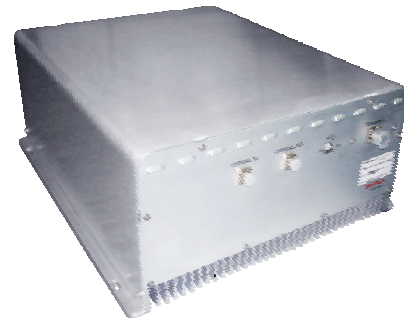


OPTICAL / MOU Series / BTS LINK**OPERATION & INSTALLATION MANUAL****BTS Link® -208****MOU****DBROU**

**FIBER OPTICAL
DISTRIBUTED ANTENNA SYSTEM with 8 DBROUs**

5920 0020 200

April 2008

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1. Document History

Document Number	Document Name	Date	Compiled by	Approved by	Revision
5920 0020 200	BTS Link- 208	April	Inderjit	D.S.Nagi	

	Repeater	2008			
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Revision**Revised Section****Date****Intentionally Left Blank****2. Disclaimer**

Every attempt has been made to make this material complete, accurate, and up-to-date. Users are cautioned, however, that **Shyam Telecom Limited** reserves the right to make changes without notice and shall not be responsible for any damages including consequential, caused by reliance of

the contents presented, including, but not limited to, typographical, arithmetical, or listing errors.

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In areas with unstable power grids (mains) all repeaters must be installed with a voltage regulator ensuring a constant voltage level at the repeater power input. A maximum voltage deviation should remain within the input range to the repeaters for warranty purposes.

All antennas must be installed with lightning protection. Damage to internal modules, as a result of lightning is not covered by the warranty.

All specifications are subject to change without prior notice

3. Safety Instructions and Warnings

3.1. Personnel Safety

Before installing or replacing any equipment, the entire manual should be read and understood. The user needs to supply the appropriate AC power to the Repeater. Incorrect AC power settings can damage the repeater and may cause injury to the user.

Throughout this manual, there are "**Caution**" warnings, "**Caution**" calls attention to a procedure or practice, which, if ignored, may result in injury or damage to the system or system component or even the user. Do not perform any procedure preceded by a "Caution" until the described conditions are fully understood and met.

3.2. Equipment Safety

When installing, replacing or using this product, observe all safety precautions during handling and operation. Failure to comply with the following general safety precautions and with specific precautions described elsewhere in this manual violates the safety standards of the design, manufacture, and intended use of this product. **Shyam Telecom Limited** assumes no liability for the customer's failure to comply with these precautions. This entire manual should be read and understood before operating or maintaining the repeater system.

CAUTION

It calls attention to a procedure or practice which, if not followed, may result in personal injury, damage to the system or damage to individual components. Do not perform any procedure preceded by a

CAUTION until described conditions are fully understood and met.

3.3. Electrostatic Sensitivity

CAUTION
ESD = ELECTROSTATIC DISCHARGE SENSITIVE DEVICE

Observe electrostatic precautionary procedures.

Semiconductor transmitters and receivers provide highly reliable performance when operated in conformity with the intentions of their design. However, a semiconductor may be damaged by an electrostatic charge inadvertently imposed by careless handling.

Static electricity can be conducted to the semiconductor chip from the centre pin of the RF input connector, and through the AC connector pins. When unpacking and otherwise handling the Repeater, follow **ESD** precautionary procedures including the use of grounded wrist straps, grounded workbench surfaces, and grounded floor mats.

WARNING! This equipment complies with FCC & IC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. For mobile or fixed location transmitters, the minimum separation distance is greater than 40 cm, even if calculations indicate that the MPE distance would be less.

4. Introduction

4.1. Purpose

The purpose of this document is to describe the electrical and mechanical specifications, operation and maintenance of the **BTS Link-208** Repeater.

4.2. Scope

This document is the product description of the Shyam **BTS Link-208** Repeater.

4.3. Definitions

AGC	Automatic Gain Control
ALC	Automatic Level Control
APC	Automatic Power Control
BTS	Base Transceiver Station
CDMA	Coded Division Multiple Access
CMC	Configuration & Monitoring Console software
DBROU	Dual Band Remote Optical Unit
DCS	Digital Communication System
DL	Downlink signal (from base station via repeater to mobile station)
EGSM	Extended Global System for Mobile Communication
ETSI	European Telecommunications Standard Institute
FDF	Fiber Distribution Frame
GSM	Global System for Mobile communication
IMD	Inter Modulation Distortion
LAC	Location Area Code of the BTS site
LED	Light Emitting Diode
LNA	Low Noise Amplifier
LO	Local Oscillator
MOU	Master Optical Unit
MS	Mobile Station
NMS	Network Management System
PCN	Personal Communication Network
PCS	Personal Communication System
PSU	Power Supply Unit
RF	Radio Frequency
RMS	Remote Management System
ROU	Remote Optical Unit
RSSI	Received Signal Strength Indication
UL (Uplink)	Uplink signal direction (from mobile station via repeater to base station)
UMTS	Universal Mobile Telecommunication System

4.4. References

[1] ETS 300 086.

Radio Equipment and Systems Land mobile service Technical characteristics and test conditions for radio equipment with an internal or external RF connector intended primarily for analogue speech.

[2]ETS300609-4.

Digital cellular telecommunications system (phase 2): Base Station Systems (BSS) equipment specification: Part 4: Repeaters.

[3] ETS 300 342-3

Radio Equipment and Systems (RES); Electro-Magnetic Compatibility (EMC) for European Digital Cellular Telecommunications systems. Base Station Radio and ancillary equipment and Repeaters meeting phase 2 GSM requirements.

4.5. General

Mobile Communications Systems are planned as cellular systems and each cell of the base station is required to provide RF coverage over a certain geographical area as per defined RF power levels. Due to the RF propagation properties, even using high radiated RF powers or complicated antenna systems, there are zones within the coverage area where the RF signal strength from base station remains inadequate for establishing the desired connectivity to mobile users.

Repeaters traditionally are deployed in the Mobile Communication Network to fill in the “Dead Zones” caused by blocking of signals by geographic topologies such as mountains, valleys, dense foliage, high rise urban landscapes, and other man-made structures. The distance from the base station also adversely affects the RF signal strength. The user views repeaters as a means to extend base station coverage so as to reduce the number of base stations and thereby accelerate network availability.

Repeater systems are installed after meticulous planning between BTSs and the mobile users to provide RF coverage in the shadowed regions. Repeater systems are available for different applications and **ultimate choice** shall depend on some of the factors mentioned below:

- Area to be provided with coverage.
- Indoor/outdoor coverage.
- Availability of BTSs in the vicinity.

5. Functional Description of BTS Link-208 Repeater

5.1. General Description

The **BTS Link-208** Repeater System is designed to provide indoor coverage and can handle signals in two service bands viz. Cellular & PCS, used by various service operators. It provides highly selective amplification in the pre-set bands. The details of operating frequencies are:

Cellular 869 MHz to 894 MHz (DL) 824 MHz to 849 MHz (UL)

PCS 1930 MHz to 1990 MHz (DL) 1850 MHz to 1910 MHz (UL)

- The **BTS Link-208 repeater** system is a dual band Distributed Antenna System (DAS) for point to point & point to multi-point coverage.
- It is comprised of a Master Optical Unit (MOU) and Dual Band Remote Optical Units (DBROUs), maximum 8, installed at different sites. MOU & DBROUs are connected through a pair of optical fibers.
- DBROUs with appropriate housings for indoor application can be installed at the pre-planned sites.
- Master Optical Unit (MOU) is installed at indoor location close to BTSs from where the signals are to be received and also OFC terminations destined for DBROUs at different sites are available.
- The repeater is deployed in the network where RF coverage is required for large clusters of mobile users at different sites.
- The repeater can be equipped with a RMS (Optional) for speedy maintenance & monitoring.
- The antenna isolation problem is of little consequence since the signals between MOU and DBROUs are propagated as optical signals, which are insensitive to any electrical interference/disturbances.

The system is comprised of two units:

I) Master Optical Unit (MOU): The MOU is installed at a suitable indoor location close to the BTS. It receives/transmits RF signals in dual band from the BTSs through BTS couplers and optical signals from different DBROUs. It consists of modules/units:

- Duplexers [Band 1 & Band 2]
- Optical Transmitter Unit (OTX)
- Optical Splitter (1:4)
- Optical Receiver Unit (ORX)
- Power Supply Unit
- Gain modules
- Supervisory and ASK modem
- A metallic housing (Indoor application) accommodates all the above units/modules. Arrangement is made for dissipation of heat generated in the unit and the unit is not waterproof.

II) Dual Band Remote Optical Unit (DBROU): Depending on the requirement DBROUs maximum up to 4 or 8 are installed at different locations where coverage is desired. Each of the DBROUs consists of modules/units:

- Optical Receiver Unit (ORX)
- Power Amplifier
- Quad-plexer
- LNA
- Optical Transmitter Unit (OTX)
- Power Supply Unit
- Gain modules
- Supervisory & ASK module
- A metallic housing for Indoor application accommodates all the above units/modules. The housing is designed for dissipation of heat generated in the unit.

5.2. Coverage

When installing DBROU for indoor application, precautions should be taken not to expose it to direct Sunlight, chemical fumes, and water vapors etc. Suitable sets of server antennas are to be installed at predetermined locations to achieve the desired coverage. Some of the applications are shown in Figures 2 & 3.



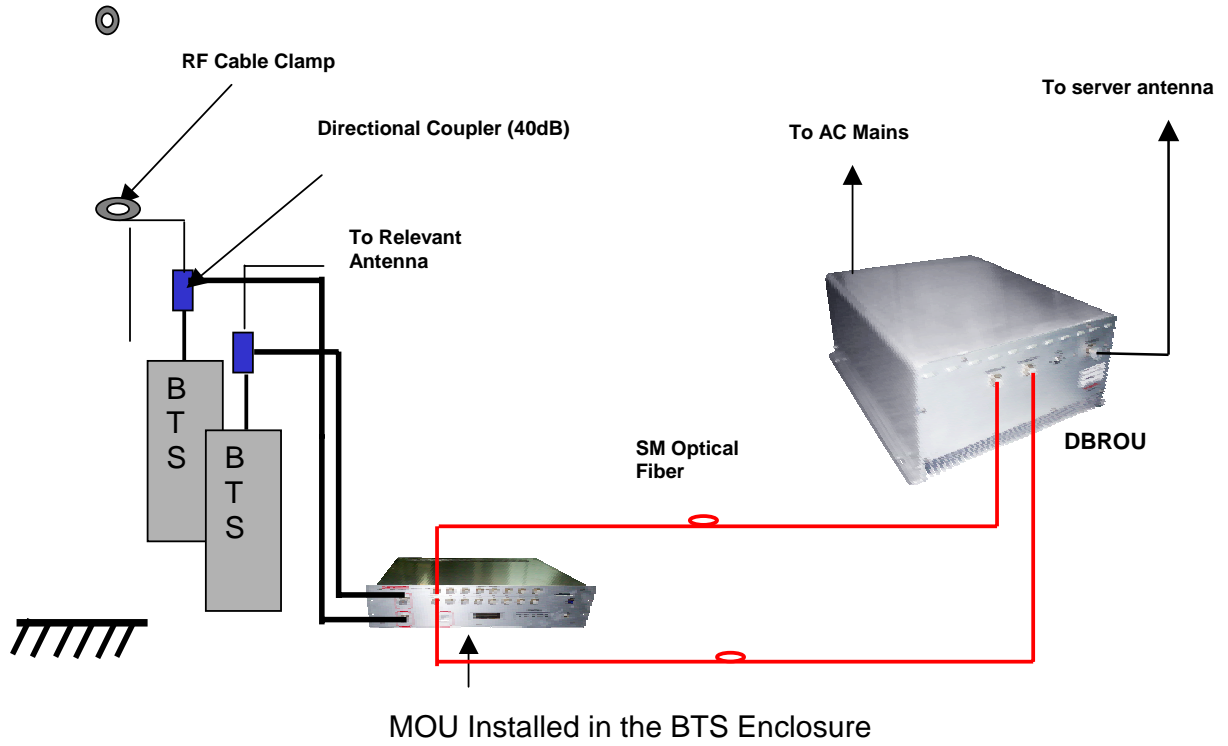


Figure 1: Constituents of BTS Link-208 Repeater

6. To Get started-Basic Software Control of the System

6.1. General

The system (MOU & DBROU) is equipped with a supervisory module that allows the monitoring and control of various parameters such as RF power, attenuation, temperature, and alarm conditions etc.

The communication interface between the local terminal and the control module can be set up using the Configuration & Monitoring Console software (CMC), which is an easy to use GUI for simple control and monitoring. It enables monitoring of parameters & subsequent adjustment if required.

This function can be performed either using a terminal (PC/laptop) locally, or through remote login using the wireless modem (Optional) located in the repeater. USB port is provisioned in the equipment for connecting PC/laptop.

6.2. Terminal Set-up

The system is delivered with software loaded in order to perform configuration as per requirement. It also enables monitoring the status. Configuration of parameters can be carried out locally at MOU & DBROU with the help of laptop / PC connected to the system by means of local USB serial interface or remotely via wireless modem (Optional) mounted inside the MOU. The laptop/PC should be loaded with the CMC software available on the supplied CD along with the USB driver.



Figure 4: Login Repeater

Functions as described below are carried out through CMC software:

I) Login Repeater (Figure 4)

After running the *Configuration & Monitoring Console* (CMC), user needs to login. Similar sequence is to be followed at MOU & ROU. To login:

- Click the “**Login**” on the command bar.
- Select the user type.
- Enter the password.
- Finally click the “OK”.

After successful login a message, “**Logged in successfully**” message appears on the screen. Now user can start the operation through CMC.

There are two types of user’s viz. **ADMINISTRATOR** and **SUPERVISOR**. If user logged in as an ADMINISTRATOR, all the operation through the CMC can be carried out. By default password is “**SHYAM**”.

SUPERVISOR is allowed to perform monitoring of the status & alarms but no change in configuration is permitted. However, the **SUPERVISOR** can change password if so desired.

II) Configuration & Monitoring

Configuring system means setting the system parameters for operation as per the requirement at site. Configuration & monitoring is carried out at MOU and ROU separately.

a) Settings in MOU

To begin with MOU ID settings as per **Figure 5** are carried out, information specified is:

- Repeater ID
- Repeater Location

Configurable parameters as per **Figure 6** are:

- Out put power limit UL Band 1
- Out put power limit UL Band 2
- Laser Diode ON/OFF
- OTX1 ON/OFF and OTX2 ON/OFF

After specifying these parameters, SET is pressed

b) MOU Status

Status of MOU as per **Figure 7** is displayed through following set (configurable) parameters:

Downlink

- RSSI Band 1 & Band 2
- Attenuation in Band 1 & Band 2

Uplink

- Out put Power Band 1 & Band 2
- Attenuation in Band 1 & Band 2

Optical Power

- OTX 1 & OTX 2
- ORX 1 to 8 [As per number of equipped DBROUs]

Power Supply

- 5.5 V

Alarms

- Alarms as per categorization viz. Critical, major & minor are set. Clicking at “detail alarms” can further check detail of alarms.



Figure 5: MOU ID Settings

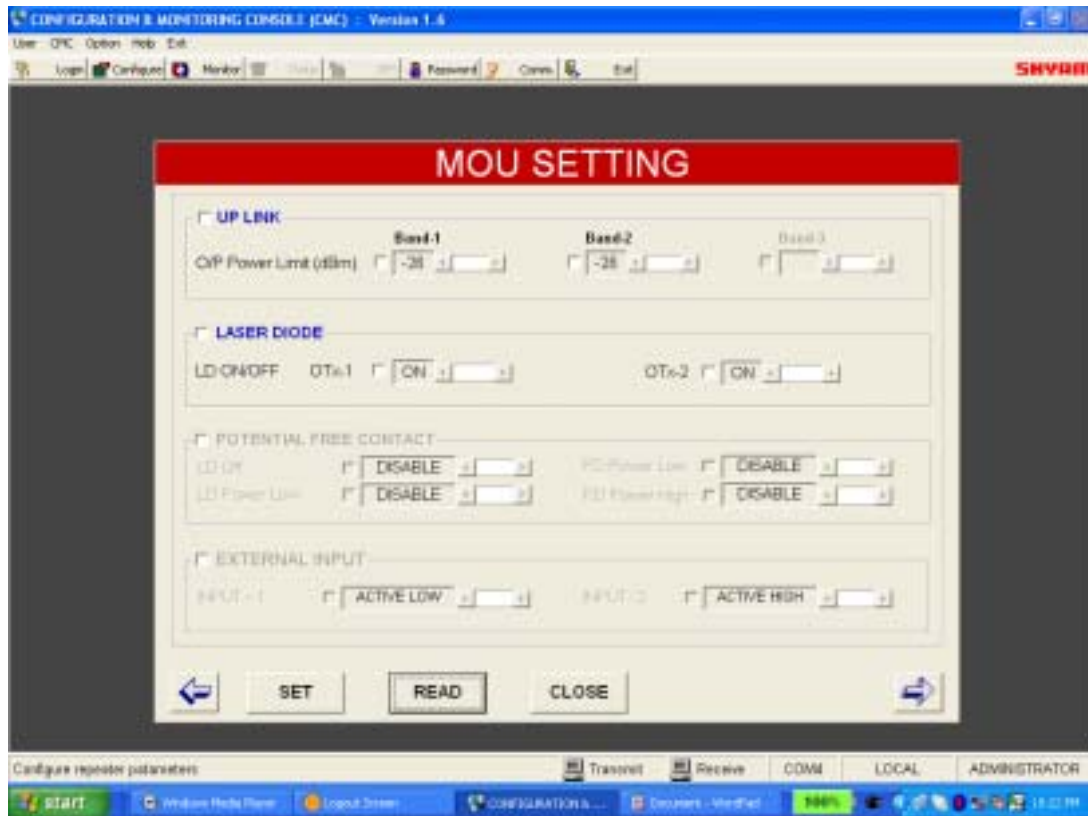


Figure 6: MOU Settings Window

c) MOU-Alarms (Figure 9)

S.NO.	Alarm	Remarks
1.	RSSI Low Down Link	The alarm is generated when the RSSI detected is lower than the set limit in Band 1/Band 2.
2.	RSSI High Down Link	The alarm is generated when the RSSI detected exceeds the set limit in Band 1/Band 2.
3.	Power High (uplink)	The alarm is generated when the power limit detected exceeds the limit in Band 1/Band 2.
4.	Power Supply 5.5 V	The alarm indicates the failure/low of 5.5 V power supply.
5.	LD OFF	The alarm is generated when Laser Diode Off is detected in OTX 1/OTX 2.
6.	LD power low	The alarm is generated when lower optical power than the set is detected from Laser Diode is detected in OTX 1 /OTX 2.
7.	LD power high	The alarm is generated when higher than the set optical power from Laser Diode is detected in OTX 1 /OTX 2.
8.	PD power low	The alarm is generated when lower than the set optical power from photo diode is detected in ORX 1.....ORX 8 (De[pendig on the number of ROUs equipped)
9.	PD power high	The alarm is generated when higher than the set optical

		power from photo diode is detected in ORX 1.....ORX 8 (De[pendng on the number of ROUs equipped)
10.	System Temperature	It indicates that the temperature of the system has exceeded the limit.



Figure 7: MOU Status



Figure 8: MOU-Alarms

d) Settings ROU

After login, following settings as per **Figure 9** are carried out:

- Output power limits in downlink for Band 1 Band 2 are specified.
- PA ON/OFF as per requirement in Band 1 Band 2. Both the PAs remain in ON condition under normal circumstances.
- RSSI limits in Band 1 & Band 2 in uplink path are specified.
- Attenuation inserted in Band 1 & Band 2 , values are indicated.
- Laser Diode ON or OFF setting can be made as per requirement. It will remain in ON condition during normal working of the system.

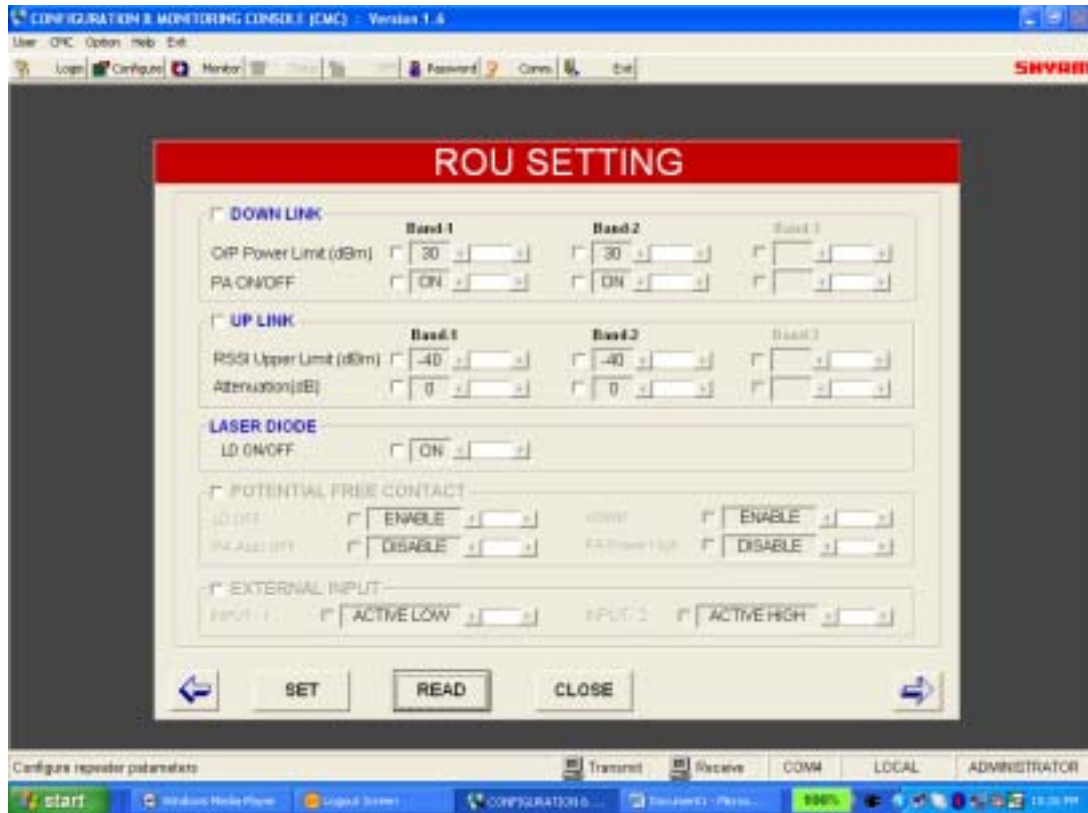


Figure 9: ROU settings

One MOU supports up to 8 DBROUs, unit selection can be made for a particular DBROU as per Figure 10 for settings etc.

e) DBROU Status (Figure 11)

Parameters as indicated below are monitored:

- Attenuation inserted In Downlink path in Band 1 & Band 2 in auto mode is indicated.
- Real time Output power in Band 1 Band 2 is indicated.
- Real time value of RSSI in Uplink path in Band 1 & Band 2 is indicated.
- Real time LD optical power is displayed.
- Real time PD optical power is displayed.
- Real time values of power supply voltages 5.5 V, 7 V supply B, 27 V supply A & 27 V supply B.
- System temperature is indicated.
- Categories of alarms prevailing in the system are displayed.

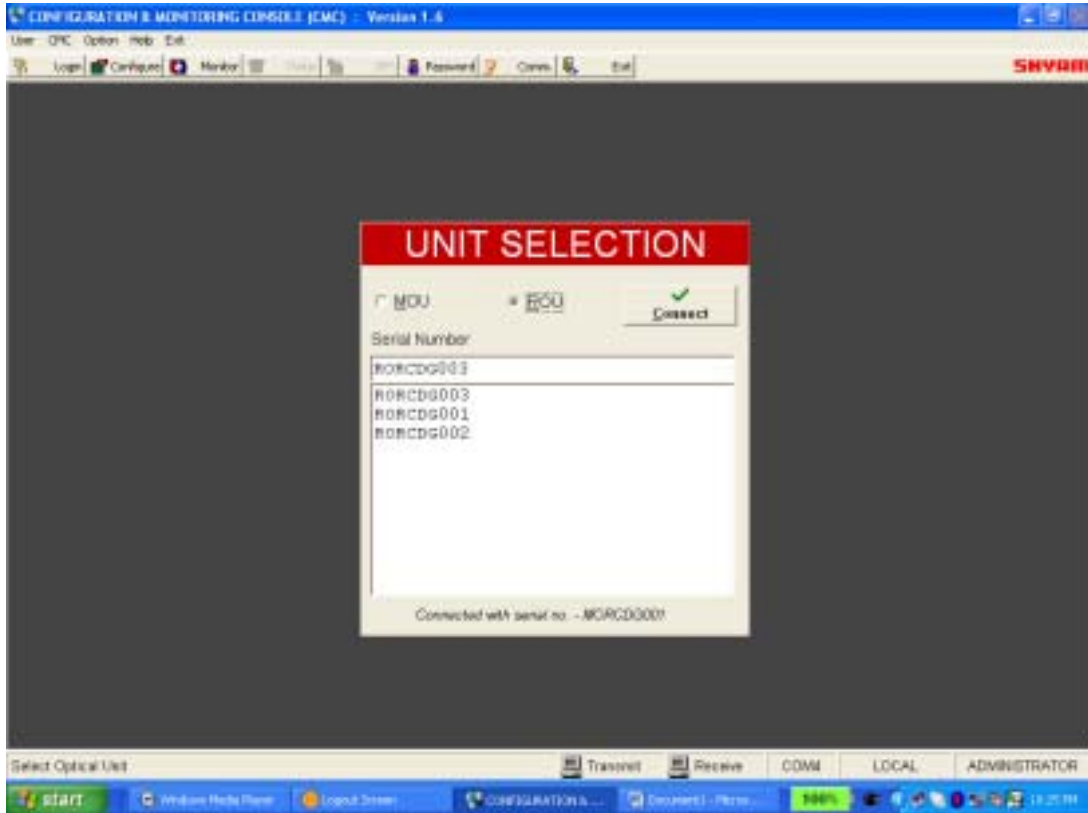


Figure 10: Unit Selection

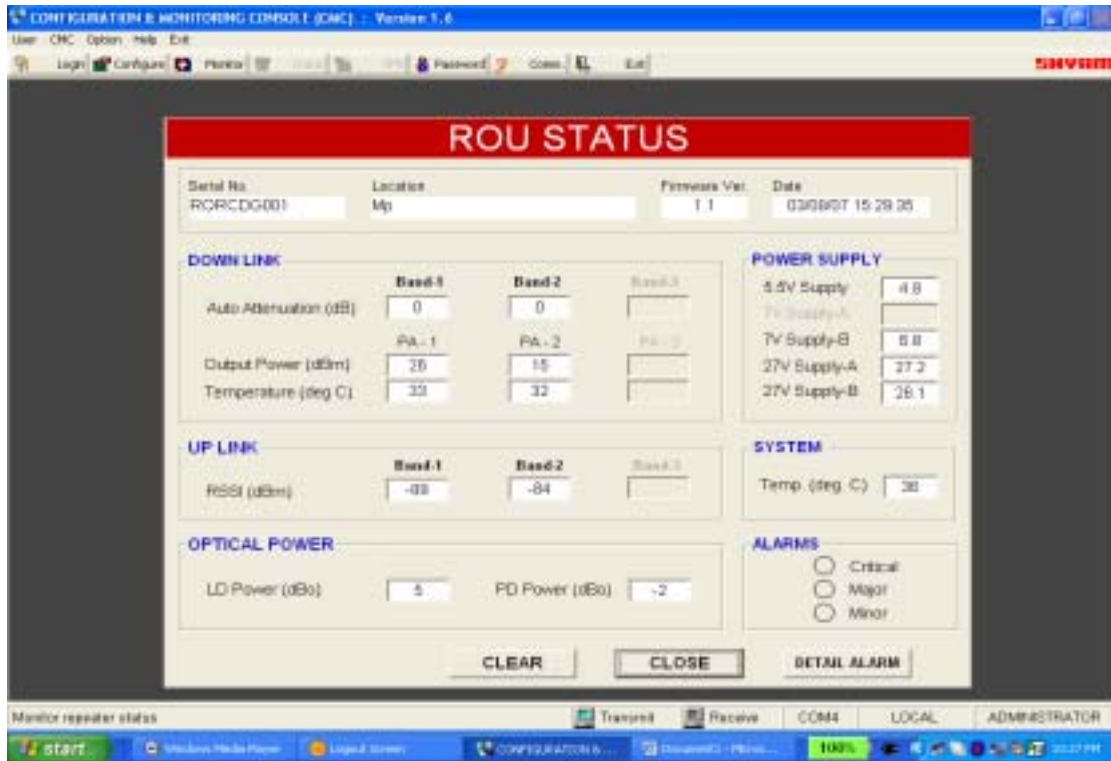


Figure 11: ROU Status Monitoring Window

Clicking “Detail Alarm” can check alarms on DBROU

III) Communication Settings (Figure 12)

In COMMUNICATION window, user can select serial communication port of the computer and type of connection between repeater and computer. There are two types of connections viz. Local and Remote.

a) Local Connection

In this type of connection user computer COM Port and repeater’s USB Port are connected directly using cable. Sequence is as under:

- Click the “**COMM.**” on the command bar to display the COMMUNICATION window.
- Select the Connection Type as “**LOCAL**”
- Select the computer’s Comm. Port where the repeater is connected.
- Click “**OK**”.

b) Remote Connection

In this type of connection, User communicates remotely with the system using wireless Modem / Cell phone.

To connect:

- Click the “**COMM.**” on the command bar to display the COMMUNICATION window.
- Select the Connection Type as “**REMOTE**”
- Select the computer’s Comm. Port where the wireless Modem is connected.
- Click “**OK**”.
- Now click the “**DIALUP**” on the command bar to display the DIALUP window.
- Enter / Select the repeater phone number.
- Click the “**DIAL**” and wait (maximum 60 seconds) for connection.
- A message “**CONNECTED**” will appear on the screen after the connection is established.



Click “**DISCONNECT**” to break the connection.

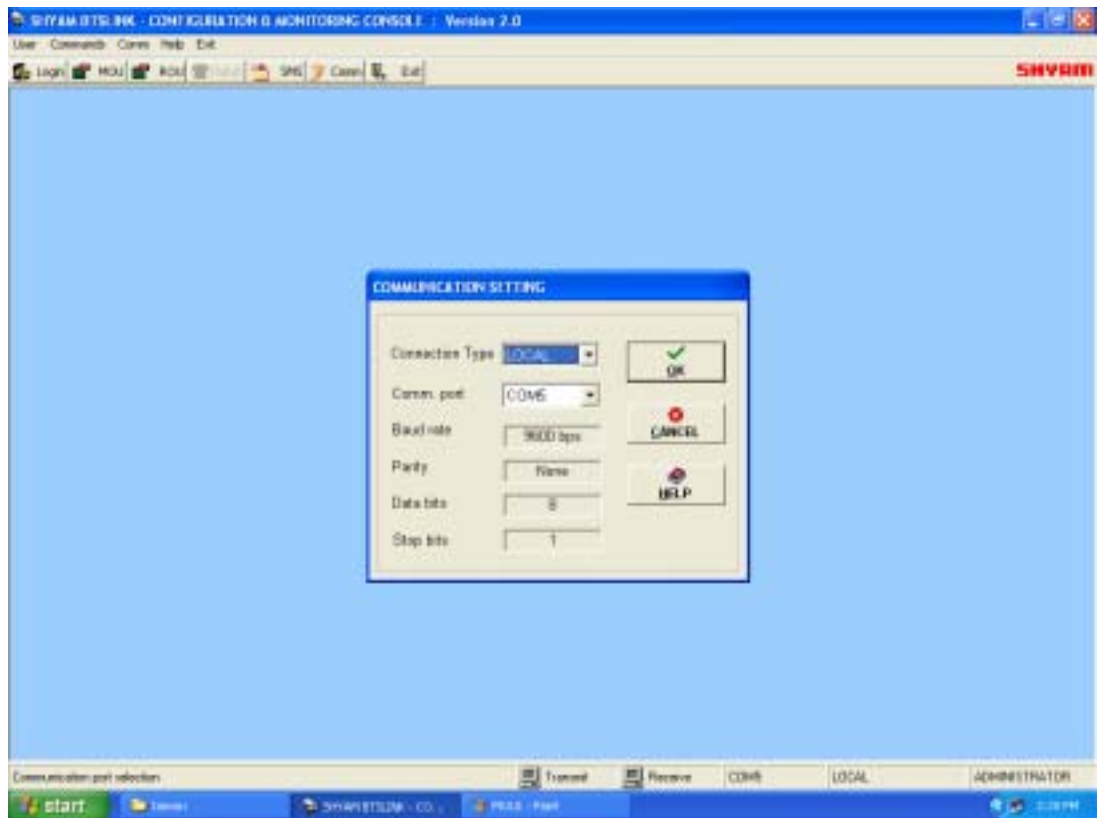


Figure 12: Communication Settings

CAUTION

When the communication between repeater & PC/Laptop is in progress through USB:

- Do not remove cable from the USB port.
- Do not switch off the repeater.

In case the communication is not required any more, click at EXIT before removing cable from USB port to avoid *hanging* of the PC/Laptop. In case the PC/Laptop goes in to *hanging* mode, it has to be restarted after closing/switching OFF & ON the repeater.

IV) Security Settings (Figure 13)

The system has two levels of permitting Log in to the repeater to avoid unauthorized operation.

The levels are: **ADMINISTRATOR & SUPERVISOR.**

Each level has a specific password. The password for each level can be changed at intervals. **ADMINISTRATOR** has rights to perform all functions Viz. Configuration, Monitoring etc. Whereas the **SUPERVISOR** has jurisdiction to perform limited functions like monitoring of alarms, establishing communication etc.