Radiant Broadband Wireless Access Network
ODU Node Production Test

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0.1	9 October 2001	Draft for comment.
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1 Introduction

This is a temporary “ODU Production Test Spec” for use in TCAS ODU commissioning.

It is based on the ODU Test Plan (PRD_ODU_1_PLAN_1.0_53) but in some cases uses different test interfaces and procedures in order to get things moving quickly. E.g MIB browsing is used in some cases in advance of automated scripts being written.

The ODUs will be connected to Ethernet.

Key command types: - Borg operations

NC Debug port operations

Modem debug terminal operations

MIB operations

PC or equipment operations

2 Abbreviations

TBA_{DE} To Be Assessed By Design Engineering

UPS Uninterruptible Power Supply

PSU Power Supply Unit.

RF Radio Frequency.

UUT Unit Under Test.

DC Direct current

3 Test Equipment

- 2 PCs running HyperTerminal or similar. Each PC must have two HyperTerminal screens activated: one for Modem and the other for Node Controller.
- 2 UPS, one for each node.
- Golden Node No.10.
- One Oscilloscope for each setup.
- All cables necessary to communicate with and power up nodes.
- ATM25 Tester: TTC 750E
- ATM155 Tester: TBD

Ensure that test equipment details are logged before starting tests – a template for this purpose will be found in the Appendix, Section 7.1.

4 Equipment and UUT Configuration

4.1 Sanity check for PSU problems

Power ODU from PSU and check power consumption

Ensure that the correct modem software has been downloaded, this can be checked using the following methods:

- NC debug port, reports the build version on restart.
- The SNMP inventory MIB, shows the loaded software versions and individual component values.

4.2 Test Script Files

The nodes under test are controlled using two types of test scripts:

- TCL scripts executed under Linux
- Text Commands issued to the NC debug port using hyper-terminal

TCL Scripts

The factory TCL scripts are run from Hummingbird Connectivity V7.0 > Exceed >Exceed. Right-click on Exceed and choose tools > client startup > GAIA Login. The user details are:

- Login: sl
- Password: sl

The factory test scripts, are accessed by issuing the following UNIX command:

- cd projects/nodos_v2/nodos/nodos_test/factory

These commands are described in more detail in the following sections. To kill a Unix script type:

- <ctrl> + c

Sometimes the X-session locks, this may be recovered by typing:

- <ctrl> + q

The following test scripts are available in this directory:

4.2.1 *Clear_all.tcl*

This command will destroy any active links in a single node.

- *clear_all.tcl <Node Id>*
- E.g.: *clear_all.tcl 4*

The script assumes that the IP address for a node is 173.31.3.2xx, where xx is the node ID of the node. You need to run this script for the two nodes at each end of the link.

4.2.2 *Config_node.tcl*

This script configures the following data in the requested node, and saves it in flash.

- Node Id
- Scanning Channel
- Debug logger level

The command has the following parameters:

- *config_node.tcl <Node ID> <CEPT Scan channel>*
- E.g.: *config_node.tcl 4 10*

The script assumes that the IP address for a node is 173.31.3.2xx, where xx is the node ID of the node.

4.2.3 *Chan3_test.tcl <node1> <node2>*

This script attempts to form a link using the top TRM over each possible CEPT channel.

4.2.4 *Chan2_test.tcl <node1> <node2>*

This script attempts to form a link using the bottom TRM over each possible CEPT channel.

4.2.5 *Channel_test.tcl*

This script attempts to form a link using each possible CEPT channel. The script checks that it can ping the nodes under test, and that they have good timing before it attempts to form any links. It also captures the temperature sensor reading from the node. The script can be run in two modes. The first checks all CEPT channels:

- *channel_test.tcl <Node ID#A> <NodeID#B>*
- E.g.: *channel_test.tcl 4 6*

In the second mode a single channel can be checked, with tighter control on the antennas that are used.

- *channel_test.tcl <Node ID#A> <NodeID#B> <Ant#A> <Ant#B> <CEPT Chan> <Power> <Len m> <Up Time>*
- E.g.: *channel_test.tcl 4 6 4 4 10 0 11 30*

The test has passed if a link has been established and runs error free for the test "Up Time". The results of the test are stored in the following directory:

- `"/home/sl/projects/nodos_v2/nodos/nodos_test/factory/results"`

And the file names have the following format for full tests and single channel tests:

- `channel_test_<NodeID#A>_<NodeID#B>_<YYY>_<MM>_<DD>_<HH>_<MM>_<SS>`
- `node_test_<NodeID#A>_<NodeID#B>_<YYY>_<MM>_<DD>_<HH>_<MM>_<SS>`

The script assumes that the IP address for a node is 173.31.3.2xx, where xx is the node ID of the node.

4.3 Hyper-Terminal Scripts

To set-up ATM traffic you need to configure Hyper-Terminal with the following settings:

- Speed: 9600
- Data Bits: 8
- Parity: None
- Stop: 1
- Flow Control: None

The following test files are issued to the nodes using the "/Transfer/Send Text File" command:

- C:\atm_tests\ATM_Link(A).txt
- C:\atm_tests\ATM_Link(B).txt

At a future date, we will use SNMP scripts to set-up ATM cell routing.

4.4 Useful Commands

These commands are used in the Modem HyperTerminal as described below

- zjg: displays Tx and Rx attenuator settings. Toggles On/Off. In NC H.T., use the command >modem_cmd zjg.
- int: Sets Tx attenuator settings to manual /automatic. Toggles On/Off.
- inr: Sets Rx attenuator settings to manual /automatic. Toggles On/Off.
- igt <x> <y>: Sets manual Tx attenuator setting to values x and y. These values can be indexed on the IFP Attenuator Lookup table.
- igr <x> <y>: Sets manual Rx attenuator setting to values x and y. These values can be indexed on the IFP Attenuator Lookup table.
- mi<x>: Reads RF detector voltage in TRM and displays it as a hexadecimal number after PA.
- gs: Stands for GPS Status. Toggles On/Off.
- am<x><y>: Antenna move where x is the antenna number (0 to 3), and y is the number of degrees in the follow format: 279.00 Note: No spaces in this command.
- v: Returns modem software version number.

These commands are used in the NC HyperTerminal as described below

- version: Returns node controller software version number.

5 Test Procedure

5.1 Connections

Connect UUT as follows:

GPS:	Connect GPS cable on top of the stack to the available GPS connector.
ATM155:	Connect the optical cables to the daughter board on the NC board, which can be accessed through the patch panel at the bottom of the ODU.
ATM25:	Connect network cable to short female network socket.
Modem debug:	Connect RS232
NC debug:	Connect 20-way Molex.
Split connector:	Female is Ethernet – needed for MIB browser and scripts for link formation.
	Male is Craft terminal for Dial-up access test.
Round connector:	Connect to observe bursts on oscilloscope.
Power:	Connect to appropriate connector on bottom of UUT.

5.2 Power up

Power ODU up from UPS. Use the MIB Browser to poll for NODOS start (just use 'contact node, which reads sysUpTime). NB: Make sure the node boots from Flash and not Ethernet.

Ensure that the UUT boots up from Flash as opposed to Ethernet. If this is not the case, hold down the spacebar in the NC debug HyperTerminal until the cursor responds to the spacebar. Hit Enter and type in "configeeprom serialboot no". Cycle the power on the UUT and check that it boots up from Flash.

5.3 Node IP Addresses

Each node needs a valid IP address configuring for its Ethernet port.

***NOTE – if IP address has been previously entered, you only need to ping the UUT to check that you can communicate via Ethernet. You can run ping commands in Xterm or in the MIB browser. If, however, the IP address is not configured (as in the case of a new node), then you need to do this over NC debug terminal or PPP session as follows:

The node's IP address can be configured by sending the following commands on the NC debug port:

- home
- ip
- device flush
- device add Ethernet ether //edd 172.31.3.2<NodeId>
- route flush

- route add default 0.0.0.0 172.31.3.230 00:00:00:00
- home config save
- restart

The address of each node is assumed to be “172.31.3.200” ending with the nodes Identity. Thus node#4 has address “172.31.3.204”.

5.4 Open log file

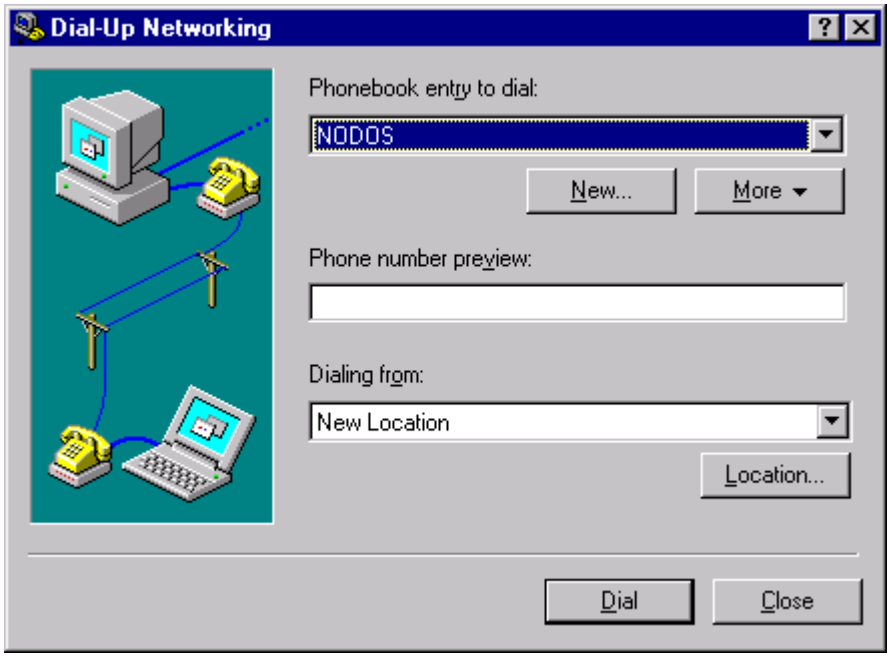
Open a Word or text file and save it with the number of the node under test. Log files of previous nodes can be found in: K:\Engineering\Departments\Sitar\Test Nodes\

Keep the file open during the test sequence and takes records as indicated.

5.5 Craft UART check

As we’ve been using Ethernet for the MIB browser, we need to do a quick check of the Craft UART. (Could perhaps use Craft for all MIB Browsing)

Bring up the Dial-up Networking screen:



Select NODOS and click on “Dial”. A smaller screen with four indicators appears. Make sure that the CD one is lit green. Set up a PPP “dial-up”. Ping the ODU from a DOS box. Password: radiant.

5.6 Inventory Check

This checks the I2C is working and gives a record of the build level. Use a MIB Browser (MG-SOFT) over Ethernet to read the Inventory MIBs.

In the MIB browser, type in the UUT's IP address in the remote SMNP agent box. E.g 172.31.3.215 where the last two numbers reflect the node's ID – in this case 15.

5.6.1 Hardware Inventory

Move down the directory structure until you find **InvHardwareComponentEntries**. Right click on the folder and choose **"Walk"** which will show a list of the node's constituents. Check that all boards are accounted for and copy the information to the appropriate block in the Log file as shown in this example:

```
Instance  invHardwareIndex(IDX)  invHardwareDescription                          invHardwareStatus
--------- ---------------------- ------------------------------------------------ ------------------
4         4                      770800-F-1 ODU Mother Board  VF.1 Serial 000011      hwOk(1)
5         5                      770900-A- 0 ODU Modem Board  VA. 0 Serial 000008     hwOk(1)
6         6                      770700- D- 0 ODU Power Supply  V D. 0 Serial 000001  hwOk(1)
9         9                      881020- D- 0 ODU TR Module  V D. 0 Serial 000020     hwFaulty(2)
```

This example is FAULTY as there should be two TRM entries and entries for the two synth boards.

5.6.2 Software Inventory

Find **InvSoftwareComponentEntries**. Right click on the folder and choose **"Walk"** which will show the version number of the node's software. Check that this is the correct software and copy the information to the appropriate block in the Log file as shown in this example:

```
Instance  invSoftwareIndex(IDX)  invSoftwareDescription                                                    invSoftwareStatus
--------- ---------------------- ------------------------------------------------------------------------- ------------------
3         swNpPpImageBankA(3)    odu_40010039_01_01_00.rnb - Radiant ODU Application S/W Version 1.1 (0)  swCrcOkRunning(3)
4         swNpPpImageBankB(4)    No file downloaded.                                                       swEmpty(1)
```

5.6.3 Environment Temperature sensors check

This checks the I2C is working and the temp sensors are working – take these readings while the node is transmitting, i.e. at normal operating temperature.

Find the **EnvironmentTemperatureEntry** folder in the Radio Group directory. **"Walk"** the folder and click on Tools to select **"Table View"**. Click on **Mirror** and then right click on the table to copy its contents (right click, copy or Ctrl-C). Now go to the log file and paste into the appropriate block.

5.6.4 GPS check

Find the **gpsCurrentConfig** folder in the Radio Group directory. Right click on the folder and choose **"Walk"** which will display the relevant GPS information. Check that this is correct and copy the information to the appropriate block in the Log file.

5.6.5 Channel Quality check

Find the **ConfigStatus** (TBC) folder in the Radio Group directory. Right click on the folder and choose **"Walk"** which will display the relevant Channel Status information. Check that this is correct and copy the information to the appropriate block in the Log file.

5.7 VCO Lock Check

While the UUT initializes, check the Modem HyperTerminal for the message stating how long it has taken for the VCO to lock. Enter this value in the log file. (read sysUpTime)

5.8 Link formation Test

Once the unit has initialized, type "modem" <- in the NC H-T.

Then type"info".

Check that timing OK is set to "1" and that CES is also "1".

Xterm: Run *config_node.tcl <node2> <CEPT channel>* script

Run *clear_all.tcl <node1>* script.

Run *clear_all.tcl <node2>* script.

Run *channel_test.tcl <nodeID1> <nodeID2> <ant1> <ant2> <channel> <power> <length> <uptime>* script.

Check the burst pattern and check that "*TRAP*" has appeared in the NC debug HyperTerminal.

5.9 Per-Antenna Link Formation & ATM test

This checks that a link can be formed using each antenna and that ATM traffic can be passed OK, proving both ATM25 and ATM155 interfaces. This will also be enhanced to characterise TX power & Rx sensitivity

Run *Channel_test.tcl <nodeID1> <nodeID2> <ant1> <ant2> <channel> <power> <length> <uptime>* script.

Repeat for all four antennas i.e. set **ant1** and **ant 2** to 1, 2, etc.

Note: Always send *clear_all.tcl* command when changing link channels. <<Tcl scripts to be provided>>

For any one of these per-antenna link formations, the following tests must be performed:

5.9.1 Rx Power Levels

To record Tx and Rx attenuator settings, type "zjg" in the relevant Modem HyperTerminal. The Tx attenuator settings are nominally set to 9 and 1 (Check this by looking at the responses to the "zjg"command). By checking the Golden Node (No.10) Rx levels, we are proving that the UUT's Tx is OK and by checking the UUT's Rx levels, its receiver.

<<Tcl scripts to be provided>>

5.9.2 ATM 155

Ensure that the node has a fibre interface daughter board plugged into the node controller. With this interface connected to a termination unit, check that a link can be made and that no errors occur.

5.9.3 ATM 25

This feature is verified using the TTC 750E ATM Testset. Check that a link can be made and that no errors occur.

5.9.4 Tx Power Levels

To record Tx and Rx attenuator settings, type "zjg" in the relevant Modem HyperTerminal. The Tx attenuator settings are nominally set to 9 and 1 (Check this by looking at the responses to the "zjg"command).

Set the Tx to 9 1 (equivalent to 34dB). Record the Rx attenuator settings of the Golden Node as well as the hex value of the TRM detector voltage. To do this type "mi0" in the UUT's modem HyperTerminal which recalls four sets of hexadecimal numbers. The second reading, prefixed PA, is the value to be recorded.

Now set the Tx attenuator to 11 3 (equivalent to 24dB). Record the Rx and hexadecimal values.

Repeat this process for Tx values 17 7 and 22 7 which reduces the Tx attenuation by 10dB for each step. Make sure that the TRM voltage reaches a high enough level, according to Wies's spreadsheet, so that the UUT will have enough range.

<<Tcl scripts to be provided>>

5.10 Full Channel Check

This checks that all RF channels are OK across both TRMs.

Using Xterm, run *Chan2_test.tcl <node1> <node2>* script to check all channels through lower TRM.

Run *Chan3_test.tcl <node1> <node2>* script to check all channels through upper TRM.

<<Tcl scripts to be provided>>

5.11 Documentation

Close log file and create a delivery note for the node that you have finished testing. Delivery notes for previous nodes can be found in K:\Engineering\Projects\System Release\ODU Release\.

6 Test Results (Ambient Temp.)

A typical test report is shown in the Appendix, section 7.2.

7 Appendix

7.1 Test Equipment List

Make	MODEL	Serial Number	Description	Calibration Date

7.2 Example of Test Results

MIB Inventories

Hardware

```
***** SNMP QUERY STARTED *****
1: invHardwareIndex.4 (integer) 4
2: invHardwareIndex.5 (integer) 5
3: invHardwareIndex.7 (integer) 7
4: invHardwareIndex.8 (integer) 8
5: invHardwareIndex.9 (integer) 9
6: invHardwareIndex.10 (integer) 10
7: invHardwareDescription.4 (octet string) 770800-0J-01 ODU Mother Board  V0J.01 Serial 0000001308
8: invHardwareDescription.5 (octet string) 770900-0G-01 ODU Modem Board  V0G.01 Serial 0000001492
9: invHardwareDescription.7 (octet string) 770600- P-00 ODU IF Processor Board  V P.00 Serial 001517
10: invHardwareDescription.8 (octet string) 770500- R-00 ODU IF Synthesiser Board  V R.00 Serial 001535
11: invHardwareDescription.9 (octet string) 881020- 1- 0 ODU TR Module  V 1. 0 Serial 200083
12: invHardwareDescription.10 (octet string) 881060- 1- 0 ODU TR Module  V 1. 0 Serial 200072
13: invHardwareStatus.4 (integer) hwOk(1)
14: invHardwareStatus.5 (integer) hwOk(1)
15: invHardwareStatus.7 (integer) hwFaulty(2)
16: invHardwareStatus.8 (integer) hwFaulty(2)
17: invHardwareStatus.9 (integer) hwFaulty(2)
18: invHardwareStatus.10 (integer) hwFaulty(2)
***** SNMP QUERY FINISHED *****
```

Software

```
***** SNMP QUERY STARTED *****
1: invSoftwareIndex.3 (integer) swNpPpImageBankA(3)
2: invSoftwareIndex.4 (integer) swNpPpImageBankB(4)
3: invSoftwareDescription.3 (octet string) odu_40010031_01_04_03.rnb - Radiant ODU Application S/W Version 1.4 (3)
4: invSoftwareDescription.4 (octet string) No file downloaded.
5: invSoftwareStatus.3 (integer) swCrcOkRunning(3)
6: invSoftwareStatus.4 (integer) swEmpty(1)
***** SNMP QUERY FINISHED *****
```

Temperature

Air Temperature +18C

Instance	environmentTemperatureSensorID(IDX)	environmentTemperatureSensorDescription	environmentTemperatureNow	environmentTemperatureLowest	environmentTemperatureLowThreshold	environmentTemperatureHighest	environmentTemperatureHighThreshold
1	Not available	EPC LM83	35	25	0	35	75
2	Not available	EPC Ext1	32	22	0	32	75
3	Not available	NSC LM83	32	22	0	32	75
4	Not available	NSC Ext2	40	31	0	41	75
5	Not available	Modem LM83	35	25	0	36	75
6	Not available	Modem Ext1	45	31	0	45	75
7	Not available	IF#1 LM83	32	23	0	32	75
8	Not available	IF#2 LM83	33	24	0	33	75
9	Not available	TRM#1 LM83	34	26	0	35	75
10	Not available	TRM#1 Ext1	32	24	0	32	75
11	Not available	TRM#2 LM83	34	26	0	35	75
12	Not available	TRM#2 Ext1	32	24	0	32	75

GPS

```
***** SNMP QUERY STARTED *****
1: gpsCurrStatus.0 (integer) gpsOperational(3)
2: gpsCurrLongitude.0 (integer) 23851
3: gpsCurrLatitude.0 (integer) 5205433
4: gpsCurrElevation.0 (integer) 158
5: gpsOverDetermined.0 (integer) 0
6: gpsCurrQuality.0 (integer) 2814
7: gpsCurrErrorWord1.0 (integer) 134418719
8: gpsCurrErrorWord2.0 (integer) 1
9: gpsCurrNumSatellites.0 (integer) 8
***** SNMP QUERY FINISHED *****
```

MIB Inventories

VCO: Locked after 198 seconds.

Link Formations: OK

Channel test OK: Channels 9 –26 and 42-58

RF LEVELS

TX Attenuator Settings: 9 1

Antenna	Node 41 Levels	UUT Levels:
1	42dB	42dB
2	40dB	40dB
3	38dB	42dB
4	40dB	43dB

TRM LEVELS

Lower TRM

Tx Settings	Attenuation (dB)	Node 10 Rx Levels	Hexadecimal PA Value:
9 1	34		
11 3	24		
17 7	14		
22 7	9		

Upper TRM

Tx Settings	Attenuation (dB)	Node 10 Rx Levels	Hexadecimal PA Value:
9 1	34		
11 3	24		
17 7	14		
22 7	9		

End Of Document.