriber Terminal equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

User Response Form

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Document Rating	Excellent	Good	Average	Below Average	Poor
Accuracy / Completeness	❑	❑	❑	❑	❑
Clarity / Organisation	❑	❑	❑	❑	❑
Figures	❑	❑	❑	❑	❑
Table of Contents/Index	❑	❑	❑	❑	❑

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Abbreviations

AC	Alternating Current
AGC	Automatic Gain Control
CPE	Customer Premises Equipment
CRU	Customer Radio Unit
CT	Central Terminal
DC	Direct Current
DMM	Digital Multi Meter
DRS	Digital Radio System
ISDN	Integrated Services Digital Network
ITU-T	International Telecommunications Union -Telecommunications
LD	Loop Disconnect
LED	Light Emitting Diode
MF	Multi-Frequency
NTU	Network Termination Unit
PC	Power Control
PSU	Power Supply Unit
RF	Radio Frequency
ST	Subscriber Terminal
Rx	Receive
Tx	Transmit
VDU	Video Display Unit
VF	Voice Frequency

Related Documentation

	Fixed Assignment
605-0000-430	System Overview
605-0000-431	System Operations and Maintenance Manual
605-0000-432	Central Terminal - Equipment Rack Installation & Commissioning
605-0000-433	Central Terminal - Antenna/Feeder Installation & Commissioning
605-0000-434	Hardware Overview
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605-0000-437	D128 Terminal Converter
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INTRODUCTION

1. Purpose of Document

This document describes the operation of the ACC (CT) Rack Level Control Unit

2. Prerequisite skills

This manual is intended for use by persons familiar with the Airspan product having attended the ACC CT training course prior to performing the procedures in this practice.

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LEVEL CONTROL UNIT

1. Introduction

The Level Control Unit (LCU) is used during system commissioning and routine maintenance. The Unit can be used to commission the Central Terminal, and set to poll each modem shelf hourly or daily to ensure the receiver setting is at its optimum. One Level Control Unit may be shared by up to four modem shelves in a single rack.

2. Architecture Overview

The Level Control Unit architecture as depicted in Figure 1. Components comprise;

i. A rack mounted Level Control Unit

ii. Cables and couplers to allow the Level Control Unit to be connected to the RF sub-system.

iii. Cables to allow the Level Control Unit to be connected to each Modem Shelf (to support communications to each Shelf Controller).

iv. Associated system firmware upgrades required to support AGC operation in cards such as the Shelf Controller.

The following 'channel configuration' data is entered for each dependent modem shelf;

- Coupler, cabling and LCU losses, *Note: These components are labelled to show insertion loss.*
- Mode setting for each Shelf Controller i.e. Continuous mode, hourly poll, daily poll, automatic level control suspended.

Other channel configuration data such as frequency and PN code is automatically extracted from each shelf controller.

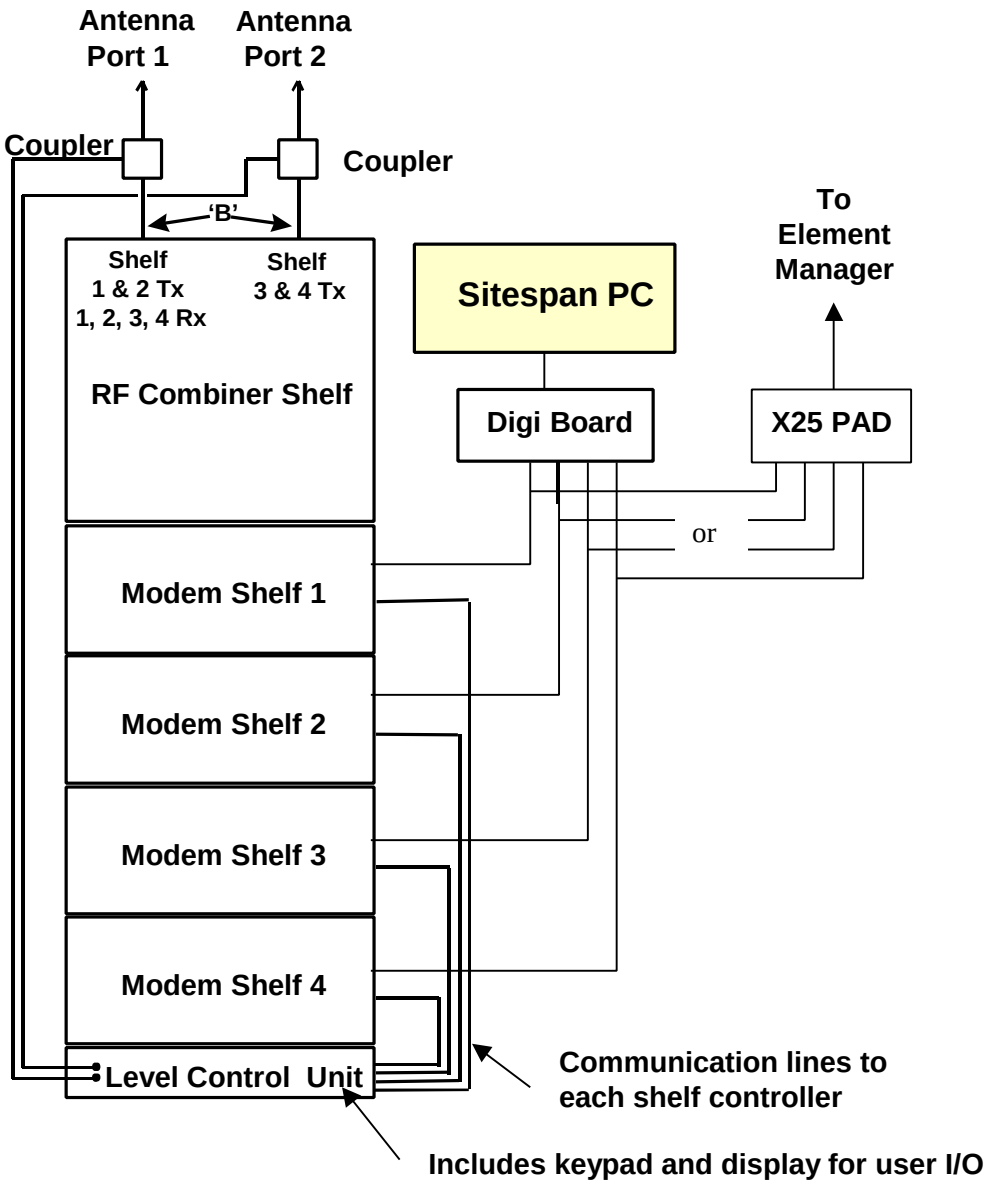


Figure 1. LCU Connections to AS4000 CT Rack

3. Principles of Operation

The Level Control Unit periodically acquires a full low rate RF downlink / uplink through RF cabling coupled into the CT transmit / receive antenna ports. Knowledge of the path loss between the Level Control Unit and RF antenna port allows the LCU to instruct the Shelf Controller to adjust RF receive level as required.

The alpha-numeric display using menu driven selections with the keypad provides:

- Input and read-back of set up information regarding RF component losses, frequency, PN code.
- Output information on the Level Control Unit status and the status of each RF channel.

To allow a specific RF channel to be quickly adjusted during commissioning (or re-checked by a visiting maintenance engineer) a “continuous mode” of operation (selected using the handheld terminal) enables downlink transmission on the code specially allocated for gain adjustment purposes. The Level Control Unit scans and acquires a CDMA link, status information such as confirmation of control loop convergence is displayed. Once control loop convergence has been confirmed the Shelf Controller mode is set to “Polled Mode”by the operator for normal background control of the receiver gain of each RF channel. Polled Mode settings of once per hour or once per day are supported

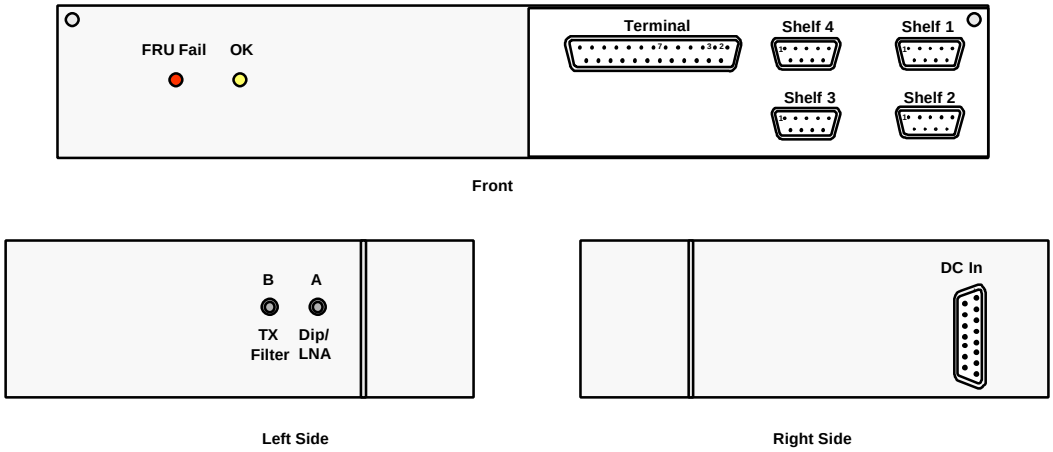
Note 1: If the LCU is left in continuous mode for more than 1 Hour, the shelf controller will disable the downlink to prevent the LCU using the radio channel indefinitely.

Note 2: The transmission of the CDMA code signal for the link to the Level Control Unit from each Modem shelf is supported using Modem number 16 which is also used to provide automatic Modem sparing. If the circumstances exist that the spare modem is required to function in place of a faulty modem, the automatic receiver gain control is suspended for that modem shelf until Modem 16 becomes free again.

4. Level Control Unit

4.1. Mechanical

The Level Control Unit is fitted at the base of the Central Terminal Rack and measures 600mm wide, 300mm deep. 100mm high.



4.2. RF Interconnect

The Level Control Unit has two RF ports (SMA connectors 50 Ohm impedance) and is connected to the RF antenna port using one length of RF cable and one coupler per antenna port. Unused ports are terminated using 50 ohm RF loads. All couplers and cables are marked to show insertion loss.

4.3. Shelf Controller Communications

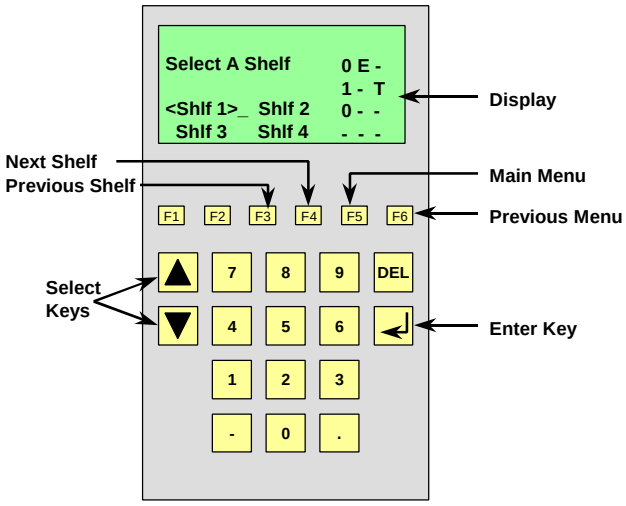
On CT racks cables with 25pin D type adapters allow communication from the management system port of each modem shelf to the Level Control Unit. A female 25 pin D type connection is presented on the adapter for connection to the Sitespan Management system.

4.4. DC Connections

The DC Supply is connected to a 15 way D-type connector on the right side of the unit. The Battery return is connected to pin 4 and duplicated supplies to Batt-ve(0) to pin 8 and Batt-ve(1) to pin 7 .

4.5. Handheld Terminal

A handheld terminal is used as the man-machine interface for the Level Control Unit. This interface is menu driven and the number of data entries are kept to the absolute minimum to reduce the software complexity.



The menus are classified into three distinct types: Selection, Status and Configuration Menus. They are used to select options, display information i.e. read only, and enter information i.e. read/write, respectively.
When the LCU is switched on the version will be displayed.
The following diagram shows the menu hierarchy for the handheld terminal interface. The hierarchy also indicates the type of menu.

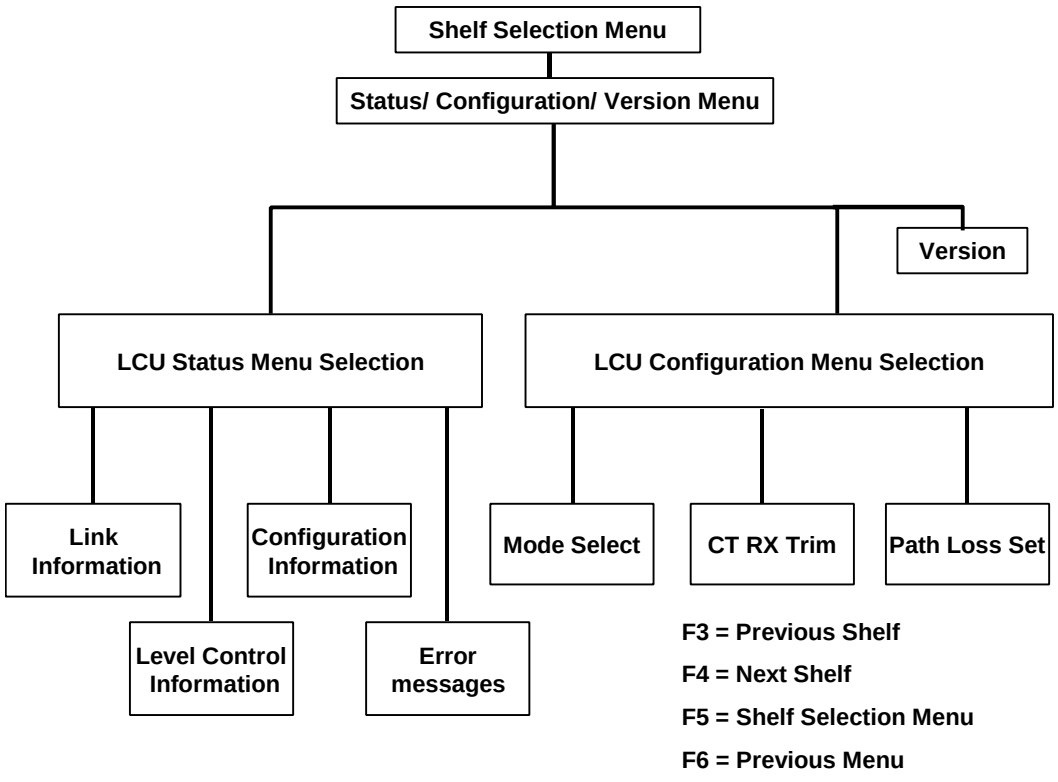


Figure 1 : LCU Handheld Terminal Interface Menu Hierarchy

Note: The shelf selection menu can be reached from any point down the menu tree by keying F5. F6 returns the user to the previous menu.

5. Data Entry / Menu Selection

The up and down arrow keys are used to move between options and fields on the display. The carriage return key will then be used to confirm the option.

Function Keys The shelf selection menu can be reached from any point down the menu tree by keying F5. F6 returns the user to the previous menu. When in a Status or Configuration Screens keying F3 moves to the previous shelf and keying F4 to the next shelf but remains with the same operation. No other keys are used.

6. Menu Displays

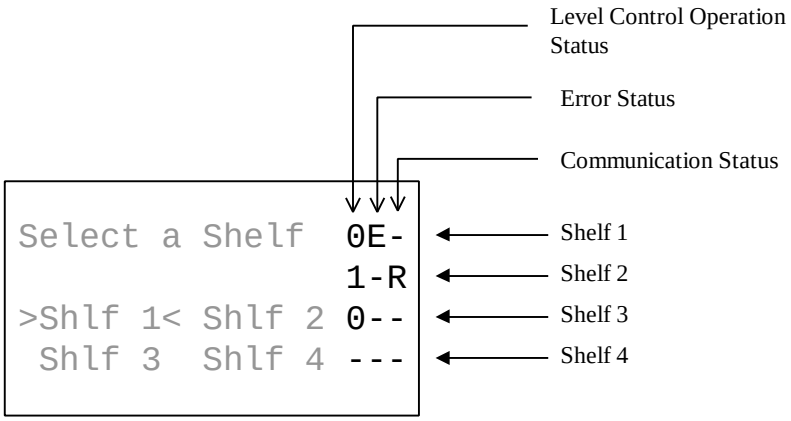
Note :

= Numerical value

* = Alphabetical character

6.1. Status

The status display is shown at all times and indicates the current selected shelf, transmit or receive polling, and state of communication with shelf controller.



The **Level Control Operation Status** column (see figure above) indicates the shelf configuration status and state of communication between the shelf controller and LCU. Possible states are:-

- = No Shelf present or configured.

0 = Shelf present and configured but level control operation is not taking place .

1 = Shelf present and configured and level control operation is taking place.

The **Error Status** shows that errors have been detected during polling.

The **Communication Status** column indicates the direction of communications with the shelf controller.

T = Transmit data is being sent to the Shelf Controller.

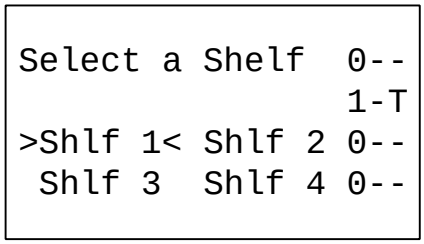
R = Receive: Data is being received to the Shelf Controller.

- = Idle a pause in communication between the SC and LCU (this state is usually momentary).

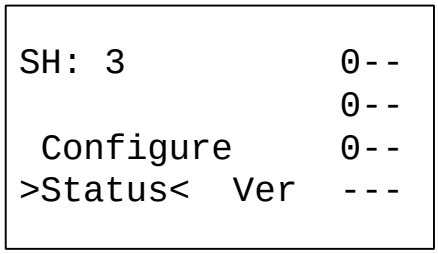
The example shown in the figure above shows shelf 1 is configured and there has been an error between the shelf controller and the LCU. Shelf 2 is in communication with the shelf controller and packets being received (R). Shelf 3 is configured it is not currently active. If no attempt at convergence is in progress, as will often be the case all shelves are marked ‘0’. Shelf 4 is not provided or equipped.

6.2. Shelf Selection Menu

This menu is used to select the shelf, of which the LCU operation and configuration information needs to be displayed and set respectively. Once the shelf has been selected all the subsequent menus display the current shelf identifier.

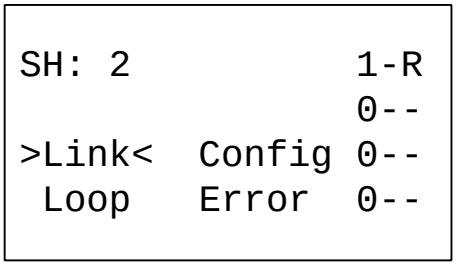


6.3. Status/Configuration/Version Selection Menu



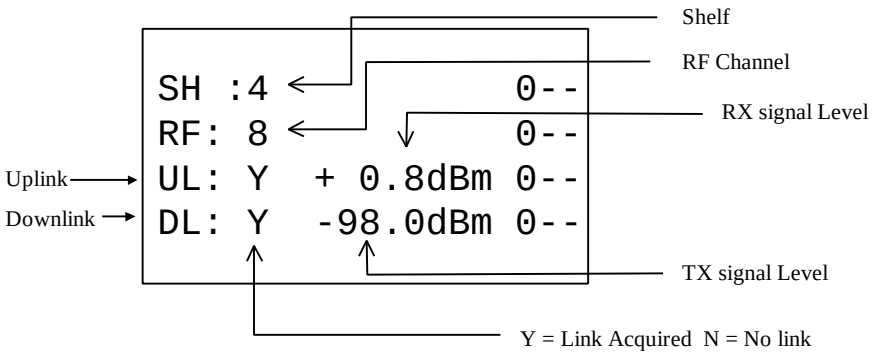
6.4. LCU Status Selection Menu

This menu allows selection between the four information screens



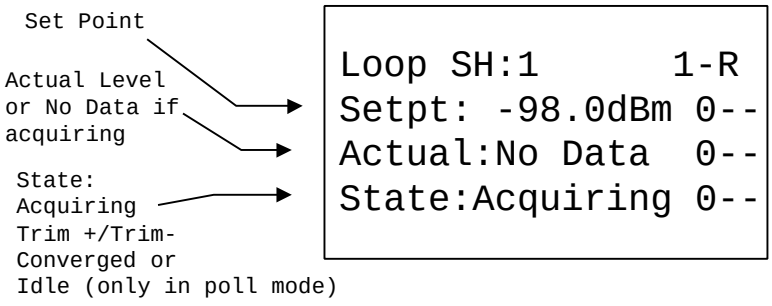
6.5. Link Information Menu

This menu displays the following information: Current Shelf Id, RF channel number, Uplink status and transmit signal power, Downlink status and recovered signal power.



6.6. Loop Menu

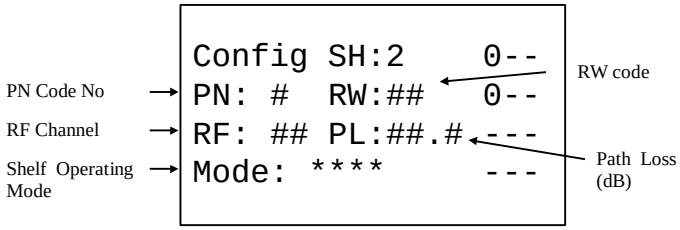
The information displayed in this menu: Current Shelf Id, set-point, actual power reading, and convergence state.
Possible Convergence States are:
Acquiring = Trying to acquire uplink and downlink.
Trim + /Trim - = Links acquired and convergence in progress (adjusting the CT receive levels).
Converged = Link has converged to the set-point.
Idle = Link has converged to the set-point but there is no further activity with the LCU. This state is not displayed when the LCU is in continuous mode and only occurs in polled mode when the LCU performs a level control operation and the link has converged at the set point, the LCU will stop the level control operation . When the operation is halted the link becomes idle.



The actual signal power at the CT is displayed in dBm or 'No Data' is displayed when the link is acquiring.

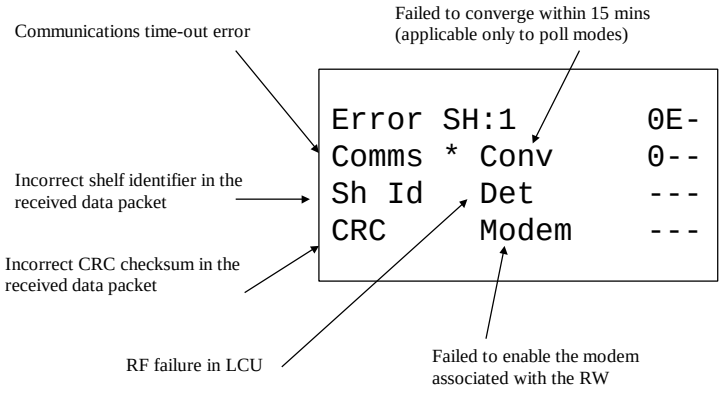
6.7. Configuration Information Menu

This menu displays: Current Shelf Id, PN code, RW Code RF channel number and Mode. This menu cannot be used to alter any of the displayed parameters.



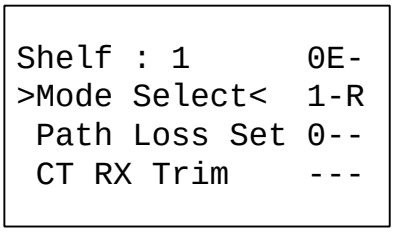
6.8. Error Information Menu

This menu will display the error status for the given shelf.. The '*' next to the error type indicates that error has occurred .



6.9. LCU Configuration Set-up Selection Menu

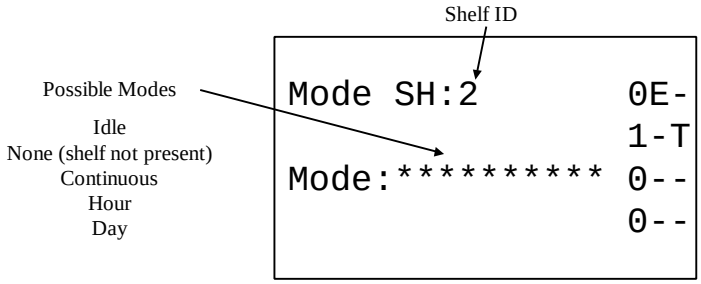
The LCU configuration information is divided into: Calibration Mode and Path Loss Information. This menu displays the current shelf identifier.



6.10. Mode Select Menu

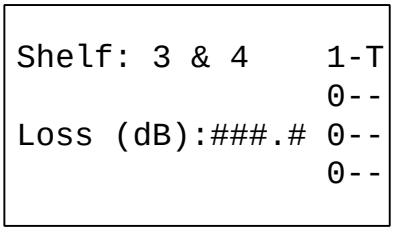
This menu is used to select any one of the available modes. The available calibration modes are: Continuous 1 hour, 1 day, idle or none. The continuous

mode is used during commissioning or maintenance operations only, It is only possible to have one shelf at a time in continuous mode. Attempts to put a second shelf in continuous mode are rejected until an option other than continuous mode is chosen for the first shelf. This menu will also display the current shelf identifier. If the shelf is left in continuous mode it will revert to disabled after 1 hour the SC will disable the RW channel. The LCU will then report Modem Enable error and disable the mode of operation to idle.



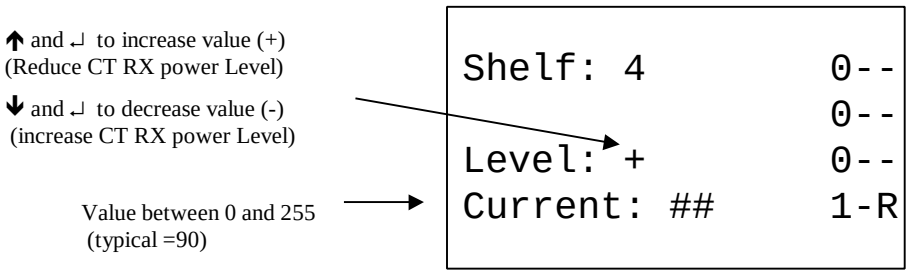
6.11. Path Loss Menu

This menu is used to set the path loss between the LCU unit and the radio RX port in the Central Terminal. The current shelf identifiers will also be displayed in this menu.



6.12. CT RX Trim

This menu allows the user to override the set point. The point can be raced or lowered keying up and down arrows and keying enter to send the selection. After a trim up (reduce CT receive power level) or down (increase CT receive power level) a period of ten to twenty seconds will elapse before the current level is updated. Once the current level has been updated, repeat the process to nudge further if required.



This option is used if the LCU does not obtain the uplink during level control operation.

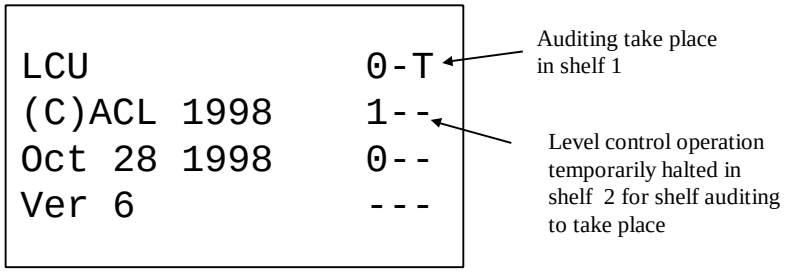
6.13. Version

The Version Screen gives copyright and informs of the software version and compile date. This will be displayed automatically when the hand held terminal is plugged in and can be reviewed form the Status/Configuration Selection Menu.

```
LCU              0--
(C)ACL 1998      0--
Oct 28 1998      0--
Ver 6            1-R
```

7. Shelf Audit

The LCU will perform a shelf audit every 15mins and ensure that the shelf is in the correct RW state. If the shelf is not active it will disable the RW and if the shelf is active it will enable the RW code. This ensures that the shelf remains operational and cannot lock up.



SETTING UP RX SENSITIVITY USING THE LEVEL CONTROL UNIT

1. Setting up RX sensitivity using the Level Control Unit

1. Use Sitespan/ Element Manger to enter the set point for the required receive levels. If no set point is set the unit will default to -98dBm.

2. From the shelf selection menu, using the keypad select a Shelf. Use arrow keys to scroll between options and enter key to select.

```
Select a Shelf  0--
                1-T
>Shlf 1< Shlf 2 0--
 Shlf 3  Shlf 4 0--
```

3. Select Configuration Set-up.

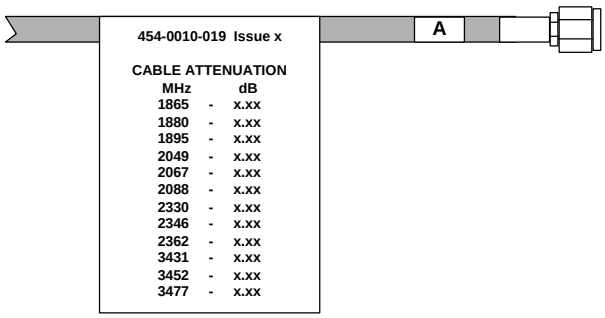
```
SH: 1           0--
                0--
>Configure<     0--
 Status   Ver   ---
```

4. If the LCU is being set-up for the first time Select Path Loss Set.

```
Shelf: 1 & 2    1-T
                0--
Loss (dB):###.# 0--
                0--
```

Enter the sum of the component losses for the system.
The losses for the cable are recorded on a cable attenuation record

attached to the top of the cable. Cable A is supporting modem shelves one and two. Cable B is supporting modem shelves three and four.



The coupler loss is recorded on the coupler using a similar label and the internal loss for the LCU is recorded on a Label on the LCU.

The path loss entered using the hand held terminal is the loss occurring in the transmitted signal from the LCU before reaching the CT LNA. Therefore path loss for signals to all shelves is the same.

The path loss for both modem shelves 1&2 and 3&4 = Loss coupler (LNA) + loss Cable + internal loss of LCU.

5. Key F6 to return to the previous menu

6. Select Mode Select.

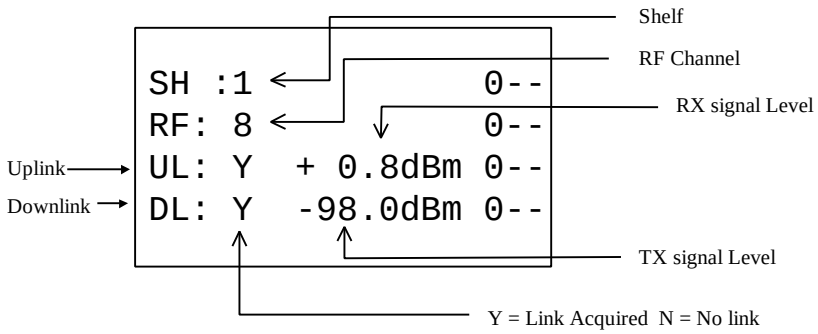
```
Shelf : 1      0E-
>Mode Select<  1-R
 Path Loss Set 0--
 CT RX Trim    ---
```

7. Set to Continuous

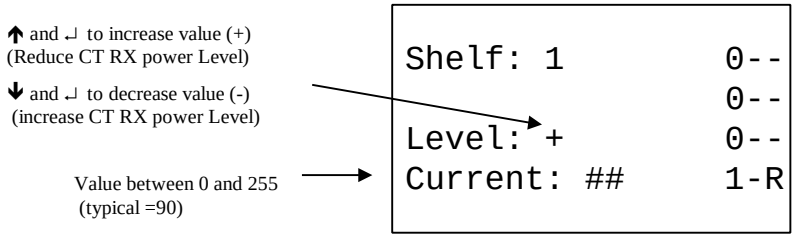
```
Mode SH:1       0E-
                1-T
Mode:Continuous 0--
                0--
```

8. Key F6 twice to return to the Status/Configuration Selection Menu.

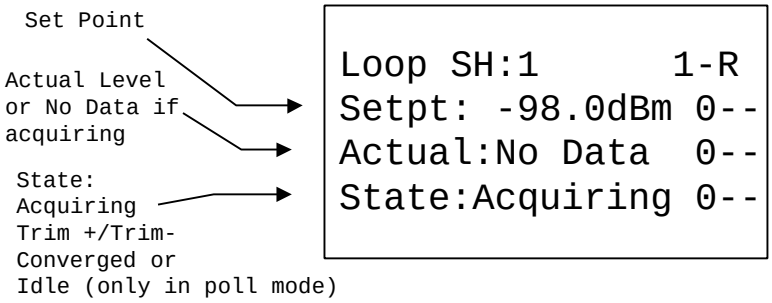
9. Select Status. Select the Link Menu.



Wait for both uplink and downlink signal acquisition. If a downlink is acquired but no uplink is established go to the Trim Menu (Status/Configuration selection menu and select configure Menu and select CT RX Trim Menu)and adjust the CT RX level to establish uplink.

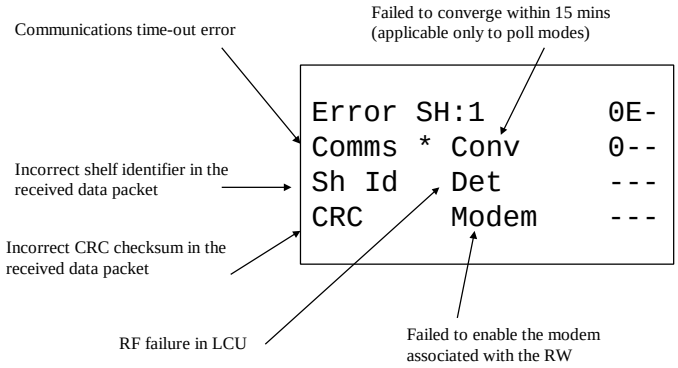


10. From the LCU Status Selection Menu select Loop.



11. Wait for the link to converge. When the CT RX level loop to converge. When it converges, 'Converged' state will be displayed. If the shelf has not converged within 3 minutes after link acquisition check the shelf configuration.

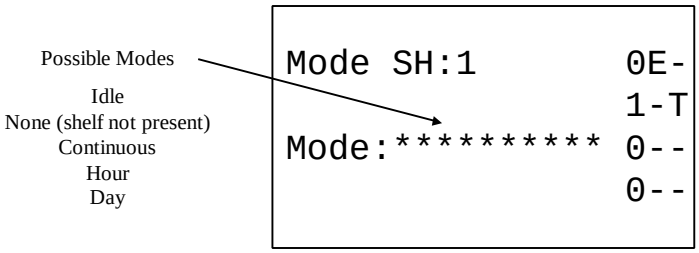
If any errors occur the LCU will stop the level control operation and set the operation mode to Idle automatically. When this occurs view the Error Menu for the source of this error.



12. Key F6 twice Select Configuration Set-up.

13. Select Mode Select.

14. Set to the required polling interval 1 hour, 1 day, or Idle. If the shelf is left in continuous mode it will revert to idle mode after 1 hour.



15. Key F5 to return to the Shelf Selection Menu